ComAp
The heart of smart control

# InteliGen4 200

## Controller for multiple gen-set applications

SW version 2.1.0


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Global Guide

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## 1.1 Clarification of Notation

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

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

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

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

## 1.2 About this Global Guide

This manual contains important instructions for InteliGen4 200 family controllers which must be followed during installation and maintenance of the controllers.

This manual provides general information how to install and operate InteliGen4 200 controllers.

This manual is dedicated for:

- Operators of Gen-sets
- Gen-set control panel builders
- Anyone who is involved with the installation, operation and maintenance of the Gen-set

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

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

**Warning:** 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.

### 1.3.1 General security recommendations and set of measures

1. Production mode
   - Disable production mode BEFORE the controller is put into regular operation.
2. User accounts
   - Change password for the existing default administrator account or replace that account with a completely new one BEFORE the controller is put into regular operation mode.
   - Do not leave PC tools (e.g. InteliConfig) unattended while a user, especially administrator, is logged in.
3. AirGate Key
   - Change the AirGate Key BEFORE the device is connected to the network.
   - Use a secure AirGate Key – preferably a random string of 8 characters containing lowercase,

uppercase letters and digits.

- Use a different AirGate Key for each device.

4. MODBUS/TCP
   - The MODBUS/TCP protocol (port TCP/502) is an instrumentation protocol designed to exchange data between locally connected devices like sensors, I/O modules, controllers etc. By it's nature it does not contain any kind of security – neither encryption nor authentication. Thus it is intended to be used only in closed private network infrastructures.
   - Avoid using MODBUS/TCP in unprotected networks (e.g. Internet).
5. SNMP
   - The SNMP protocol (port UDP/161) version 1 and version 2 are not encrypted. They are intended to be used only in closed private network infrastructures.
   - Avoid using SNMP v1 and v2 in unprotected networks (e.g. Internet).

### 1.3.2 Used open source software

| Name of software | License name | License condition web address |
|---|---|---|
| **Mbed TLS** | Apache 2.0 | license |
| **Aladin MD5** | Zlib | license |
| **EmbOS** | Segger License Agreement v. 150515 | license |
| **emFile** | Segger License Agreement | license |
| **emUSB Device** | Segger License Agreement | license |
| **emUSB-Host** | Segger License Agreement | license |
| **Tiny Mersenne Twister (tinymt32)** | BSD 3 | license |

## 1.4 General warnings

### 1.4.1 Remote control and programming

Controller can be controlled remotely. In the event that maintenance of a Gen-set needs to be done, or the controller must be programmed, check the following points to ensure that the engine cannot be started or any other parts of the system cannot be affected.

Make sure:

- Disconnect remote control
- Disconnect binary outputs

### 1.4.2 SW and HW versions compatibility

SW version 2.x.x is not compatible with the InteliGen 200 and it is not possible to upload the FW to the controller. At the same time, older SW versions 1.x.x are not compatible with InteliGen 4 200.

### 1.4.3 Dangerous voltage

Under no circumstances should you touch the terminals for voltage and current measurement!

Always connect grounding terminals!

Under no circumstances should you disconnect controller CT terminals!



### 1.4.4 Adjusting the setpoints

All parameters are adjusted to their typical values. However the setpoints must be checked and adjusted to their real values before the first use of the Gen-set.

**IMPORTANT: Wrong adjustment of setpoints can destroy the Gen-set.**

***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 a 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.

## 1.5 Functions and protections

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

| Description | ANSI code | Description | ANSI code |
|---|---|---|---|
| **Master unit** | 1 | **Voltage unbalance** | 47 |
| **Stopping device** | 5 | **Incomplete sequence relay** | 48 |
| **Multi-function device** | 11 | **Overcurrent** | 50/50TD |
| **Overspeed** | 12 | **Earth fault** | 50G |
| **Underspeed** | 14 | **Breaker failure** | 50BF |
| **Speed & frequency matching Device** | 15 | **Overcurrent IDMT** | 51 |
| **Starting-to-running transition contactor** | 19 | **Overvoltage** | 59 |
| **Synchronizing-check** | 25 | **Aux Over Voltage** | 59X |
| **Thermal relay** | 26 | **Pressure switch** | 63 |
| **Undervoltage** | 27 | **Liquid level switch** | 71 |
| **Aux Battery Under Voltage** | 27X | **Alarm relay**** | 74 |
| **Annunciator** | 30 | **Vector shift** | 78 |
| **Overload (real power)** | 32P | **Reclosing relay** | 79 |
| **Reverse power** | 32R | **Overfrequency** | 81O |
| **Master sequence device** | 34 | **Underfrequency** | 81U |
| **Excitation loss** | 40 | **ROCOF** | 81R |
| **Unit sequence starting *** | 44 | **Auto selective control/transfer** | 83 |
| **Current unbalance** | 46 | | |

*MINT ** extension module IGL-RA15 required

# 1.6 Certifications and standards

| | | | |
|---|---|---|---|
| EN 61000-6-2<br>EN 61000-6-4<br>EN 61010-1<br>EN 60068-2-1 (-20 °C/16 h)<br>EN 60068-2-2 (70 °C/16 h) | EN 60068-2-6 (2÷25 Hz / ±1,6 mm; 25÷100 Hz / 4.0 g)<br>EN 60068-2-27 (a=500 m/s$^2$; T=6 ms)<br>EN 60068-2-30:2005 25/55°C, RH 95%, 48hours<br>EN 60529 (front panel IP65, back side IP20)<br>UL 6200 | c UL us LISTED<br>CE | EAC<br>UK CA |

| **Supplier's Declaration of Conformity**<br>**47 CFR § 2.1077 Compliance Information** |
|---|
| |
| **Unique identifier:** IG4200XXBAA, IG4200XXBLA |
| |
| **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**<br>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. |

# 1.7 Document history

| Revision number | Related sw. version | Date | Author |
|---|---|---|---|
| 2 | 2.1.0 | 15.3.2023 | Čeněk Pěč |
| 1 | 2.0.0 | 28.2.2022 | Čeněk Pěč |

# 1.8 Symbols in this manual

- 3 x Phases
- Active current sensor
- AirGate
- Alternating current
- Analog modem
- Battery
- Binary output
- Breaker contact
- Breaker contact
- Breaker
- Breaker
- Breaker
- Capacitor
- Coil
- Connector - female
- Connector - male
- Contact
- Contactor
- Controller simplified
- Module simplified
- Current measuring
- Current measuring
- Diode
- Ethernet male
- Ethernet female
- Fuel solenoid
- Fuse
- Fuse switch
- Generator
- Generator schematic
- Grounding
- GSM
- GSM modem
- Jumper
- Load
- Mains
- Mains
- Mobile provider
- Passive current sensor
- Pick - up
- Relay coil
- Relay coil of slow-operating
- Resistor
- Resistor adjustable
- Resistive sensor RPTC
- RS 232 male
- RS 232 female
- Starter
- Switch - manually operated
- Transformer
- USB type B male
- USB type B female
- Voltage measuring
- Wi-fi / WAN / LAN

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# 2 System overview

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## 2.1 General description

InteliGen4 200 is a new generation control unit for simple paralleling stand-by (SPtM) and back-up (MINT) applications. It supports remote communication capabilities, high security standards and additional degree of flexibility thanks to the PLC blocks and new possibilities in the configuration providing a perfect solution for various applications.

### 2.1.1 The key features of InteliGen4 200

- Two applications in one hardware (SPtM, MINT)
- Easy-to-use operation and installation & system configurability
- Integrated communication and control ports (USB/CAN/RS485, AVRi)
- System extendability by plug-in and CAN modules
- Remote communication support
- Compatible Load/VAr Sharing & Power Management with InteliCompact and InteliGen family controllers (IC-NT, IG200/500/1000 and IGS-NT)
- Stage V and Tier 4 Final requirements ready
- High reliability

## 2.2 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.

## 2.3 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.

## 2.3.1 Supported configuration and monitoring tools

- InteliConfig – complete configuration and single or multiple Gen-sets monitoring
- WebSupervisor – web-based system for monitoring and controlling
  - WebSupervisor mobile – supporting application for smart-phones
- WinScope 1000 – special graphical monitoring software
- InteliSCADA – monitoring and management of ComAp devices

***Note:*** *Use the InteliConfig PC software to read, view and modify configuration from the controller or disk and write the new configuration to the controller or disk.*

The firmware of the controller contains a large number of logical binary inputs and outputs needed for all necessary functions available. However, not all functions are required at the same time on the same Gen-set; 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.

## 2.3.2 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
- Assigning sensor characteristics (curves) and alarms to analog inputs
- Selection of peripheral modules, which are connected to the controller, and performing the same functions (as mentioned above) for them
- Selection of ECU type, if an ECU is connected
- Changing the language of the controller interface

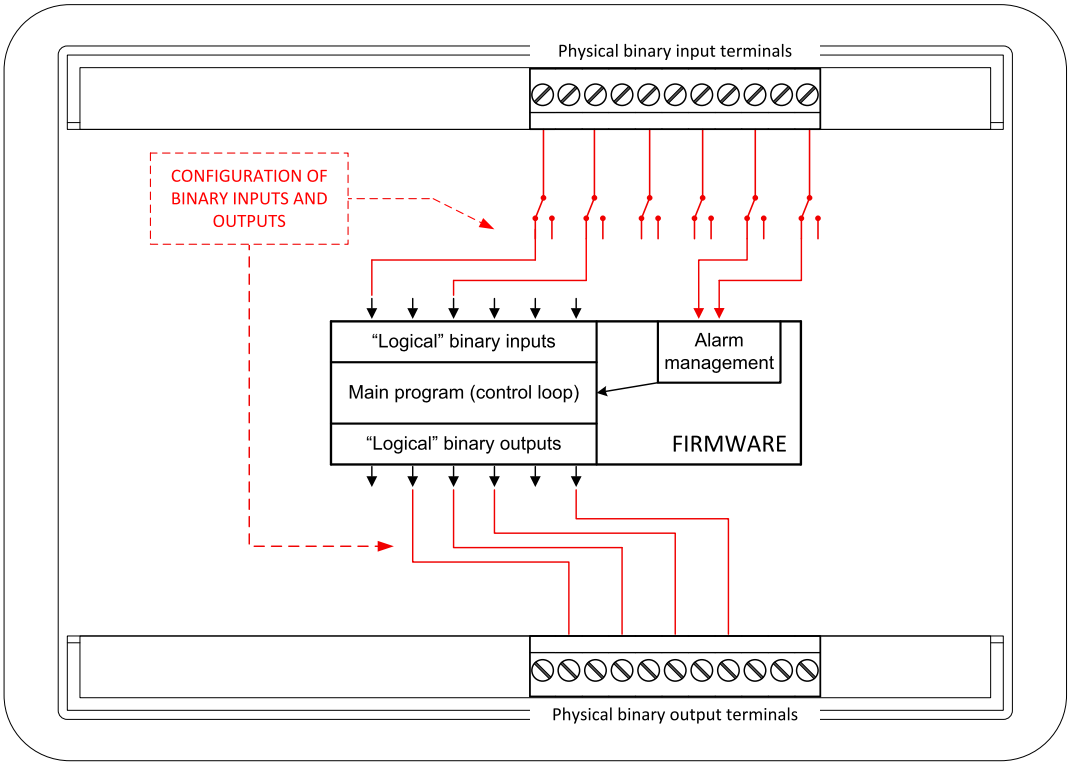



Image 2.1 Principle of binary inputs and outputs configuration

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

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

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

# 2.4 PC Tools

## 2.4.1 InteliConfig

Configuration and monitoring tool for various ComAp controllers. See more in InteliConfig Reference Guide.

**This tool provides the following functions:**

- Direct or internet communication with the controller
- Offline or online controller configuration
- Controller firmware upgrade
- Reading/writing/adjustment of setpoints
- Reading of measured values
- Browsing of controller history records
- Exporting data into an XLS file
- Controller language translation

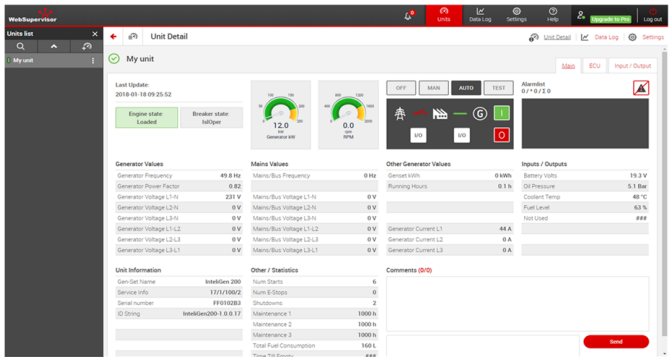



## 2.4.2 WebSupervisor

Web-based system for monitoring and controlling of controllers. See more at the WebSupervisor webpage.

**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:

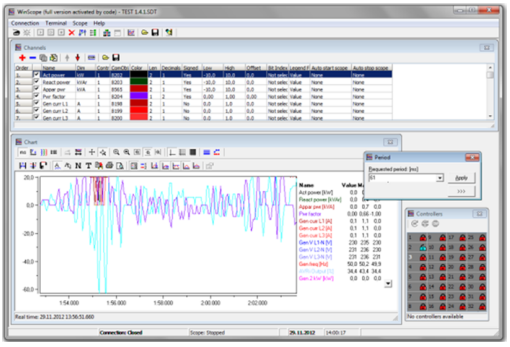
- Login: comaptest
- Password: ComAp123

## 2.4.3 WinScope 1000

Special graphical controller monitoring software used mainly for commissioning and Gen-set troubleshooting. See more in the WinScope 1000 Reference guide.

**This tool provides the following functions:**

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



## 2.4.4 InteliSCADA

InteliSCADA is a Windows based software with modern look and feel that has been developed with current web technologies. See more in the InteliSCADA Global guide.

**This tool provides the following functions:**

- Basic SCADA in a few minutes (auto-generated SCADA)
- Broad range of instruments with easy and fast configuration
- Fully customizable SCADA diagram
- Browsing of all measured and computed values
- More than 200 images available
- Browsing of controllers' history records
- Multimedia support (IP cam, video, animated images, map, …)
- Industrial security level – sites are protected against stealing of controllers' credentials
- Support of new controllers as well as old important ones
- Simple and less time-consuming SCADA creation
- Modern look and feel
- Reliability

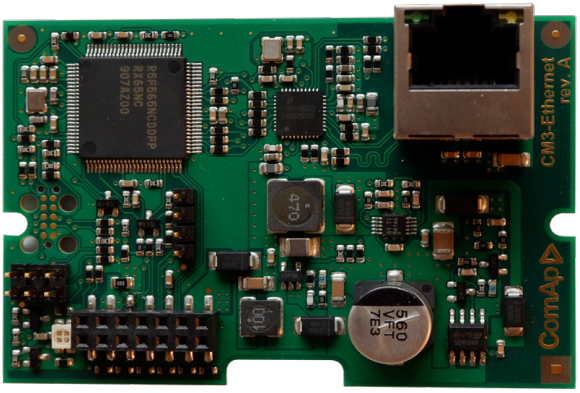


# 2.5 Plug-in Modules

## 2.5.1 CM3-Ethernet

Internet/Ethernet module.

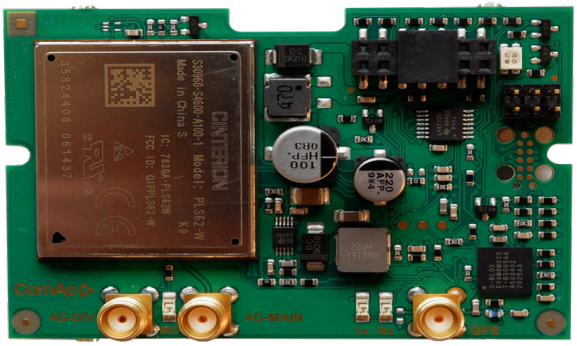
- 10/100 Mbit interface over RJ45 socket
- Remote control and monitoring of the controller via InteliConfig, WebSupervisor
- Modbus TCP support
- Full SNMP support including traps (v1 & v2c)
- Active e-mail sending
- AirGate 2.0 technology support for easy connection – no need of public and static IP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




## 2.5.2 CM2-4G-GPS

GSM/4G module

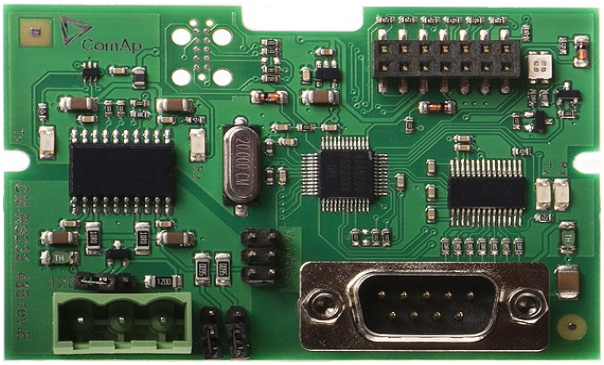
- GSM/4G Internet module and GPS locator
- Global 4G (LTE) module with 3G/2G backup
- Remote control and monitoring of the controller via InteliConfig, WebSupervisor
- Active e-mail and SMS support
- AirGate 2 technology support for easy connection – no need of public and static IP address
- Tracking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




## 2.5.3 CM-RS232-485

Communication module with two communication ports.

- RS232 and RS485 interface
- Modbus RTU support
- Serial connection to InteliConfig

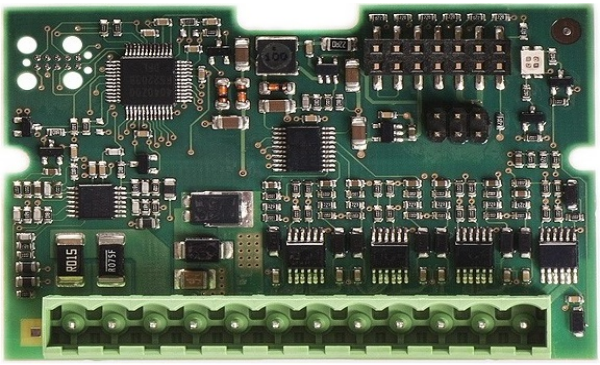


### 2.5.4 EM-BIO8-EFCP

Hybrid current input and binary input/output extension module.

- One additional AC current (CT) measuring for Earth Fault Current protection (EFCP)
- Wide range of measured current – one input for 1 A and 1 input for 5 A
- Up to 8 additional configurable binary inputs or outputs

***Note:*** *This protection is active ONLY when Engine is running.*



# 2.6 CAN modules

## 2.6.1 Inteli IO8/8

The unit offers the user the flexibility 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.

**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 (0-10 V), current (0-20 mA) and PWM (5 V, adjustable frequency 200 Hz-2.4 kHz))

**Configuration 16/0**

- 16 Binary inputs (options: pull up or pull down logic)
- 0 Binary outputs
- 2 Analog outputs (options: voltage (0-10 V), current (0-20 mA) and PWM (5 V, adjustable frequency 200 Hz-2.4 kHz))



## 2.6.2 Inteli AIN8

The unit offers the user the flexibility to configure the unit to have 8 analog inputs.

**Supported sensors:**

- Resistor 3-wire input
  - Common resistor: 0-250 Ω, 0-2400 Ω, 0-10 kΩ
  - Temperature sensor: Pt100, Pt1000, Ni100, Ni1000
- Current (active or passive sensors)
  - ±20 mA, 0-20 mA, 4-20 mA
- Voltage
  - ±1 V, 0-2.4 V, 0-5 V, 0-10 V
  - Lambda probes
  - Thermocouples are not supported (the measuring loop was designed for lambda probes, which caused non-support of thermocouples)




**Impulse/RPM sensor:**

- RPM measuring pulses with frequency 4 Hz-10 kHz
- Impulse
  - Possibility to measure pulses from electrometer, flowmeter (measurement of total consumption, average fuel consumption)

## 2.6.3 Inteli AIN8TC

8 Analog Channels Module. The unit offers flexibility to configure 8 thermocouple inputs.

- 8 analog input channels for measuring temperature by thermocouples



## 2.6.4 Inteli AIO9/1

9 Analog Inputs and 1 Analog Output Module

- 4× differential voltage inputs for measurement in range of 0 – 65 V or -65 – 0 V
- 4× shielded, galvanically separated ±75 mV inputs
- Resistance analog input 0-2500 Ω
- One analog output




## 2.6.5 Inteli AOUT8

The unit offers the user the flexibility to configure the unit to have 8 analog outputs via switches inside the controller.

- 8 configurable analog outputs

Outputs are configurable to:

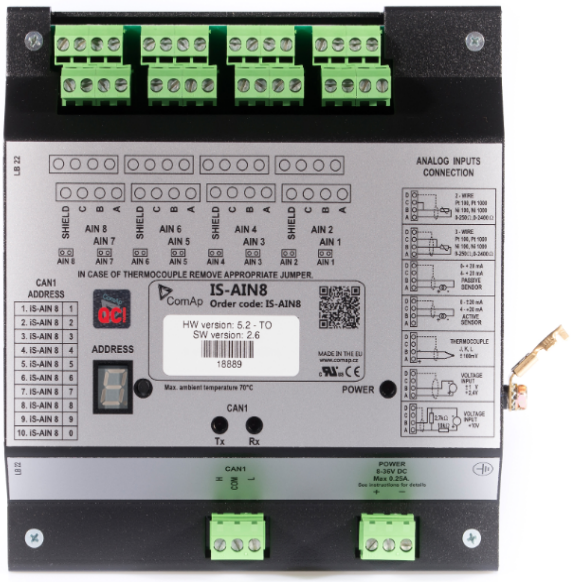
- 0-10 V DC or
- 0/4-20 mA range or
- 1200 Hz PWM
- Up to four I-AOUT8 can be connected to one controller
- UL certified



## 2.6.6 InteliSys AIN8

The unit offers the user the flexibility to configure the unit to have 8 analog inputs via switches inside the controller.

- Configurable 8 analog inputs
- Precision of inputs is 1%
- Accept 2/3 wire resistive, current, voltage sensors
- Predefined sensor (Pt100, Pt1000, Ni100, Ni1000, thermocouple type J/K/L, 0-20 mA, 0-10 V)
- Up to 10 IS-AIN8 can be connected to the controller
- UL certified




## 2.6.7 InteliSys BIN16/8

The unit offers the user the flexibility to configure the unit to have 16 binary inputs and 8 binary outputs via switches inside the controller.

- 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
- Up to 6 IS-BIN16/8 can be connected to the controller
- UL certified



## 2.6.8 IGS-PTM

The unit offers the user the flexibility to configure the unit to have 8 binary inputs, 8 binary outputs, 4 analog inputs and 1 analog outputs.

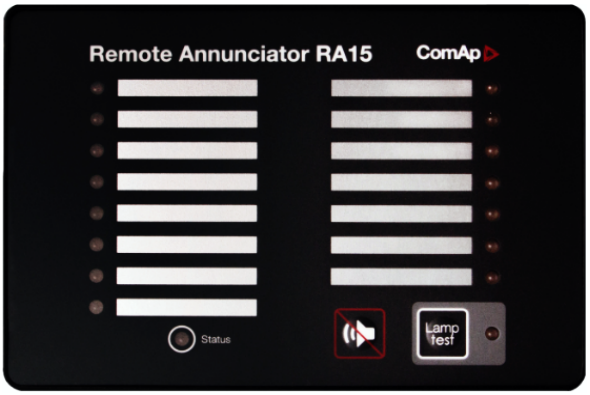
- Configurable 8 binary and 4 analog inputs
- Configurable 8 binary and 1 analog output
- LEDs indicate the state of binary inputs/outputs
- Measures values from Pt100 and Ni100 sensors
- Analog inputs (resistance range 0-250 Ω, voltage range 0-100 mV, current range 0-20 mA – selectable via jumper)
-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




## 2.6.9 IGL-RA15

Remote annunciator.

- 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




**back to System overview**

# 3 Applications overview

3.1 SPtM ..... 21
3.2 MINT ..... 22

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## 3.1 SPtM

The typical scheme of a single parallel to mains application is shown below. The controller controls two breakers – a mains breaker and a generator breaker. Feedback from both breakers is required.

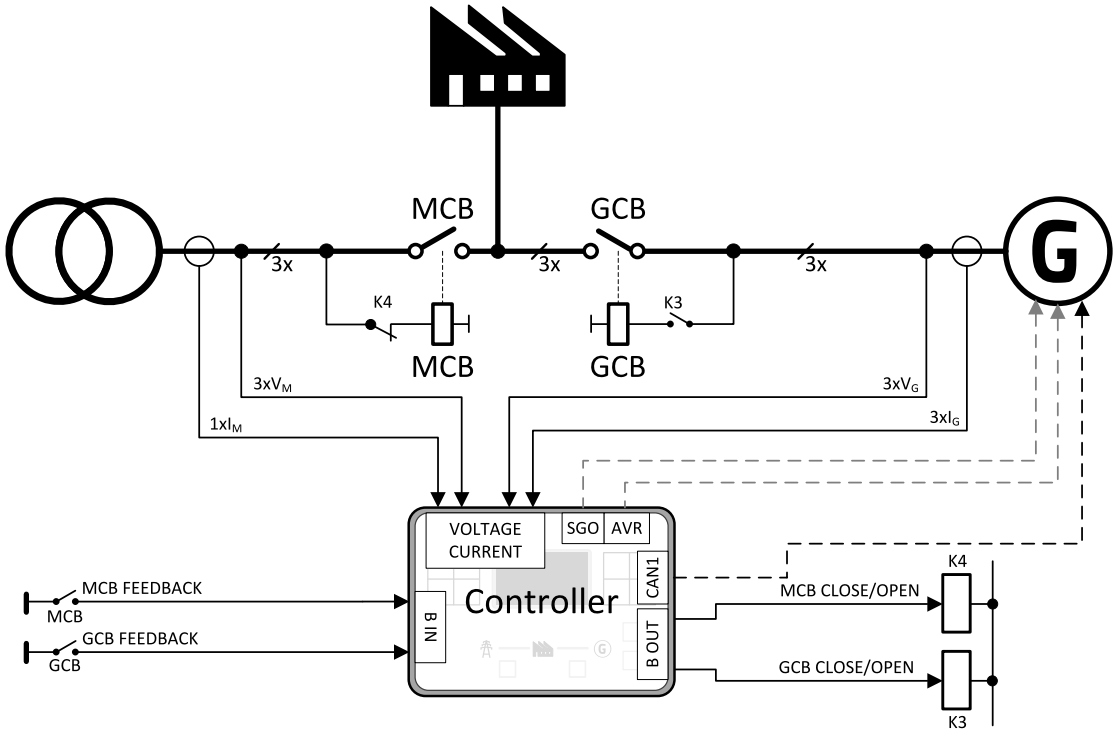



Image 3.1 Single parallel to mains application

# 3.2 MINT

The typical schemes of multiple island-parallel application without mains. The controller controls one breaker only, the generator breaker. Feedback from the generator breaker is required.

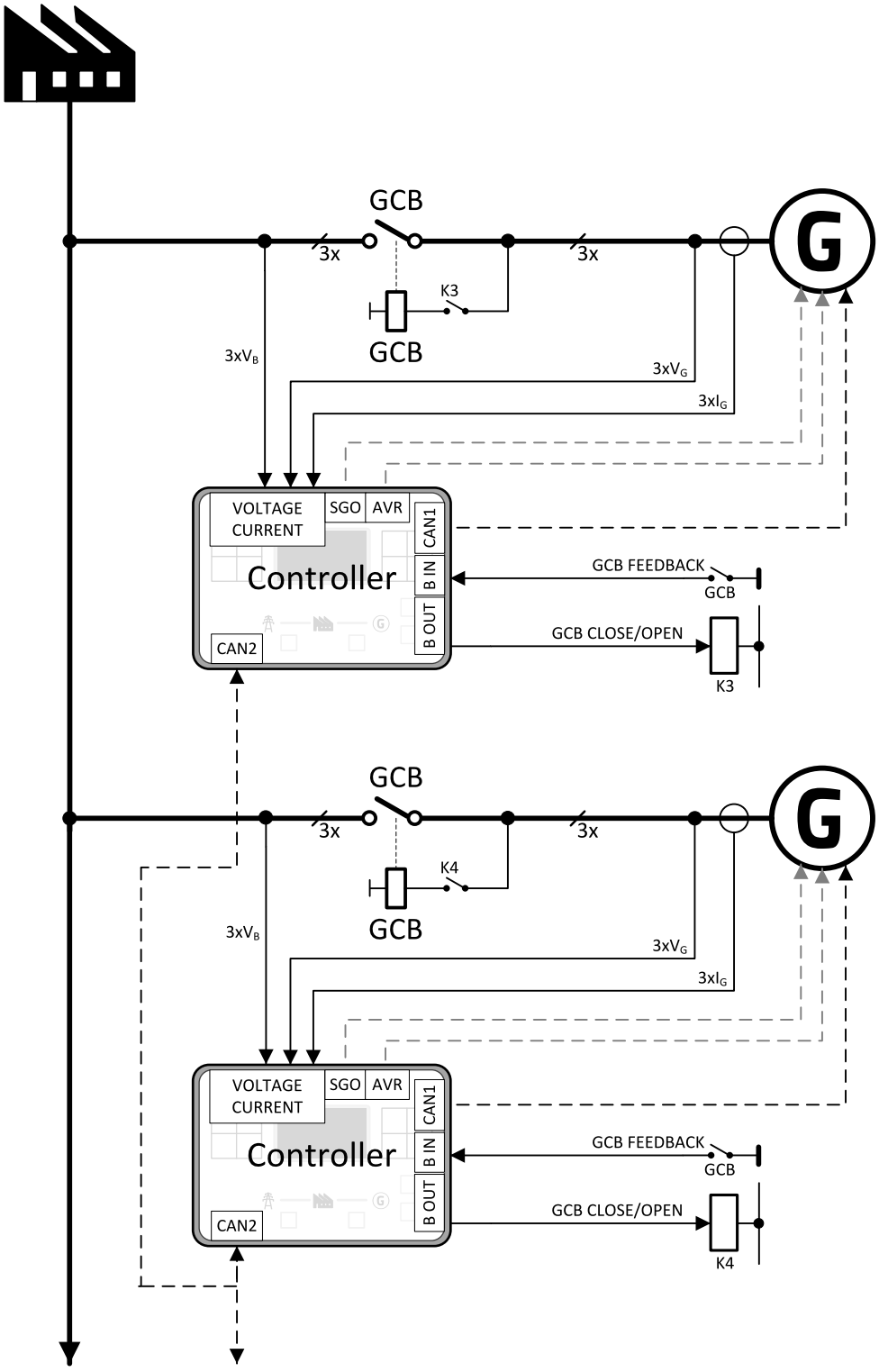



Image 3.2 Multiple island-parallel application without mains

back to Applications overview

# 4 Installation and wiring

4.1 Package content ..... 23
4.2 Controller installation ..... 23
4.3 Terminal Diagram ..... 25
4.4 Recommended wiring ..... 26
4.5 Plug-in module installation ..... 52
4.6 Maintenance ..... 54

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## 4.1 Package content

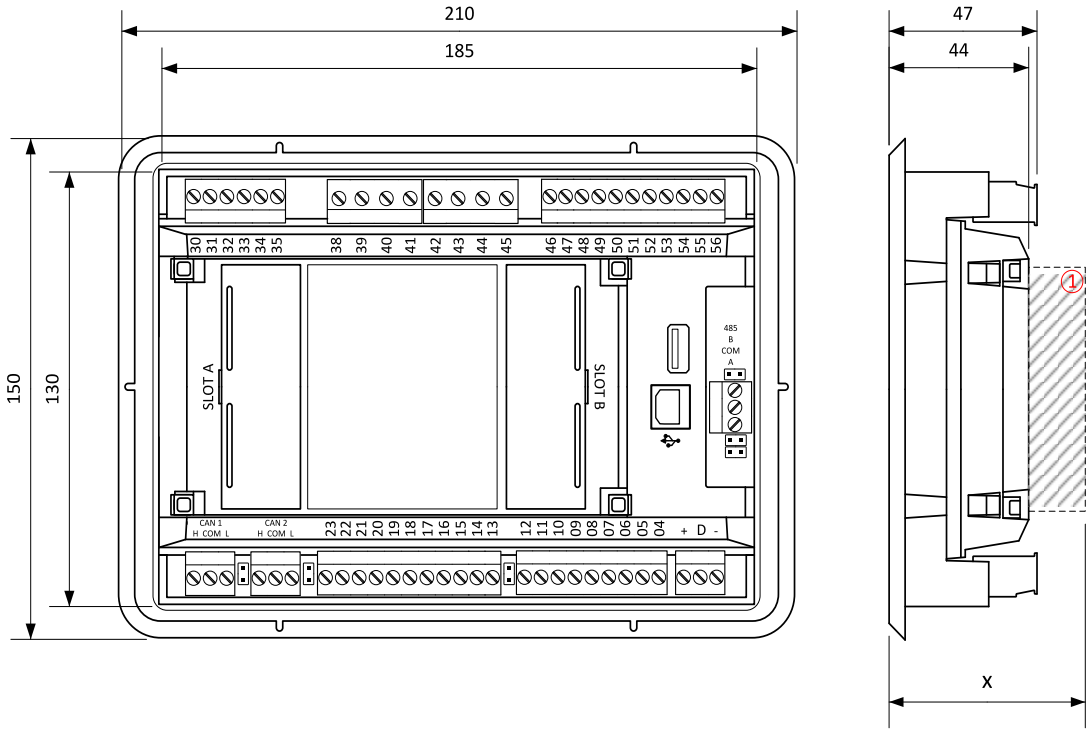
The package contains:

- Controller
- Mounting holders
- Terminal blocks

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

## 4.2 Controller installation

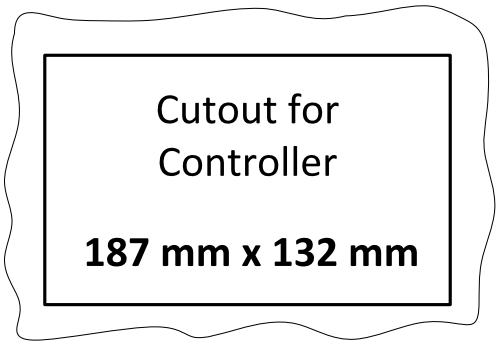
### 4.2.1 Dimensions




① Plug-in module

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

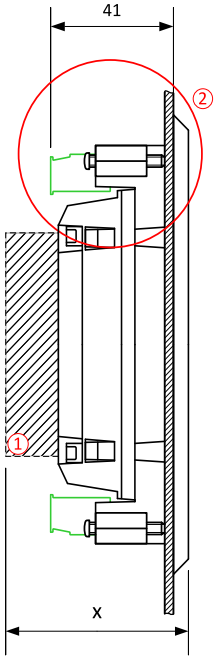
***Note:*** *Dimensions are in millimeters.*




## 4.2.2 Mounting

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

### Panel door mounting




***Note:*** *Enclosure Type rating with mounting instruction – For use on a Flat surface of a type 1 enclosure.*

# 4.3 Terminal Diagram

| ① GENERATOR CURRENT MEASUREMENT | | ② GENERATOR VOLTAGE MEASUREMENT | | ③ MAINS VOLTAGE MEASUREMENT | | ④ BINARY INPUTS | |
|---|---|---|---|---|---|---|---|
| T30 | COM | T38 | N | T42 | N | T46 | BI1 |
| T31 | L1 | T39 | L1 | T43 | L1 | T47 | BI2 |
| T32 | L2 | T40 | L2 | T44 | L2 | T48 | BI3 |
| T33 | L3 | T41 | L3 | T45 | L3 | T49 | BI4 |
| T34 | COM | | | | | T50 | BI5 |
| T35 | L1 | | | ⑤ AVR | | T51 | BI6 |
| | | | | T55 | COM | T52 | BI7 |
| | | | | T56 | OUT | T53 | BI8 |

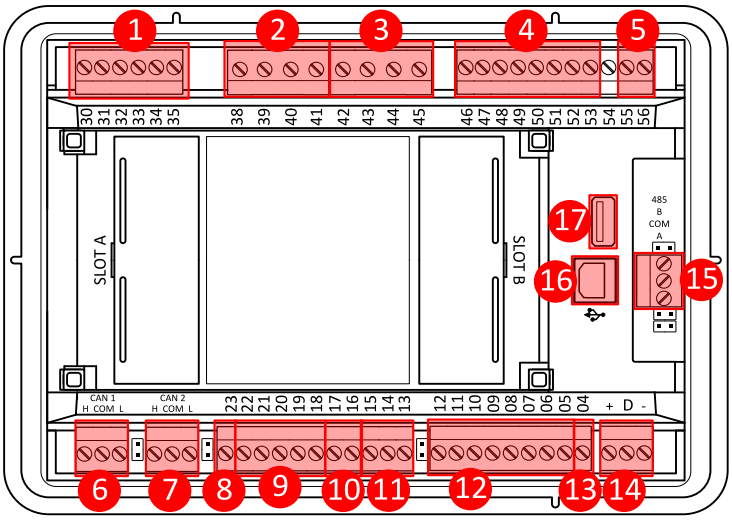
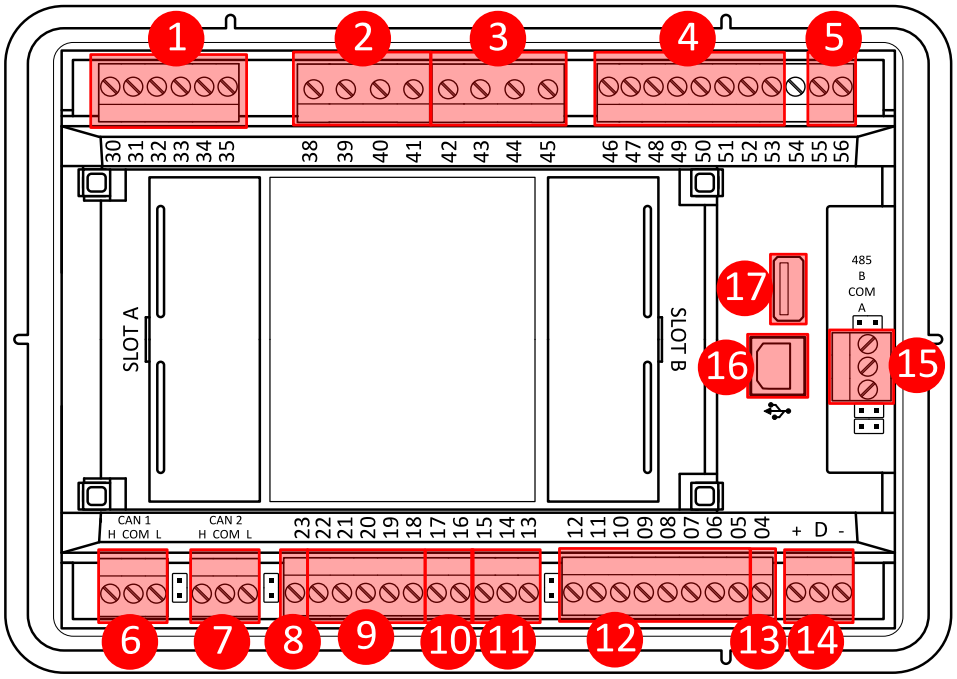



Image 4.1 Terminal diagram for InteliGen4 200

| ⑥ CAN1 | | ⑨ ANALOG INPUTS | | ⑫ BINARY OUTPUTS | | ⑭ POWER SUPPLY, D+ | |
|---|---|---|---|---|---|---|---|
| T29 | H | T22 | AI4 | T12 | BO8 | T01 | BATT - |
| T28 | COM | T21 | AI3 | T11 | BO7 | T02 | D+ |
| T27 | L | T20 | AI2 | T10 | BO6 | T03 | BATT + |
| ⑦ CAN2 | | T19 | AI1 | T09 | BO5 | ⑮ RS485 | |
| T26 | H | T18 | ACOM | T08 | BO4 | T56 | B |
| T25 | COM | ⑩ RPM | | T07 | BO3 | T57 | COM |
| T24 | L | T17 | RPM IN | T06 | BO2 | T58 | A |
| ⑧ +5 V | | T16 | RPM GND | T05 | BO1 | ⑯ USB | |
| T23 | +5 V | ⑪ SPEED GOVERNOR | | ⑬ E-STOP | | ⑰ USB HOST | |
| | | T15 | PWM | T04 | E-STOP | | |
| | | T14 | OUT | | | | |
| | | T13 | COM | | | | |

# 4.4 Recommended wiring




| | | | |
|---|---|---|---|
| 1 | Current inputs | 30-35 | **Current measurement wiring (page 29)** |
| 2 | Generator voltage inputs | 38-41 | **Voltage measurement SPtM (page 34)** |
| 3 | Mains voltage inputs | 42-45 | **Voltage measurement SPtM (page 34)** |
| 4 | Binary inputs | 46-53 | **Binary inputs (page 42)** |
| 5 | AVR | 55-56 | **AVR Interface (page 48)** |
| 6 | CAN1 | H, COM, L | **CAN bus and RS485 wiring (page 48)** |
| 7 | CAN2 | H, COM, L | **CAN bus and RS485 wiring (page 48)** |
| 8 | +5 V | 23 | **Analog inputs (page 44)** |
| 9 | Analog inputs | 18-22 | **Analog inputs (page 44)** |
| 10 | RPM | 16,17 | **Magnetic pick-up (page 41)** |
| 11 | SRO | 13-15 | **Speed governor interface (page 47)** |
| 12 | Binary outputs | 05-12 | **Binary Outputs (page 43)** |
| 13 | E-Stop | 04 | **E-Stop (page 44)** |

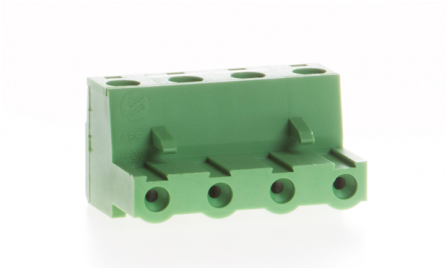
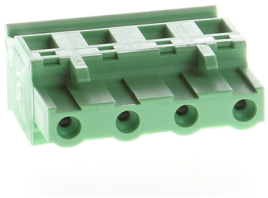
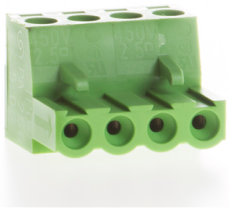
| | | | |
|---|---|---|---|
| 14 | Power supply | "+", D, "-" | **Power supply (page 28)** |
| 15 | RS485 | A, B, C | **CAN bus and RS485 wiring (page 48)** |
| 16 | USB | | **USB (page 52)** |
| 17 | USB Host | | **USB HOST (page 52)** |

***Note:*** *Wiring terminal markings to included tightening torque: 0.5 N-m (4.5 lb-in)., and wire size: 2 mm$^2$ (12-26 AWG).*

## 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 be wired with shielded cables, especially when the length is more than 3 m.

| **Tightening torque, allowable wire size and type, for the Field-Wiring Terminals:** | |
|---|---|
| For Mains Voltage, Generator Voltage and Current terminals | |
|  | Specified tightening torque is 0.56 Nm (5.0 In-lbs) |
| | use only diameter 0.5 - 2.0 mm (12 - 26 AWG) conductor, rated for 90 °C minimum. |
| For other controller field wiring terminals | |
|  | Specified tightening torque 0.79 nm (7.0 In-lb) |
| | Use only diameter 0.5 - 2.0 mm (12 - 26 AWG) conductor, rated for 75 °C minimum. |
|  | Use copper conductors only |

## 4.4.2 Grounding

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

The negative "–" battery terminal must be properly grounded.

Switchboard and engine must be grounded at common point. Use the shortest possible cable to the grounding point.

## 4.4.3 Power supply

To ensure proper function:

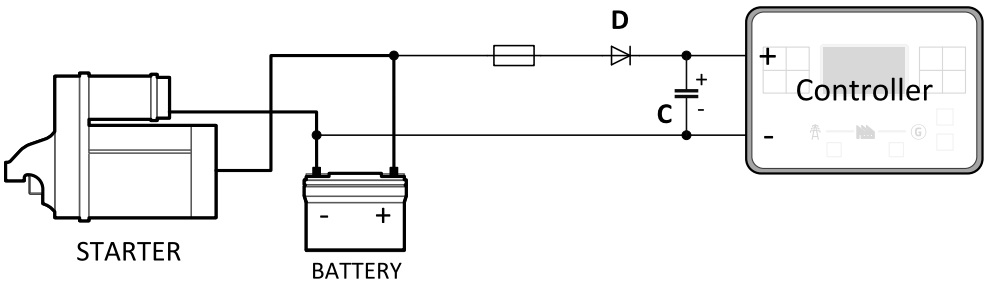
- Use power supply cable min. 1.5 $mm^2$

Maximum continuous DC power supply voltage is 36 V. 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.

It is necessary to ensure that potential difference between generator current COM terminal and battery "–" terminal is maximally ±2 V. Therefore it is strongly recommended to interconnect these two terminals together.

***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 (this is dependent on binary output load).*

For the connections with 12 V DC power supply, the controller includes internal capacitors that allow the controller to continue in operation during cranking if the batter voltage dip occurs. If the voltage dip goes to 0 V during cranking and after 50 ms it recovers to 4 V, the controller continues operating. This cycle can repeat several times. During this voltage dip the controller screen backlight can turn off.




***Note:*** *Recommended fusing is 4 A fuse.*

***Note:*** *In case of the dip to 0 V the high-side binary outputs will be temporarily switched off and after recovering to 4 V back on.*

**IMPORTANT: When the controller is powered up only by USB and the USB is disconnected then the actual statistics can be lost.**

***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.*

***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. Diode should be able to withstand at least 1 kV.*

### Power supply fusing

The controller should never be connected directly to the starting battery. A 4 A fuse should be connected in-line with the battery positive terminal to the controller and CAN modules. Fuse value and type depends on the number of connected devices and wire length. Recommended fuse (not fast) type – T4 A. Not fast types are recommended due to internal capacitors charging during power up.

> **IMPORTANT: 4 A fuse is calculated without BOUT consumption nor extension modules. Real value of fuse depends on consumption of binary outputs and modules.**

## 4.4.4 Measurement wiring

Use 1.5 $mm^2$ cables for voltage connection and 2.5 $mm^2$ for current transformers connection. Adjust **Connection type (page 277)**, **Nominal Voltage Ph-N (page 278)**, **Nominal Voltage Ph-Ph (page 279)**, **Nominal Current (page 275)**, **Gen VT Ratio (page 281)**, **Mains/Bus VT Ratio (page 282)** and **Gen CT Ratio Prim (page 275)** to 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 277)** [3Ph4Wire / High Leg D / 3Ph3Wire / SplPhL1L2 / SplPhL1L3 / Mono Ph].

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

To ensure proper function:

- Use cables of 2.5 $mm^2$
- Use transformers to 5 A
- Connect CT according to following drawings:

### 3 phase application

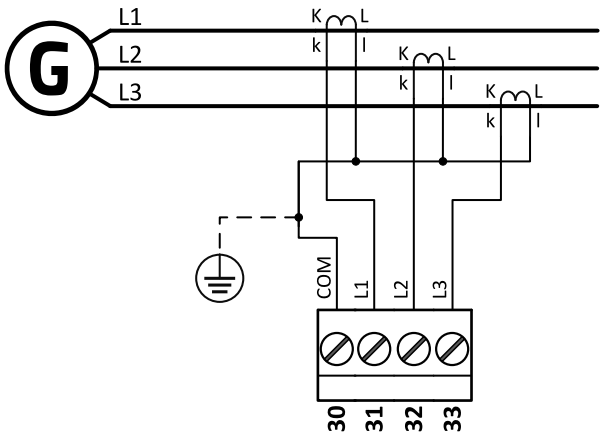



Image 4.2 3 phase application

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

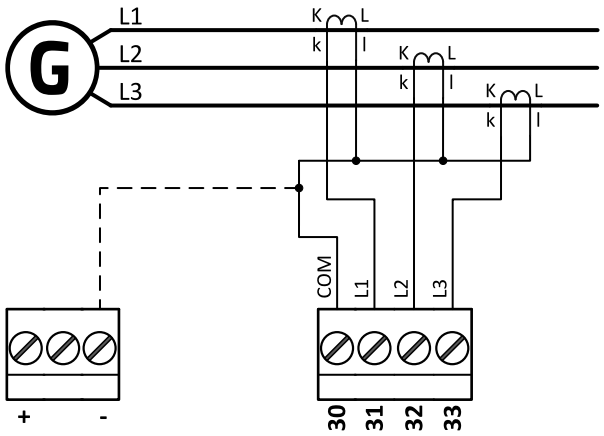



Image 4.3 3 phase application

**IMPORTANT: It is necessary to ensure that potential difference between current COM terminal and power supply "–" terminal is maximally ±2 V. To do so interconnect these two terminals.**

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

### SplPhL1L2 application

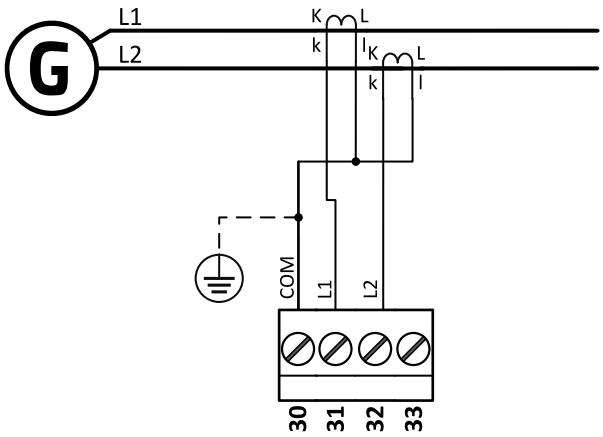



Image 4.4 SplPhL1L2 application

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

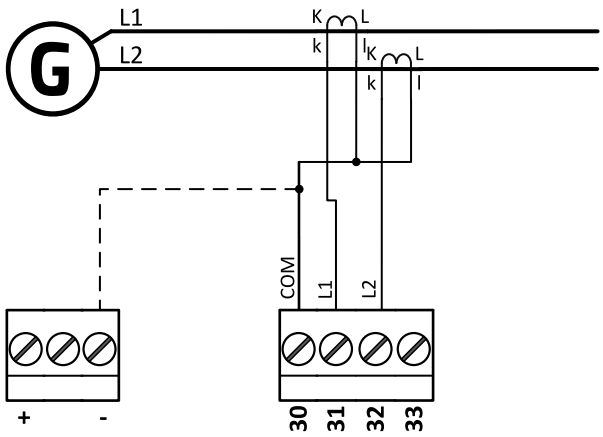



Image 4.5 SplPhL1L2 application

**IMPORTANT: It is necessary to ensure that potential difference between current COM terminal and power supply "–" terminal is maximally ±2 V. To do so interconnect these two terminals.**

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

### SplPhL1L3 application

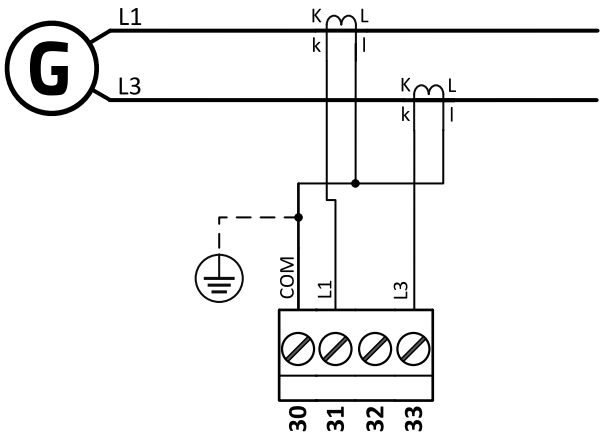



Image 4.6 SplPhL1L3 application

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

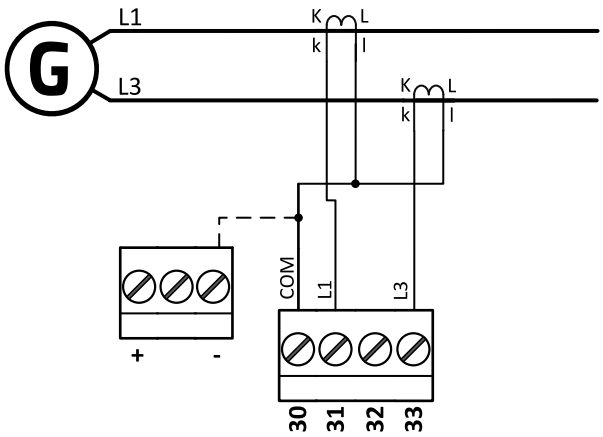



Image 4.7 SplPhL1L3 application

**IMPORTANT: It is necessary to ensure that potential difference between current COM terminal and power supply "–" terminal is maximally ±2 V. To do so interconnect these two terminals.**

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

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

### Mono phase application

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

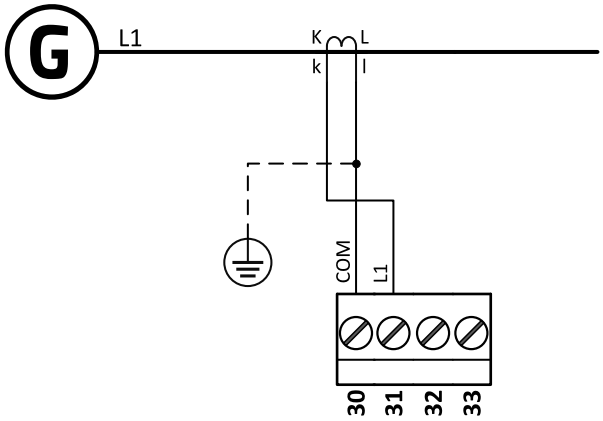



Image 4.8 Mono phase application

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

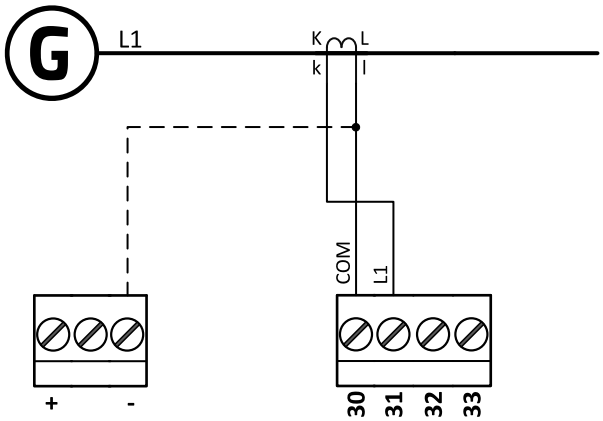



Image 4.9 Mono phase application

**IMPORTANT: It is necessary to ensure that potential difference between current COM terminal and power supply "–" terminal is maximally ±2 V. To do so interconnect these two terminals.**

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

### Earth fault current measurement

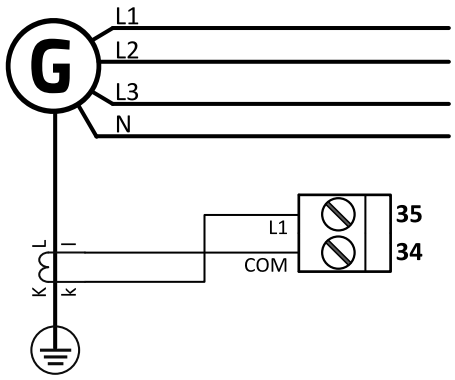



Image 4.10 Typical Earth fault current measurement

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

### Mains current measurement

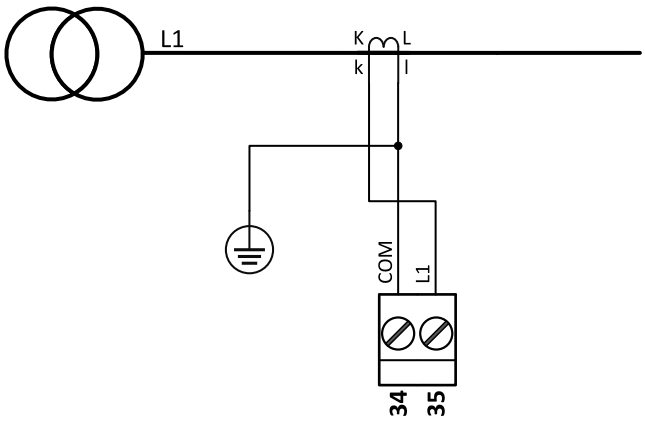



Image 4.11 Typical Mains current measurement

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

## Voltage measurement SPtM

There are 6 voltage measurement Connection Type (setpoint **Connection type (page 277)** [3Ph4Wire / High Leg D / 3Ph3Wire / SplPhL1L2 / SplPhL1L3 / Mono Ph]) options, every type matches to corresponding generator connection type.

***Note:*** *For fusing of voltage measurement input use T1A or T2A fuse.*

The generator protections are evaluated from different voltages base d on **Connection type (page 277)** setting:

- 3Ph 4W – Ph-Ph voltage, Ph-N voltage
- High Leg D – Ph-Ph voltage, Ph-N voltage
- 3Ph 3W – Ph-Ph voltage

- SplPhL1L2 – Ph-N voltage
- SplPhL1L3 – Ph-N voltage
- Mono Ph – Ph-N voltage

### ConnectionType: 3 Phase 4 Wires

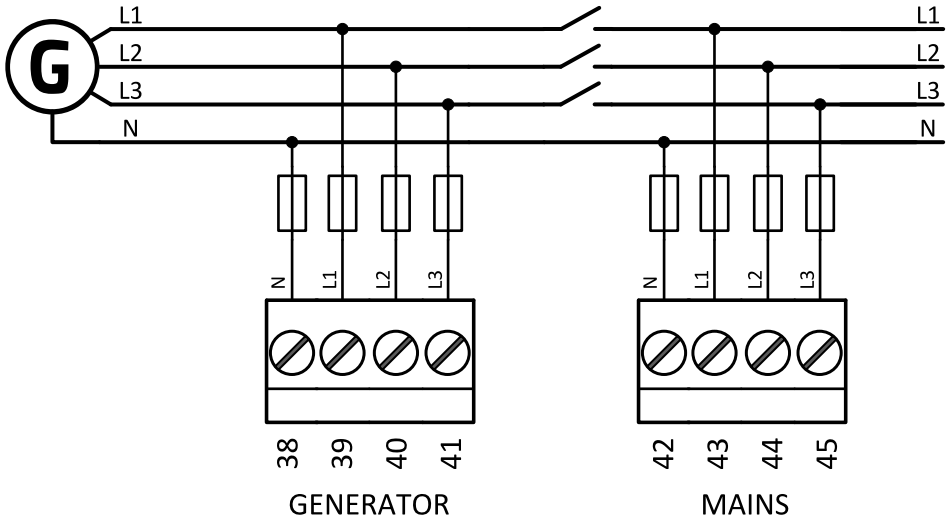



Image 4.12 3 phase application with neutral

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

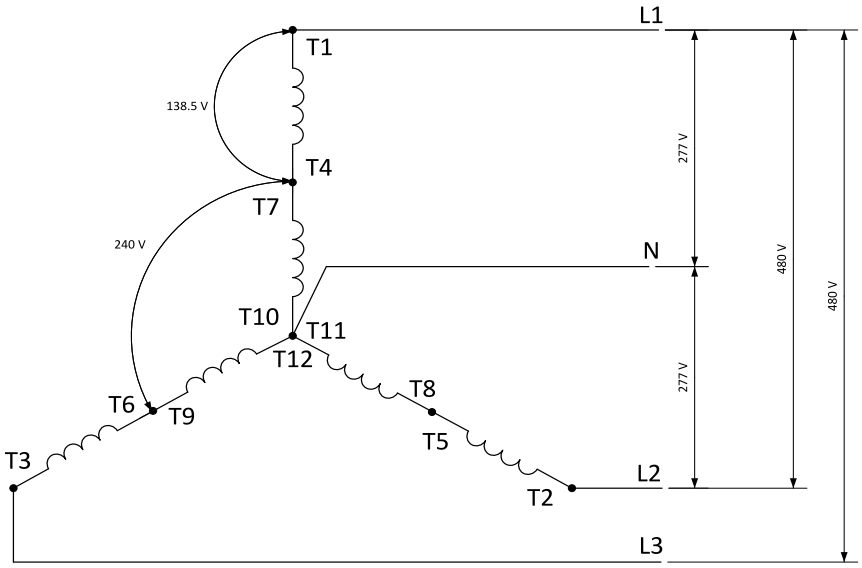



Image 4.13 Typical 3 Phase 4 Wires generator wiring, also known as 3ph High Y

***Note:*** *Connection type 277/480V 3-PHASE,* ***Nominal Voltage 3Ph High Y (page 280)****.*

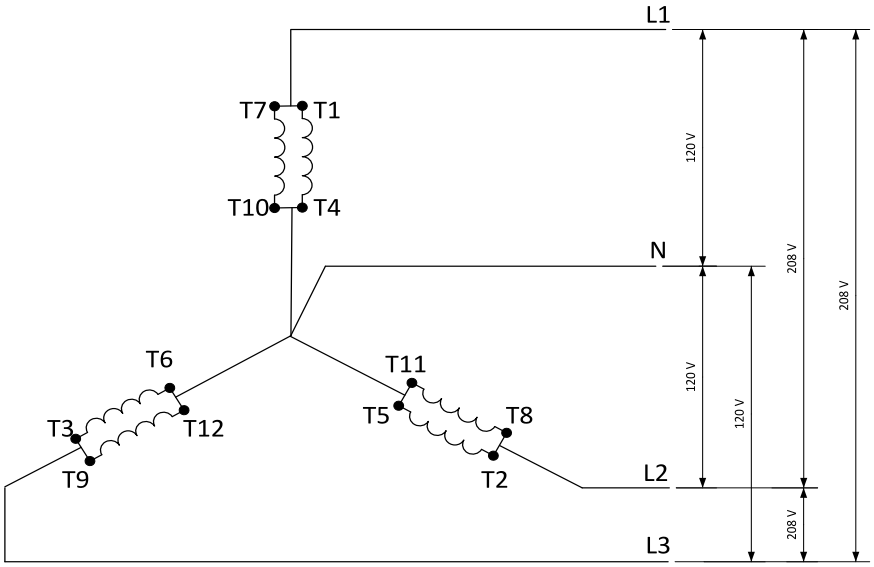



Image 4.14 3 Phase 4 Wires generator wiring, also known as 3ph Low Y

***Note:*** *Connection type 120/208V 3-PHASE,* ***Nominal Voltage 3Ph Low Y (page 279)****.*

## ConnectionType: High Leg D

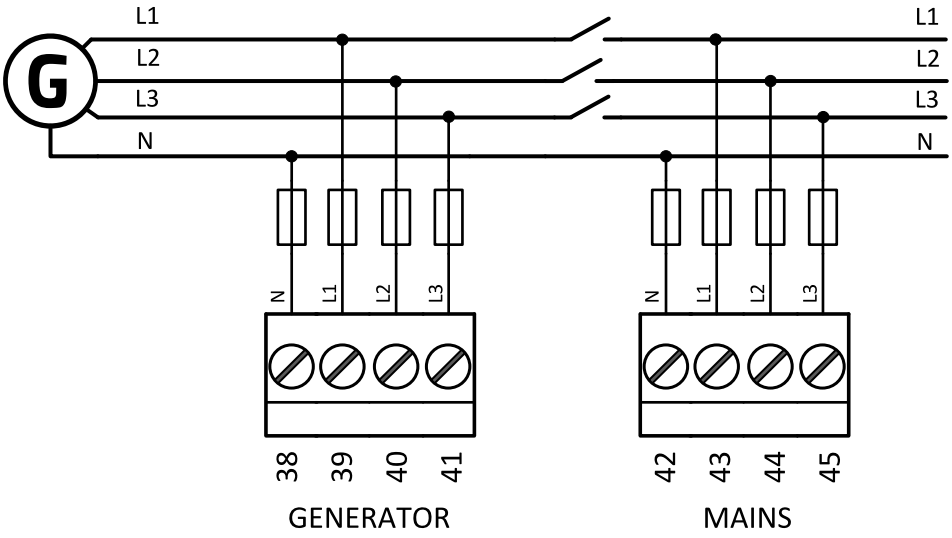



Image 4.15 High Leg Delta application

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

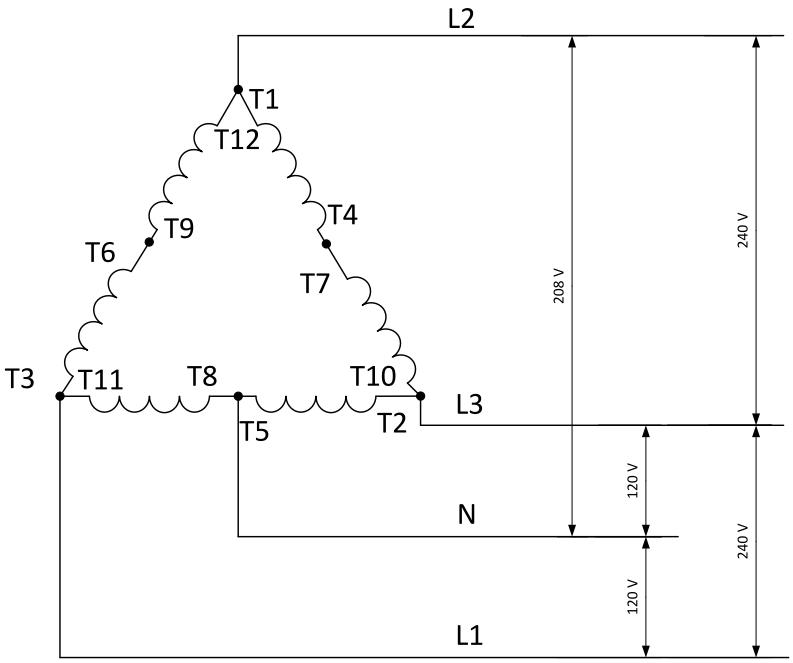



Table 4.1 Typical High Leg D generator wiring

### ConnectionType: 3 Phase 3 Wires

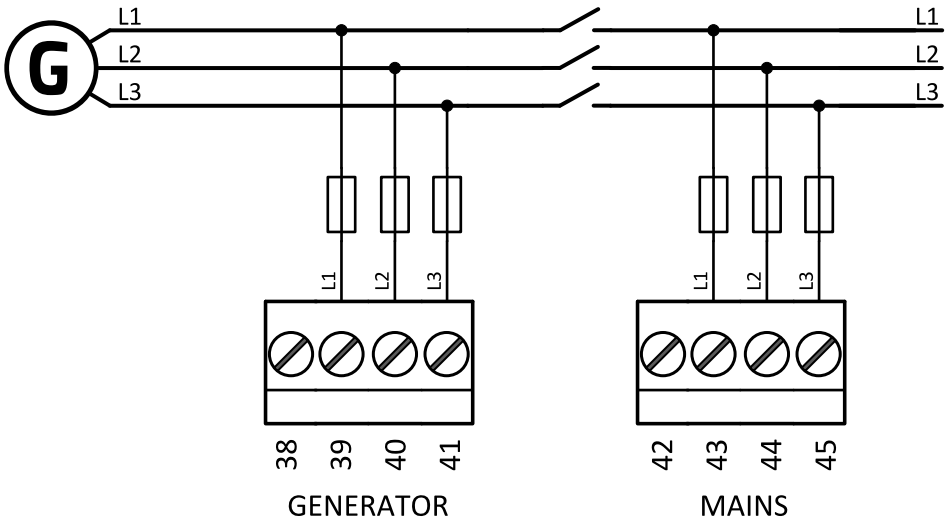



Image 4.16 3 phase application without neutral

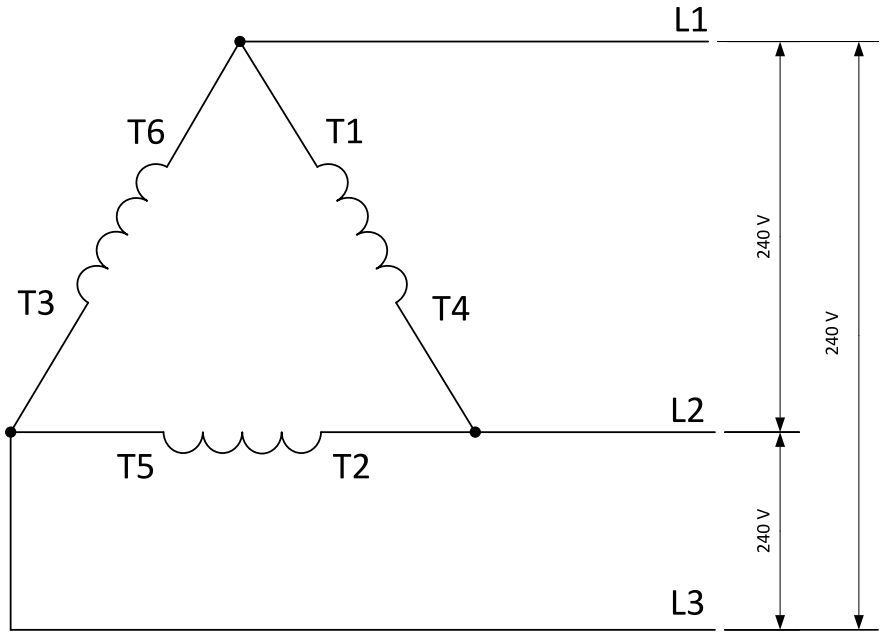



Image 4.17 Typical 3 Phase 3 Wires generator wiring

### ConnectionType: SplPhL1L3

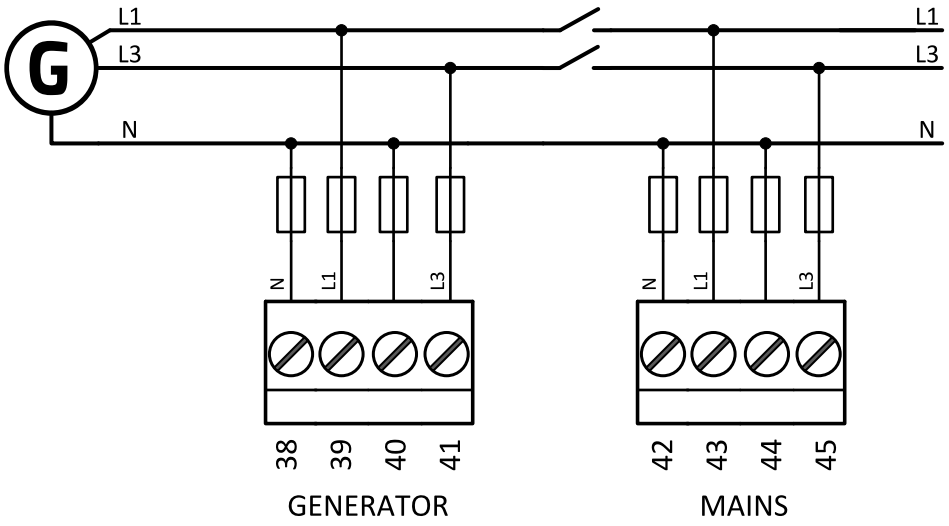



Image 4.18 Split phase application (SplPhL1L3)

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

**IMPORTANT: The second phase of split phase connection is connected to the terminal, where is usually connected the third phase.**

### ConnectionType: SplPhL1L2

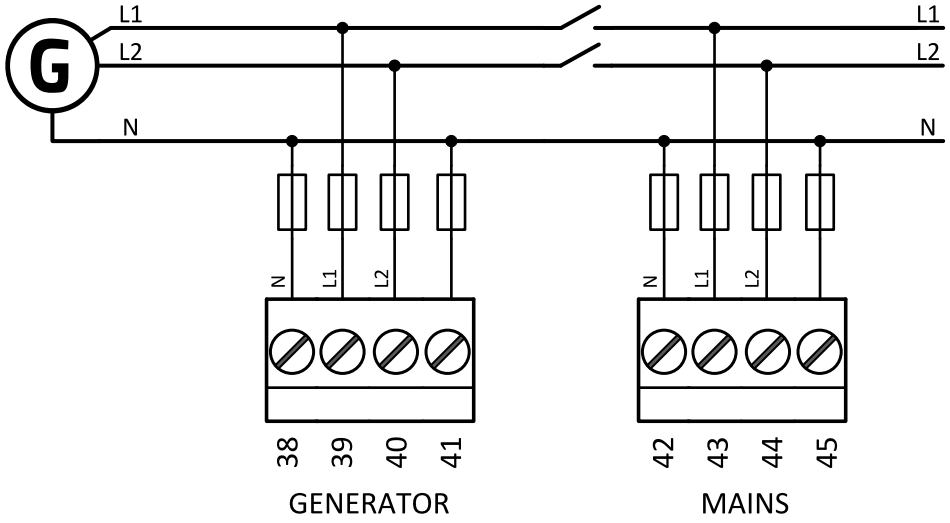



Image 4.19 Split phase application (SplPhL1L2)

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

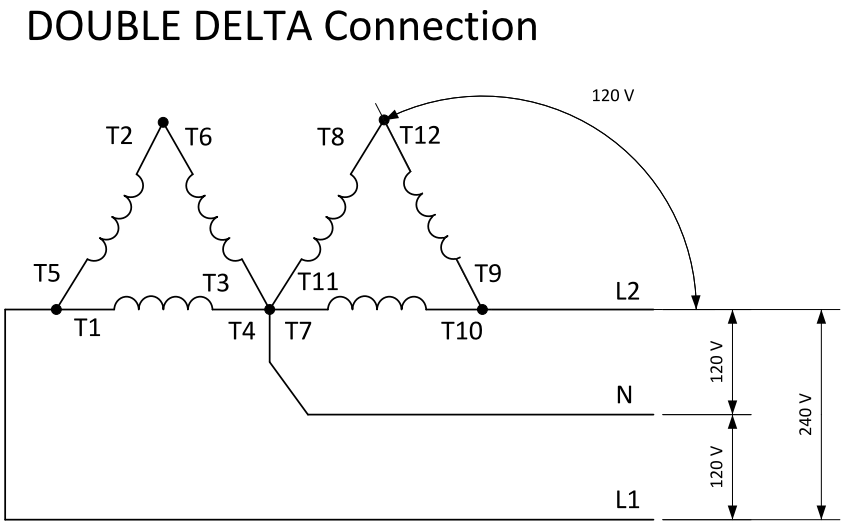



Image 4.20 Typical Split Phase generator wiring

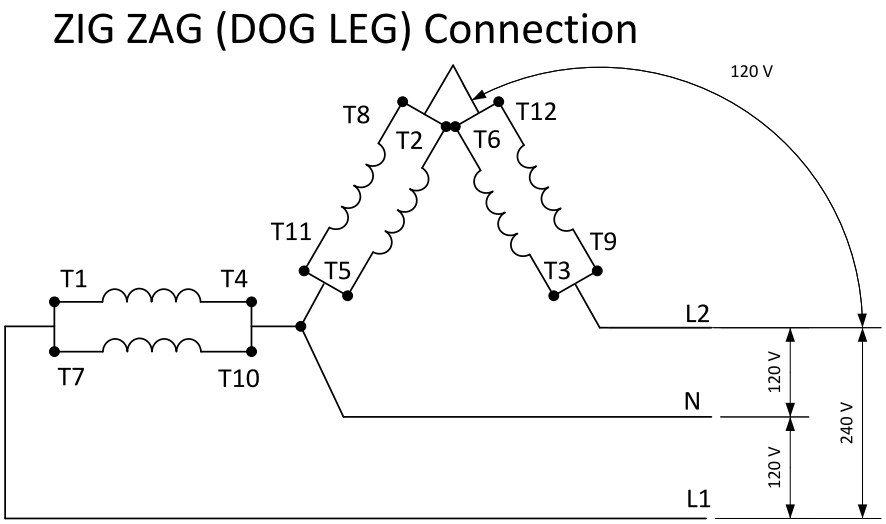



Image 4.21 Typical Split Phase generator wiring

***Note:*** *Connection type 120/240V 1-PHASE,* ***Nominal Voltage SplitPhase (page 281)****.*

### ConnectionType: Mono Phase

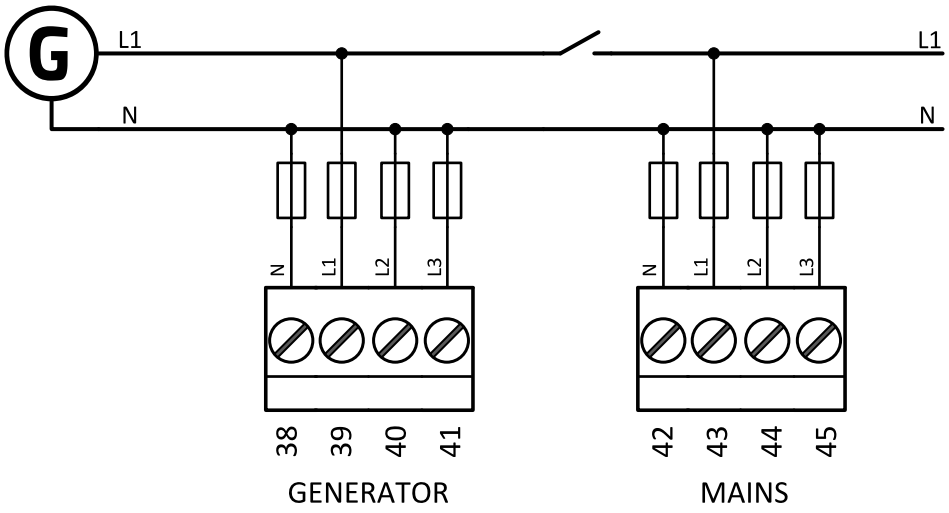



Image 4.22 Mono phase application

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

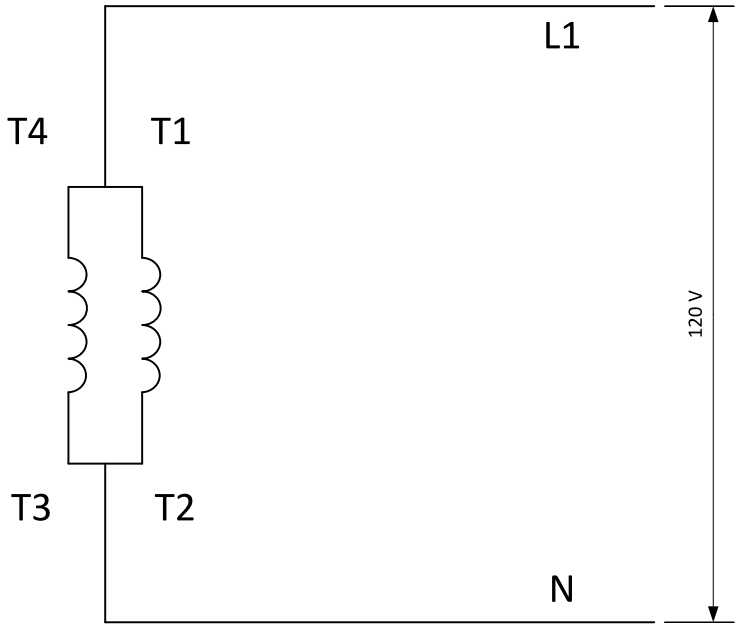


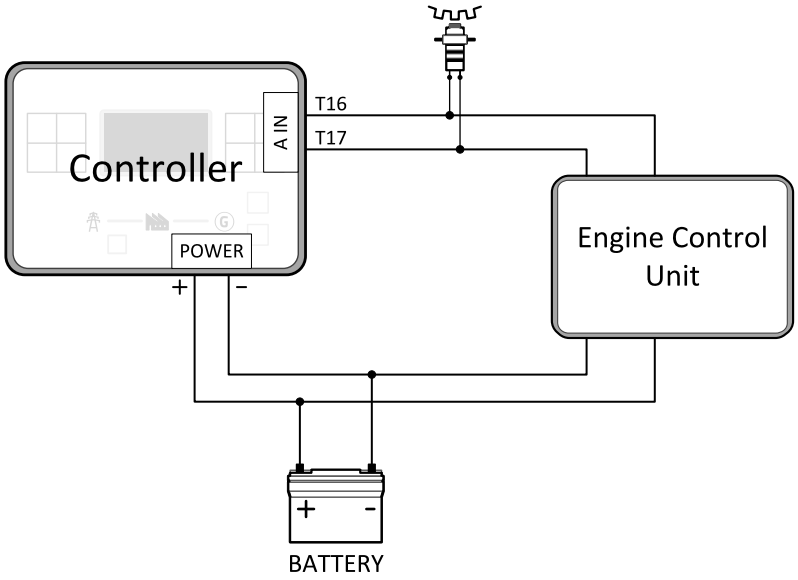

Image 4.23 Typical Mono Phase generator wiring

## 4.4.5 Magnetic pick-up

A magnetic speed sensor (pickup) is the most common method of engine speed measurement. To use this method, mount the pickup opposite the engine flywheel, connect the cable to the controller as shown on the picture below and adjust the setpoint **Gear Teeth (page 283)** according to the number of teeth on the flywheel.

For the details about the pick-up input parameters **see Technical data on page 246**.

**IMPORTANT: To ensure proper function use a shielded cable.**




If engine will not start:

- Check ground connection from pick-up to controllers, if the problem continues, disconnect ground connection from one of them.

***Note:*** *In some cases the controller will measure RPM value even though the gen-set is not running: RPM is measured from the generator voltage (Gear Teeth = 0). Controller is measuring some voltage value on input terminals due to open fusing. If RPM > 0 the controller will be put into a Not ready state and the engine will not be allowed to start.*

## 4.4.6 Binary inputs

Use minimally 1 $mm^2$ cables for wiring of Binary inputs.

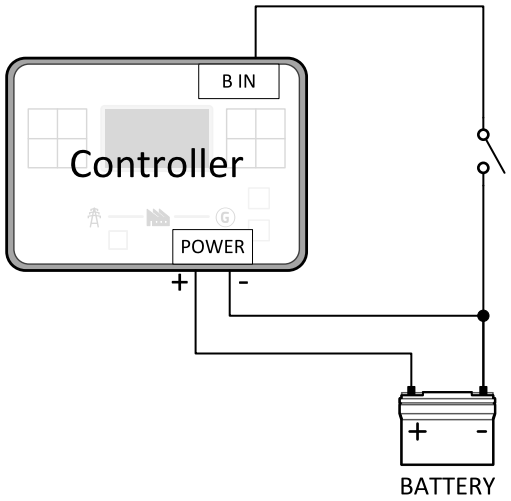



Image 4.24 Wiring binary inputs

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

## 4.4.7 Binary Outputs

Use min. 1 $mm^2$ cables for wiring of binary outputs. Use external relays as indicated on the schematic below for all outputs except those where low-current loads are connected (signalization etc.).

**IMPORTANT: Use suppression diodes on all relays and other inductive loads!**

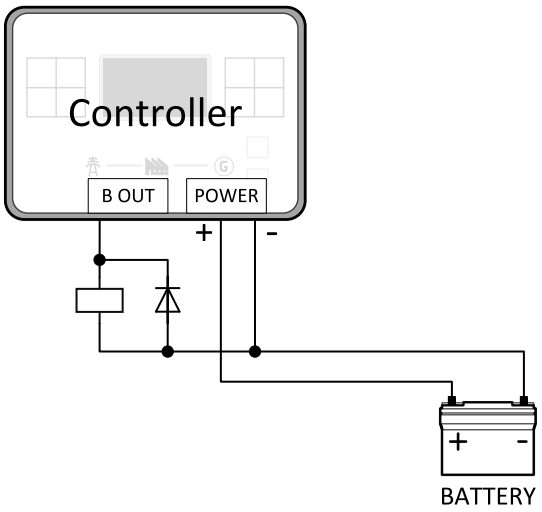
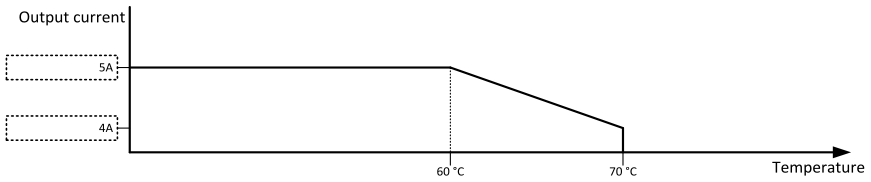



Image 4.25 Binary outputs wiring

***Note:*** *Every single low current binary output can provide up to 0.5 A of steady current.*

**IMPORTANT: Binary output 1 and 2 is power up by E-Stop terminal.**

**IMPORTANT: When operating temperature is higher than 60 °C it is strongly recommended to limit output current of high current binary outputs to 4 A (each).**



## 4.4.8 E-Stop

E-Stop has dedicated terminal T04. Power supply of binary output 1 and binary output 2 is internally connected (in controller) to E-Stop terminal. It means higher security and faster disconnection of these outputs. More information about E-Stop functions **see E-Stop on page 121**.

***Note:*** *This function has the same behavior as binary input* ***EMERGENCY STOP (PAGE 613)****.*

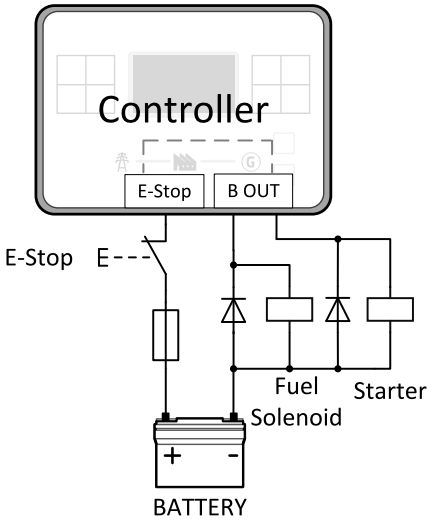



Image 4.26 E-Stop wiring

***Note:*** *Recommended fusing is 10 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: Suppression diodes are not indicated, but required.**

## 4.4.9 Analog inputs

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

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.

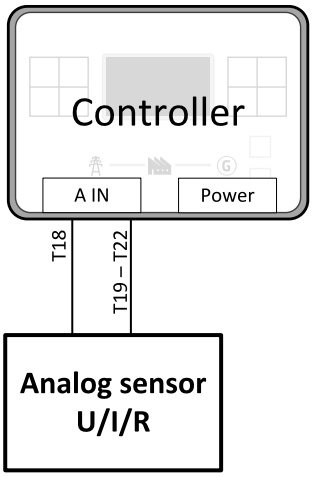



Image 4.27 Wiring of analog sensor

- In the case of grounded sensors, connect the AI COM terminal to the engine body as near to the sensors as possible.
- In the case of isolated sensors, connect the AI COM terminal to the negative power supply terminal of the controller as well as one pole of each sensor.

Analog inputs are typically used for: Oil Pressure, Coolant Temperature and Fuel Level. All of these parameters are connected with relevant protections.

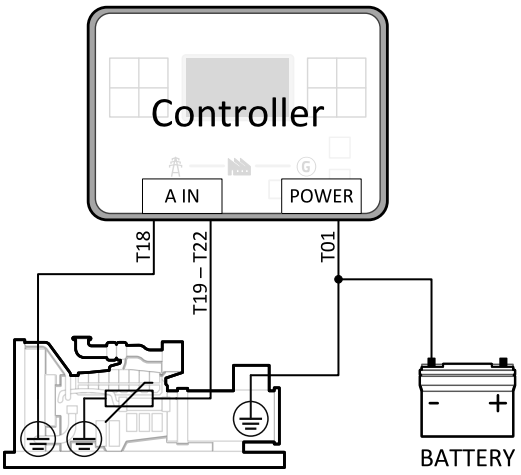



Image 4.28 Grounded sensors

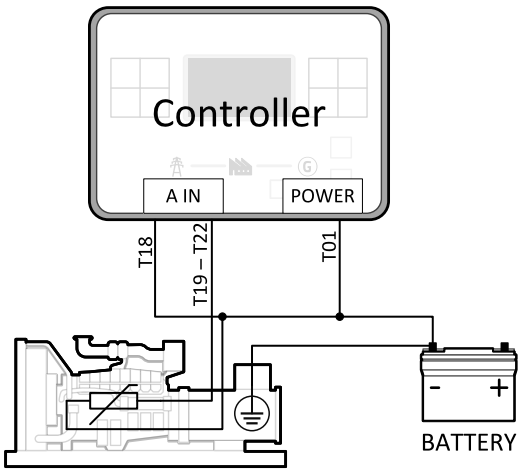



Image 4.29 Isolated sensors

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

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

## Analog 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 2400 Ω are evaluated as sensor failure (short or open circuit). This can be used for example to prevent running the engine with failed temperature sensor, so it wont be overheated.

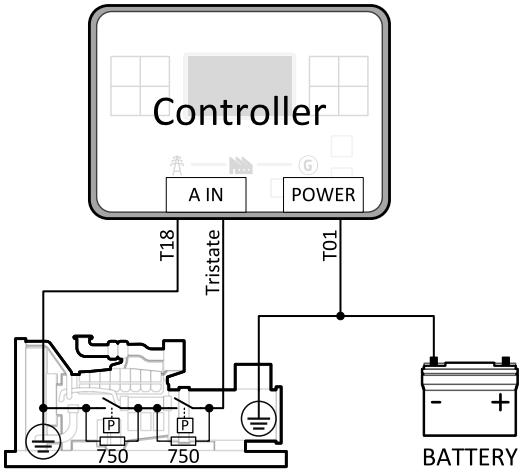



Image 4.30 Analog inputs as tristate

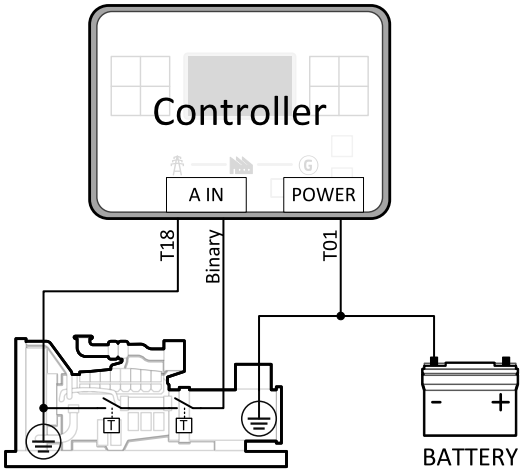



Image 4.31 Analog inputs as binary

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

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

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

## Analog Voltage sensor

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

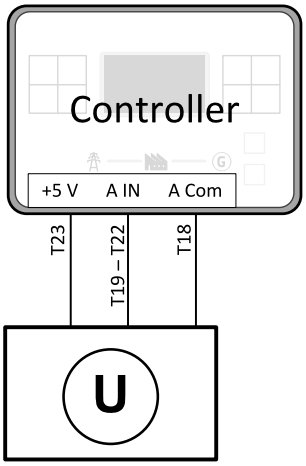



Image 4.32 Analog Voltage sensor

***Note:*** *Maximal current of 5V output is 45 mA.*

# 4.4.10 Speed governor interface

The speed governor output is used to control the speed or the power of the engine via the remote speed controlling input provided by the speed governor. The output from the controller can work in the following modes:

- voltage mode -10 to 10 V (10k output resistance can be internally connected by jumper)
  - Maximum load current: 5 mA both sourcing and sinking.
  - Precision: 1% of set value ±100 mV.
  - Resolution / minimum step: 3 mV approx.
  - Step response: less than 10 ms, measured between 10 % and 90 %.
  - Output ripple: 30 mV max. at 50 % of pwm.
  - Galvanic insulation: NO
- 5 V PWM mode
  - PWM amplitude: 5 V.
  - PWM frequency: 500 to 2900 Hz defined by setpoint **Speed Governor PWM Rate (page 381)**
  - Maximum load current: 20 mA both sourcing and sinking.
  - PWM Resolution: 14 bit.
  - Galvanic insulation: NO

Please **see Speed control outputs on page 200** for more information about set-up of controller's Speed governor.

***Note:*** *For the connection of individual speed governors please refer to concrete speed governor manual.*

> **IMPORTANT: Read carefully specific Speed governor instructions before connecting to controller.**

## 4.4.11 AVR Interface

The output from the controller work in the following mode:

- Output type: Voltage in range of -10 V to +10 V maximum
- Maximum load current: 5 mA both sourcing and sinking.
- Precision: 1% of set value ±100 mV.
- Resolution / minimum step: 3 mV approx.
- Step response: less then 10 ms, measured between 10 % and 90 %
- Output ripple: 30 mV max. at 50% of PWM
- Galvanic insulation: YES

Please **see Voltage control outputs on page 212** for more information about set-up of controller's AVR.

***Note:*** *For the connection of individual AVRs please refer to concrete AVR manual.*

**IMPORTANT: Read carefully specific AVR instructions before connecting to controller.**

## 4.4.12 CAN bus and RS485 wiring

### CAN bus wiring

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

- The maximum length of the CAN bus depends on the communication speed. For a speed of 250 kbps, which is used on the CAN1 bus (extension modules, ECU), the maximum length is 200 m.
- The bus must be wired in linear form with termination resistors at both ends. No nodes are allowed except on the controller terminals.
- Shielded cable[1] must be used, and shielding must 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 must be terminated by 120Ω resistors at both ends using a cable with following parameters:

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

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

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

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

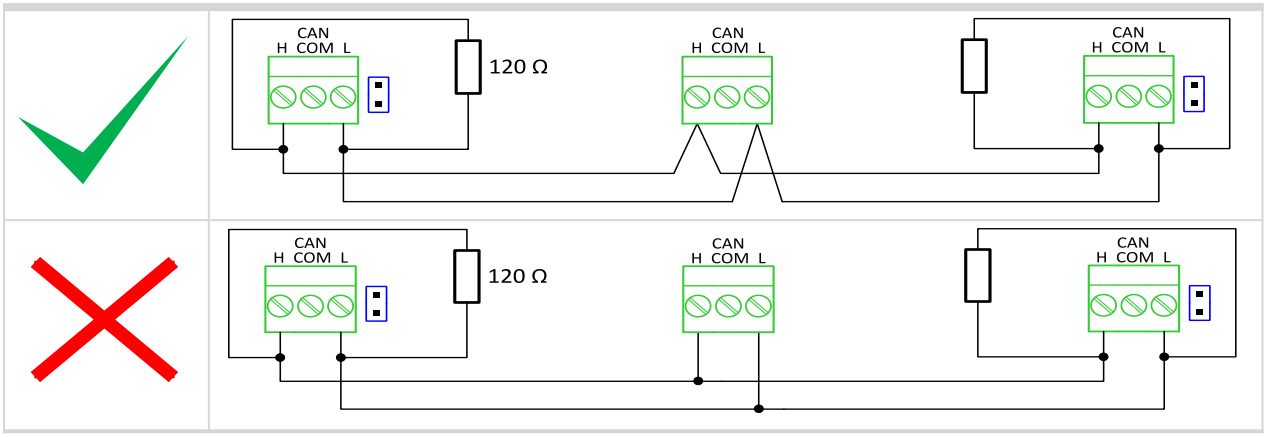



Image 4.33 CAN bus topology

› For shorter distances (connection within one building)

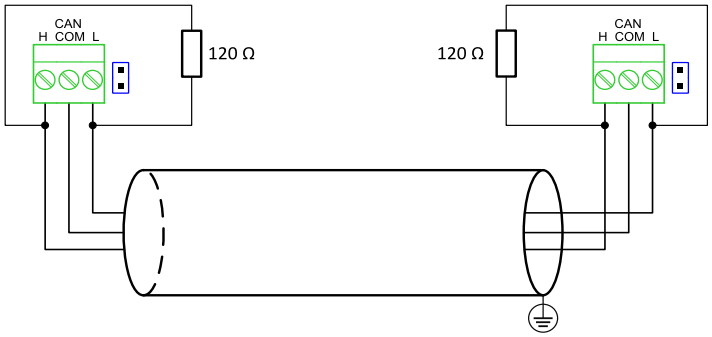



Image 4.34 CAN bus wiring for shorter distances

***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.)

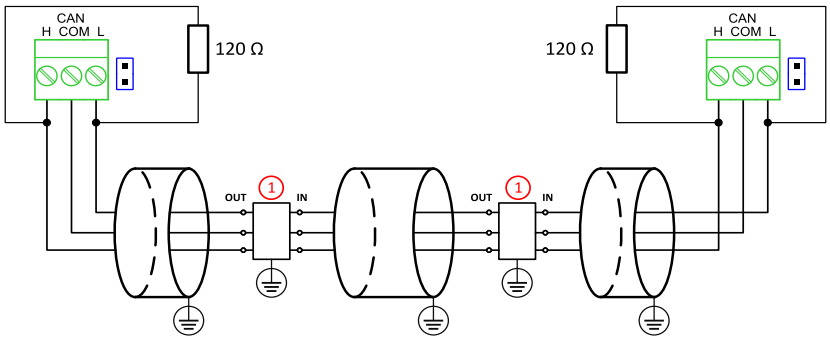



Image 4.35 CAN bus wiring for longer distances

① Recommended PT5-HF-12DC-ST[1]

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

## 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 CAN (120 Ω) is already implemented on the PCB. For connecting, close the jumper near the appropriate CAN terminal.*

- Standard maximum bus length is 1000 m.
- Shielded cable[1] must be used, and shielding must be connected to the terminal T01 (Grounding).
- External units can be connected on the RS485 line in any order, but keeping the line arrangement (no tails, no star) is necessary.
- The line must be terminated by 120Ω resistors at both ends.
- For shorter distances (connection within one building)

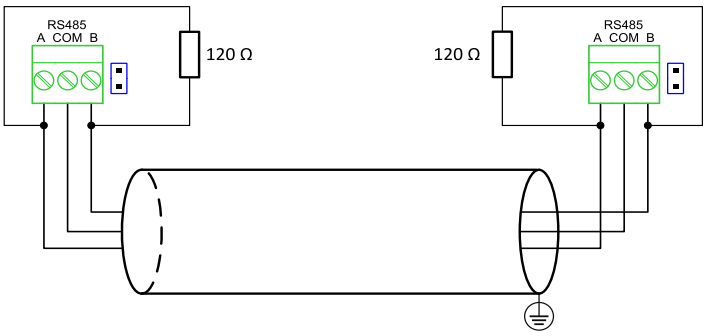



Image 4.36 RS485 wiring for shorter distances

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

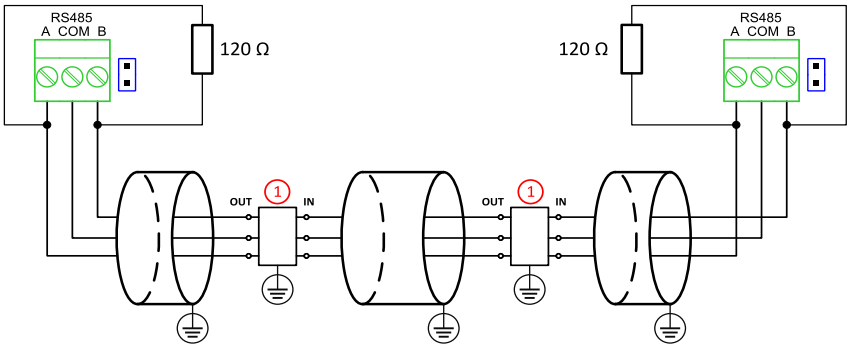



Image 4.37 RS485 wiring for longer distances

① Recommended PT5HF-5DC-ST[2]

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

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

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

## On board RS485 description

### Balancing resistors

The transmission bus into the RS485 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, force the transmission line into a known state. By installing two 620Ω balancing resistors at one node on the transmission line, a voltage divider is created that forces the voltage between the differential pair to be less than 200 mV, which is the threshold for the receiver. 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 the jumpers PULL UP/PULL DOWN to connect the balancing resistors.

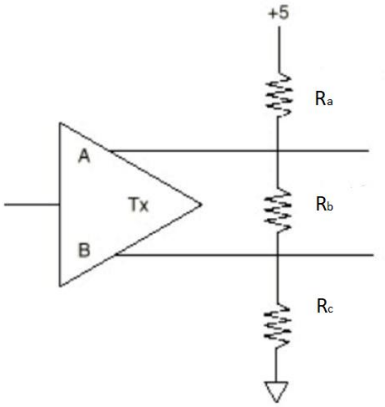



Image 4.38 Balancing resistors

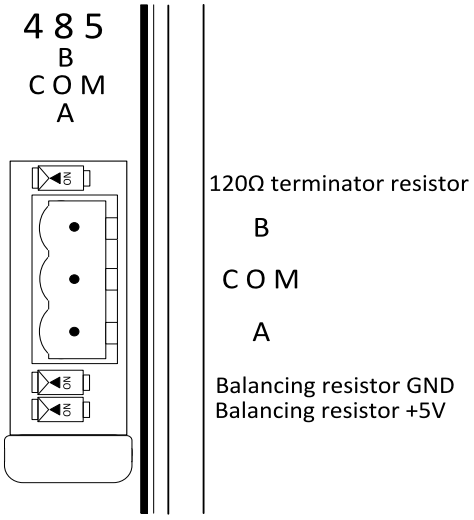



Image 4.39 RS485 on board

### 4.4.13 USB

This is required for computer connection. Use the shielded USB A-B cable.

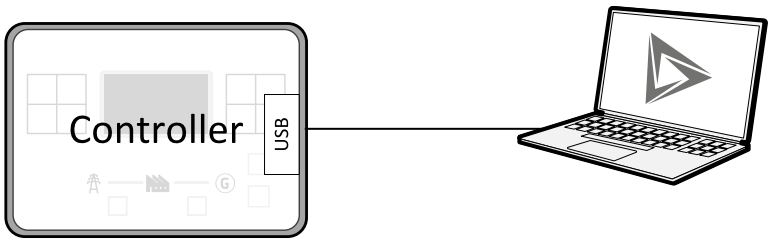



Image 4.40 USB connection

Controller can be also powered by USB (only for service purpose like an uploading firmware, change of configuration etc.).

> **IMPORTANT: Power supply by USB is only for service purpose. Binary inputs and outputs are in logical 0. Also plug-in modules are not working.**

### 4.4.14 USB HOST

USB Flash Drive can be connected into USB A connector.

***Note:*** *For more information* ***see USB host on page 205****.*

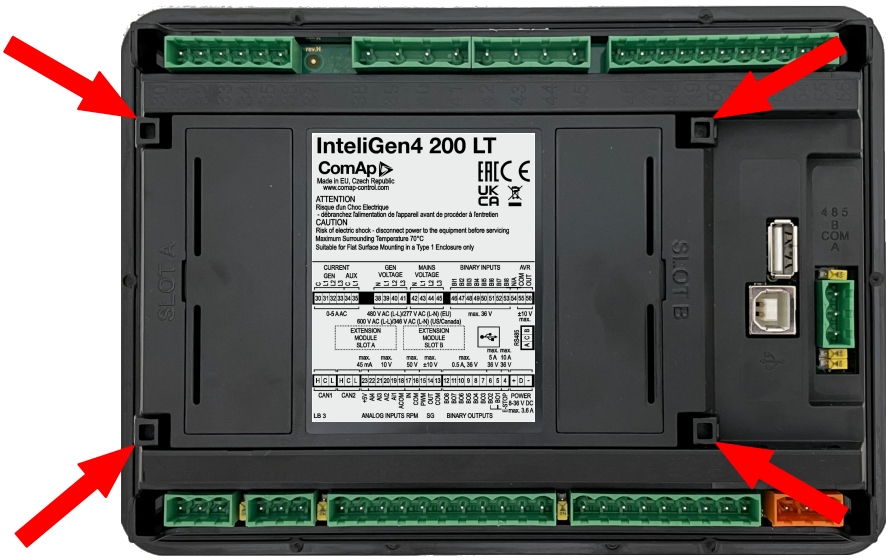
**back to Recommended wiring**

# 4.5 Plug-in module installation

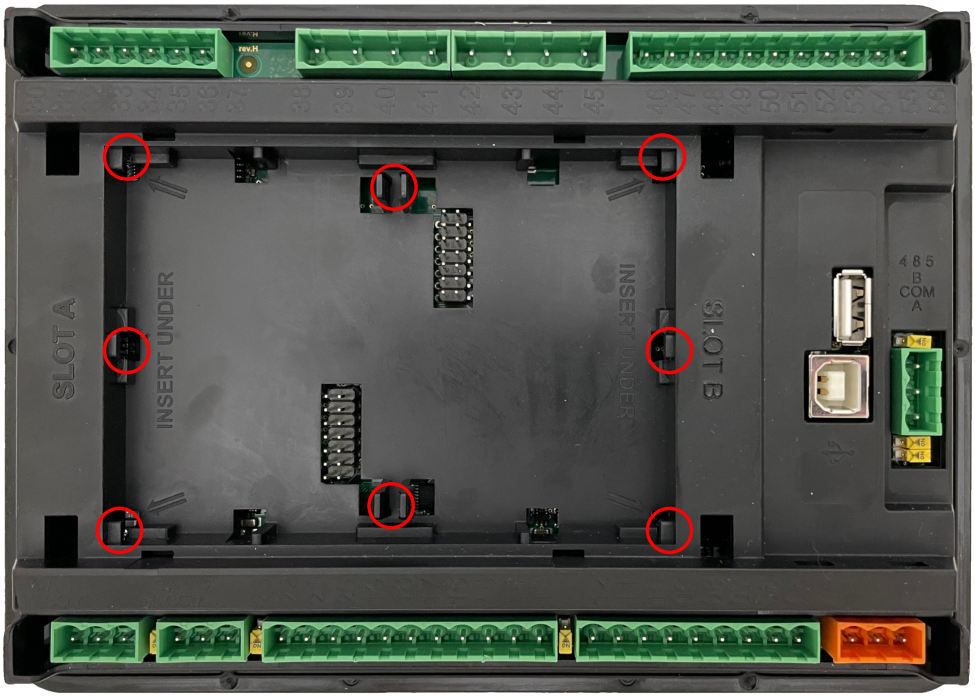
## 4.5.1 Installation

> **IMPORTANT: Any manipulation with plug-in module shall be done with disconnected power supply to controller.**

Remove the back cover. To do this, press four holders which are located in corners.




After removing the back cover insert the plug-in module. The plug-in module must be inserted under holders. Start with holders marked by arrows. After inserting plug-in module under holders press it down. This locks the module in place.




After locking the plug-in module into holders, place back the back cover (small cover for connectors has to be removed from back cover). Finally insert the small cover for connectors. Small covers are unique for each plug-in module.

# 4.6 Maintenance

## 4.6.1 Backup battery replacement

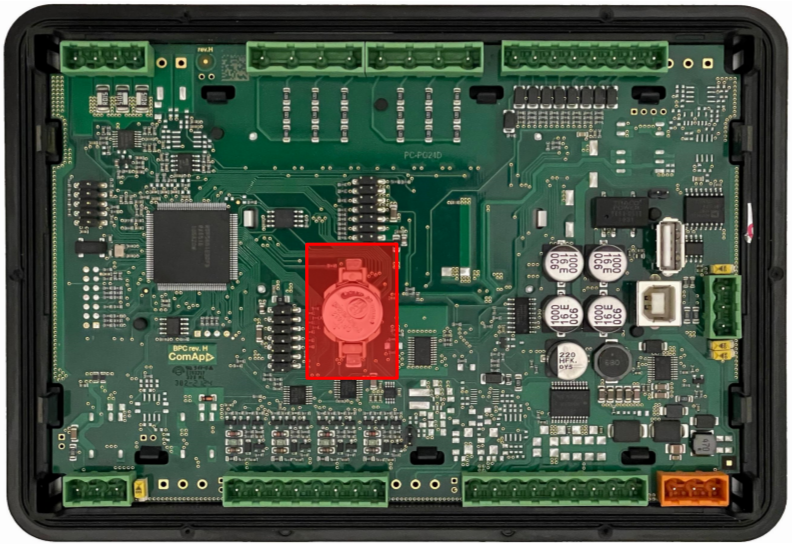
This battery serves to maintain the run of RTC (real time clock) so that controller does not lose information about time and date when disconnected from power supply.

The internal backup battery lifetime is approx. 6 years. If 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.
- Remove the back cover and all plug-in modules.
- 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 the new battery into the holder using a finger.



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

**back to Installation and wiring**

# 5 Controller setup

5.1 Default configuration ..... 55
5.2 Controller configuration and PC tools connection ..... 56
5.3 Operator Guide ..... 65
5.4 Remote Display ..... 91
5.5 Functions ..... 96
5.6 User management and data access control ..... 214

back to Table of contents

## 5.1 Default configuration

### 5.1.1 Binary inputs

| Number | Description | Configured function |
|---|---|---|
| **BIN1** | Generator circuit breaker feedback | **GCB FEEDBACK (PAGE 618)** |
| **BIN2** | Mains circuit breaker feedback | **MCB FEEDBACK (PAGE 622)** |
| **BIN3** | Not Used | **Not Used** |
| **BIN4** | Access lock keyswitch | **ACCESS LOCK (PAGE 604)** |
| **BIN5** | Switch controller to OFF mode | **REMOTE OFF (PAGE 628)** |
| **BIN6** | Switch controller to TEST mode | **REMOTE TEST (PAGE 629)** |
| **BIN7** | Suppression of alarms | **SD OVERRIDE (PAGE 629)** |
| **BIN8** | Not Used | **Not Used** |

### 5.1.2 Binary outputs

| Number | Description | Function |
|---|---|---|
| **BOUT1** | Starter motor control | **STARTER 1 (PAGE 680)** |
| **BOUT2** | Fuel solenoid valve | **FUEL SOLENOID (PAGE 653)** |
| **BOUT3** | Indication of breaker state | **GCB CLOSE/OPEN (PAGE 655)** |
| **BOUT4** | Indication of breaker state | **MCB CLOSE/OPEN (PAGE 668)** |
| **BOUT5** | Activation of any devices before start | **PRESTART (PAGE 674)** |
| **BOUT6** | Gen-set can be connected to load | **READY TO LOAD (PAGE 677)** |
| **BOUT7** | Indication of unconfirmed alarm | **ALARM (PAGE 643)** |
| **BOUT8** | Not Used | **NOT USED (PAGE 673)** |

### 5.1.3 Analog inputs

| Number | Configured sensor | Function |
|---|---|---|
| **AIN1** | VDO 10 Bar | **OIL PRESSURE (PAGE 693)** |
| **AIN2** | VDO40-120°C | **COOLANT TEMP (PAGE 692)** |

| | | |
|---|---|---|
| **AIN3** | VDOLevel % | **FUEL LEVEL (PAGE 692)** |
| **AIN4** | Not Used | **NOT USED (PAGE 693)** |

# 5.2 Controller configuration and PC tools connection


5.2.1 USB ..... 56
5.2.2 RS232/RS485 ..... 57
5.2.3 Ethernet ..... 58


**back to Controller setup**

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

## 5.2.1 USB

You may connect to the controller using the USB port. In this case standard USB A to B cable should be used.

### Connection using InteliConfig

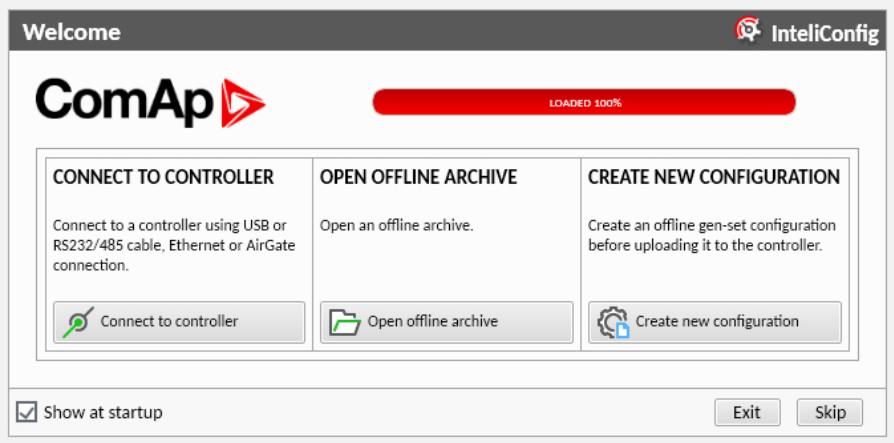



Image 5.1 First screen of InteliConfig – select connect to controller

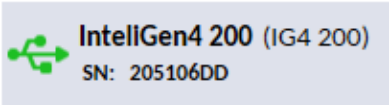



Image 5.2 Second screen of InteliConfig – select detected controllers

## Connection using WinScope 1000

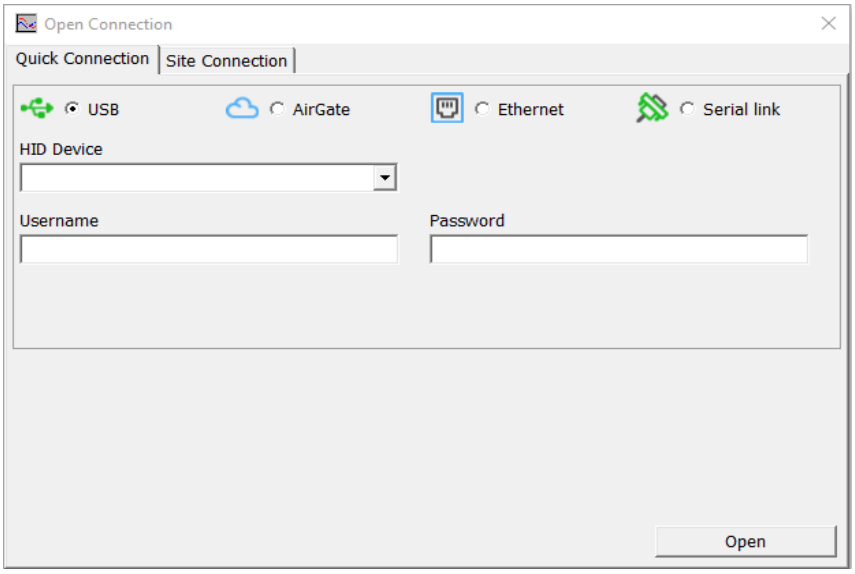



Image 5.3 WinScope 1000 screen – select USB connection

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

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

## 5.2.2 RS232/RS485

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

- **COM1 Mode (page 476)** = Direct
- **Controller Address (page 289)** must be set

## Connection using InteliConfig

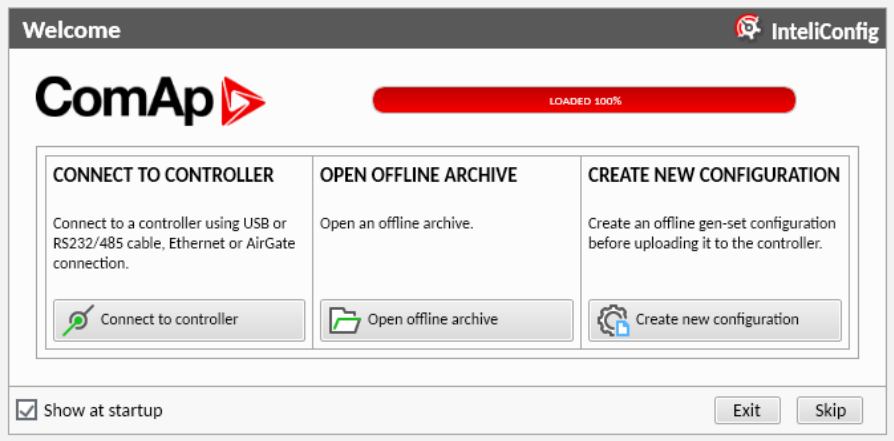



Image 5.4 First screen of InteliConfig – select connect to controller

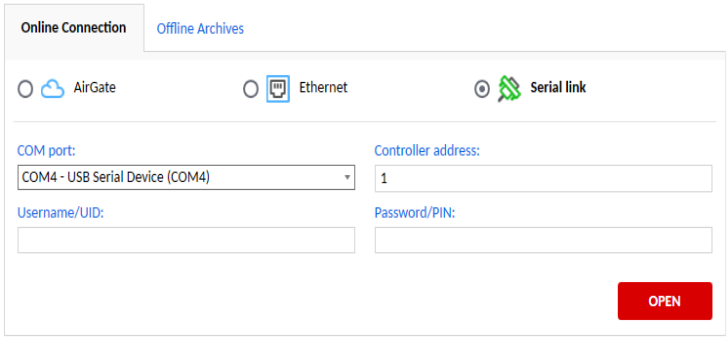



Image 5.5 Second screen of InteliConfig – select Serial link

## Connection using WinScope 1000

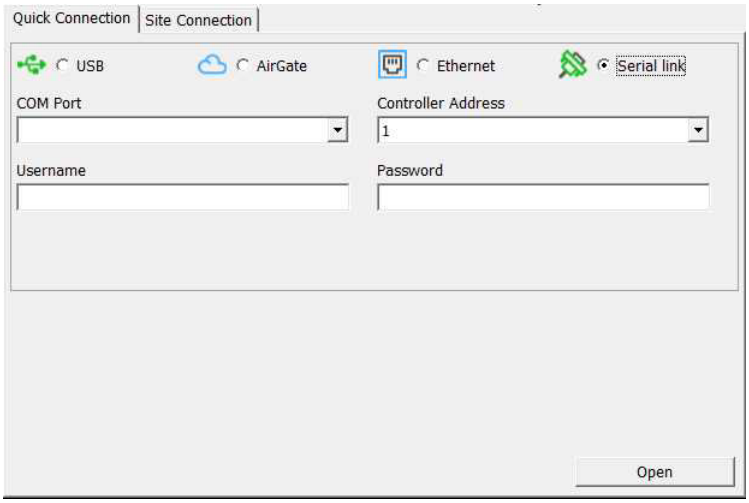



Image 5.6 WinScope 1000 screen – select serial link

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

# 5.2.3 Ethernet

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

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

## Direct connection

If you use a 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 should to be checked in the controller:

- **Controller Address (page 289)** must be set to the same value as in the PC tool
- **IP Address Mode (page 501)** can be set to AUTOMATIC when there is DHCP service available. Otherwise it should be set to FIXED
- **IP Address (page 502)** is either set automatically or it can be adjusted to a specific requested value
- **Subnet Mask (page 502)** is either set automatically or it can be adjusted to a specific requested value
- **Gateway IP (page 503)** can be set here when it is used

## Connection using InteliConfig

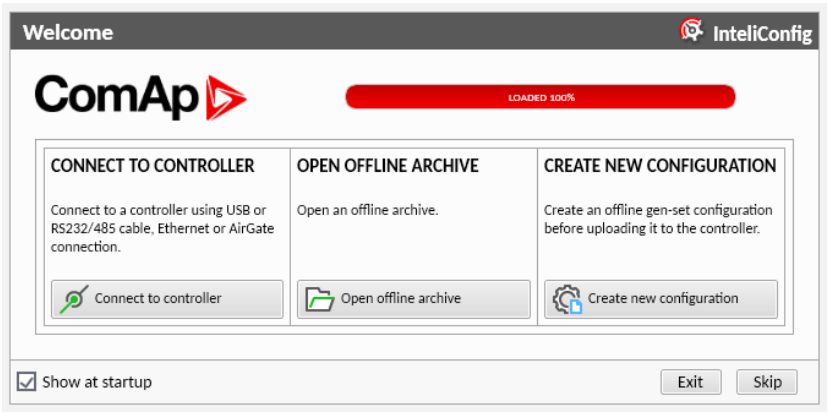



Image 5.7 First screen of InteliConfig – select connect to controller

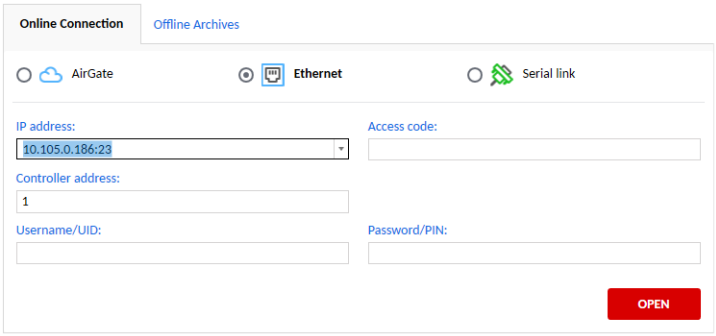



Image 5.8 Second screen of InteliConfig – select Internet / Ethernet

## Connection using WinScope 1000

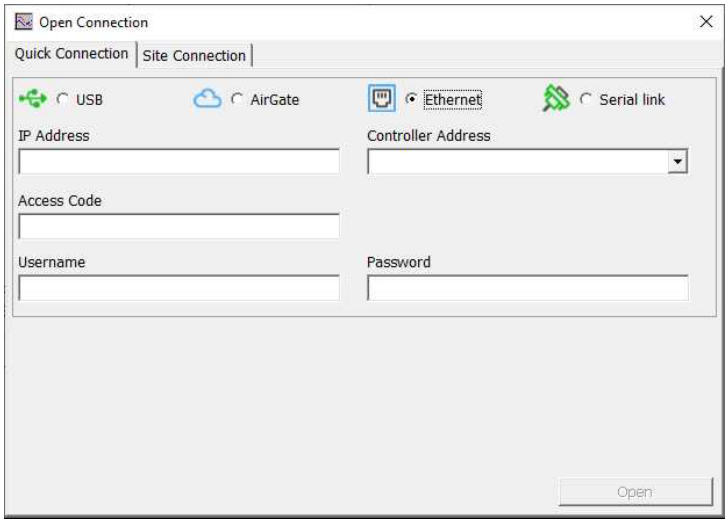



Image 5.9 WinScope 1000 screen – select Ethernet

Following information has to be filled to establish connection:

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

## AirGate connection

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

- **Controller Address (page 289)** has to be set to the same value as in the PC tool
- **IP Address Mode (page 501)** must set to AUTOMATIC when there is DHCP service available. Otherwise it should be set to FIXED
- **IP Address (page 502)** is either set automatically or it can be adjusted to a specific requested value
- **Subnet Mask (page 502)** is either set automatically or it can be adjusted to a specific requested value
- **Gateway IP (page 503)** can be set here when it is used
- **AirGate Connection (page 505)** must be set to Enabled
- **AirGate Address (page 506)** currently there is one AirGate server running at URL global.airgate.link (enter this URL into the setpoint)

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

> **IMPORTANT: Controller has to be connected to the Internet.**

### Getting started with AirGate

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

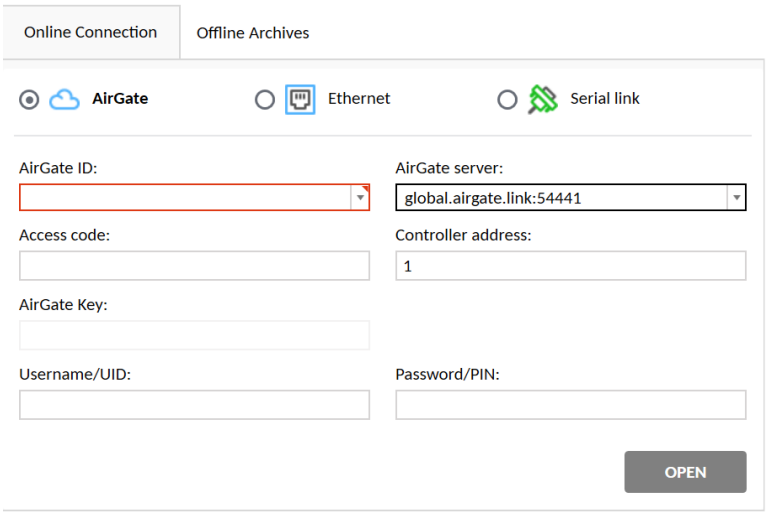


Image 5.10 Changing AirGate key

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

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

## Connecting from InteliConfig via AirGate 2.0




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

## AirGate operational and diagnostic information

| Object | Description |
|---|---|
| **Not defined** | Indicated while the controller is actually not trying to connect to AirGate. This is initial value of the status. |
| **Wait to connect** | Indicated while the controller is waiting the "repetition period" before next attempt to connect to a node is performed. |
| **Resolving** | Indicated while the controller is resolving domain name of the node to which it is attempting to connect. |
| **Connecting** | Indicated while the controller is attempting to establish TCP link to the node. |
| **Creat sec chan** | Indicated while CCS encrypted channel is being negotiated. |
| **Registering** | Indicated when the CCS channel has been established until AirGate sends message "setRuntimeParams" (with any registration status). |

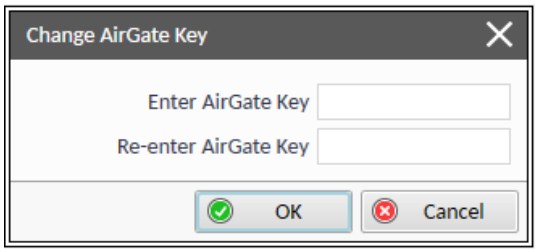
| Object | Description |
|---|---|
| **Conn inoperable** | Indicated when AirGate sent registration status other than "Authorized" until the status changed to "Authorized". |
| **Conn operable** | Indicated when AirGate sent registration status "Authorized" until the status changed to any other one. |
| **Susp AGkeyEmpty** | Indicated when the service is enabled but suspended due to empty AirGate key.<br>***Note:*** *If you see this status message you have to adjust AirGate Key as per instructions above.* |

## Connection using InteliConfig

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

- **AirGate ID (page 595)**
- AirGate Server → **AirGate Address (page 506)**
- **Controller Address (page 289)**
- User name and Password
- AirGate Key

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



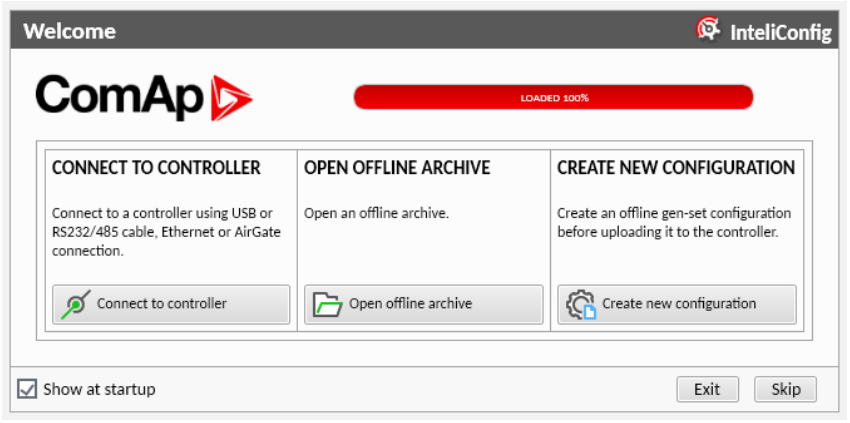




Image 5.11 First screen of InteliConfig – select connect to controller

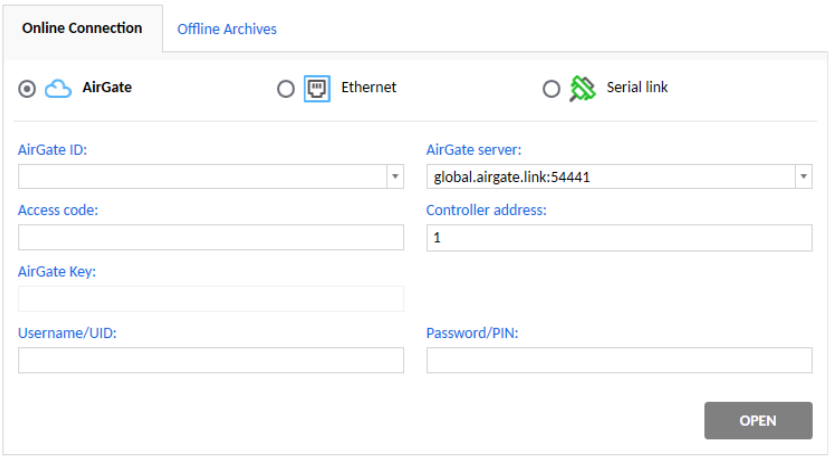


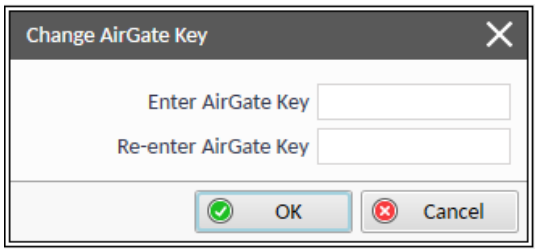

Image 5.12 Second screen of InteliConfig – AirGate

## Connection using WinScope 1000

In order to connect to WinScope 1000 following information have to be filled out:

- **AirGate ID (page 595)**
- AirGate Server → **AirGate Address (page 506)**
- **Controller Address (page 289)**
- User name and Password
- Device Access Key →AirGate Key
- Access code is required

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



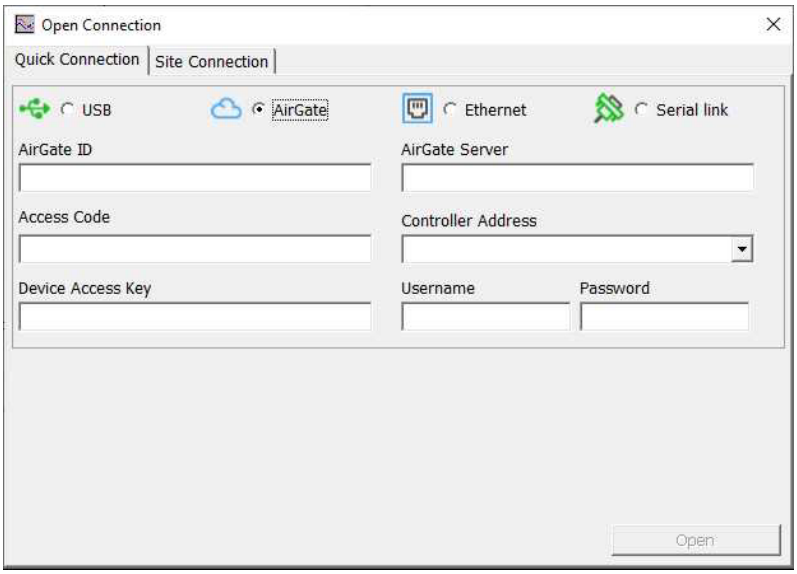



Image 5.13 WinScope 1000 screen – select AirGate

# 5.3 Operator Guide


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5.3.6 Information screen ..... 87
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5.3.8 Display contrast adjustment ..... 90


## 5.3.1 Front panel elements

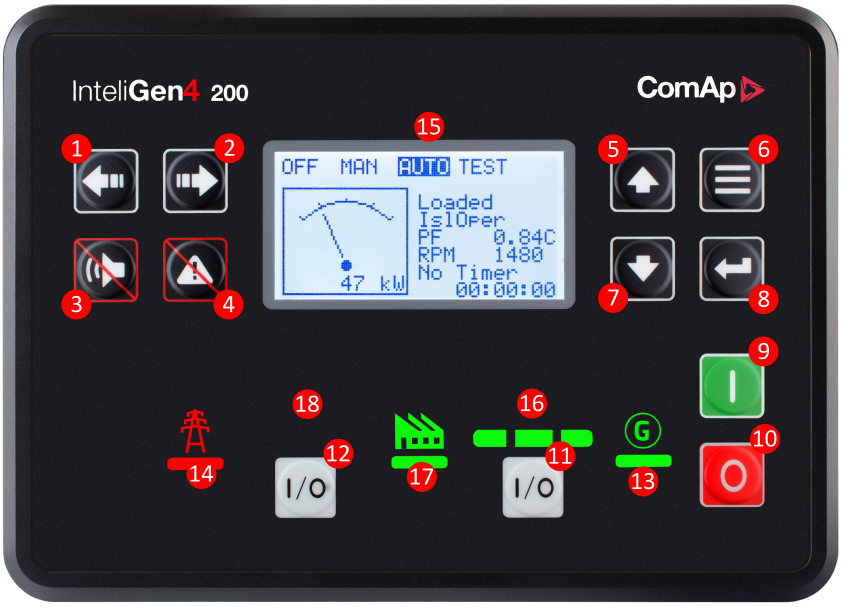



Image 5.14 Operator interface of InteliGen4 200

| Control buttons | | |
|---|---|---|
| **Position** | **Picture** | **Description** |
| 1 |  | **LEFT** button. Use this button to move left or to change the mode. The button can change the mode only if the main screen with the indicator of currently selected mode is displayed.<br>***Note:*** *This button will not change the mode if the controller mode is forced by one of binary inputs listed in the Reference Guide – "Operating modes" chapter.* |
| 2 |  | **RIGHT** button. Use this button to move right or to change the mode. The button can change the mode only if the main screen with the indicator of currently selected mode is displayed. |

| | | |
|---|---|---|
| | | ***Note:*** *This button will not change the mode if the controller mode is forced by one of binary inputs listed in the Reference Guide – "Operating modes" chapter.* |
| 3 |  | **HORN RESET** button. Use this button to deactivate the horn output without acknowledging the alarms. |
| 4 |  | **FAULT RESET** button. Use this button to acknowledge alarms and deactivate the horn output. Inactive alarms will disappear immediately and status of active alarms will be changed to "confirmed" so they will disappear as soon as their reasons dismiss. |
| 5 |  | **UP** button. Use this button to move up or increase value. |
| 6 |  | **PAGE** button. Use this button to switch over display pages. |
| 7 |  | **DOWN** button. Use this button to move down or decrease value. |
| 8 |  | **ENTER** button. Use this button to finish editing a setpoint or moving right in the history page. |
| 9 |  | **START** button. Works in MAN mode only. Press this button to initiate the start sequence of the engine. |
| 10 |  | **STOP** button. Works in MAN mode only. Press this button to initiate the stop sequence of the Gen-set. Repeated pressing of button will cancel current phase of stop sequence (like cooling) and next phase will continue. |
| 11 |  | **GCB** button. Works in MAN mode only. Press this button to open or close the GCB. This button also start the synchronization process. |
| 12 |  | **MCB** button. Works in MAN mode only. Press this button to open or close the MCB. This button also start the synchronization process. |

| **Indicators and others** | |
|---|---|
| **Position** | **Description** |
| 13 | **GENERATOR** status indicator. There are two states – Gen-set OK (indicator is green) and Gen-set failure (indicator is red). Green LED is on if the generator voltage and frequency is present and within limits. Red LED starts flashing when Gen-set failure occurs. After FAULT RESET button is pressed, Red LED goes to steady light (if an alarm is still active) or is off (if no alarm is active). |
| 14 | **MAINS** status indicator. There are two states – Mains OK (indicator is green) and Mains failure (indicator is red). Green LED is on, if mains is present and within limits. Red LED starts blinking when the mains failure is detected and after the Gen-set has started and connected to the load it lights permanently until the mains failure disappears. |

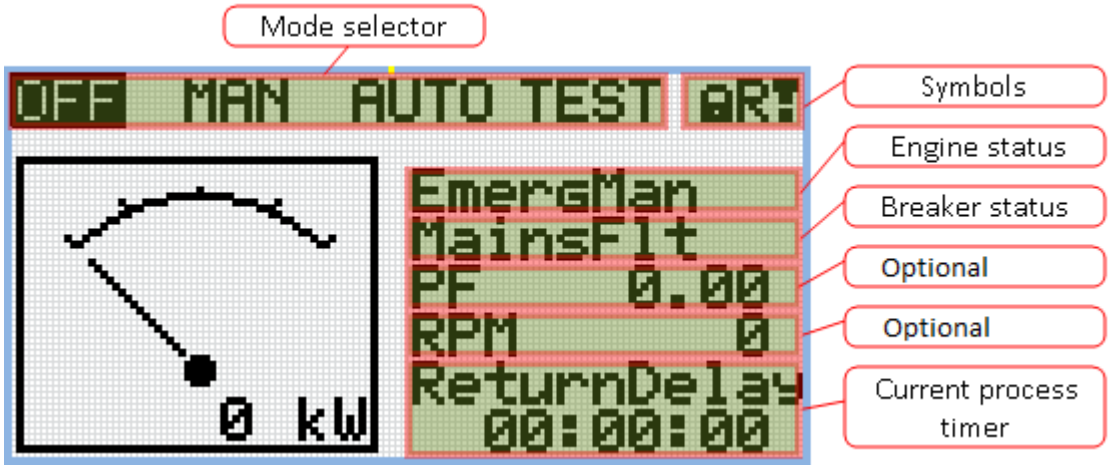
| | |
|---|---|
| 15 | Graphic B/W display, 132 × 64 px. |
| 16 | **GCB Status**. Consists of 3 green LEDs. The middle green LED is on if GCB is closed. It is driven by GCB CLOSE/OPEN output or by GCB feedback signal. Side green LEDs are on in case the generator status indicator is ok. |
| 17 | **LOAD**. Green LED is ON if load is supplied by mains or by generator. It means, that Gen-set or mains is OK and proper circuit breaker is closed. |
| 18 | **MCB Status**.Consists of 3 green LEDs. The middle green LED is on if MCB is closed. It is driven by MCB CLOSE/OPEN output or by MCB feedback signal. Side green LEDs are on in case the mains status indicator is ok. |

## 5.3.2 Display screens and pages structure

The displayed information is structured into "pages" and "screens". Use the PAGE button to switch over the pages.

- The page Measurement consists of screens which display measured values such as voltages, current, oil pressure etc.; computed values such as Gen-set power, statistic data and the alarm list on the last screen.
- The page setpoints contains all setpoints organized to groups and also a special group for entering a password.
- The page History log shows the history log with the most recent record displayed first.

### Main Screen



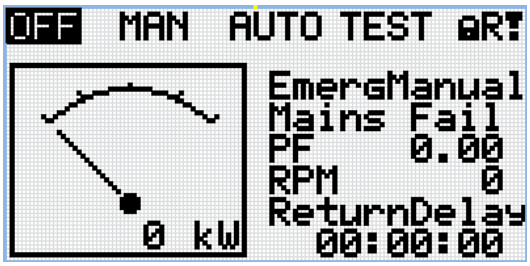

#### Symbols

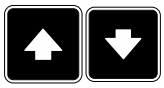
- Padlock – active when LBI ACCESS LOCK is active
- R – active when there is active remote connection to controller
- Exclamation mark – active when there is any alarm in alarm list

#### Optional

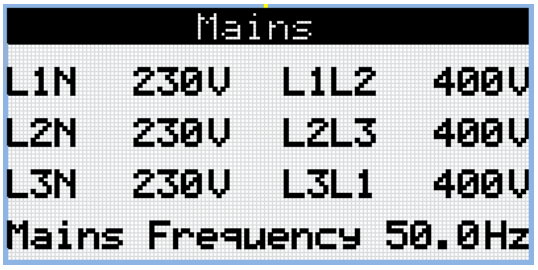
- Value can be chosen via setpoints **Main Screen Line 1 (page 288)** and **Main Screen Line 2 (page 288)**.
- Possibilities are: RPM, PF, Run Hours, ATT, AIN1

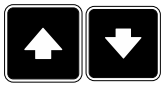
## Measurement Screens



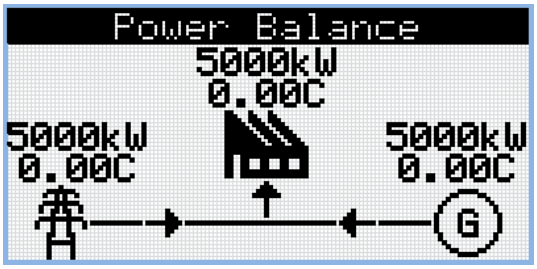



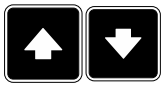
***Note:*** *Use the Up and Down buttons to move between measurement pages.*



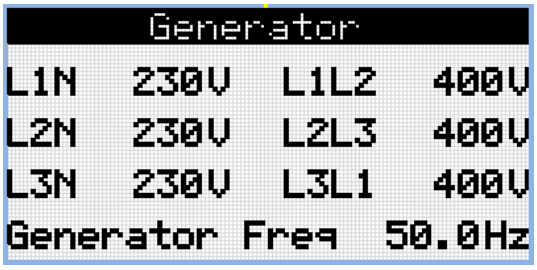
***Note:*** *Use the Up and Down buttons to move between measurement pages.*

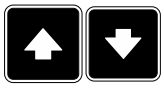


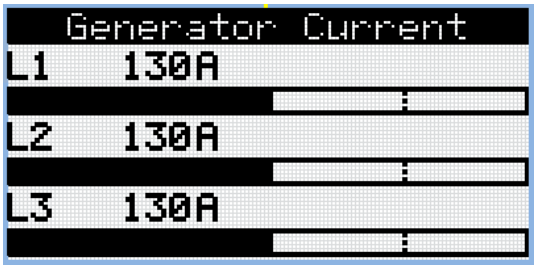
***Note:*** *Use the Up and Down buttons to move between measurement pages.*

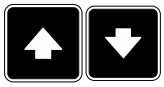
***Note:*** *Only in SPtM application.*



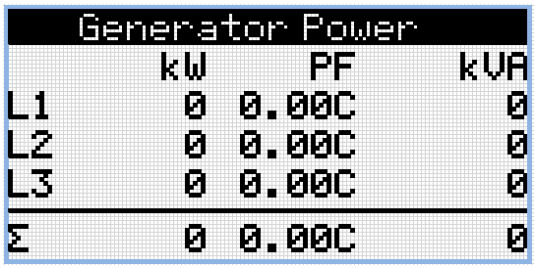



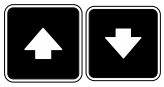
***Note:*** *Use the Up and Down buttons to move between measurement pages.*



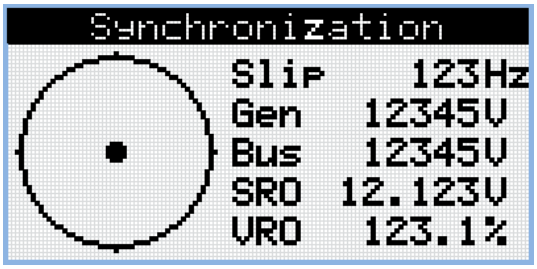



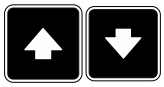
***Note:*** *Use the Up and Down buttons to move between measurement pages.*



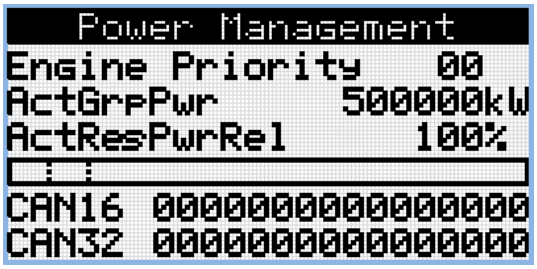



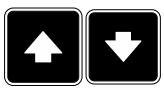
***Note:*** *Use the Up and Down buttons to move between measurement pages.*



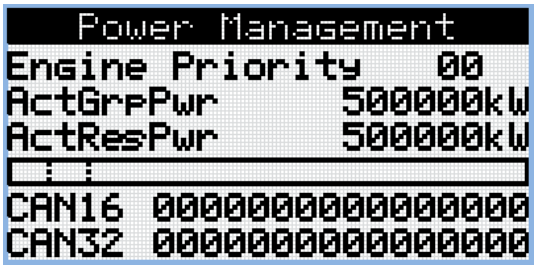
***Note:*** *Use the Up and Down buttons to move between measurement pages.*

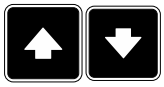


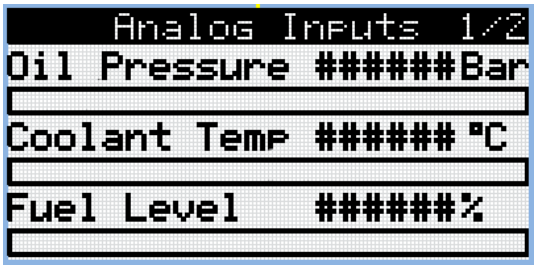
***Note:*** *Use the Up and Down buttons to move between measurement pages.*

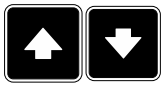
***Note:*** *Only in MINT application.*



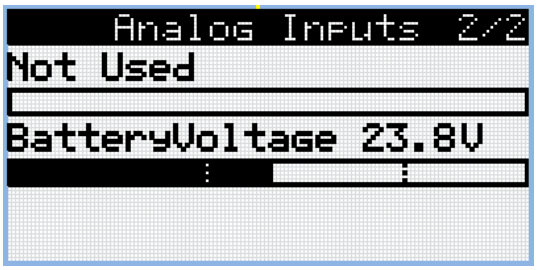



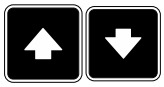
***Note:*** *Use the Up and Down buttons to move between measurement pages.*



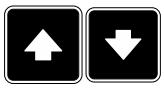
***Note:*** *Use the Up and Down buttons to move between measurement pages.*



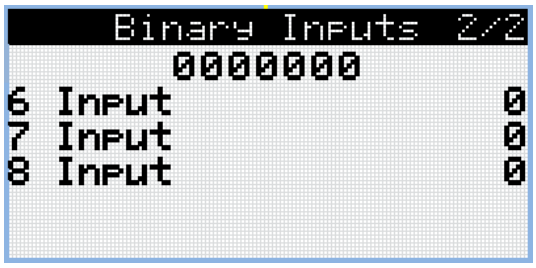



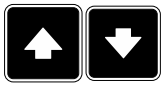
***Note:*** *Use the Up and Down buttons to move between measurement pages.*



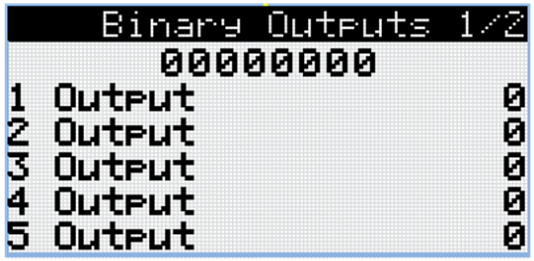



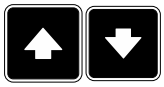
***Note:*** *Use the Up and Down buttons to move between measurement pages.*



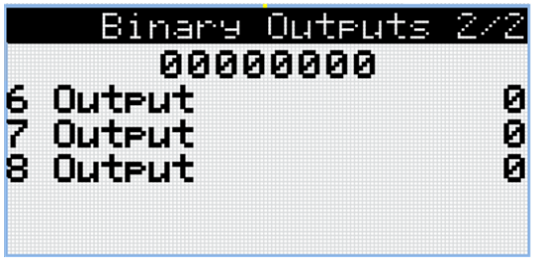



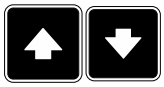
***Note:*** *Use the Up and Down buttons to move between measurement pages.*



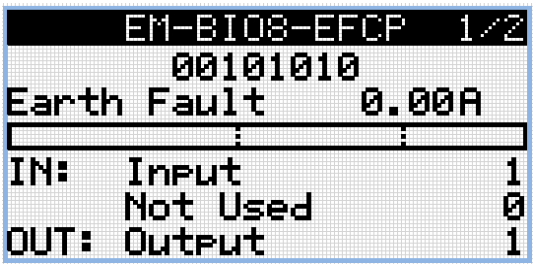



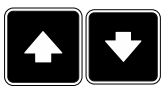
***Note:*** *Use the Up and Down buttons to move between measurement pages.*



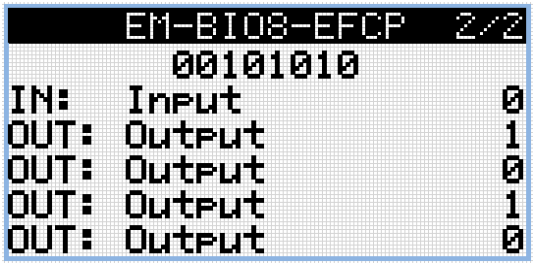
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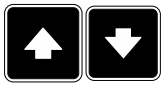


***Note:*** *Use the Up and Down buttons to move between measurement pages.*

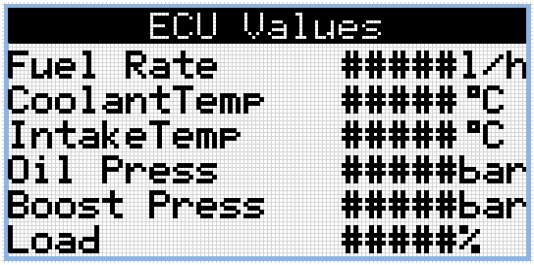
***Note:*** *Available only with plug-in module.*

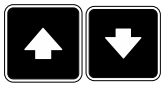


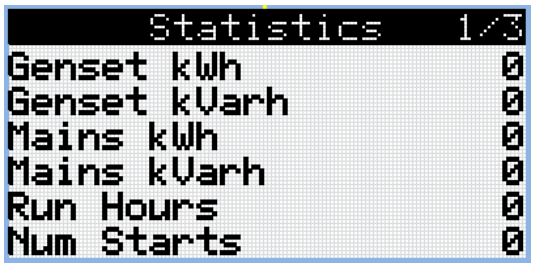
***Note:*** *Use the Up and Down buttons to move between measurement pages.*

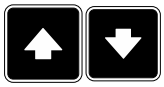
***Note:*** *Available only with plug-in module.*



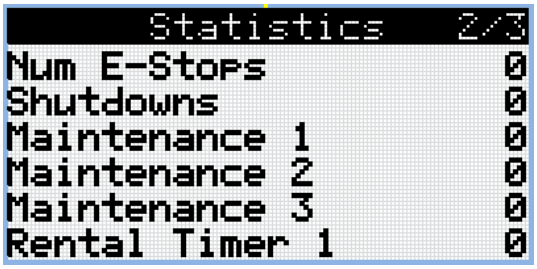



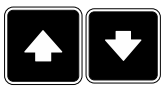
***Note:*** *Use the Up and Down buttons to move between measurement pages.*



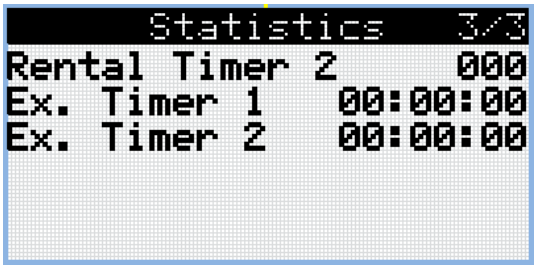



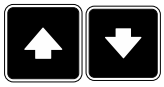
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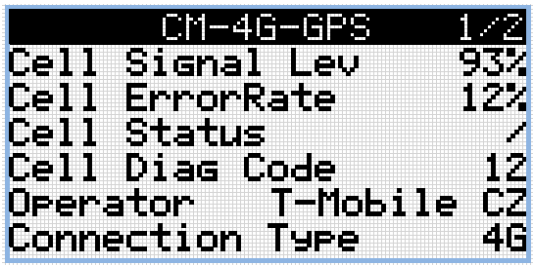



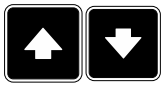
***Note:*** *Use the Up and Down buttons to move between measurement pages.*



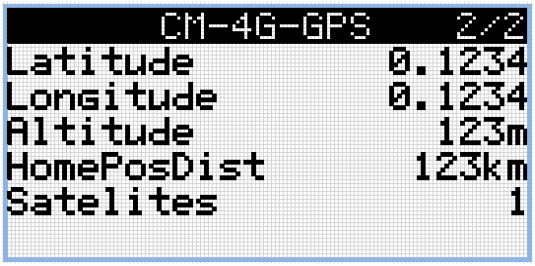
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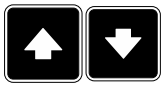


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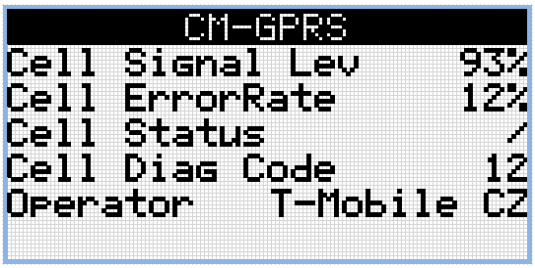
***Note:*** *Available only with plug-in module.*

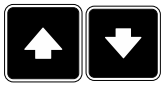


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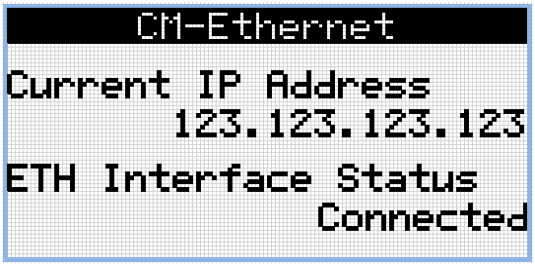
***Note:*** *Available only with plug-in module.*

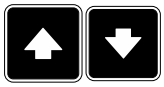


***Note:*** *Use the Up and Down buttons to move between measurement pages.*

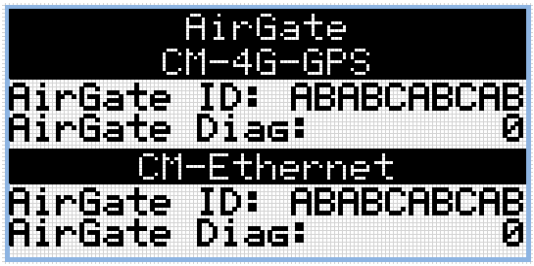
***Note:*** *Available only with plug-in module.*

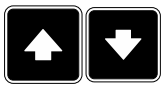


***Note:*** *Use the Up and Down buttons to move between measurement pages.*

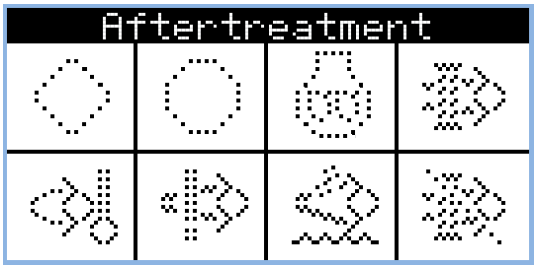
***Note:*** *Available only with plug-in module.*

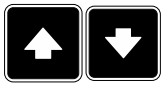


***Note:*** *Use the Up and Down buttons to move between measurement pages.*

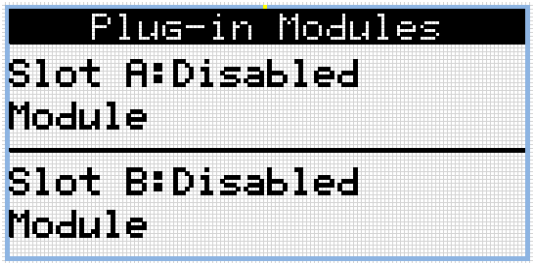
***Note:*** *Available only with plug-in module.*

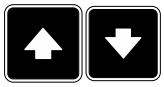


***Note:*** *Use the Up and Down buttons to move between measurement pages.*

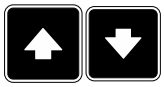
***Note:*** *Available only with ECU supported by TIER4F*



***Note:*** *Use the Up and Down buttons to move between measurement pages.*



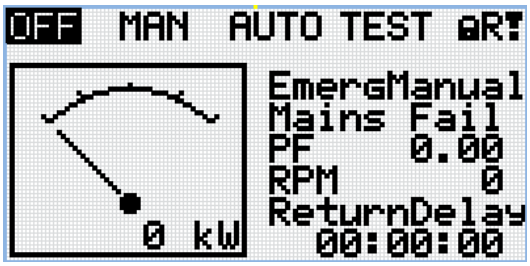



***Note:*** *Use the Up and Down buttons to move between measurement pages.*

***Note:*** *From all of these pages it is possible to switch seamlessly to the setpoint group page by pressing Page button.*

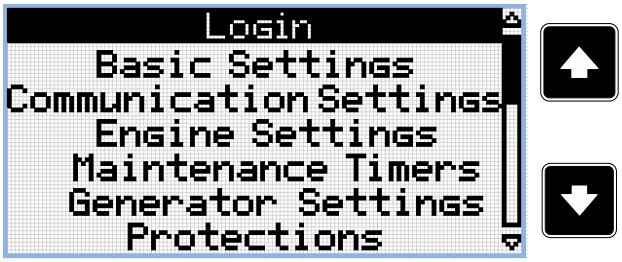
***Note:*** *There can be some additional screens and also some screens can be hidden. Screen's visibility depends on actual configuration (usage of extension or communication modules, ECU etc.).*

## Setpoint Screens





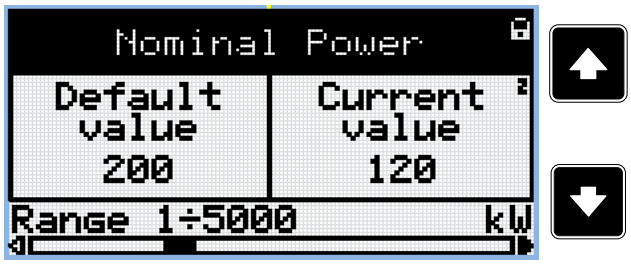

***Note:*** *From all measurement pages you can easily go to the setpoint group page by pressing the Page button.*



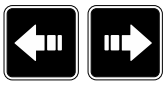

***Note:*** *Use Up and Down button to select required setpoint group.*



***Note:*** *Use the Enter button to enter selected setpoint group.*



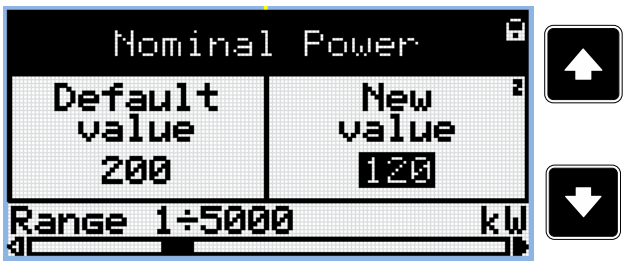

***Note:*** *Use Up and Down button to select required setpoint.*



***Note:*** *Use the Left and the Right button to select required setpoint.*



***Note:*** *Use the Enter button to enter selected setpoint.*

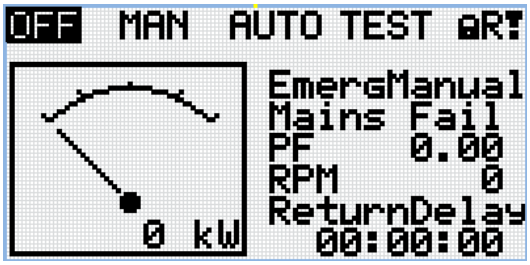



***Note:*** *Use Up and Down button to set required value of selected setpoint.*

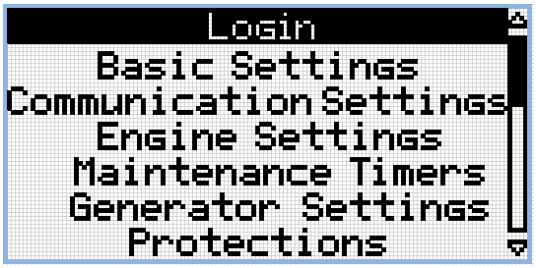
***Note:*** *Use the Enter button to confirm adjusted value of setpoint.*

***Note:*** *Use the Page button to discard changes, to set setpoint to previous value and to return to the list of setpoints of selected group.*

## History Log




***Note:*** *From all measurement pages you can easily go to the setpoint group page by pressing the Page button.*

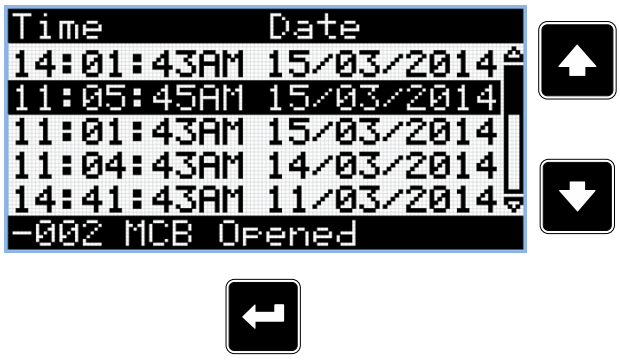



***Note:*** *From setpoint group page we can fluently go to the history log pages by pressing the Page button.*



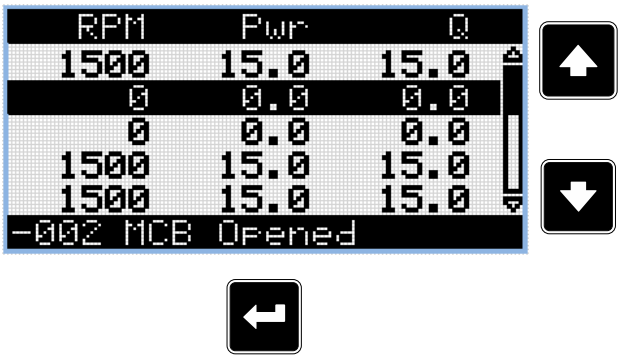

***Note:*** *Use the Up and the Down button to select required alarm reason.*

***Note:*** *Use the Enter button to move to the next page of history log.*




***Note:*** *Use the Up and the Down button to select required alarm reason.*

***Note:*** *Use the Enter button to move to the next page of history log.*



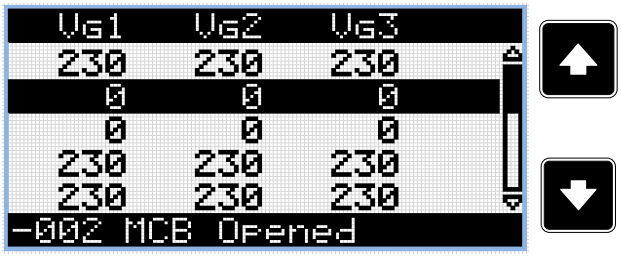

***Note:*** *Use the Up and the Down button to select required alarm reason.*

***Note:*** *Use the Enter button to move to the next page of history log.*



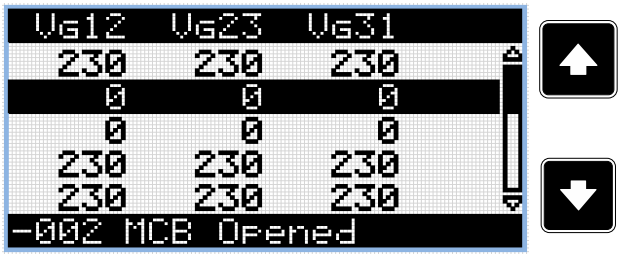

***Note:*** *Use the Up and the Down button to select required alarm reason.*

***Note:*** *Use the Enter button to move to the next page of history log.*



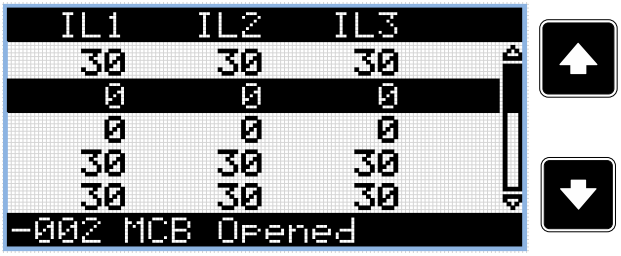

***Note:*** *Use the Up and the Down button to select required alarm reason.*

***Note:*** *Use the Enter button to move to the next page of history log.*



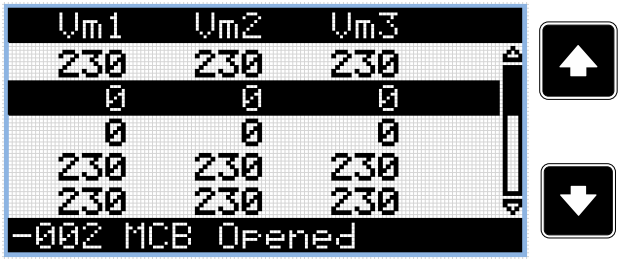

***Note:*** *Use the Up and the Down button to select required alarm reason.*

***Note:*** *Use the Enter button to move to the next page of history log.*



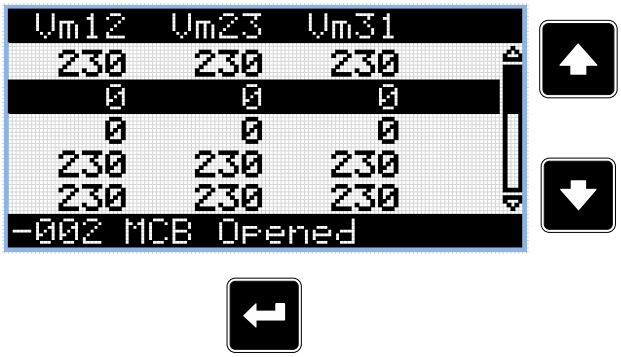

***Note:*** *Use the Up and the Down button to select required alarm reason.*

***Note:*** *Use the Enter button to move to the next page of history log.*



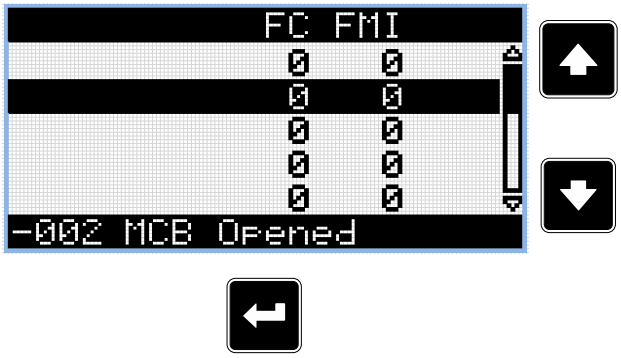

***Note:*** *Use the Up and the Down button to select required alarm reason.*

***Note:*** *Use the Enter button to move to the next page of history log.*



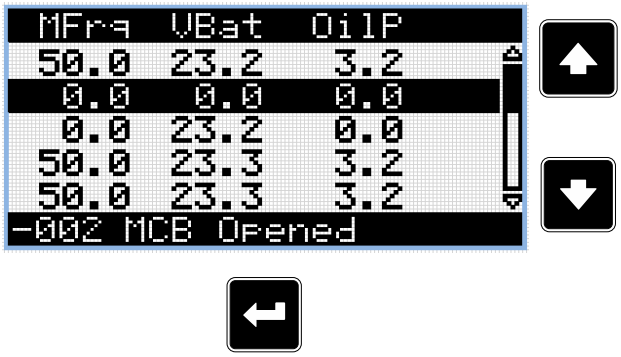

***Note:*** *Use the Up and the Down button to select required alarm reason.*

***Note:*** *Use the Enter button to move to the next page of history log.*



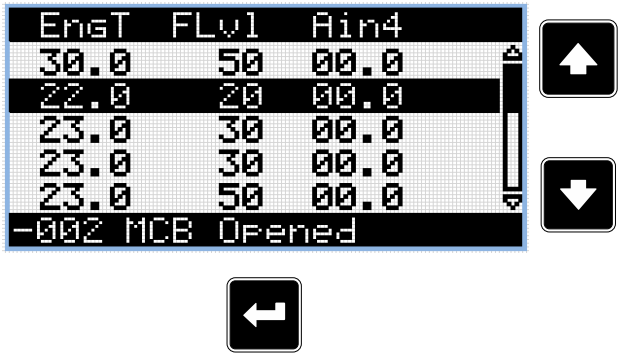

***Note:*** *Use the Up and the Down button to select required alarm reason.*

***Note:*** *Use the Enter button to move to the next page of history log.*



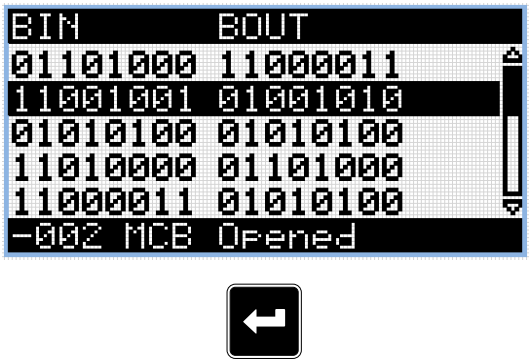

***Note:*** *Use the Up and the Down button to select required alarm reason.*

***Note:*** *Use the Enter button to move to the next page of history log.*




***Note:*** *Use the Up and the Down button to select required alarm reason.*

***Note:*** *Use the Enter button to move to the next page of history log.*




***Note:*** *Use the Up and the Down button to select required alarm reason.*

***Note:*** *Use the Enter button to move to the next page of history log.*



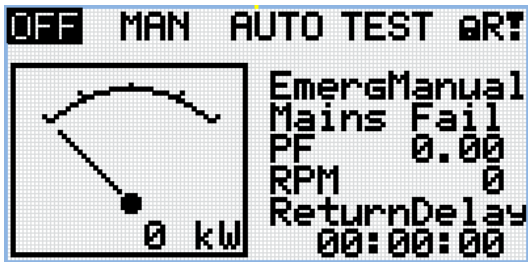

***Note:*** *Use the Up and the Down button to select required alarm reason.*

***Note:*** *Use Enter button to move to the first page of history log.*

**IMPORTANT: The records are numbered in reverse order, i.e. the latest (newest) record is "0" and older records have "-1", "-2" etc.**

***Note:*** *This is only basic history record. There can be some additional screens in case that in controller is extension module or ECU is configured. Also it depends on connection type.*

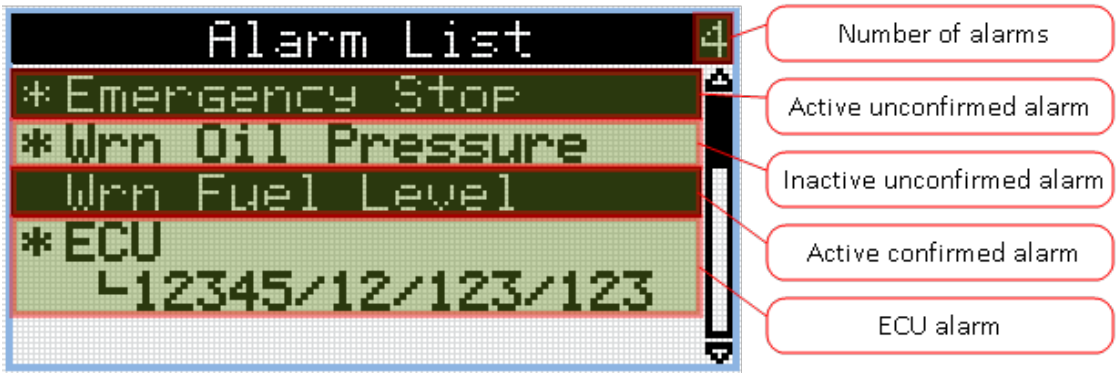
## 5.3.3 Browsing alarms




***Note:*** *Use the Up button to move to alarm list from main measurement screen.*




- Active alarms are displayed as white text on black background. It means the alarm is still active, i.e. the appropriate alarm conditions are still present.
- Inactive alarms are displayed as black text on white background. It means the alarm is not active, i.e. the appropriate alarm conditions are gone.
- Unconfirmed alarms are displayed with an asterisk. This means the alarm is still not acknowledged (confirmed).
- ECU alarms: SPN/FMI/OC/SC
  - SPN – Suspect parameter number
  - FMI – type of protection
  - OC – number of errors
  - SC – source of error



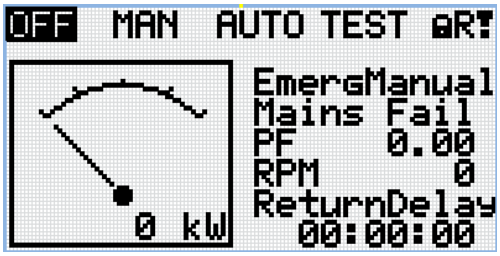

## User access management alarms

The controller comes to the customer with Production mode turned on, the default administrator password installed and with no prefilled email address for password reset. For security purposes, the following user access management alarms will appear. Detailed description of situation when the alarms are active is provided below:

- **Wrn Production Mode** is present in the alarm list any time the production mode is turned on. To turn off the Production mode go to User management and uncheck the checkbox Production mode or go to Production Mode display screen and select disable.
- **Wrn Default Password** appears in alarm list when the default administrator password is set and communication module is plugged in the controller. The purpose of alarm is to inform that the controller might be or is connected to an untrusted interface and cybersecurity rules are not fulfilled because there is default administrator password.
- **Wrn Password reset e-mail address is not set** appears in alarm list when there is no email address set and the administrator password is not the default one. The purpose of alarm is to inform that there is possibility that the controller might not be accessible by administrator password due to a forgotten

password. The password reset procedure cannot be performed without a filled email address. To fill out email address, the administrator password is required.

## 5.3.4 Login




***Note:*** *From all measurement pages you can easily go to the setpoint group page by pressing the Page button.*




***Note:*** *Use the Up and the Down button to select setpoint group Login.*

***Note:*** *Use the Enter button to enter setpoint group Login.*




***Note:*** *Use the Up and the Down Button to select Login.*

***Note:*** *Use the Enter button to enter Login.*



## UserID Edit




***Note:*** *Use the Up and the Down Button to change the digit.*

***Note:*** *Use the Left and the Right buttons to move between digits.*




***Note:*** *Use the Enter button to confirm the UserID or Page button to cancel entering Login.*

## PIN Edit







***Note:*** *Use the Up and the Down Button to change the digit.*

***Note:*** *Use the Left and the Right buttons to move between digits.*



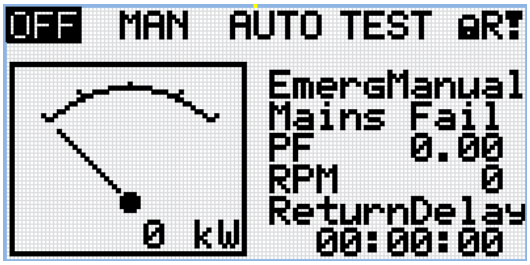



***Note:*** *Use the Enter button to confirm the PIN and Login or the Page button to cancel entering the Login.*



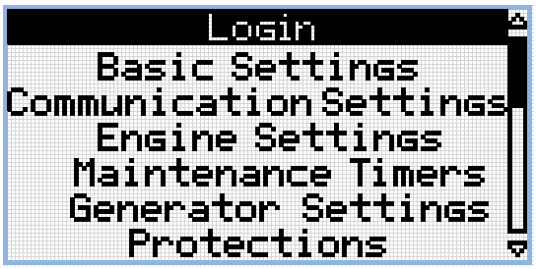

***Note:*** *In case that invalid UserID or PIN are entered, the controller shows Wrong Credentials screen. Use the Enter button to enter Login again or the Page Button to go back to menu.*

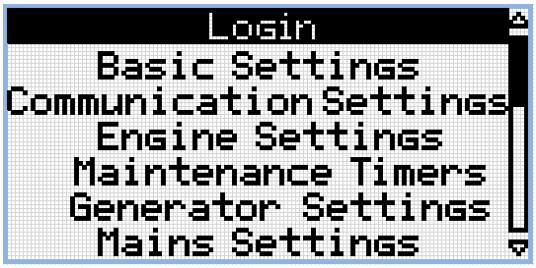
## 5.3.5 Production mode






***Note:*** *From all measurement pages you can fluently go to the setpoint group page by pressing the Page button.*





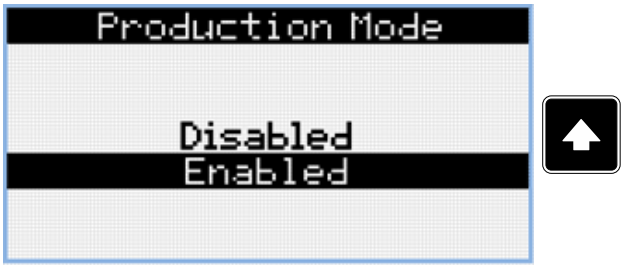

***Note:*** *Use the Enter button to enter setpoint group Login.*

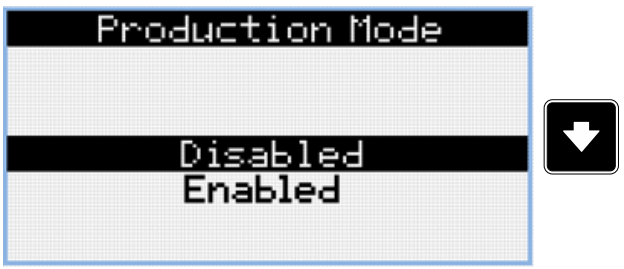





***Note:*** *Use the Up and the Down Button to select Production Mode*

***Note:*** *Use the Enter button to enter the Production Mode.*





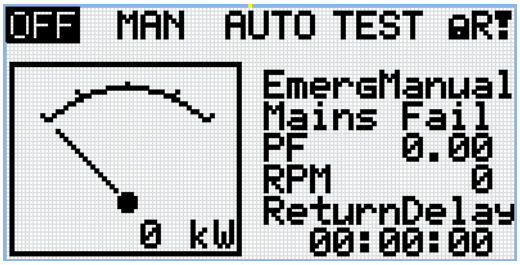

***Note:*** *Use the Up and the Down Button to change to disabled*

***Note:*** *Use the Enter button to disable the Production Mode.*




***Note:*** *Once Disabled is confirmed by Enter button the option Enabled is no longer on the screen and therefore it is not possible to enable Production mode by HMI display screen. Use InteliConfig to enable the Production mode.*

## 5.3.6 Information screen






***Note:*** *On Main measurement screen press the Enter and the Page button together. The Enter button has to be pressed first.*



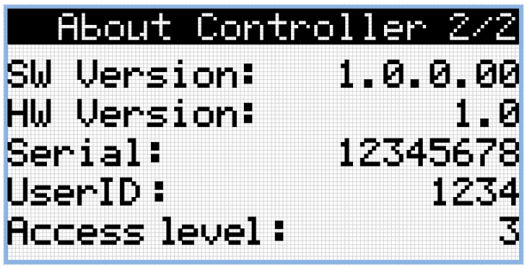



***Note:*** *Use the Page button to move to the next page.*





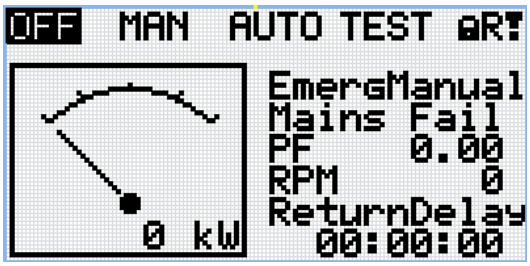

***Note:*** *Use the Page button to move to the next page.*






***Note:*** *Use the Up button to move back to main measurement screen.*

## 5.3.7 Language selection



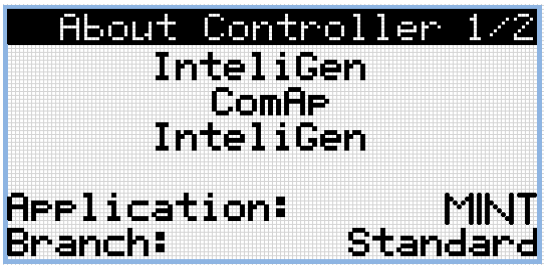



***Note:*** *On Main measurement screen press the Enter and the Page button together. The Enter button has to be pressed first.*



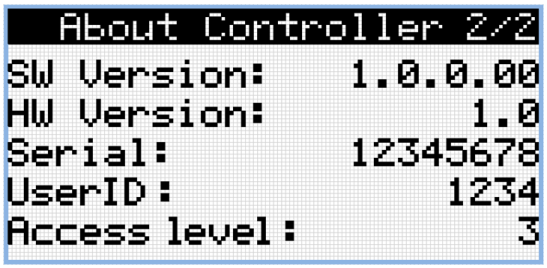



***Note:*** *Use the Page button to move to the next page.*



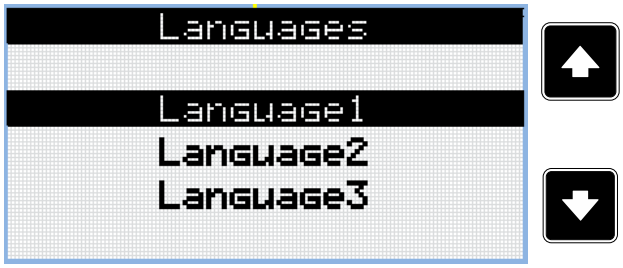



***Note:*** *Use the Page button to move to the next page.*






***Note:*** *Use the Page button to move to the next page.*

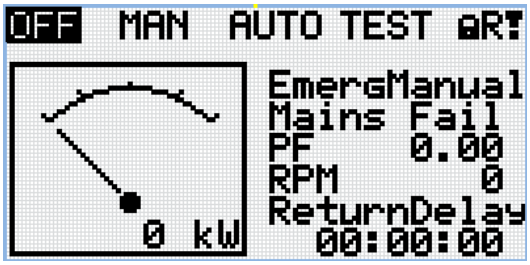


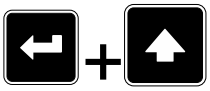

***Note:*** *Use the Up and the Down button to select required language.*



***Note:*** *Use the Enter button to confirm the selected language.*

## 5.3.8 Display contrast adjustment

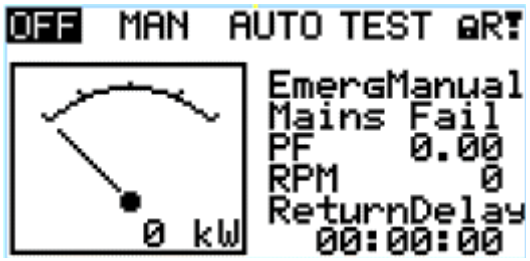


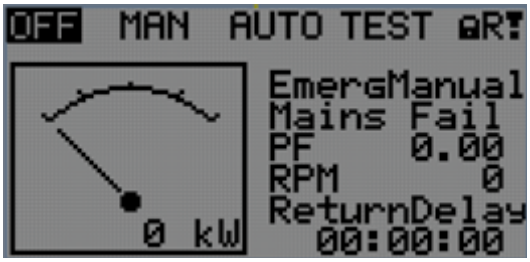



***Note:*** *On any measurement screen press the Enter and the Up button together for higher contrast.*



***Note:*** *On any measurement screen press the Enter and the Down button together for lower contrast.*




***Note:*** *After setting the contrast, no another action is needed.*

# 5.4 Remote Display

This chapter describes Remote display firmware IL4-RD, which is designed as a remote signalling and control software for InteliGen4 200 controller. It is an optional software which is possible to upload into the controller rather than the controller's standard firmware.

***Note:*** *InteliGen4 200 can not become remote display for other controllers, this function is facilitated by IL4 family controllers.*

## 5.4.1 General description

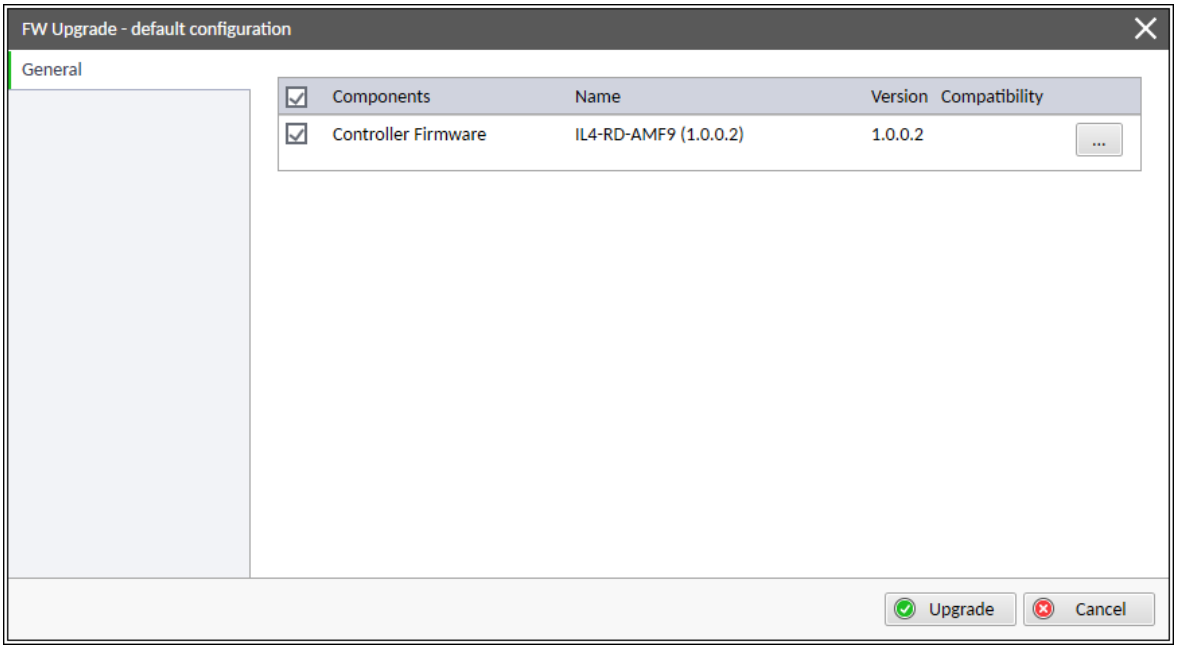
Remote display software works as "remote display and control" for the Master InteliGen4 200 controller. Gen-set can be controlled using the Remote display and the Master controller simultaneously and independently. All Remote display screens (Measurement screens, Setpoint screens and History Log) display the same data as the Master controller. The front panel buttons on both controllers work the same way. All remote display LEDs show the same state as corresponding LEDs on Master controller.

***Note:*** *Some settings are not shared between display and control unit (setpoint* ***Backlight Timeout (page 285)****, Controller language and Controller user mode).*

## 5.4.2 IL4-RD Firmware installation

The IL4-RD Remote display firmware is installed in the same way as any other InteliGen4 200 firmware using the InteliConfig PC tool. Reverting the Remote display controller back to regular Gen-set controller is carried out the same way.

***Note:*** *InteliConfig shows the most compatible and the most recent firmware as default option. Thus, it is necessary use "More options" (…) button to pick IL4-RD firmware for uploading to controller. (See details on picture below.)*




***Note:*** *IL4-RD consists of firmware only, there is no archive included.*

***Note:*** *When IL4-RD firmware is uploaded to controller there is only possible connect InteliConfig using USB connection. InteliConfig serves only for firmware update when connected to Remote display. There is no Master controller SCADA displayed, no possibility to adjust setpoints, display Values etc.*

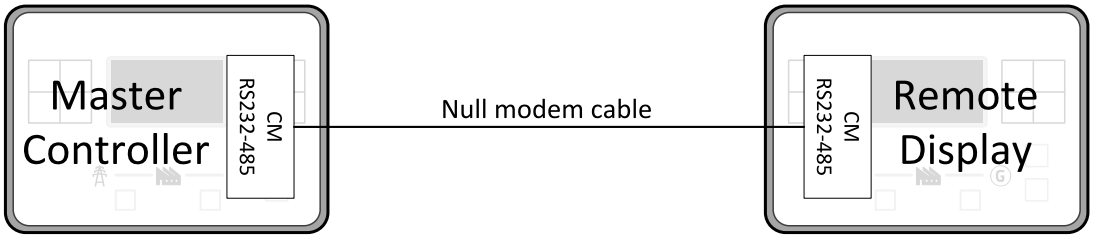
***Note:*** *Please refer to InteliConfig Global Guide for details about firmware uploading to controller.*

## 5.4.3 Wiring

IL4-RD can be connected to any InteliGen4 200 controller via an onboard RS485 communication port or via the external RS232/RS485communication ports on CM-RS232-485 communication module . It is possible to connect up to three Remote displays to one Master controller, but each one needs to be using different communication interface.. Connecting two or more remote displays to one communication line (e.g. RS485) is not possible. Using one Remote display it is possible to monitor only one Master controller at the time.

## 5.4.4 Interconnection variants

### RS232

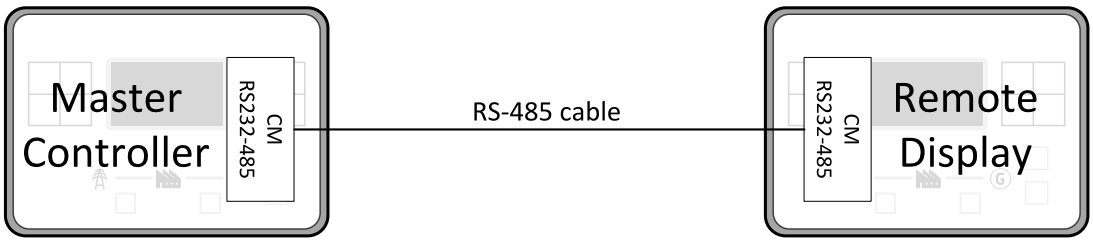



It is necessary to use CM-RS232-485 communication module on both the Master controller and the Remote display. COM 1 communication channel is used with these settings:

- COM 1 Mode: Direct
- COM 1 Communication Speed: 57600 or 115200 bps
- Controller Address: 1 – 32

The maximal distance between Master controller and Remote display is 10 m for RS-232 connection. It is recommended to use standard Null modem cable (crossover cable), although three wire (TxD, RxD, GND) RS-232 connection is sufficient for communication.

### RS485




Any combination of internal RS485 port or external one on CM-RS232-485 communication module can be used for the Master and Remote Displays.

COM 2 communication channel is used with these settings:

- COM 2 Mode: Direct
- COM 2 Communication Speed: 57600 or 115200 bps
- Controller Address: 1 – 32

The maximal distance between Master controller and Remote display is 1200 m for RS485 connection. It is recommended to use shielded twisted-pair cables that comply with the EIA RS-485 standard to reduce interference and to achieve maximal distance.

## Onboard RS485

The remote display can be connected by onboard RS485 communication port on both the Master controller and CM-RS232-485 Remote Display or a combination of these.

- RS485 Mode: Direct
- RS485 Communication speed: 57600 or 115200 bps
- Controller address: 1-32

The maximal distance between Master controller and Remote display is 1200 m for RS485 connection. It is recommended to use shielded twisted-pair cables that comply with the EIA RS-485 standard to reduce interference and to achieve maximal distance.

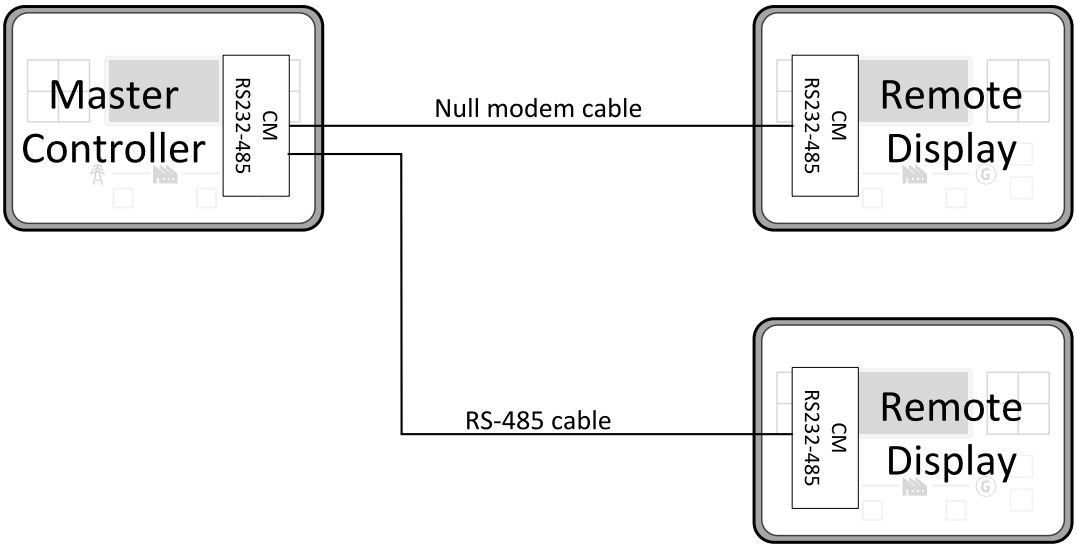
## RS232 + RS485

### Master Controller with Two Remote Displays

It is possible to combine two of the previous methods of interconnection and connect two Remote display to one Master controller concurrently. All parameters and settings are the same as mentioned above.

***Note:*** *Onboard RS485 and CM-232-485 communication module can be used to achieve both remote displays being connected via RS485 for IL4 MRS16 and IL4 AMF25.*

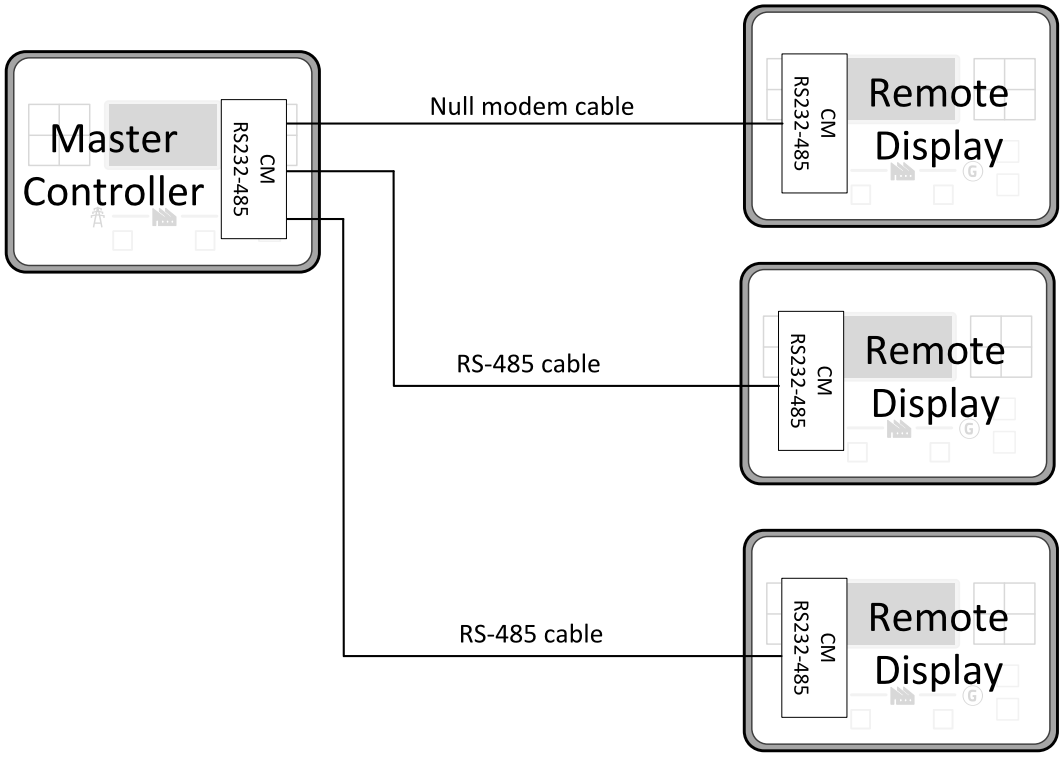
***Note:*** *IL4 AMF8, IL4 AMF9 and IL4 AMF20 as master controller can only have up to two remote displays at the same time and will need to use RS232 combined with RS485.*



### Master Controller with Three Remote Displays

It is possible to combine all of the previous methods of interconnection and connect three Remote display to one Master controller concurrently. All parameters and settings are the same as mentioned above.

***Note:*** *This is only possible if IL4 MRS16 or IL4 AMF25 is the master controller.*




## 5.4.5 Connection process

After powering up, the Remote Display automatically tries to connect to the last known Master controller (if such configuration exists in Remote display). Otherwise the Remote display searches for any Master controller connected. The Remote Display tries two communication speeds 57600 bps and 115200 bps.

During this autodetection process the message "Trying to connect" is displayed on screen. This process takes approx. one minute.

When an incompatible configuration type is found in a detected controller, the message "Unknown cfg format COM x Addr yy" is displayed on screen for 5 seconds. Detecting continues with the next address in the range.

If detecting finishes with no compatible Master controller found, the message "No connection" is displayed on screen for 5 seconds. The detecting process starts from the beginning and continues until compatible a Master controller is found.

Unsupported types of controllers or controllers that are not properly communicating are skipped during the search.

## 5.4.6 Connection troubleshooting

There are a few reasons why the Remote display may not connect to the Master controller:

- An unsupported type of Master controller connected.
- Unsupported firmware in Master controller.
- Configuration table error in Master controller.
- Wrong settings of setpoint COM x Mode in master controller.

- Wrong settings of setpoint COM x Communication Speed in master controller.
- Wrong connection, wiring, or communication failure.

## 5.4.7 Function description

Remote display software works as "remote display and control" for the Master InteliGen4 200 controller. Genset can be controlled using the Remote display and the Master controller simultaneously and independently. All Remote display screens (Information screens, Measurement screens, Setpoint screens and History Log) display the same data as the Master controller. The front panel buttons on both controllers work the same way. All remote display LEDs show the same state as corresponding LEDs on Master controller. User can switch screens, enter or set password, adjust setpoints, change language, change Configuration Level, change display contrast and view history records.

***Note:*** *It is recommended to use the same type and model of controller for Master and for Remote display. Only in such case is assured the proper function of all buttons, LED diodes and display.*

> **Example:** When AMF controller HW type is used as a Master controller and MRS controller HW type is used for Remote display there is no possibility to control MCB in MAN mode as there is no MCB button on the MRS controller. Even though all these not recommended combinations may work, all of the limitations above must be considered.

Master device is always able to function without a connected Remote display. Disconnecting of the serial line between the Master controller and Remote display has no effect on the Master controller.

When the serial line between the Master controller and Remote display is disconnected, or communication cannot be established, Remote display shows its own Init screen with the message "Trying to connect" and all LEDs are off.

Once the Remote display finds compatible Master controller it shows message "Cfg processing" and downloads configuration table from master controller. After the configuration from Master controller is downloaded and the Remote display is reinitiated, jump to master controller's Main measurement screen and regular operation is started.

It is possible to switch to Remote display's own Init screen to check IL4-RD FW version and serial number of used controller and communication status by pressing and holding the Page button for more than 3 seconds.

## 5.4.8 Firmware compatibility

### Remote Display

IL4-RD FW is able to be uploaded into the following controllers:

- InteliLite 4 AMF25
- InteliLite 4 AMF20
- InteliLite 4 AMF9
- InteliLite 4 AMF8
- InteliLite 4 MRS16

***Note:*** *All controllers from the list above can function as a remote display for InteliGen4 200 controller*

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back to Controller setup

## 5.5.1 Additional running engine indications

It is helpful to have information other than speed (RPM), whether the engine is rotating or not, especially if RPM is measured from the generator frequency instead of magnetic pickup. The generator frequency measurement can be unreliable at very low speeds and/or may have a delayed reaction to sudden and big changes (i.e. in the moment that the engine has just started…).

The following conditions are evaluated as additional running engine indication:

- Voltage on the D+ input is higher than the **D+ Threshold (page 308)** of battery voltage. Connect this input to the D+ (L) terminal of the charging alternator and enable the D+ function by the setpoint **D+ Threshold (page 308)** . If D+ terminal is not available, leave the input unconnected and disable the function.
- The pickup is not used and frequency is not detected on the pickup input. Connect the pickup input to the W terminal of the charging alternator if you do not use pickup and the W terminal is available. If not, leave the input unconnected.
- Oil pressure > **Starting Oil Pressure (page 297)** setpoint. The oil pressure is evaluated from the analog input or from the ECU if an ECU is configured.
- Binary input **OIL PRESSURE (PAGE 624)** is in logical 0.
- At least one phase of generator voltage is >25 % of nominal voltage.

These signals are used during start for powering down the starter motor even if no RPM is measured. These signals are used during stop in order to evaluate if the engine has really stopped.

## 5.5.2 After-treatment Support

Afer-treatment support generally provides monitoring and control of the after-treatment system installed on generators engine. The requirements are defined as:

- Providing After-Treatment status information by
  - Displaying universal lamps (icons)
  - Displaying analog and binary values
- Control of After-Treatment regeneration function by
  - Transmitting commands to the ECU

### Providing After-treatment status information

#### After-Treatment screen

This screen is shown with configured ECU which supports Tier 4 Final / Stage V. The After-Treatment screen is automatically shown, once any of the selected lamps gets active or change status. Deactivation of the lamp will not trigger showing the screen. The screen is then shown until the operator switches it to another one. Alarm list screen has lower priority so even if a new alarm appears, the After-treatment screen is still displayed. To avoid displaying a blank screen, inactive lamps are represented by "dotted" icons. For no active lamp the screen shows all dotted icons. Please see examples below:

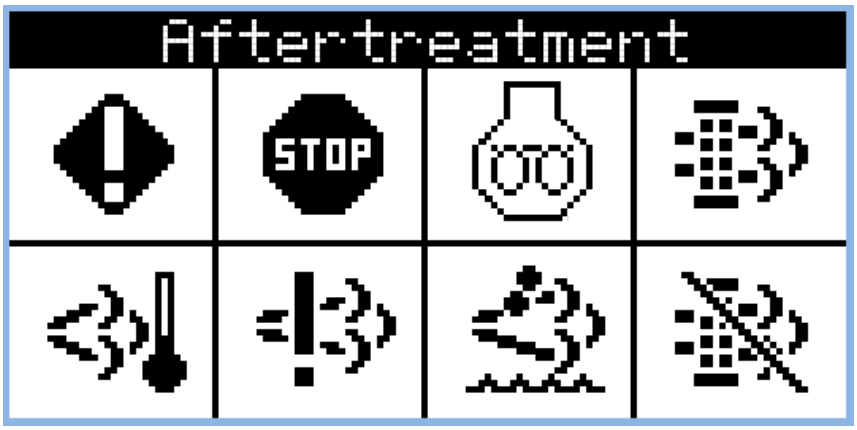



Image 5.15 Example of active After-treatment screen

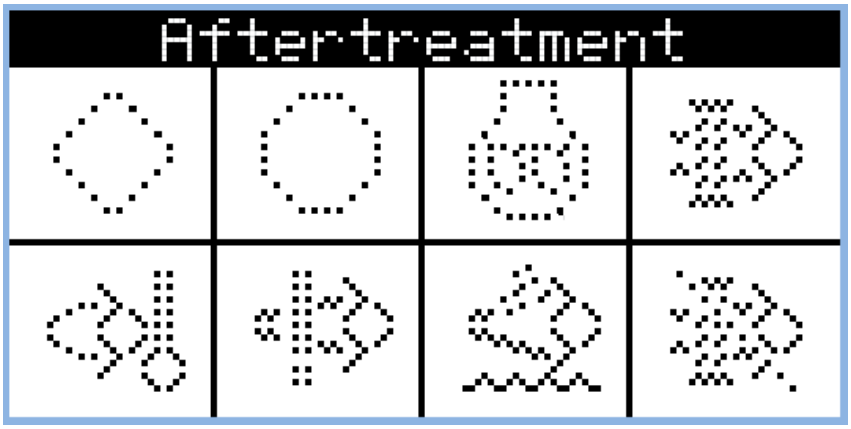
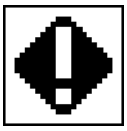
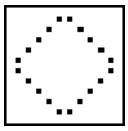
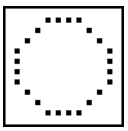
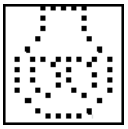
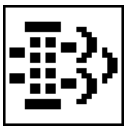
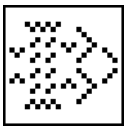
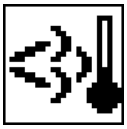
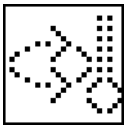
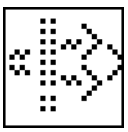


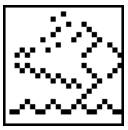
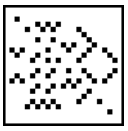

Image 5.16 Example of inactive After-treatment screen

### Universal lamps (icons)

Universal lamp icons are shown on the After-Treatment screen. Based on specific value read in specific frame with specific SPN, every lamp icon is either:

- shown
- hidden
- blinking slow (1 Hz)
- blinking fast (2 Hz)

| Lamp name | Active icon | Inactive icon | Alarm | LBO | LBI |
|---|---|---|---|---|---|
| ECU Yellow Lamp |  |  | Wrn ECU Yellow Lamp (page 723) | ECU Yellow Lamp (page 651) | ECU Yellow Lamp Blink (page 612)<br>ECU Yellow Lamp Fast Blink (page 612)<br>ECU Yellow Lamp Solid (page 612) |
| ECU Red Lamp |  |  | Wrn ECU Red Lamp (page 723) | ECU Red Lamp (page 650) | ECU Red Lamp Blink (page 610)<br>ECU Red Lamp Fast Blink (page 611)<br>ECU Red Lamp Solid (page 611) |
| ECU Wait To Start |  |  | Wrn ECU Wait To Start (page 724) | ECU Wait To Start (page 651) | ECU Wait To Start Blink (page 611)<br>ECU Wait To Start Fast Blink (page 611)<br>ECU Wait To Start Solid (page 611) |
| ATT DPF Lamp |  |  | Wrn ATT DPF Lamp (page 724) | ATT DPF Lamp (page 644) | ATT DPF Lamp Blink (page 606)<br>ATT DPF Lamp Fast Blink (page 606)<br>ATT DPF Lamp Solid (page 606) |
| ATT HEST Lamp |  |  | Wrn ATT HEST Lamp (page 724) | ATT HEST Lamp (page 644) | ATT HEST Lamp Blink (page 606)<br>ATT HEST Lamp Fast Blink (page 607)<br>ATT HEST Lamp Solid (page 607) |
| ATT SCR Error Lamp |  |  | Wrn ATT SCR Error Lamp (page 724) | ATT SCR Error Lamp (page 645) | ATT SCR Error Lamp Blink (page 608)<br>ATT SCR Error Lamp Fast Blink (page 608)<br>ATT SCR Error |

| Lamp name | Active icon | Inactive icon | Alarm | LBO | LBI |
|---|---|---|---|---|---|
| | | | | | LAMP SOLID (PAGE 608) |
| ATT DEF Level Lamp |  |  | Wrn ATT DEF Level Lamp (page 724) | ATT DEF LEVEL LAMP (PAGE 644) | ATT DEF LEVEL LAMP BLINK (PAGE 605)<br>ATT DEF LEVEL LAMP FAST BLINK (PAGE 605)<br>ATT DEF LEVEL LAMP SOLID (PAGE 605) |
| ATT Inhibited Lamp |  |  | Wrn ATT Inhibited Lamp (page 725) | ATT INHIBITED LAMP (PAGE 645) | ATT INHIBITED LAMP BLINK (PAGE 607)<br>ATT INHIBITED LAMP FAST BLINK (PAGE 607)<br>ATT INHIBITED LAMP SOLID (PAGE 608) |

***Note:*** *Lamps can by disabled during prestart phase. Checkbox: Ignore ECU lamps during prestart is located in InteliConfig -> Controller Configuration -> Modules -> ECU module -> Electronic control unit settings.*

***Note:*** *Aftertreatment support can be disabled. Aftertreatment HMI Screen is hidden and alarms related to aftertreatment are not shown. Use the checkbox: Disable aftertreatment support located in InteliConfig -> Controller Configuration -> Modules -> ECU module -> Electronic control unit settings.*

## Changing behavior of Aftertreatment lamps using PLC

The behavior of lamps can be changed using PLC logic. For this reason there is group of LBI introduced which directly controls each lamp state. These LBIs can be used for control of the lamps the way the user wants. PLC Decomposer block should be used in a case the signal from ECU is analog one.

**Example:**

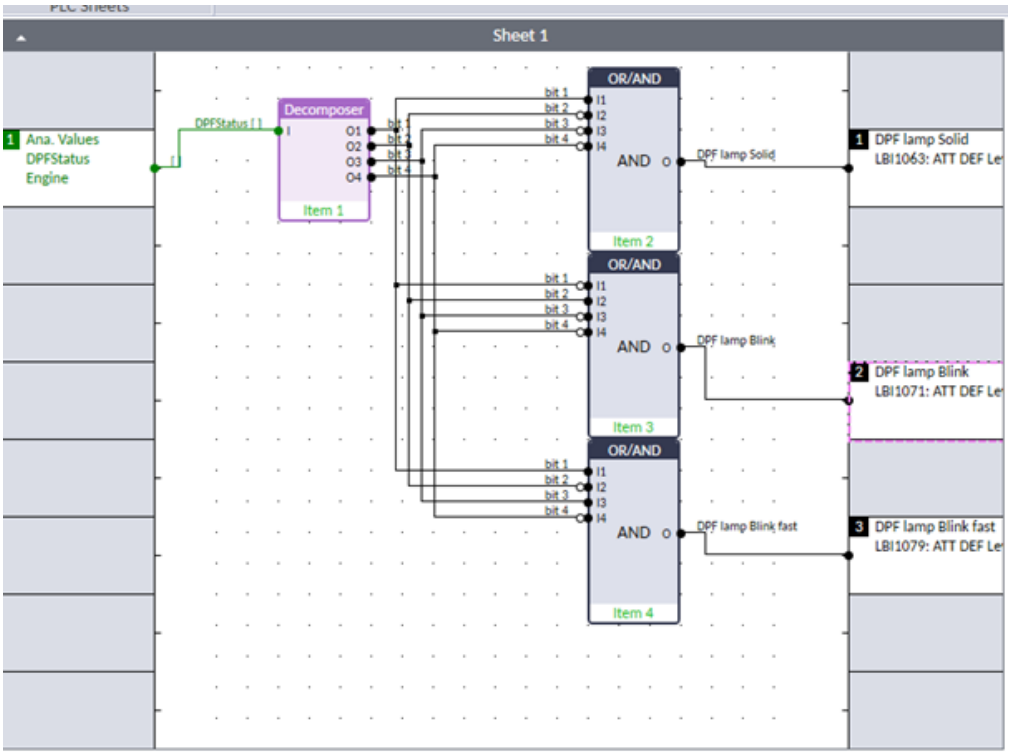



Image 5.17 The lamp state will be solid when signal is value 1, 2 = blink, 5 = blink fast

## Control of After-Treatment regeneration function

Control of the non-mission regeneration is dependent on several conditions:

- Controller is in MAN mode
- GCB muset be open only when **GCB Control Mode (page 271)** = Internal
- State Running

When these conditions are met, user can either switch LBI **ATT Interlock (page 608)** which acts as acknowledgment for the ECU that everything is prepared for the DPF regeneration, after that user can start regeneration by closing LBI **ATT Force Regen (page 606)**. Some ECUs however do not include LBI **ATT Interlock (page 608)** and closing just LBI **ATT Force Regen (page 606)** is enough to start the regeneration process.

Some engines may require the regeneration to run on higher RPM than is normally expected. For this reason we recommend to adjust Overspeed Limit setpoint.

The exact process and conditions for each particular engine should be studied carefully from the engine documentation issued by the manufacturer.

**User can also inhibit regeneration process by:**

- **ATT Inhibit Regen (page 607)**

By doing so, the process of regeneration will be postponed until user switches the LBI back to open position. The Regeneration Inhibit lamp should be usually on solid when the LBI is closed. If the LBI is closed during regeneration, the process stops and it will have to start over if the ECU allows it.

## 5.5.3 Alternate configuration

There are 3 sets of alternate configurations in a controller:

| Configuration set 1 | Configuration set 2 | Configuration set 3 |
|---|---|---|
| Nominal Power Split Phase 1 (page 526) | Nominal Power Split Phase 2 (page 532) | Nominal Power Split Phase 3 (page 537) |
| Nominal Power 1 (page 526) | Nominal Power 2 (page 531) | Nominal Power 3 (page 537) |
| Nominal RPM 1 (page 522) | Nominal RPM 2 (page 528) | Nominal RPM 3 (page 533) |
| Nominal Frequency 1 (page 523) | Nominal Frequency 2 (page 528) | Nominal Frequency 3 (page 534) |
| Nominal Voltage Ph-N 1 (page 523) | Nominal Voltage Ph-N 2 (page 528) | Nominal Voltage Ph-N 3 (page 534) |
| Nominal Voltage Ph-Ph 1 (page 523) | Nominal Voltage Ph-Ph 2 (page 529) | Nominal Voltage Ph-Ph 3 (page 534) |
| Nominal Current 1 (page 524) | Nominal Current 2 (page 529) | Nominal Current 3 (page 535) |
| Connection Type 1 (page 524) | Connection type 2 (page 529) | Connection type 3 (page 535) |
| Speed Governor Bias 1 (page 522) | Speed Governor Bias 2 (page 527) | Speed Governor Bias 3 (page 533) |
| Voltage Regulator Bias 1 (page 521) | Voltage Regulator Bias 2 (page 527) | Voltage Regulator Bias 3 (page 532) |

Configuration sets can be changed via logical binary inputs **Alternate Config 2 (page 604)** and **Alternate Config 3 (page 604)**. Configuration set 1 is active when there is no input activated. In the case that the inputs **Alternate Config 2 (page 604)** and **Alternate Config 3 (page 604)** are active at the same time, configuration set 3 is taken in account.

| Alternate Config 2 (page 604) | Alternate Config 3 (page 604) | Active configuration set |
|---|---|---|
| 0 | 0 | 1 |
| 1 | 0 | 2 |
| 0 | 1 | 3 |
| 1 | 1 | 3 |

**IMPORTANT: Gen-set can not switch to the alternative setpoints when running.**

## 5.5.4 AMF operation

The "AMF function" represents the automatic start in the event that the mains have failed, and a stop after the mains have been restored. The automatic start can be enabled or disabled by binary inputs **AMF Start Block (page 604)** or **Mains Fail Block (page 621)**.

***Note:*** *The MINT function works only in AUTO mode.*

### 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 Undervoltage (page 346)** and **Mains Overvoltage (page 343)** for a time period longer than **Mains Undervoltage Delay (page 346)** or **Mains**

**Overvoltage Delay (page 344)**.

- The mains voltage unbalance is out of limit given by setpoint **Mains Voltage Unbalance (page 348)** for a time period longer than **Mains Voltage Unbalance Delay (page 348)**.
- The mains frequency is out of the limits given by the setpoints **Mains Underfrequency (page 350)** and **Mains Overfrequency (page 348)** for a time period longer than **Mains < > Frequency Delay (page 352)**.
- The MCB close command was not successful and the alarm **Wrn MCB Fail (page 730)** was not reset.
- Phase rotation is incorrect.

## Healthy mains detection

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

- The mains voltage is within the limits given by the setpoints **Mains Undervoltage (page 346)** and **Mains Overvoltage (page 343)**.
- The mains voltage unbalance is within the limits given by the setpoint **Mains Voltage Unbalance (page 348)**.
- The mains frequency is within the limits given by the setpoints **Mains Underfrequency (page 350)** and **Mains Overfrequency (page 348)**.
- The alarm **Wrn MCB Fail (page 730)** is not active (if the **MCB FEEDBACK (PAGE 622)** matches the expected position given by the **MCB CLOSE/OPEN (PAGE 668)**). This condition is not required if MCB is open (**MCB FEEDBACK (PAGE 622)** is inactive).
- Phase rotation is correct.

## The AMF procedure

When the mains failure is detected, the following steps are performed:

- If the setpoint **MCB Opens On (page 354)** is set to Mains Failure, the MCB is opened
- The timer for automatic start of the Gen-set **Emergency Start Delay (page 342)** begins to count down.
- After the timer has elapsed, the Gen-set is started.

***Note:*** *The automatic start of the Gen-set due to AMF function can be disabled by the binary inputs **AMF START BLOCK (PAGE 604)** or **MAINS FAIL BLOCK (PAGE 621)**.*

- If the setpoint **MCB Opens On (page 354)** is set to Gen Run, the MCB is opened once the generator voltage is within limits (after **Minimal Stabilization Time (page 301)** elapses).

***Note:*** *If the mains are restored to health and the Gen-set is still not connected to the load, the controller interrupts the startup process and closes back the MCB.*

- After **Open Transfer Min Break (page 385)** elapses, the GCB is closed and the Gen-set begins to supply the load.
- After the mains is restored to normal, the timer **Mains Return Delay (page 342)** begins to count down.
- Maximum time between closing of MCB and opening GCB is given by the setpoint **Open Transfer Min Break (page 385)**. After GCB is opened, the Gen-set cools down and stops.

**IMPORTANT: Controller has this behavior only in AUTO mode!**

## 5.5.5 Analog switches

There are logical analog function dedicated for analog switches. Each analog switch has setpoints for level ON and level OFF and logical binary output.

| Analog switch | Setpoints | Binary output |
|---|---|---|
| AIN SWITCH 01 (PAGE 690) | AIN Switch01 On (page 420)<br>AIN Switch01 Off (page 421) | AIN SWITCH01 (PAGE 635) |
| AIN SWITCH 02 (PAGE 690) | AIN Switch02 On (page 422)<br>AIN Switch02 Off (page 423) | AIN SWITCH02 (PAGE 636) |
| AIN SWITCH 03 (PAGE 690) | AIN Switch03 On (page 424)<br>AIN Switch03 Off (page 425) | AIN SWITCH03 (PAGE 636) |
| AIN SWITCH 04 (PAGE 691) | AIN Switch04 On (page 426)<br>AIN Switch04 Off (page 427) | AIN SWITCH04 (PAGE 637) |
| AIN SWITCH 05 (PAGE 691) | AIN Switch05 On (page 428)<br>AIN Switch05 Off (page 429) | AIN SWITCH05 (PAGE 637) |
| AIN SWITCH 06 (PAGE 691) | AIN Switch06 On (page 430)<br>AIN Switch06 Off (page 431) | AIN SWITCH06 (PAGE 638) |

The behavior of the switch depends on the adjustment of the setpoints.

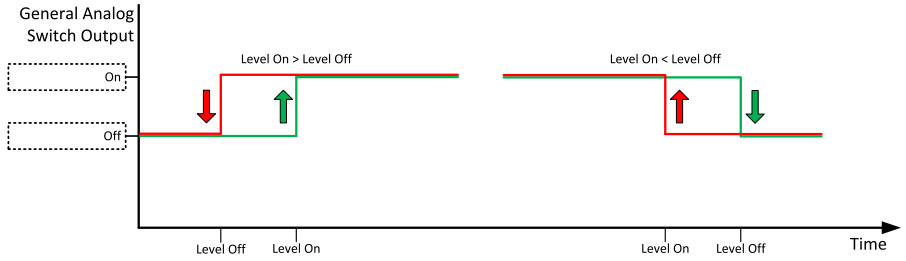



Image 5.18 Principle of analog switch

## 5.5.6 Breaker control

The following power switches are controlled by the controller:

- The generator circuit breaker or contactor – GCB
- The Mains circuit breaker or contactor – MCB

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 followed to when designing the wiring of power switches:

- The control outputs must be configured and wiring of the power switches must be provided in such a way, that the controller has full control over the breakers – i.e. the controller can open and close the breaker at any time.
- The breaker must respond within max. 2 seconds to a close and open command. Special attention should be paid to opening of motorized circuit breakers, as it could take more than 2 seconds on some types. In such cases it is necessary to use an undervoltage coil for fast opening.

- After opening the breaker, there is an internal delay before closing the breaker. Delay is 3 seconds – 2 seconds for OFF coil and 1 second for UV coil. After these 3 seconds, breaker can be closed again. There is no delay when opening a breaker.

## Breaker control outputs

| | |
|---|---|
| **Close/Open** | An output for control of a contactor. Its state represents the breaker position requested by the controller. The breaker must react within 2 seconds to a close or open command, otherwise an alarm is issued. |
| **ON coil** | An output giving a 2 second pulse in the moment the breaker has to be closed. The output is intended for control of close coils of circuit breakers. |
| **OFF coil** | An output giving a pulse in the moment the breaker has to be opened. The pulse lasts until the feedback deactivates, but at least for 2 seconds. The output is intended for control of open coils of circuit breakers. |
| **UV coil** | The GCB UV coil output is active the whole time the Gen-set is running (not in idle or cooling). 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. |

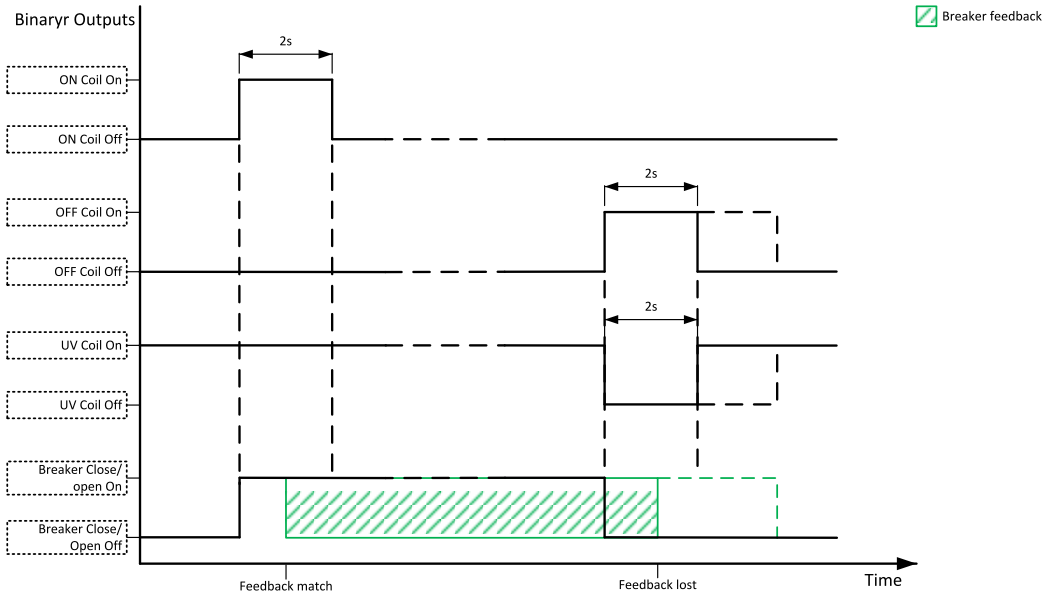



Image 5.19 Breaker control outputs

## MCB special requirements

- If a contactor is used on the MCB position, it is recommended that the wiring be provided in such a way that the contactor will be normally closed and will open if the logical binary output **MCB CLOSE/OPEN (PAGE 668)** is activated. This behavior is called "negative logic" and can be adjusted by the setpoint **MCB Logic (page 352)**. 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 to the coil. That is why the following adjustment is necessary to prevent

triggering the Wrn MCB Fail (page 730) alarm: **MCB Opens On (page 354)** = Mains Fail, **Mains Undervoltage Delay (page 346)** ≤1.

- 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 Gen-set is started and providing voltage. Adjusting the setpoint **MCB Opens On (page 354)** = Gen Run will prevent triggering the Wrn MCB Fail (page 730) alarm.

## Breaker failure detection

Breaker fail detection is based on binary output breaker close/open comparing with binary input breaker feedback.

**IMPORTANT: It is necessary to configure breaker feedback to use this function.**

**IMPORTANT: If a breaker feedback is configured, it will be required all the time. Otherwise alarms will be issued.**

There are three different time delays for breaker failure detection – see following diagrams.

When binary output breaker close/open is in steady state and breaker feedback is changed the breaker failure is detected immediately (no delay).

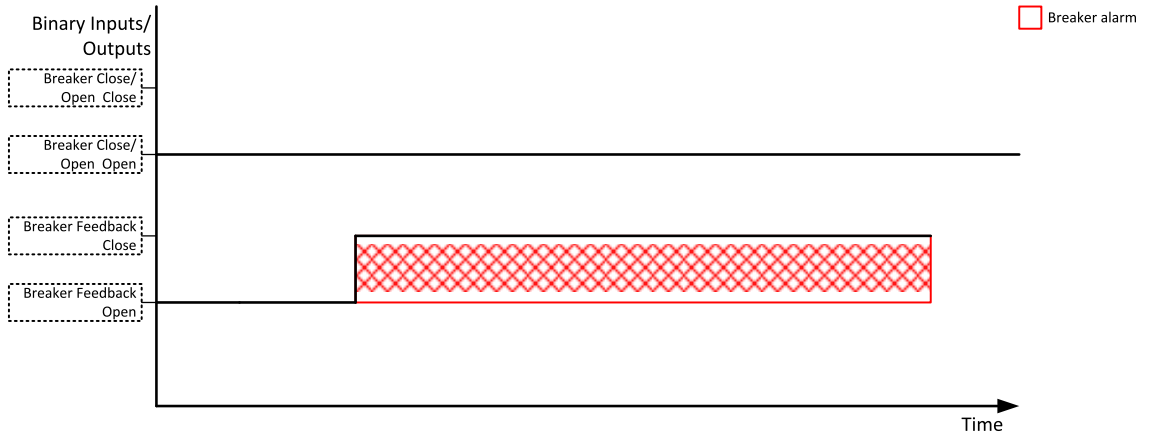



Image 5.20 Breaker failure – breaker close/open in steady position – open

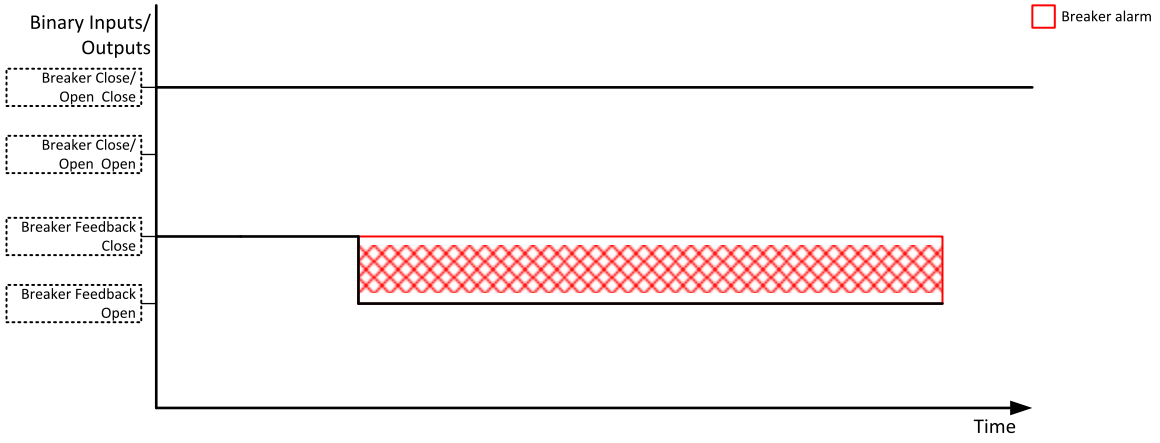



Image 5.21 Breaker failure – breaker close/open in steady position – close

When binary output breaker close/open opens there is 2 sec delay for breaker failure detection.

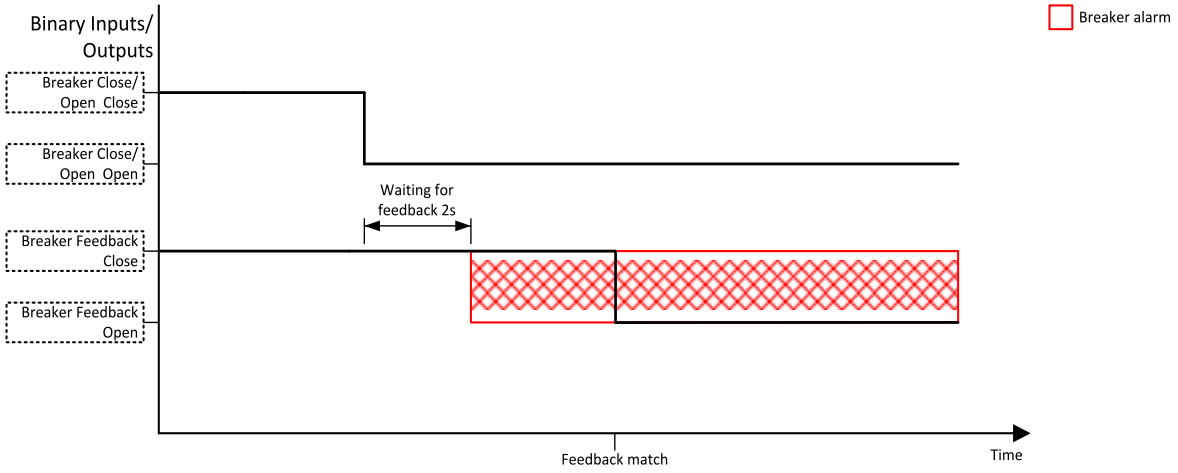



Image 5.22 Breaker failure – breaker close/open opens

When binary output breaker close/open closes there is 2 sec delay for breaker failure detection.

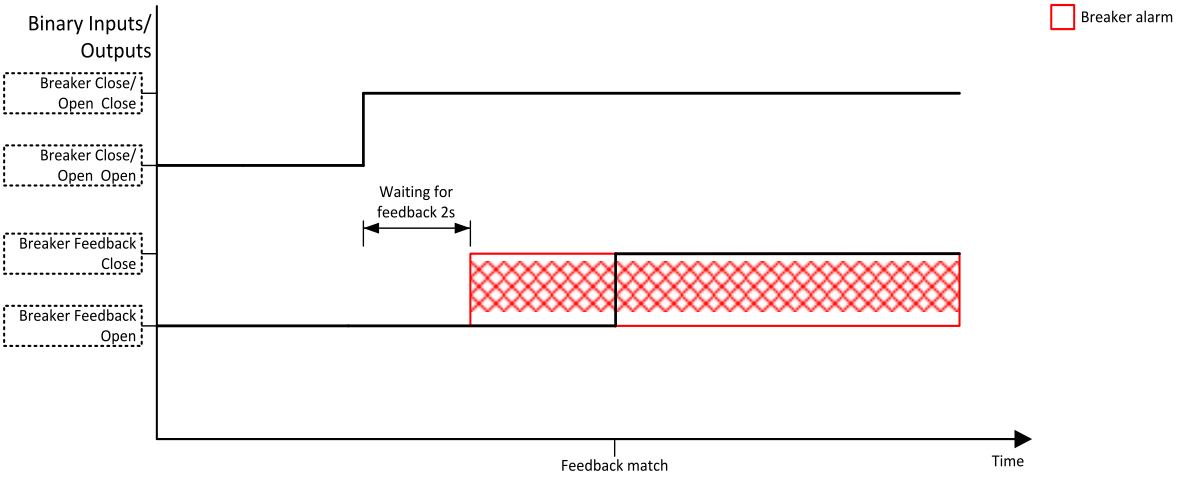



Image 5.23 Breaker failure – breaker close/open closes

## 5.5.7 Connecting to load

When the **Stabilization (page 203)** phase is finished, the Gen-set can be connected to the load.

The command for connecting the Gen-set to the load is issued either automatically (AUTO, TEST modes) or manually by pressing the GCB button. The following conditions must be valid:

- The Gen-set is running and the **Minimal Stabilization Time (page 301)** timer has elapsed.
- The Gen-set voltage and frequency are within limits.

***Note:*** *The speed governor and AVR must be adjusted properly to achieve these limits as the controller does not perform any regulation and the regulation outputs have constant values given by the* ***Voltage Regulator Bias (page 390)*** *and* ***Speed Governor Bias (page 380)*** *setpoints.*

There are two ways to connect the gen-set to the load (bus bar). This depends on the state of **MCB FEEDBACK (PAGE 622)** and on the measured mains/bus voltage.

# Connecting to dead bus

### SPtM

If the MCB is open, the bus bar is considered as voltage-free and the GCB is closed without synchronization.

### MINT

The measured bus voltage is also taken in account – it must be below 2 % of the nominal bus voltage and with the open MCB (evaluated by **MCB Feedback (page 622)**) and also others GCB have to be open to close the GCB without synchronization.

***Note:*** *If the group of Gen-sets is activated and multiple Gen-sets have to start simultaneously and connect to the empty bus bar, there is an internal logic to prevent closing of more GCBs to the bus bar at the same moment without synchronization. One of the Gen-sets will close the GCB, the others will wait and then they will synchronize to the first one.*

***Note:*** *There also is a protection of "Bus power loss sensing". The "Bus Measure Error" is detected in MINT application when the voltage on the controller's bus terminals is out of limits 20 seconds after:*

- *GCB (own) was closed in MAN or AUT mode*
- *MCB (feedback) was closed in AUT mode*
- *Any other GCB in power management group (on CAN bus) was closed.*

*The alarm is activated after 20 s. However, the GCB (own) closing is blocked immediately for safety reasons. This protection can avoid e.g. potential direct closing of GCB while the controller's bus conductors are unintentionally unplugged from the terminals.*

# Synchronization

### Synchronization process

Behavior of synchronization process depends on, which breaker is used for synchronization and in which **Controller Mode (page 284)** is controller switched.

***Note:*** *When the controller starts to synchronize and the main measuring screen is displayed, it will be automatically changed to the synchroscope screen for the entire duration of synchronization. After synchronization the synchroscope screen is automatically changed back to the main measuring screen. It is also possible to change screens manually (arrows up and down) after displaying the synchroscope screen. In this case there is no automatic return to the main measuring screen after synchronization is finished.*

## Synchronization via GCB in AUTO mode

Gen-set synchronization to the mains (common bus bar) via GCB (available for SPtM and MINT):

- if the mains (bus) voltage or the mains (bus) frequency gets out of the limits then the synchronization continues until the mains fail is confirmed. Then:
  - In SPtM – MCB is opened and GCB is closed.
  - In MINT – Bus measurement error alarm is issued and controller goes to slow stop.
- if the Gen-set voltage or frequency gets out of the limits during the synchronization the synchronization process is interrupted. The synchronization starts again when Gen-set parameters gets restored. the synchronization timeout starts count down again.
- If the synchronization timeout gets elapsed the slow stop protection gets active.

### Synchronization via GCB in MAN mode

Gen-set synchronization to the mains (common bus bar) via GCB (available for SPtM and MINT):

- Behavior is exactly the same as in AUTO mode – but the synchronization does not start again automatically when parameters of the Gen-set gets out of limits and back. The breaker control button must be pressed again.
- When the GCB button is pressed during the synchronization, then the synchronization process is interrupted.

### Synchronization via MCB in AUTO mode

Gen-set synchronization to the mains (common bus bar) via MCB (available only for SPtM):

- if the mains voltage or the mains frequency gets out of the limits during synchronization, then the synchronization process is interrupted and can continue again when mains parameters gets restored after **Mains Return Delay (page 342)**.
- if the Gen-set voltage or frequency gets out of the limits during the synchronization, the synchronization process continues until the generator parameters fail is confirmed.
- If the synchronization timeout gets elapsed the **Wrn Reverse Synchro FailWrn Synchronisation Fail (page 745)** protection gets active and GCB stays closed. Synchronization is stopped.

### Synchronization via MCB in MAN mode

Gen-set synchronization to the mains (common bus bar) via MCB (available only for SPtM):

- Behavior is exactly the same as in AUTO mode – but the synchronization does not start again automatically when parameters of the mains gets out of limits and back. The breaker control button must be pressed again.
- When the MCB button is pressed during the synchronization, then the synchronization process is interrupted.

## Synchronization types

There are two types of synchronization. Type of synchronization is adjusted via setpoint **Synchronization Type (page 394)**.

### 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 395)**. If the synchronization is not successful within this period of time, the **Stp Synchronisation Fail (page 772)** alarm will be issued.

**Voltage matching**

The Gen-set bus voltage is regulated to match the mains/bus voltage with tolerance given by the setpoint **Voltage Window (page 395)**. The regulation is adjusted by the setpoints **Voltage Gain (page 391)** and **Voltage Int (page 392)**.

**Frequency / angle matching**

The Gen-set bus frequency is regulated to match the mains/bus frequency first. The frequency regulation loop is active (setpoints **Frequency Gain (page 382)** and **Frequency Int (page 382)**). Once the frequency is matched, the regulation loop is switched to match the angle (setpoint **Angle Gain (page 383)**). When the angle is matched with tolerance ± **Phase Window (page 396)** for a time given by the setpoint **Dwell Time (page 396)** and the voltage is matched too, then the GCB is closed.

***Note:*** *The matching loops will continue to run even if the GCB close command has been already issued until the controller receives* ***GCB FEEDBACK (PAGE 618)*** *or a GCB fail alarm occurs. After the feedback has been received, the control loops are switched to load and power factor loops or load and power factor sharing respectively.*

## Slip synchronization

The slip synchronizing is based on frequency / angle matching. The maximum duration of synchronizing is given by the setpoint **Synchronization Timeout (page 395)**. If the synchronizing is not successful within this period of time, the Sync Timeout alarm will be issued.

The Gen-set frequency is regulated to match the mains/bus frequency + **Slip Frequency (page 396)** value and the window is set by setpoint **Slip Frequency Window (page 397)**. When the generator frequency reaches (Mains/Bus Frequency + Slip frequency) value regulation loop is stopped (output is frozen at the actual value). If the generator frequency remains inside the window for the time longer than setpoint **Dwell Time (page 396)** the controller will allow GCB closing. The controller calculates periodically so called preclosing angle (based on the actual value **Slip Frequency (page 396)** and CB closing delay given by the setpoint CB Latency). When the preclosing angle is reached the controller issues CB closing command. The breaker will close and CB feedback confirms that to the controller. When the breaker is closed the controller goes to parallel and activates regulation loops again (parallel to Mains regulation loop).

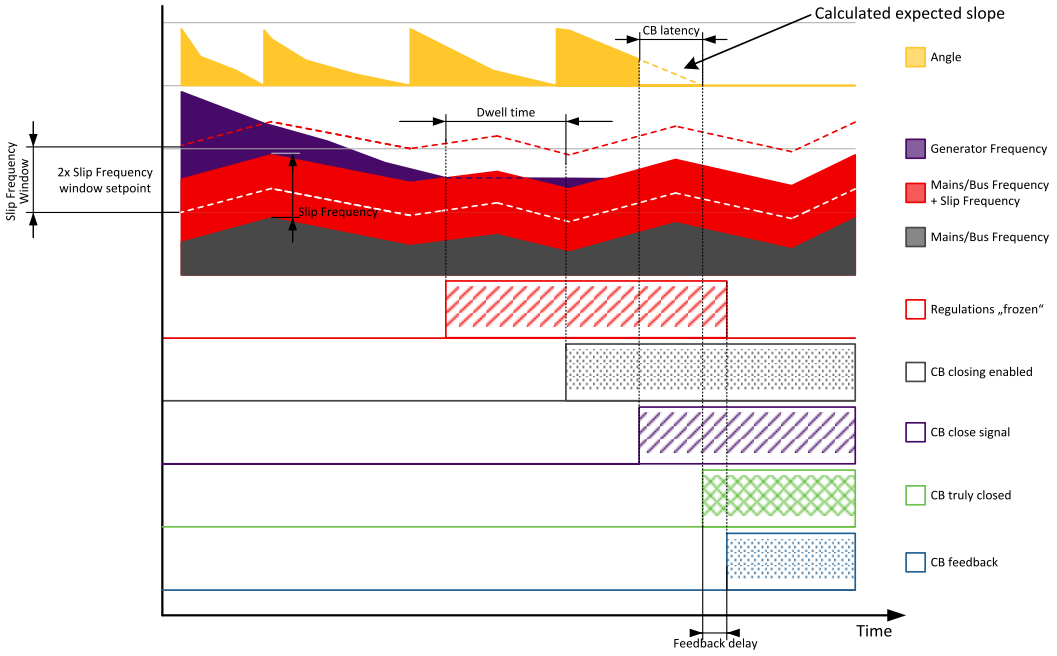



Image 5.24 Slip synchronization

If the generator frequency goes out of the window (either because generator frequency changes or Mains/Bus frequency changes or setpoint **Slip Frequency Window (page 397)** changes) the controller will reactivate regulation loop and try to reach the target value again. The sync timeout timer runs regardless of this. If the generator frequency reaches the target frequency again the regulations are frozen and if the generator frequency remains in the window for the time longer than setpoint **Dwell Time (page 396)** the controller will continue in the standard sequence as seen in the previous case. *If the sync timeout elapses the controller will immediately stop synchronization.

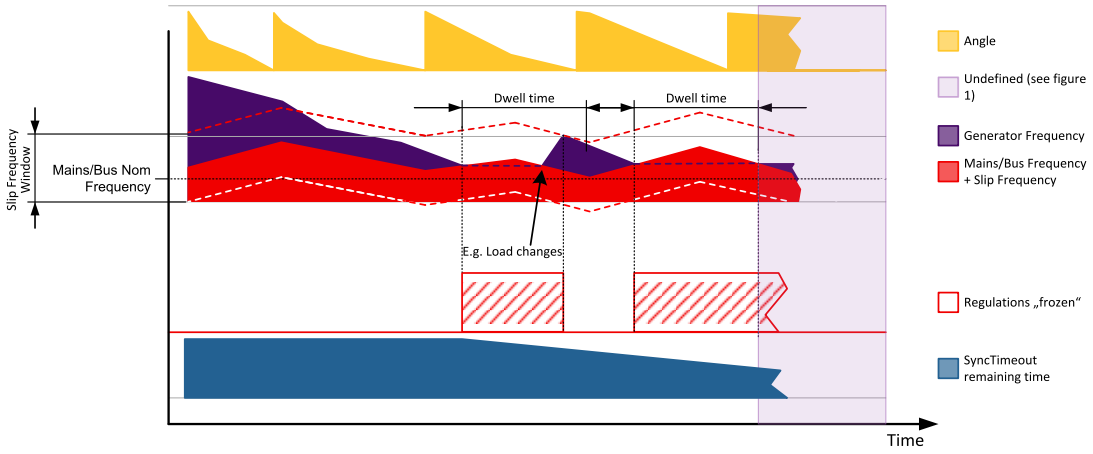



Image 5.25 Slip synchronization

The window is limited by the actual measured Mains/Bus frequency if one of the window limits is below this value (e.g. for setting where setpoint **Slip Frequency (page 396)** is set to 0.1 Hz and setpoint **Slip Frequency Window (page 397)** is set to 0.5 Hz).

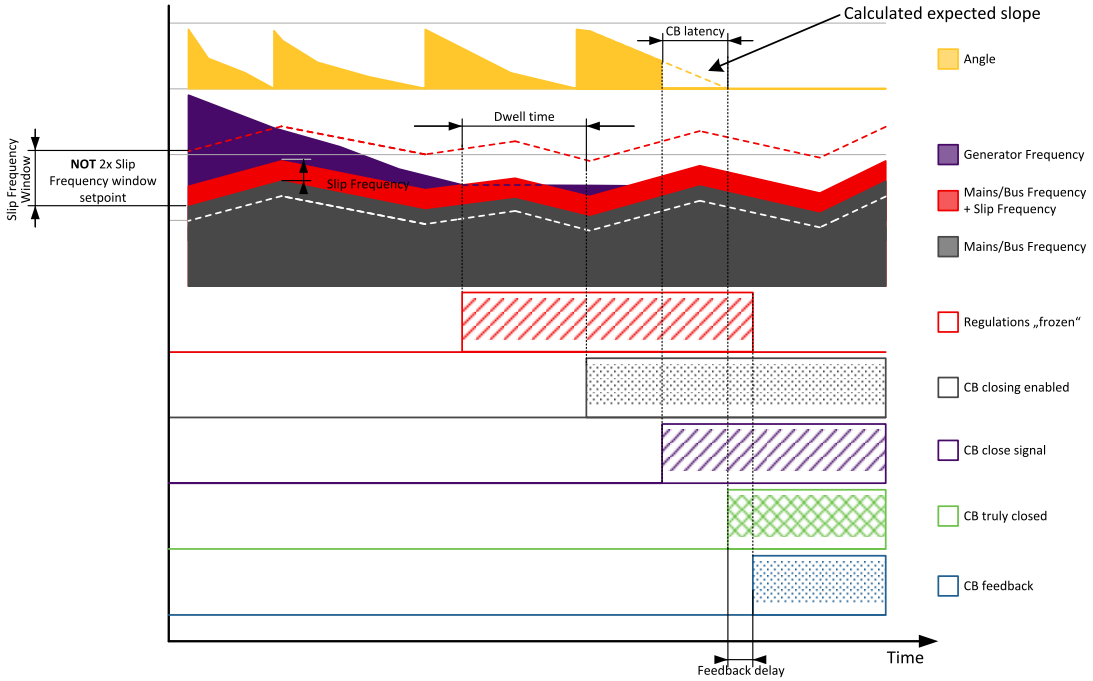



Image 5.26 Slip synchronization

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.

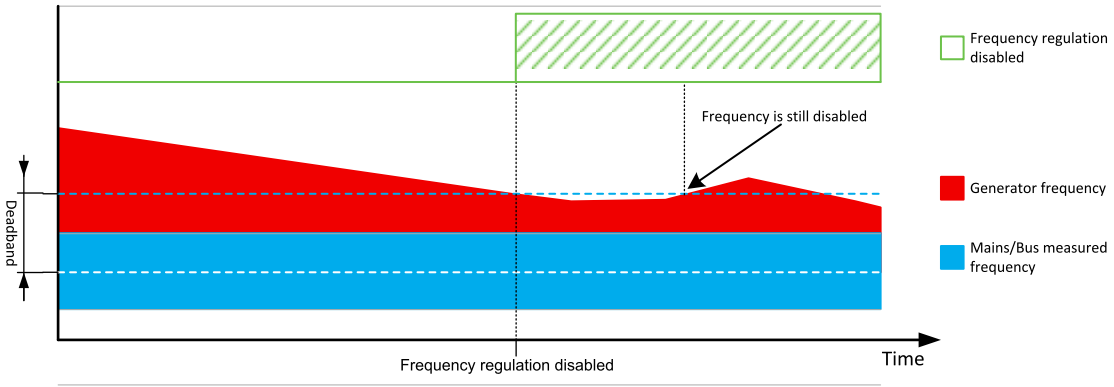
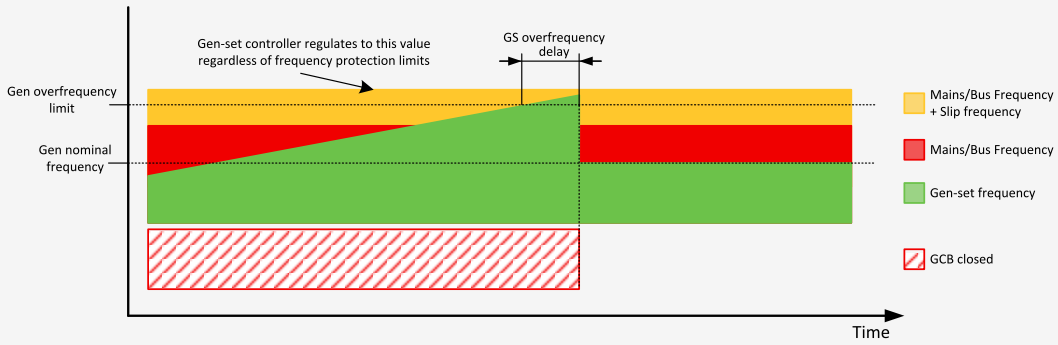



Image 5.27 Slip synchonization – deadband

***Note:*** *Due to the nature of this function it is possible that in limit cases the Gen-set controller will regulate the generator frequency outside of protection limits. Example: Mains/Bus frequency is high but within its protection limits (e.g. 50.9 Hz, limit is 51 Hz).* ***Slip Frequency (page 396)*** *is set to 0.5 Hz. This will cause regulation loop of the gen-set controller to push the gen-set frequency to 51.4 Hz and eventually the controller will issue overfrequency delay. It is recommended to set the setpoint* ***Slip Frequency (page 396)*** *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/Bus Frequency protection limits to more rigid values than the generator frequency protection limits. In this case the setpoint* ***Slip Frequency (page 396)*** *can be set to 0.1 Hz and the Mains/Bus Frequency overfrequency protection limit is set to 50.9 Hz instead of 51 Hz. This will ensure that problematic state cannot be reached.*




## 5.5.8 Control groups

The physical group of the Gen-sets (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 Gen-set 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 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 setpoint **Control Group (page 378)**. 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 378)** and **Group Link R (page 379)**.
- Controller sends via CAN2 bus information that controllers from groups *Group Link L* and *Group Link R* are linked together, if the *Group link* function (signal associated with the function) is active. It sends information that the groups are separated, if the *Group link* function is not active.

***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 Gen-set / controllers in linked groups cooperate with each other and perform load sharing, VAr sharing and power management together. These functionalities are performed independently in each group, when the groups are separated.

**Example:** 4 Gen-sets 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 backup source of the group link information, if the primary source (controller) is switched off.

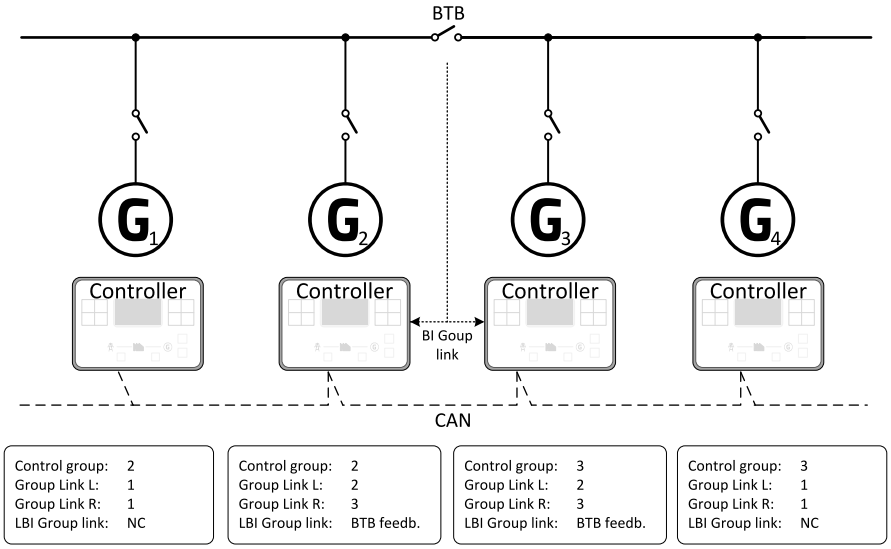



Image 5.28 Example of control groups

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

## 5.5.9 Distributed power management signals

Sharing of multiple Logical Binary Input (LBI) functions is critical for power management system operation, because several power management functionality require simultaneous activation of LBI functions in controllers, which are involved in power management operation. It can be done either automatically using CAN2 bus link between controllers or using dedicated LBI functions.

These LBI functions are shared automatically:

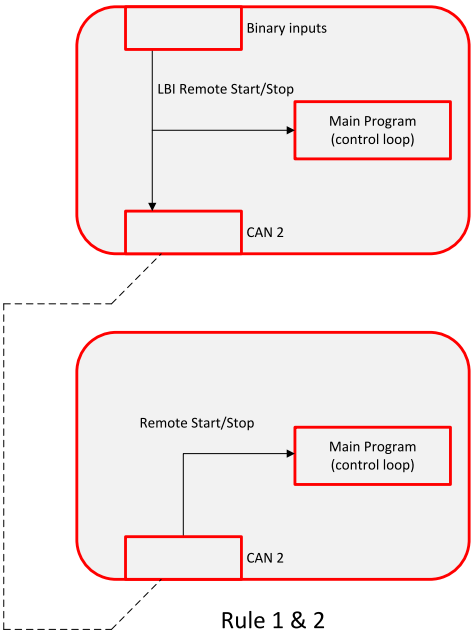
- Remote Start/Stop
- Min Run Power Act
- Load Res 2 Active
- MCB Feedback

| Distributed signal | Description (Mains controller) | Description (Gen-set controller) |
|---|---|---|
| System Start/Stop | • LBI **REMOTE START/STOP (PAGE 628)** is the request for start of the group of the Gen-sets. It is shared to LBO **SYS START/STOP (PAGE 685)** and distributed trough CAN2 to Gen-set controllers. | • Accepted only in Gen-set controllers belonging to the same logical group.<br>• Accepted only in Gen-set controllers where the Distributed signal is not configured.<br>• If the Distributed signal is configured to any binary input (physical or virtual), the signal is automatically shared to other controllers via CAN2 as CAN Distributed signal.<br>• If distributed signal is shared on CAN2 by more sources, it is accepted from any of them. |
| Min Run Power 1, 2, 3 | | |
| Load Reserve 1, 2, 3, 4 | | |
| MCB Feedback | • The mains controller set this signal on whenever there is a closed path between the Mains and the Load side.<br>• The signal is shared only inside the logical group (or interconnected logical groups). | • Accepted only in Gen-set controllers belonging to the same logical group as the source Mains Controller only.<br>• Accepted only in Gen-set controllers where the Distributed signal is not configured. |

These rules applies to the automatic sharing of the selected signals:

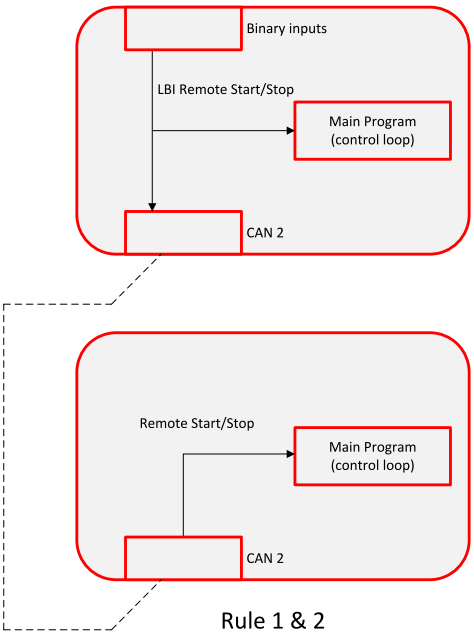
1. LBI state is automatically shared via CAN2 bus, if corresponding LBI function is configured in a controller.

   **Example:** Logical input Remote Start/Stop is configured with a controller. State of the signal is automatically transmitted to other controllers via CAN2 bus as Remote Start/Stop.



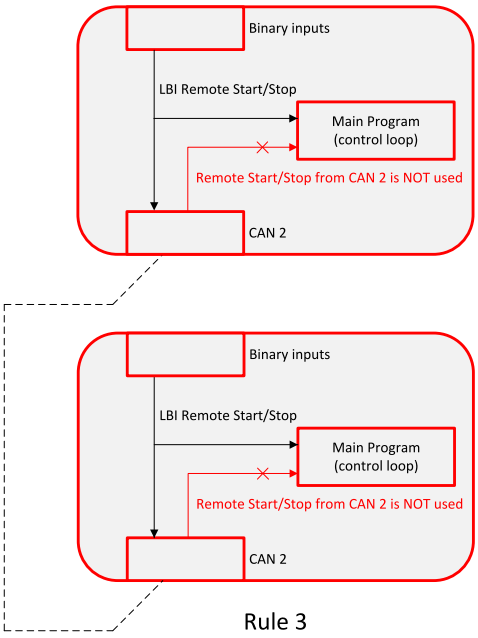

2. LBI state received from CAN2 bus is automatically used, if corresponding LBI function is not configured in a controller.

   **Example:** LBI Remote Start/Stop is not configured with a controller, but automatically shared Remote Start/Stop is received from CAN2 bus. Controller follows state of the shared LBI signal then.

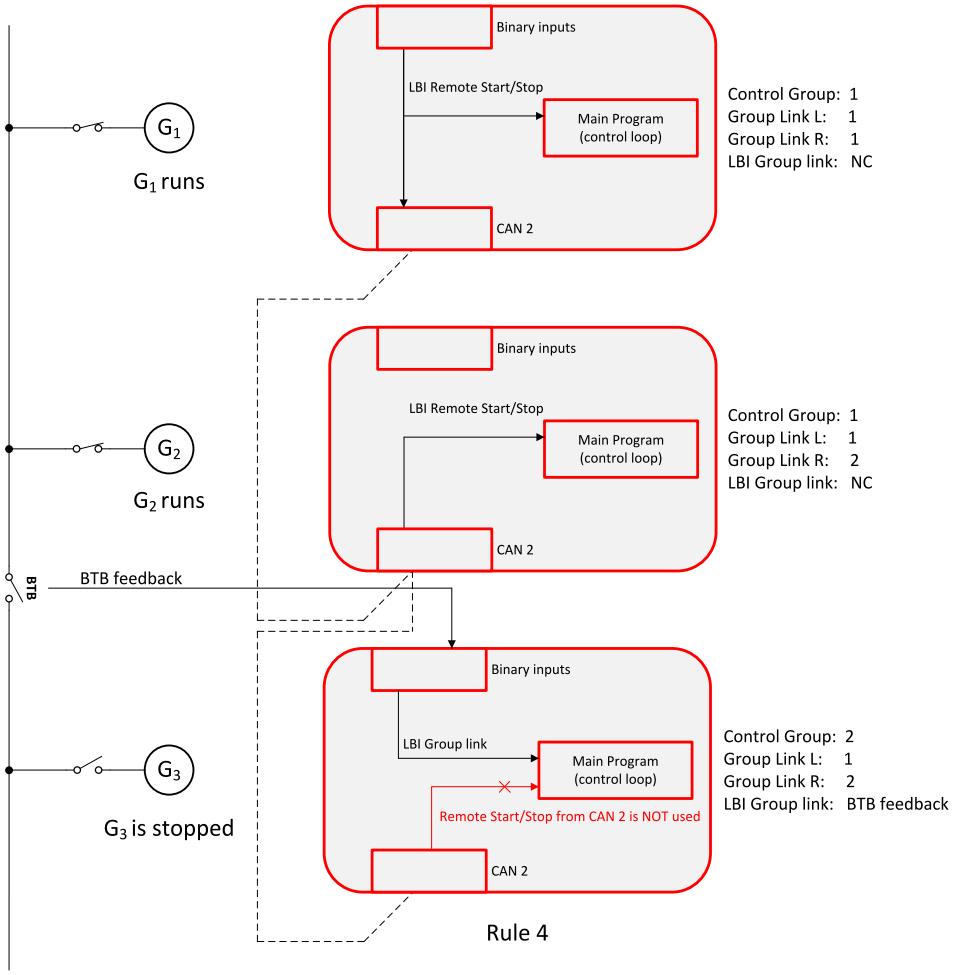



3. LBI state received from CAN2 bus is not used, if corresponding LBI function is configured in a controller.

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




4. LBI function state transmitted via CAN2 bus is used only by controllers, which are in the same group as controller, which is source of the shared signal. Signal coming from controller in a different group is accepted only if the "source controller" group is linked with the "receiving controller" group.




5. LBI function can be configured with multiple controllers, which transmit through CAN2 bus state of the function. OR function applies to the function evaluation in controllers, in which the function is not

configured. It means that function is activated by shared signal coming from any controller (rule 4. applies).

## 5.5.10 Droop

**IMPORTANT: Droop is relevant only for MINT application.**

The DROOP is primarily intended for Multiple parallel operation in Island to ensure the load sharing and VAr sharing when intercontroller communication fails. The Active and Reactive power is not regulated based on data communicated between the units (isochronous regulation) but the speed request and voltage request is calculated from actual voltage and actual frequency of the system (the measured Voltage and frequency of whole system is always equal). Actually the speed request is correlative to active power and the voltage request is correlative to reactive power. The correlation is the decreasing function and it creates the negative feedback of regulation.

Function is activated via setpoint **Load/Var Sharing Regulation Type (page 398)**. There are two droop modes – emergency droop and droop.

### Frequency droop

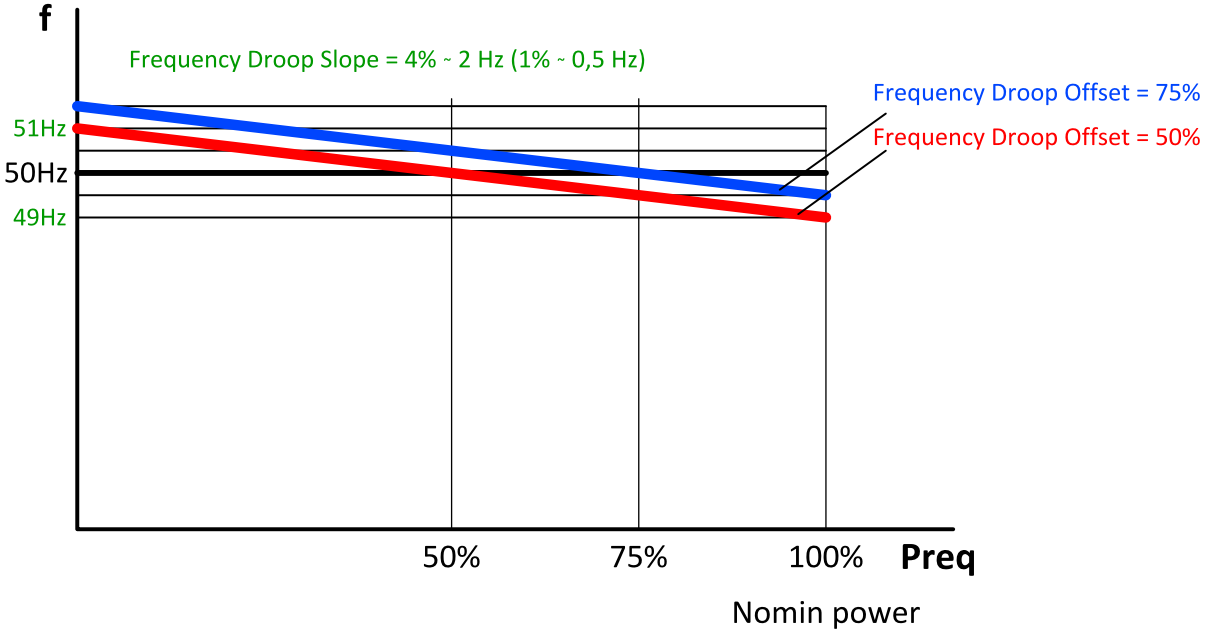



Image 5.29 Frequency droop

**Equation:**

Required frequency = Nominal frequency – [(Nominal frequency * **Frequency Droop Slope (page 399)** / 100) * ( Active power / Nominal power – **Frequency Droop Offset (page 400)** / 100)).

## Voltage droop

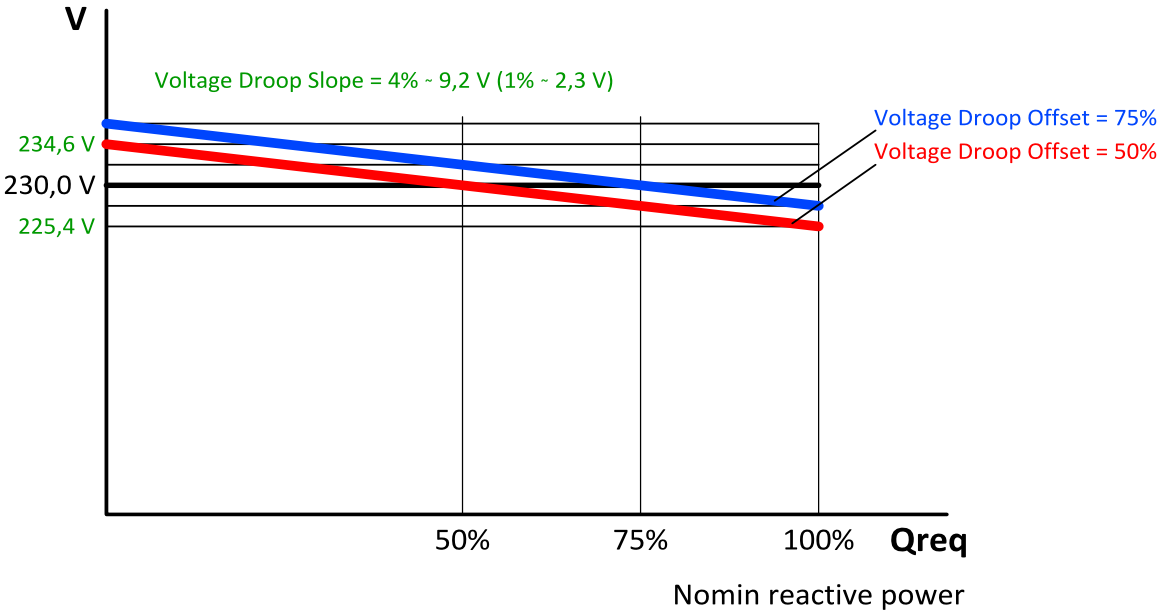



Image 5.30 Voltage droop

**Equation**

Required voltage = Nominal voltage – [(Nominal voltage * **Voltage Droop Slope (page 400)** / 100) * (Reactive power / Nominal reactive power – **Voltage Droop Offset (page 401)** / 100) )

***Note:*** *Nominal reactive power is not setpoint, but is calculated from Nominal power for PF = 0.8*

# Principle of droop operation

### Connecting of the Gen-set operating in droop to the common bus bar

- Start command is received – start button in MAN mode or LBI **REMOTE START/STOP (PAGE 628)** in AUTO mode gets active
  - The gen-set operating in droop is not calculated in the load reserve.
  - LBI **REMOTE START/STOP (PAGE 628)** is not influenced by power management and Gen-set starts if it gets active.
- Gen-set is starting – voltage and speed regulation are set to **Voltage Regulator Bias (page 390)** and **Speed Governor Bias (page 380)** (droop regulation is not active when GCB is opened).
- Connecting to bus
  - Dead bus – controller is prohibited to close it's GCB because of safety reasons (controller does not know about other controllers). Only controller with setpoint **Dead Bus GCB Close Master (page 399)** = ENABLED is allowed to close it's GCB to the dead bus. Otherwise it must be done manually in MAN mode.
  - Energized bus – controller starts synchronization (standard isochronous regulation).
  - GCB closes when synchronized – Now the droop regulation gets active

### Disconnecting of loaded Gen-set from common bus bar in droop

- Gen-set is operating in droop and is loaded. Stop command is received – stop button in MAN mode or LBI **REMOTE START/STOP (PAGE 628)** in AUTO mode gets inactive.
- Controller starts soft unload of loaded Gen-set
  - Soft unload can be disabled via LBI **DROOP UNLOAD DISABLED (PAGE 609)** in case when there is the last Gen-set on the common bus bar and it is not possible to unload it. Then the GCB is opened immediately.
- GCB opens when the active power drops under **Generator Unload GCB Open Level (page 388)**, latest when timer **Load Ramp (page 389)** elapses.

### Transition from droop to iscochronous regulations

- The speed request during the transition from droop (or emergency droop) to is ochronous regulation is changed smoothly (not in step). It prevents the system against overshoot of the frequency.
- Frequency is changed by 2 Hz per **Load Ramp (page 389)**.

### Forcing of the regulation to droop

- Droop regulation can be forced by LBI **FORCE DROOP OPER (PAGE 614)**.

## Principle of emergency droop

When **Load/Var Sharing Regulation Type (page 398)** = Emrg Droop, Isonchronous regulation is used until the conditions for activation of emergency droop are fulfilled. After activation, emergency droop regulation is used until the conditions for deactivation are fulfilled.

### Conditions for activation

- The number of controllers detected by the controller on can is lower than the number in the setpoint **#Number Of Controllers On CAN (page 401)**.
- **#Emergency Droop On Delay (page 403)** has count down.

### Conditions for deactivation

- The number of controllers detected by the controller on can is equal or higher than the number in the setpoint **#Number Of Controllers On CAN (page 401)**.
- **#Emergency Droop Off Delay (page 403)** has count down.

# 5.5.11 Dummy Load

This function is meant to prevent engine from running without load, which can in some cases shorten engine lifespan. It is a way user can set when to load external power bank and when to unload it.

This function can only be active if the setpoint **Dummy Load Active (page 358)** is set to correct value (Gen Only) and Engine State is loaded. Dummy Load function is triggered when the conditions mentioned before are met and Generator power is bellow **Dummy Load On (page 359)** setpoint level, or above **Dummy Load Off (page 359)** level.

Controller supports up to 5 Dummy Load stages. When the function is enabled, controller will always use all the dummy load stages up to the highest one configured. User can configure any number of these either in PLC or as LBO, but if just Dummy Load Stage 1 and Dummy Load Stage 5 are configured, **Dummy Load On Delay (page 359)** will trigger five times anyway when going from Dummy Load Stage 1 to Dummy Load

Stage 5. Whenever controller checks conditions and Dummy Load function is triggered, it will do the following (depending on the power level):

- Power is bellow level set by **Dummy Load On (page 359)** – in this case controller will wait for a period of time specified in **Dummy Load On Delay (page 359)** before activating **DUMMY LOAD STAGE 1 (PAGE 647)** LBO if no Dummy Load was active before. Otherwise the original outputs will stay on and controller will activate next stage of Dummy Load LBO (if **DUMMY LOAD STAGE 2 (PAGE 648)** was active before, **DUMMY LOAD STAGE 3 (PAGE 648)** will be activated and all 5 LBOs **DUMMY LOAD STAGE 1 (PAGE 647)**, **DUMMY LOAD STAGE 2 (PAGE 648)**, **DUMMY LOAD STAGE 3 (PAGE 648)** will be active).

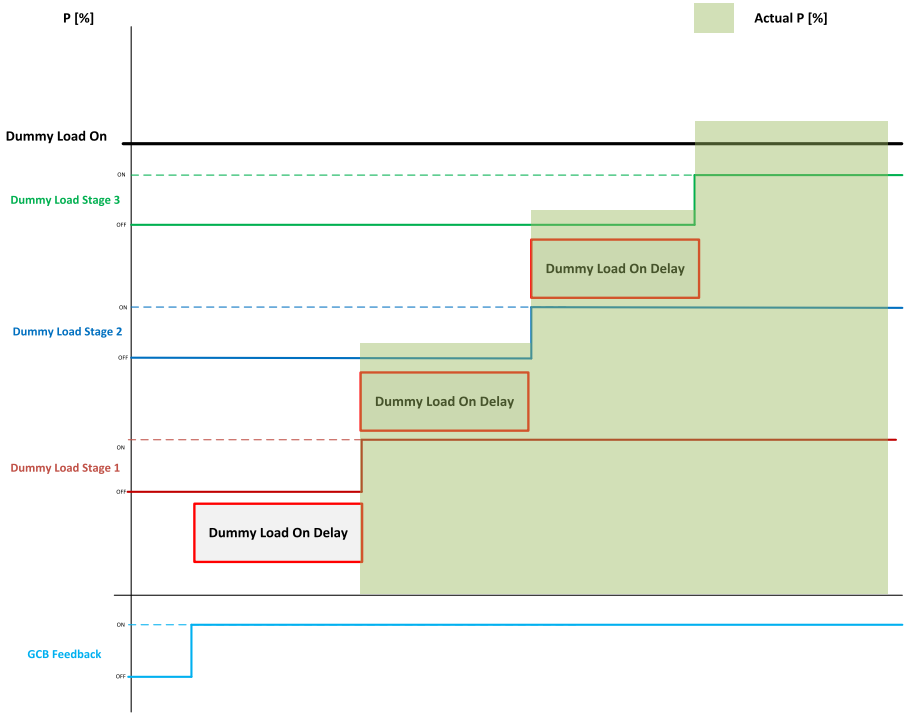



Image 5.31 Dummy load is on

- Power is above level set by **Dummy Load Off (page 359)** – in this case controller will wait for time set by setpoint **Dummy Load Off Delay (page 360)** before deactivating the highest active stage of Dummy Load (If **DUMMY LOAD STAGE 1 (PAGE 647)**, **DUMMY LOAD STAGE 2 (PAGE 648)** are active, controller will deactivate **DUMMY LOAD STAGE 2 (PAGE 648)**). If no Dummy Load outputs are active, nothing will happen.

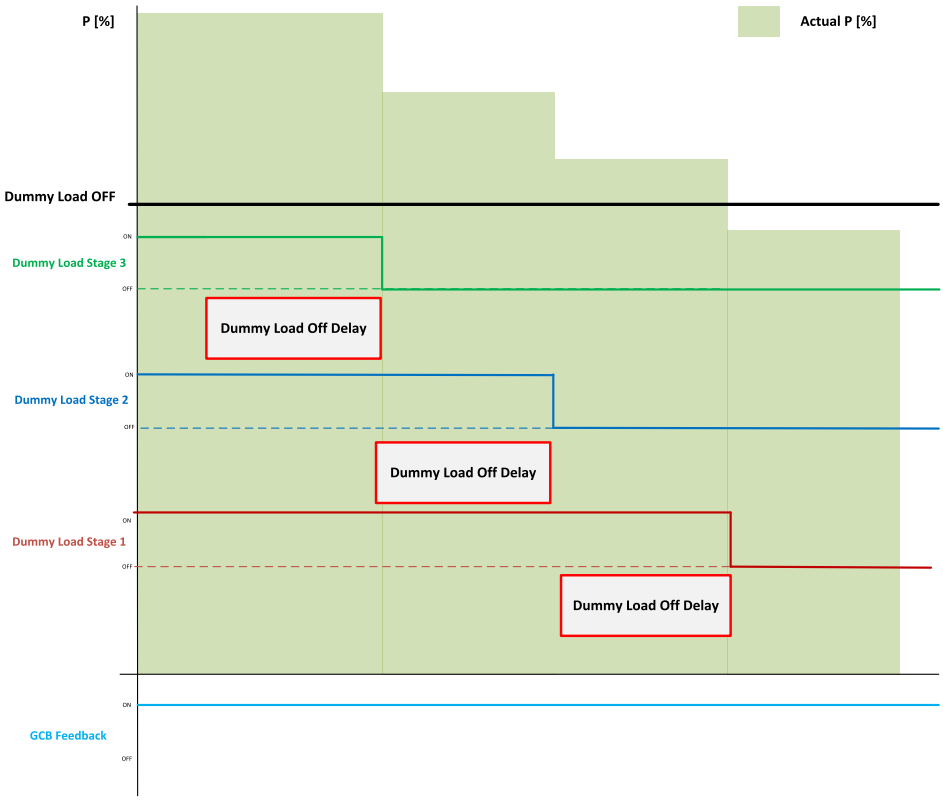



Image 5.32 Dummy load is off

- Controller will always work only with Dummy Load Stages up to highest one configured (if you only configure **DUMMY LOAD STAGE 1 (PAGE 647)** and **DUMMY LOAD STAGE 2 (PAGE 648)**, there will effectively only be two stages and if **DUMMY LOAD STAGE 1 (PAGE 647)** is already active and **Dummy Load On Delay (page 359)** timer collapses, **DUMMY LOAD STAGE 2 (PAGE 648)** will be activated but there will be no timer for **DUMMY LOAD STAGE 3 (PAGE 648)**.

**IMPORTANT: Check how big your load bank is and set the Dummy Load On (page 359) and Dummy Load Off (page 359) setpoints to correct levels, so that when dummy load is activated , power will not immediately go over the Dummy Load Off (page 359).**

## 5.5.12 E-Stop

Binary outputs for the control of some essential functions are internally wired as "safe", meaning that their deactivation is directly bound with the dedicated Input E-STOP (not evaluated as the LBI in the controller). These BO are fully configurable and are used e.g. for the Starter and Fuel control.

- The emergency stop circuit must be secured.
- The power supply of the associated binary outputs (BOUT1 and BOUT2) is supplied by the E-STOP input, not by the + battery voltage.

***Note:*** *There is no difference in the way of configuration of all binary outputs. Binary outputs BO1 (Starter), BO2 (Fuel Solenoid) are intended for these functions (not dedicated).*

There is a measurement of E-STOP input voltage analogically and setting the binary value (representing emergency stop input level) based on comparison of the measured voltage to two analog levels, which are derived from the controller supply voltage (battery voltage) perceptually.

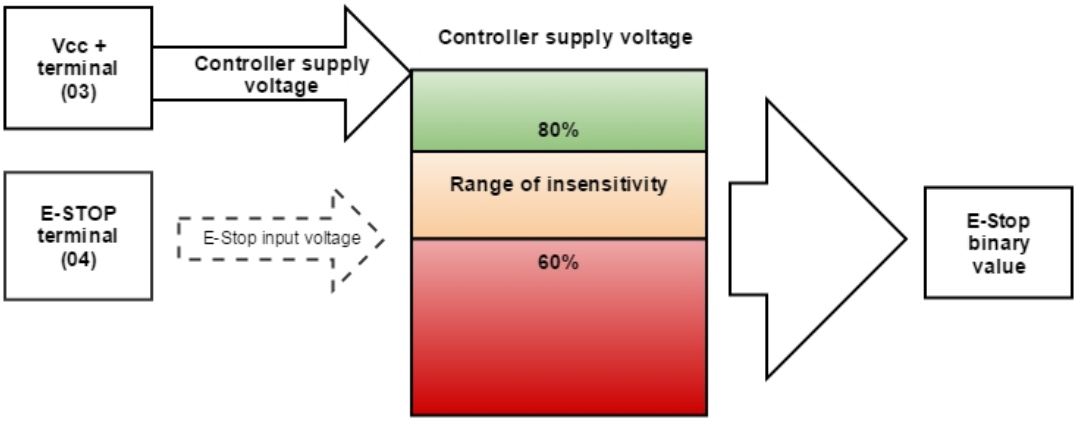



Image 5.33 SW principle of E-STOP

- If the input voltage of E-stop is higher than high comparison level (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 (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 (ex. between 60 and 80 %of the supply voltage, then E-stop binary value will remain in its previous state (meaning the E-Stop binary value will not change).

**Visualization on CU screen**

- 1 – E-STOP has voltage – state is OK
- 0 – E-STOP has no voltage – protection is active

For more information about connection **see E-Stop on page 44**.

## 5.5.13 ECU Frequency selection

Value Ecu freq select is calculated from **Nominal Frequency (page 282)** setpoint. The sequence for frequency change is executed automatically (engine must be in still condition) in the following steps:

1. Starting of the engine is blocked (state: Not Ready)
2. LBO: *ECU Power relay* is activated
3. Wait 5 s
4. LBO: *Stop Pulse* is set for 1 s (standard Stop Pulse duration)
5. Wait 3 s
6. Frequency selection is changed to a new value
7. Wait 2 s
8. LBO: *Stop Pulse* is set for 1 s (standard Stop Pulse duration)
9. Wait 2 s
10. LBO: *ECU Power relay* is deactivated
11. Return from start blocking state

## 5.5.14 Engine cool down and stop

The cool down phase begins after the stop command has been issued and the GCB has been opened.

- Duration of the cool down phase is determined by the setpoint **Cooling Time (page 305)**.
- Cooling is performed either at nominal speed (generator voltage and frequency protections are evaluated) or at idle speed (generator voltage and frequency protections are not evaluated). Selection of the speed is done by the setpoint **Cooling Speed (page 304)**.
- The cool down can be finished manually in MAN mode by pressing the STOP button.
- If a new start request comes, the cool down will be interrupted and the Gen-set will go back to the stabilization phase. If the cooling was at nominal speed, the stabilization timers will not count down again so the GCB is ready to be closed (after 2s delay).

When the cool down is finished, the output **Fuel Solenoid (page 653)** is de-energized and **Stop Solenoid (page 682)** is energized. The engine will stop within the time period determined by the setpoint **Stop Time (page 305)**. If the engine does not stop within this time, the alarm **Wrn Stop Fail (page 728)** will be issued.

The output **Stop Solenoid (page 682)** is energized until the engine is stopped, but at least for the duration of **Stop Time (page 305)**. If the **Stop Time (page 305)** has elapsed and the engine has still not stopped, the **Stop Solenoid (page 682)** is de-energized for 5 s and then energized again for **Stop Time (page 305)**.This is repeated until the engine is stopped.

The output **Ignition (page 663)** is continuously energized until the engine is stopped.

### Stopped Gen-set evaluation

The Gen-set is considered as stopped when all of following conditions are valid:

- The engine speed is lower than 2 RPM.
- The generator voltage in all phases is lower than 10 V.
- None of the **Additional running engine indications (page 97)** signals is active.

## 5.5.15 Engine start

### Diesel engine

The setpoint **Fuel Solenoid (page 293)** must be switched to the Diesel position.

- After the command for start is issued (pressing the Start button in MAN mode, auto start condition is fulfilled in AUTO mode or controller is switched to TEST mode), **Prestart (page 674)** and **Glow Plugs (page 660)** outputs are energized for a time period established by the setpoints **Prestart Time (page 296)** and **Glow Plugs Time (page 297)**.
- After **Prestart Time (page 296)** and **Glow Plugs Time (page 297)**, the output **Fuel Solenoid (page 653)** is energized after **Fuel Solenoid Lead (page 298)** the motor starter is activated by energizing the output **Starter 1 (page 680)**.
- When one or more of following conditions is met, the starter output is de-energized:
  - The engine speed exceeds the value of **Starting RPM (page 296)**, or
  - One of the **Additional running engine indications (page 97)** signals is active.
- The controller remains in the Starting phase until the engine speed exceeds the value of **Starting RPM (page 296)**, after which it is considered started and the Idle period will follow.
- The maximum duration that the output **Starter 1 (page 680)** is energized is determined by the setpoint **Maximum Cranking Time (page 295)**. If the engine does not start within this period, the output **Starter**

**1 (PAGE 680)** is de-energized and a pause with a length determined by **Cranking Fail Pause (page 295)** will follow. **PRESTART (PAGE 674)** and **GLOW PLUGS (PAGE 660)** outputs are active during the pause. After the pause has elapsed, the next start attempt is executed. The number of start attempts is given by the setpoint **Cranking Attempts (page 294)**.

- Once the engine is started, the Idle period follows. The binary output **IDLE/NOMINAL (PAGE 663)** remains inactive (as it was during the start). The idle period duration is adjusted by the setpoint **Idle Time (page 299)**.
- After the idle period has finished, the output **IDLE/NOMINAL (PAGE 663)** is activated and the start-up sequence is finished. The **Stabilization (page 203)** phase follows.

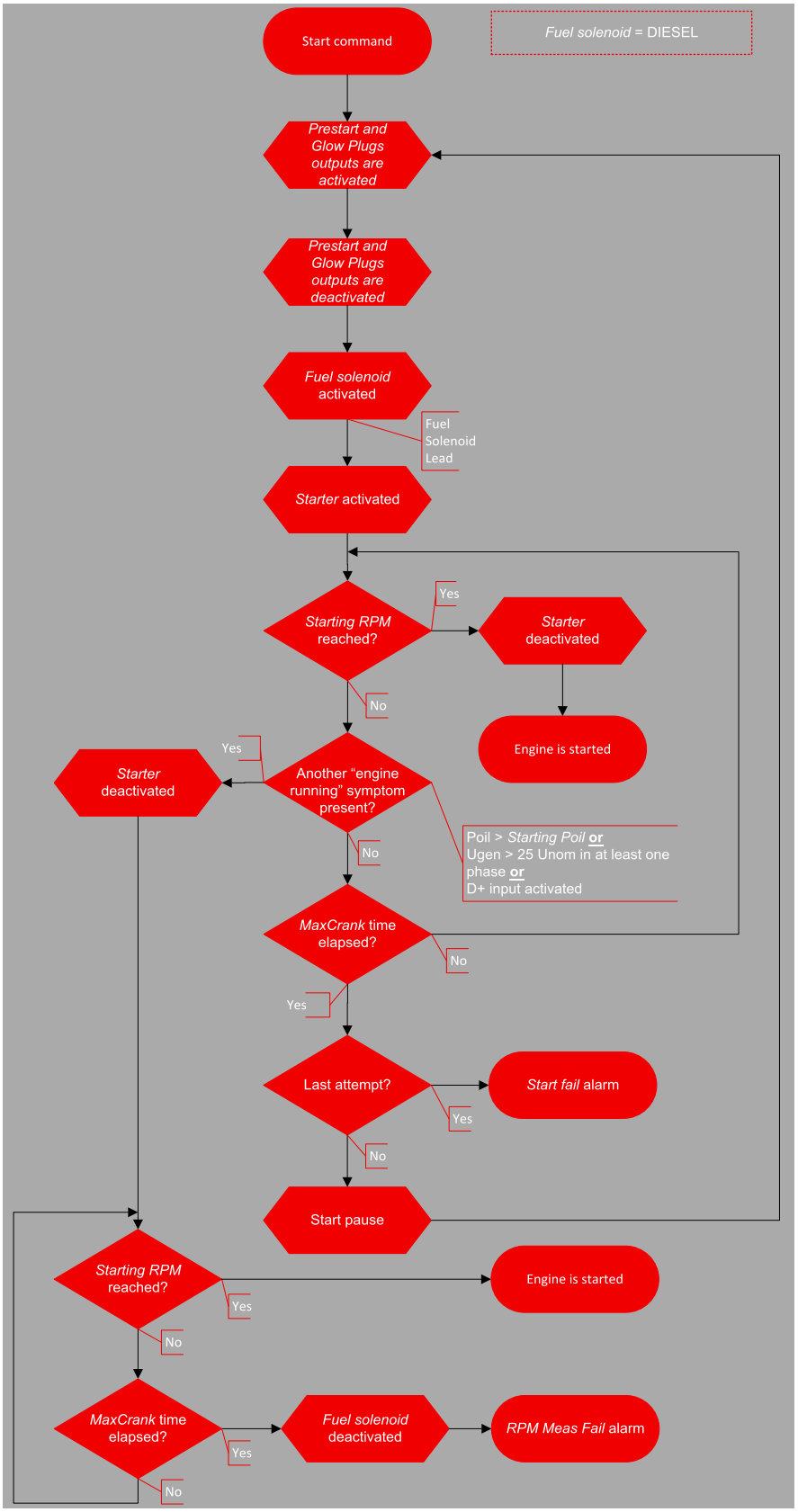



Image 5.34 Flowchart of start of diesel engine

## GAS engine

The setpoint **Fuel Solenoid (page 293)** must be switched to the Gas position.

- After the command for start is issued (pressing the Start button in MAN mode, auto start condition is fulfilled in AUTO mode or controller is switched to TEST mode), **PRESTART (PAGE 674)** and **GLOW PLUGS (PAGE 660)** outputs are energized for a time period established by the setpoints **Prestart Time (page 296)** and **Glow Plugs Time (page 297)** begins.
- After **Prestart Time (page 296)** and **Glow Plugs Time (page 297)**, the countdown of **Sd Ventilation Time (page 304)**
- After **Sd Ventilation Time (page 304)**, the engine starter is activated by energizing the output **STARTER 1 (PAGE 680)**.
- When the engine speed exceeds 30 RPM, the outputs **FUEL SOLENOID (PAGE 653)** and **IGNITION (PAGE 663)** are energized.
- When the engine speed exceeds value of **Starting RPM (page 296)**, the engine starter is de-energized. The engine is considered as started and the Idle period will follow.

**IMPORTANT: Additional running engine indications (page 97) signals are not evaluated during the start of a gas engine. The Pickup must be used in any case!**

- The maximum duration that the output **STARTER 1 (PAGE 680)** is energized is determined by the setpoint **Maximum Cranking Time (page 295)**. If the engine does not start within this period, outputs **STARTER 1 (PAGE 680)** and **FUEL SOLENOID (PAGE 653)** are de-energized and a pause with length determined by **Cranking Fail Pause (page 295)** will follow. **PRESTART (PAGE 674)**, **GLOW PLUGS (PAGE 660)** and **IGNITION (PAGE 663)** outputs are active during the pause. After the pause has elapsed, the next start attempt is executed. The number of start attempts is given by the setpoint **Cranking Attempts (page 294)**.
- Once the engine is started, the Idle period follows. The binary output **IDLE/NOMINAL (PAGE 663)** remains inactive (as it was during the start). The idle period duration is adjusted by the setpoint **Idle Time (page 299)**.
- After the idle period has finished, the output **DESCRIPTION (PAGE 663)** is activated and the start-up sequence is finished. The **Stabilization (page 203)** phase follows.

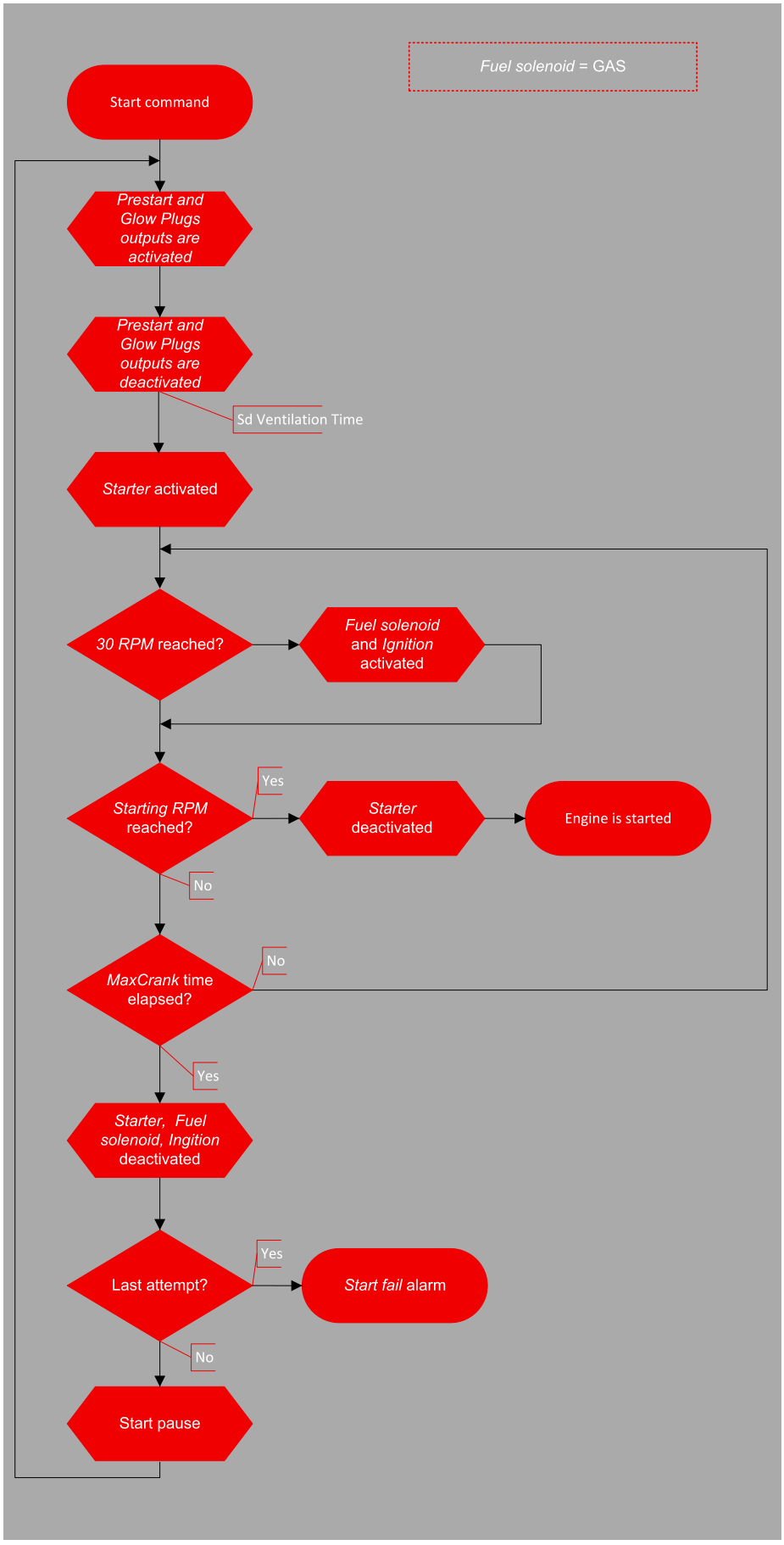



Image 5.35 Flowchart of start of gas engine

## Dual Starter

Dual Starter function is enabled if LBO **STARTER 2 (PAGE 681)** is configured and Setpoint **Dual Starter Sequence (page 294)** is set to any of sequence options: 1-2 or 11-22 or 111-222.

Dual Starter Sequence options:

- Disabled (Default)
- 1-2: (Controller in cranking phase will activate **STARTER 1 (PAGE 680)** then **STARTER 2 (PAGE 681)** according to the order of option pattern 1-2.
- 11-22: (Controller in cranking phase will activate **STARTER 1 (PAGE 680)** then **STARTER 1 (PAGE 680)** then **STARTER 2 (PAGE 681)** then **STARTER 2 (PAGE 681)** according to the order of option pattern 11-22.
- 111-222: (Controller in cranking phase will activate **STARTER 1 (PAGE 680)** then **STARTER 1 (PAGE 680)** then **STARTER 1 (PAGE 680)** then **STARTER 2 (PAGE 681)** then **STARTER 2 (PAGE 681)** then **STARTER 2 (PAGE 681)** according to the order of option pattern 111-222.

The total number of attempts is defined by the Setpoint **Cranking Attempts (page 294)**.

**Example:**

- Cranking Attempts=5, Dual Starter Sequence =1-2
  - Gen-set will activate Starter 1 (if failed) then Starter 2 (if failed) then Starter 1 (if failed) then Starter 2 (if failed) then Starter 1
- Cranking Attempts=5, Dual Starter Sequence =11-22
  - Gen-set will activate Starter 1 (if failed) then Starter 1 (if failed) then Starter 2 (if failed) then Starter 2 (if failed) then Starter 1

The order of sequence is affected by the actual status of LBI **STARTER PRIORITY (PAGE 630)** (0-Starter 1, 1-Starter 2). Can be used for disabling a particular starter.

LBIs **STARTER 1 DISABLED (PAGE 629)**, **STARTER 2 DISABLED (PAGE 630)**. If the LBI Starter 1,2 Disabled state is 1 then the Starter 1 ,2 will be skipped in the sequence. Skipped starter is not counted as cranking attempt.

In case both starters are disabled, controller is in the state not ready.

Value **Num Starts (page 577)** stores the total successful starts of both starters.

# 5.5.16 Exercise timers

The exercise (general-purpose) timers in controller are intended for scheduling of any operations such as periodic tests of the Gen-set, scheduled transfer of the load to the Gen-set prior to an expected disconnection of the mains etc.

Related setpoints for timer 1 are:

- **Timer 1 Function (page 434)**
- **Timer 1 Repetition (page 436)**
- **Timer 1 First Occur. Date (page 435)**
- **Timer 1 First Occur. Time (page 436)**
- **Timer 1 Duration (page 436)**
- **Timer 1 Repeated (page 437)**
- **Timer 1 Repeat Day (page 437)**
- **Timer 1 Day (page 438)**
- **Timer 1 Repeated Day In Week (page 438)**
- **Timer 1 Repeat Day In Month (page 438)**
- **Timer 1 Repeat Week In Month (page 439)**
- **Timer 1 Refresh Period (page 440)**
- **Timer 1 Weekends (page 441)**
- **Timer 1 Setup (page 435)**

Related setpoints for timer 2 are:

- **Timer 2 Function (page 442)**
- **Timer 2 Repetition (page 444)**
- **Timer 2 First Occur. Date (page 443)**
- **Timer 2 Setup (page 443)**
- **Timer 2 Duration (page 444)**
- **Timer 2 Repeated (page 445)**
- **Timer 2 Repeat Day (page 445)**
- **Timer 2 Day (page 446)**
- **Timer 2 Repeated Day In Week (page 446)**
- **Timer 2 Repeat Day In Month (page 446)**
- **Timer 2 Repeat Week In Month (page 447)**
- **Timer 2 Refresh Period (page 448)**
- **Timer 2 Weekends (page 449)**
- **Timer 2 Setup (page 443)**

Related setpoints for timer 3 are:

- **Timer 3 Function (page 450)**
- **Timer 3 Repetition (page 452)**
- **Timer 3 First Occur. Date (page 451)**
- **Timer 3 Setup (page 451)**
- **Timer 3 Duration (page 452)**
- **Timer 3 Repeated (page 453)**
- **Timer 3 Repeat Day (page 453)**
- **Timer 3 Day (page 454)**
- **Timer 3 Repeated Day In Week (page 454)**
- **Timer 3 Repeat Day In Month (page 454)**
- **Timer 3 Repeat Week In Month (page 455)**
- **Timer 3 Refresh Period (page 456)**
- **Timer 3 Weekends (page 457)**
- **Timer 3 Setup (page 451)**

Related setpoints for timer 4 are:

- **Timer 4 Function (page 458)**
- **Timer 4 Repetition (page 460)**
- **Timer 4 First Occur. Date (page 459)**
- **Timer 4 Setup (page 459)**
- **Timer 4 Duration (page 460)**
- **Timer 4 Repeated (page 461)**
- **Timer 4 Repeat Day (page 461)**
- **Timer 4 Day (page 462)**
- **Timer 4 Repeated Day In Week (page 462)**
- **Timer 4 Repeat Day In Month (page 462)**
- **Timer 4 Repeat Week In Month (page 463)**
- **Timer 4 Refresh Period (page 464)**
- **Timer 4 Weekends (page 465)**
- **Timer 4 Setup (page 459)**

## 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. |

# Once mode

## Set-up via InteliConfig

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

***Note:*** *First, the timer functions must be adjusted via setpoint* ***Timer 1 Function (page 434)****.*

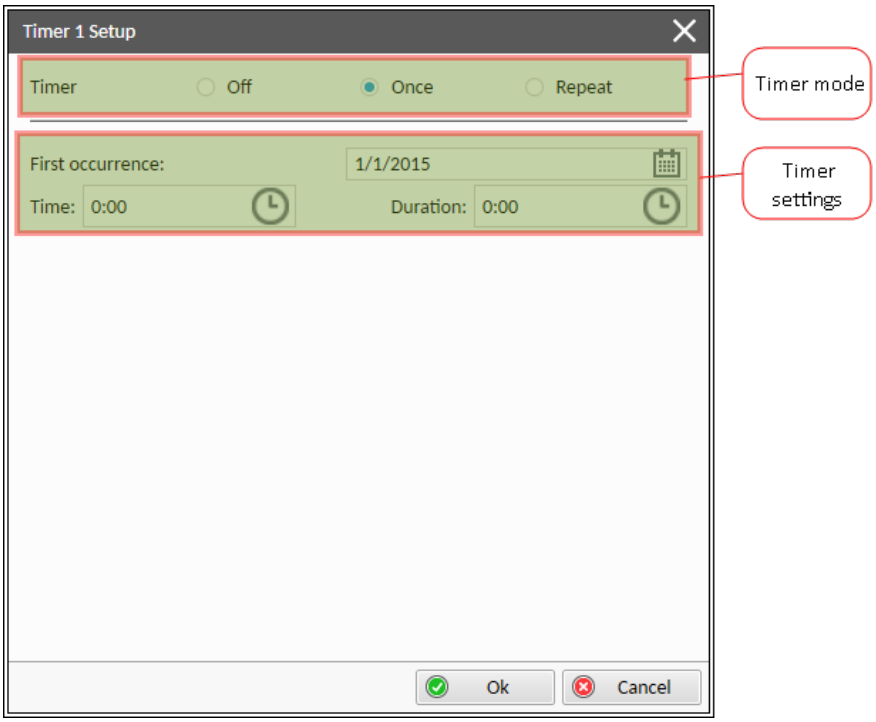



Image 5.36 Once mode – InteliConfig

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

## Set-up via controller interface

In controller go to the Scheduler setpoint group. Select the function of timer via **Timer 1 Function (page 434)** setpoint. Then go to *Timer 1 Setup* and press the Enter button. In **Timer 1 Repetition (page 436)** setpoint select Once mode. Then adjust **Timer 1 First Occur. Date (page 435)**, **Timer 1 First Occur. Time (page 436)** and **Timer 1 Duration (page 436)**.

***Note:*** *Use the Left and the Right buttons to move between timer setpoints.*

# Daily mode

## Set-up via InteliConfig

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

***Note:*** *First, the timer functions must be adjusted via setpoint* ***Timer 1 Function (page 434)****.*

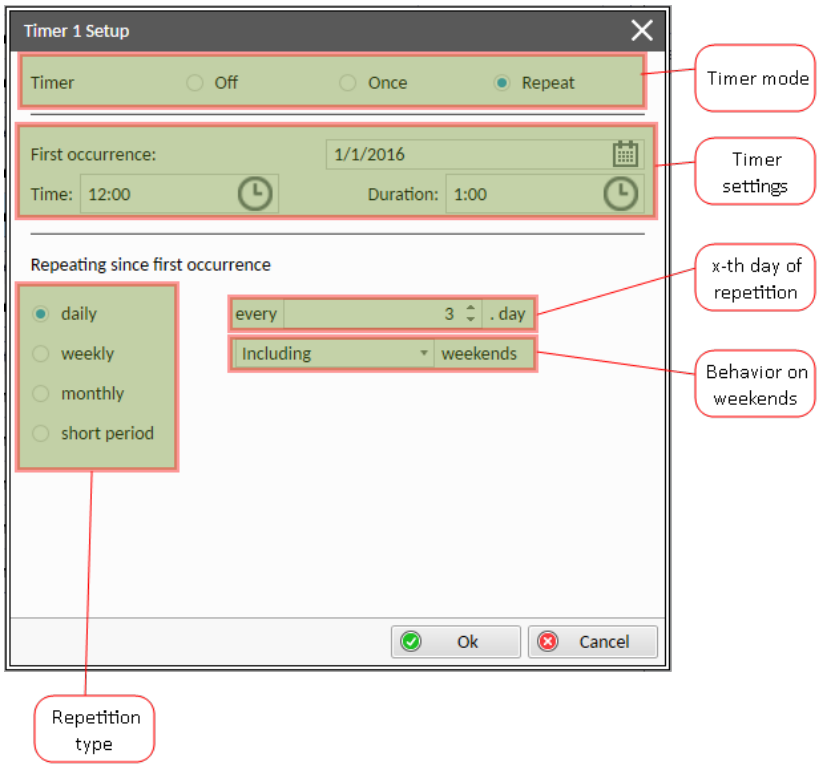



Image 5.37 Daily mode – InteliConfig

In timer mode select Repeat. In repetition type select Daily. In timer settings adjust date and time of first occurrence of timer. Also adjust the duration of each occurrence of timer. Then select the xth day of repetition (**Timer 1 Refresh Period (page 440)**) and behavior of timer on weekends (**Timer 1 Weekends (page 441)**).

> **Example:** On image example first start of timer will be 1/1/2016 at 12:00. Duration will be 1 hour. Timer will be activated again every 3rd day at 12:00 for 1 hour including weekends.

### Set-up via controller interface

In controller go to the Scheduler setpoint group. Select the function of timer via **Timer 1 Function (page 434)** setpoint. Then go to *Timer 1 Setup* and press the Enter button. In **Timer 1 Repetition (page 436)** setpoint select Repeated mode. Then adjust **Timer 1 First Occur. Date (page 435)**, **Timer 1 First Occur. Time (page 436)** and **Timer 1 Duration (page 436)**. In setpoint **Timer 1 Repeated (page 437)** select Daily and adjust **Timer 1 Refresh Period (page 440)** (xth day of repetition) and **Timer 1 Weekends (page 441)** (behavior of timer on weekends).

***Note:*** *Use the Left and the Right buttons to move between timer setpoints.*

## Weekly mode

### Set-up via InteliConfig

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

***Note:*** *First, the timer functions must be adjusted via setpoint **Timer 1 Function (page 434)**.*

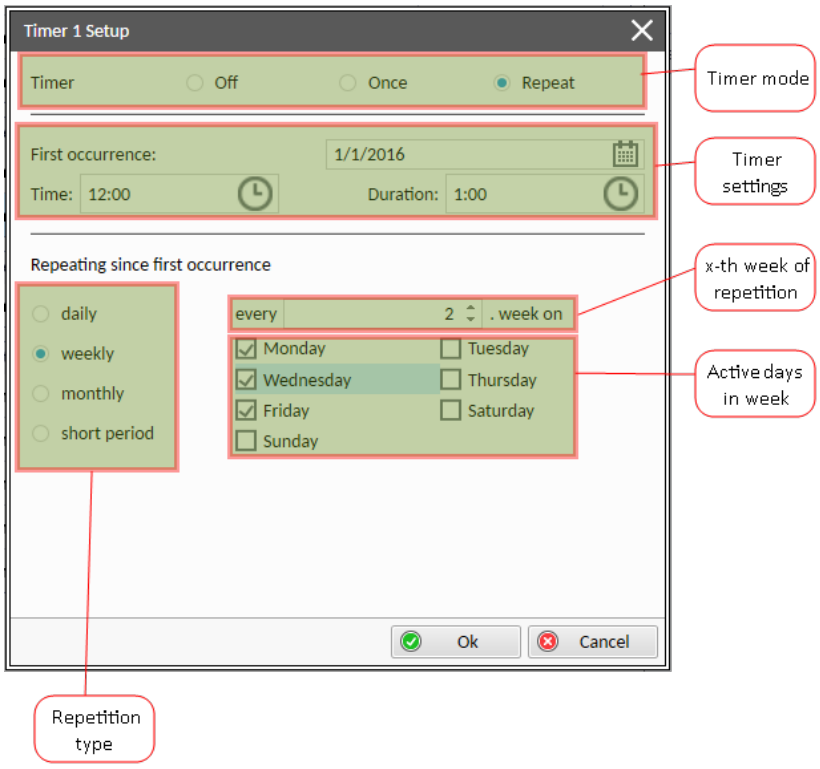



Image 5.38 Weekly mode – InteliConfig

In timer mode select Repeat. In repetition type select Weekly. In timer settings adjust date and time of first occurrence of timer. Also adjust the duration of each occurrence of timer. Then select the xth week of repetition (**Timer 1 Refresh Period (page 440)**) and days when timer should be active (**Timer 1 Day (page 438)**).

> **Example:** On image example first start of timer will be 1/1/2016 at 12:00. Duration will be 1 hour. Timer will be again activated every 2nd week on Monday, Wednesday and Friday at 12:00 for 1 hour.

### Set-up via controller interface

In controller go to the Scheduler setpoint group. Select the function of timer via **Timer 1 Function (page 434)** setpoint. Then go to *Timer 1 Setup* and press the Enter button. In **Timer 1 Repetition (page 436)** setpoint select Repeated mode. Then adjust **Timer 1 First Occur. Date (page 435)**, **Timer 1 First Occur. Time (page 436)** and **Timer 1 Duration (page 436)**. In setpoint **Timer 1 Repeated (page 437)** select Weekly and adjust **Timer 1 Day (page 438)** (days when timer should be active) and **Timer 1 Refresh Period (page 440)** (xth week of repetition).

***Note:*** *Use the Left and the Right buttons to move between timer setpoints.*

## Monthly mode

### Set-up via InteliConfig

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

***Note:*** *First, the timer functions must be adjusted via setpoint **Timer 1 Function (page 434)**.*

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

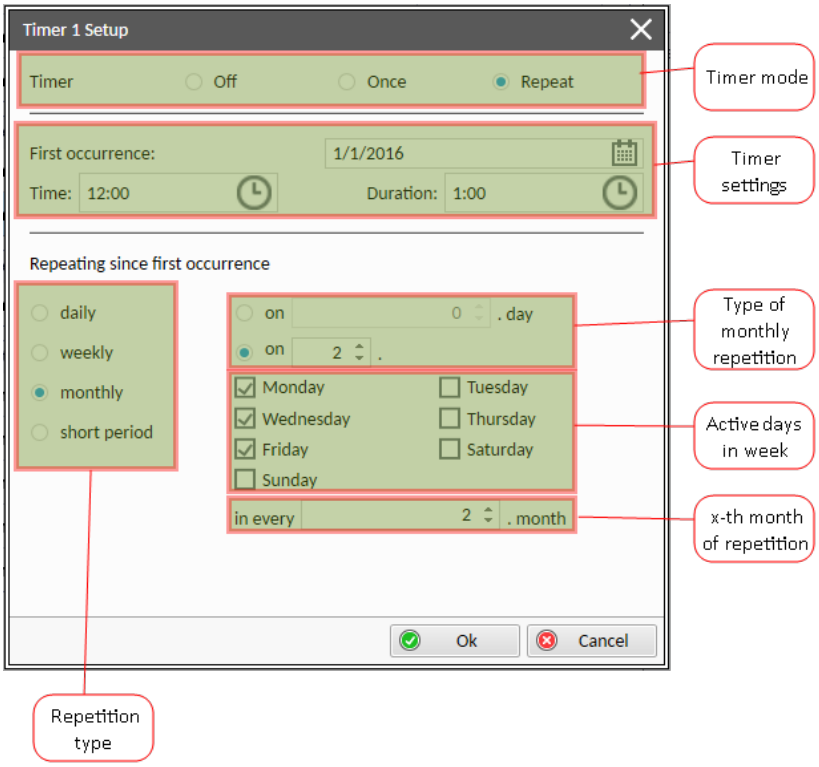



Image 5.39 Monthly mode – InteliConfig

In timer mode select Repeat. In repetition type select Monthly. In timer settings adjust date and time of first occurrence of timer. Also adjust the duration of each occurrence of timer. Then select the type of monthly repetition and the xth day of repetition (**Timer 1 Repeat Day In Month (page 438)**). Than select the xth month of repetition.

> **Example:** On image example first start of timer will be 1/1/2016 at 12:00. Duration will be 1 hour. Timer will be activated again every 2nd day in 2nd month at 12:00 for 1 hour.

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

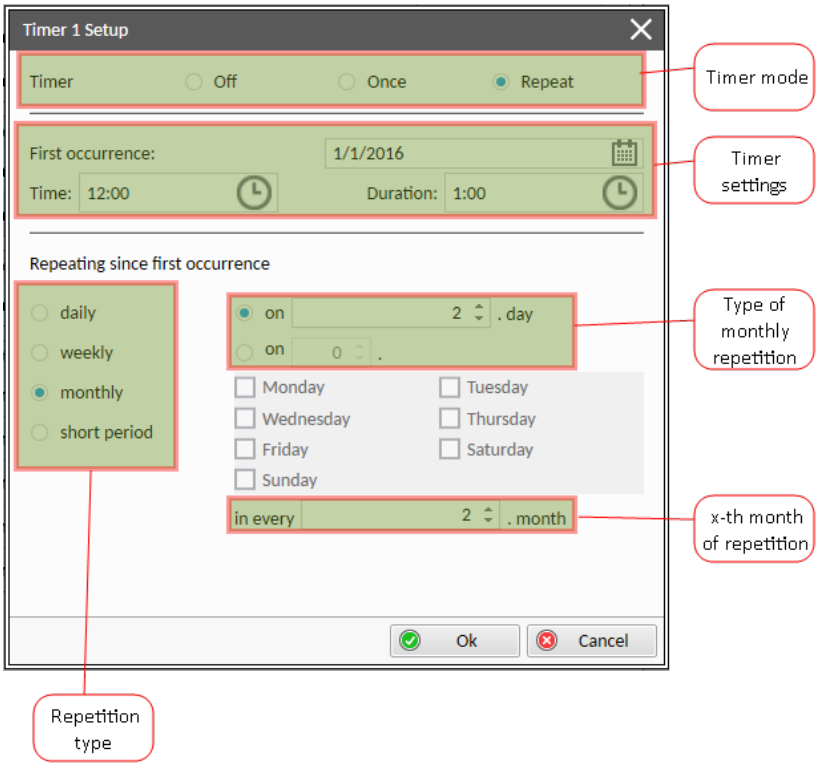



Image 5.40 Monthly mode – InteliConfig

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

> **Example:** On image example first start of timer will be 1/1/2016 at 12:00. Duration will be 1 hour. Timer will be activated again every 2nd week in 2nd month on Monday, Wednesday and Friday at 12:00 for 1 hour.

## Set-up via controller interface

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

In controller go to the Scheduler setpoint group. Select the function of timer via **Timer 1 Function (page 434)** setpoint. Then go to *Timer 1 Setup* and press the Enter button. In **Timer 1 Repetition (page 436)** setpoint select Repeated mode. Then adjust **Timer 1 First Occur. Date (page 435)**, **Timer 1 First Occur. Time (page 436)** and **Timer 1 Duration (page 436)**. In setpoint **Timer 1 Repeated (page 437)** select Monthly and adjust type of monthly repetition via **Timer 1 Repeat Day (page 437)**, **Timer 1 Refresh Period (page 440)** (xth month of repetition) and **Timer 1 Repeat Day In Month (page 438)** (concrete day in repeated months).

The second type of monthly repetition is based on repeating on certain days of the week in a month.

In controller go to the Scheduler setpoint group. Select the function of timer via **Timer 1 Function (page 434)** setpoint. Then go to *Timer 1 Setup* and press the Enter button. In **Timer 1 Repetition (page 436)** setpoint select Repeated mode. Than adjust **Timer 1 First Occur. Date (page 435)**, **Timer 1 First Occur. Time (page 436)** and **Timer 1 Duration (page 436)**. In setpoint **Timer 1 Repeated (page 437)** select Monthly and adjust type of monthly repetition via **Timer 1 Repeat Day (page 437)**, **Timer 1 Refresh Period (page 440)** (xth month of repetition), **Timer 1 Repeated Day In Week (page 438)** (days in week when timer is active) and **Timer 1 Repeat Week In Month (page 439)** (concrete week in repeated months).

***Note:*** *Use the Left and the Right buttons to move between timer setpoints.*

## Short period mode

### Set-up via InteliConfig

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

***Note:*** *First, the timer functions must be adjusted via setpoint* ***Timer 1 Function (page 434)****.*

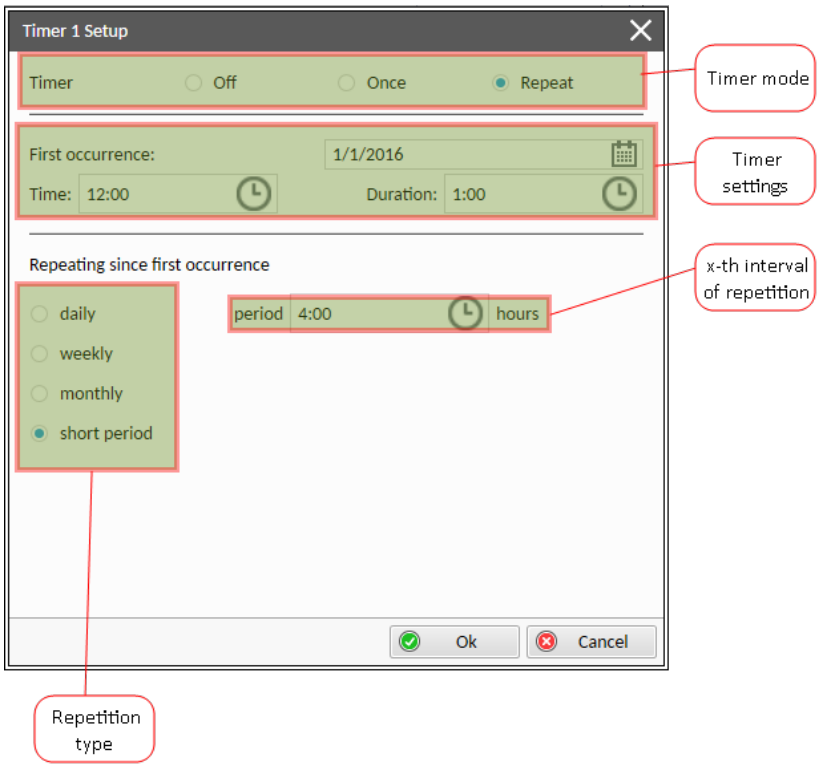



Image 5.41 Short period mode – InteliConfig

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

> **Example:** On image example first start of timer will be 1/1/2016 at 12:00. Duration will be 1 hour. Timer will be activated again every 4th hour for 1 hour.

### Set-up via controller interface

In controller go to the Scheduler setpoint group. Select the function of timer via **Timer 1 Function (page 434)** setpoint. Then go to *Timer 1 Setup* and press the Enter button. In **Timer 1 Repetition (page 436)** setpoint select Repeated mode. Then adjust **Timer 1 First Occur. Date (page 435)**, **Timer 1 First Occur. Time (page 436)** and **Timer 1 Duration (page 436)**. In setpoint **Timer 1 Repeated (page 437)**, select Short Period and adjust **Timer 1 Refresh Period (page 440)** (interval of repetition).

***Note:*** *Use the Left and the Right buttons to move between timer setpoints.*

# 5.5.17 Firewall

The firewall function allows to restrict the access to the controller application services (ComAp/TCP server, MODBUS/TCP server etc.) or to the specific computers or networks. Firewall can be activated on Ethernet port.

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

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

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

## 5.5.18 Gen-set operation states

### Engine state machine

| | |
|---|---|
| **Init** | Autotest during controller power on.<br>***Note:*** *Sometimes controller stays in Init mode after FW upgrade. It means that there are new parameters which should be checked by user. It is possible to disable this control via InteliConfig.* |
| **Not ready** | Gen-set is not ready to start.<br>**Example:** When shutdown alarm is active or unit is in OFF mode. |
| **Ready** | Gen-set is ready to run. |
| **Prestart** | Prestart sequence in process, **PRESTART (PAGE 674)** output is active.<br>**Example:** Usually used for preheating or processes executed prior Gen-set start. |
| **Cranking** | Engine is cranking, **STARTER 1 (PAGE 680)** or **STARTER 2 (PAGE 681)** output is active. |
| **Pause** | Pause between start attempts. |
| **Starting** | Starting speed is reached and the Idle timer is running. |
| **Running** | Gen-set is running at nominal speed. |
| **Soft load** | Gen-set power is ramping up. |
| **Loaded** | Gen-set is running at nominal speed and **GCB CLOSE/OPEN (PAGE 655)** is active. |
| **Soft unld** | Gen-set power is ramping down. |
| **Cooling** | Gen-set is cooling before stop. |
| **Stop** | Stop.<br>**Example:** Automatic or manual stop command was issued, engine is stopping. |
| **Shutdown** | Shut-down alarm activated. |

| | |
|---|---|
| **Ventil** | Gas engine - ventilation of unburned fuel when stop command comes during cranking with gas |
| **SDVentil** | Gas engine - ventilation of unburned fuel after unsuccessful start attempt or after shutdown stop. |
| **EmergMan** | **EMERGENCY MAN (PAGE 612)** Gen-set operation.<br>**Example:** Used for bypass the controller and engine manual start.<br>Controller mode, where the LBI **EMERGENCY MAN (PAGE 612)** is activated. All control functions are stopped |

## Engine started conditions

- Engine speed (RPM) > **Starting RPM (page 296)** or
- Oil pressure > **Starting Oil Pressure (page 297)** or
- Binary input **OIL PRESSURE (PAGE 624)** is in logical 0 or
- D+ terminal active (reached **D+ Threshold (page 308)** of supply voltage) for minimum 1 s or
- Generator voltage > 25 % of **Nominal Voltage Ph-N (page 278)** or **Nominal Voltage Ph-Ph (page 279)** (any phase)

***Note:*** *Any of these condition will disconnect starter of the engine, however for transition to next state RPM needs to be higher than **Starting RPM (page 296)**.*

## Engine running conditions

- Engine speed (RPM) > **Starting RPM (page 296)** or
- Oil pressure > **Starting Oil Pressure (page 297)** or
- Binary input **OIL PRESSURE (PAGE 624)** is in logical 0 or
- Generator voltage > 25 % of **Nominal Voltage Ph-N (page 278)**

## Still engine conditions

- Engine speed (RPM) < **Starting RPM (page 296)** and
- Oil pressure < **Starting Oil Pressure (page 297)** and
- Binary input **OIL PRESSURE (PAGE 624)** is in logical 1 and
- Generator voltage < 50 V (all phases)

***Note:*** *When the engine was running before and all above conditions are fulfilled, additional 2 s delay is necessary to confirm "still engine".*

When any engine running conditions are observed in still engine, then the **Wrn Stop Fail (page 728)** is activated with the following delays:

- For generator voltage from 10 V to < 50 % of nominal voltage, Wrn Stop Fail has delay 1 s
- For generator voltage > 50 % of nominal voltage, Wrn Stop Fail has delay 200 ms
- Oil pressure > **Starting Oil Pressure (page 297)**, Wrn Stop Fail has delay 1 s
- Binary input **OIL PRESSURE (PAGE 624)** is in logical 0, Wrn Stop Fail has delay 1 s
- For detected RPM, there is no delay.

## Stop engine conditions

If no engine running conditions are validated, then the controller will wait extra 12 s before leaving the Machine Stop state and releasing the **STOP SOLENOID (PAGE 682)** output.

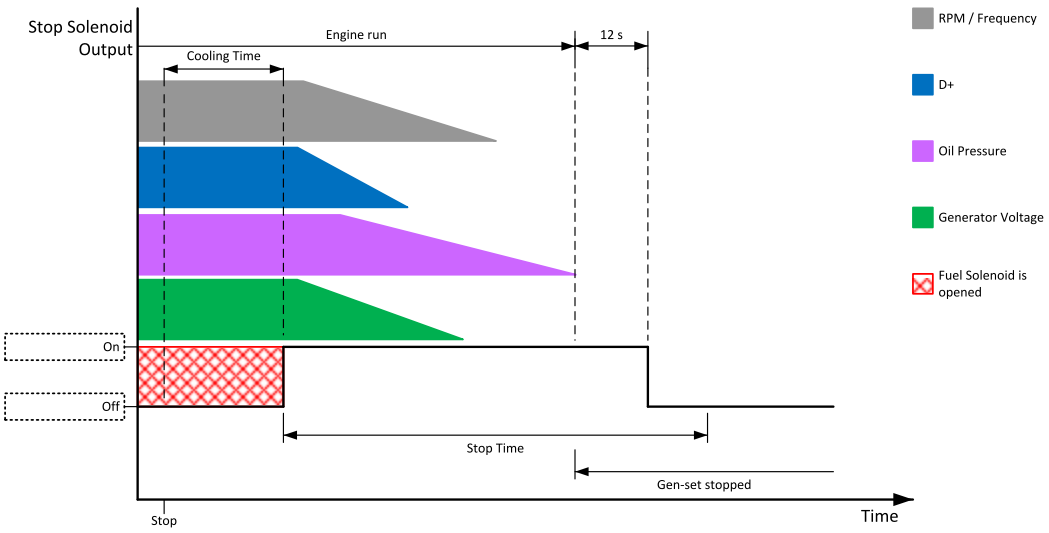



Image 5.42 Engine stops in **Stop Time (page 305)**

If the total stopping time will exceed setpoint **Stop Time (page 305)** then the **Wrn Stop Fail (page 728)** and binary outputs for stopping are activated. The controller will continuously try to stop the engine.

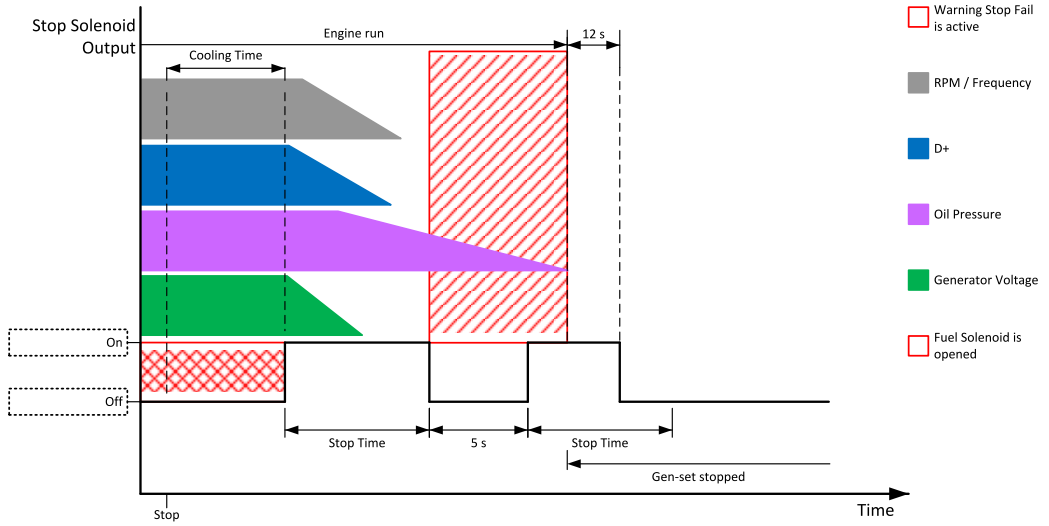



Image 5.43 Engine stops after first **Stop Time (page 305)**

## Electric state machine

| | |
|---|---|
| **MainsOper** | Mains is present and all its values are within limits.<br>**Example:** MCB is closed, GCB is opened |
| **MainsFlt** | Mains fails |
| **IslOper** | Island operation<br>**Example:** MCB is opened, GCB is closed |

| | |
|---|---|
| **MainsRet** | Mains recover |
| **Synchro** | Gen-set is synchronizing (MCB is closed, GCB is opened) |
| **ParalOper** | Gen-set is in parallel with mains (MCB is closed, GCB is closed) |
| **BrksOff** | GCB, MCB opened |

## 5.5.19 Geo-fencing

Geo-fencing function (available with CM2-4G-GPS) is kind of protection that evaluates whether the actual GPS location is within a predefined area, then based on this evaluation takes an action (sends SMS message, stops engine, make history record etc.). This function is enabled by setpoint **Geo-Fencing (page 470)** or by logical binary input **GEO-FENCING ENABLE (PAGE 620)**.

Using InteliConfig, it is possible to set two concentric geo-circles within which the unit is allowed to be located. Each geo-circle is defined as a circular geographic area with its center (common for both geo-circles) named Home Position. This point is adjusted via setpoints **Home Latitude (page 470)** and **Home Longitude (page 471)** and radius named Fence Radius adjusted via setpoints **Fence 1 Radius (page 473)** and **Fence 2 Radius (page 475)**.

The Protection can be different for both circles and are adjusted via setpoints **Fence 1 Protection (page 472)** and **Fence 2 Protection (page 474)**.

It is also possible to see the current position of the controller in WebSupervisor map view.

## 5.5.20 History log

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. "Overspeed alarm" or "GCB closed")
- The date and time when it was recorded
- All important data values such as RPM, kW, voltages, etc. from the moment that the event occurred.

***Note:*** *It is possible to clear history on users demand. To execute history log clearing, navigate to History page in InteliConfig and select the option ClearHistory.*

**Moving in the History log:**

- When the first item is selected in history, pressing of the UP button leads to the last history item to be selected.
- When the last item is selected in history, pressing of the DOWN button leads to the first history item to be selected.

### Record structure

| Name | Abbreviation | Description |
|---|---|---|
| Number | No. | Row number (0 corresponds to the last record, -1 to the previous one, etc.) |
| Reason | Reason | Reason for history record (any event or alarm related to the gen-set |

| | | |
|---|---|---|
| Time | Time | Time |
| Date | Date | Date |
| RPM | RPM | Engine rotations per minute |
| Power | Pwr | Generator active power |
| Reactive power | Q | Generator reactive power |
| Power Factor | PF | Generator power factor |
| Load Character | LChr | Generator load character |
| Generator Frequency | Gfrq | Generator Frequency |
| Generator Voltage | Vg1 | Generator voltage Ph1 |
| Generator Voltage | Vg2 | Generator voltage Ph2 |
| Generator Voltage | Vg3 | Generator voltage Ph3 |
| Generator Voltage | Vg12 | Generator voltage Ph12 |
| Generator Voltage | Vg23 | Generator voltage Ph23 |
| Generator Voltage | Vg31 | Generator voltage Ph31 |
| Generator Current | Ig1 | Generator current Ph1 |
| Generator Current | Ig2 | Generator current Ph2 |
| Generator Current | Ig3 | Generator current Ph3 |
| Mains Frequency | Mfrq | Mains Frequency |
| Mains Voltage | Vm1 | Mains voltage Ph1 |
| Mains Voltage | Vm2 | Mains voltage Ph2 |
| Mains Voltage | Vm3 | Mains voltage Ph3 |
| Mains Voltage | Vm12 | Mains voltage Ph12 |
| Mains Voltage | Vm23 | Mains voltage Ph23 |
| Mains Voltage | Vm31 | Mains voltage Ph31 |
| Mains Current | IL1 | Mains current Ph1 |
| Voltage Battery | VBat | Voltage of battery |
| Analog Input 1 | Ain1 | Analog input 1 |
| Analog Input 2 | Ain2 | Analog input 2 |
| Analog Input 3 | Ain3 | Analog input 3 |
| Analog Input 4 | Ain4 | Analog input 4 |
| Binary Inputs | BIN | Controller binary inputs |
| E-Stop | E-Stop | State of dedicated E-Stop input |
| Binary Outputs | BOUT | Controller binary outputs |
| Controller Mode | Mode | Controller mode |

***Note:*** *When some setpoint is changed, its number of the communication object is written in the history log.*

## 5.5.21 Load shedding

The Load shedding is the controlled disconnection of less important load groups (circuits) when the object consumption is too high.

## Load shedding stages

The Load Shedding function consists of 5 stages which are numbered 1-5. Stages are disconnected in ascending order up to the last configured stage. Reconnecting of stages is in descending order and starts with higher configured stage. A stage is considered configured when the respective Load Shedding Output is configured. Highest activated load shedding stage is stored in value **Load Shedding Status (page 583)**.

### Load shedding outputs

| Stage | LBO |
|---|---|
| Stage 1 | **LOAD SHEDDING STAGE 1 (PAGE 666)** |
| Stage 2 | **LOAD SHEDDING STAGE 2 (PAGE 666)** |
| Stage 3 | **LOAD SHEDDING STAGE 3 (PAGE 666)** |
| Stage 4 | **LOAD SHEDDING STAGE 4 (PAGE 666)** |
| Stage 5 | **LOAD SHEDDING STAGE 5 (PAGE 667)** |

## How the Load shedding controls the Load shedding outputs

The load shedding function is active in all controller modes except OFF.

Load shedding has 5 steps and each step is linked with its own binary output, **LOAD SHEDDING STAGE 1 (PAGE 666)**, **LOAD SHEDDING STAGE 2 (PAGE 666)**, **LOAD SHEDDING STAGE 3 (PAGE 666)**, **LOAD SHEDDING STAGE 4 (PAGE 666)** and **LOAD SHEDDING STAGE 5 (PAGE 667)**.

The Load shedding outputs can be activated one by one in the order 1, 2, 3, 4, 5. The conditions for activation are defined by setpoints **Load Shedding Level (page 362)** and **Load Shedding Delay (page 362)**.

The Load shedding outputs are deactivated one by one according to the conditions given by the setpoints **Load Reconnection Level (page 363)**, **Load Reconnection Delay (page 363)**, **AUTO LOAD RECONNECTION (PAGE 364)**.

If manual reconnection of the load is desired the **Auto Load Reconnection (page 364)** setpoint must be disabled and the **MANUAL LOAD RECONNECTION (PAGE 621)** digital input must be configured.

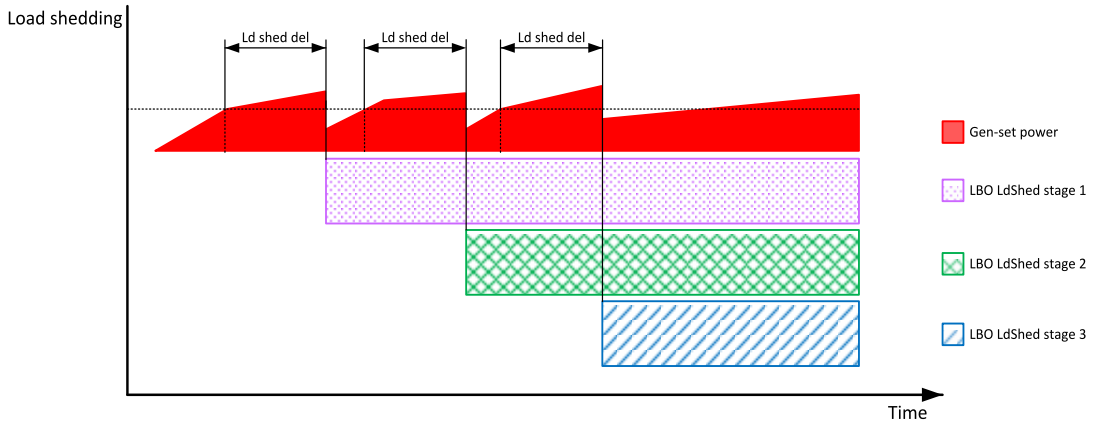



Image 5.44 Load shedding

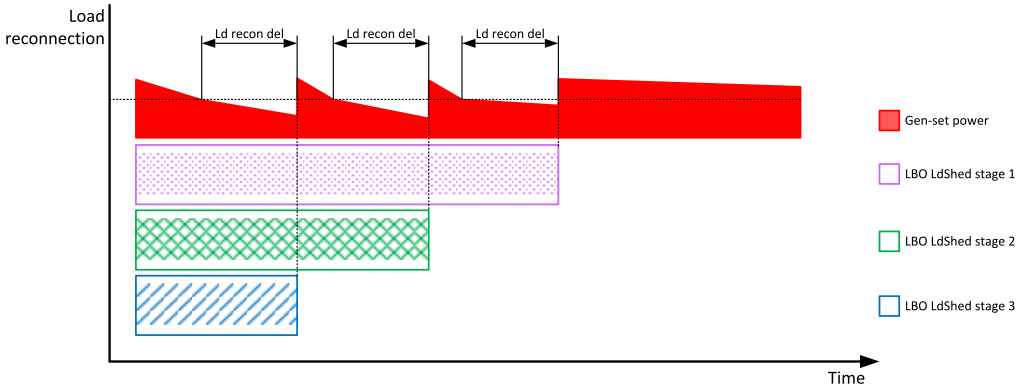



Image 5.45 Load reconnection

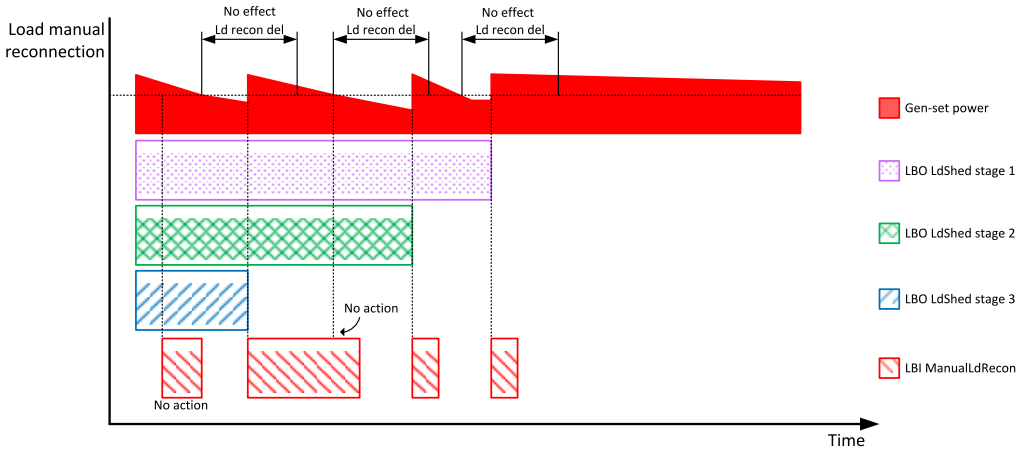



Image 5.46 Load manual reconnection

## 5.5.22 Mains decoupling protections

### Vector shift

The vector shift function is the fast protection for mains decoupling. It monitors the Load angle of the generator and if it gets changed dramatically, the protection is issued. The Vector shift is evaluated from the Mains Voltage Measurement (Phase 1).

Protection is enabled via setpoint **Vector Shift Protection (page 355)**. Limit of protection is adjusted via setpoint **Vector Shift Limit (page 356)**. When protection is activated, the breaker is opened. Which breaker is opened is adjusted via setpoint **Vector Shift CB Selector (page 358)**. Maximal value of vector shift is represented by value **Max Vector Shift (page 560)**.

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

The settings can lead to these situations:

| MCB status | GCB status | Vector Shift CB Selector | Vector Shift Protection | Action |
|---|---|---|---|---|
| 1 | 1 | MCB or GCB | Parallel or Enabled (No influence) | Opens MCB or GCB based on setpoint Vector Shift CB Selector. |
| 0 | 1 | No influence | No influence | No action (GCB stays alaways closed) |
| 1 | 0 | No influence | Parallel | No action MCB stays closed |
| 1 | 0 | GCB | Enabled | No action MCB stays closed |
| 1 | 0 | MCB | Enabled | MCB opens |

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) after **Mains Return Delay (page 342)** as the mains is evaluated as healthy.

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

### 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.

Protection is enabled via setpoint **ROCOF Protection (page 356)**. Limit of protection is adjusted via setpoints **ROCOF df_dt (page 357)** and **ROCOF Windows Length (page 357)**. When protection is activated, the breaker is opened. Which breaker is opened is adjusted via setpoint **Vector Shift CB Selector (page 358)**.

## 5.5.23 Mains import measurement

This functionality is available only when the **Active Application (page 578)** = SPTM. The mains measurement can be measured by dedicated CT terminals or by analog inputs, and it is divided to **Mains Measurement P (page 267)** and **Mains Measurement Q (page 268)**. The Mains Measurement P has to be enabled for proper work of active power Import/Export. The both measurements has to be enabled for proper work of reactive power Import/Export and power factor control.

> **IMPORTANT: The Earth Fault Current Protection (page 519) and Mains Import Measurement shares same physical input. At one moment this input can be used only for one purpose. The protection will work only if Mains Measurement P (page 267) and Mains Measurement Q (page 268)!= Mains CT.**

### Mains Measurement P

- If **Mains Measurement P (page 267)** = Mains CT then **Mains Measurement P (page 267)** is counted from the current which is measured on Mains current.
- If **Mains Measurement P (page 267)** = Analog Input then **Mains Measurement P (page 267)** is taken from LAI **MAINS IMPORT MEASUREMENT P (PAGE 692)**. Mains current can still be measured if **Mains Measurement Q (page 268)** = Mains CT.
- If **Mains Measurement P (page 267)** = None then **Mains Measurement P (page 267)** is not counted because there is no current measurement.

### Mains Measurement Q

- If **Mains Measurement Q (page 268)** = Mains CT then **Mains Measurement Q (page 268)** is counted from the current which is measured onMains current.
- If **Mains Measurement Q (page 268)** = Analog Input then **Mains Measurement Q (page 268)** is taken from the LAI **MAINS MEASUREMENT Q (PAGE 693)**. Mains current can be still measured if **Mains Measurement P (page 267)** = Mains CT.
- If **Mains Measurement Q (page 268)** = None then **Mains Measurement Q (page 268)** is not counted because there is no current measurement.

## 5.5.24 Maintenance Timers

Maintenance timer contains two types of timers – **Maintenance Timer RunHours** and **Maintenance Timer Interval**.

- **Maintenance Timer RunHours** is based on engine running hours and it only counts down when engine is running. When engine runs value **Maintenance Timer RunHours** counts down, but setpoint **Maintenance Timer RunHours** will not change.
- **Maintenance Timer Interval** is set in months. Specific date is calculated as the setpoint is set. E.g. when the timer is set to 6 months on June 10th, corresponding **Maintenance Timer Interval** value is set to the number of days remaining to December 10th, the timer count down is done in days and alarm is issued on December 10th. The setpoint value does not change, as the remaining days count down is done.
- Timers can be reset by changing the corresponding setpoint value (it does not have to be a different value, editing it and confirming original value is enough).
- When either of the timers elapse, appropriate LBO **Maintenance** will be activated and stays active until timers are reset.

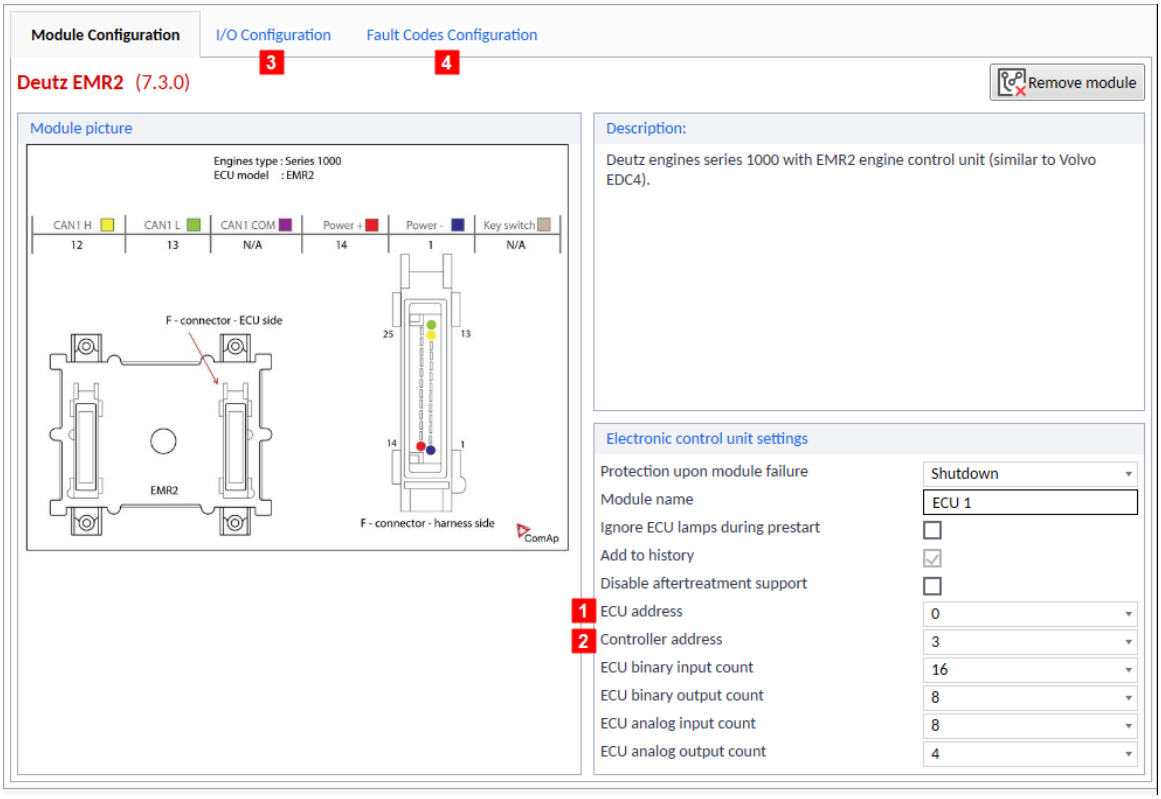
***Note:*** *For more information* ***see Group: Maintenance Timers on page 319****.*

## 5.5.25 Multi ECU

InteliGen4 200 allows you to configure, monitor and control multiple Electronic Control Units (ECUs), such as Engine Control Units, AVR modules, Breakers and Modbus modules which are connected to the CAN. At this moment there are 4 ECU slots available, each slot can contain one ECU which settings can be separately configured.

In order to ensure proper functionality you shall pay extra attention to settings 1 ECU address and 2 Controller address. ECU address has to be always unique whereas Controller address is required to be set to same value as **Subgroup: Controller Address (page 289)** of the Controller Unit that sends commands frames to this ECU.

Moreover you can now also modify 3 I/O Configuration and recognized 4 Fault Codes.




***Note:*** *Module name effects name of the value screen shown on the controller.*

## Controller objects related to ECU

| ECU Slot | LBI | LBO | Alarm |
|---|---|---|---|
| 1 | **ECU Communication Fail Block 1 (page 609)** | **ECU 1 Comm Fail (page 648)** | **Wrn ECU 1 Comm Fail (page 726)** |
| 2 | **ECU Communication Fail Block 2 (page 610)** | **ECU 2 Comm Fail (page 649)** | **Wrn ECU 2 Comm Fail (page 726)** |
| 3 | **ECU Communication Fail Block 3 (page 610)** | **ECU 3 Comm Fail (page 649)** | **Wrn ECU 3 Comm Fail (page 726)** |
| 4 | **ECU Communication Fail Block 4 (page 610)** | **ECU 4 Comm Fail (page 649)** | **Wrn ECU 4 Comm Fail (page 726)** |

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 649)**. 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 609)**. 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.

## 5.5.26 Multiple island operation

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

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

> **IMPORTANT: The controller in MINT application does not control the MCB! Only the MCB position is evaluated from the binary input MCB FEEDBACK (PAGE 622) and the position is the basic source of information for switching between island and parallel to mains operation.**

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.

When a stop command is received, e.g. from the power management or binary input **REMOTE START/STOP (PAGE 628)** is deactivated or the STOP button is pressed, the GCB will be opened and the Gen-set will go to cool down phase.

Behavior of controllers is adjusted via **Power management (page 159)** settings. Please see this chapter for more information.

## 5.5.27 Operating Modes

Selecting the operating mode is done with the Left and the Right buttons on the front panel or by changing the **Controller Mode (page 284)** setpoint (from the front panel or remotely).

> ***Note:*** *If this setpoint is configured as password-protected, the correct password must be entered prior to attempting to change the mode.*

> ***Note:*** *The mode cannot be changed if Access Lock input is active.*

The following binary inputs can be used to force one respective operating mode independent of the mode setpoint selection:

- **Remote OFF (page 628)**
- **Remote TEST (page 629)**
- **Remote MAN (page 627)**
- **Remote AUTO (page 627)**

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.

### OFF

No start of the Gen-set is possible. If the Gen-set is running, it is not possible to switch directly to OFF mode. First you have to stop the engine. After that the controller will stay in Not ready status and cannot be started any way. The MCB is closed permanently (**MCB Opens On (page 354)** = GenRun) or is open or closed according to whether the mains is present or not (**MCB Opens On (page 354)** = MainsFail). No AMF or

Power management function will be performed. The buttons MCB, GCB, Start and Stop including the appropriate binary inputs for external buttons are not active.

***Note:*** *When engine is running, it is not possible to switch Gen-set to OFF mode*

## MAN

The engine can be started and stopped manually using the START and STOP buttons (or external buttons wired to the appropriate binary inputs) in MAN mode.

When the engine is running and generator parameters are in the limits, GCB can be closed to a dead bus or synchronization can be started by the GCB button.

Also MCB can be closed and opened manually using the MCB button, if mains is present. MCB can be opened manually after mains failure (it is not tripped in case of mains failure), but it can not be closed with failed mains.

Controller does not respond to external signals and/or conditions. The gen-set is fully in manual control; there is no automatic way to stop it (except protections). The Gen-set stays running until STOP button is pressed. Controller does not take place in **Power management (page 159)** in MINT application.

## AUTO

Gen-set is controlled based on external signal (**REMOTE START/STOP (PAGE 628)**) or by conditions (AMF, Power management system, …).

When one condition deactivates the engine does not stop if another condition for automatic starts is active.

The controller does not respond to buttons Start, Stop, MCB ON/OFF and GCB ON/OFF.

> **IMPORTANT: If a red alarm is present and the Gen-set is in AUT mode, it can start by itself after all red alarms become inactive and are acknowledged!!! To avoid this situation, adjust the setpoint Fault Reset To Manual (page 285) to the Enabled position.**

## TEST

The behavior of the controller in TEST mode depends mainly on the setting of the setpoints and binary inputs. TEST mode can be activated via front panel of controller or via binary input **REMOTE TEST (PAGE 629)**.

The Gen-set will be started when the controller is put to TEST mode and will remain running unloaded. If a mains failure occurs, the MCB will be opened and after **Open Transfer Min Break (page 385)** the GCB will be closed and the Gen-set will supply the load. After the mains have recovered, the delay **Mains Return Delay (page 342)** will count down and if it elapses and the mains is still ok, the controller will transfer the load back to the mains after **Open Transfer Min Break (page 385)** and the Gen-set will remain running unloaded again until the mode is changed.

The controller does not respond to buttons Start, Stop, MCB ON/OFF and GCB ON/OFF.

Behavior of TEST mode also depends on setpoints **Transfer Gen To Mains (page 387)** and **Transfer Mains To Gen (page 386)** and on binary inputs **FORCE ISLAND (PAGE 616)** and **FORCE PARALLEL (PAGE 616)**.

# 5.5.28 Parallel to mains operation – MINT application

If the MCB is closed (**MCB FEEDBACK (PAGE 622)** is present) and the Gen-set has been synchronized to the bus bar, the parallel to mains operation will follow. It consists of the following phases:

## Ramping the power

### Power up

The first phase of the parallel to mains operation is the ramping of the Gen-set up to the desired power level derived from the **#System BaseLoad (page 264)** or up to the load given by load sharing with other Gen-sets connected to the bus bar. The speed of the ramp is given by the setpoint **Load Ramp (page 389)**. The setpoint adjusts the ramp time for a change from 0 % to 100 % of nominal power.

### Power down

When a stop command is received the Gen-set load is ramped down before opening the GCB. The ramp speed is given by the setpoint **Load Ramp (page 389)** and the end level is given by **Generator Unload GCB Open Level (page 388)**.

When the GCB button is pressed, the Gen-set load is ramped down before opening the GCB as well. But after the GCB has been opened, the gen-set remains running until a stop command comes or the GCB is pressed again to reclose the GCB.

## Load control

If **MCB Feedback (page 622)** is active (parallel to mains operation) the load of group of the Gen-sets is controlled to reach the power defined by setpoint **#System BaseLoad (page 264)**. Each loaded Gen-set takes equal part (relative to their nominal power) from **#System BaseLoad (page 264)** requested value. The load is regulated locally in each controller by load control regulation loop, load-sharing regulation loop is not active. The setpoint **#System BaseLoad (page 264)** is also used for determining which Gen-sets have to run or not. Control is adjusted via setpoints **Load Int (page 384)** and **Load Gain (page 383)**.

## PF control

If **MCB Feedback (page 622)** is active (parallel to mains operation) the value of PF (power factor) of group of the Gen-sets is controlled to reach the PF defined by setpoint **#System Power Factor (page 264)**. The PF is regulated locally in each controller by PF control regulation loop, VAr-sharing regulation loop is not active. Control is adjusted via setpoints **PF Gain (page 392)** and **PF Int (page 392)**.

# 5.5.29 Parallel to mains operation – SPtM application

After the Gen-set has been synchronized to the mains, the parallel to mains operation follows. It consists of the following phases:

## Ramping the power

### Power up

The first phase of the parallel to mains operation is the ramping of the Gen-set up to the desired power level. The speed of the ramp is given by the setpoint **Load Ramp (page 389)**. The setpoint adjusts the ramp time for a change from 0 % to 100 % of nominal power.

### Power down

When a stop command is received the Gen-set load is ramped down before opening the GCB. The ramp speed is given by the setpoint **Load Ramp (page 389)** and the end level is given by **Mains Unload MCB Open Window (page 388)**.

When the GCB button is pressed, the Gen-set load is ramped down before opening the GCB as well. But after the GCB has been opened, the Gen-set remains running until a stop command comes or the GCB is pressed again to reclose the GCB.

# Load control

Load control ensures that the gen-set keep the certain load in parallel to mains operation (**MCB FEEDBACK (PAGE 622)** and **GCB FEEDBACK (PAGE 618)** = active).

There are available two modes of load control. Type of control is adjusted via setpoint **Load Control PTM Mode (page 258)**.

***Note:*** *In both modes, the lower level of the power is always limited by the setpoint **MINIMAL POWER PTM (PAGE 324)**. If the requested load (given by the active load control mode, e.g. Baseload, Import/Export) is below this limit the requested load is limited to the level adjusted by this setpoint.*

## Baseload

**Load Control PTM Mode (page 258)** = Baseload. Gen-set produces amount of the power given by setpoint **Baseload (page 261)**. The rest of power is supplied from the mains or exported to the mains (depends on proportions of load and **Baseload (page 261)** setpoint). Even in baseload control mode can be the Import/Export limited. This function can be activated by setpoint **Import/Export Limitation (page 263)** = Enabled. Then the request for the power of the Gen-set operating in baseload can be limited to prevent the Import/Export go below the limit given by setpoint **Import Load (page 262)**.

> **Example:** Baseload = 1000 kW, load = 700 kW, Import load = 100 kW. Then the Baseload request will be limited to 600 kW to prevent the Import power to go below 100 kW.

> **Example:** Baseload = 1000 kW, load = 700 kW, Import load = -100 kW. Then the Baseload request will be limited to 800 kW to prevent the Import power to go below -100 kW (actually it is limitation of the export).

## Import/Export

**Load Control PTM Mode (page 258)** = Imp/Exp. Gen-set produces the certain amount of power to keep constant import/export from the mains regardless the demand of the load. The requested import/export is given by setpoint **Import Load (page 262)**. If the value of the setpoint is >0 the power is imported from the mains, if setpoint value is <0, then the power is exported to the mains.

# PF control

PF control ensures that the Gen-set keep the certain reactive load in parallel to mains operation (**MCB Feedback (page 622)** and **GCB Feedback (page 618)** = active).

There are available two modes of PF control. Type of control is adjusted via setpoint **PF Control PTM Mode (page 259)**.

## Base PF

The power factor on the Gen-set is kept on the level given by the setpoint **BasePower Factor (page 262)** regardless the load demand. The rest of demanded reactive power is supplied from the mains. Values >1 means that capacitive reactive power is supposed to be imported from mains, values <1 means that inductive reactive power is imported from the mains.

## Import/Export

Gen-set produces the certain amount of reactive power to keep constant PF imported from the mains regardless the demand of the load. The requested power factor import is given by setpoint **Import Power**

**Factor (page 263)**. Values >1 means that the Gen-set is pushing the capacitive power to the system (system Gen-set – Load – Mains), values <1 means that the Gen-set is pushing the inductive power to the system.

# Transfers of load

Type of transfer of load between mains and Gen-set and vice versa is adjusted via setpoints **Transfer Gen To Mains (page 387)** and **Transfer Mains To Gen (page 386)**.

## Types of transfers

| | |
|---|---|
| Open | Transfer of the load from generator to mains and vice versa without parallel work and synchronization (one breaker opens and second is closed – checking feedbacks). The setpoint **Open Transfer Min Break (page 385)** sets the minimal duration of break. |
| Close Only | Transfer of the load from generator to mains and vice versa with synchronization and parallel work. The maximal time of parallel work is given by setpoint **Close Transfer Max Duration (page 385)**.<br>In case of synchronization fail, MCB stays close and Gen-set is stopped. |
| Close Primarily | Transfer of the load from generator to mains and vice versa with synchronization and parallel work. The time of parallel work is given by setpoint **Close Transfer Max Duration (page 385)**.<br>In case of synchronization fail, open transfer is done. |
| Soft Transfer | Transfer of the load from generator to mains and vice versa with parallel work and soft loading/unloading of the Gen-set This function is proceeded like the closed transfer, but there is time limitation of loading/unloading of the Gen-set adjusted via setpoint **Load Ramp (page 389)**. The transfer is succeed only when the Gen-set is fully loaded/unloaded (level of load when mains is considered as unloaded – Gen-set is loaded is adjusted via setpoint **Generator Unload GCB Open Level (page 388)**), level of load when Gen-set is considered as unloaded is adjusted via setpoint **Generator Unload GCB Open Level (page 388)**). |

## Transfer of load in MAN mode

Behavior of transfer of load in MAN mode is adjusted via setpoint **CB Control In MAN Mode (page 266)**. For details see the setpoint description.

## Transfer of load in AUTO mode

Behavior of transfer of load in AUTO mode is affected by binary inputs **Force Island (page 616)**, **Force Parallel (page 616)** and **Remote Start/Stop (page 628)**.

When more binary inputs are activated at the same time, their priority is shown in the list below:

- **Force Island (page 616)** (highest priority).
- **Remote Start/Stop (page 628)**.
- **Force Parallel (page 616)** (lowest priority).

***Note:*** *MINT function has the highest priority (if it is enabled).*

| Logical binary input | AUTO mode | TEST mode |
|---|---|---|
| FORCE ISLAND (PAGE 616) | When activated:<br>› starts Gen-set<br>› the transfer of load from mains to generator is done<br>When deactivated:<br>› the transfer of load from generator to mains is done<br>› cooling and stopping of the Gen-set | The Gen-set is started anyway due to the TEST mode.<br>When activated:<br>› the transfer of load from mains to generator is done<br>When deactivated:<br>› the transfer of load from generator to mains is done |
| **Remote Start/Stop (page 628)** | When activated:<br>› starts Gen-set<br>› if mains parameters ok – synchronize, run in parallel<br>› if mains parameters not ok – run in island<br>When deactivated:<br>› unloading (if Gen-setwas in parallel), cooling and stopping of the Gen-set | The Gen-set is started anyway due to the TEST mode.<br>When activated:<br>› if mains parameters ok – synchronize, run in parallel<br>When deactivated:<br>› unloading, of the Gen-set, opening GCB |
| FORCE PARALLEL (PAGE 616) | When activated:<br>› check mains parameters – if not ok no action, if ok the procedure follows<br>› starts the Gen-set, synchronize, parallel operation<br>› in case of mains fail – Gen-set is stopped (if AMF function is disabled, otherwise it goes to island operation)<br>When deactivated:<br>› unloading, cooling and stopping of the Gen-set | The Gen-set is started anyway due to the TEST mode.<br>When activated:<br>› check mains parameters – if not ok no action, if ok the procedure follows<br>› synchronize, parallel operation<br>When deactivated:<br>› unloading, of the Gen-set, opening GCB |

Type of transfer of load between mains and Gen-set and vice versa is adjusted via setpoints **Transfer Gen To Mains (page 387)** and **Transfer Mains To Gen (page 386)**.

## 5.5.30 Peak shaving

Peak shaving is applicable on SPtM application only. The function compares the mains import with some certain limit and start the Gen-set when the load excised this limit to decrease the mains import for some certain time.

The Peak shaving function is active only in AUT mode in parallel to mains operation. Peak shaving is based on active power only. If load consumption increases over **Peak Shaving Start Level (page 269)** and for period longer than **Peak Shaving Start/Stop Delay (page 270)** the Gen-set is started. If load consumption decreases below **Peak Shaving Stop Level (page 269)** and period longer than **Peak Shaving Start/Stop**

**Delay (page 270)** the Gen-set is stopped. The activation of the function is indicated by LBO: **PEAK SHAVING ACTIVE (PAGE 674)**.

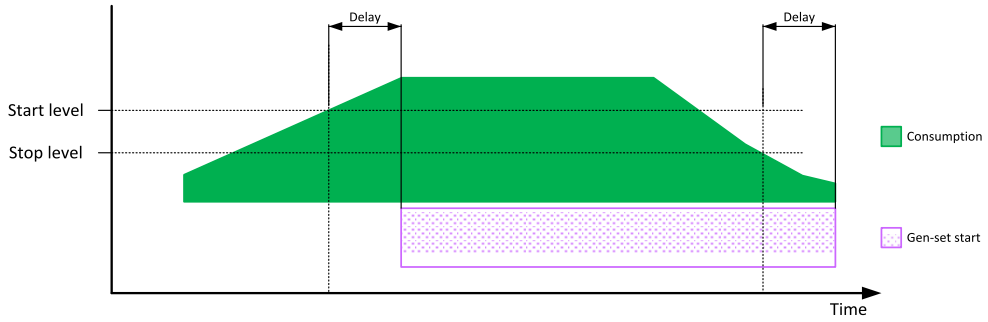



Image 5.47 Peak shaving

## 5.5.31 PLC

PLC Editor is a powerful tool which helps you to create your own PLC scheme. It has a graphical interface to make user interface easy to use.

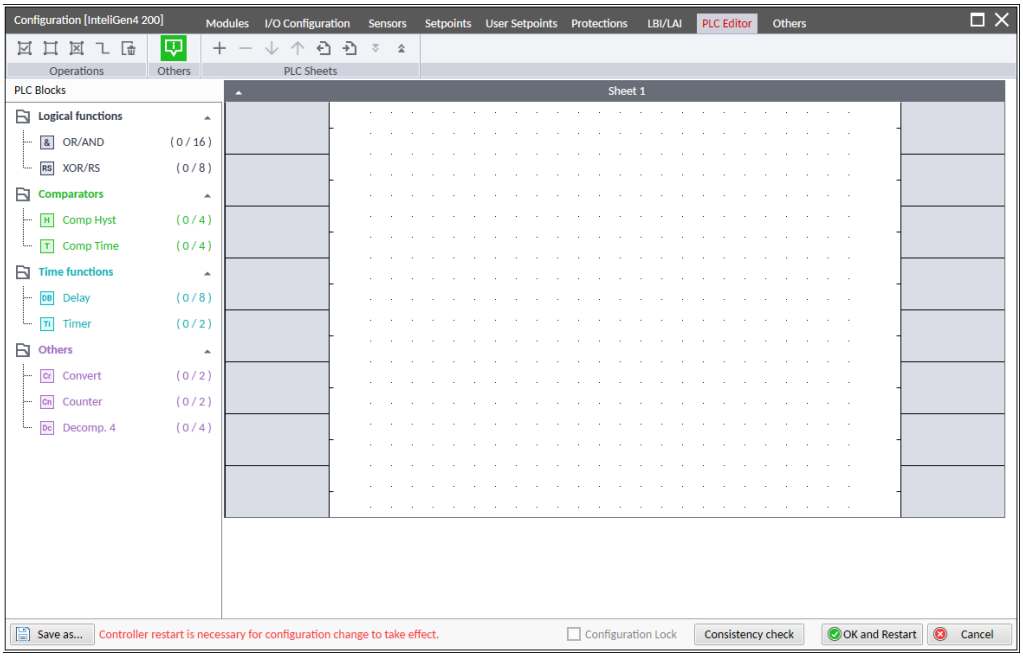



Image 5.48 PLC Editor main page

### List of available PLC blocks

| PLC block | Number of blocks |
|---|---|
| OR/AND | 16 |
| XOR/RS | 8 |
| Comparator with hysteresis (Comp Hyst) | 4 |
| Comparator with delay (Comp Time) | 4 |
| Timer | 2 |
| Delay | 8 |

| | |
|---|---|
| Counter | 2 |
| Decomposer | 4 |
| Convert | 2 |

## Working with the editor

If the currently opened archive does not contain any PLC program, then an empty drawing is created automatically when you select the PLC Editor. The procedure of creation of a PLC drawing (program) contains the following essential steps:

- Adjust the sheet to your needs. See **Working with sheets (page 153)** for more information.
- Add PLC blocks into the sheets. See **Adding PLC blocks (page 153)** for more information.
- Define inputs and outputs of the PLC program. See **Define inputs and outputs (page 155)** for more information.
- Create connections between inputs, blocks and outputs. See **Creating wires (page 157)** for more information.
- Adjust properties of the blocks. See **List of PLC blocks (page 694)** for more information about blocks.

### Working with sheets

Drag the sheet edges to re-size the sheet according to your needs.

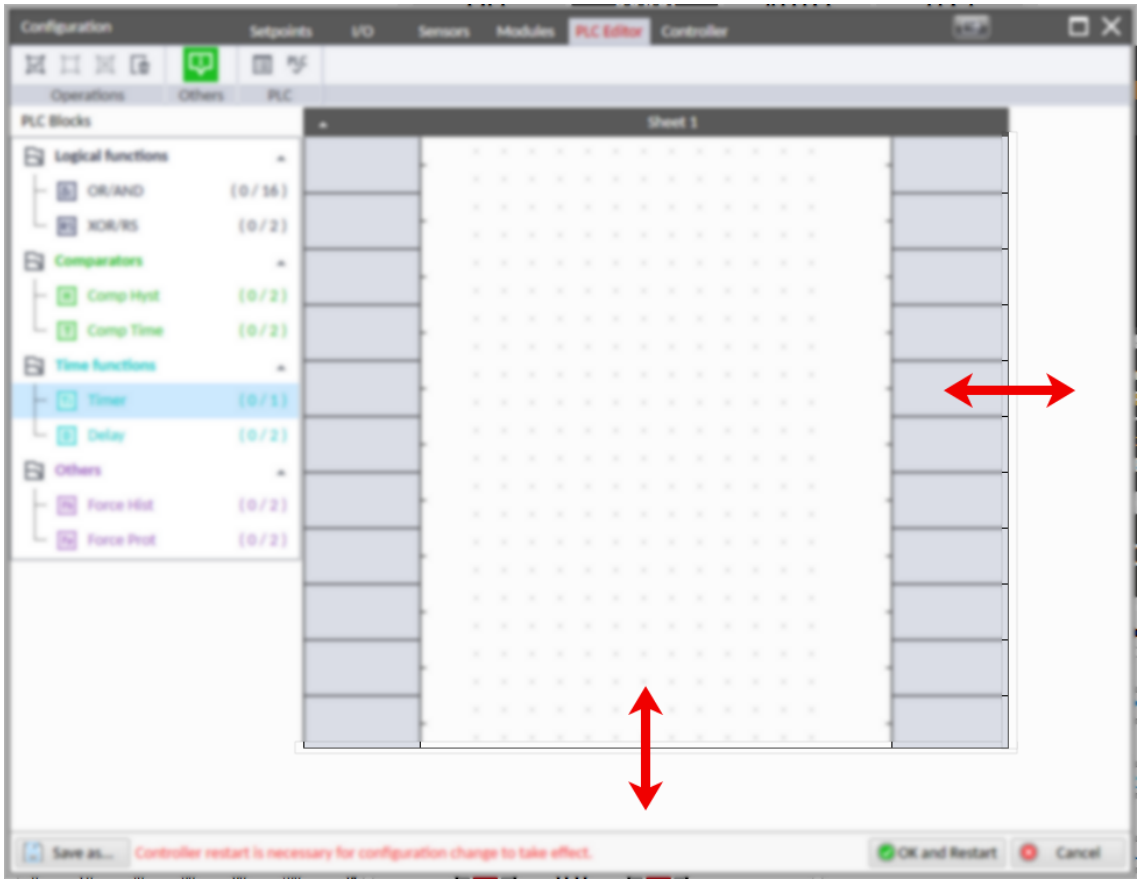



Image 5.49 Adjusting PLC sheet

### Adding PLC blocks

Adding a PLC block is simple and intuitive. Follow the procedure below to add PLC block.

- Select the required block from the list of available PLC blocks at the left and drag it into the sheet.
- Double-click on the block and adjust the properties of the block. See **List of PLC blocks (page 694)** for more information about blocks.
- Connect the block inputs and outputs by drawing wires in the sheet. See **Define inputs and outputs (page 155)** for more information. It is also possible to connected inputs and outputs via properties of selected PLC block.

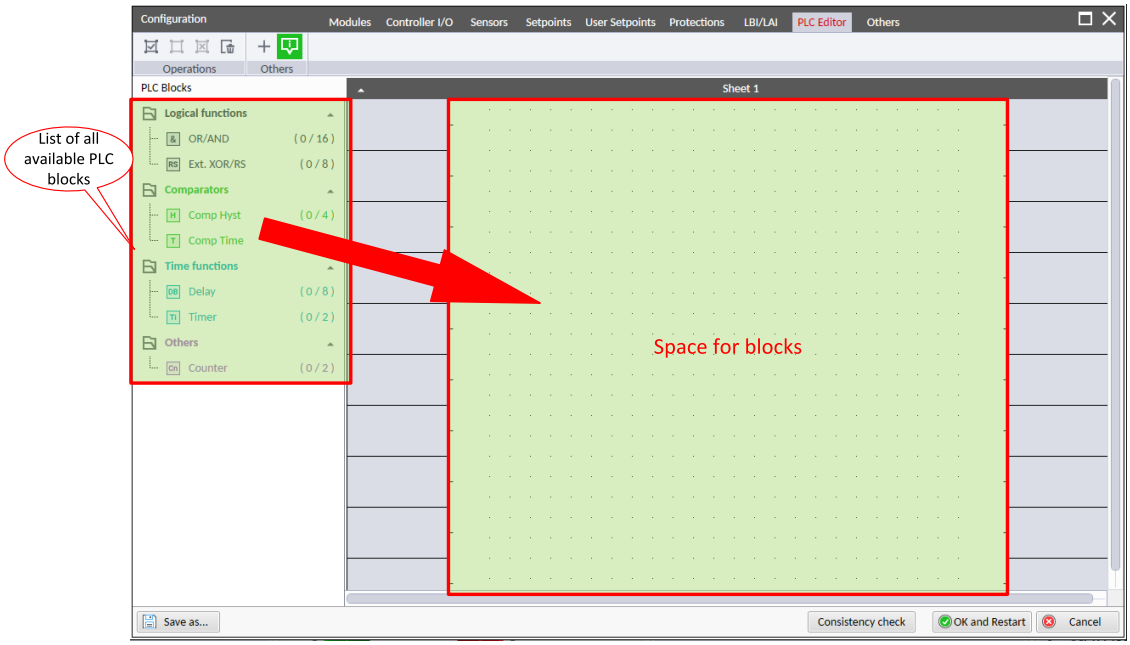



Image 5.50 Adding PLC blocks

***Note:*** *To delete a PLC block just click on it and press delete button. Also the delete selection function can be used.*

***Note:*** *To see context help for selected PLC block just press the F1 button.*

## Define inputs and outputs

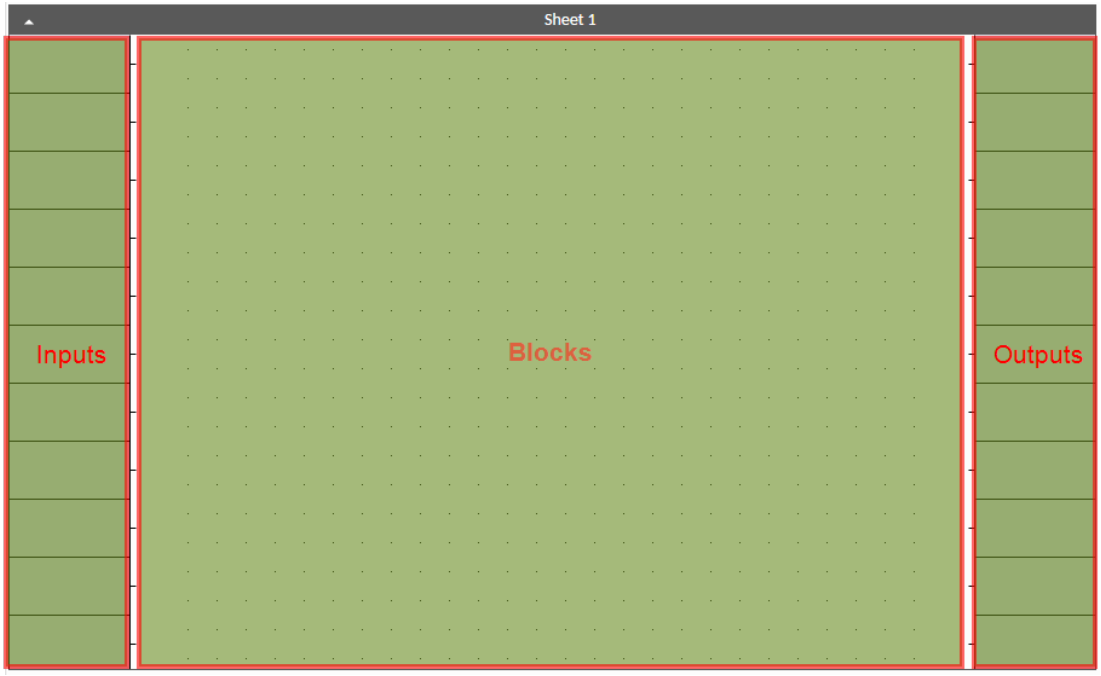



Image 5.51 Blank sheet of PLC Editor

### Inputs

Sheet inputs are located at the left side of a sheet. Follow the procedure below to add or edit an input.

- Double-click on a free input position 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 the following categories:
    - Bin. values – this category contains all binary values available in the controller as binary inputs, logical binary outputs, fixed protection states, user buttons, user protection states.
    - PLC outputs – this category contains all PLC blocks binary outputs available in the controller.
  - If you create an analog input, you can select a source from the 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.

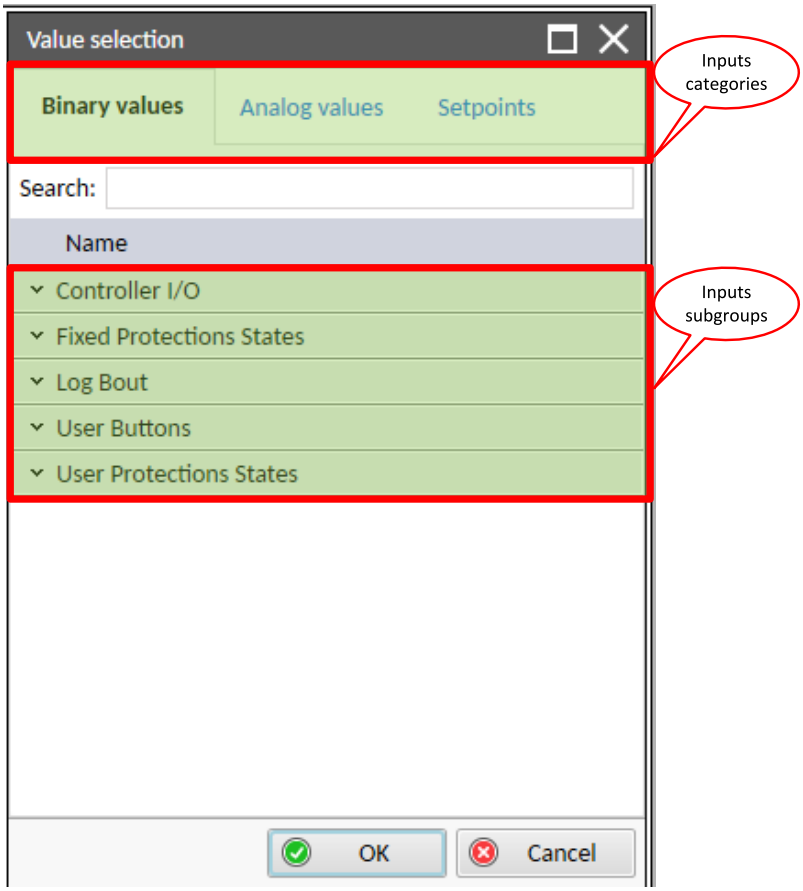



Image 5.52 PLC inputs

## Outputs

Sheet output is located at the right side of a sheet. Follow the procedure below to add or edit an input.

- Double-click on a free output position to add a new sheet output.
- Double-click on an already created output to configure the output onto a controller output terminal or a logical binary input (first some PLC block output must be connected to this output to enable configuration of output).

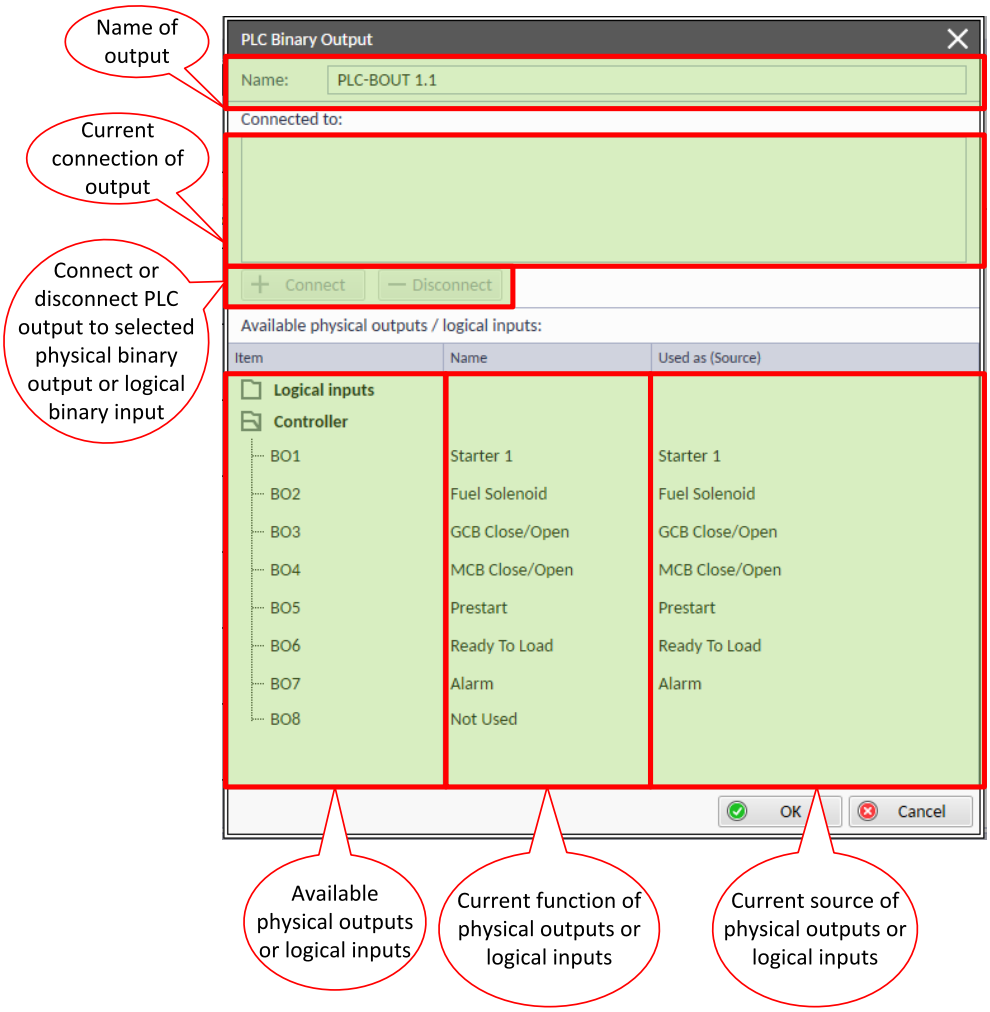



Image 5.53 PLC outputs

**IMPORTANT: It is necessary to click on Connect button after selecting the output. Otherwise PLC output is not connected to output.**

## Creating wires

Wires can be created between PLC inputs and PLC blocks and between PLC blocks and PLC outputs.

**IMPORTANT: Keep the order of starting and finishing connection points. Wires between inputs and blocks have to start from inputs. Wires between blocks and outputs have to start from blocks.**

Follow the procedure below to create wire:

- Situate the mouse pointer over the starting point of the wire. If the area under the mouse pointer is a connection point, the pointer will change color (fill of pointer will be white).
- Press and hold the left mouse button and drag the wire to the destination of required connection point. If you point over a valid connection point, the connection point will be marked with a red circle.
- Release the left mouse button to create a wire between the two points. 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 pointer, analog values are marked with green pointer.*

***Note:*** *To delete wire just click on it and press the Delete button. Also the Delete selection function can be used.*

## PLC logic execution rules

The PLC program is executed every 100 ms. The blocks are executed in order according to block numbers (item numbers), which are indicated in each block. Block numbers are assigned automatically according to their position on sheet.

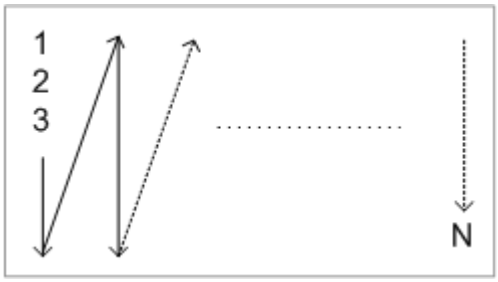
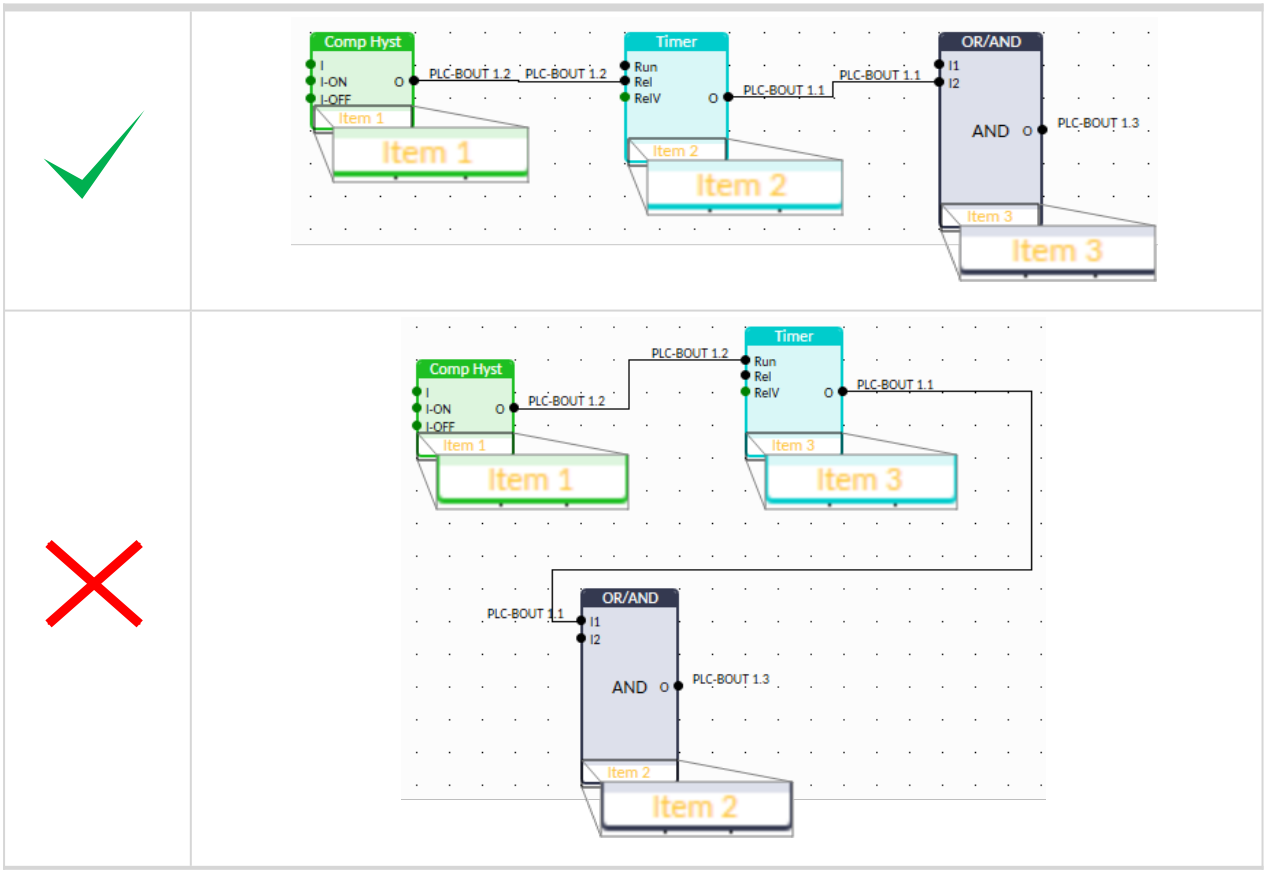



Image 5.54 PLC execution logic

**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!!!**



## Other functions

### Consistency check

Use this function to check if all inputs and outputs of PLC block are connected.

### Delete whole content of sheet

Use this function to delete the whole content of sheet (including blocks, wires, inputs, outputs, etc...).

### Hints

Use this function to enable or disable quick hints for blocks (controller help is not affected by this function).

### PLC monitor

PLC Monitor is a powerful tool for monitoring your PLC. Just click on PLC Monitor button on main InteliConfig page to see your PLC. Active inputs and outputs are a blue color. Also wires with active signals are blue color.

> **IMPORTANT: It is not possible to edit PLC in PLC Monitor tool.**

# 5.5.32 Power formats and units

InteliGen4 200 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

| Identification/Name | Power | Voltage | Current |
|---|---|---|---|
| **Small** | 0.1 kW / kVA / kVAr | 1 V | 1 A |
| **Standard** | 1 kW / kVA / kVAr | 1 V | 1 A |

Range of some setpoints and values is changed significantly when different Power Formats are selected. Affected setpoint are displayed during selection of power format.

# 5.5.33 Power management

> **IMPORTANT: Power management is relevant only for MINT application.**

> **IMPORTANT: The Gen-set will take part of the power management (= will be active) only if the controller is in AUTO mode!**

The Power management function decides how many Gen-sets should run and selects particular Gen-sets to run. The power management is applicable in cases multiple Gen-sets run in parallel to mains or in the island operation. The function is based on the load evaluation in order to provide enough of available running power. Since it allows the system to start and stop Gen-sets based on the load demand, it can vastly improve the system fuel efficiency. In other words, an additional Gen-set starts when the load of the system raises above certain level. The additional Gen-set stops, when the load of the system drops down below a certain level.

The process of determining Gen-set start and stop is done in each controller; there is no "master slave" system. Therefore, the system is very robust and resistant to failures of any unit in the system. Each of the controllers can be switched off without influencing the whole system. Except the situation the respective Gen-set is not available for the power management.

The power management evaluates so called load reserve. The load reserve is calculated as difference between actual load and nominal power of running Gen-sets. The reserve is calculated as absolute value (in kW / kVA) or relatively to the nominal power of Gen-set(s) (in %). The setpoint **#Power Management Mode (page 365)** is used to select the absolute or relative mode.

The automatic priority swapping function focuses on efficient run of Gen-set in regards to running hours and Gen-set size.

**IMPORTANT: The function of the controller is designed to handle the maximum sum of nominal power at 32000 kW (or 3200.0 with decimal number).**

**Example:** There are 20 Gen-sets each with 1000 kW of nominal power. The sum of the nominal power is 20000 kW. Therefore the decimal power format in 0.1 kW cannot be used because the sum exceeds 32000. Therefore power format in kW needs to be chosen.

## Basic power management

The setpoint **Power Management (page 364)** enables and disables the Gen-set to be active within the power management and makes automatic load dependent starts and stops. If the power management is disabled, the start and stop of the Gen-set do not depend on the load of the group. If the Gen-set remains in AUTO mode, the running condition depends only on the Logical binary inputs **REMOTE START/STOP (PAGE 628)**.

The Logical binary inputs **REMOTE START/STOP (PAGE 628)** requests the system to start or stop. If the input is not active, the system stops with delay **#System Stop Delay (page 368)** after the input has been deactivated and will not start again if in AUTO mode. If the input is activated again, the delay **#System Start Delay (page 368)** starts to count down. Once the delay elapsed, the system is activated and can be started by the power management. In other words, the power management is activated only if the Logical binary inputs **REMOTE START/STOP (PAGE 628)** is activated, the option of setpoint **Power Management (page 364)** = ENABLED and the AUTO mode is selected.

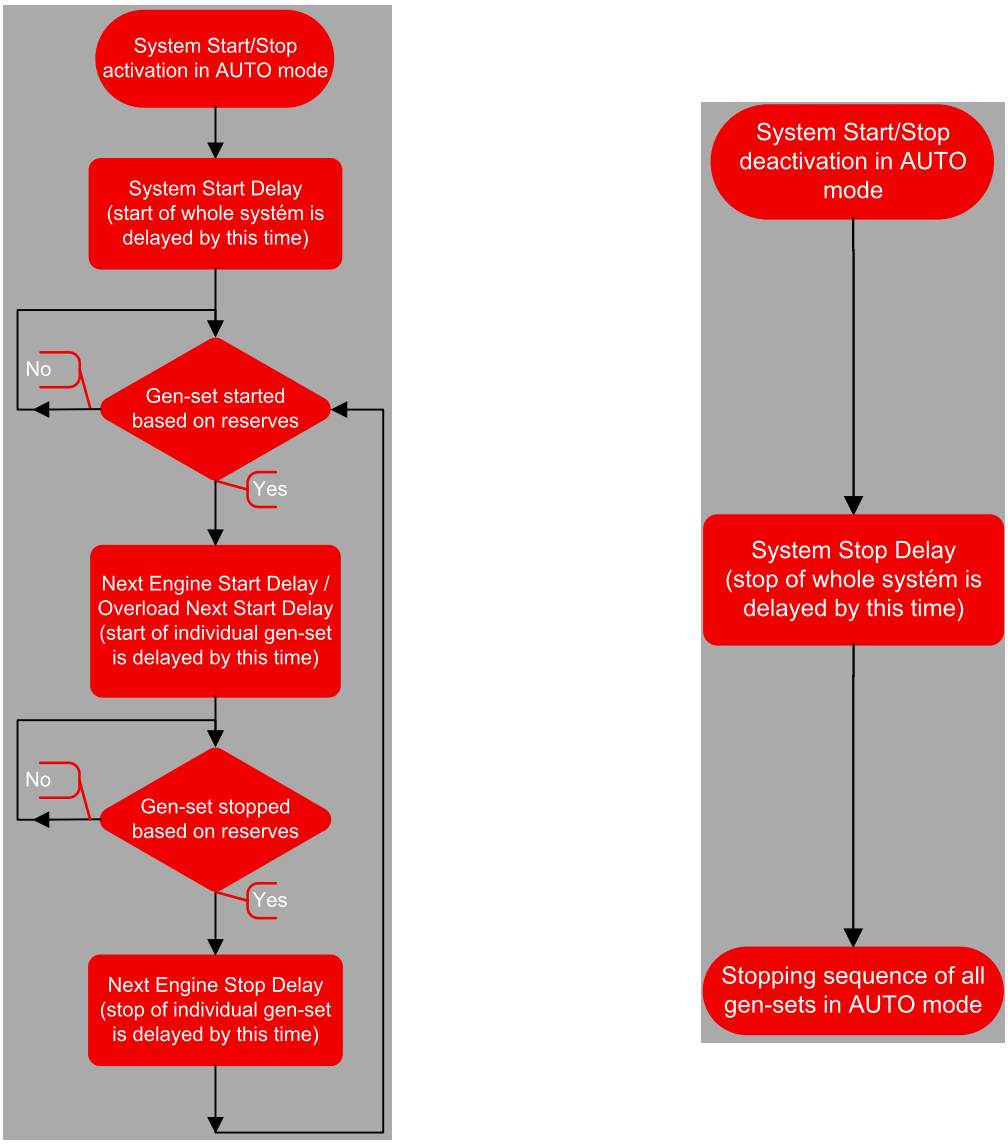
***Note:*** *The Gen-set performs load and VAR sharing whenever it is connected to the bus bar i.e. it is independent on whether the controller is in AUTO or MAN mode or whether the power management is active or not.*

Function of power management can be temporarily blocked after **REMOTE START/STOP (PAGE 628)** activation a count down of **#System Start Delay (page 368)**. The delay is given by setpoint **Power Management Delay (page 365)**. In this delay all Gen-sets where power management is enabled are running. After this period elapses, only the Gen-set(s) needed according to the Power Management calculation stay running and the rest is stopped.

## Principle of power management

Internal conditions based on remaining load reserves and priorities are evaluated once a delay is elapsed. If the load reserve is insufficient the Gen-set is started after delay given by the setpoint **#Next Engine Start Delay (page 373)** is elapsed. Once the Gen-set runs the controller evaluates stopping conditions based on load reserves and priorities. If the reserve is sufficient enough to stop a particular Gen-set, it is stopped after delay given by the setpoint **#Next Engine Stop Delay (page 374)** is elapsed. All the time the system stop condition – i.e. the Logical binary inputs **REMOTE START/STOP (PAGE 628)** deactivated – is evaluated as well.

Once the delay given by the setpoint **#System Stop Delay (page 368)** has elapsed all Gen-sets in AUTO mode are stopped. Following figure depicts the system activation and deactivation logic.




Setpoint **#Overload Next Start Delay (page 375)** is used in case that **#Overload Next Start Protection (page 375)** is enabled and Gen-sets are running at **#Overload Next Start Level (page 375)** or more of their nominal power.

## Load reserve

The power management is based on the load reserve concept. The load reserve is defined as a difference of the running nominal power of the group within power management and the total load of the system. There are two ways how to determine the load reserve. The absolute power management allows the system to keep the load reserve higher or equal to value in kW given by a relevant setpoint. The relative power management assures that load reserve is kept higher or equal to relative portion in % of the nominal power of group (i.e. running Gen-sets active in power management) given by a relevant set-point. Depending of the situation, load reserves are calculated differently in two cases:

### Case #1

This case is used in island operation.

| Reserve | Actual Reserve | Start condition | Stop condition |
|---|---|---|---|
| Absolute kW | ARstrt = $\sum Pg_{Nom} - \sum Pg_{Act}$<br>ARstp = $\sum Pg^*_{Nom} - \sum Pg_{Act}$ | ARstrt < #LoadResStrt | ARstp > #LoadResStop |
| Relative % | RRstrt = $[(\sum Pg_{Nom} - \sum Pg_{Act}) / \sum Pg_{Nom}].100\%$<br>RRstp = $[(\sum Pg^*_{Nom} - \sum Pg_{Act}) / \sum Pg^*_{Nom}].100\%$ | RRstrt < #%LdResStrt | RRstp > #%LdResStop |

### Case #2

This case is used in parallel to mains operation.

| Reserve | Actual Reserve | Start condition | Stop condition |
|---|---|---|---|
| Absolute kW | ARstrt = $\sum Pg_{Nom}$ - BaseLoad<br>ARstp = $\sum Pg^*_{Nom}$ - BaseLoad | ARstrt < #LoadResStrt | ARstp > #LoadResStop |
| Relative % | RRstrt = $[(\sum Pg_{Nom}$ - BaseLoad) / $\sum Pg_{Nom}].100\%$<br>RRstp = $[(\sum Pg^*_{Nom}$ - BaseLoad) / $\sum Pg^*_{Nom}].100\%$ | RRstrt < #%LdResStrt | RRstp > #%LdResStop |

List of abbreviations:

- ARstrt .. Actual Absolute reserve in kW or kVA – for engine start calculation.
- ARstp .. Actual Absolute reserves in kW or kVA – for engine stop calculation.
- RRstrt .. Actual Relative reserve in % – for engine start calculation.
- RRstp .. Actual Relative reserves in % – for engine stop calculation.
- ΣPgNom .. Sum of Nominal power of all Gen-sets on the bus.
- ΣPg*Nom .. Sum of Nominal power of all Gen-sets on the bus apart of the one, which is going to be stopped.
- ΣPgAct .. Sum of Actual power of all Gen-sets on the bus = system load.
- BaseLd .. Baseload is given by the setpoint **#System BaseLoad (page 264)**

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

## Starting sequence

As written above, the power management is based on the load evaluation in order to provide enough of available running power. An additional Gen-set starts when the load of the system raises above certain level to keep the load reserve big enough. Following figure depicts the situation when an additional Gen-set is requested to join the already running Gen-set(s) to the bus.

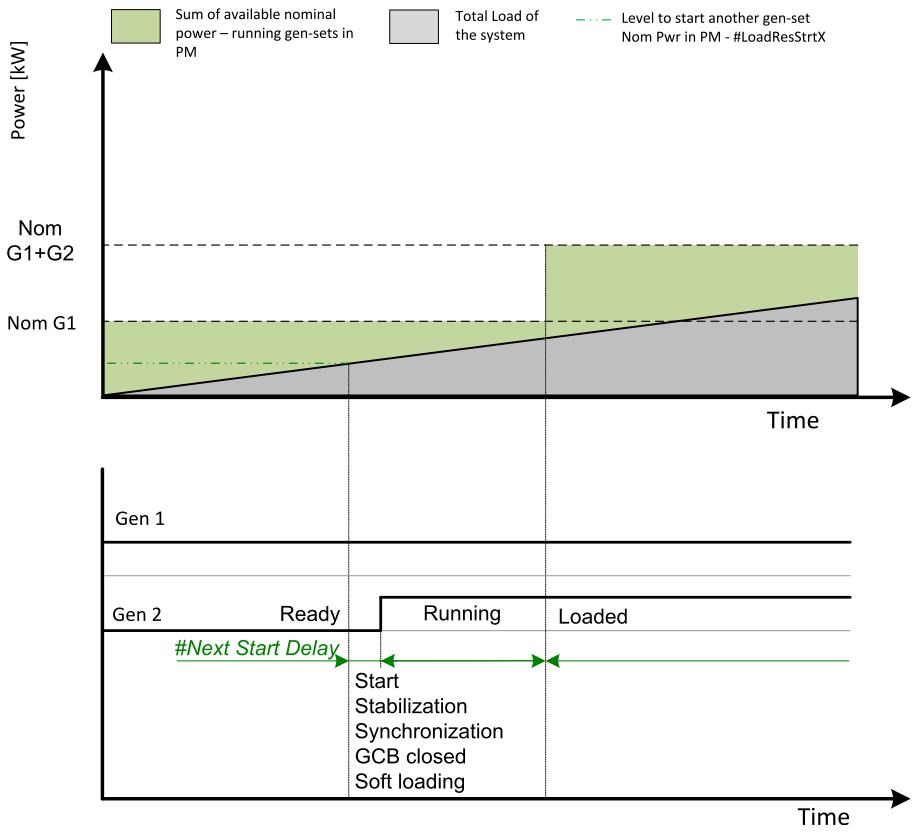



Image 5.55 Start sequence of power management

As shown above, the load of the system has increased above the level defined by the start condition – i.e. the load reserve is not sufficient as required by the appropriate setpoint. Further explanation is provided in chapters **Absolute power management (page 164)** and **Relative power management (page 167)**.

The level is illustrated by the green dashed line. If the load reserve keeps insufficient for longer time than defined by the setpoint **#Next Engine Start Delay (page 373)**, the next Gen-set is actually started. The standard starting sequence follows. Once the synchronization procedure is done, the GCB breaker is closed and the Gen-set power is ramping up. Once loaded, the system load reserve is raised and becomes sufficient again. Please note the sum of nominal power of all Gen-sets on the bus is increased by the nominal power of the additional Gen-set.

## Stopping sequence

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

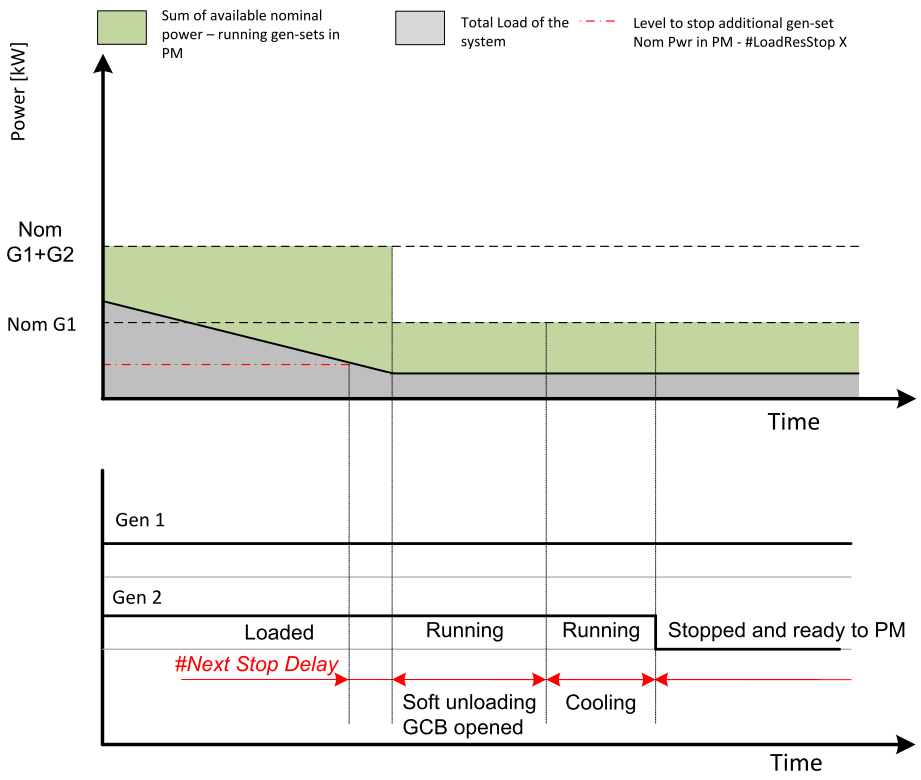



Image 5.56 Stopping sequence of power management

As shown above, the system load has decreased below the level defined by the stop condition – i.e. the load reserve is over a limit given by the appropriate setpoint. Further explanation is provided in chapters **Absolute power management (page 164)** and **Relative power management (page 167)**.

The level is illustrated by the red dashed line. If the load reserve keeps over this limit for longer time than defined by setpoint **#Next Engine Start Delay (page 373)**, the next Gen-set is actually requested to stop. Once the Gen-set is unloaded, the GCB breaker is opened. Please note the sum of nominal power of all Gen-sets on the bus is decreased by the nominal power of the stopped Gen-set. The cooling sequence follows before the Gen-set is actually stopped. The Gen-set is ready to be started if the system load increases again.

## Absolute power management

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

The absolute power management guarantees adjustable load reserve in kW. This mode is active when **#Power Management Mode (page 365)** is set to ABS [kW] mode.

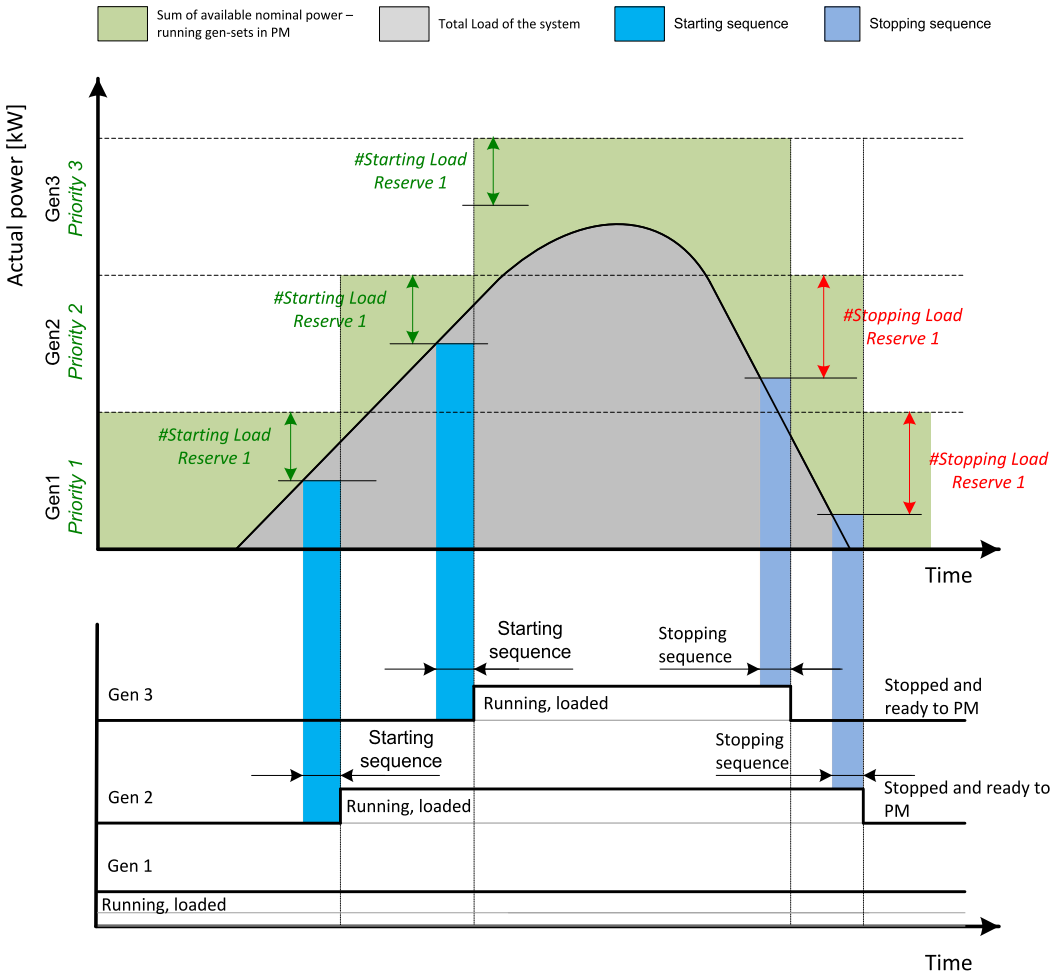



Image 5.57 Power management based on absolute load reserve

**Example:** An example of absolute power management is shown on the image below. There are three Gen-sets with following choice of setpoints:

| Gen-set | Nominal power | Power management | #Power management mode | Priority | #Priority Auto Swap | #Starting Load Reserve X | #Stopping Load Reserve X |
|---|---|---|---|---|---|---|---|
| Gen-set #1 | 200 kW | ENABLED | ABS (kW) | 1 | DISABLED | 100 kW | 125 kW |
| Gen-set #2 | 500 kW | ENABLED | ABS (kW) | 2 | DISABLED | 100 kW | 125 kW |
| Gen-set #3 | 1 000 kW | ENABLED | ABS (kW) | 3 | DISABLED | 100 kW | 125 kW |

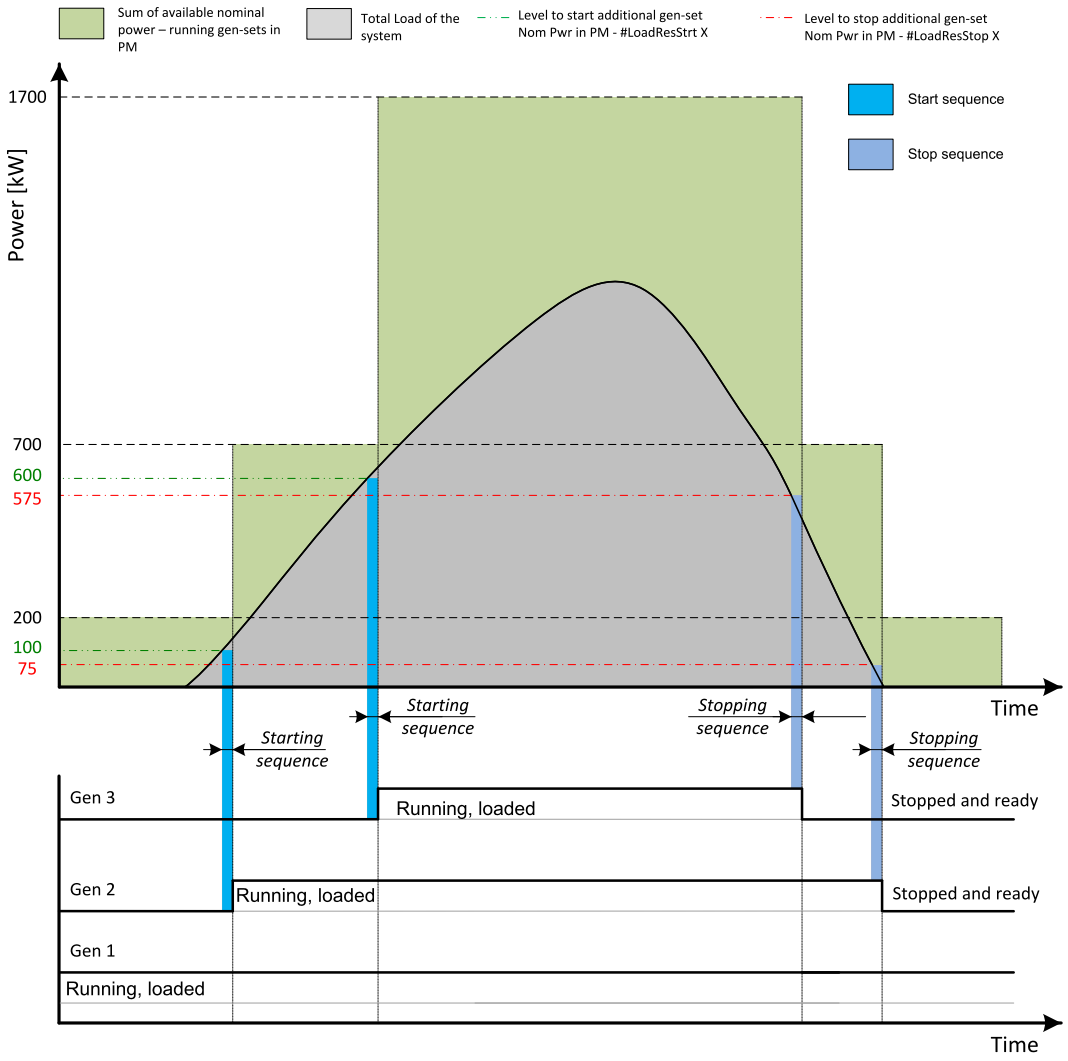



Image 5.58 Absolute power management example

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

The green dashed line depicts the value of load at which the additional Gen-set is requested to start. This value of the load is linked with the setpoint **#Starting Load Reserve 1 (page 369)** (or other selected reserve set) in following way:

Sum of nominal power for start – **#Starting Load Reserve 1 (page 369)** (or other selected reserve set) = value of load when additional Gen-set requested to start (e.g.: 700 kW - 100 kW = 600 kW).

The red dashed line depicts the value of load at which the additional Gen-set is requested to stop. This value of the load is linked with the setpoint **#Stopping Load Reserve 1 (page 369)** (or other selected reserve set) in following way:

Sum of nominal power for stop – **#Stopping Load Reserve 1 (page 369)** (or other selected reserve set) = value of load when additional Gen-set requested to stop (e.g.: 700 kW - 125 kW = 575 kW).

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

- **#Starting Load Reserve 1 (page 369)** and **#Stopping Load Reserve 1 (page 369)**
- **#Starting Load Reserve 2 (page 371)** and **#Stopping Load Reserve 2 (page 371)** considered if binary input **LOAD RES 2 ACTIVE (PAGE 621)** is activated

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

## Relative power management

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

The relative power management guarantees that the engines are not continuously loaded more than to a certain level. This mode is active when **#Power Management Mode (page 365)** is set to REL [%] mode.

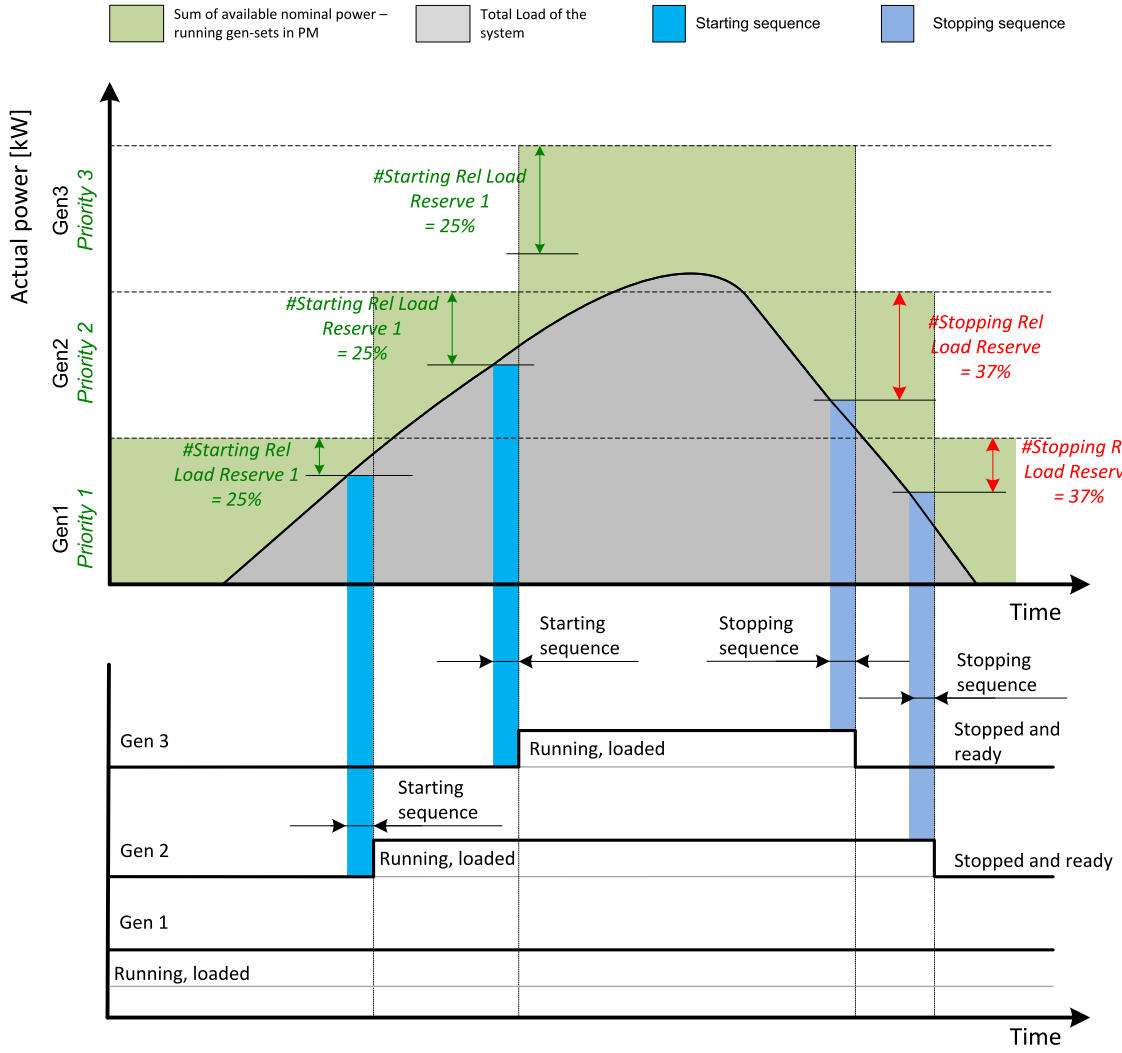



Image 5.59 Power management based on relative load reserve

**Example:** An example of relative power management is shown on the image below. There are three Gen-sets with following choice of setpoints:

| Gen-set | Nominal power | Power management | #Power management mode | Priority | #Priority Auto Swap | #Starting Rel Load Reserve X | #Stopping Rel Load Reserve X |
|---|---|---|---|---|---|---|---|
| Gen-set #1 | 200 kW | ENABLED | REL (%) | 1 | DISABLED | 35 % | 40 % |
| Gen-set #2 | 500 kW | ENABLED | REL (%) | 2 | DISABLED | 35 % | 40 % |
| Gen-set #3 | 1 000 kW | ENABLED | REL (%) | 3 | DISABLED | 35 % | 40 % |

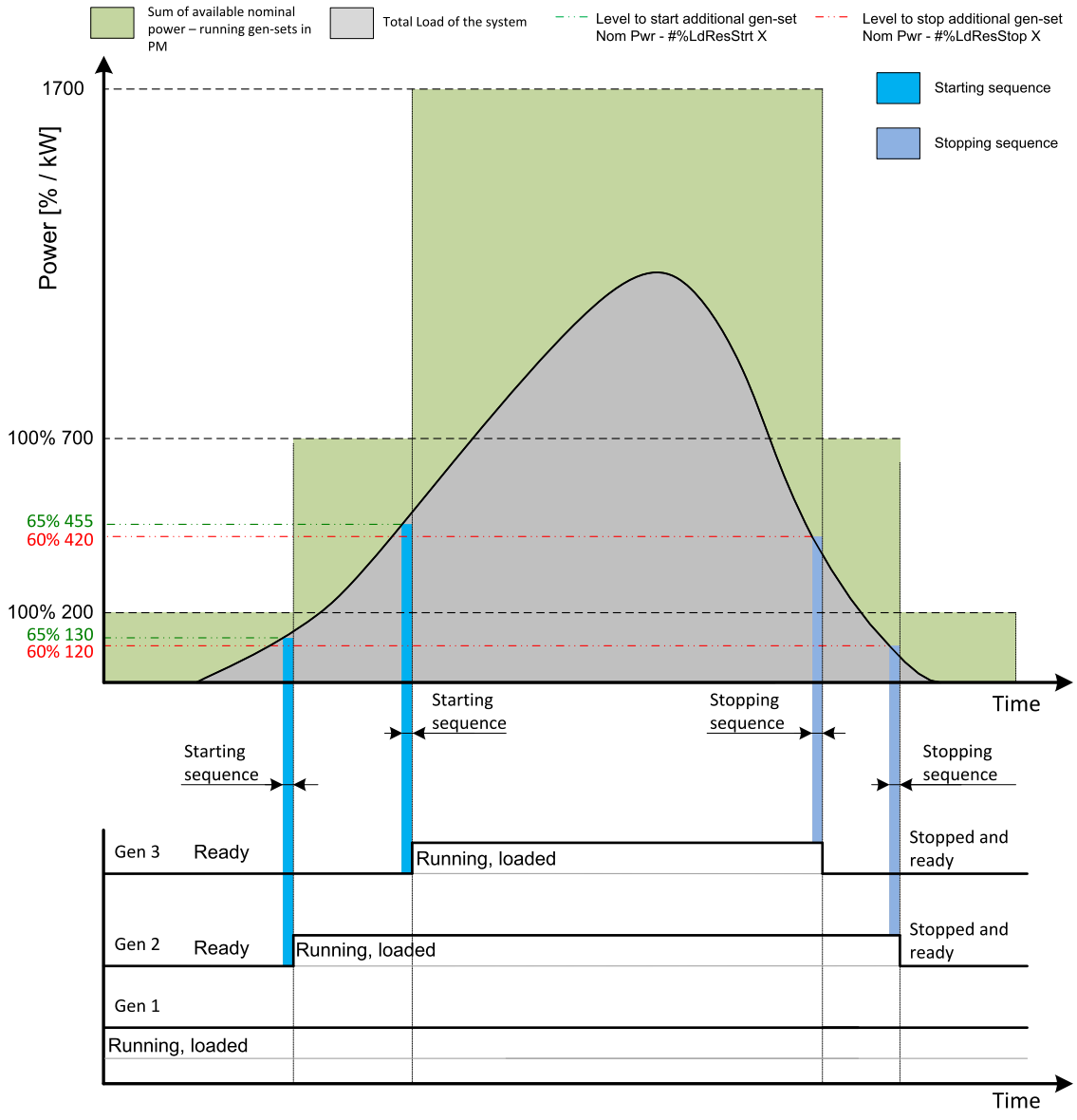



Image 5.60 Relative power management example

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

The green dashed line depicts the value of load at which the additional Gen-set is requested to start. This value of the load is linked with the setpoint **#Starting Rel Load Reserve 1 (page 370)** (or other selected reserve set) in following way:

(100 % - **#Starting Rel Load Reserve 1 (page 370)** (or other selected reserve set)) * Sum of Nominal power = Value of load when additional Gen-set requested to start in kW (in % of nominal power), e.g.: (100 % – 35 %) * 700 kW = 455 kW (65 % of nominal power).

The red dashed line depicts the value of load at which the additional Gen-set is requested to stop. This value of the value is linked with the setpoint **#Stopping Rel Load Reserve 1 (page 370)** (or other selected reserve set) in following way:

(100 % - **#Stopping Rel Load Reserve 1 (page 370)** (or other selected reserve set)) * Sum of Nominal power = Value of load when additional Gen-set requested to stop in kW (in % of nominal power), e.g.: (100 % – 40 %) * 700 kW = 420 kW (60 % of nominal power).

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

- **#Starting Rel Load Reserve 1 (page 370)** and **#Stopping Rel Load Reserve 1 (page 370)**
- **#Starting Rel Load Reserve 2 (page 372)** and **#Stopping Rel Load Reserve 2 (page 372)** considered if binary input **Load Res 2 Active (page 621)** is activated

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

## Priorities

The priority of the Gen-set within the group is given by the setpoint **Priority (page 366)**. Lower number represents "higher" priority, i.e. a Gen-set with lower number starts before another one with higher number. In other words, the setpoint **Priority (page 366)** means order in which Gen-sets are started and connected to the bus. An example is shown on the figure below. There are four Gen-sets with following choice of setpoints:

| Gen-set | Nominal power | Power management | #Power management mode | Priority | #Priority Auto Swap | #Starting Load Reserve X | #Stopping Load Reserve X |
|---|---|---|---|---|---|---|---|
| Gen-set #1 | 200 kW | ENABLED | ABS (kW) | 4 | DISABLED | 50 kW | 70 kW |
| Gen-set #2 | 200 kW | ENABLED | ABS (kW) | 3 | DISABLED | 50 kW | 70 kW |
| Gen-set #3 | 200 kW | ENABLED | ABS (kW) | 2 | DISABLED | 50 kW | 70 kW |
| Gen-set #4 | 200 kW | ENABLED | ABS (kW) | 1 | DISABLED | 50 kW | 70 kW |

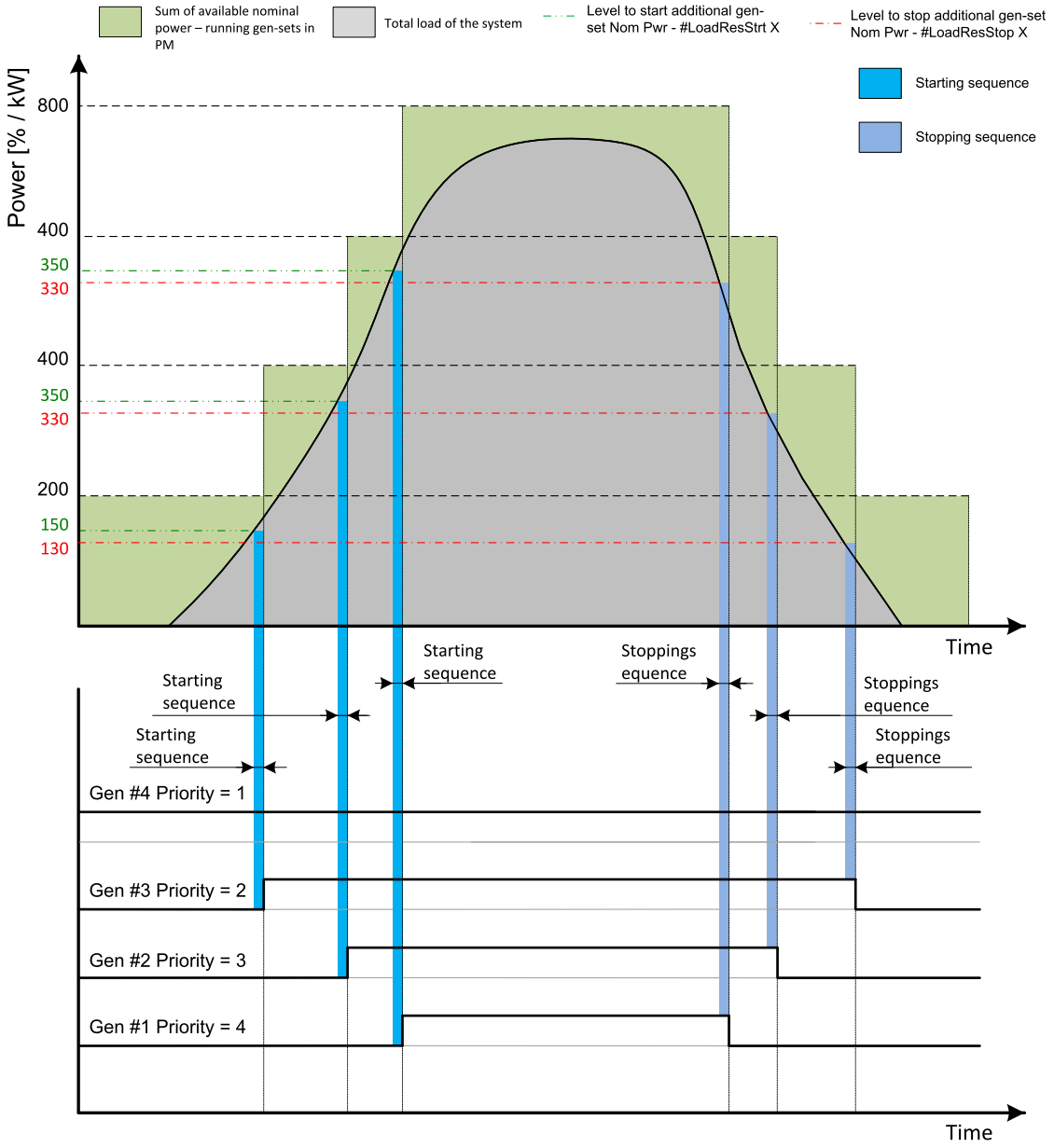



Image 5.61 Example of priorities in power management

By choosing the setpoint **Priority (page 366)** = 1, the Gen-set #4 is running all the time in the example shown on the image above (AUTO mode selected, Power management enabled and LBI **REMOTE START/STOP (PAGE 628)** ctivated).

The LBI **TOP PRIORITY (PAGE 630)** can be used to force priority 0 into the setpoint **PRIORITY (PAGE 366)**. Priority 0 is the "highest" one, which means the Gen-set will be running all the time while the power management is switched on.

If more than one Gen-set have the same priority, they will act as "one big" Gen-set. There are methods of automatic optimization of the priorities to achieve specific behavior of the group such as equalizing engine hours of the Gen-sets or selection of optimal Gen-sets to run according to their size and current load demand.

## Priority auto swap

As stated in the chapter **Priorities (page 169)**, the operator is able to select the order of gen-set starting. There is also the option of automatic priority selection. The controllers are sharing data concerning the

running hours and all important information relevant to the actual load. Thanks to the Automatic priority swapping function the controllers choose the Gen-set(s) to be running with consideration of their running hours and the actual load.

The running hours equalization function keeps a constant maximal difference of Gen-set's running hours. The efficient function keeps running only the Gen-sets with suitable nominal power to avoid inefficient fuel consumption or Gen-set overload.

***Note:*** *The Automatic priority swapping function does not change the setpoint* ***Priority (page 366)****. The function sets the order of Gen-sets by virtual values "engine priority".*

## Run hours equalization

The Gen-sets engine priorities are automatically swapped to balance engine running hours. In other words, the controllers compare running hours of each Gen-set and select Gen-set(s) to run in order to maintain constant maximal difference of running hours. Up to 32 controllers are supported. This function is activated via setpoint **#Priority Auto Swap (page 367)** = RUN HOURS.

The value of running hours which is used in run hours equalization is calculated by following formula:

RHE = **Running Hours (page 578)** – **Run Hours Base (page 376)**

RHE is considered value for running hours equalization, **Running Hours (page 578)** is a cumulative sum of run hours available in statistic values of the controller, **Run Hours Base (page 376)** is a setpoint. This setpoint may be used in the case of Gen-sets with different runs hours are intended to be set at the same initial point (e.g. a new Gen-set and a used Gen-set after retrofit maintenance inspection).

The Running hours equalization function compares RHE value of each controller in the group. Once the difference between RHE of individual controllers is higher than **#Run Hours Max Difference (page 376)** (i.e. **#Run Hours Max Difference (page 376)** + 1), the Gen-set(s) with the lowest RHE is/are started.

**Example:** The system structure and its settings is shown on the picture below.

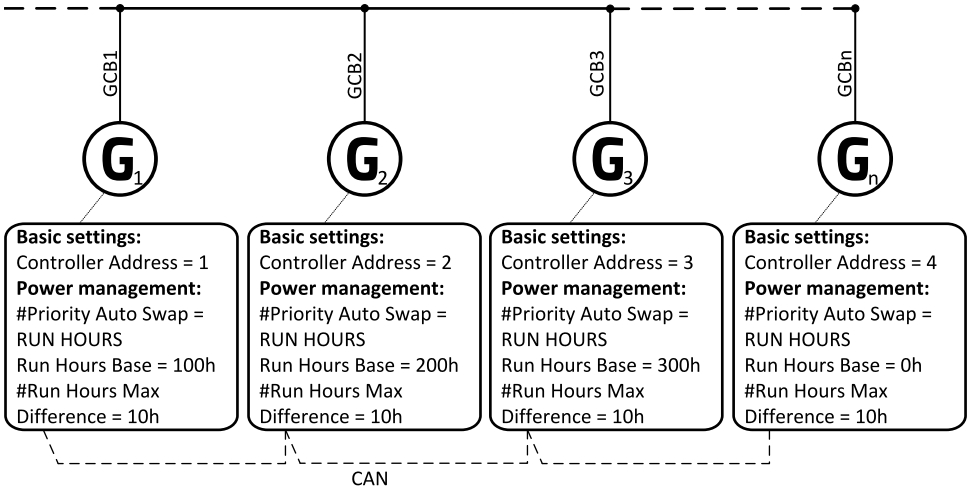



Image 5.62 Example of the system

3 cases are considered:

- Case #1: 2 Gen-sets available
- Case #2: 3 Gen-sets available with same initial RHE.
- Case #3: 3 Gen-sets available with different initial RHE.

**Case #1:**

- Gen-set 1 running hours = 250 -> running hours considered in RHE = 100 (150 - **Run Hours Base (page 376)**)
- Gen-set 2 running hours = 450 -> running hours considered in RHE = 200 (250 - **Run Hours Base (page 376)**)

Both Gen-sets have the same nominal power of 700 kW. Originally, priority of Gen-sets was G1 = 2, G2 = 1. Load demand in this example is constant and it is 500 kW (i.e. only one engine is running at any time). In this case, the controllers set the engine priority of the Gen-set 1 to 1 because it has the lowest considered RHE and the difference between RHE2 (i.e. considered RHE of Gen-set 2) and RHE1 is higher than **#Run Hours Max Difference (page 376)** that is set to 10 h.

| | Run hours | #RunHoursBase | RHE |
|---|---|---|---|
| Gen-set #1 | 250 | 150 | 100 |
| Gen-set #2 | 450 | 250 | 200 |

The Gen-set 1 runs for 100 hours to equalize the RHE of both Gen-sets. The Gen-set 1 keeps running until the difference between RHE1 and RHE2 exceeds **#Run Hours Max Difference (page 376)** (i.e. 10h). The Gen-set 1 runs 100 + **#Run Hours Max Difference (page 376)** + 1 = 100 + 10 + 1 = 111 hours. After 111 hours the Gen-sets 2 has the lowest RHE and the difference between RHE1 and RHE2 is higher than **#Run Hours Max Difference (page 376)**. The Gen-set 2 runs 11 hours to equalize the RHE of both Gen-sets and then additional **#Run Hours Max Difference (page 376)** + 1 hours (i.e. 11 + 10 + 1 = 22 hours). The evolution of RHE1 and RHE2 is shown on the figure below.

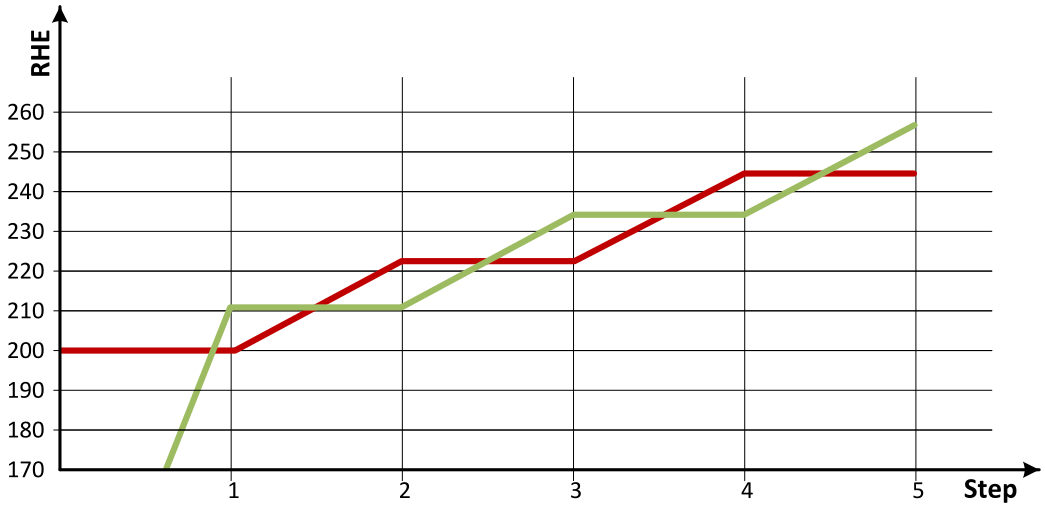



Image 5.63 Run hours equalization – case #1

| Step | 0 | 1 | 2 | 3 | 4 | 5 |
|---|---|---|---|---|---|---|
| RHE1 | 100 | 211 | 211 | 233 | 233 | 255 |
| RHE2 | 200 | 200 | 222 | 222 | 244 | 244 |
| Run G1 (ΔRHE1) | 0 | 111 | 0 | 22 | 0 | 22 |
| Run G2 (ΔRHE2) | 0 | 0 | 22 | 0 | 22 | 0 |

From the example of the case #1, it can be concluded that the Gen-sets are swapped after the duration determined by following formula:

SwapTime = Second lowest considered running hours – Current lowest considered running hours + **#Run Hours Max Difference (page 376)** +1

### Case #2:

- Gen-set 1 running hours = 0 -> running hours considered in RHE = 0 (0-RunHoursBase)
- Gen-set 2 running hours = 0 -> running hours considered in RHE = 0 (0-RunHoursBase)
- Gen-set 3 running hours = 0 -> running hours considered in RHE = 0 (0-RunHoursBase)

Each Gen-set has the same RHE = 0 h. By applying the SwapTime formula, we get the run time of Gen-set 1 before next swapping:

SwapTimeG1 = 0 – 0 + 10 + 1 = 11

Similar way, we get the run time of Gen-set 2 before next swapping:

SwapTimeG2 = 11 – 11 + 10 + 1 = 11

Finally, we get the run time of Gen-set 3 before next swapping:

SwapTimeG2 = 11 – 0 + 10 + 1 = 22

Please refer to figure below to understand the evolution of RHE of Gen-sets in this particular case.

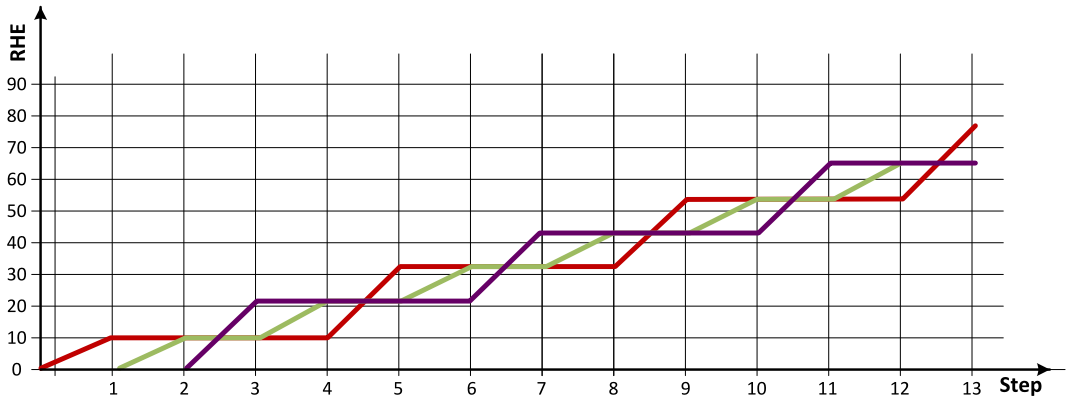



Image 5.64 Run hours equalization – case #2

| step | 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| RHE1 | 0 | 11 | 11 | 11 | 11 | 33 | 33 | 33 | 33 | 55 | 55 | 55 | 55 | 77 |
| RHE2 | 0 | 0 | 11 | 11 | 22 | 22 | 33 | 33 | 44 | 44 | 55 | 55 | 66 | 66 |
| RHE3 | 0 | 0 | 0 | 22 | 22 | 22 | 22 | 44 | 44 | 44 | 44 | 66 | 66 | 66 |
| Run G1 (ΔRHE1) | 0 | 11 | 0 | 0 | 0 | 22 | 0 | 0 | 0 | 22 | 0 | 0 | 0 | 22 |
| Run G2 (ΔRHE2) | 0 | 0 | 11 | 0 | 11 | 0 | 11 | 0 | 11 | 0 | 11 | 0 | 11 | 0 |
| Run G3 (ΔRHE3) | 0 | 0 | 0 | 22 | 0 | 0 | 0 | 22 | 0 | 0 | 0 | 22 | 0 | 0 |

### Case #3:

- Gen-set 1 running hours = 250 -> running hours considered in RHE = 100 (150-RunHoursBase)
- Gen-set 2 running hours = 450 -> running hours considered in RHE = 200 (250-RunHoursBase)
- Gen-set 3 running hours = 750 -> running hours considered in RHE = 250 (500-RunHoursBase)

The Gen-set 1 has the lowest RHE1 = 100 h. By applying the SwapTime formula, we get the run time of Gen-set 2 before next swapping:

SwapTimeG1 = 200 – 100 + 10 + 1 = 111

Till the step 5, the evolution of the Gen-set swapping is the same as in the case #1, just Gen-set 1 and Gen-set 2 involve. In the step 6 the Gen-set 2 can run only 17 hours (previously 22 hours) because the Gen-set 3 involves. The evolution of RHE1, RHE2 and RHE3 is shown on the figure below.

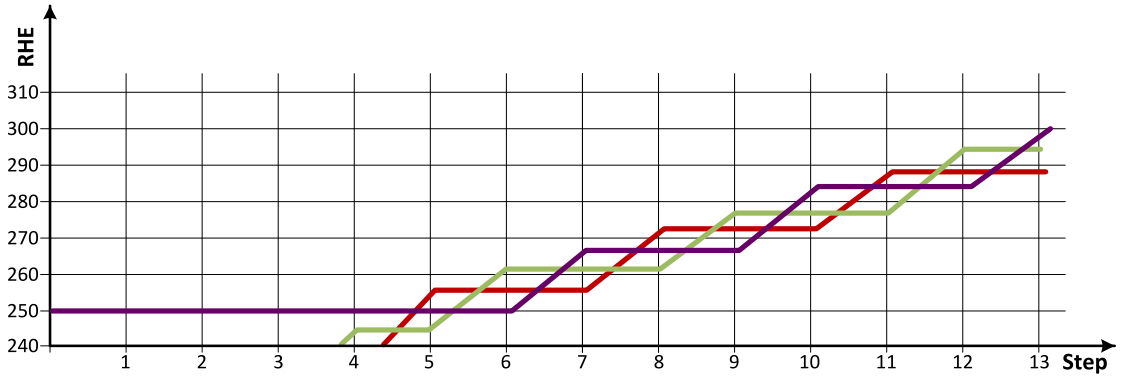



Image 5.65 Run hours equalization – case #3

| step | 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| RHE1 | 100 | 211 | 211 | 232 | 233 | 255 | 255 | 255 | 272 | 272 | 272 | 288 | 288 | 288 |
| RHE2 | 200 | 200 | 222 | 222 | 244 | 244 | 261 | 261 | 261 | 277 | 277 | 277 | 294 | 294 |
| RHE3 | 250 | 250 | 250 | 250 | 250 | 250 | 250 | 266 | 266 | 266 | 283 | 283 | 283 | 299 |
| Run G1 (ΔRHE 1) | 0 | 111 | 0 | 22 | 0 | 22 | 0 | 0 | 17 | 0 | 0 | 16 | 0 | 0 |
| Run G2 (ΔRHE 2) | 0 | 0 | 22 | 0 | 22 | 0 | 17 | 0 | 0 | 16 | 0 | 0 | 17 | 0 |
| Run G3 (ΔRHE 3) | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 16 | 0 | 0 | 17 | 0 | 0 | 16 |

***Note:*** *Setting* ***#Run Hours Max Difference (page 376)*** *= 5 does not mean that Gen-sets swap every 5 hours. The Swap time is determined by the formula stated above. Please read the entire chapter Running hours equalization for better understanding.*

***Note:*** *In the case* ***#Run Hours Max Difference (page 376)*** *is set to 0 and all Gen-set in the group are at the same initial point (RHE are equal), the Gen-set swapping happens every hour.*

## Efficiency

The gen-sets engine priorities are automatically swapped to best fit to the actual load demand (load demand swap – LDS). Also engine running hours are taken to the calculation (run hours equalization – RHE). This function is activated via setpoint **#Priority Auto Swap (page 367)** = Efficiency.

Algorithm of function:

- In the first step, the Gen-sets are sorted according to their nominal power.
- In the second step, the Gen-sets with the same nominal power are sorted according to their RHE
- The Gen-set(s) with nominal power which fits the most actual load demand are chosen. From those with same nominal power, the Gen-set(s) with lowest RHE are chosen. Selection formula:
  - **#Power Management Mode (page 365)** = ABS (kW)
    - Nominal power of Gen-set > actual load demand + **#Starting Load Reserve 1 (page 369)**
  - **#Power Management Mode (page 365)** = REL (%)
    - Nominal power of Gen-set > (actual load demand × 100)/(100 - **#Starting Rel Load Reserve 1 (page 370)**)
- If two or more Gen-sets are available for taking over the load always the one with the lowest CAN address is chosen.
- If load demand is higher than nominal power of the biggest Gen-set, this one is fixed and the whole process repeats from the third bullet.

**Example:** The system structure and its settings is shown on the picture below.

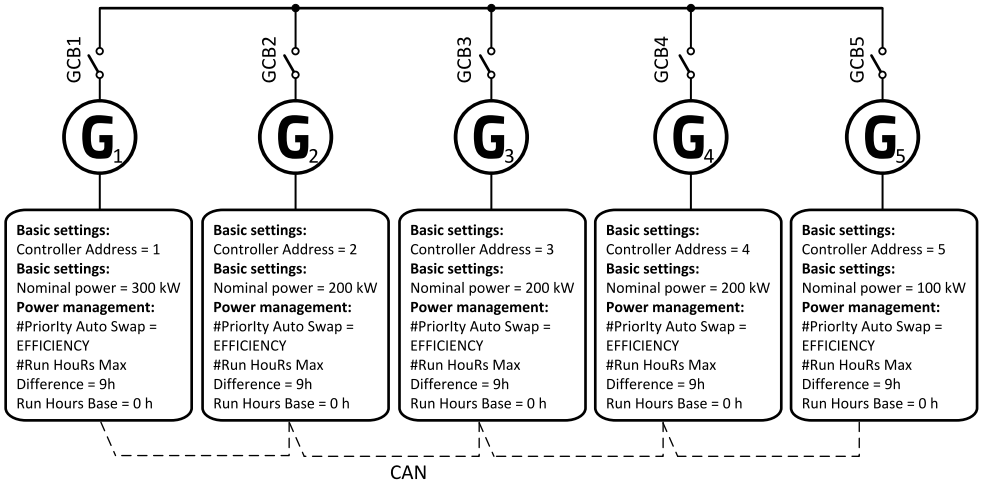



Image 5.66 Example of the system

Following table provide an example of Gen-set selection in respect to the system load evolution. The table is an example of Efficiency priority optimization function (**#Power Management Mode (page 365)** = ABS (kW) and **#Starting Load Reserve 1 (page 369)** = 20 kW).

| System Load [kW] | Running Gen-sets | | Description | Total Running power within PM [kW] | Relative load of Gen-sets [%] |
|---|---|---|---|---|---|
| **40** | **5** | | | **100** | **40** |
| 60 | 5 | | | 100 | 60 |
| 80 | 5<br>2 [0h] | 2 start<br>5 stop | LDS Swap | 300 | 26 |
| 100 | 2 [10h] | | | 200 | 50 |
| 120 | 2 [20h] | | | 200 | 60 |
| 120 | 2 [30h]<br>3 [10h] | 3 start<br>2 stop | RHE Swap | 400 | 30 |

| System Load [kW] | Running Gen-sets | | Description | Total Running power within PM [kW] | Relative load of Gen-sets [%] |
|---|---|---|---|---|---|
| 120 | 3 [20h] | | | 200 | 60 |
| 140 | 3 [30h] | | | 200 | 70 |
| 180 | 3 [40h]<br>1 | 1 start<br>3 stop | LDS Swap | 500 | 36 |
| 200 | 1 | | | 300 | 67 |
| 240 | 1 | | | 300 | 80 |
| 280 | 1<br>5 | 5 start | Gen#5 joins (LDS) | 400 | 70 |
| 340 | 1<br>5 | | | 400 | 85 |
| 380 | 1<br>5<br>4 [20h] | 4 start<br>5 stop | LDS + RHE Swap | 600 | 63 |
| 400 | 1<br>4 | | | 500 | 80 |
| 440 | 1<br>4 | | | 500 | 88 |
| 480 | 1<br>4<br>5 | 5 start | Gen#5 joins (LDS) | 600 | 80 |
| 540 | 1<br>4<br>5 | | | 600 | 90 |
| 580 | 1<br>4<br>5<br>2 [30h] | 2 start<br>5 stop | LDS Swap | 800 | 73 |
| 600 | 1<br>4<br>2 | | | 700 | 86 |
| 640 | 1<br>4<br>2 | | | 700 | 91 |
| 680 | 1<br>4<br>2<br>5 | 5 start | Gen#5 joins (LDS) | 800 | 85 |
| 740 | 1<br>4 | | | 800 | 93 |

| System Load [kW] | Running Gen-sets | | Description | Total Running power within PM [kW] | Relative load of Gen-sets [%] |
|---|---|---|---|---|---|
| | 2<br>5 | | | | |
| 780 | 1<br>4<br>2<br>5<br>3 [40h] | 3 start<br>5 stop | LDS Swap | 1000 | 78 |
| 800 | 1<br>4<br>2<br>3 | | | 900 | 89 |
| 840 | 1<br>4<br>2<br>3 | | | 900 | 93 |
| 880 | 1<br>4<br>2<br>3<br>5 | 5 start | Gen#5 joins (LDS) | 1000 | 88 |
| 940 | 1<br>4<br>2<br>3<br>5 | | | 1000 | 94 |

## Minimal running power

Minimum Running Power function is used to adjust a minimum value of the sum of nominal power of all running Gen-sets. If the function is active, then the Gen-sets would not be stopped, although the reserve for stop is fulfilled. Function is activated via logical binary input **MIN RUN POWER ACT (PAGE 623)**.

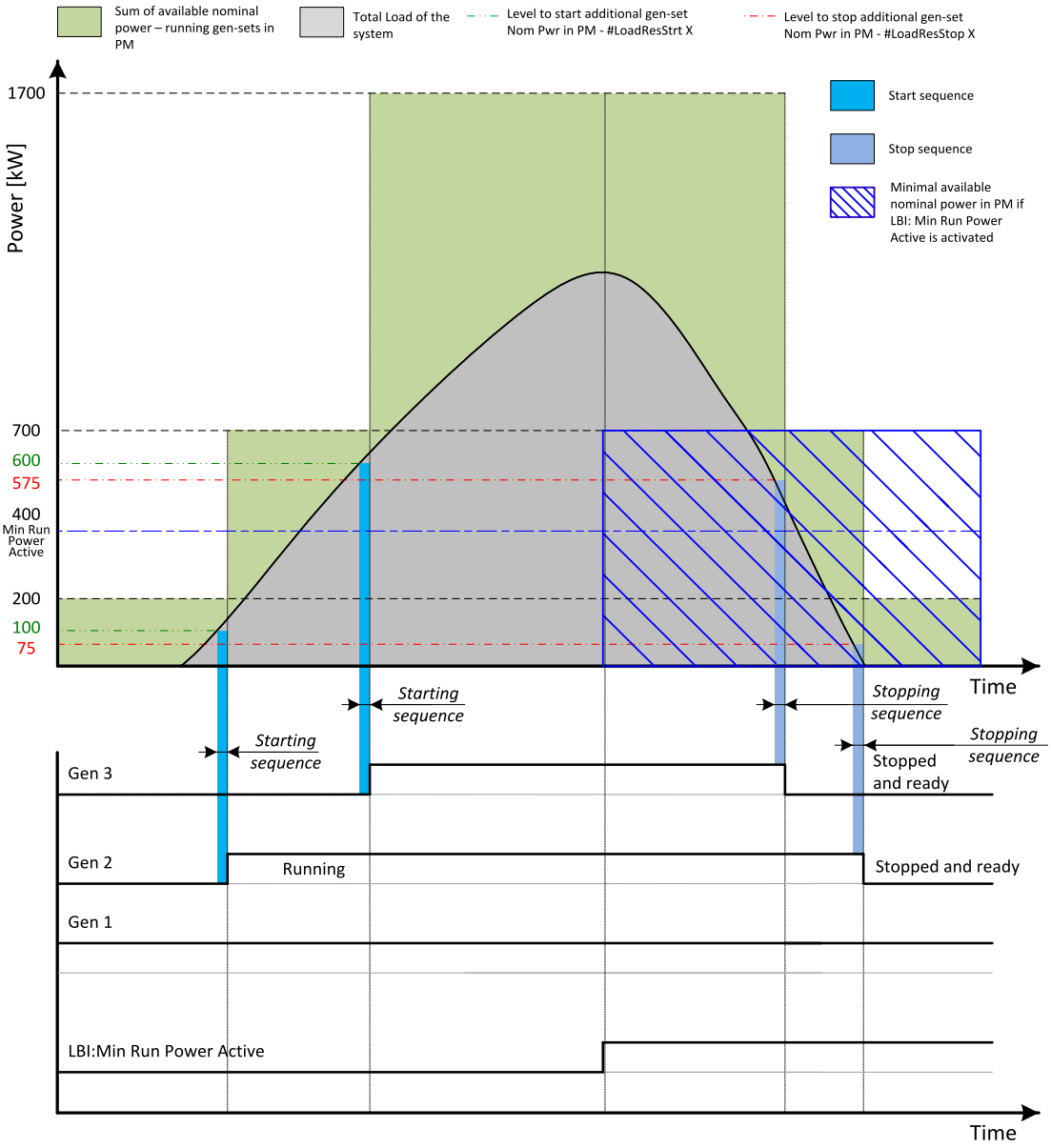



Image 5.67 Minimal running power

Setpoint **#Min Run Power 1* (page 373)** is adjusted to 400 kW. Once the **MIN RUN POWER ACT (PAGE 623)** is activated, the available nominal running power has to be equal or higher to 400 kW. Even if the load reserve is big enough to stop the Gen-set #2 (nominal power 500 kW), the Gen-set keeps running as at least 400 kW has to be available. The Gen-set#1 (nominal power 200 kW) is not enough.

## 5.5.34 Protections

### Fixed Protections

Fixed protections are built in protections for Generator, Engine, Mains or for other functionalities (battery voltage, fuel theft, D+, etc…). Their purpose is to inform or perform actions when the malfunction is detected.

## Fixed Protection types

| Name | Level | Abbreviation | Alarm List | History | Fault Reset needed | LBO Horn activation | LBO Alarm activation | Action: CB open | Action: Gen-set stop | SD Override blocking | Common LBO |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **History Record Only** | 1 | Hst | - | ✓ | - | - | - | - | - | - | - |
| **Alarm List Indication** | 1 | ALI | ✓ | - | - | - | - | - | - | - | - |
| **Alarmlist indication + history record** | 1 | AHI | ✓ | ✓ | - | - | - | - | - | - | - |
| **Alarm only** | 1 | - | ✓ | - | ✓ | ✓ | ✓ | - | - | - | - |
| **Warning** | 1 | Wrn | ✓ | ✓ | ✓ | ✓ | ✓ | - | - | - | AL Common Wrn (page 640) |
| **Shutdown** | 2 | Sd | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | AL Common Sd (page 640) |
| **Breaker Open & Cool Down** | 2 | BOC | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | AL Common BOC (page 639) |
| **Slow stop** | 2 | Stp | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | AL Common Stp (page 640) |
| **Shutdown Override** | 2 | Sd | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | - | |

### Protection blocking

Engine and generator fixed protections are blocked during starting phases or Ready and Stop states. They become unblocked once **Maximal Stabilization Time (page 302)** has elapsed or GCB is closed whichever happens first.

Exceptions are:

- Overspeed protection which has two limits defined via setpoints **Overspeed Sd (page 309)** and **Starting Overspeed Sd (page 309)**. Starting Overspeed limit is considered in the starting phase till Starting Overspeed Time elapses. This time starts to count once the RPM exceeds the value of **Starting RPM (page 296)**.
- E-Stop and Emergency stop

The other way fixed protections can be blocked is by active LBI **SD OVERRIDE (PAGE 629)**.

***Note:*** *LBI **SD OVERRIDE (PAGE 629)** (Shutdown Override) does not block evaluation of fixed protection conditions and their visualization. They are recorded into alarm list or history. It only blocks their actions. Shutdown Override blocks all level 2 (Sd, BOC) fixed protection. It does not block level 1 (Wrn, AHI, Hist) or protection of type Sd Override.*

Some generators or engine protections have 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

| Options | Description |
|---|---|
| Enable | Protection is enabled |
| Disable | Protection is blocked |
| ExtDisable | Disabling of the protection can be forced by LBI **PROTECTION FORCE DISABLE (PAGE 625)** |

### Generator and engine protections lists

#### Generator protections

| | Setpoint for protection ON / OFF | Alarms / Protection name |
|---|---|---|
| **Current** | *Always active* | **BOC Short Circuit (page 767)** |
| | **IDMT Generator >A Protection (page 335)** | **BOC Overcurrent IDMT (page 768)** |
| | **Generator Current Unbalance Protection (page 335)** | **BOC Current Unbalance (page 767)** |
| **Frequency** | **Generator Frequency Protection (page 339)** | **BOC Generator Overfrequency (page 762)** |
| | **Generator Frequency Protection (page 339)** | **BOC Generator Underfrequency (page 763)** |

| | Setpoint for protection ON / OFF | Alarms / Protection name |
|---|---|---|
| Others | *Always active* | ALI Gen Ph L1 Inverted (page 740) |
| | *Always active* | ALI Gen Ph L2 Inverted (page 741) |
| | *Always active* | ALI Gen Ph L3 Inverted (page 741) |
| | *Always active* | ALI Gen Ph Rotation Opposite (page 741) |
| | Earth Fault Current Protection (page 519) | Sd Earth Fault Current (page 768) |
| Power | Overload Protection (page 334) | BOC Overload (page 767) |
| | Reverse Power Protection (page 340) | BOC Reverse Power (page 767) |
| Voltage | Generator <> Voltage Protection (page 337) | Sd Generator L1 Overvoltage (page 757) |
| | | Sd Generator L2 Overvoltage (page 757) |
| | | Sd Generator L3 Overvoltage (page 757) |
| | | Sd Generator L1L2 Overvoltage (page 757) |
| | | Sd Generator L2L3 Overvoltage (page 758) |
| | | Sd Generator L3L1 Overvoltage (page 758) |
| | | BOC Generator L1 Undervoltage (page 758) |
| | | BOC Generator L2 Undervoltage (page 759) |
| | | BOC Generator L3 Undervoltage (page 759) |
| | | BOC Generator L1L2 Undervoltage (page 759) |
| | | BOC Generator L2L3 Undervoltage (page 759) |
| | | BOC Generator L3L1 Undervoltage (page 760) |
| | Generator V Unbalance Protection (page 337) | BOC Gen Voltage Unbalance Ph-N (page 762) |
| | | BOC Gen Voltage Unbalance Ph-Ph (page 762) |

## Engine protections

| | Protection Enable / Disable | Alarms / Protection name |
|---|---|---|
| Speed | *Always active* | Sd Overspeed (page 755) |
| | Underspeed Protection (page 341) | Sd Underspeed (page 755) |

## Mains protections

| | Alarms / Protection name |
|---|---|
| **Frequency** | Mains Overfrequency (page 743) |
| | Mains Underfrequency (page 744) |
| **Others** | ALI Mains Ph L1 Inverted (page 742) |
| | ALI Mains Ph L2 Inverted (page 742) |
| | ALI Mains Ph L3 Inverted (page 742) |
| | ALI Mains Ph Rotation Opposite (page 743) |
| **Voltage** | MP Mains L1 Overvoltage (page 763) |
| | MP Mains L1 Undervoltage (page 763) |
| | MP Mains L2 Overvoltage (page 764) |
| | MP Mains L2 Undervoltage (page 764) |
| | MP Mains L3 Overvoltage (page 764) |
| | MP Mains L3 Overvoltage (page 764) |
| | MP Mains L1L2 Overvoltage (page 765) |
| | MP Mains L1L2 Undervoltage (page 765) |
| | MP Mains L2L3 Overvoltage (page 765) |
| | MP Mains L2L3 Undervoltage (page 765) |
| | MP Mains L3L1 Overvoltage (page 766) |
| | MP Mains L3L1 Undervoltage (page 766) |
| | Mains Voltage Unbalance ph-n (page 743) |
| | Mains Voltage Unbalance ph-ph (page 743) |

# User Protections

InteliGen4 200 allows users to configure their own protections to any analog input or binary input/output. Only one protection of 1st level and/or one protection of 2nd level can be configured on logical binary input/output. More than one protection can be configured on analog input. Max simultaneous number of configured user protections is 64.

Source upon which the protection is configured can be selected. It can be any analog value or binary state.

## Source

| Analog values | Binary states |
|---|---|
| › Analog inputs<br>» Controller, Modules<br>› Values<br>» ECU, Generator, Mains, others<br>› Statistics | › Binary inputs<br>» Controller, Modules, ECU<br>› Binary outputs<br>» PLC<br>› Protection states<br>› LBOs |

## Protection activation

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

## User Protection types

| Name | Level | Abbreviation | Alarm List | History | Fault Reset needed | LBO Horn activation | LBO Alarm activation | Action: CB open | Action: Gen-set stop | SD Override blocking | Common LBO |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **History Record Only** | 1 | Hst | - | ✓ | - | - | - | - | - | - | - |
| **Alarm List Indication** | 1 | ALI | ✓ | - | - | - | - | - | - | - | - |
| **Alarmlist indication + history record** | 1 | AHI | ✓ | ✓ | - | - | - | - | - | - | - |
| **Alarm only** | 1 | - | ✓ | - | ✓ | ✓ | ✓ | - | - | - | - |
| **Warning** | 1 | Wrn | ✓ | ✓ | ✓ | ✓ | ✓ | - | - | - | AL Common Wrn (page 640) |
| **Shutdown** | 2 | Sd | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | AL Common Sd (page 640) |
| **Breaker Open & Cool Down** | 2 | BOC | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | AL Common BOC (page 639) |
| **Slow stop** | 2 | Stp | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | AL Common Stp (page 640) |
| **Shutdown Override** | 2 | Sd | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | - | |

## Protection blocking

It is possible to configure one Protection Blocking to any **User Protections (page 182)**. 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.

## Protection blocking

| Block Type | Description |
|---|---|
| All the time | The protection is not blocked. It can be blocked only by LBI **SD OVERRIDE (PAGE 629)**. |
| Run Only Block Delay | The protection is blocked depending on engine state and time defined by setpoint **Run Only Block Delay (page 303)**. It can also be blocked by LBI **SD OVERRIDE (PAGE 629)**. |
| Force Block | The protection is blocked by LBI **PROTECTION FORCE DISABLE (PAGE 625)** or by LBI **SD OVERRIDE (PAGE 629)**. |
| Electrical Protection | The protection is blocked depending on engine state. It is unblocked once **Maximal Stabilization Time (page 302)** is elapsed or GCB is closed. It can also be blocked by LBI **SD OVERRIDE (PAGE 629)**. |

***Note:*** *LBI **SD OVERRIDE (PAGE 629)** (Shutdown Override) does not block evaluation of user protection conditions and their visualization. They are recorded into alarm list or history. It only blocks their actions. Shutdown Override blocks all level 2 (Sd,BOC) protection. It does not block level 1 (Wrn, AHI, Hist) or protection of type **SD OVERRIDE (PAGE 629)**.*

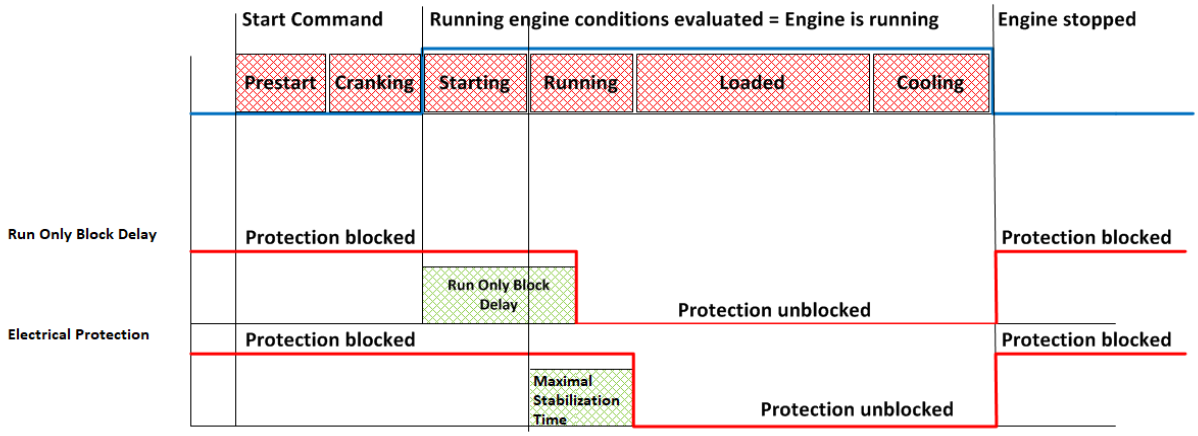



Image 5.68 Run only block delay and electrical protection blocking

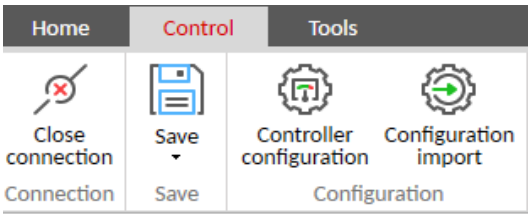
## History record

- Always – History is recorded all the time.
- Once – History is recorded only once after fault reset.

***Note:*** *Every User protection is evaluated with period 0.1 s.*

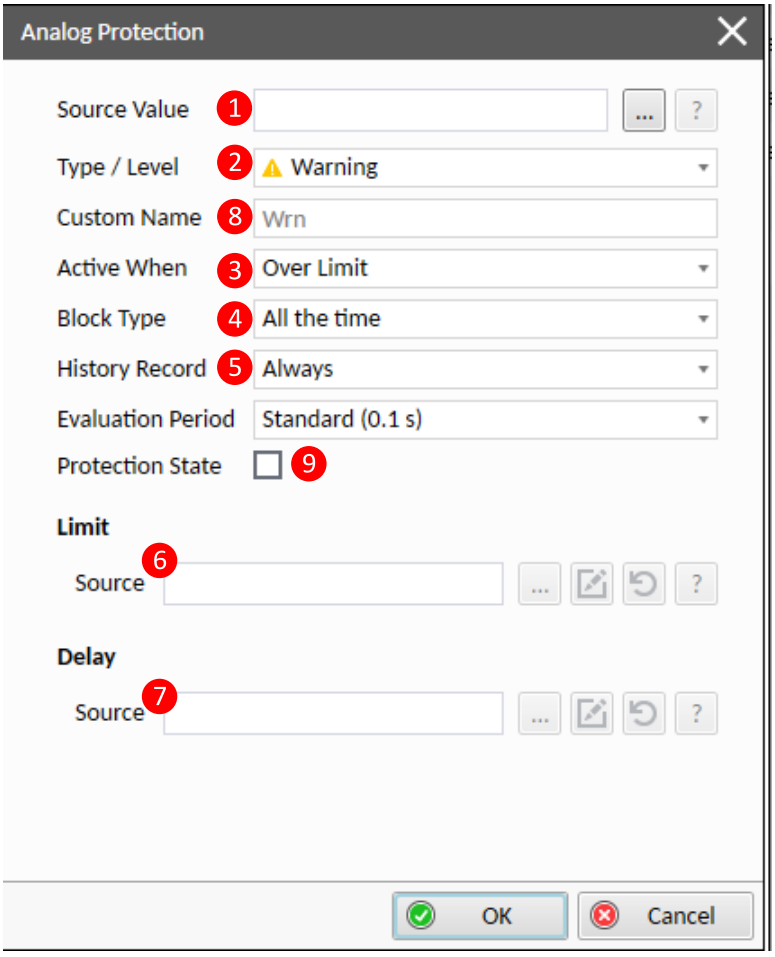
## Configuration of protections in InteliConfig

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



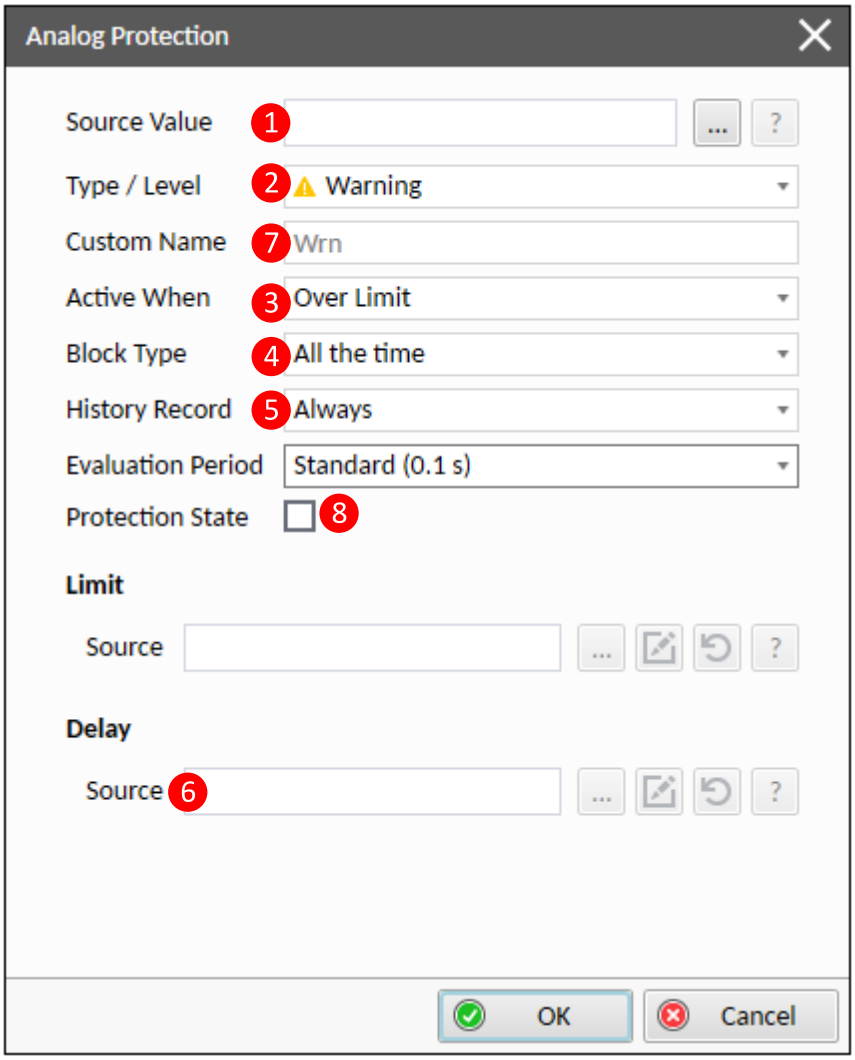

| | |
|---|---|
| 1 | Select the desired protections to be configured (Analog protections / Binary protections). |
| 2 | Add protection by clicking on the icon  .<br>Delete selected protection by clicking on the icon  .<br>Edit selected protection by clicking on the icon  . |

## Adding analog protection



| | |
|---|---|
| 1 | Selecting the input source **see User Protections on page 182**. |
| 2 | Selecting the protection type **see Fixed Protection types on page 179**. |
| 3 | Selecting the protection activation **see Protection activation on page 183**. |
| 4 | Selecting the block type **see Protection blocking on page 185**. |
| 5 | Selecting if the occurrence of a protection is recorded every time or only once after a Fault Reset. |
| 6 | Selecting the input for limit.<br>Setpoints must have the correct resolution and dimension as protection source value.<br>› Existing setpoint<br>› New user setpoint<br>› Existing user setpoint<br>Prefix is added to the name based on protection type / level |
| 7 | Selecting the input for delay.<br>Setpoints must have the correct resolution **0.1** and dimension **[s]**<br>› Existing setpoint<br>› New user setpoint<br>› Existing user setpoint<br>Prefix is added to the name based on protection type / level. |
| 8 | Text input for Alarm / History message. |
| 9 | If user protection state is checked then created user protection has LBO located in Bin Values in the **Group: User Protection States (page 587)**. |

## Adding binary protection




| | |
|---|---|
| 1 | Selecting the input source **see User Protections on page 182**. |
| 2 | Selecting the protection type **see Fixed Protection types on page 179**. |
| 3 | Selecting the protection activation **see Protection activation on page 183**. |
| 4 | Selecting the block type **see Protection blocking on page 185**. |
| 5 | Selecting if the occurrence of a protection is recorded every time or only once after a Fault Reset. |

| | |
|---|---|
| 6 | Selecting the input for delay.<br>Setpoints must have the correct resolution **0.1** and dimension **[s]**<br>› Existing setpoint<br>› New user setpoint<br>› Existing user setpoint |
| 7 | Text input for Alarm / History message |
| 8 | If user protection state is checked then created user protection has LBO located in Bin Values in the **Group: User Protection States (page 587)**. |

# Protection states

Protection states are states of fixed and user protections. These states can be configured as binary output or used in PLC logic.

## Fixed protection states

Important **Fixed Protections (page 178)** have a protection state. The protection state is (usually) named the same as the alarm. Fixed protection states are in a group of 32 values.

Protection states groups:

- **Fixed Protections States 1 (page 586)**
- **Fixed Protections States 2 (page 586)**
- **Fixed Protections States 3 (page 586)**
- **Fixed Protections States 4 (page 586)**
- **Fixed Protections States 5 (page 587)**

## User protections states

During the **Configuration of protections in InteliConfig (page 186)**, you can decide whether you want to add user protection state for the protection. The name is the same as the alarm's message.

User protection states are in a group of 32 values.

***Note:*** *Group of User protection states is showed only when there is at least 1 protection state in it.*

Protection states group:

- **User Protections States 1 (page 587)**

# Alarm management

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

## Analog input alarm evaluation principle

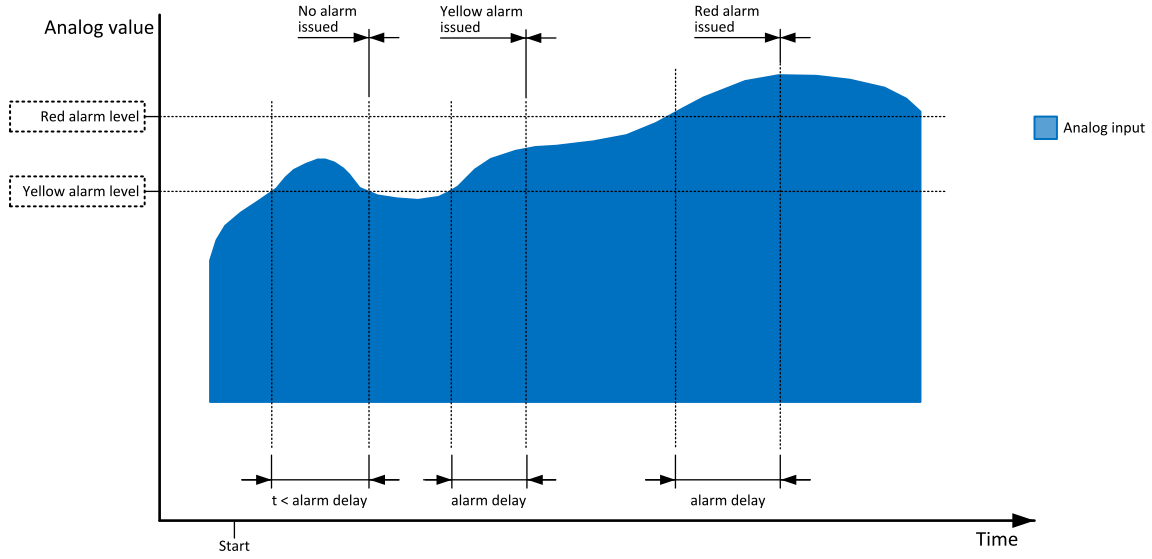



Image 5.69 Analog input alarm evaluation principle

## Alarm handling

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

- The alarm is evaluated all the time the controller is switched on.
- The alarm is evaluated only when the engine is running. This type should be used for e.g. oil pressure. These alarms begin to be evaluated after the engine has been started with the delay given by the setpoint **Run Only Block Delay (page 303)**.
- The alarm is evaluated only when the generator is excited. These alarms begin to be evaluated after the engine has been started and **Maximal Stabilization Time (page 302)** has elapsed or the GCB has been closed. They remain evaluated until cooling has finished. Only Generator under/overvoltage, Generator voltage unbalance and Generator under/overfrequency belong to this category. This category is not configurable to binary and analog input alarms.
- The alarm is evaluated only when LBI **Protection Force Disable (page 625)** is not active.

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

After pressing the Fault reset button or activating the binary input **Fault Reset Button (page 613)**, all active alarms change to confirmed state. Confirmed alarms will disappear from the Alarm list as soon as the respective condition dismisses. If the condition is dismissed before acknowledging the alarm, the alarm will remain in the Alarm list as Inactive.

***Note:*** *The input **SD Override (page 629)** can be used for temporary disabling of red alarms to shutdown the engine. This input may be used in situations where providing the power is extremely important – e.g. if the Gen-set drives pumps for fire extinguishers (sprinklers).*

### Alarm states

An alarm can have the following states:

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

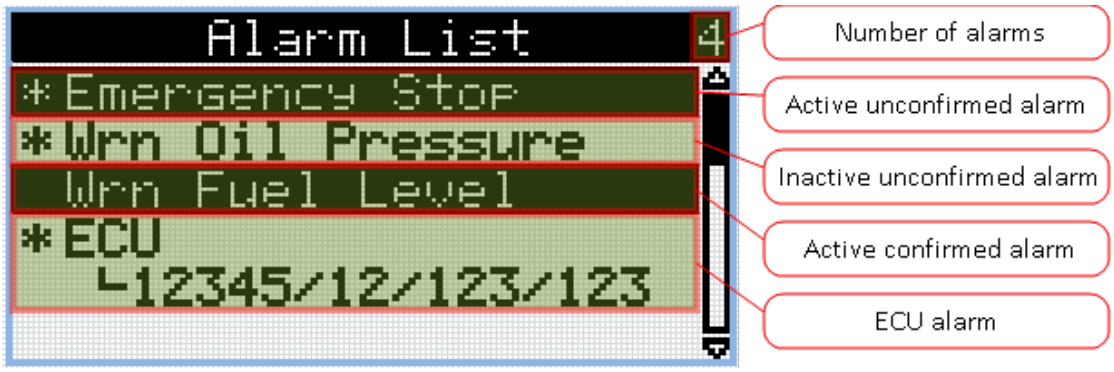



Image 5.70 Alarm List

### Alarm types – Level 1

The level 1 alarm indicates that a value or parameter is out of normal limits, but has still not reached critical level. This alarm does not cause any actions regarding the gen-set control.

#### Warning (Wrn)

The alarm appears in the Alarm list and is recorded into the history log. Activates the output **AL COMMON WRN (PAGE 640)** as well as the standard alarm outputs (**HORN (PAGE 662)** and **ALARM (PAGE 643)**).

#### Alarm only

The alarm appears in the Alarm list. Standard alarm outputs (**HORN (PAGE 662)** and **ALARM (PAGE 643)**) are activated.

#### Alarm list indication + History record (AHI)

The alarm appears in the Alarm list and is recorded into the history log.

#### Alarm list indication (ALI)

The event is only indicated in the Alarmlist. It disappears for the alarmist automatically as soon as the cause disappears. Standard alarm outputs (**HORN (PAGE 662)** and **ALARM (PAGE 643)**) are not activated.

#### History record only (Hst)

The event is recorded into the history. Standard alarm outputs (**HORN (PAGE 662)** and **ALARM (PAGE 643)**) are not activated.

### Alarm types – Level 2

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

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

> **IMPORTANT: The Gen-set 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!**

### Shutdown (Sd)

The alarm appears in the Alarm list and is recorded into the history log. It causes immediate stop of the Gen-set without cooling phase. Also GCB breaker will open. The Gen-set cannot be started again while there is a shutdown alarm in the Alarm list. Activates the output **AL COMMON SD (PAGE 640)** as well as the standard alarm outputs (**HORN (PAGE 662)** and **ALARM (PAGE 643)**).

### Shutdown override

If the Logical binary input **SD OVERRIDE (PAGE 629)** is closed, all 2nd level protections are disabled to allow the Gen-set run in an emergency situation, e.g. sprinkler devices power supply.

All protections are shown in Alarmlist and recorded into History, but the controller does not stop the engine because of them. If the input is deactivated and some protections are still active or not yet reset, the controller starts to take these protections into account and consequently stops the engine.

All 2nd level protections are locked out, except of these:

- Emergency stop
- Overspeed
- Underspeed
- Binary and analog protections configured as Sd override type. In fact this protection type means "Unoverridable shutdown", i.e. it works the same way as standard shutdown protection, however it cannot be overridden (blocked) by the **SD OVERRIDE (PAGE 629)** input.

### Breaker open and cool down (BOC)

The event appears in the Alarm list and is recorded into the history log. It causes immediate opening of the GCB and then the standard stop sequence with cooling follows. The Gen-set cannot be started again while there is a BOC alarm in the Alarm list. Activates the output **AL COMMON BOC (PAGE 639)** as well as the standard alarm outputs (**HORN (PAGE 662)** and **ALARM (PAGE 643)**).

### Slow stop (Stp)

The alarm appears in the alarmlist and is recorded into the history log. It causes stop of the Gen-set by the standard stop sequence, i.e. including unloading and cooling phase. The Gen-set cannot be started again while there is a slow stop alarm in the alarmlist. Activates the output **AL COMMON STP (PAGE 640)** as well as the standard alarm outputs (**HORN (PAGE 662)** and **ALARM (PAGE 643)**).

### Sensor failure detection (FLS)

If the measured resistance on an analog input exceeds the valid range, a sensor failure will be detected and a sensor failure message will appear in the **Alarm list (page 193)**. The valid range is defined by the far left (RL) and far right (RH) points of the sensor characteristic ±12.5 % from RH-RL.

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

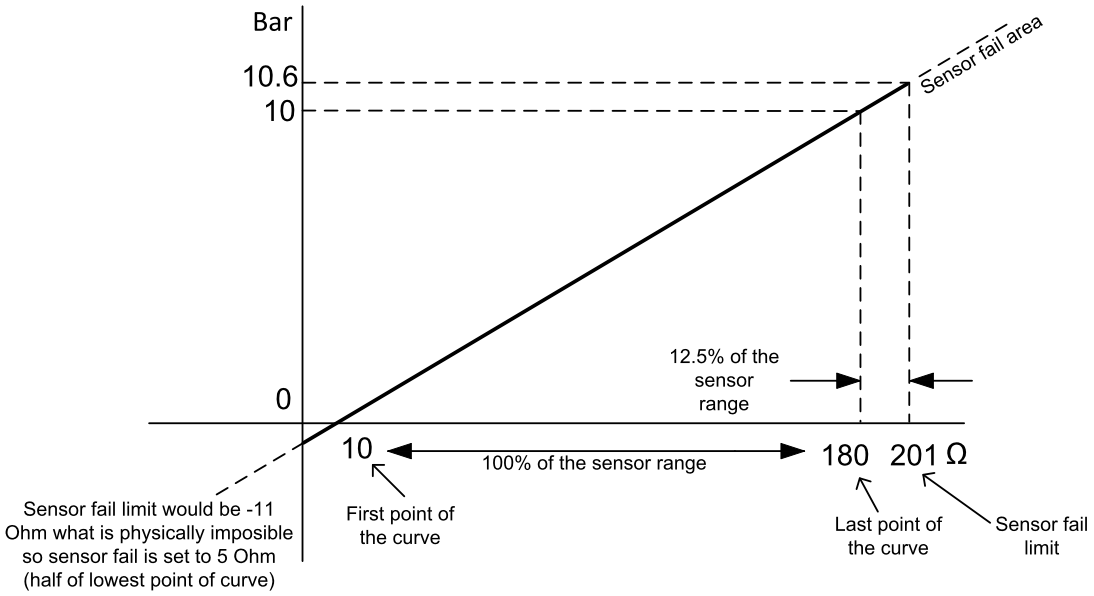



Image 5.71 Sensor failure detection principle

## Remote alarm messaging

If the communication plug-in module is connected to the controller, the controller can send SMS messages (CM-RS232-485 module) and emails (CM2-4G-GPS or CM3-Ethernet modules) at the moment when a new alarm appears in the **Alarm list (page 193)** or new event is written in the **History log (page 139)**. The message will contain a copy of the **Alarm list (page 193)** or reasons from the **History log (page 139)**. To enable this function first to check the controller internet connection (**Subgroup: TCP/IP Settings (page 501)** for CM3-Ethernet or **Subgroup: TCP/IP Settings (page 484)**/**Subgroup: Cellular Interface (page 479)** for CM2-4G-GPS). Then adjust setpoints **Event Message (page 516)**, **Wrn Message (page 517)**, **BOC Message (page 515)** and **Sd Message (page 517)** to ON. Also enter a valid GSM phone number or email address to the setpoints **Telephone Number 1 (page 496)**, **Telephone Number 2 (page 496)**, **Telephone Number 3 (page 497)**, **Telephone Number 4 (page 497)**, **Email Address 1 (page 513)**, **Email Address 2 (page 514)**,**Email Address 3 (page 514)**, and **Email Address 4 (page 515)**.

## Alarm list

Alarm list 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.

Alarm list contains three types of alarms:

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

### Controller built-in alarms

An alarm message in the Alarm list begins with a prefix, which represents the alarm type (e.g. Wrn, Sd, BOC). Then the alarm name follows. In some cases the prefix can be omitted.

## User configured alarms

An alarm message in the Alarm list begins with a prefix, which represents the alarm type (e.g. Wrn, Sd, BOC). Alarm type is selected by user during the configuration of binary or analog user protection. Then the alarm name follows, which can be adjusted by user during the configuration.

## ECU alarms

The ECU alarms are received from the ECU. 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 engine fault codes list must be used to determine the reason.

### Built-in alarms

| Events specification | Protection type | Description |
|---|---|---|
| Wrn Battery Overvoltage | WRN | Battery voltage is out of limits given by **Battery Overvoltage (page 316)** setpoint. |
| Wrn Battery Undervoltage | WRN | Battery voltage is out of limits given by **Battery Undervoltage (page 315)** setpoint. |
| Sd Battery Flat | SD | If the controller switches off during starting sequence ( **STARTER 1 (PAGE 680)** output is active) it doesn't try to start again and activates this protection (controller assumes bad battery condition). |
| Sd Start Fail | SD | Gen-set start failed. All crank attempts were tried without success. |
| BOC Gen Lx Undervoltage<br>Sd Gen Lx Overvoltage<br>(where x=1,2,3) | SD<br>BOC | The generator voltage is out of limits given by **Generator Undervoltage BOC (page 329)** and **Generator Overvoltage Sd (page 328)** setpoints. |
| BOC Gen V Unbalance | BOC | The generator voltage is unbalanced more than the value of **Generator V Unbalance (page 330)** setpoint. |
| BOC Gen >, <Frequency | BOC | The generator frequency is out of limits given by **Generator Overfrequency BOC (page 331)** and **Generator Underfrequency BOC (page 332)** setpoints. |
| BOC Current Unbalance | BOC | The generator current is unbalanced more than the value of **Generator Current Unbalance (page 326)** setpoint. |
| BOC Current IDMT | BOC | Generator current exceeds the limit for IDMT protection given by **Nominal Current (page 275)** and **IDMT Generator >A Delay (page 325)** setpoints. |
| BOC Overload | BOC | The load is greater than the value given by **Overload BOC (page 323)** setpoint. |
| Sd Earth Fault | SD | This alarm is activated when Earth Fault value exceeds **IDMT Earth Fault Current Sd (page 521)** limit for at least **IDMT Earth Fault Current Delay (page 520)** period. |

| Events specification | Protection type | Description |
|---|---|---|
| Sd Overspeed | SD | The protection comes active if the speed is greater than **Overspeed Sd (page 309)** setpoint. |
| Sd Underspeed | SD | During starting of the engine when the RPM reach the value of **Starting RPM (page 296)** setpoint the starter is switched off and the speed of the engine can drop under **Starting RPM (page 296)** again. Then the Underspeed protection is active. Protection evaluation starts 5 seconds after reaching **Starting RPM (page 296)**. |
| Emergency Stop | SD | If the input Emergency Stop is active shutdown is immediately activated. |
| E-Stop | SD | If the input E-Stop is active shutdown is immediately activated. |
| GCB Fail | SD | Failure of generator circuit breaker. |
| MCB Fail | WRN | Failure of mains circuit breaker. |
| Sd RPM Measurement Fail | SD | Failure of magnetic pick-up sensor for speed measurement. This alarm appears, if starter was disengaged for other reason than over-crossing **Starting RPM (page 296)** (like oil pressure or D+) and at the end of timer **Maximum Cranking Time (page 295)** there are no RPMs > **Starting RPM (page 296)** detected. |
| Wrn Stop Fail | WRN | Gen-set stop failed. See description at Gen-set Operation States chapter. |
| Charge Alternator Fail | WRN | Failure of alternator for charging the battery. |
| Wrn Override All Sd | WRN | The protection is active if the output Sd Override is active. |
| ALI Gen Ph-Rotation Opposite | ALI | Gen-set voltage phases are not wired correctly. GCB closing is prohibited by controller. |
| ALI Mains Ph-Rotation Opposite | ALI | Mains voltage phases are not wired correctly. GCB closing is prohibited by controller. |
| Stp Synchronization Fail | STP | If the synchronization timeout gets elapsed (forward synchronization). |
| Wrn Reverse synchro Fail | WRN | If the synchronization timeout gets elapsed (reverse synchronization). |
| BOC Reverse Power | BOC | The reverse power is higher than limit adjusted via setpoint **Reverse Power Level (page 333)**. |
| BOC Excitation Loss | BOC | The reactive power is higher than limit adjusted via setpoint **Excitation Loss Level (page 333)**. |
| Wrn Voltage Regulation Limit | WRN | The AVR output stays close to one of the limit values for more than 2 seconds. |
| Wrn Speed Regulation Limit | WRN | The speed governor output stays close to one of the limit values for more than 2 seconds. |
| MP Mains Lx >V | MP | The mains voltage is out of limits given by **Mains** |

| Events specification | Protection type | Description |
|---|---|---|
| MP Mains Lx <V (where x=1,2,3) | | **Undervoltage (page 346)** and **Mains Overvoltage (page 343)** setpoints. |
| Mains Voltage Unbalance | MP | The mains voltage is unbalanced more than the value of **Mains Voltage Unbalance (page 348)** setpoint. |
| Mains >, <Frequency | MP | The mains frequency is out of limits given by **Mains Overfrequency (page 348)** and **Mains Underfrequency (page 350)** setpoints. |
| Bus Meas Error | WRN | Bus measurement error. Bus voltage is out of limits for 20 s. |
| Vectorshift | MP | Vectorshift protection activated. |
| ROCOF | MP | Rocof protection activated. |

***Note:*** *This table does not contain all alarms in the controller. It is only a list of the most common alarms.*

## 5.5.35 Regulation loops

### Regulation loops overview

#### Regulation loops overview

| Loop type | Related applications | Related setpoints |
|---|---|---|
| Frequency | MINT, SPtM | **Frequency Gain (page 382)**, **Frequency Int (page 382)** |
| Load sharing | MINT | **Load Sharing Gain (page 384)**, **Load Sharing Int (page 384)** |
| Load | MINT, SPtM | **Load Gain (page 383)**, **Load Int (page 384)** |
| Voltage | MINT, SPtM | **Voltage Gain (page 391)**, **Voltage Int (page 392)** |
| VAr sharing | MINT | **VAr Sharing Gain (page 393)**, **VAr Sharing Int (page 393)** |
| PF control | MINT, SPtM | **PF Gain (page 392)**, **PF Int (page 392)** |
| Angle regulation | MINT, SPtM | **Angle Gain (page 383)** |

Speed, Frequency, Load sharing, Load regulation loops have one common output = Speed request. 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 = Voltage request. The value of this output is always composed from the contribution of each of the regulation loop.

Each of the regulation loops is active in some certain time during the process, which is given by the state of the automat. If no regulation loop is active the speed governor output is kept on the level given by setpoint **Speed Governor Bias (page 380)** or **Voltage Regulator Bias (page 390)** in case of voltage regulator output.

***Note:*** *All regulation loops are PID, but only PI components are visible as setpoints.*

### MINT regulation loops

| Loop type | Description |
|---|---|
| Frequency | After Idle timer elapses, the frequency loop is active to reach the nominal frequency. It is also activated in the first phase of synchronization when the **Minimal Stabilization Time (page 301)** has elapsed. The generator frequency is regulated to match the mains/bus frequency. |
| Load sharing | The load sharing loop is active in multiple-island operation. |
| Load | The load regulation loop is active when single Gen-set is running in parallel with mains and during load transfers from mains to generator or vice versa. This regulation loop is also active when multiple Gen-sets are running in parallel with Mains. |
| Voltage | The voltage regulation loop gets active after **Minimal Stabilization Time (page 301)**. The loop is deactivated at the beginning of cooling sequence. |
| VAr sharing | The VAr sharing loop is active in multiple-island operation. |
| PF control | The PF control loop is active when single Gen-set is running in parallel with mains and during load transfers from mains to generator or vice versa. This regulation loop is also active when multiple Gen-sets are running in parallel with Mains. |
| Angle regulation | The differential angle control loop is active during the synchronization when phase match type of synchronization is used. |

### SPtM regulation loop

| Loop type | Description |
|---|---|
| Frequency | The frequency regulation loop gets active after **Minimal Stabilization Time (page 301)**. The loop is deactivated at the beginning of cooling sequence. Loop is not active in parallel operation. In parallel operation Load Regulation Loop is used. |
| Load | The load regulation loop is active when Gen-set is running in parallel with mains and during load transfers from mains to generator or vice versa. |
| Voltage | The voltage regulation loop gets active after **Minimal Stabilization Time (page 301)**. The loop is deactivated at the beginning of cooling sequence. Loop is not active in parallel operation. In parallel operation PF control loop is used. |
| PF control | The PF control loop is active when Gen-set is running in parallel with mains and during load transfers from mains to generator or vice versa. |
| Angle regulation | The differential angle control loop is active during the synchronization when phase match type of synchronization is used. |

## 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.

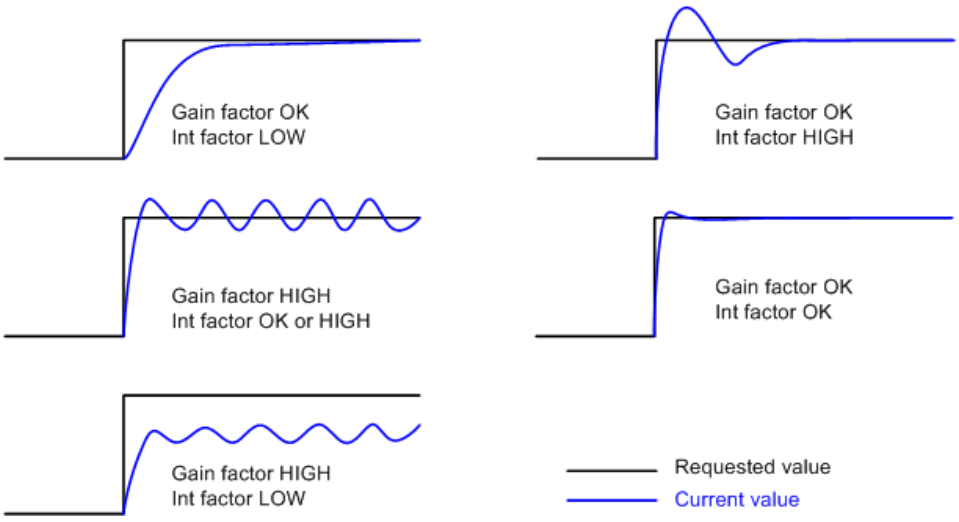



Image 5.72 Typical responses of PI regulator

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.**

## 5.5.36 Rental Timers

In controller, there are two timers which are designed like rental timers. Rental timers will stop the Gen-set after their elapse.

### How to set-up rental timer

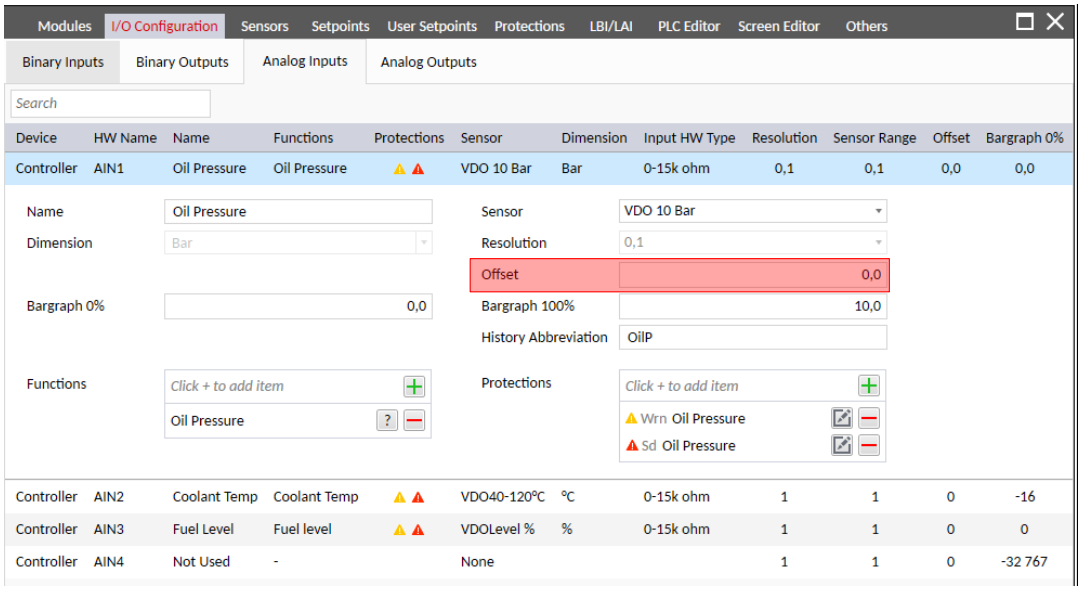
This is a short guide for settings of rental timers. Please see following few steps regarding how to set up rental timers:

- Choose the type of rental timer
  - **Rental Timer 1 (page 465)** (based on engine running hours)
  - **Rental Timer 2 (page 467)** (based on date)
- Adjust the length of chosen timer
- Adjust the warning for user **Rental Timer 1 Wrn (page 467)** or **Rental Timer 2 Wrn (page 469)** (warning will be displayed in Alarm list before elapsing of rental timer)
- Adjust **Rental Timer BOC (page 469)** – common for both timers (if engine is still running after rental timer counts down, this timer will start tocount down. After the time has elapsed, the Gen-set will be cooled down and stop).

# 5.5.37 Sensor curves

## Background of the sensor calibration

To correct measuring error of each analog input (pressure, temperature, level, etc.), calibrating constants should be set. To correct an offset of each analog input, select an option Offset in InteliConfig and set the appropriate value.




***Note:*** *The calibration must be done at the operational point of the analog input (e.g. 80 °C, 4.0 Bar etc..)*

## 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. The purpose is to prolong curve to the lower temperature values, so the cold engine will not raise alarm failure sensor.

| Curve | Min [Ω] | Max [Ω] | Units |
|---|---|---|---|
| VDO 10 Bar | 10 | 180 | Bar |
| VDO40-120°C | 22 | 3200 | °C |
| VDOLevel% | 0 | 180 | % |
| General line 1 | 0 | 1000 | Ω |
| General line 2 | 0 | 1000 | Ω |
| General line 3 | 0 | 1000 | Ω |
| General line 4 | 0 | 1000 | Ω |
| General line 5 | 0 | 1000 | Ω |
| General line 6 | 0 | 1000 | Ω |
| General line 7 | 0 | 1000 | Ω |
| General line 8 | 0 | 1000 | Ω |
| General line 9 | 0 | 1000 | Ω |

| | | | |
|---|---|---|---|
| General line 10 | 0 | 1000 | Ω |
| General line 11 | 0 | 1000 | Ω |
| General line 12 | 0 | 1000 | Ω |
| General line 13 | 0 | 1000 | Ω |

***Note:*** *Curves can be modified via InteliConfig. Some standard curves are also prepared in InteliConfig.*

**IMPORTANT: For right behavior of function Total Fuel Consumption, curve for analog input FUEL LEVEL (PAGE 692) has to be in percentage and setpoint Fuel Tank Volume (page 311) has to be adjusted correctly.**

## 5.5.38 Speed/Load control

The speed control output is used to control the speed or the power of the engine. The frequency regulation, load regulation and load sharing are realized through the speed control. The speed request is internal value of the regulator. This value is transformed to range ±10 V based on setpoints **Speed Governor Low Limit (page 380)** and **Speed Governor High Limit (page 381)**. This value of speed request is then transformed to request which comes out of the controller. There are several ways how to send this request to Gen-set:

- Analog output (speed governor output)
- ECU speed control
- Binary pulse control

### Speed control outputs

#### Analog Output (speed governor output)

The direction of speed regulation required by Speed regulator of the engine is given by the setpoint **Speed Regulator Character (page 379)**. A full range change of the speed governor output (from **Speed Governor Low Limit (page 380)** to **Speed Governor High Limit (page 381)**) should cause 5-10% change of the engine speed (**Speed Governor Low Limit (page 380)** ~ 95% **Nominal RPM (page 283)**, **Speed Governor Bias (page 380)** ~ 100% **Nominal RPM (page 283)**, **Speed Governor High Limit (page 381)** ~ 105% **Nominal RPM (page 283)**).

**IMPORTANT: Speed governor has to be adjusted for optimum performance before Speed/Load control adjusting. Check generator phase sequence before the first GCB connection.**

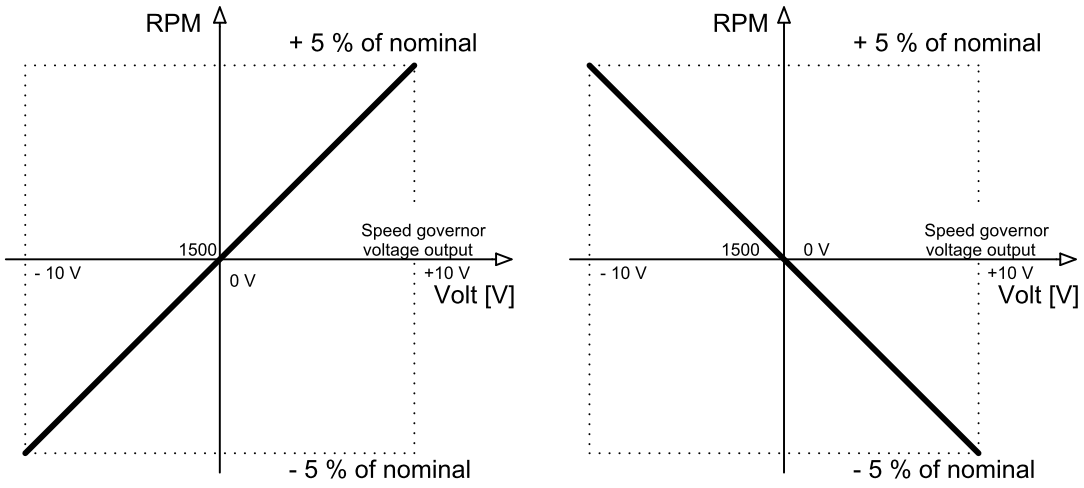



Image 5.73 Example of speed governor curve

### ECU speed control

In case that ECU with speed control support is configured, then the speed is controlled via ECU.

### Binary pulse control

The internal speed request is transformed to Up/Down pulse control. These pulses get out of the controller via binary outputs **SPEED UP (PAGE 679)** and **SPEED DOWN (PAGE 679)**. Length of pulses **SPEED UP (PAGE 679)** and **SPEED DOWN (PAGE 679)** depends on the difference of actual RPM and requested RPM (actual power and requested power, actual frequency and requested frequency) and on the parameter **Tau Speed Governor Actuator (page 381)**. **Tau Speed Governor Actuator (page 381)** defines the pulse duration which is needed for the speed controller to travel from minimal position to the maximal position. The Maximum length of pulses is limited to 5 s, the minimal length of pulses is limited to 150 ms and minimal length between the pulses is 200 ms.

## Speed/Load control adjustment

### Synchronization adjustment

- Start the engine in MAN Mode.
- Set the engine RPM by speed trim on the speed governor or by **Speed Governor Bias (page 380)**, **Speed Governor Low Limit (page 380)** and **Speed Governor High Limit (page 381)** to achieve frequency according to setpoint **Nominal Frequency (page 282)**.
- To start the synchronization press GCB ON/OFF button. GCB LED starts to flash to indicate synchronization. To stop synchronization press again GCB ON/OFF .
- Adjust **Frequency Gain (page 382)** to unstable speed control and decrease value by 30 % to insure stable performance.
- Adjust **Frequency Int (page 382)** to stable (fast and smooth) slip control. Synchroscope movement on the controller measure screen should slow down and stop (in any position, because **Angle Gain (page 383)** control is off).
- Set **Angle Gain (page 383)**. Synchroscope on the controller measure screen should move slowly and stop in "up" position. Set **Angle Gain (page 383)** to unstable value (synchroscope swings) and decrease value by 30 % to insure stable performance.

## Load control adjustment

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

### MINT application

Load control loop is active in parallel to mains mode only (MCB feedback closed). Switch off other engines while adjusting.

1. Set **#System BaseLoad (page 264)** setpoint to 30 % of one Gen-set.
2. Set **Load Gain (page 383)** to the same value as **Angle Gain (page 383)**. Set **Load Int (page 384)** to zero.
3. Start the Gen-set in MAN Mode, press GCB ON/OFF button to synchronize and close Gen-set to mains.
4. When GCB is closed, Gen-set load slowly increases to **#System BaseLoad (page 264)** value. Check that Gen-set power is positive (CT polarity).
5. Increase **Load Int (page 384)** to unstable load control and decrease value by 30 % to insure stable performance. When **Load Int (page 384)** factor is set to zero Gen-set load can differ from required **#System BaseLoad (page 264)**.
6. To adjust and optimize **Load Int (page 384)** change **#System BaseLoad (page 264)** several times between 30 and 70 % of **Nominal Power (page 274)**. Usually setting **Load Int (page 384)** to 100 % gives optimal performance.
7. When Gen-set is running under full load check if
   a. Speed governor output voltage value is not limited (it does not reach **Speed Governor Low Limit (page 380)** or **Speed Governor High Limit (page 381)**)
   b. Speed governor actuator is not mechanically limited or operates in a small section of the throttle range.

### SPtM application

Load control loop is active in parallel to mains mode only (MCB feedback closed).

1. Set **Load Control PTM Mode (page 258)** = BASELOAD, set **Baseload (page 261)** setpoint to 30 % **Nominal Power (page 274)** of Gen-set.
2. Set **Load Gain (page 383)** to the same value as **Angle Gain (page 383)**. Set **Load Int (page 384)** to zero.
3. Start the Gen-set in MAN Mode, press GCB ON/OFF button to synchronize and close Gen-set to mains.
4. When GCB is closed, Gen-set load slowly increases to **Baseload (page 261)** value. Check that Gen-set power is positive (CT polarity).
5. Increase **Load Gain (page 383)** to unstable load control and decrease value by 30 % to insure stable performance. When **Load Int (page 384)** factor is set to zero Gen-set load can differ from required **Baseload (page 261)**.
6. To adjust and optimize **Load Int (page 384)** change **Baseload (page 261)** several times between 30 and 70 % of **Nominal Power (page 274)**. Usually setting **Load Int (page 384)** to 100 % gives optimal performance.
7. When Gen-set is running under full load check if
   a. Speed governor output voltage value is not limited (it does not reach **Speed Governor Low Limit (page 380)** or **Speed Governor High Limit (page 381)**)
   b. Speed governor actuator is not mechanically limited or operates in a small section of the throttle range.

## 5.5.39 Stabilization

When the **Engine start (page 123)** sequence is finished, the Gen-set goes into the stabilization phase. There are two timers (setpoints) in this phase:

- **Minimal Stabilization Time (page 301)** starts to count down just after the idle period has finished. Generator voltage and frequency are not checked (respective protections are not evaluated) and the GCB cannot be closed even if the generator voltage and frequency are within limits.
- **Maximal Stabilization Time (page 302)** starts to count down just after the idle period has finished. Generator voltage and frequency are not checked (respective protections are not evaluated), but contrary to the previous timer, the GCB can be closed if generator voltage and frequency are within limits.

In situations where the GCB is closed automatically (AUTO, TEST modes), the closing of GCB will occur as soon as the generator voltage and frequency will get into limits and the **Minimal Stabilization Time (page 301)** has elapsed.

In the event that the generator voltage or frequency are not within limits of the **Maximal Stabilization Time (page 302)** period, the appropriate protection(s) will be activated and the Gen-set will be cooled down and stopped.

***Note:*** *The limits for the generator voltage and frequency are given by setpoints in the* ***Group: Generator settings (page 323)****.*

***Note:*** *The value of the* ***Minimal Stabilization Time (page 301)*** *setpoint has to be lower than the value of* ***Maximal Stabilization Time (page 302)*** *setpoint.*

## 5.5.40 Start-stop sequence

| State | Condition of the transition | Action | Next state |
|---|---|---|---|
| Ready | Start request | **PRESTART (PAGE 674)** on **Prestart Time (page 296)** counter started | Prestart |
| | RPM > 2 or Oil pressure > **Starting Oil Pressure (page 297)** or Generator voltage > 10V or D+ voltage is higher than **D+ Threshold (page 308)** | | Stop (Stop fail) |
| | OFF Mode selected or Shutdown alarm active | | Not Ready |
| Not Ready | RPM < 2, Oil pressure not detected, Generator voltage < 10 V, D+ not Active no shutdown alarm active, other than OFF Mode selected | | Ready |
| Prestart | Prestart time elapsed | **FUEL SOLENOID (PAGE 653)** on, **STARTER 1 (PAGE 680)** or**STARTER 2 (PAGE 681)** on, **Maximum Cranking Time (page 295)** counter started | Cranking |
| Cranking | RPM > Starting RPM | **STARTER 1 (PAGE 680)** or **STARTER 2 (PAGE 681)** off, **PRESTART (PAGE 674)** | Starting |

| | | | |
|---|---|---|---|
| | | off | |
| | D+ input activated or oil pressure detected or Generator voltage > 25% Nominal voltage | **Starter 1 (page 680)** or **Starter 2 (page 681)** off, **Prestart (page 674)** off | Cranking |
| | **Maximum Cranking Time (page 295)**, 1st attempt | **Starter 1 (page 680)** or **Starter 2 (page 681)** off, **Fuel Solenoid (page 653)** off, **Stop Solenoid (page 682)** on, **Cranking Fail Pause (page 295)** timer started | Crank pause |
| | **Maximum Cranking Time (page 295)** elapsed, last attempt | **Starter 1 (page 680)** or **Starter 2 (page 681)** off, **Prestart (page 674)** off | Shutdown (Start fail) |
| | all cranking attempts elapsed | **Fuel Solenoid (page 653)** off, **Stop Solenoid (page 682)** on | Shutdown (Start fail) |
| Crank pause | **Cranking Fail Pause (page 295)** elapsed | **Starter 1 (page 680)** or **Starter 2 (page 681)** off, **Fuel Solenoid (page 653)** on, **Stop Solenoid (page 682)** off, **Maximum Cranking Time (page 295)** counter started | Cranking |
| Starting | **Idle Time (page 299)** elapsed | **Minimal Stabilization Time (page 301)** and **Maximal Stabilization Time (page 302)** counter started | Running |
| | any shutdown condition | **Fuel Solenoid (page 653)** off, **Stop Solenoid (page 682)** on | Shutdown |
| Running | Stop request | **Ready To Load (page 677)** off,**Cooling Time (page 305)** counter started | Cooling |
| | RPM = 0 or any other shutdown condition | **Ready To Load (page 677)** off, **Fuel Solenoid (page 653)** off | Shutdown |
| | **GCB Close/Open (page 655)** closed | | Loaded |
| Loaded | **GCB Close/Open (page 655)** opened | | Running |
| | RPM = 0 or any other shutdown condition | **Fuel Solenoid (page 653)** off, **Stop Solenoid (page 682)** on, **Ready To Load (page 677)** off, | Shutdown |
| Cooling | **Cooling Time (page 305)** elapsed | **Fuel Solenoid (page 653)** off, **Stop Solenoid (page 682)** on | Stop |
| | RPM = 0 or any other shutdown condition | **Fuel Solenoid (page 653)** off, **Stop Solenoid (page 682)** on | Shutdown |

| | | | |
|---|---|---|---|
| | Start request | **READY TO LOAD (PAGE 677)** on | Running |
| Stop | RPM = 0, Oil pressure not detected, Generator voltage <10 V, D+ not active | | Ready |
| | If at least one of engine running indication is detected when **Stop Time (page 305)** elapsed. | | Stop (Stop fail) |

***Note:*** *If all generator parameters are OK and* ***Minimal Stabilization Time (page 301)*** *elapsed, indicates that GCB is possible to close. In AUTO Mode GCB is closed in this moment automatically.*

***Note:*** *The start-up sequence can be interrupted atn any time by a stop request.*

## 5.5.41 USB host

USB host is a function for programming the controller from the USB Flash Drive. In order to get the latest firmware and archive to USB flash drive following steps have to be followed:

- Download and install latest .psi package from www.comap-control.com
- Use InteliConfig -> Tools -> USB Flash Export -> Export Manager

***Note:*** *M.N.P.B stands for number 0 – 9.*

The following functions are supported:

- Firmware upload (Access level 3 is required)
- Configuration upload (Access level 3 is required)
- Firmware and configuration upload (Access level 3 is required)
- Configuration download (Access level 0 is satisfactory)

**IMPORTANT: Do not unplug USB Flash Drive during programming!**

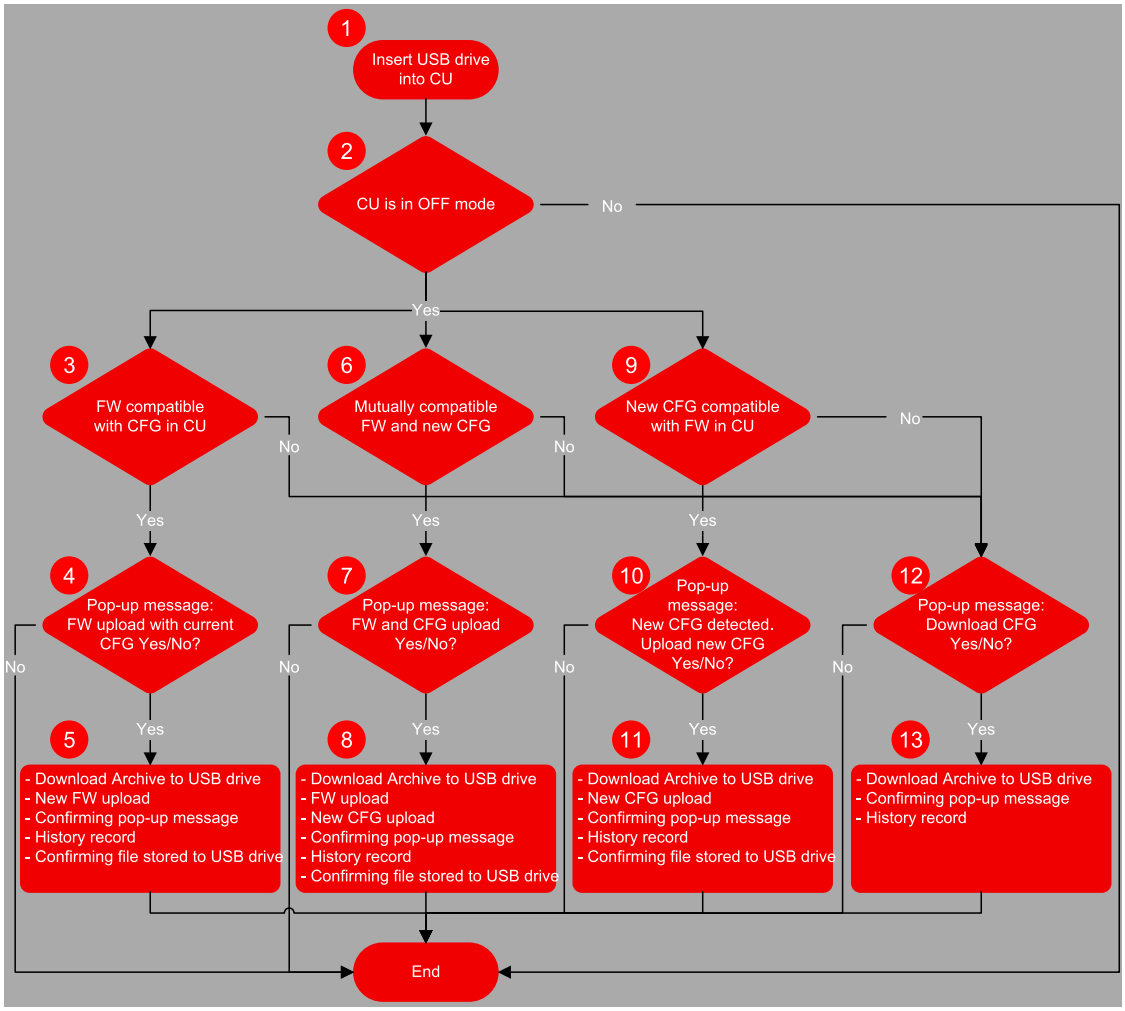



Image 5.74 USB host flowchart

Terminology:

- The Archive = the native file of InteliConfig, including the complete Configuration + History + Statistic + Values (at time of download) + Alarm list.
- Configuration = the part of Archive, in the terms of Configuration + Setpoints + PLC + IO definitions + Languages (for more information **see Configuration download on page 208**).
- New configuration = the configuration created in InteliConfig for the purpose of uploading it into the controller using the USB memory stick. The new configuration is recognized due to its name. The name must contain the specific string ="InteliGen4-Genset name-M.N.P.B.ail4".

  ***Note:*** *M.N.P.B stands for number 0 – 9.*

- Compatible firmware = the firmware version compatible with the configuration in the controller.

Abbreviations:

- CU – control unit
- FW – firmware
- CFG – configuration

## Firmware upload

- Point 1 – controller detects that USB Flash Drive has been inserted.
  - If the communication via USB is running, the controller will not detect the USB flash drive.
  - On the other hand if the USB flash drive was detected, communication via USB B port is not possible.
- Point 2 – controller is in OFF mode
  - All operations with USB memory key are possible only in OFF mode
- Point 3 – Conditions for firmware upload with current configuration
  - The new firmware compatible with the version of the configuration in the controller has been detected (and there is no new configuration file).
  - Detection is based on the name of firmware
  - More firmware can be stored on the USB Flash Drive. Controller automatically selects the compatible firmware with the highest version.
- Point 4 – Pop-up message
  - Do you want to update firmware?
- Point 5 – Firmware upload
  - Current archive is downloaded to USB Flash Drive (Name = SN_YYMMDDHHMM).
  - New firmware is uploaded into the controller without the change of the configuration
  - History record "Firmware loaded" is made
  - Confirming file (.txt) on USB Flash Drive is made (Name = SN_YYMMDDHHMM)
    - Content: Serial number, Year/Date/Time, Upgrade to the FW "Name of the new FW" successful.
  - Confirmation pop-up message: "Controller programming successful"

## Configuration upload

- Point 1 – controller detects that USB Flash Drive has been inserted.
  - If the communication via USB B is running, the controller will not detect the USB memory key.
  - On the other hand if the USB flash drive was detected, communication via USB B port is not possible.
- Point 2 – controller is in OFF mode
  - All operations with USB flash drive are possible only in OFF mode
- Point 9 – conditions for new configuration upload
  - The new configuration compatible with the version of the firmware in the controller has been detected (and there is no new firmware file).
  - Detection is based on name of configuration – required name: "InteliGen4 200-Genset name-M.N.P.B.ail4

    ***Note:*** *M.N.P.B stands for number 0 – 9."*
  - There can be only one configuration file
- Point 10 – Pop-up message
  - Do you want to update configuration?
- Point 11 – Configuration upload
  - Current archive is download to USB flash drive (Name = SN_YYMMDDHHMM).
  - New configuration is uploaded into the controller without the change of the firmware

- History record "Config loaded" is made
- Confirming file (.txt) on USB flash drive is made (Name = SN_YYMMDDHHMM)
  - Content: Serial number, Year/Date/Time, Upgrade to the FW "Name of the new CFG" successful.
- Confirmation pop-up message: "Controller programming successful"

## Firmware and configuration upload

- Point 1 – controller detects that USB Flash Drive has been inserted.
  - If the communication via USB B is running, the controller will not detect the USB memory key.
  - On the other hand if the USB flash drive was detected, communication via USB B port is not possible.
- Point 2 – controller is in OFF mode
  - All operations with USB flash drive are possible only in OFF mode
- Point 6 – conditions for new firmware and configuration upload
  - The new configuration has been detected. Also there is a firmware file compatible with detected new configuration
  - Detection is based on name of configuration – required name: "InteliGen4 200-Genset name-M.N.P.B.ail4" and on name of firmware
  - There can be only one configuration file
  - More firmware can be stored on the USB flash drive. Controller automatically selects the compatible firmware with the highest version.
- Point 7 – Pop-up message
  - Do you want to update firmware and configuration?
- Point 8 – Configuration and firmware upload
  - Current archive is download to USB flash drive (Name = SN_YYMMDDHHMM).
  - New firmware is uploaded into the controller
  - New configuration is uploaded into the controller
  - History record "Firmware loaded" and "Config loaded" is made
  - Confirming file (.txt) on USB flash drive is made (Name = SN_YYMMDDHHMM)
    - Content: Serial number, Year/Date/Time, Upgrade to the FW "Name of the new FW" successful, Upgrade to the FW "Name of the new CFG" successful.
  - Confirmation pop-up message: "Controller programming successful"

## Configuration download

- Point 1 – controller detects that USB Flash Drive has been inserted.
  - If the communication via USB B is running, the controller will not detect the USB memory key.
  - On the other hand if the USB flash drive was detected, communication via USB B port is not possible.
- Point 2 – controller is in OFF mode
  - All operations with USB flash drive are possible only in OFF mode
- Points 3, 6, 9 – conditions for configuration download
  - There is no firmware or configuration with required name
- Point 12 – Pop-up message
  - Do you want to download archive?

- Point 11 – Configuration download
  - Current archive is download to USB flash drive (Name = SN_YYMMDDHHMM).
  - Confirmation pop-up message: "Archive successfully saved"

## 5.5.42 User Buttons

The User button is a binary signal. Its value can be set by its setpoint or by remote connection (WebSupervisor or by third party device such as Modbus).

States of user buttons signals are visible in the Values group User Buttons. There are 16 user buttons available.

### Each setpoint has these options

| Option | Description |
|---|---|
| **COMMAND** | The LBO User Button X is controlled by command from WebSupervisor or third party device. |
| **MAN OFF** | The LBO User Button X is controlled manually via the setpoint, value of the user button is still 0. |
| **MAN ON** | The LBO User Button X is controlled manually via the setpoint, value of the user button is still 1.<br>***Note:*** *You should always switch from MAN ON to MAN OFF before switching to COMMAND, otherwise value of the LBO User Button will be 1 until command is received.* |

### Commands

Commands can be sent from third party device via Modbus or remote connection (WebSupervisor). Following types are available:

| Command | Description |
|---|---|
| **ON/OFF** | When a command ON is received, User Button is activated. Subsequent commands ON when User Button is active have no effect. If a command OFF is received, User Button is deactivated. Subsequent commands OFF when User Button is inactive have no effect. |
| **TOGGLE** | When a command TOGGLE is received, User Button is activated. Next command TOGGLE when User Button is active deactivates User Button and so on. |
| **PULSE** | When a command PULSE is received, User Button is activated for the set duration.<br>Pulse length is 200 ms (user can use this pulse in PLC to prolong it using e.g. block Delay)<br>Consequent commands PULSE sent during duration of the pulse prolong the duration accordingly.<br>When the setting of pulse duration is changed while the pulse is active, the current pulse will have the original duration and the new setting is applied for the next pulse.<br>If the User Button is active (as a result of COMMAND ON or COMMAND TOGGLE) and COMMAND PULSE comes, User Button remains active for the duration of the pulse and then it deactivates.<br>While a pulse is active (duration of the pulse) and COMMAND ON, COMMAND OFF or |

| Command | Description |
|---|---|
| | COMMAND TOGGLE comes, the pulse is canceled. Next state depends on the canceling command |

***Note:***

- *COMMAND ON – User Button remains active until COMMAND OFF or COMMAND TOGGLE comes*
- *COMMAND OFF or COMMAND TOGGLE – User Button deactivates until COMMAND ON, COMMAND TOGGLE or COMMAND PULSE come*

### User button MODBUS commands

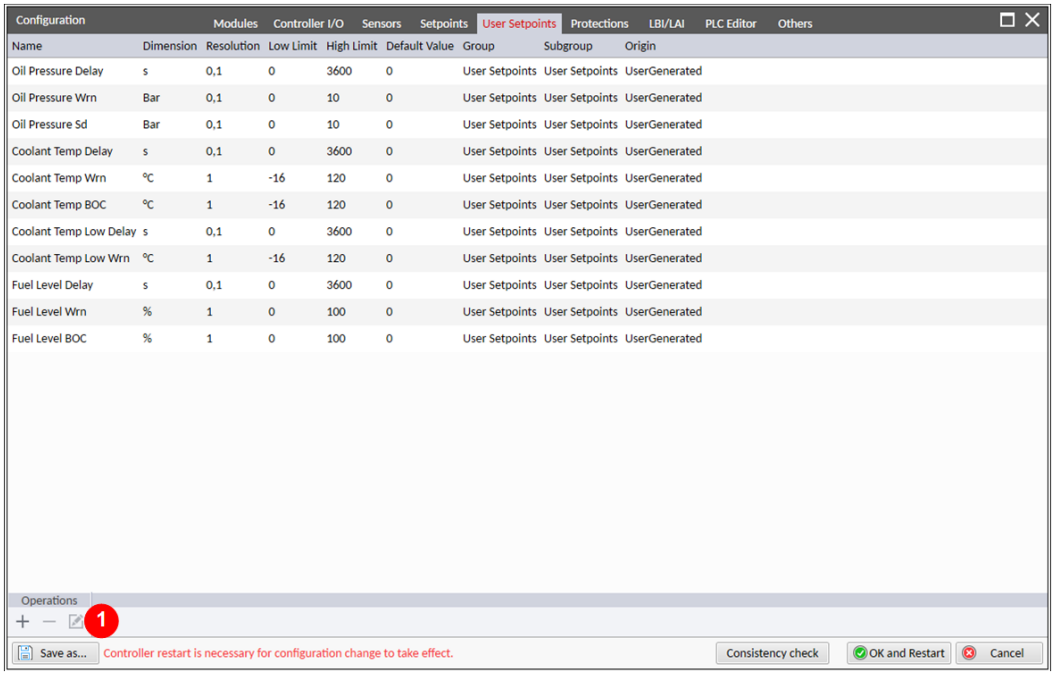
| | User Button 1 | User Button 2 | User Button 3 | User Button 4 | User Button 5 | User Button 6 | User Button 7 | User Button 8 |
|---|---|---|---|---|---|---|---|---|
| **PULSE** | 00 0A 00 00 00 47 | 00 14 00 00 00 47 | 00 1E 00 00 00 47 | 00 28 00 00 00 47 | 00 32 00 00 00 47 | 00 3C 00 00 00 47 | 00 46 00 00 00 47 | 00 50 00 00 00 47 |
| **TOGGLE** | 00 0B 00 00 00 47 | 00 15 00 00 00 47 | 00 1F 00 00 00 47 | 00 29 00 00 00 47 | 00 33 00 00 00 47 | 00 3D 00 00 00 47 | 00 47 00 00 00 47 | 00 51 00 00 00 47 |
| **ON** | 00 0C 00 00 00 47 | 00 16 00 00 00 47 | 00 20 00 00 00 47 | 00 2A 00 00 00 47 | 00 34 00 00 00 47 | 00 3E 00 00 00 47 | 00 48 00 00 00 47 | 00 52 00 00 00 47 |
| **OFF** | 00 0D 00 00 00 47 | 00 17 00 00 00 47 | 00 21 00 00 00 47 | 00 2B 00 00 00 47 | 00 35 00 00 00 47 | 00 3F 00 00 00 47 | 00 49 00 00 00 47 | 00 53 00 00 00 47 |
| | **User Button 9** | **User Button 10** | **User Button 11** | **User Button 12** | **User Button 13** | **User Button 14** | **User Button 15** | **User Button 16** |
| **PULSE** | 00 5A 00 00 00 48 | 00 64 00 00 00 48 | 00 6E 00 00 00 48 | 00 78 00 00 00 48 | 00 82 00 00 00 48 | 00 8C 00 00 00 48 | 00 96 00 00 00 48 | 00 A0 00 00 00 48 |
| **TOGGLE** | 00 5B 00 00 00 48 | 00 65 00 00 00 48 | 00 6F 00 00 00 48 | 00 79 00 00 00 48 | 00 83 00 00 00 48 | 00 8D 00 00 00 48 | 00 97 00 00 00 48 | 00 A1 00 00 00 48 |
| **ON** | 00 5C 00 00 00 48 | 00 66 00 00 00 48 | 00 70 00 00 00 48 | 00 7A 00 00 00 48 | 00 84 00 00 00 48 | 00 8E 00 00 00 48 | 00 98 00 00 00 48 | 00 A2 00 00 00 48 |
| **OFF** | 00 5D 00 00 00 48 | 00 67 00 00 00 48 | 00 71 00 00 00 48 | 00 7B 00 00 00 48 | 00 85 00 00 00 48 | 00 8F 00 00 00 48 | 00 99 00 00 00 48 | 00 A3 00 00 00 48 |

***Note:*** *Table provides data which has to be written into MODBUS registers 4207-4209 (count 3) using function 16 for specific user button and command type.*

MODBUS Register: 44208(4207), Function 16, Count 3

## 5.5.43 User setpoints

Controller allows user to create their own setpoints, as well as edit and delete created setpoints. The number of setpoints created by the user is limited to 128. All setpoints created by user are located in a group selected by a user. The Comm. object number (**CO**) can be found via InteliConfig (Tools tab → Generate Cfg image (COM)). User setpoints can be used to manage User protections and PLC.




| | | |
|---|---|---|
| 1 | **Add** User setpoint | + |
| | **Delete** selected User setpoint | × |
| | **Edit** selected User setpoint | ✎ |

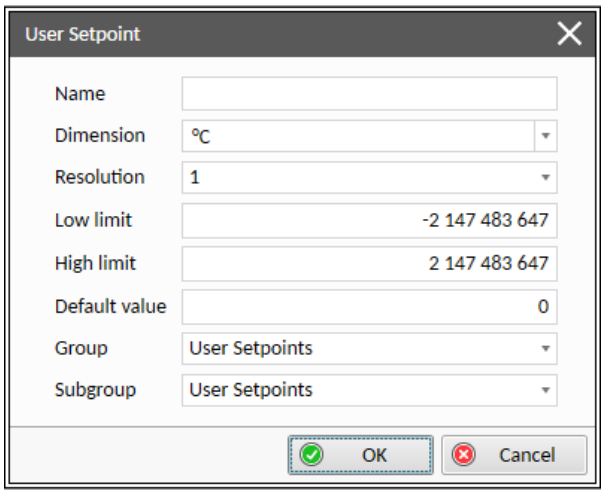



Image 5.75 Setting parameters of a user setpoint

### Contents of the user setpoint

| | |
|---|---|
| Name | Max. 32 characters<br>***Note:*** *Does not consider duplicities (It is possible to have setpoints with the same name, but it is not recommended.)* |
| Dimension | Can be chosen from a list or<br>User can create their own with a limit of 32 characters. |
| Resolution | Max. 4 decimal place |
| Low Limit | Range of the data type INT32 (restricted by resolution).<br>Value is set as a constant (can not be set as setpoint).<br>Max. value cannot exceed High Limit. |
| High Limit | Range of the data type INT32 (restricted by resolution).<br>Value is set as a constant (can not be set as setpoint).<br>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.<br>Position of a setpoint in a list. |
| Subgroup | Subgroup in which setpoint will be shown. |

## 5.5.44 Voltage/PF Control

The voltage control output is used to control the voltage or the power factor of the engine. The voltage regulation, PF regulation and VAr sharing are realized through the voltage control. The voltage request is internal value of the regulator. This value is transformed to range -10 .. 10 V based on setpoints **Voltage Regulator Low Limit (page 390)** limit and **Voltage Regulator High Limit (page 390)**. This value of voltage request is then transformed to request which comes out of the controller. There are several ways how to send this request to Gen-set:

- Analog output (integrated AVR interface)
- Binary pulse control

### Voltage control outputs

#### Analog output (integrated AVR interface)

The direction of speed regulation required by Speed regulator of the engine is given by the setpoint **Voltage Regulator Character (page 389)**. A full range change of the AVR output (from **Voltage Regulator Low Limit (page 390)** to **Voltage Regulator High Limit (page 390)**) should cause 5-10% change of the voltage (**Voltage Regulator Low Limit (page 390)** ~ 95% **Nominal Voltage Ph-N (page 278)**, **Voltage Regulator Bias (page 390)** ~ 100% **Nominal Voltage Ph-N (page 278)**, **Voltage Regulator High Limit (page 390)** ~ 105% **Nominal Voltage Ph-N (page 278)**).

#### Binary pulse control

The internal voltage request is transformed to Up/Down pulse control. These pulses get out of the controller via binary outputs **AVR Up (page 646)** and **AVR Down (page 646)**. Length of pulses **AVR Up (page 646)** and **AVR Down (page 646)** depends on the difference of actual voltage and requested voltage (actual reactive power and requested reacted power, actual PF and requested PF) and on the parameter **Tau**

**Voltage Regulator Actuator (page 391)**. **Tau Voltage Regulator Actuator (page 391)** defines the pulse duration which is needed for the voltage controller to travel from minimal position to the maximal position. The Maximum length of pulses is limited to 5 s, the minimal length of pulses is limited to 150 ms and minimal length between the pulses is 200 ms.

# Voltage/PF control adjustment

## Voltage adjustment

- Set **Voltage Gain (page 391)**, **Voltage Int (page 392)** to zero and **Voltage Regulator Bias (page 390)** to 50 %.
- Start the Gen-set in MAN Mode to without load.
- Adjust generator voltage to **Nominal Voltage Ph-N (page 278)** by change of **Voltage Regulator Bias (page 390)**.
- Change **Voltage Regulator Bias (page 390)** to 0 % and 100 % to check generator voltage control range (typically ±10 % of **Nominal Voltage Ph-N (page 278)**).
- Set **Voltage Regulator Bias (page 390)** to again reach **Nominal Voltage Ph-N (page 278)** on the generator.
- When Gen-set is running unloaded increase carefully **Voltage Gain (page 391)** to unstable point and then decrease value by 30 % to insure stable performance.
- Adjust **Voltage Int (page 392)** (usually setting to 100 % gives optimal performance).

## PF adjustment

### MINT application

Power factor control loop is active in parallel to mains mode only (MCB feedback closed). Switch off other engines while adjusting.

- Set the same values to **PF Gain (page 392)** and **PF Int (page 392)** as in the chapter **Voltage adjustment (page 213)** for parameters **Voltage Gain (page 391)** and **Voltage Int (page 392)**.
- Set **#System BaseLoad (page 264)** = 30 % of **Nominal Power (page 274)** and **#System Power Factor (page 264)** = 1.0.
- Start and synchronize the Gen-set in MAN Mode by pressing GCB ON/OFF
- When running in parallel to mains loaded on 30 %, increase slowly **PF Gain (page 392)** to unstable point and then decrease the value by 30 % to insure stable performance.
- Adjust **PF Int (page 392)** (usually setting to 100 % gives optimal performance).

***Note:*** *To judge optimal adjusting of the power factor induce generator power jumps by **Voltage Regulator Bias (page 390)** change or by **#System BaseLoad (page 264)** change.*

### SPtM application

Power factor control loop is active in parallel to mains mode only (MCB feedback closed).

- Set the same values to **PF Gain (page 392)** and **PF Int (page 392)** as in the chapter **Voltage adjustment (page 213)** for parameters **Voltage Gain (page 391)** and **Voltage Int (page 392)**.
- Set **Baseload (page 261)** = 30 % of **Nominal Power (page 274)** and **BasePower Factor (page 262)** = 1.0.
- Start and synchronize the Gen-set in MAN Mode by pressing GCB ON/OFF.

- When running in parallel to mains loaded on 30 %, increase slowly **PF Gain (page 392)** to unstable point and then decrease the value by 30 % to insure stable performance.
- Adjust **PF Int (page 392)** (usually setting to 100 % gives optimal performance).

***Note:*** *To judge optimal adjusting of the power factor induce generator power jumps by* ***Voltage Regulator Bias (page 390)*** *change or by* ***Baseload (page 261)*** *change.*

### 5.5.45 Voltage phase sequence detection

The controller detects phase sequence 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 287)**. When the phases are connected in different order (e.g. L1,L3,L2 or L2,L1,L3) the following alarms are detected:

- **ALI Gen Ph Rotation Opposite (page 741)**
- **ALI Mains Ph Rotation Opposite (page 743)**

**back to Functions**

# 5.6 User management and data access control

- Accessing, monitoring or controlling the device via any communication interface requires a 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 their 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.

***Note:*** *For trusted interfaces there is an "implicit user"(****see Implicit account on page 215****) automatically logged in always while no other explicit user is logged in.*

## 5.6.1 Types of interfaces

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

- **Trusted**
  - Trusted interfaces are operated locally inside a closed environment/ infrastructure where additional measures against misuse or attack take place (e.g. physical access limitation). Due to the nature of this interface less strict cybersecurity rules may be applied.
  - Trusted interfaces provide **Implicit account (page 215)** function which allows the performance of certain operations without requiring an explicit user to log in.
  - Trusted interfaces are USB, RS232, RS485.
- **Untrusted**
  - General-purpose interfaces, which may be exposed to public networks, such as the Internet, are untrusted. The communication is running through networks which are not under control of the entity who operates the controller. Thus, strict cybersecurity rules must apply for this type of interface.
  - Untrusted interface are Ethernet and cellular module.

## 5.6.2 User accounts

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

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

### User account must have the following properties

| | |
|---|---|
| **Username** | Consists of 6-15 alphanumeric characters, must contain at least 1 letter. This is the main identifier of the particular user account. |
| **Password** | Consists of 6-15 alphanumeric characters, must contain at least 1 letter and 1 digit. This is the password that is used together with user name to authenticate (log-in). |
| **User identifier (UID)** | Optional 4-digit identification string which can be used for simplified login at trusted interfaces (e.g. from InteliVision display when connected via Ethernet. |
| **PIN** | 4-digit “password” to be used together with UID. |
| **Access level** | Determines **Access to controller data (page 219)** |

### Implicit account

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

- The implicit account is fixedly defined in the firmware.
- The implicit account has fixed access level 0, unless production mode is activated (**see Production mode on page 216**).
- Implicit user is logged in any time no other user is logged in at the respective interface.

### User login

To login to the controller the **username and password must be provided into the login form** of the application (**InteliConfig (page 13)**, **WebSupervisor (page 13)**.

Alternatively, at **trusted interfaces**, it is possible to **login using UID and PIN** instead of username and password. This method of login is designed to simplify the login procedure at devices without alphanumeric keyboard (e.g. InteliVision).

***Note:*** *The controller is featured with a protection against brute force attack to user account credentials. For details* ***see Account break protection on page 218****.*

### 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.

## Production mode

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

In production mode the **Implicit account (page 215)** has access level adjusted to **administrator level**. Thus, in production mode at trusted interfaces (like USB) the operator is allowed to perform any operation which normally requires administrator to log in without the need of logging in.

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

There is active alarm **Wrn Production Mode (page 736)** in the alarm list any time production mode is active. To turn off the Production mode go to User management and uncheck the checkbox Production mode or go to Production Mode display screen and select disable.

## Factory default accounts

Each controller comes from the production with one factory default administrator account having following credentials:

**Username:** "administrator"

**Password:** <serial number of the controller>

> **Example:** 12345678

**User ID:** "0001"

**User PIN:** "0000"

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

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

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

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

## 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. For more information **see Resetting the administrator password on page 220**.

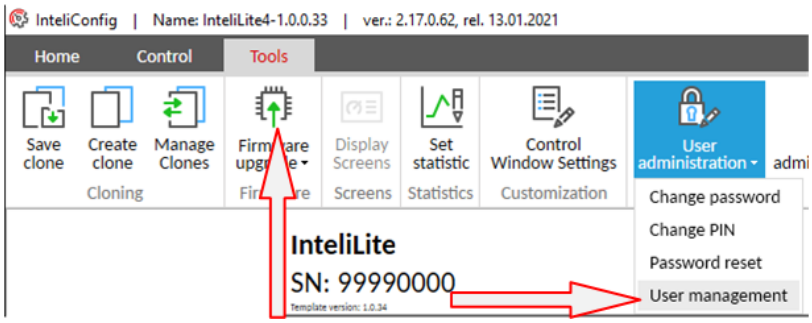
After reset procedure user accounts are in factory default state.

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

## 5.6.3 Managing accounts

User accounts can be managed from InteliConfig while an online connection to the controller is established. A 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.

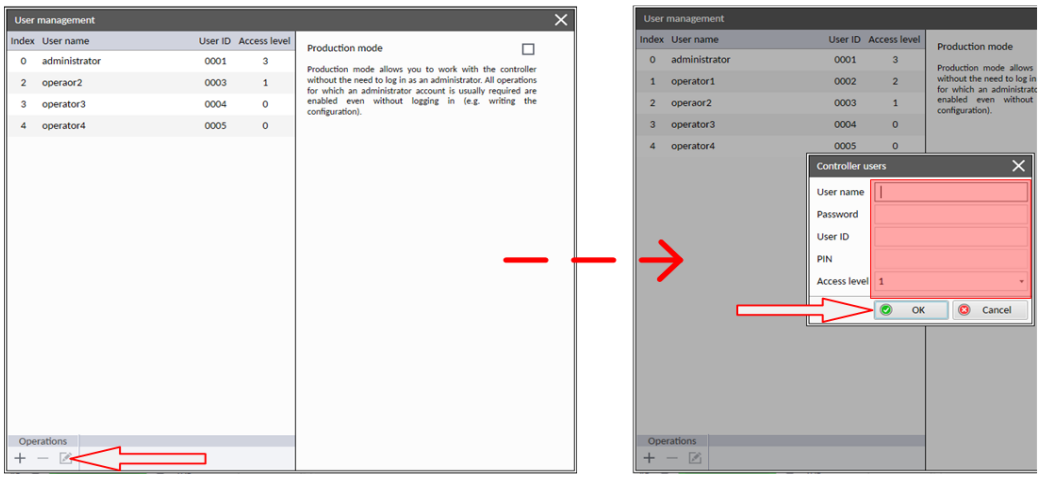
**IMPORTANT: The total available number of accounts in the controller is 5.**




## Adding an account

Click on the "**+**" button in the lower left corner of the user management window, then provide the account properties as described in **User accounts (page 215)**.

***Note:*** *Rules for the* ***User accounts (page 215)*** *credentials apply and some items are optional*



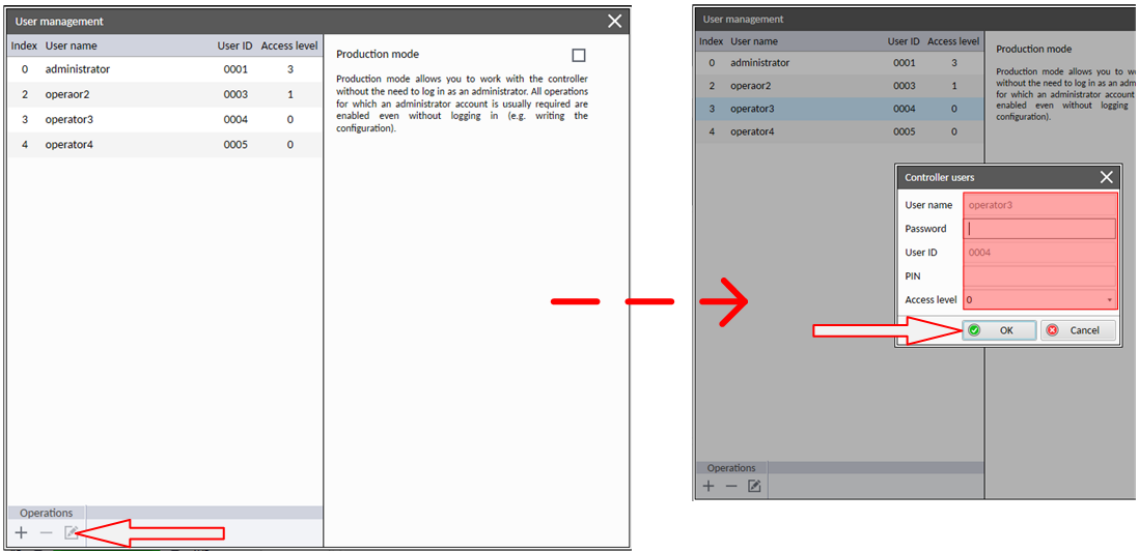

## Deleting an account

Select the account that has to be deleted and click on the "**-**" button in the lower left part of the user management window.

***Note:*** *You can not delete your own administrator account unless there is another administrator account present in the controller.*

## Changing account properties

Select the account that needs to be deleted and click on the "pencil" button in the lower left part of the user management window. Then modify the desired property or properties. You can modify one or more properties at once.




***Note:*** *It is not possible to change user name or UID. Instead of this create a new account with the required changes and delete the original one.*

# 5.6.4 Account break protection

The controller protects the user accounts against 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 736)** is activated. The alarm can be used to send an active message (e.g. e-mail) to inform about that situation The exact behavior of the controller depends on the situation.

## Password protection

1. If a 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 the correct password is provided.
3. After the blocking period elapses, another 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 repeats 1-3 times further, the duration of the blocking period is multiplied by 2 in each consequential cycle. However, the maximal blocking time is 20 minutes, the blocking time is never higher.

## PIN protection

If a 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 this 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 and does not provide either 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.

## 5.6.5 Access to controller data

Every request for reading data from the controller or writing data into it requires a user to be logged. **This user must have an 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). **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 InteliConfig.

### Special situations

There are several operations that require administrator level:

- Programming firmware
- Programming configuration
- Managing user accounts

## 5.6.6 Cybernetic security

The cybernetic security is formed by:

- Protection against a brute-force attack to the password
- Secure method to reset the password
- A new technology of encryption of the remote communication
- Web interface can be disabled

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

### Protection against the brute force attack

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

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

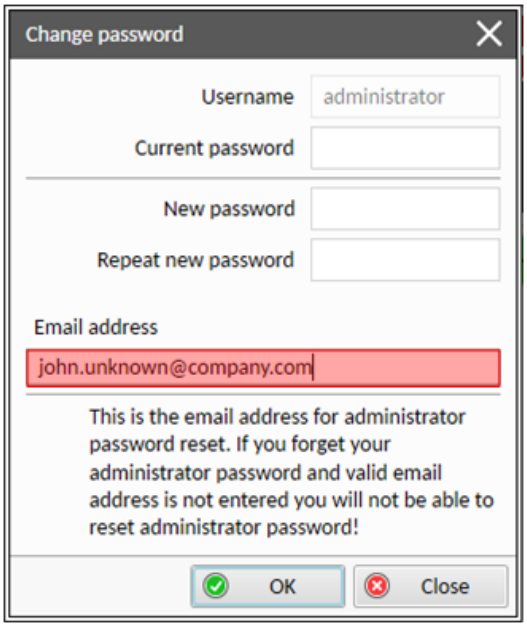
***Note:*** *Blocking of the controller for entering the password has no influence on controller / Gen-set operation*

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

## Resetting the administrator password

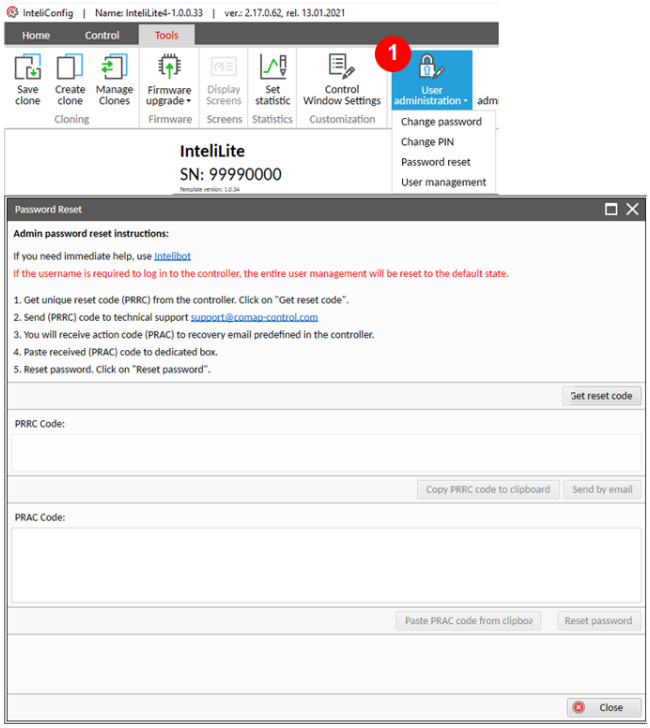
If **the administrator password is lost or controller is permanently locked** due to brute-force attack protection, proceed according to a procedure described below:

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



# Reset password procedure

1. Connect InteliConfig.
2. Get the password reset request code and send it via e-mail to support@comap-control.com



3. Once you receive the reply from ComAp, copy the code from the e-mail (all characters inside the box as indicated below)




Dear customer,

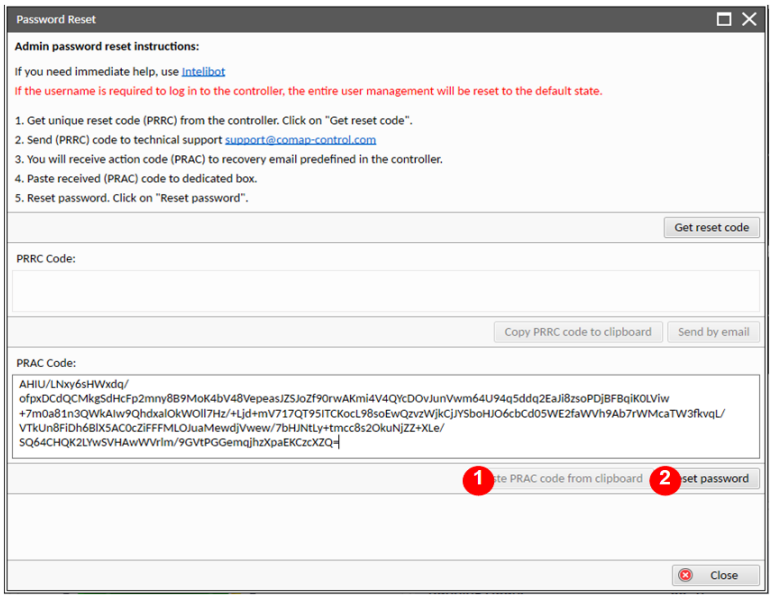
ComAp has received your request for resetting the password in the controller **N/A**, serial n umber **99990000**. Please perform following steps to finish the action.

1) Connect your PC application to the controller
2) Copy the action code stated below to the clipboard
3) Paste the clipboard content into the appropriate field in the PC application and press the "Reset" button. Password will be reset to the default value.
4) Adjust and remember new password

**Code:**

```
AHIU/LNxy6sHWxdq/ofpxDCdQCMkgSdHcFp2mny8B9MoK4bV48VepeasJZSJoZf90rwA
Kmi4V4QYcDOvJunVwm64U94q5ddq2EaJi8zsoPDjBFBqiK0LViw+7m0a81n3QWkAIw9Q
hdxalOkWOll7Hz/+Ljd+mV717QT95ITCKocL98soEwQzvzWjkCjJYSboHJO6cbCd05WE
2faWVh9Ab7rWMcaTW3fkvqL/VTkUn8FiDh6BlX5AC0cZiFFFMLOJuaMewdjVwew/7bHJ
NtLy+tmcc8s2OkuNjZZ+XLe/SQ64CHQK2LYwSVHAwWVrlm/9GVtPGGemqjhzXpaEKCzc
XZQ=
```

4. Paste the code into the password reset window




## Encryption of the communication

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

**back to Controller setup**

# 6 Communication

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# 6.1 PC

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## 6.1.1 Direct communication

A RS232, USB, RS485 or ethernet interface can be used for direct cable connection to a PC.

### Connection via RS232

A plug-in communication module CM-RS232-485 is necessary for communication via RS232 connection.

The module is plugged into the slot located on the rear side of the controller. To find more information about installation of the modules **see Plug-in module installation on page 52**.

RS232 interface uses **COM1 Mode (page 476)** port of the controller. Use a cross-wired serial communication cable with DB9 female connectors and signals Rx, Tx, GND.

***Note:*** *Also USB-RS232 convertor can be used.*

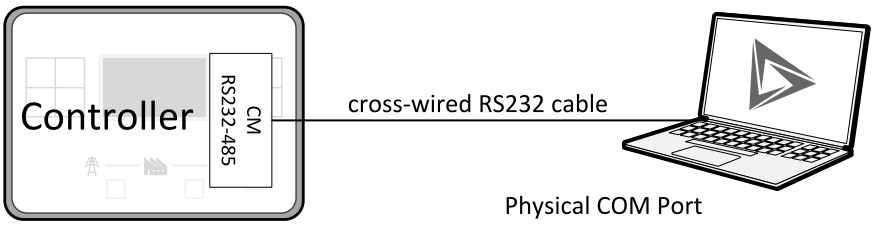



Image 6.1 Cross-wired RS232 cable is used

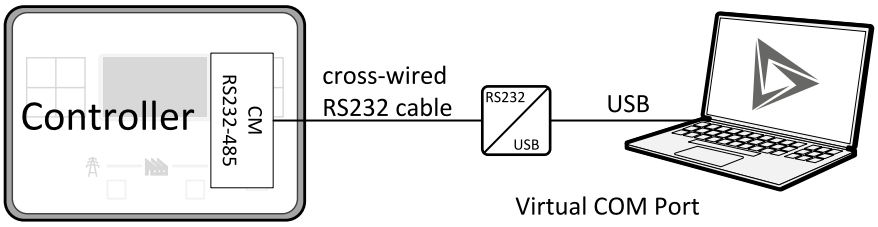



Image 6.2 Cross-wired RS232 cable and USB is used

### Connection via RS485

Plug-in module CM-RS232-485 or on board RS485 connector can be used for communication via RS485 connection.

The module is plugged into the slot located on the rear side of the controller. To find more information about installation of the modules **see Plug-in module installation on page 52**.

RS485 interface uses **COM2 Mode (page 478)** port of the controller.

***Note:*** *Also USB-RS485 convertor can be used.*

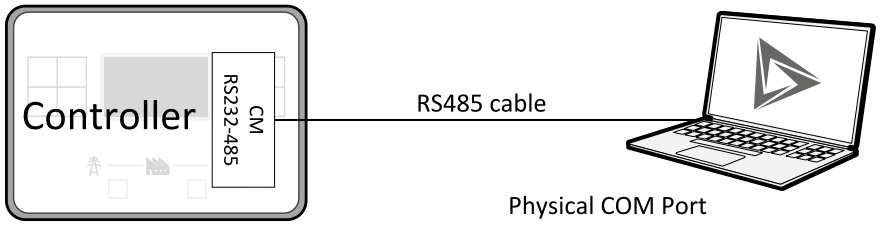



Image 6.3 Plug-in module CM RS232-485 is used

## Connection via Ethernet

A plug-in communication module CM3-Ethernet is necessary for Ethernet connection.

The module is plugged into the slot located on the rear side of the controller. To find more information about installation of the modules **see Plug-in module installation on page 52**.

This connection type is used for communication with the controller from InteliConfig or any other PC tool. This connection can be used regardless of whenever the AirGate is switched on or off. Only three remote clients can be connected at the same time (via AirGate only two remote clients at the same time). Eight remote clients can be connected at the same time (six direct IP clients and two AirGate clients).

To connect your PC tool to the controller use the INTERNET connection type and just put the CM3-Ethernet IP address into the Gen-set address box in the PC tool.

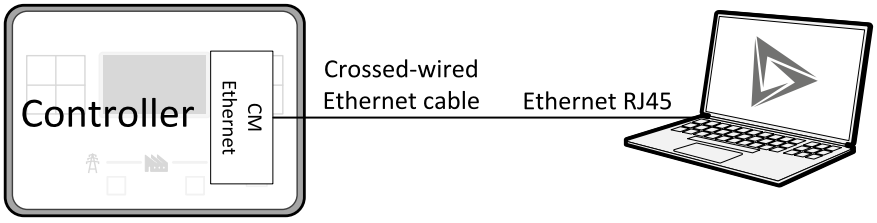



Image 6.4 Ethernet cable is used

## Connection via USB

USB interface uses HID profile.

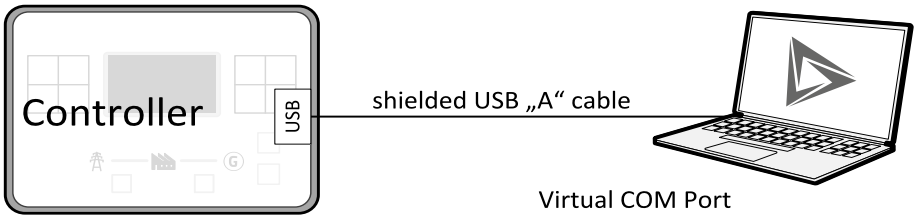



Image 6.5 Shielded USB type A cable is used

# 6.1.2 Remote communication

## Ethernet LAN connection

Direct IP LAN connection is intended to be used if the CM3-Ethernet module is reachable from the client computer by specifying the IP address at which the module can be contacted.

- If direct IP connection is to be used within a local network the CM3-Ethernet must have static IP address in the respective local network.

***Note:*** *If you have troubles with setting up static and public IP address for direct connection from Internet try using AirGate connection instead.*

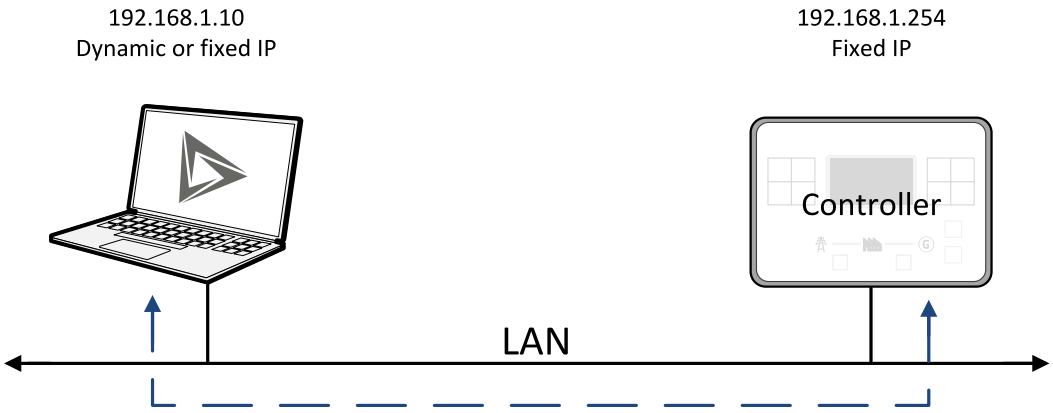



Image 6.6 Ethernet LAN connection

***Note:*** *For information how to setup an AirGate connection,* ***see AirGate connection on page 60****.*

## Onboard Ethernet setup

All settings related to the module are to be adjusted via the controller setpoints. The respective setpoints are located in the setpoint group Ethernet.

All actual operational values like actual IP address etc. are available in controller values in a group Ethernet.

## CM3-Ethernet module setup

All settings related to the module are to be adjusted via the controller setpoints. The respective setpoints are located in the setpoint group CM-Ethernet.

All actual operational values like actual IP address etc. are available in controller values in a group CM-Ethernet.

## Setting-up static IP address

There are two basic ways to get the static IP address.

First way is to switch the CM3-Ethernet to manual IP address mode. Adjust the setpoint **IP Address Mode (page 501)** to Manual. In that case all setpoints of IP settings (**IP Address (page 502)**, **Subnet Mask (page 502)**, **Gateway IP (page 503)**, **DNS IP Address 1 (page 504)**) must be adjusted manually. If this method is used several basic rules should be kept avoiding conflicts with the remaining network infrastructure:

- The static IP used in the controller must be selected in accordance with the local network in which CM3-Ethernet 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.*

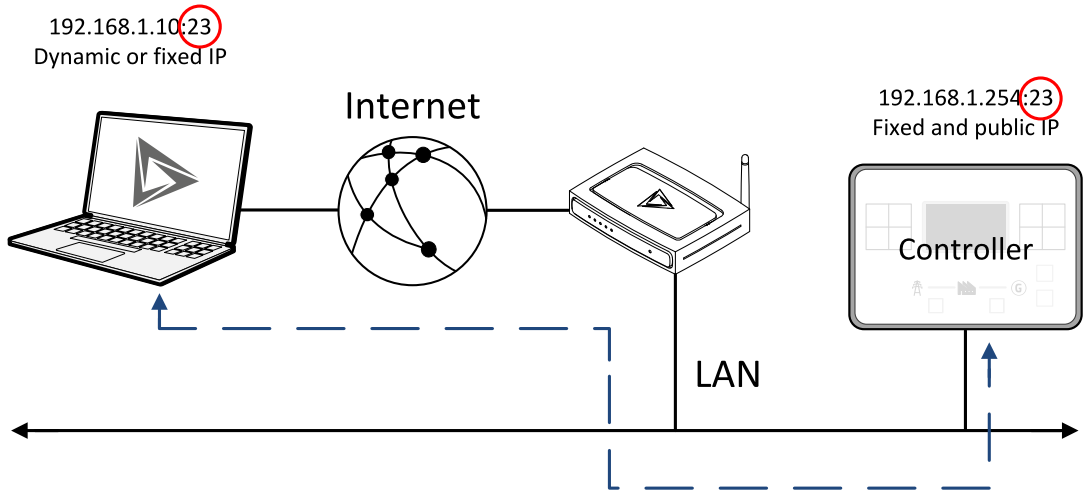
The second way to get the static IP address is to switch the CM3-Ethernet to automatic IP address mode. Adjust the setpoint**IP Address Mode (page 501)**to AUTOMATIC. In that case all IP settings are assigned by DHCP server. Then configure the DHCP server to assign always the same IP address (i.e. static IP address) to the particular CM3-Ethernet according to its MAC address.

# Internet 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 CM3-Ethernet is connected to the Internet via a local Ethernet network then in the most cases port forwarding must be created from the public IP address of the network gateway to the local IP address of CM3-Ethernet at the port specified for ComAp protocol. Different port numbers can be used to create multiple port forwarding rules in the same local network.




## AirGate

This connection type is intended for remote connection from InteliConfig, or any other ComAp PC tool over the Internet in situations, where obtaining fixed public IP address is not possible. Only two remote clients can be connected at the same time.

This connection type is active if AirGate connection is enabled. Setpoint **AirGate Address (page 506)** must contain AirGate server address. It can be entered in text form as well as numeric form. There is a public AirGate server available at the address "global.airgate.link".

Once the controller is connected to the Internet and the AirGate server address is properly adjusted then the controller registers automatically to the server and an identification string AirGate ID is given to a controller, which is visible at the controller screen.

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

- AirGate ID
- AirGate server
- Controller address
- User name and Password
- AirGate Key

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

## SMS

### Event SMS

The InteliGen4 200 controller equipped with the CM2-4G-GPS communication module is able to send Event SMS according to the setting of setpoint:

- **Event Message (page 516)**

> ***Note:** First, the setpoint **Telephone Number 1 (page 496)** must be adjusted to enable this function.*

The following events can be received by mobile phone:

- Engine Start/Stop
  - Manual Start/Stop
  - Remote Start/Stop
  - AMF Start/Stop (as Automatic Mains Failure Start/Stop)
  - Test Start/Stop Gen-set
- Mains Fail
- Mains Returned
- Load on Mains
- Load on Gen-set
- Test On Load

Message structure:

- Gen-set Name (hh:mm:ss dd.mm.yyyy)
- hh:mm:ss Mains Fail
- hh:mm:ss AMF Start
- hh:mm:ss Load on Gen-set
- hh:mm:ss Mains Returned
- hh:mm:ss Load on Mains
- hh:mm:ss AMF Stop

### Alarm SMS

The InteliGen4 200 controller equipped with the CM2-4G-GPS communication module is able to send Alarm SMS according to the setting of setpoints:

- **Wrn Message (page 517)**
- **Sd Message (page 517)**
- **BOC Message (page 515)**

***Note:*** *First, the setpoint **Telephone Number 1 (page 496)** must be adjusted to enable this function.*

Message structure:

- Gen-set Name
- AL=(Alarm 1, Alarm 2, Alarm x)

***Note:*** *An asterisk means that alarm is unconfirmed and an exclamation mark means that alarm is active.*

## Emails

### Event Email

The InteliGen4 200 controller equipped with the CM3-Ethernet communication module is able to send an Event Email according to the setting of setpoint:

- **Event Message (page 516)**

***Note:*** *Setpoints **Email Address 1 (page 513)** and **SMTP Sender Address (page 511)** or **SMTP Server Address (page 511)** must be adjusted to enable this function.*

Message structure:

Controller

---

Name: XXX

Serial number: XXX

SW branch: XXX

SW version: XXX

Application: XXX

Appl. version: XXX

Date: dd/mm/yyyy

Time: hh:mm:ss

Alarm list

---

Alarm 1

Alarm 2

Alarm 3

Events

---

hh:mm:ss Event 1

hh:mm:ss Event 2

hh:mm:ss Event 3

## Alarm Email

The InteliGen4 200 controller equipped with the CM3-Ethernet communication module is able to send Alarm Emails according to the setting of setpoints:

- **Wrn Message (page 517)**
- **Sd Message (page 517)**
- **BOC Message (page 515)**

***Note:*** *Setpoints **Email Address 1 (page 513)** and **SMTP Sender Address (page 511)** or **SMTP Server Address (page 511)** must be adjusted to enable this function.*

Message structure:

Controller

---

Name: XXX

Serial number: XXX

SW branch: XXX

SW version: XXX

Application: XXX

Appl. version: XXX

Date: dd/mm/yyyy

Time: hh:mm:ss

Alarm list

---

Alarm 1

Alarm 2

Alarm 3

History events

---

0 dd/mm/yyyy hh:mm:ss.0 Event 1

-1 dd/mm/yyyy hh:mm:ss.0 Event 2

-2 dd/mm/yyyy hh:mm:ss.0 Event 3

***Note:*** *An asterisk means that alarm is unconfirmed and an exclamation mark means that alarm is active.*

# 6.2 Connection to 3rd party systems

6.2.1 SNMP ..... 231
6.2.2 MODBUS-RTU, MODBUS/TCP ..... 233

**back to Communication**

## 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".

- CM3-Ethernet module is required for SNMP function
- Supported versions – SNMP v1 and SNMP v2c

The SNMP Agent function is to be enabled by the setpoint **SNMP Agent (page 508)** in the CM-Ethernet setpoint group. The setpoints **SNMP RD Community String (page 510)** and **SNMP WR Community String (page 510)** in the same group can be used to customize the "community strings" for the read and write operations which function like "passwords". All requests sent from the SNMP Manager must contain a community string which matches with the community string adjusted in the controller otherwise the controller will refuse the operation.

### MIB table

The "MIB table" (Management Information Base) is a table which gives to the Manager a description of all objects provided by the Agent.

- The MIB table is specific for each controller type and configuration
- The MIB table is to be exported from the controller configuration using InteliConfig
- Controllers with identical firmware and configuration also share 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 OID of the InteliGen4 200 controller is 1.3.6.1.4.1.28634.36. Under this node can be found 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 controllers 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 controllers regardless of the firmware version/type and configuration.
- GroupWrCfg contains read-write objects that depend on the firmware version/type and configuration.
- GroupW contains write-only objects.
- NotificationData group contains objects that are accessible only as bindings of the notification messages.

### SMI version

In InteliConfig the MIB table may be exported in two different formats – SMI v1 and SMI v2. The format which shall be used for export depends on the SNMP Manager and the SMI version that it supports.

Typically, SMI v1 is used for SNMP v1 and vice versa, but it is not a rule. SMI v2 may also be used for SNMP v1.

## SNMP notifications

Except for 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 which 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 CM-Ethernet setpoint group by the setpoints **SNMP Traps IP Address 1 (page 509)** and **SNMP Traps IP Address 2 (page 509)**. If the Manager address is not adjusted the particular notification channel is off. The controller will send the notifications in the format adjusted by the setpoint SNMP Trap Format.

- Each notification (kind of event) is identified by a 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 1st 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.

## SMI version

In InteliConfig the MIB table may be exported in two different formats – SMI v1 and SMI v2. The format which shall be used for export depends on the SNMP Manager and the SMI version that it supports. Typically, SMI v1 is used for SNMP v1 and vice versa, but it is not a rule and SMI v2 may also be used for SNMP v1.

## SNMP reserved objects

| Name | OID | Access | Data type | Meaning |
|---|---|---|---|---|
| pfActionArgument | groupWrFix.24550 | read,write | Gauge32 | Writing: command argument<br>Reading: command return value |
| pfActionCommand | groupW.24551 | write | Integer32 | Command code *) |
| pControllerMode | groupWrCfg.8315 | read, write | Integer32 | Writing: changing controller mode<br>Reading: checking controller mode |

***Note:*** **)*
*For list of commands, arguments and description of the procedure of invoking commands see the description of the Modbus protocol.*

# 6.2.2 MODBUS-RTU, MODBUS/TCP

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 on serial interfaces (via on board RS485 connector or via CM-RS232-485 communication module). The MODBUS-RTU server must be activated by switching the setpoint **COM1 Mode (page 476)** or **COM2 Mode (page 478)** or **RS485 Mode (page 289)** into the Modbus position. The serial speed for MODBUS-RTU communication is adjusted by the setpoint **COM1 MODBUS Communication Speed (page 477)** or **COM2 MODBUS Communication Speed (page 479)** or **RS485 Modbus Speed (page 290)**.
- MODBUS/TCP can be used on the Ethernet interface (CM3-Ethernet module is required). Up to 2 clients can be connected simultaneously. The MODBUS/TCP server must be activated by the setpoint **MODBUS Server (page 508)**.

MODBUS, MODBUS/TCP protocol can be used simultaneously with Web connection and direct Ethernet / AirGate connection.

> **IMPORTANT: Do not use setpoints for regulation purposes. Avoid fast periodical re-writing of any setpoint. Use remote control registers instead.**

***Note:*** *Modbus-RTU serial communication mode is 8-N-1 – startbit 1, 8 data bits, no parity and 1 stopbit.*

## Address space

The object address space is separated into several areas as described in the table below. The actual mapping of specific controller data objects to specific Modbus addresses, which depends on configuration, can be exported into a text file from the appropriate controller archive using InteliConfig. There are several special registers with fixed meaning (reserved registers) which are listed in a separate table in this chapter.

| MODBUS address | Meaning | Access | MODICON object type | MODBUS function |
|---|---|---|---|---|
| 0000 .. 0999 | Binary objects | Read only | Discrete Inputs | Read: 01, 02 |
| 1000 .. 2999 | Values | Read only | Input Registers | Read: 03, 04 |
| 3000 .. 3999 | Setpoints | Read/Write | Holding Registers | Read: 03, 04<br>Write: 06, 16 |
| 4200 .. 7167 | Reserved registers | Read/Write, depends on each specific register | Input Registers<br>Holding Registers | Read: 03, 04<br>Write: 06, 16 |

## Mapping data types to registers

As there are multiple data types in the controller but only one data type in MODBUS (the register, which is 2 byte long), a mapping table is necessary to compose and decompose the MODBUS messages correctly.

| Data type | Meaning | Number of registers | Data maping |
|---|---|---|---|
| Integer8 | 1-byte signed integer | 1 | MSB = sign extension<br>LSB = value |
| Unsigned8 | 1-byte unsigned integer | 1 | MSB = 0<br>LSB = value |
| Integer16 | 2-byte signed integer | 1 | MSB = value, MSB<br>LSB = value, LSB |
| Unsigned16 | 2-byte unsigned integer | 1 | MSB = value, MSB<br>LSB = value, LSB |
| Integer32 | 4-byte signed integer | 2 | MSB1 = value, byte 3 (MSB)<br>LSB1 = value, byte 2<br>MSB2 = value, byte 1<br>LSB2 = value, byte 0 (LSB) |
| Unsigned32 | 4-byte unsigned integer | 2 | MSB1 = value, byte 3 (MSB)<br>LSB1 = value, byte 2<br>MSB2 = value, byte 1<br>LSB2 = value, byte 0 (LSB) |
| Binary8 | 8-bit binary value | 1 | MSB = 0<br>LSB = value, bits 0-7 |
| Binary16 | 16-bit binary value | 1 | MSB = value, bits 8-15<br>LSB = value, bits 0-7 |
| Binary32 | 32-bit binary value | 2 | MSB1 = value, bits 24-31<br>LSB1 = value, bits 16-23<br>MSB2 = value, bits 8-15 |

| Data type | Meaning | Number of registers | Data maping |
|---|---|---|---|
| | | | LSB2 = value, bits 0-7 |
| Char | 1-byte ASCII character | 1 | MSB = 0<br>LSB = ASCII value of the character |
| StrList | Index into a list of strings | 1 | MSB = 0<br>LSB = index into the list |
| ShortStr | Zero-terminated string of max 15 ASCII characters. | 8 | MSB1 = ASCII value of the 1. character<br>LSB1 = ASCII value of the 2. character<br>MSB2 = ASCII value of the 3. character<br>LSB2 = ASCII value of the 4. character<br>… |
| LongStr | Zero-terminated string of max 31 ASCII characters. | 16 | MSB1 = ASCII value of the 1. character<br>LSB1 = ASCII value of the 2. character<br>MSB2 = ASCII value of the 3. character<br>LSB2 = ASCII value of the 4. character<br>… |
| Date | Date (dd-mm-yy) | 2 | MSB1 = BCD (dd)<br>LSB1 = BCD (mm)<br>MSB2 = BCD (yy)<br>LSB2 = 0 |
| Time | Time (hh-mm-ss) | 2 | MSB1 = BCD (hh)<br>LSB1 = BCD (mm)<br>MSB2 = BCD (ss)<br>LSB2 = 0 |
| Alarm | An item of the Alarmlist | 27 | MSB1 = reserved for future use<br>LSB1 = reserved for future use<br>MSB2 = Alarm level *)<br>LSB2 = Alarm status **)<br>MSB3 = alarm string ***)<br>LSB3 = alarm string<br>MSB4 = alarm string<br>LSB5 = alarm string<br>… |

***Note:***
**) 1 .. level 1 (yellow), 2 .. level 2 (red), 3 .. sensor fail*
***) Bit0 – alarm is active, Bit1 – alarm is confirmed*
****) String encoding is UTF-8*

## Error codes (exception codes)

An 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 an 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 obtained by reading the registers 4205 – 4206.

## Reserved registers

There are several registers with specific meanings. 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<br>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 |
| 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 |

| Register addresses | Number of registers | Access | Data type | Meaning |
|---|---|---|---|---|
| 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 |
| 5001 | 1 | read/write | int16 | RemoteControl2B 2 |
| 5002 | 1 | read/write | int16 | RemoteControl2B 3 |
| 5003 | 1 | read/write | int16 | RemoteControl2B 4 |
| 5004 | 1 | read/write | int16 | RemoteControl2B 5 |
| 5005 | 1 | read/write | int16 | RemoteControl2B 6 |
| 5006 | 1 | read/write | int16 | RemoteControl2B 7 |
| 5007 | 1 | read/write | int16 | RemoteControl2B 8 |
| 5100-5001 | 2 | read/write | int32 | RemoteControl4B 1 |
| 5102-5003 | 2 | read/write | int32 | RemoteControl4B 2 |
| 5104-5105 | 2 | read/write | int32 | RemoteControl4B 3 |
| 5106-5107 | 2 | read/write | int32 | RemoteControl4B 4 |
| 5200 | 1 | read/write | binary16 | RemoteControlBin |
| 5210 | 1 | read/write | - | RemoteControlBin_1 |
| 5211 | 1 | read/write | - | RemoteControlBin_2 |
| 5212 | 1 | read/write | - | RemoteControlBin_3 |
| 5213 | 1 | read/write | - | RemoteControlBin_4 |
| 5214 | 1 | read/write | - | RemoteControlBin_5 |
| 5215 | 1 | read/write | - | RemoteControlBin_6 |
| 5216 | 1 | read/write | - | RemoteControlBin_7 |
| 5217 | 1 | read/write | - | RemoteControlBin_8 |
| 5218 | 1 | read/write | - | RemoteControlBin_9 |
| 5219 | 1 | read/write | - | RemoteControlBin_10 |
| 5220 | 1 | read/write | - | RemoteControlBin_11 |
| 5221 | 1 | read/write | - | RemoteControlBin_12 |
| 5222 | 1 | read/write | - | RemoteControlBin_13 |

| Register addresses | Number of registers | Access | Data type | Meaning |
|---|---|---|---|---|
| 5223 | 1 | read/write | - | RemoteControlBin_14 |
| 5224 | 1 | read/write | - | RemoteControlBin_15 |
| 5225 | 1 | read/write | - | RemoteControlBin_16 |

## List of commands and arguments

"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 cannot be closed in the specific situation etc.)

| Action | Command code | Argument | Return value |
|---|---|---|---|
| Engine start *) | 0x01 | 0x01FE0000 | 0x000001FF |
| Engine stop *) | 0x01 | 0x02FD0000 | 0x000002FE |
| Fault reset *) | 0x01 | 0x08F70000 | 0x000008F8 |
| Horn reset *) | 0x01 | 0x04FB0000 | 0x000004FC |
| GCB toggle *) | 0x02 | 0x11EE0000 | 0x000011EF |
| GCB on | 0x02 | 0x11EF0000 | 0x000011F0 |
| GCB off | 0x02 | 0x11F00000 | 0x000011F1 |
| MCB toggle *) | 0x02 | 0x12ED0000 | 0x000012EE |
| MCB on | 0x02 | 0x12EE0000 | 0x000012EF |
| MCB off | 0x02 | 0x12EF0000 | 0x000012F0 |

***Note:*** **)*
*This action is an equivalent of pressing the front panel button*

# MODBUS examples

**Modbus RTU examples**

- Reading of Battery voltage
  - Export table of values from InteliConfig

| Table: Values | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| Allowed Modbus functions: 03, 04 | | | | | | | | | |
| Register address | Com.Obj. | Name | Dimension | Type | Len | Dec | Min | Max | Group |
| **01053** | 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 a value 240 from register 01053. From the table of Modbus registers we get the dimension of read value and "Dec". Dec=1 means shift one decimal place to the right. So the battery voltage is **24.0 V**.

› Reading Nominal power

» Export table of values from InteliConfig

| Table: Values | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| Allowed MODBUS functions: 03, 04 | | | | | | | | | |
| Register address | Com.Obj. | Name | Dimension | Type | Len | Dec | Min | Max | Group |
| **01227** | 9018 | **Nominal Power** | **kW** | Integer | 2 | **0** | 0 | 32767 | Generator |

| 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 address | Com.Obj. | Name | Dimension | Type | Len | Dec | Min | Max | Group |
| **01089** | 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. This means Binary input 2 and binary input 5 are active.

***Note:*** *You can use Modbus function 4 instead of 3, the rest of the data remains the same (CRC differs).*

› Reading binary inputs as coil status.

| Table: Binaries | | | | | | |
|---|---|---|---|---|---|---|
| Allowed Modbus functions: 01, 02 | | | | | | |
| Addresses<br>Modbus Addr.<br>Prot. Addr. | Source<br>= Value<br>= State | C.O.#<br>State # | Name of<br>Value<br>Name of State | Bit # | Bit Name<br>Activated by protection (s): | Group |
| 00000 | Value | 8235 | Binary Inputs | 1 | GCB Feedback | Controller I/O |
| 00001 | Value | 8235 | Binary Inputs | 2 | MCB Feedback | Controller I/O |
| 00002 | Value | 8235 | Binary Inputs | 3 | Emergency Stop | 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<br>$0001_{hex}$ =<br>**0001**$_{dec}$ | | Number of registers | | CRC | |

| Response: (Numbers in Hex) | | | | | |
|---|---|---|---|---|---|
| 01 | 01 | 01 | 01 | 90 | 48 |
| Controller address | Modbus function | Length of data<br>$01_{hex}$ = 1 byte read | Data<br>$01_{hex}$ = active | CRC | |

The read data is 01. This means this binary input is active.

***Note:*** *You can use Modbus function 2 instead of 1, the rest of the data remains the same (CRC differs).*

› Starting the engine

Before starting engine you may need to write password depending on the settings in controller.

Table **Reserved registers (page 236)**

| Register address | Number of registers | Access | Data type | Meaning |
|---|---|---|---|---|
| 4207 - 4208 | 2 | read/write | Unsigned32 | Writing:command argument<br>Reading: command return value |
| 4209 | 1 | write | Unsigned16 | Command code |

Table **List of commands and arguments (page 238)**

| Action | Command code | Argument | Return value |
|---|---|---|---|
| Engine start | 0x01 | 0x01FE0000 | 0x000001FF |
| Engine stop | 0x01 | 0x02FD0000 | 0x000002FE |

| Request 1/2: (Numbers in Hex) | | | | | | |
|---|---|---|---|---|---|---|
| 01 | 10 | 10 | 6F | 00 | 03 | 06 |
| Controller address | Modbus function<br>$10_{hex} = 16_{dec}$ | Register address<br>$106F_{hex} = \mathbf{4207}_{dec}$ | | Number of registers | | Data length in bytes |

| Request 2/2: (Numbers in Hex) | | | | | | | |
|---|---|---|---|---|---|---|---|
| 01 | FE | 00 | 00 | 00 | 01 | 68 | 0B |
| Argument | | | | Command code | | CRC | |

***Note:*** *Command and argument may be written as one "packet" (function 16) or you can split it and write argument (function 16) and then the command code (function 6).*

› Nominal Power – writing

| Table: Setpoints | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| Allowed Modbus functions: 03, 04, 06, 16 | | | | | | | | | |
| Register address | 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: $01060BC00064_{hex}$

**Modbus TCP examples**

› Reading of Battery voltage

» Export table of values from InteliConfig

| Table: Values | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| Allowed Modbus functions: 03, 04 | | | | | | | | | |
| Register address | Com.Obj. | Name | Dimension | Type | Len | Dec | Min | Max | Group |
| **01053** | 8213 | **BatteryVoltage** | **V** | Integer | 2 | **1** | 0 | 400 | Controller I/O |

| Request: (Numbers in Hex) | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 00 | 00 | 00 | 00 | 00 | 06 | 01 | 03 | 04 | 1D | 00 | 01 |
| transaction identifier (usually 0) | | protocol identifier (usually 0) | | Length of data bytes following | | Controller address | Modbus function | Register address $041D_{hex}$ = **$1053_{dec}$** | | Number of registers | |

| Response: (Numbers in Hex) | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| 00 | 00 | 00 | 00 | 00 | 05 | 01 | 03 | 02 | 00 | F0 |
| transaction identifier (usually 0) | | protocol identifier (usually 0) | | Length of data bytes following | | Controller address | Modbus function | Length of data $02_{hex}$ = 2 bytes read | Data $00F0_{hex}$ = **$240_{dec}$** | |

We read a value of 240 from register 01053. From the table of Modbus registers we get the dimension of read value and "Dec". Dec=1 means shift one decimal place to the right. So the battery voltage is **24.0 V**.

**back to Communication**

# 7 Technical data

## Power supply

| | |
|---|---|
| **Power supply range** | 8-36 VDC |
| **Power consumption (without modules)** | 3.5 W |
| **RTC battery** | Replaceable (3 V) |
| **Fusing power** | 4 A w/o BOUT consumption |
| **E-Stop fusing** | 10 A |
| **Max. Power Dissipation** | 9 W |

## Operating conditions

| | |
|---|---|
| **Protection degree (front panel)** | IP 65 |
| **Operating temperature** | -20 ˚C to +70 ˚C |
| **Operating temperature for Low Temp. version** | -40 ˚C to +70 ˚C |
| **Storage temperature** | -30 ˚C to +80 ˚C |
| **Operating humidity** | 95 % non-condensing (EN 60068-2-30) |
| **Vibration** | 5-25 Hz, ± 1.6 mm<br>25-100 Hz, a = 4 g |
| **Shocks** | a = 500 m/s$^2$ |
| Surrounding air temperature rating 70 °C<br>Suitable for pollution degree 2 | |

## D+

| | |
|---|---|
| **Max. output current** | 250 mA |
| **Charging fail threshold** | Adjustable |

## Voltage measurement

| | |
|---|---|
| **Measurement inputs** | 3ph-n Gen voltage , 3ph-n Mains |
| **Measurement range** | 10-277 V AC / 10-480 V AC (EU)<br>10-346 V AC / 10-600 V AC (US/Canada) |
| **Linear measurement and protection range** | 350 V AC Ph-N<br>660 V AC Ph-Ph |
| **Accuracy** | 1 % |
| **Frequency range** | 30-70 Hz (accuracy 0.1 Hz) |
| **Input impedance** | 0.72 MΩ ph-ph , 0.36 MΩ ph-n |

## Voltage regulator output

| | |
|---|---|
| **Isolation** | Isolated |
| **Type** | max ±10 V DC |

## Speed governor output

| | |
|---|---|
| **Isolation** | Non-isolated |
| **Output Type** | ±10 V DC or 5 V @ 500 Hz, PWM selectable by jumper |

## Display

| | |
|---|---|
| **Type** | Build-in monochromatic 3.2" |
| **Resolution** | 132 × 64 px |

## Communications

| | |
|---|---|
| **USB Device** | Non-isolated type B connector |
| **USB Host** | Non-isolated type A connector |
| **RS485** | Isolated |
| **CAN 1 + CAN 2** | Isolated, 250 / 50 kbps, Terminator impedance 120 Ω |

## Current measurement

| | |
|---|---|
| **Measurement inputs** | 3ph Gen current, 1ph Mains current |
| **Measurement range** | 5 A |
| **Max. allowed current** | 10 A |
| **Accuracy** | ±20 mA for 0-2 A; 1 % of value for 2-5 A |
| **Input impedance** | <0.1 Ω |

## E-Stop

Dedicated terminal for safe E-Stop input.
Physical supply for binary outputs 1 & 2.

## Binary inputs

| | |
|---|---|
| **Number** | 8 |
| **Close/Open indication** | 0-2 VDC close contact<br>6-36 VDC open contact |

## Binary outputs

| | |
|---|---|
| **Number** | 8 |
| **Max. current** | BO1,2=5 A (60 °C); BO1,2=4 A (70 °C), BO3-8=0.5 A |
| **Switching to** | positive supply terminal |

## Analog inputs

| | |
|---|---|
| **Number** | 4, switchable (R/U/I) |
| **Range** | R = 0-2500 Ω; U = 0-10 V; I = 0-20 mA |
| **Accuracy** | R: ±2 % from value ±5 Ω in range 0-250 Ω<br>R: ±4 % from value in range 250 Ω-2500 Ω<br>U: 1 % from value ±100 mV<br>I: 1 % from value ±0.2 mA |

## +5 V Power supply output

| | |
|---|---|
| **Max. current** | 45 mA |

## Magnetic pickup

| | |
|---|---|
| **Voltage input range** | 4 Vpk-pk to 50 Vpk-pk in range 4 Hz to 1 kHz<br>6 Vpk-pk to 50 Vpk-pk in range 1 to 5 kHz<br>10 Vpk-pk to 50 Vpk-pk in range 5 to 10 kHz |
| **Frequency input range** | 4 Hz to 10 kHz |
| **Frequency measurement tolerance** | 0.2 % from measured value |

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# 8.1 Controller objects

## 8.1.1 List of controller objects types

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## 8.1.2 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 EEPROM memory, which can be overwritten up to $10^5$ times without risk of damage or data loss, but it may become damaged, when the allowed number of writing cycles is exceeded.**

For full list of setpoints go to the chapter **List of setpoints (page 249)**.

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## Group: Process Control

### Subgroup: Application Selector

## Default Application Select

| | | | |
|---|---|---|---|
| **Setpoint group** | Basic settings | **Related FW** | 2.1.0 |
| **Range [units]** | SPtM / MINT [-] | | |
| **Default value** | SPtM | **Alternative config** | NO |
| **Step** | [-] | | |
| **Comm object** | 12157 | **Related applications** | MINT, SPtM |
| **Config level** | Advanced | | |
| **Setpoint visibility** | Always | | |

**Description**

This setpoint defines the controller application.

| | |
|---|---|
| SPtM | Single parallel to mains application. The controller controls two breakers – a mains breaker and a generator breaker. Feedback from both breakers is required. |
| MINT | Multiple island-parallel application without mains and multiple parallel application with mains. The controller controls one breaker only, the generator breaker. Feedback from the generator breaker is required. For parallel to mains operation also mains breaker feedback is required. |

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## Subgroup: Load Control

## Load Control PTM Mode

| | | | |
|---|---|---|---|
| **Setpoint group** | Process Control | **Related FW** | 2.1.0 |
| **Range [units]** | Baseload / Import/Export [-] | | |
| **Default value** | Baseload | **Alternative config** | NO |
| **Step** | [-] | | |
| **Comm object** | 8638 | **Related applications** | SPtM |
| **Config level** | Standard | | |
| **Setpoint visibility** | Always | | |
| **Description** | | | |

This setpoint adjust the type of load control.

| | |
|---|---|
| Baseload | Gen-set produces amount of the power given by setpoint **Baseload (page 261)**. The rest of power is supplied from the mains or exported to the mains (depends on proportions of load and **Baseload (page 261)** setpoint). Even in baseload control mode can be the Import/Export limited. This function can be activated by setpoint **Import/Export Limitation (page 263)** = Enabled. Then the request for the power of the genset operating in baseload can be limited to prevent the Import/Export go below the limit given by setpoint **Import Load (page 262)**.<br>**Example:** Baseload = 1000 kW, load = 700 kW, Import load = 100. Then the Baseload request will be limited to 600 kW to prevent the Import power go below 100 kW<br>**Example:** Baseload = 1000 kW, load = 700 kW, Import load = -100. Then the Baseload request will be limited to 800 kW to prevent the Import power go below -100 kW (actually it is limitation of the export).<br>The load of the Gen-set group is controlled to keep constant level of base load of the whole system. The level is adjusted by the setpoint **#System BaseLoad (page 264)**. |
| Imp/Exp | Gen-set produces the certain amount of power to keep constant import/export from the mains regardless the demand of the load. The requested import/export is given by setpoint **Import Load (page 262)**. If the value of the setpoint is >0 the power is imported from the mains, if setpoint value is <0, then the power is exported to the mains. |

***Note:*** *In both modes, the lower level of the power is always limited by the setpoint **Minimal Power PTM (page 324)**. If the requested load (given by the active load control mode, e.g. Baseload, Import/Export) is below this limit the requested load is limited to the level adjusted by this setpoint.*

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## PF Control PTM Mode

| | | | |
|---|---|---|---|
| **Setpoint group** | Process Control | **Related FW** | 2.1.0 |
| **Range [units]** | Base PF/ PF Import/Export [-] | | |
| **Default value** | Base PF | **Alternative config** | NO |
| **Step** | [-] | | |
| **Comm object** | 10120 | **Related applications** | SPtM |
| **Config level** | Standard | | |
| **Setpoint visibility** | Always | | |
| **Description** | | | |

This setpoint adjust the type of power factor control.

| | |
|---|---|
| Base PF | The power factor on the Gen-set is kept on the level given by the setpoint **BasePower Factor (page 262)** regardless the load demand. The rest of demanded reactive power is supplied from the mains. Values >1 means that capacitive reactive power is supposed to be imported from mains, values <1 means that inductive reactive power is imported from the mains.<br>Gen-sets are controlled to keep the constant level of the power factor. The level is adjusted by setpoint **#System Power Factor (page 264)**. |
| PF Imp/Exp | Gen-set produces the certain amount of reactive power to keep constant PF imported from the mains regardless the demand of the load. The requested power factor import is given by setpoint **Import Power Factor (page 263)**. Values >1 means that the gen-set is pushing the capacitive power to the system (sytem Gen-set – Load- Mains) , values <1 means that the Gen-set is pushing the inductive power to the system. |

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## #System Load Control PTM

| | | | |
|---|---|---|---|
| **Setpoint group** | Process Control | **Related FW** | 2.1.0 |
| **Range [units]** | Baseload / Loadsharing [-] | | |
| **Default value** | Baseload | **Alternative config** | NO |
| **Step** | [-] | | |
| **Comm object** | 8774 | **Related applications** | MINT |
| **Config level** | Standard | | |
| **Setpoint visibility** | Always | | |
| **Description** | | | |

Load control mode in parallel to mains operation of the whole group of Gen-sets.

| | |
|---|---|
| Baseload | The total power of the group is controlled to constant level given by the setpoint **#System BaseLoad (page 264)**. Each loaded Gen-set takes equal part (relative to their nominal power) from this requested value. The load is regulated locally in each controller by Load control regulation loop, load-sharing is not active. The setpoint **#System BaseLoad (page 264)** is also used for determining which Gen-sets have to run or not. |
| Loadsharing | Gen-sets load is controlled by InteliMains 210 controller to share the total load (given by the setpoint **#System BaseLoad (page 264)**) with other loaded Gen-sets in such a way, that all loaded gen-sets will be loaded at the same level (relative to gen-set nominal power). Load-sharing regulation loop is active. |

***Note:*** *The Loadsharing mode shall be used in case a InteliMains 210 controller is present in the system. In systems without InteliMains 210 the setpoint must be in the Baseload position.*

***Note:*** *The power factor (PF) is regulated to constant level given by the setpoint **#System PF Control PTM (page 261)** in parallel to mains operation and does not depend on active load control mode.*

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## #System PF Control PTM

| | | | |
|---|---|---|---|
| **Setpoint group** | Process Control | **Related FW** | 2.1.0 |
| **Range [units]** | Base PF / Var Sharing [-] | | |
| **Default value** | Base PF | **Alternative config** | NO |
| **Step** | [-] | | |
| **Comm object** | 8779 | **Related applications** | MINT |
| **Config level** | Standard | | |
| **Setpoint visibility** | Always | | |
| **Description** | | | |

Power factor control mode in parallel to mains operation of the whole group of Gen-sets.

| | |
|---|---|
| Base PF | Gen-sets PF is controlled by their PF control loops to provide constant power factor adjusted by setpoint **#System Power Factor (page 264)**. InteliMains 210 doesn't play active role in PF control in parallel to mains operation. |
| Var Sharing | Gen-sets PF is controlled by InteliMains 210 through the VAr sharing line. |

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## Baseload

| | | | |
|---|---|---|---|
| **Setpoint group** | Process Control | **Related FW** | 2.1.0 |
| **Range [units]** | 0 .. **Nominal Power (page 274)** [kW] | | |
| **Default value** | 100 kW | **Alternative config** | NO |
| **Step** | 1 kW | | |
| **Comm object** | 8639 | **Related applications** | SPtM |
| **Config level** | Standard | | |
| **Setpoint visibility** | Always | | |
| **Description** | | | |

Required Gen-set load in parallel to mains operation.

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## BasePower Factor

| | | | |
|---|---|---|---|
| **Setpoint group** | Process Control | **Related FW** | 2.1.0 |
| **Range [units]** | 0.60 .. 1.20 [-] | | |
| **Default value** | 1.00 [-] | **Alternative config** | NO |
| **Step** | 0.01 [-] | | |
| **Comm object** | 8640 | **Related applications** | SPtM |
| **Config level** | Standard | | |
| **Setpoint visibility** | Always | | |
| **Description** | | | |
| Required Gen-set power factor when the Gen-set is running in parallel to the mains. | | | |

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## Import Load

| | | | |
|---|---|---|---|
| **Setpoint group** | Process Control | **Related FW** | 2.1.0 |
| **Range [units]** | -32 000 .. 32 000 [kW] | | |
| **Default value** | 0 kW | **Alternative config** | NO |
| **Step** | 1 kW | | |
| **Comm object** | 8641 | **Related applications** | SPtM |
| **Config level** | Standard | | |
| **Setpoint visibility** | Always | | |
| **Description** | | | |

Defines maximal limit of load for import/export. Behavior of setpoint depends on setpoint **Load Control PTM Mode (page 258)**.

| | |
|---|---|
| Baseload | Setpoint adjust the maximal value of import/export. Also **Import/Export Limitation (page 263)** setpoint has to be set to Enabled. |
| Import/Export | Setpoint adjust requested value of constant import/export. |

If the value of the setpoint is >0 the power is imported from the mains, if the setpoint value is <0, then the power is exported to the mains.

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## Import Power Factor

| | | | |
|---|---|---|---|
| **Setpoint group** | Process Control | **Related FW** | 2.1.0 |
| **Range [units]** | 0.60 .. 1.20 [-] | | |
| **Default value** | 1.00 [-] | **Alternative config** | NO |
| **Step** | 0.01 [-] | | |
| **Comm object** | 8642 | **Related applications** | SPtM |
| **Config level** | Standard | | |
| **Setpoint visibility** | Always | | |
| **Description** | | | |

Defines maximal limit of power factor for import/export. Behavior of setpoint depends on setpoint **PF Control PTM Mode (page 259)**.

| | |
|---|---|
| Baseload | Setpoint adjust the maximal value of import. Also **Import/Export Limitation (page 263)** setpoint has to be set to Enabled. |
| Import/Export | Setpoint adjust requested value of constant import. |

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## Import/Export Limitation

| | | | |
|---|---|---|---|
| **Setpoint group** | Process Control | **Related FW** | 2.1.0 |
| **Range [units]** | ENABLED / DISABLED [-] | | |
| **Default value** | Disabled | **Alternative config** | NO |
| **Step** | [-] | | |
| **Comm object** | 9592 | **Related applications** | SPtM |
| **Config level** | Standard | | |
| **Setpoint visibility** | Always | | |
| **Description** | | | |

Enable or disable limitation for import/export. If function is enabled, then the request for the power of the Gen-set is limited to prevent the Import/Export go below the limits. Limits are adjusted via setpoints **Import Load (page 262)** and **Import Power Factor (page 263)**.

> **Example:** Baseload = 1000 kW, load = 700 kW, Import load = 100 kW. Then the Baseload request will be limited to 600 kW to prevent the Import power go below 100 kW.

> **Example:** Baseload = 1000 kW, load = 700 kW, Import load = -100 kW. Then the Baseload request will be limited to 800 kW to prevent the Import power go below -100 kW (actually it is limitation of the export).

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## #System BaseLoad

| | | | |
|---|---|---|---|
| **Setpoint group** | Process Control | **Related FW** | 2.1.0 |
| **Range [units]** | 0 .. 32 000 [kW] | | |
| **Default value** | 1000 kW | **Alternative config** | NO |
| **Step** | 1 [kW] | | |
| **Comm object** | 8775 | **Related applications** | SPtM |
| **Config level** | Standard | | |
| **Setpoint visibility** | Always | | |
| **Description** | | | |
| Required total load of the Gen-set group in parallel to mains operation in baseload mode (setpoint **#System Load Control PTM (page 260)** = Baseload). | | | |

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## #System Power Factor

| | | | |
|---|---|---|---|
| **Setpoint group** | Process Control | **Related FW** | 2.1.0 |
| **Range [units]** | 0.60 .. 1.20 [-] | | |
| **Default value** | 1.00 [-] | **Alternative config** | NO |
| **Step** | 0.01 [-] | | |
| **Comm object** | 8776 | **Related applications** | SPtM |
| **Config level** | Standard | | |
| **Setpoint visibility** | Always | | |
| **Description** | | | |
| Required Gen-set power factor when the group of Gen-sets is running parallel to the mains. The PF is regulated locally in each controller by PF control regulation loop, VARsharing is not active. | | | |

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## Subgroup: Neutral Contactor

## #Neutral Contactor Control

| | | | |
|---|---|---|---|
| **Setpoint group** | Process Control | **Related FW** | 2.1.0 |
| **Range [units]** | Each / Common [-] | | |
| **Default value** | Each | **Alternative config** | NO |
| **Step** | [-] | | |
| **Comm object** | 9890 | **Related applications** | MINT, SPtM |
| **Config level** | Standard | | |
| **Setpoint visibility** | Always | | |
| **Description** | | | |

Setpoint changes behavior of binary output **NCB CLOSE/OPEN (PAGE 672)**which is used for neutral contactor control.

| | |
|---|---|
| Each | The EACH option should be used if each Gen-set has it's own neutral contactor. Four-pole GCB must be used in this case.<br>› The output is always opened while the Gen-set is not running<br>› The output is always opened while the MCB is closed<br>› While the Gen-set is running and GCB is open, the output closes when generator voltage in at least one phase exceeds 85 % of the nominal voltage. It opens when the generator voltage in all phases drops below 50 % of the nominal voltage<br>› While the Gen-set is running, MCB is open and GCB is closed, then the position of the output is given by an internal algorithm, which ensures, that always exactly one Gen-set connected to the bus has the neutral contactor closed. It is always the Gen-set with lowest CAN address |
| Common | The COMMON option should be used if there is one common neutral contactor for the whole site. The **NCB CLOSE/OPEN (PAGE 672)** outputs from all controllers are combined together and the combined signal is used to control the breaker. Three-pole GCB must be used in this case.<br>› The output is always opened while the Gen-set is not running<br>› The output is always opened while the MCB is closed<br>› While the Gen-set is running the output closes when generator voltage in at least one phase exceeds 85 % of the nominal voltage. It opens when the generator voltage in all phases drops below 50 % of the nominal voltage. That means if at least one Gen-set in the site is running and having proper voltage, the neutral contactor is closed |

***Note:*** *Logical binary input **NCB FEEDBACK (PAGE 624)** has to be configured for proper functionality.*

***Note:*** *For the SPtM application there is only 1 Gen-set so the setpoint #Neutral contactor control is hidden and the NCB behave like it is setup to COMMON option.*

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## Subgroup: Process Limitation

## CB Control In MAN Mode

| | | | |
|---|---|---|---|
| **Setpoint group** | Speed/Load Control | **Related FW** | 2.1.0 |
| **Range [units]** | Full Ctrl / Aut Trans / Islnd Disl [-] | | |
| **Default value** | Full Ctrl | **Alternative config** | NO |
| **Step** | [-] | | |
| **Comm object** | 14962 | **Related applications** | SPtM |
| **Config level** | Standard | | |
| **Setpoint visibility** | Always | | |

**Description**

The behavior of transition of load in MAN mode is adjusted via this setpoint.

| | |
|---|---|
| Full Ctrl | No limitation of CB control in MAN mode (operator can close any breaker manually or evoke the synchronization and consequential operation in parallel to mains) |
| Aut Trans | Operator can control both MCB or MGCB breaker. However once transition is evoked the controller performs the automatic transfer of the load (depends on adjustment of setpoints **Transfer Gen To Mains (page 387)** and **Transfer Mains To Gen (page 386)**).<br>Controller performs synchronization across MCB, ifMGCB is closed and MCB button is pushed. Load transfer is done after synchronization andMGCB is opened automatically.<br>Controller performs synchronization acrossMGCB, if MCB is closed andMGCB button is pushed. Load transfer is done after synchronization and MCB is opened automatically.<br>It is also possible to open currently closed breaker and keep the load non-energized. Then it is possible to close MCB orMGCB to energize the load from a healthy source.<br>***Note:*** *Parallel operation with mains continues, if system already operates in parallel with mains and setting is changed to Aut Trans. It is necessary to push MCB or MGCB button to open a breaker.*<br>***Note:*** *Open transfer is performed, if the Open option is selected with **Transfer Gen To Mains (page 387)** or **Transfer Mains To Gen (page 386)**.* |
| Islnd Disl | Behaves like the full manual control but the Island operation is disabled.<br>**Example:** When MCB opened and MGCB is pressed, controller doesn't go to island.<br>**Example:** In parallel operation when MCB button pressed, MCB is not opened. |

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## Subgroup: Mains Import Measurement

## Mains Measurement P

| | | | |
|---|---|---|---|
| **Setpoint group** | Mains Settings | **Related FW** | 2.1.0 |
| **Range [units]** | None / Mains CT / Analog Input [-] | | |
| **Default value** | None | **Alternative config** | NO |
| **Step** | [-] | | |
| **Comm object** | 10599 | **Related applications** | SPtM |
| **Config level** | Advanced | | |
| **Setpoint visibility** | Visible only in SPtM mode | | |

**Description**

Defines source value of the **Mains Import P (page 560)** measurement.

| | |
|---|---|
| None | The Mains Import Power is not measured and the duration of the load transfer in direction Mains to Generator is given exactly by the setpoint **Close Transfer Max Duration (page 385)**. |
| Mains CT | The **Mains Import P (page 560)** value is measured via Mains CTs. The load transfer in direction Mains to Generator is considered to be finished when the mains is unloaded under certain level. |
| Analog Input | The **Mains Import P (page 560)** value is measured via analog input, accordingly LAI: **MAINS IMPORT MEASUREMENT P (PAGE 692)**. The load transfer in direction Mains to Generator is considered to be finished when the mains is unloaded under certain level. |

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## Mains Measurement Q

| | | | |
|---|---|---|---|
| **Setpoint group** | Process Control | **Related FW** | 2.1.0 |
| **Range [units]** | None / Mains CT / Analog Input [-] | | |
| **Default value** | None | **Alternative config** | NO |
| **Step** | [-] | | |
| **Comm object** | 10598 | **Related applications** | MINT, SPtM |
| **Config level** | Advanced | | |
| **Setpoint visibility** | Visible only in SPtM mode | | |
| **Description** | | | |

Defines source value of the **Mains kVArh (page 573)**.

| | |
|---|---|
| None | The value **Mains Import Q (page 560)** is not measured. |
| Mains CT | The value **Mains kVArh (page 573)** is measured via Mains CTs which are located on phase L1, L2 and L3. |
| Analog Input | The value **Mains kVArh (page 573)** is measured via analog input, accordingly LAI: **MAINS MEASUREMENT Q (PAGE 693)**. |

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## Subgroup: Peak Shaving

## Peak Shaving

| | | | |
|---|---|---|---|
| **Setpoint group** | Process Control | **Related FW** | 2.1.0 |
| **Range [units]** | Enabled / Disabled [-] | | |
| **Default value** | Disable | **Alternative config** | NO |
| **Step** | [-] | | |
| **Comm object** | 11601 | **Related applications** | SPtM |
| **Config level** | Advanced | | |
| **Setpoint visibility** | Always | | |
| **Description** | | | |

The behavior of peak shaving functions

| | |
|---|---|
| Enabled | The Peak Shaving function is active and the start command is activated when the conditions for Peaks Shaving activation were fulfilled. |
| Disabled | The Peak Shaving function is BLOCKED and the start command can not be activated even the conditions for Peaks Shaving activation were fulfilled. |

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## Peak Shaving Start Level

| | | | |
|---|---|---|---|
| **Setpoint group** | Process Control | **Related FW** | 2.1.0 |
| **Range [units]** | **Peak Shaving Stop Level (page 269)** .. 32000 [kW] | | |
| **Default value** | 1000 kW | **Alternative config** | NO |
| **Step** | 1 [kW] | | |
| **Comm object** | 8643 | **Related applications** | SPtM |
| **Config level** | Advanced | | |
| **Setpoint visibility** | Visible only if **Peak Shaving (page 268)** = enabled | | |
| **Description** | | | |
| This setpoint starts Gen-set, when the value of the load consumption Load kW exceeds the value given by this setpoint for the time of **Peak Shaving Start/Stop Delay (page 270)**.<br>The gen-set is synchronized to the Mains (kept in the parallel to the Mains) and the Gen-set power is controlled according to the settings in the Group Process Control/Load Control.<br>The Gen-set stays running until the conditions for Peak Shaving run are active. Conditions of deactivation are given by the setpoint **Peak Shaving Stop Level (page 269)** and **Peak Shaving Start/Stop Delay (page 270)**. | | | |

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## Peak Shaving Stop Level

| | | | |
|---|---|---|---|
| **Setpoint group** | Process Control | **Related FW** | 2.1.0 |
| **Range [units]** | 0 .. **Peak Shaving Start Level (page 269)** [kW] | | |
| **Default value** | 900 kW | **Alternative config** | NO |
| **Step** | 1 [kW] | | |
| **Comm object** | 8644 | **Related applications** | SPtM |
| **Config level** | Advanced | | |
| **Setpoint visibility** | Visible only if **Peak Shaving (page 268)** = enabled | | |
| **Description** | | | |
| This setpoint stops Gen-set, of the load consumption Load kW decreases under the value given by this setpoint for the time of **Peak Shaving Start/Stop Delay (page 270)**. | | | |

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## Peak Shaving Start/Stop Delay

| | | | |
|---|---|---|---|
| **Setpoint group** | Process Control | **Related FW** | 2.1.0 |
| **Range [units]** | 0 .. 600 [s] | | |
| **Default value** | 600 s | **Alternative config** | NO |
| **Step** | 1 s | | |
| **Comm object** | 9989 | **Related applications** | SPtM |
| **Config level** | Advanced | | |
| **Setpoint visibility** | Visible only if **Peak Shaving (page 268)** = enabled | | |
| **Description** | | | |

Defines of the delay of activation or deactivation of the Peak Shaving. Starts when:

- The value of the load consumption Load kW exceeds the value given by the setpoint **Peak Shaving Start Level (page 269)**.
- The value of the load consumption Load kW decreases under the value given by the setpoint **Peak Shaving Stop Level (page 269)**

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## Subgroup: Breaker Control Mode

## MCB Control Mode

| | | | |
|---|---|---|---|
| **Setpoint group** | Process Control | **Related FW** | 2.1.0 |
| **Range [units]** | Internal / External [-] | | |
| **Default value** | Internal | **Alternative config** | YES |
| **Step** | [-] | | |
| **Comm object** | 9873 | **Related applications** | SPtM |
| **Config level** | Advanced | | |
| **Setpoint visibility** | Only if **Controller Mode (page 284)** = SPTM | | |
| **Description** | | | |

This setpoint adjusts control mode of MCB.

| | |
|---|---|
| Internal | The MCB breaker is controlled by controller.<br>The controller accepts the opening of MCB from the external device (mains relay). When the MCB is opened externally then:<br>- The event "MCB opened Externally" is recorded in history log<br>- Controller starts to count down the MCB Close Delay and is going to be closed to the MCB once it elapses.<br>Incorrect reaction of the **MCB FEEDBACK (PAGE 622)** to internal MCB Close/Open command causes **Wrn MCB Fail (page 730)** |
| External | Controller does not control the MCB at all. The MCB is controlled externally, when the **MCB FEEDBACK (PAGE 622)** gets changed, then the event "MCB Opened" or "MCB Closed" is recorded to the history log.<br>Controller always accepts the **MCB FEEDBACK (PAGE 622)** without of issuing any |

| | |
|---|---|
| | alarm.<br>The controller informs the superordinate system about the status of the breaker automat using the signals<br>› LBO FORWARD SYNCHRONIZATION (PAGE 653)<br>› LBO REVERSE SYNCHRONIZATION (PAGE 677) |

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## GCB Control Mode

| | | | |
|---|---|---|---|
| **Setpoint group** | Process Control | **Related FW** | 2.1.0 |
| **Range [units]** | Internal / Follow / External [-] | | |
| **Default value** | Internal | **Alternative config** | YES |
| **Step** | [-] | | |
| **Comm object** | 11771 | **Related applications** | MINT, SPtM |
| **Config level** | Advanced | | |
| **Setpoint visibility** | Only if **Controller Mode (page 284)** = GCB | | |

**Description**

This setpoint adjusts control mode of GCB.

| | |
|---|---|
| **Internal** | The breaker is controlled only from controller. Any unexpected change of **GCB FEEDBACK (PAGE 618)** causes **Stp GCB Fail (page 756)** immediately.<br>Incorrect reaction of the **GCB FEEDBACK (PAGE 618)** on internal GCB Close/Open command causes **Stp GCB Fail (page 756)**<br>Anytime when the controller is synchronizing via GCB the External GCB closing is being accepted in all GCB control modes. |
| **Follow** | GCB Openning **GCB FEEDBACK (PAGE 618)** = 0 is accepted from external devices with history record "GCB Opened Externally".<br>Incorrect reaction of the **GCB FEEDBACK (PAGE 618)** to internal GCB Close/Open command causes **Stp GCB Fail (page 756)** |
| **External** | Controller does not control the GCB at all. The GCB is controlled externally, when the **GCB FEEDBACK (PAGE 618)** get changed, then the event "GCB Opened" or "GCB Closed" is recorded to the history log.<br>Controller always accept the **GCB FEEDBACK (PAGE 618)** without of issuing any alarm.<br>When the Sd protection shuts down the engine, the GCB stays closed. The BOC protection does not open the GCB, controller goes to cooling when the BOC protection is tripped (GCB stays closed until opened externally).<br>**IMPORTANT: Gen-set with closed GCB is not blocked against starting.** |

**IMPORTANT: Anytime when the controller is synchronizing via GCB the External GCB closing is being accepted in all GCB control modes.**

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## Attempts To Close Breaker

| | | | |
|---|---|---|---|
| **Setpoint group** | Process Control | **Related FW** | 2.1.0 |
| **Range [units]** | 1 .. 5 [-] | | |
| **Default value** | 2 [-] | **Alternative config** | YES |
| **Step** | 1 [-] | | |
| **Comm object** | 19885 | **Related applications** | MINT, SPtM |
| **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.

> **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.

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## Delay Between Closing Attempts

| | | | |
|---|---|---|---|
| **Setpoint group** | Process Control | **Related FW** | 2.1.0 |
| **Range [units]** | [-] | | |
| **Default value** | [-] | **Alternative config** | YES |
| **Step** | [-] | | |
| **Comm object** | 19883 | **Related applications** | MINT, SPtM |
| **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** | Process Control | **Related FW** | 2.1.0 |
| **Range [units]** | 1 .. 60 [s] | | |
| **Default value** | 2 [s] | **Alternative config** | YES |
| **Step** | 1 [s] | | |
| **Comm object** | 19884 | **Related applications** | MINT, SPtM |
| **Config level** | Advanced | | |
| **Setpoint visibility** | Always | | |
| **Description** | | | |

This setpoint adjusts the length of breaker closing attempt.

**Example:** When set to 10 s, the LBO **GCB ON COIL (PAGE 658)** is set for 10 s.

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## Group: Basic settings

### Subgroup: Name

### Gen-Set Name

| | | | |
|---|---|---|---|
| **Setpoint group** | Basic settings | **Related FW** | 2.1.0 |
| **Range [units]** | 0 .. 15 characters [-] | | |
| **Default value** | InteliGen4 200 | **Alternative config** | NO |
| **Step** | [-] | | |
| **Comm object** | 8637 | **Related applications** | MINT, SPtM |
| **Config level** | Standard | | |
| **Setpoint visibility** | Always | | |
| **Description** | | | |

User defined name, used for the controller identification at remote phone or mobile connection. Gen-set Name is maximally 15 characters long and can be entered using InteliConfig or from controller's configuration menu.

***Note:*** *If the Gen-set Name is "TurboRunHours", the running hours will be counted faster – 1 minute in real will represent 1 hour.*

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## Subgroup: Power settings

## Nominal Power

| | | | |
|---|---|---|---|
| **Setpoint group** | Basic settings | **Related FW** | 2.1.0 |
| **Range [units]** | 1 .. 5 000 [kW] | | |
| **Default value** | 200 kW | **Alternative config** | YES |
| **Step** | 1 kW | | |
| **Comm object** | 8276 | **Related applications** | MINT, SPtM |
| **Config level** | Standard | | |
| **Setpoint visibility** | Always | | |
| **Description** | | | |

Nominal power of the Gen-set. Generator **Overload BOC (page 323)** protection is based on this setpoint.

***Note:*** *This setpoint is used when setpoint **Connection type (page 277)** is adjusted to Monophase or Splitphase or 3Ph3Wire or High Leg D or 3Ph4Wire or when Autodetect detects connection type as 3Ph3Wire or High Leg D or 3Ph4Wire.*

***Note:*** *To lock this setpoint against editing you also have to lock setpoint **Nominal Power 1 (page 526)**, **Nominal Power 2 (page 531)** and **Nominal Power 3 (page 537)**.*

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## Nominal Power Split Phase

| | | | |
|---|---|---|---|
| **Setpoint group** | Basic settings | **Related FW** | 2.1.0 |
| **Range [units]** | 1 .. 5 000 [kW] | | |
| **Default value** | 200 kW | **Alternative config** | YES |
| **Step** | 1 kW | | |
| **Comm object** | 9977 | **Related applications** | MINT, SPtM |
| **Config level** | Standard | | |
| **Setpoint visibility** | Conditioned by the setpoint **Connection type (page 277)** | | |
| **Description** | | | |

Nominal power of the Gen-set for detected split-phase or mono phase connection. Generator **Overload BOC (page 323)** protection is based on this setpoint.

***Note:*** *This setpoint is used when setpoint **Connection type (page 277)** is adjusted to Autodetect and Autodetect detects connection type as Monophase or Splitphase.*

***Note:*** *To lock this setpoint against editing you also have to lock setpoint **Nominal Power Split Phase 1 (page 526)**, **Nominal Power Split Phase 2 (page 532)** and **Nominal Power Split Phase 3 (page 537)**.*

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## Subgroup: Current settings

## Nominal Current

| | | | |
|---|---|---|---|
| **Setpoint group** | Basic settings | **Related FW** | 2.1.0 |
| **Range [units]** | 1 .. 65 000 [A] | | |
| **Default value** | 350 A | **Alternative config** | YES |
| **Step** | 1 A | | |
| **Comm object** | 8275 | **Related applications** | MINT, SPtM |
| **Config level** | Standard | | |
| **Setpoint visibility** | Always | | |
| **Description** | | | |

It is current limit for mains Gen-set current protections and means maximal continuous mainsGen-set current. Nominal Current can be different from mainsGen-set rated current value.

> ***Note:*** *To lock this setpoint against editing you also have to lock setpoint* ***Nominal Current 1 (page 524)****,* ***Nominal Current 2 (page 529)*** *and* ***Nominal Current 3 (page 535)****.*

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## Gen CT Ratio Prim

| | | | |
|---|---|---|---|
| **Setpoint group** | Basic settings | **Related FW** | 2.1.0 |
| **Range [units]** | 1 .. 10000 [A] | | |
| **Default value** | 500 A | **Alternative config** | NO |
| **Step** | 1 A | | |
| **Comm object** | 8274 | **Related applications** | MINT, SPtM |
| **Config level** | Standard | | |
| **Setpoint visibility** | Always | | |
| **Description** | | | |

Current transformers ratio of Gen-set Mains import.

The CT is usually described by this definition: CT Ratio Prim / CT Ratio Sec: Example:100/5, 500/5, 1000/1

> ***Note:*** *See also* ***Gen CT Ratio Sec (page 276)****.*

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## Gen CT Ratio Sec

| | | | |
|---|---|---|---|
| **Setpoint group** | Basic settings | **Related FW** | 2.1.0 |
| **Range [units]** | - [/1A / /5A] | | |
| **Default value** | /5A | **Alternative config** | NO |
| **Step** | - | | |
| **Comm object** | 10556 | **Related applications** | MINT, SPtM |
| **Config level** | Standard | | |
| **Setpoint visibility** | Always | | |
| **Description** | | | |
| Current transformers ratio of Gen-set Mains import. | | | |

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## Mains/EFC CT Ratio Prim

| | | | |
|---|---|---|---|
| **Setpoint group** | Basic settings | **Related FW** | 2.1.0 |
| **Range [units]** | 1 .. 10000 [A] | | |
| **Default value** | 500 A | **Alternative config** | NO |
| **Step** | 1 A | | |
| **Comm object** | 8566 | **Related applications** | MINT, SPtM |
| **Config level** | Standard | | |
| **Setpoint visibility** | Always | | |
| **Description** | | | |
| Current transformers ratio of  Mains import. | | | |

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## Mains/EFC CT Ratio Sec

| | | | |
|---|---|---|---|
| **Setpoint group** | Basic settings | **Related FW** | 2.1.0 |
| **Range [units]** | /5A .. /1A [-] | | |
| **Default value** | /5A [-] | **Alternative config** | NO |
| **Step** | 1 A/5A [-] | | |
| **Comm object** | 10557 | **Related applications** | MINT, SPtM |
| **Config level** | Standard | | |
| **Setpoint visibility** | Always | | |
| **Description** | | | |
| Current transformers ratio of  Mains import. | | | |

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## Subgroup: Voltage settings

## Connection type

| | | | |
|---|---|---|---|
| **Setpoint group** | Basic settings | **Related FW** | 2.1.0 |
| **Range [units]** | Mono Phase / SplPhL1L2 / SplPhL1L3 / 3Ph3Wire / 3Ph4Wire / High Leg D / Autodetect [-] | | |
| **Default value** | 3Ph4Wire | **Alternative config** | YES |
| **Step** | [-] | | |
| **Comm object** | 11628 | **Related applications** | MINT, SPtM |
| **Config level** | Standard | | |
| **Setpoint visibility** | Always | | |
| **Description** | | | |

Connection type:

| | |
|---|---|
| Mono Phase | Single phase voltage measurement L1-N<br>1x CT (Current Transformer) |
| SplPhL1L2 | Double Delta connection<br>Split Phase<br>Two phase voltage measurement L1,L2 with 180° phase shift<br>2x CT (Current Transformer) |
| SplPhL1L3 | Double Delta connection<br>Split Phase<br>Two phase voltage measurement L1,L3 with 180° phase shift<br>2x CT (Current Transformer) |
| 3Ph3Wire | Ungrounded Delta connection<br>Open Delta<br>Ungrounded Wye<br>Corner-Grounded Delta<br>Split Phase Delta<br>Three phase voltage measurement L1,L2,L3 with 120° phase shift<br>No neutral is available 3x CT (Current Transformer) |
| 3Ph4Wire | Grounded Star (Grounded Wye) connection – 3PY<br>Three phase voltage measurement L1,L2,L3 with 120° phase shift<br>3x CT (Current Transformer) |
| High Leg D | High Leg Delta connection<br>Three phase voltage measurement L1,L2,L3<br>3x CT (Current Transformer) |

| | | | |
|---|---|---|---|
| Autodetect | High Leg Delta | L1 >=100 V; L1 <=140 V<br>L2 >=140 V<br>L3 >=100 V; L3 <=140 V | |
| | 3Ph Low Y | L1 <=160 V<br>L2 <=160 V<br>L3 <=160 V | |
| | 3Ph High Y | L1 >160 V<br>L2 >160 V<br>L3 >160 V | |
| | SplPhL1L3 | L1 >=100 V<br>L2 <= 20 V<br>L3 >=100 V | |
| | SplPhL1L2 | L1 >=100 V<br>L2 >= 100 V<br>L3 <= 20 V | |
| | Mono Phase | L1 >=100 V<br>L2 <= 20 V<br>L3 <= 20 V | |
| | **Voltage Autodetect shutdown** | | |

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## Nominal Voltage Ph-N

| | | | |
|---|---|---|---|
| **Setpoint group** | Basic settings | **Related FW** | 2.1.0 |
| **Range [units]** | 80 .. 20 000 [V] | | |
| **Default value** | 231 V | **Alternative config** | YES |
| **Step** | 1 V | | |
| **Comm object** | 8277 | **Related applications** | MINT, SPtM |
| **Config level** | Standard | | |
| **Setpoint visibility** | Always | | |
| **Description** | | | |

Nominal voltage (phase to neutral).

***Note:*** *To lock this setpoint against editing you also have to lock setpoint* ***Nominal Voltage Ph-N 1 (page 523)****,* ***Nominal Voltage Ph-N 2 (page 528)*** *and* ***Nominal Voltage Ph-N 3 (page 534)****.*

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## Nominal Voltage Ph-Ph

| | | | |
|---|---|---|---|
| **Setpoint group** | Basic settings | **Related FW** | 2.1.0 |
| **Range [units]** | 80 .. 40 000 [V] | | |
| **Default value** | 400 V | **Alternative config** | YES |
| **Step** | 1 V | | |
| **Comm object** | 11657 | **Related applications** | MINT, SPtM |
| **Config level** | Standard | | |
| **Setpoint visibility** | Always | | |
| **Description** | | | |
| Nominal system voltage (phase to phase).<br>***Note:*** *To lock this setpoint against editing you also have to lock setpoint* ***Nominal Voltage Ph-Ph 1 (page 523)****,* ***Nominal Voltage Ph-Ph 2 (page 529)*** *and* ***Nominal Voltage Ph-Ph 3 (page 534)****.* | | | |

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## Nominal Voltage 3Ph Low Y

| | | | |
|---|---|---|---|
| **Setpoint group** | Basic settings | **Related FW** | 2.1.0 |
| **Range [units]** | 80 .. 20 000 [V] | | |
| **Default value** | 120 V | **Alternative config** | YES |
| **Step** | 1 V | | |
| **Comm object** | 20811 | **Related applications** | MINT, SPtM |
| **Config level** | Standard | | |
| **Setpoint visibility** | Visible if one of the three **Connection type (page 277)** Setpoints is set to Autodetect. | | |
| **Description** | | | |
| This setting is used as phase-neutral **Nominal Voltage Ph-N (page 278)** by the voltage autodetect function, if detected **Connection type (page 277)** is 3Ph Low Y (controller can not distinguish between the 4 wire and 3 wire connection), detected phase-phase voltage is lower than 300 V in all three phases and phase-neutral voltage is lower than or equal to 160 V in all three phases. | | | |

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## Nominal Voltage 3Ph High Y

| | | | |
|---|---|---|---|
| **Setpoint group** | Basic settings | **Related FW** | 2.1.0 |
| **Range [units]** | 80 .. 20 000 [V] | | |
| **Default value** | 277 V | **Alternative config** | YES |
| **Step** | 1 V | | |
| **Comm object** | 20812 | **Related applications** | MINT, SPtM |
| **Config level** | Standard | | |
| **Setpoint visibility** | Visible if one of the three **Connection type (page 277)** Setpoints is set to Autodetect. | | |
| **Description** | | | |
| This setting is used as phase-neutral **Nominal Voltage Ph-N (page 278)** by the voltage autodetect function, if detected **Connection type (page 277)** is 3Ph High Y, detected phase-phase voltage is higher than or equal to 300 V in all three phases and phase-neutral voltage is higher than 160 V in all three phases. | | | |

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## Nominal Voltage High Leg D

| | | | |
|---|---|---|---|
| **Setpoint group** | Basic settings | **Related FW** | 2.1.0 |
| **Range [units]** | 80 .. 20 000 [V] | | |
| **Default value** | 277 V | **Alternative config** | YES |
| **Step** | 1 V | | |
| **Comm object** | 20813 | **Related applications** | MINT, SPtM |
| **Config level** | Standard | | |
| **Setpoint visibility** | Visible if one of the three **Connection type (page 277)** Setpoints is set to Autodetect. | | |
| **Description** | | | |
| This setting is used as phase-neutral **Nominal Voltage Ph-N (page 278)** by the voltage autodetect function, if detected **Connection type (page 277)** is High Leg D. Set this setpoint to 120 V with high leg delta system, which works with the high leg voltage 208 V (L2-N). | | | |

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## Nominal Voltage SplitPhase

| | | | |
|---|---|---|---|
| **Setpoint group** | Basic settings | **Related FW** | 2.1.0 |
| **Range [units]** | 80 .. 20 000 [V] | | |
| **Default value** | 120 V | **Alternative config** | YES |
| **Step** | 1 V | | |
| **Comm object** | 20814 | **Related applications** | MINT, SPtM |
| **Config level** | Standard | | |
| **Setpoint visibility** | Visible if one of the three **Connection type (page 277)** Setpoints is set to Autodetect. | | |
| **Description** | | | |
| This setting is used as phase-neutral **Nominal Voltage Ph-N (page 278)** by the voltage autodetect function, if detected **Connection type (page 277)** is SplPhL1L2 or SplPhL1L3. | | | |

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## Nominal Voltage MonoPhase

| | | | |
|---|---|---|---|
| **Setpoint group** | Basic settings | **Related FW** | 2.1.0 |
| **Range [units]** | 80 .. 20 000 [V] | | |
| **Default value** | 120 V | **Alternative config** | YES |
| **Step** | 1 V | | |
| **Comm object** | 20815 | **Related applications** | MINT, SPtM |
| **Config level** | Standard | | |
| **Setpoint visibility** | Visible if one of the three **Connection type (page 277)** Setpoints is set to Autodetect. | | |
| **Description** | | | |
| This setting is used as phase-neutral **Nominal Voltage Ph-N (page 278)** by the voltage autodetect function, if detected **Connection type (page 277)** is MonoPhase. | | | |

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## Gen VT Ratio

| | | | |
|---|---|---|---|
| **Setpoint group** | Basic settings | **Related FW** | 2.1.0 |
| **Range [units]** | 0.1 .. 500.0 [V/V] | | |
| **Default value** | 1.0 V/V | **Alternative config** | NO |
| **Step** | 0.1 V/V | | |
| **Comm object** | 9579 | **Related applications** | MINT, SPtM |
| **Config level** | Advanced | | |
| **Setpoint visibility** | Always | | |
| **Description** | | | |
| Generator voltage potential transformers ratio. If no VTs are used, adjust this setpoint to 1. | | | |

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## Mains/Bus VT Ratio

| | | | |
|---|---|---|---|
| **Setpoint group** | Basic settings | **Related FW** | 2.1.0 |
| **Range [units]** | 0.1 .. 500.0 [V/V] | | |
| **Default value** | 1.0 V/V | **Alternative config** | NO |
| **Step** | 0.1 V/V | | |
| **Comm object** | 9580 | **Related applications** | SPtM |
| **Config level** | Advanced | | |
| **Setpoint visibility** | Conditioned by the setpoint **Default Application Select (page 257)** | | |
| **Description** | | | |
| Mains voltage potential transformers ratio. If no VTs are used, adjust the setpoint to 1. | | | |

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## Subgroup: Frequency settings

## Nominal Frequency

| | | | |
|---|---|---|---|
| **Setpoint group** | Basic settings | **Related FW** | 2.1.0 |
| **Range [units]** | 30 .. 65 [Hz] | | |
| **Default value** | 50 Hz | **Alternative config** | YES |
| **Step** | 1 Hz | | |
| **Comm object** | 8278 | **Related applications** | MINT, SPtM |
| **Config level** | Standard | | |
| **Setpoint visibility** | Always | | |
| **Description** | | | |
| Nominal system frequency (usually 50 or 60 Hz).<br>***Note:*** *To lock this setpoint against editing you also have to lock setpoint* ***Nominal Frequency 1 (page 523)****,* ***Nominal Frequency 2 (page 528)*** *and* ***Nominal Frequency 3 (page 534)****.* | | | |

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## Gear Teeth

| | | | |
|---|---|---|---|
| **Setpoint group** | Basic settings | **Related FW** | 2.1.0 |
| **Range [units]** | FGen->RPM / 1 .. 500 [-] | | |
| **Default value** | FGen->RPM | **Alternative config** | NO |
| **Step** | 1 | | |
| **Comm object** | 8252 | **Related applications** | MINT, SPtM |
| **Config level** | Advanced | | |
| **Setpoint visibility** | Always | | |
| **Description** | | | |

Number of teeth on the engine flywheel where the pick-up is installed. Set to zero if no pick-up is used and the Engine speed will be counted from the generator frequency.

***Note:*** *If no pickup is used, the D+ or W terminal should be used to prevent possible overcranking, which can occur if at least 25% of nominal generator voltage is not present immediately after exceeding firing speed.*

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## Nominal RPM

| | | | |
|---|---|---|---|
| **Setpoint group** | Basic settings | **Related FW** | 2.1.0 |
| **Range [units]** | 100 .. 4 000 [RPM] | | |
| **Default value** | 1 500 RPM | **Alternative config** | YES |
| **Step** | 1 RPM | | |
| **Comm object** | 8253 | **Related applications** | MINT, SPtM |
| **Config level** | Advanced | | |
| **Setpoint visibility** | Always | | |
| **Description** | | | |

Nominal engine speed (RPM – revolutions per minute).

***Note:*** *To lock this setpoint against editing you also have to lock setpoint **Nominal RPM 1 (page 522)**, **Nominal RPM 2 (page 528)** and **Nominal RPM 3 (page 533)**.*

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## Subgroup: Controller settings

## Controller Mode

| | | | |
|---|---|---|---|
| **Setpoint group** | Basic settings | **Related FW** | 2.1.0 |
| **Range [units]** | OFF / MAN / AUTO / TEST [-] | | |
| **Default value** | OFF | **Alternative config** | NO |
| **Step** | [-] | | |
| **Comm object** | 8315 | **Related applications** | MINT, SPtM |
| **Config level** | Advanced | | |
| **Setpoint visibility** | Always | | |
| **Description** | | | |
| This setpoint can be used for changing the Controller mode remotely, e.g. via Modbus. Use the mode selector on the main screen for changing the mode from the front panel. Use mode selector in the control window for changing the mode from InteliConfig. | | | |

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## Power On Mode

| | | | |
|---|---|---|---|
| **Setpoint group** | Basic settings | **Related FW** | 2.1.0 |
| **Range [units]** | Previous / OFF [-] | | |
| **Default value** | Previous | **Alternative config** | NO |
| **Step** | [-] | | |
| **Comm object** | 13000 | **Related applications** | MINT, SPtM |
| **Config level** | Advanced | | |
| **Setpoint visibility** | Always | | |
| **Description** | | | |

This setpoint adjusts controller mode after power on of controller.

| | |
|---|---|
| Previous | When controller is power on, controller is switched to last mode before power off. |
| OFF | When controller is power on, controller is switched to OFF Mode. |

***Note:*** *Remote modes – In case that some LBI remote mode is activated during power on of controller than this LBI has higher priority than this setpoint – controller mode is forced into mode selected via LBI. After deactivation of LBI, controller is switched into value selected via setpoint Power On Mode*

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## Fault Reset To Manual

| | | | |
|---|---|---|---|
| **Setpoint group** | Basic settings | **Related FW** | 2.1.0 |
| **Range [units]** | Disabled / Enabled [-] | | |
| **Default value** | Disabled | **Alternative config** | NO |
| **Step** | [-] | | |
| **Comm object** | 9983 | **Related applications** | MINT, SPtM |
| **Config level** | Advanced | | |
| **Setpoint visibility** | Always | | |
| **Description** | | | |
| If this function is enabled, the controller will switch automatically to MAN mode when there is a red alarm in the alarm list and fault reset button is pressed. This is a safety function that prevents the Gen-set starting again automatically in specific cases when fault reset button is pressed. | | | |

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## Backlight Timeout

| | | | |
|---|---|---|---|
| **Setpoint group** | Basic settings | **Related FW** | 2.1.0 |
| **Range [units]** | Disabled / 1 .. 255 [min] | | |
| **Default value** | Disabled | **Alternative config** | NO |
| **Step** | 1 min | | |
| **Comm object** | 10121 | **Related applications** | MINT, SPtM |
| **Config level** | Advanced | | |
| **Setpoint visibility** | Always | | |
| **Description** | | | |
| The display backlight is switched off when this timer exceed. When setpoint is adjusted to disabled then the display will be backlighted all the time. | | | |

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## Horn Timeout

| | | | |
|---|---|---|---|
| **Setpoint group** | Basic settings | **Related FW** | 2.1.0 |
| **Range [units]** | Disabled / 1 .. 600 s / Horn Reset [-] | | |
| **Default value** | 10 s | **Alternative config** | NO |
| **Step** | 1 s | | |
| **Comm object** | 8264 | **Related applications** | MINT, SPtM |
| **Config level** | Advanced | | |
| **Setpoint visibility** | Always | | |
| **Description** | | | |

Setting of horn behavior.

| | |
|---|---|
| Disabled | Disabling the Horn sounding function |
| 1 .. 600 [s] | Timeout for **HORN (PAGE 662)** binary output. The **HORN (PAGE 662)** output is active when this timeout elapsed. |
| Horn reset | LBO **HORN (PAGE 662)** is deactivated by Fault reset button or by Horn reset button. |

***Note:*** *Horn timeout starts again from the beginning if a new alarm appears before previous Horn timeout has elapsed.*

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## Zero Power Mode

| | | | |
|---|---|---|---|
| **Setpoint group** | Basic settings | **Related FW** | 2.1.0 |
| **Range [units]** | Disabled / 1 .. 360 [min] | | |
| **Default value** | Disabled | **Alternative config** | NO |
| **Step** | 1 min | | |
| **Comm object** | 8548 | **Related applications** | MINT, SPtM |
| **Config level** | Advanced | | |
| **Setpoint visibility** | Conditioned by the setpoint **Default Application Select (page 257)** | | |
| **Description** | | | |

The controller is switched to Zero Power Mode when there is no user interaction with the controller for the preset time period. For the controller wake up press button Start or activate Binary Input 1. The controller will not switch to Zero Power Mode if generator is running. In Zero Power Mode binary outputs go to high impedance.

***Note:*** *Power consumption of controller in Zero Power Mode is 0 mA. Controller is internally disconnected from power supply.*

***Note:*** *While there is USB power present (USB cable plagued) the controller is able to turn off when there is no user interaction but wake up is not possible. USB power has to be cut off (USB cable un-plugged).*

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## Run Hours Source

| | | | |
|---|---|---|---|
| **Setpoint group** | Basic settings | **Related FW** | 2.1.0 |
| **Range [units]** | AUTO / ECU / INTERNAL [-] | | |
| **Default value** | AUTO | **Alternative config** | NO |
| **Step** | [-] | | |
| **Comm object** | 13345 | **Related applications** | MINT, SPtM |
| **Config level** | Advanced | | |
| **Setpoint visibility** | Always | | |
| **Description** | | | |

This setpoint selects source of running hours.

| | |
|---|---|
| AUTO | If there is some ECU which send valid running hours, then this value is used. Otherwise value from internal counter is used. |
| ECU | Running hours are taken from ECU if ECU send valid data. It is not possible to set and reset this value in statistics. |
| INTERNAL | Running hours are taken from internal counter. It is possible to set and reset this value in statistics. |

***Note:*** *It is not necessary to restart controller when this setpoint is changed. Change of this setpoint is applied immediately.*

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## Subgroup: Phase Rotation

## Phase Rotation

| | | | |
|---|---|---|---|
| **Setpoint group** | Basic settings | **Related FW** | 2.1.0 |
| **Range [units]** | Clockwise / Counterclockwise [-] | | |
| **Default value** | Clockwise | **Alternative config** | NO |
| **Step** | [-] | | |
| **Comm object** | 15122 | **Related applications** | MINT, SPtM |
| **Config level** | Advanced | | |
| **Setpoint visibility** | All the time | | |
| **Description** | | | |

This setpoint adjust the phase sequence of voltage terminals.

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## Subgroup: HMI Settings

### Main Screen Line 1

| | | | |
|---|---|---|---|
| **Setpoint group** | Basic settings | **Related FW** | 2.1.0 |
| **Range [units]** | RPM / PF / Run Hours / ATT / AIN1 [-] | | |
| **Default value** | PF | **Alternative config** | NO |
| **Step** | [-] | | |
| **Comm object** | 13346 | **Related applications** | MINT, SPtM |
| **Config level** | Advanced | | |
| **Setpoint visibility** | Always | | |
| **Description** | | | |
| This setpoint adjusts line 1 on Main screen. | | | |

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### Main Screen Line 2

| | | | |
|---|---|---|---|
| **Setpoint group** | Basic settings | **Related FW** | 2.1.0 |
| **Range [units]** | RPM / PF / Run Hours / ATT / AIN1 [-] | | |
| **Default value** | RPM | **Alternative config** | NO |
| **Step** | [-] | | |
| **Comm object** | 14628 | **Related applications** | MINT, SPtM |
| **Config level** | Advanced | | |
| **Setpoint visibility** | Always | | |
| **Description** | | | |
| This setpoint adjusts line 2 on Main screen. | | | |

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### Screen Filter

| | | | |
|---|---|---|---|
| **Setpoint group** | Basic settings | **Related FW** | 2.1.0 |
| **Range [units]** | Enable / Disabled [-] | | |
| **Default value** | Disabled | **Alternative config** | NO |
| **Step** | [-] | | |
| **Comm object** | 15889 | **Related applications** | MINT, SPtM |
| **Config level** | Advanced | | |
| **Setpoint visibility** | Always | | |
| **Description** | | | |
| Every analog value showed on CU screen is filtered when setpoint is enabled. | | | |

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## Group: Communication Settings

### Subgroup: Controller Address

### Controller Address

| | | | |
|---|---|---|---|
| **Setpoint group** | Communication Settings | **Related FW** | 2.1.0 |
| **Range [units]** | 1 .. 32 [-] | | |
| **Default value** | 1 | **Alternative config** | NO |
| **Step** | 1 | | |
| **Comm object** | 24537 | **Related applications** | MINT, SPtM |
| **Config level** | Standard | | |
| **Setpoint visibility** | Always | | |
| **Description** | | | |

Controller identification number. It is possible to set controller address different from the default value (1) so that more controllers can be interconnected (via RS485) and accessed e.g. from Modbus terminal.

> ***Note:*** *When opening connection to the controller it's address has to correspond with the setting in PC tool.*

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### Subgroup: RS485 Settings

### RS485 Mode

| | | | |
|---|---|---|---|
| **Setpoint group** | Communication Settings | **Related FW** | 2.1.0 |
| **Range [units]** | Direct / MODBUS [-] | | |
| **Default value** | Direct | **Alternative config** | NO |
| **Step** | [-] | | |
| **Comm object** | 24134 | **Related applications** | MINT, SPtM |
| **Config level** | Standard | | |
| **Setpoint visibility** | Always | | |
| **Description** | | | |

Communication protocol switch for on-board RS485.

| | |
|---|---|
| Direct | InteliConfig communication protocol via serial cable. |
| MODBUS | MODBUS protocol. |

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## RS485 Communication Speed

| | | | |
|---|---|---|---|
| **Setpoint group** | Communication Settings | **Related FW** | 2.1.0 |
| **Range [units]** | 9600 / 19200 / 38400 / 57600 / 115200 [bps] | | |
| **Default value** | 57600 bps | **Alternative config** | NO |
| **Step** | [-] | | |
| **Comm object** | 24135 | **Related applications** | MINT, SPtM |
| **Config level** | Standard | | |
| **Setpoint visibility** | Always | | |
| **Description** | | | |
| If the direct mode is selected on on-board RS485, the direct communication speed of controller part of line can be adjusted here. Speed of second part of line has to be adjusted to the same value. | | | |

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## RS485 Modbus Speed

| | | | |
|---|---|---|---|
| **Setpoint group** | Communication Settings | **Related FW** | 2.1.0 |
| **Range [units]** | 9600 / 19200 / 38400 / 57600 / 115200 [bps] | | |
| **Default value** | 9600 bps | **Alternative config** | NO |
| **Step** | [-] | | |
| **Comm object** | 24141 | **Related applications** | MINT, SPtM |
| **Config level** | Standard | | |
| **Setpoint visibility** | Only if relevant module is installed + conditioned by the setpoint **COM1 Mode (page 476)** | | |
| **Description** | | | |
| If the MODBUS mode is selected on COM1 channel, the MODBUS communication speed can be adjusted here. | | | |

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## Subgroup: Intercontroller communication

## #CAN2 Units Missing Protection

| | | | |
|---|---|---|---|
| **Setpoint group** | Communication Settings | **Related FW** | 2.1.0 |
| **Range [units]** | HistRecOnly / Wrn / Sd / BOC [-] | | |
| **Default value** | HistRecOnly [-] | **Alternative config** | NO |
| **Step** | [-] | | |
| **Comm object** | 17503 | **Related applications** | MINT |
| **Config level** | Standard | | |
| **Setpoint visibility** | Always | | |
| **Description** | | | |
| This setpoint adjusts type of protection for alarm **Wrn CAN 2 Units Missing (page 711)**. | | | |

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## #Number Of Controller On CAN

| | | | |
|---|---|---|---|
| **Setpoint group** | Communication Settings | **Related FW** | 2.1.0 |
| **Range [units]** | HistRecOnly / Wrn / Sd / BOC [-] | | |
| **Default value** | HistRecOnly [-] | **Alternative config** | NO |
| **Step** | [-] | | |
| **Comm object** | | **Related applications** | MINT |
| **Config level** | Standard | | |
| **Setpoint visibility** | Always | | |
| **Description** | | | |
| This setpoint defines the minimum number of units supposed to be connected to CAN2. Controller counts itself as well, the number is always 1 or higher, it is never 0. If the number of controllers detected by the controller on CAN2 is lower than the number in this setpoint, the system falls in emergency droop, it means that regulations are switched to droop after delay defined by **#Number Of Controller On Delay (page 402)**. If the intercontroller communication recovers (the number of controllers detected on CAN2 gets equal or higher than value in this setpoint, then the system turns the regulations back to isochronous mode after delay defined by setpoint **#Number Of Controller Off Delay (page 402)**. | | | |

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## #Number Of Units On CAN2 Check

| | | | |
|---|---|---|---|
| **Setpoint group** | Communication Settings | **Related FW** | 2.1.0 |
| **Range [units]** | Enable / Disabled [-] | | |
| **Default value** | Disabled [-] | **Alternative config** | NO |
| **Step** | [-] | | |
| **Comm object** | 17463 | **Related applications** | MINT |
| **Config level** | Standard | | |
| **Setpoint visibility** | Always | | |
| **Description** | | | |
| This setpoints enabled/disabled protection which checks number of units on CAN2 communication line. When number of detected unit is lower than value adjusted by setpoint **#Number Of Units On CAN2 (page 292)**, alarm **Wrn CAN 2 Units Missing (page 711)** or **Sd CAN 2 Units Missing (page 748)** is activated. Type of alarm is adjusted via setpoint **#CAN2 Units Missing Protection (page 291)**. | | | |

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## #Number Of Units On CAN2

| | | | |
|---|---|---|---|
| **Setpoint group** | Communication Settings | **Related FW** | 2.1.0 |
| **Range [units]** | Enable / Disabled [-] | | |
| **Default value** | Disabled [-] | **Alternative config** | NO |
| **Step** | [-] | | |
| **Comm object** | 13953 | **Related applications** | MINT |
| **Config level** | Standard | | |
| **Setpoint visibility** | Always | | |
| **Description** | | | |
| Description | | | |

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## Group: Engine settings

### Subgroup: Starting

## Fuel Solenoid

| | | | |
|---|---|---|---|
| **Setpoint group** | Engine settings | **Related FW** | 2.1.0 |
| **Range [units]** | Diesel / Gas [-] | | |
| **Default value** | Diesel | **Alternative config** | NO |
| **Step** | [-] | | |
| **Comm object** | 9100 | **Related applications** | MINT, SPtM |
| **Config level** | Advanced | | |
| **Setpoint visibility** | Always | | |
| **Description** | | | |

Determines behavior of the Binary output **FUEL SOLENOID (PAGE 653)**

| | |
|---|---|
| Diesel: | Output is activated before binary output **STARTER 1 (PAGE 680)**. Lead of output is adjusted via setpoint **Fuel Solenoid Lead (page 298)**. The output is deactivated if Emergency Stop comes or Gen-set is stopped and in pause between repeated starts. |
| Gas: | Output is activated together with binary output **IGNITION (PAGE 663)** if RPM is over the 30 RPM (fixed value). Output is deactivated after stop command or in pause between repeated start. |

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## Dual Starter Sequence

| | | | |
|---|---|---|---|
| **Setpoint group** | Engine settings | **Related FW** | 2.1.0 |
| **Range [units]** | Disabled / 1-2 / 11-22 / 111-222 [-] | | |
| **Default value** | Disabled | **Alternative config** | NO |
| **Step** | - | | |
| **Comm object** | 16644 | **Related applications** | MINT, SPtM |
| **Config level** | Standard | | |
| **Setpoint visibility** | Always | | |
| **Description** | | | |

Setpoint is used to enable LBO **STARTER 2 (PAGE 681)** by choosing the predefined sequence.

Dual Starter Sequence options:

- Disabled (Default)
- 1-2 – Controller in cranking phase will activate **STARTER 1 (PAGE 680)** then **STARTER 2 (PAGE 681)** according to the order of option pattern 1-2.
- 11-22 – Controller in cranking phase will activate **STARTER 1 (PAGE 680)** then Starter 1 then **STARTER 2 (PAGE 681)** then **STARTER 2 (PAGE 681)** according to the order of option pattern 11-22.
- 111-222 – Controller in cranking phase will activate **STARTER 1 (PAGE 680)** then Starter 1 then Starter 1 then **STARTER 2 (PAGE 681)** then Starter 2 and then Starter 2 according to the order of option pattern 111-222.

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## Cranking Attempts

| | | | |
|---|---|---|---|
| **Setpoint group** | Engine settings | **Related FW** | 2.1.0 |
| **Range [units]** | 1 .. 10 [-] | | |
| **Default value** | 3 | **Alternative config** | NO |
| **Step** | 1 | | |
| **Comm object** | 8255 | **Related applications** | MINT, SPtM |
| **Config level** | Standard | | |
| **Setpoint visibility** | Always | | |
| **Description** | | | |

Maximal number of cranking attempts.

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## Maximum Cranking Time

| | | | |
|---|---|---|---|
| **Setpoint group** | Engine settings | **Related FW** | 2.1.0 |
| **Range [units]** | 1 .. 255 [s] | | |
| **Default value** | 5 s | **Alternative config** | NO |
| **Step** | 1 s | | |
| **Comm object** | 8256 | **Related applications** | MINT, SPtM |
| **Config level** | Advanced | | |
| **Setpoint visibility** | Always | | |
| **Description** | | | |
| Maximum time limit of cranking time. | | | |

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## Cranking Fail Pause

| | | | |
|---|---|---|---|
| **Setpoint group** | Engine settings | **Related FW** | 2.1.0 |
| **Range [units]** | 5 .. 60 [s] | | |
| **DefaultFixed value** | 8 s | **Alternative config** | NO |
| **Step** | 1 s | | |
| **Comm object** | 8257 | **Related applications** | MINT, SPtM |
| **Config level** | Advanced | | |
| **Setpoint visibility** | Always | | |
| **Description** | | | |
| Pause between **Cranking Attempts (page 294)**. **PRESTART (PAGE 674)** output is active in this pause until Cranking Fail Pause elapses. | | | |

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## Prestart Time

| | | | |
|---|---|---|---|
| **Setpoint group** | Engine settings | **Related FW** | 2.1.0 |
| **Range [units]** | 0 .. 3600 [s] | | |
| **Default value** | 2 s | **Alternative config** | NO |
| **Step** | 1 s | | |
| **Comm object** | 8394 | **Related applications** | MINT, SPtM |
| **Config level** | Standard | | |
| **Setpoint visibility** | Always | | |
| **Description** | | | |

Time of closing of the **PRESTART (PAGE 674)** output prior to the engine start. Set to zero if you want to leave the output **PRESTART (PAGE 674)** open.

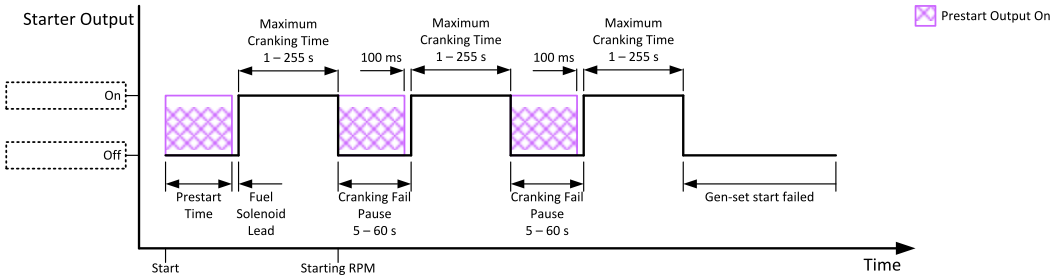



Image 8.1 Prestart Time

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## Starting RPM

| | | | |
|---|---|---|---|
| **Setpoint group** | Engine settings | **Related FW** | 2.1.0 |
| **Range [units]** | 5 .. 50 [%] | | |
| **Default value** | 25% | **Alternative config** | NO |
| **Step** | 1 % of **Nominal RPM (page 283)** | | |
| **Comm object** | 8254 | **Related applications** | MINT, SPtM |
| **Config level** | Advanced | | |
| **Setpoint visibility** | Always | | |
| **Description** | | | |

This setpoint defines the "firing" speed level as percent value of the **Nominal RPM (page 283)**. If this level is exceeded the engine is considered as started.

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## Starting Oil Pressure

| | | | |
|---|---|---|---|
| **Setpoint group** | Engine settings | **Related FW** | 2.1.0 |
| **Range [units]** | Disabled / 0,1 .. 10,0 [bar] | | |
| **Default value** | 4,5 bar | **Alternative config** | NO |
| **Step** | 0,1 bar | | |
| **Comm object** | 9681 | **Related applications** | MINT, SPtM |
| **Config level** | Standard | | |
| **Setpoint visibility** | Always | | |
| **Description** | | | |

Oil pressure limit for starting. The controller will stop cranking (**STARTER 1 (PAGE 680)** goes OFF) if the oil pressure rises above this limit.

Option Disabled – when this option is selected, Oil Pressure value (value from CU analog Oil Pressure, value from ECU analog Oil pressure and state of binary input Oil Pressure) is not used for disengagement of starter and for engine running evaluation.

> **IMPORTANT: Value from analog input has higher priority than value from ECU.**

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## Glow Plugs Time

| | | | |
|---|---|---|---|
| **Setpoint group** | Engine settings | **Related FW** | 2.1.0 |
| **Range [units]** | 0.0 .. **Prestart Time (page 296)** [s] | | |
| **Default value** | 0.0 s | **Alternative config** | NO |
| **Step** | 1.0 s | | |
| **Comm object** | 14412 | **Related applications** | MINT, SPtM |
| **Config level** | Standard | | |
| **Setpoint visibility** | Always | | |
| **Description** | | | |

This setpoint defines the time before starting when logical binary output **GLOW PLUGS (PAGE 660)** will be active.

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## Idle RPM

| | | | |
|---|---|---|---|
| **Setpoint group** | Engine settings | **Related FW** | 2.1.0 |
| **Range [units]** | 100 .. 4000 [RPM] | | |
| **Default value** | 900 RPM | **Alternative config** | NO |
| **Step** | 1 RPM | | |
| **Comm object** | 9946 | **Related applications** | MINT, SPtM |
| **Config level** | Advanced | | |
| **Setpoint visibility** | Always | | |
| **Description** | | | |
| This setpoint adjusts idle speed of engine. | | | |

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## Subgroup: Starting Timers

## Fuel Solenoid Lead

| | | | |
|---|---|---|---|
| **Setpoint group** | Engine settings | **Related FW** | 2.1.0 |
| **Range [units]** | 0,0 .. 25,0 [s] | | |
| **Default value** | 0,5 s | **Alternative config** | NO |
| **Step** | 0,1 s | | |
| **Comm object** | 10525 | **Related applications** | MINT, SPtM |
| **Config level** | Advanced | | |
| **Setpoint visibility** | Always | | |
| **Description** | | | |

Delay between **FUEL SOLENOID (PAGE 653)** and **STARTER 1 (PAGE 680)** logical binary outputs.**FUEL SOLENOID (PAGE 653)** is active before **STARTER 1 (PAGE 680)**. Lead time is adjusted via this setpoint.

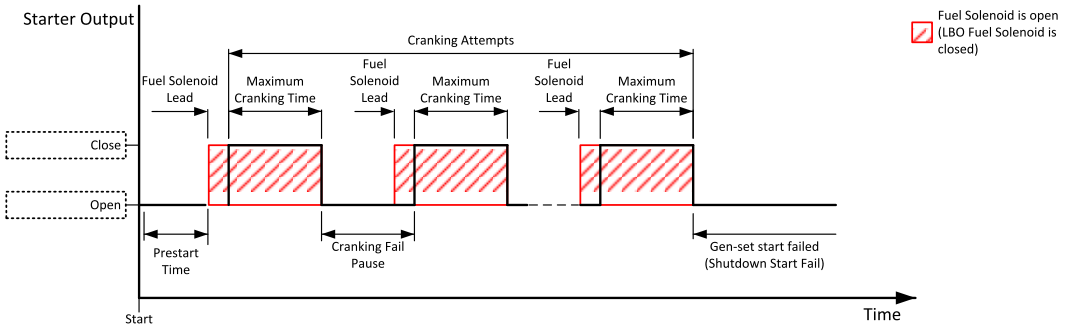



Image 8.2 Fuel Solenoid Lead

***Note:*** *LBO **PRESTART (PAGE 674)** goes to logical zero when Fuel Solenoid Lead goes to logical one.*

***Note:*** *This setpoint is used only for diesel **Fuel Solenoid (page 293)**.*

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## Idle Time

| | | | |
|---|---|---|---|
| **Setpoint group** | Engine settings | **Related FW** | 2.1.0 |
| **Range [units]** | 0 .. 600 [s] | | |
| **Default value** | 12 s | **Alternative config** | NO |
| **Step** | 1 s | | |
| **Comm object** | 9097 | **Related applications** | MINT, SPtM |
| **Config level** | Standard | | |
| **Setpoint visibility** | Always | | |
| **Description** | | | |

Idle Time delay starts when RPM exceeds **Starting RPM (page 296)**. Start fail is detected when during Idle state RPM decreases below 2 RPM.
The output **IDLE/NOMINAL (PAGE 663)** remains inactive during the idle period. Binary output Idle/Nominal opens during Cooling period again. This output can be used for switching the governor between idle and nominal speed.

***Note:*** *When controller is in the MAN mode, it is possible to finish the Idle Time count down by pushing the Start button.*

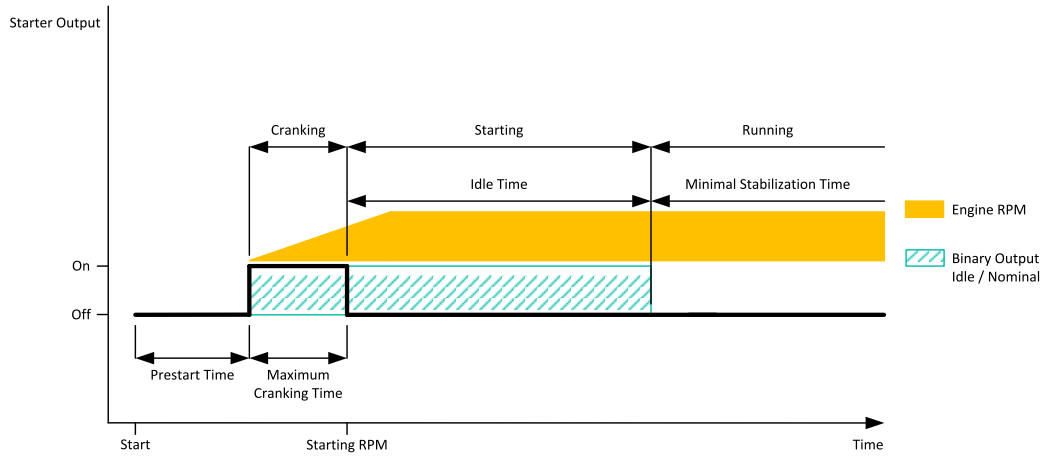



Image 8.3 Idle Time 1

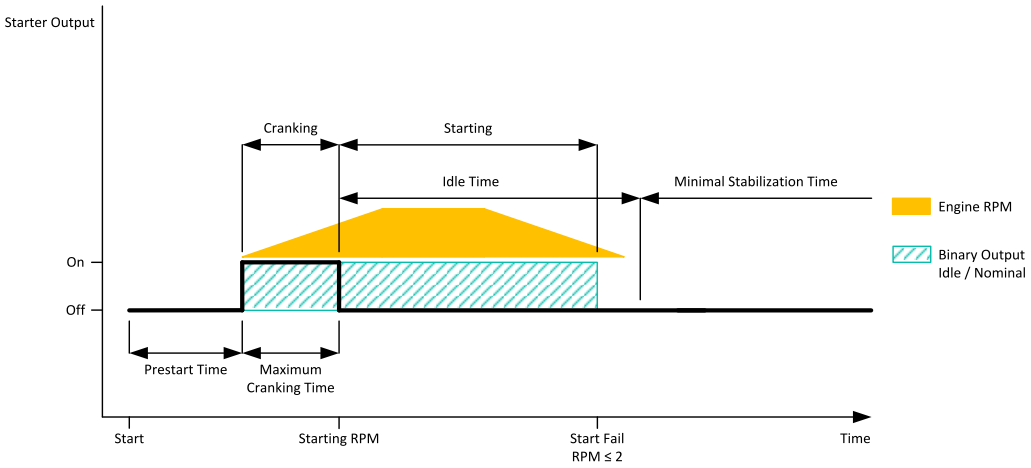



Image 8.4 Idle Time 2

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## Minimal Stabilization Time

| | | | |
|---|---|---|---|
| **Setpoint group** | Engine settings | **Related FW** | 2.1.0 |
| **Range [units]** | 1 .. **Maximal Stabilization Time (page 302)** [s] | | |
| **Default value** | 2 s | **Alternative config** | NO |
| **Step** | 1 s | | |
| **Comm object** | 8259 | **Related applications** | MINT, SPtM |
| **Config level** | Standard | | |
| **Setpoint visibility** | Always | | |
| **Description** | | | |

When the Gen-set has been started and the idle timer has elapsed, the controller will wait for a period adjusted by this setpoint before closing GCB, even if the generator voltage and frequency are already in limits.

***Note:*** *When starting the engine, setpoint should be set >300 s.*

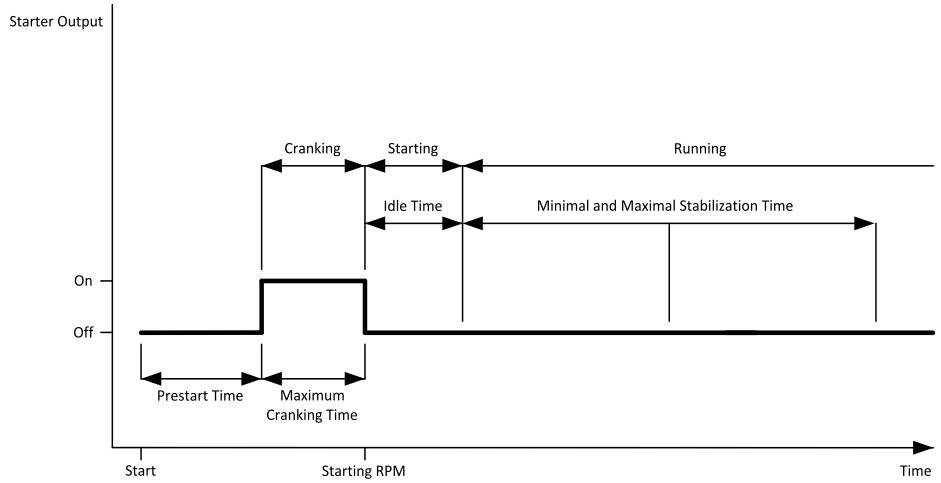



Image 8.5 Minimal Stabilization Time

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## Maximal Stabilization Time

| | | | |
|---|---|---|---|
| **Setpoint group** | Engine settings | **Related FW** | 2.1.0 |
| **Range [units]** | **Minimal Stabilization Time (page 301)** .. 3600 [s] | | |
| **Default value** | 10 s | **Alternative config** | NO |
| **Step** | 1 s | | |
| **Comm object** | 8313 | **Related applications** | MINT, SPtM |
| **Config level** | Advanced | | |
| **Setpoint visibility** | Always | | |
| **Description** | | | |

When the Gen-set has been started and the idle timer has elapsed, the generator voltage and frequency must get within limits within this period of time, otherwise an appropriate shutdown alarm (generator voltage and/or frequency) is issued.

***Note:*** *When starting the engine, setpoint should be set >300 s.*

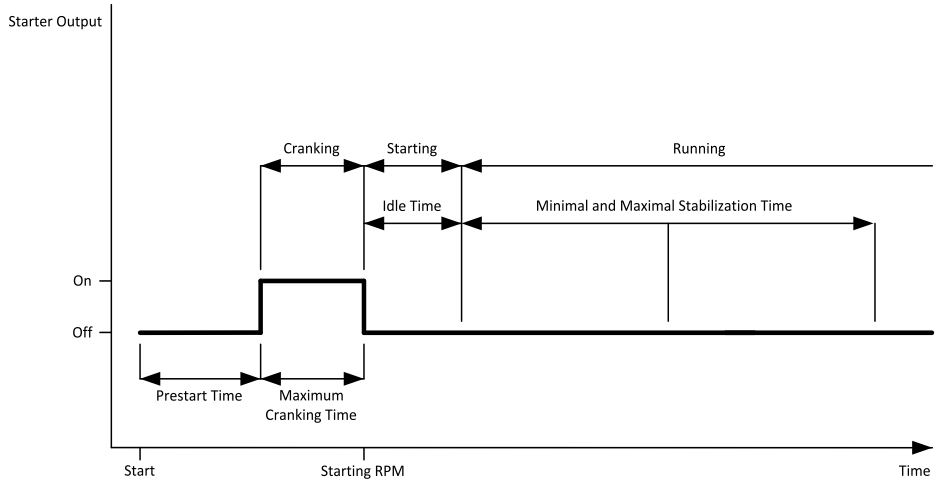



Image 8.6 Maximal Stabilization Time

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## GCB Delay

| | | | |
|---|---|---|---|
| **Setpoint group** | Engine settings | **Related FW** | 2.1.0 |
| **Range [units]** | 1 .. 600 [s] | | |
| **Default value** | 2 s | **Alternative config** | NO |
| **Step** | 1 s | | |
| **Comm object** | 20816 | **Related applications** | MINT, SPtM |
| **Config level** | Advanced | | |
| **Setpoint visibility** | Always | | |
| **Description** | | | |
| GCB Delay count down is used with the voltage autodetection function. Controller regulates generator voltage to selected nominal voltage during the GCB Delay count down and GCB closing is possible only when it is over. | | | |

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## Run Only Block Delay

| | | | |
|---|---|---|---|
| **Setpoint group** | Engine settings | **Related FW** | 2.1.0 |
| **Range [units]** | 0.0 .. 600.0 [s] | | |
| **Default value** | 5.0 s | **Alternative config** | YES |
| **Step** | 0.1 s | | |
| **Comm object** | 10023 | **Related applications** | MINT, SPtM |
| **Config level** | Advanced | | |
| **Setpoint visibility** | Always | | |
| **Description** | | | |
| During the start of the Gen-set, some engine protections have to be blocked (e.g. Oil pressure). The protections are unblocked after the Protect Hold Off. The time starts after reaching Starting RPM.<br>The protection blocking is based on the operating state of the engine automat. Once the engine automat reaches the state "Running" the protection with this blocking condition gets unblocked after delay Run Only Block Delay. | | | |

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## Sd Ventilation Time

| | | | |
|---|---|---|---|
| **Setpoint group** | Engine settings | **Related FW** | 2.1.0 |
| **Range [units]** | 0 .. 60 [s] | | |
| **Default value** | 5 s | **Alternative config** | NO |
| **Step** | 1 s | | |
| **Comm object** | 9695 | **Related applications** | MINT, SPtM |
| **Config level** | Advanced | | |
| **Setpoint visibility** | Always | | |
| **Description** | | | |
| In case **Fuel Solenoid (page 293)** is set to GAS, the Sd Ventilation Time adjusts the time of the starter to be switched on for engine pre-ventilation in the case of a first start attempt after shutdown or controller switch-on. | | | |

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## Subgroup: Stopping

## Cooling Speed

| | | | |
|---|---|---|---|
| **Setpoint group** | Engine settings | **Related FW** | 2.1.0 |
| **Range [units]** | Idle / Nominal [-] | | |
| **Default value** | Nominal | **Alternative config** | NO |
| **Step** | [-] | | |
| **Comm object** | 10046 | **Related applications** | MINT, SPtM |
| **Config level** | Advanced | | |
| **Setpoint visibility** | Always | | |
| **Description** | | | |

Selects the function of the binary output **IDLE/NOMINAL (PAGE 663)** during engine cooling state.

| | |
|---|---|
| Idle | Cooling is executed at Idle speed and generator protections are switched off. |
| Nominal | Cooling is executed at Nominal speed and generator protections are active. |

***Note:*** *When ECU is connected the predefined value 900 RPM for Idle speed is requested.*

***Note:*** *Binary output **IDLE/NOMINAL (PAGE 663)** must be configured and connected to speed governor. Engine Idle speed must be adjusted on speed governor.*

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## Subgroup: Stopping Timers

## Cooling Time

| | | | |
|---|---|---|---|
| **Setpoint group** | Engine settings | **Related FW** | 2.1.0 |
| **Range [units]** | 0 .. 3 600 [s] | | |
| **Default value** | 30 s | **Alternative config** | NO |
| **Step** | 1 s | | |
| **Comm object** | 8258 | **Related applications** | MINT, SPtM |
| **Config level** | Standard | | |
| **Setpoint visibility** | Always | | |
| **Description** | | | |
| Runtime of the unloaded Gen-set to cool the engine before stop. | | | |

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## Stop Time

| | | | |
|---|---|---|---|
| **Setpoint group** | Engine settings | **Related FW** | 2.1.0 |
| **Range [units]** | 0 .. 600 [s] | | |
| **Default value** | 60 s | **Alternative config** | NO |
| **Step** | 1 s | | |
| **Comm object** | 9815 | **Related applications** | MINT, SPtM |
| **Config level** | Advanced | | |
| **Setpoint visibility** | Always | | |
| **Description** | | | |

Under normal conditions the engine must certainly stop within this period after the **FUEL SOLENOID (PAGE 653)** has been de-energized and the **STOP SOLENOID (PAGE 682)** energized. The Stop Solenoid output is deactivated 12 s after last running engine indication went off.

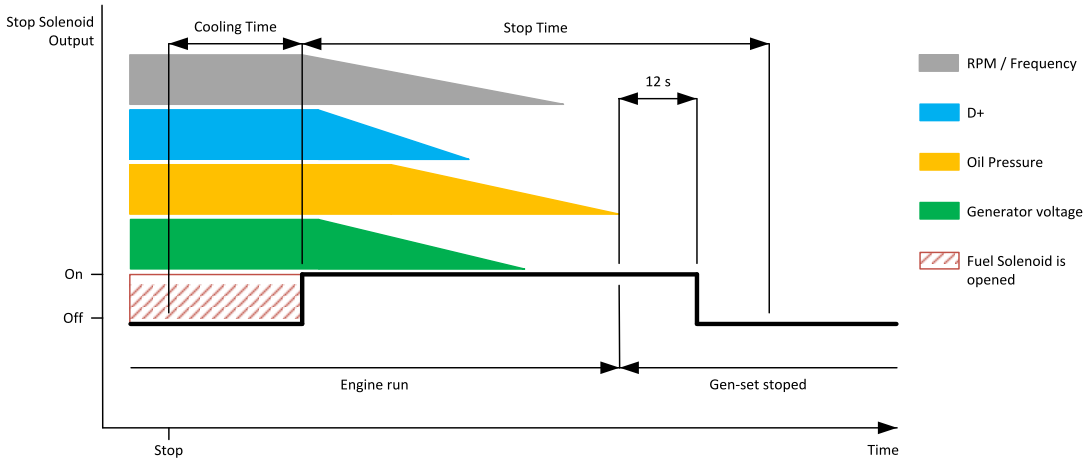



Image 8.7 Stop Time 1

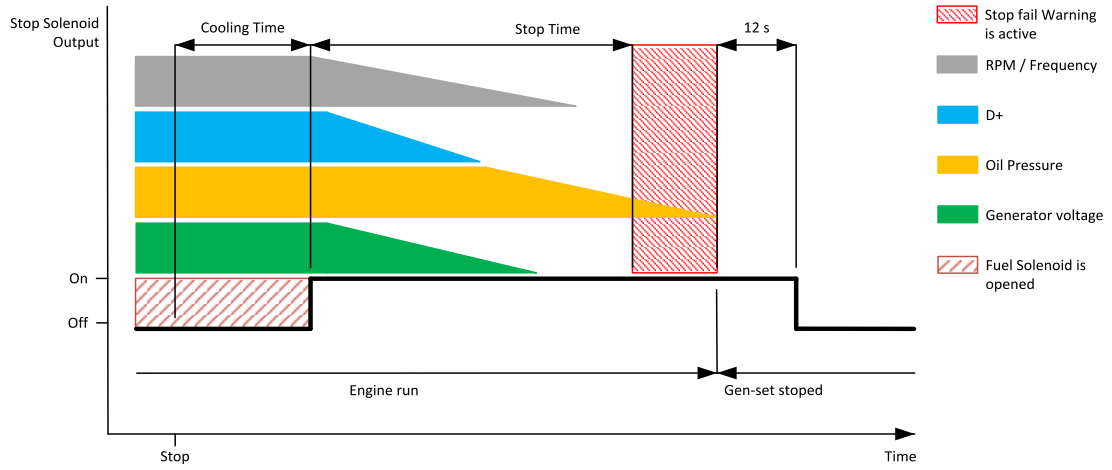



Image 8.8 Stop Time 2

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## After Cooling Time

| | | | |
|---|---|---|---|
| **Setpoint group** | Engine settings | **Related FW** | 2.1.0 |
| **Range [units]** | 0 .. 3 600 [s] | | |
| **Default value** | 180 s | **Alternative config** | NO |
| **Step** | 1 s | | |
| **Comm object** | 8662 | **Related applications** | MINT, SPtM |
| **Config level** | Standard | | |
| **Setpoint visibility** | Always | | |
| **Description** | | | |
| Runtime of engine after cooling pump. Binary output **COOLING PUMP (PAGE 647)** is active when the engine starts deactivates after timer set in this setpoint elapses (timer starts counting down as soon as engine switches to stop phase). | | | |

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## Subgroup: D+ Function

## D+ Function

| | | | |
|---|---|---|---|
| **Setpoint group** | Engine settings | **Related FW** | 2.1.0 |
| **Range [units]** | Enabled / ChargeFail / Disabled [-] | | |
| **Default value** | Disabled | **Alternative config** | NO |
| **Step** | [-] | | |
| **Comm object** | 9683 | **Related applications** | MINT, SPtM |
| **Config level** | Standard | | |
| **Setpoint visibility** | Always | | |
| **Description** | | | |
| Behavior of D+ terminal. | | | |

| | |
|---|---|
| Enabled | The D+ terminal is used for both functions – “running engine” detection and charge fail detection. |
| ChargeFail | The D+ terminal is used for charge fail detection only |
| Disabled | The D+ terminal is not used. |

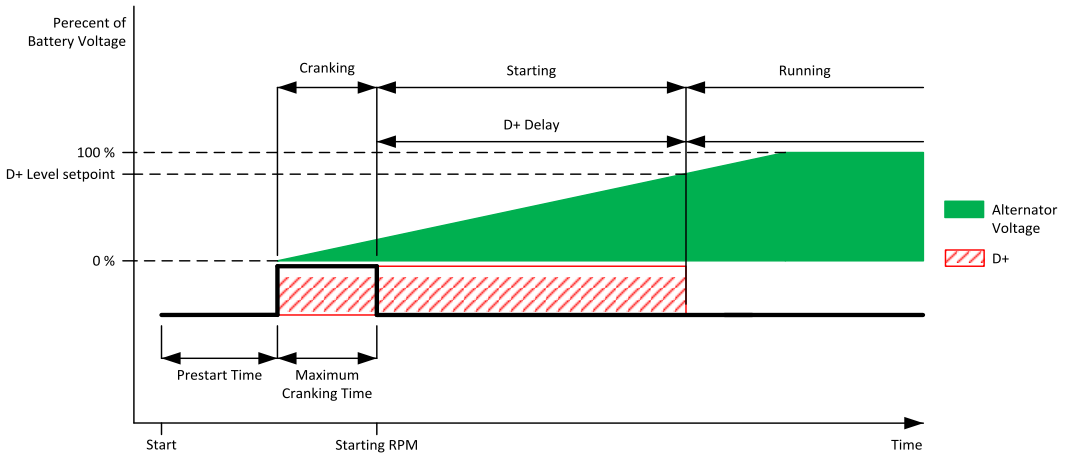



Image 8.9 D+ Function 1

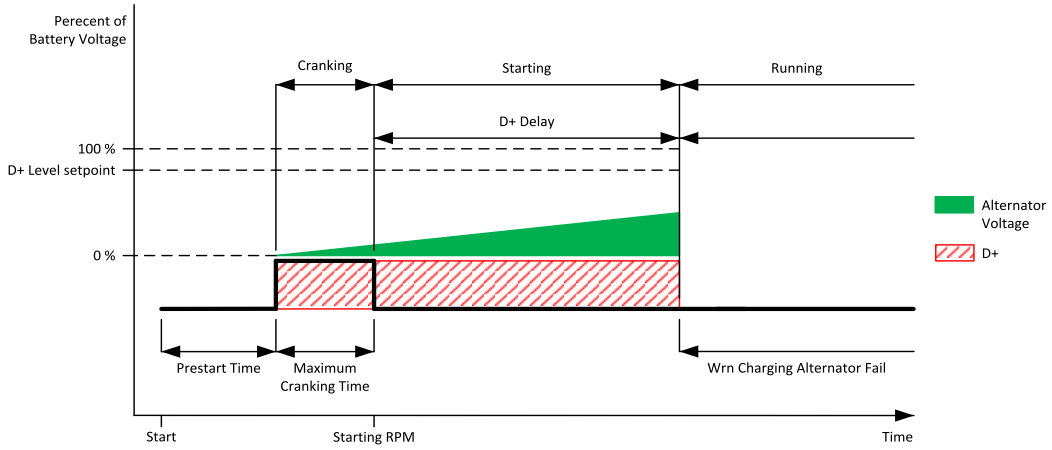



Image 8.10 D+ Function 2

***Note:*** *Delay of this function is adjusted via* ***D+ Delay (page 308)*** *setpoint, threshold of this function is adjusted via D+ Level setpoint.*

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## D+ Threshold

| | | | |
|---|---|---|---|
| **Setpoint group** | Engine settings | **Related FW** | 2.1.0 |
| **Range [units]** | 0..100 [%] | | |
| **Default value** | 80 % | **Alternative config** | NO |
| **Step** | 1 % | | |
| **Comm object** | 14959 | **Related applications** | MINT, SPtM |
| **Config level** | Advanced | | |
| **Setpoint visibility** | Only if setpoint **D+ Function (page 306)** is not set to *Disabled* value. | | |
| **Description** | | | |
| This setpoint adjusts threshold level for **D+ Function (page 306)**. | | | |

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## D+ Delay

| | | | |
|---|---|---|---|
| **Setpoint group** | Engine settings | **Related FW** | 2.1.0 |
| **Range [units]** | 1..255 [s] | | |
| **Default value** | 1 s | **Alternative config** | NO |
| **Step** | 1 s | | |
| **Comm object** | 14960 | **Related applications** | MINT, SPtM |
| **Config level** | Advanced | | |
| **Setpoint visibility** | Only if setpoint **D+ Function (page 306)** is not set to *Disabled* value. | | |
| **Description** | | | |
| This setpoint adjusts delay for **D+ Function (page 306)**. This delay is used for:<br>› Alarm **Wrn Charging Alternator Fail (page 728)**.<br>› For engine running condition – disengagement of starter | | | |

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## D+ Alarm Type

| | | | |
|---|---|---|---|
| **Setpoint group** | Engine settings | **Related FW** | 2.1.0 |
| **Range [units]** | No Protec/Wrn/Sd [-] | | |
| **Default value** | Wrn | **Alternative config** | NO |
| **Step** | [-] | | |
| **Comm object** | 15751 | **Related applications** | MINT, SPtM |
| **Config level** | Advanced | | |
| **Setpoint visibility** | Only if setpoint **D+ Function (page 306)** is not set to *Disabled* value. | | |
| **Description** | | | |
| This setpoint adjusts type of alarm **Wrn Charging Alternator Fail (page 728)**. | | | |

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## Subgroup: Engine Protections

## Overspeed Sd

| | | | |
|---|---|---|---|
| **Setpoint group** | Engine settings | **Related FW** | 2.1.0 |
| **Range [units]** | **Underspeed Sd (page 309)** .. 200 [%] | | |
| **Default value** | 115% | **Alternative config** | NO |
| **Step** | 1 % of **Nominal RPM (page 283)** | | |
| **Comm object** | 8263 | **Related applications** | MINT, SPtM |
| **Config level** | Standard | | |
| **Setpoint visibility** | Always | | |
| **Description** | | | |
| Threshold for over speed protection. Relative to the nominal speed. | | | |

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## Underspeed Sd

| | | | |
|---|---|---|---|
| **Setpoint group** | Engine settings | **Related FW** | 2.1.0 |
| **Range [units]** | 0 .. **Overspeed Sd (page 309)** [%] | | |
| **Default value** | 25% | **Alternative config** | NO |
| **Step** | 1 % of **Nominal RPM (page 283)** | | |
| **Comm object** | 8260 | **Related applications** | MINT, SPtM |
| **Config level** | Standard | | |
| **Setpoint visibility** | Always | | |
| **Description** | | | |
| Threshold for underspeed protection. Relative to the nominal speed. | | | |

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## Starting Overspeed Sd

| | | | |
|---|---|---|---|
| **Setpoint group** | Engine settings | **Related FW** | 2.1.0 |
| **Range [units]** | 100 ..200 [%] | | |
| **Default value** | 115% | **Alternative config** | NO |
| **Step** | 1 % | | |
| **Comm object** | 11033 | **Related applications** | MINT, SPtM |
| **Config level** | Standard | | |
| **Setpoint visibility** | Always | | |
| **Description** | | | |
| The rise up threshold for overspeed protection. The time for which this level is accepted is defined as **Starting Overspeed Time (page 310)**. This period starts to be counted once the RPM exceeds the value **Starting RPM (page 296)**. The threshold **Overspeed Sd (page 309)** starts to be valid once this period elapsed.<br>The type of reaction of the overspeed protection within the **Starting Overspeed Time (page 310)** is defined by the setpoint **Starting Overspeed Protection (page 311)**, so it is either considered as Sd | | | |

Overspeed or unsuccessful start attempt. Then the next start attempt is enabled once the engine was stopped. History record Starting Overspeed should be written in this case.

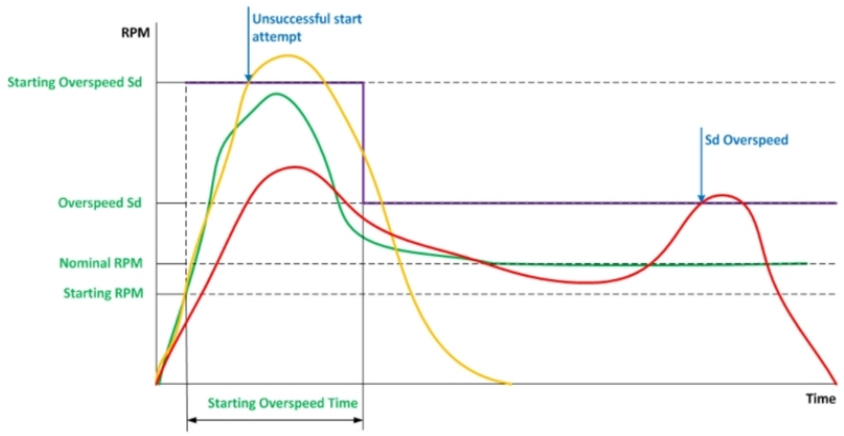



Image 8.11 Staring speed overshoot › Ovespeed Sd

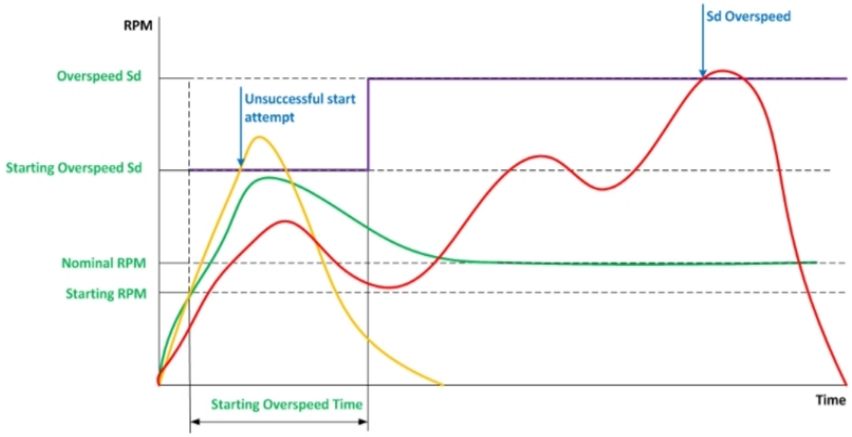



Image 8.12 Staring speed overshoot ‹ Ovespeed Sd

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## Starting Overspeed Time

| | | | |
|---|---|---|---|
| **Setpoint group** | Engine protection | **Related FW** | 2.1.0 |
| **Range [units]** | 0 .. 255 [s] | | |
| **Default value** | 5 s | **Alternative config** | NO |
| **Step** | 1 s | | |
| **Comm object** | 14108 | **Related applications** | MINT, SPtM |
| **Config level** | Standard | | |
| **Setpoint visibility** | Always | | |
| **Description** | | | |

Time when **Starting Overspeed Sd (page 309)** level is used for overspeed protection. This time starts countdown when starting RPM are reached.

Upper limit of **Starting Overspeed Protection (page 311)** is used during Starting Overspeed Time or

| |
|---|
| until generator goes to **loaded state**. |

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## Starting Overspeed Protection

| | | | |
|---|---|---|---|
| **Setpoint group** | Engine settings | **Related FW** | 2.1.0 |
| **Range [units]** | OverSpd Sd / NextStartAt [-] | | |
| **Default value** | OverSpd Sd | **Alternative config** | NO |
| **Step** | [-] | | |
| **Comm object** | 15808 | **Related applications** | MINT, SPtM |
| **Config level** | Standard | | |
| **Setpoint visibility** | Always | | |
| **Description** | | | |
| The setpoint allows user to chose which kind of protection will be triggered if speed limit is reached during **Starting Overspeed Time (page 310)**.<br>Sd overspeed option will result in controller shutting down the engine and displaying Sd Starting Overspeed alarm and NextStartAt option will result in controller stopping the engine and trying to start again. The number of attempts is defined by **Cranking Attempts (page 294)**. | | | |

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## Subgroup: Fuel Theft Protection

## Fuel Tank Volume

| | | | |
|---|---|---|---|
| **Setpoint group** | Engine settings | **Related FW** | 2.1.0 |
| **Range [units]** | 0 .. 10 000 [l] | | |
| **Default value** | 200 l | **Alternative config** | NO |
| **Step** | 1 l | | |
| **Comm object** | 11103 | **Related applications** | MINT, SPtM |
| **Config level** | Advanced | | |
| **Setpoint visibility** | Visible only if the logical analog input **FUEL LEVEL (PAGE 692)** is or ECU is configured | | |
| **Description** | | | |
| Define a capacity of Gen-set fuel tank. | | | |

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## Maximal Fuel Drop

| | | | |
|---|---|---|---|
| **Setpoint group** | Engine settings | **Related FW** | 2.1.0 |
| **Range [units]** | Disabled / 1 .. 50 [%/h] | | |
| **Default value** | 25 %/h | **Alternative config** | NO |
| **Step** | 1%/h | | |
| **Comm object** | 12373 | **Related applications** | MINT, SPtM |
| **Config level** | Advanced | | |
| **Setpoint visibility** | Always | | |
| **Description** | | | |
| Setpoint indicates the maximum allowable drop of fuel in fuel tank per running hour. When the engine is not running the maximal allowed fuel drop-off is preset to 5% of total tank volume per hour. | | | |

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## Maximal Fuel Drop Delay

| | | | |
|---|---|---|---|
| **Setpoint group** | Engine settings | **Related FW** | 2.1.0 |
| **Range [units]** | 0 .. 600 [s] | | |
| **Default value** | 5 s | **Alternative config** | NO |
| **Step** | s | | |
| **Comm object** | 14683 | **Related applications** | MINT, SPtM |
| **Config level** | Advanced | | |
| **Setpoint visibility** | Always | | |
| **Description** | | | |
| When the value of fuel drop per hour is higher than **Maximal Fuel Drop (page 312)** this delay starts count down. After count down of this delay alarm **Wrn Fuel Theft (page 745)** is activated. | | | |

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## Subgroup: Fuel Pump

## Fuel Pump On

| | | | |
|---|---|---|---|
| **Setpoint group** | Engine settings | **Related FW** | 2.1.0 |
| **Range [units]** | 0 .. **Fuel Pump Off (page 314)** [%] | | |
| **Default value** | 20 % | **Alternative config** | NO |
| **Step** | 1 % | | |
| **Comm object** | 10100 | **Related applications** | MINT, SPtM |
| **Config level** | Advanced | | |
| **Setpoint visibility** | All the time | | |
| **Description** | | | |

Threshold level for switching the binary output **FUEL PUMP (PAGE 653)** on.

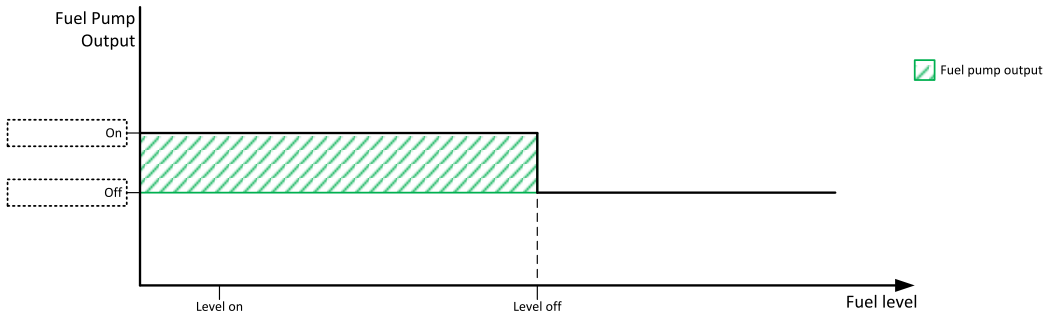



Image 8.13 Fuel Pump On

> **IMPORTANT: When binary input FUEL PUMP ON/OFF (PAGE 616) is configured then binary output FUEL PUMP (PAGE 653) is control by this binary input. Setpoints Fuel Pump On and Fuel Pump Off (page 314) are not evaluated!**

***Note:*** *Value from analog input has higher priority than ECU.*

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## Fuel Pump Off

| | | | |
|---|---|---|---|
| **Setpoint group** | Engine settings | **Related FW** | 2.1.0 |
| **Range [units]** | **Fuel Pump On (page 313)** .. 100 [%] | | |
| **Default value** | 90 % | **Alternative config** | NO |
| **Step** | 1 % | | |
| **Comm object** | 10101 | **Related applications** | MINT, SPtM |
| **Config level** | Advanced | | |
| **Setpoint visibility** | All the time | | |
| **Description** | | | |

Threshold level for switching the binary output **FUEL PUMP (PAGE 653)** off.

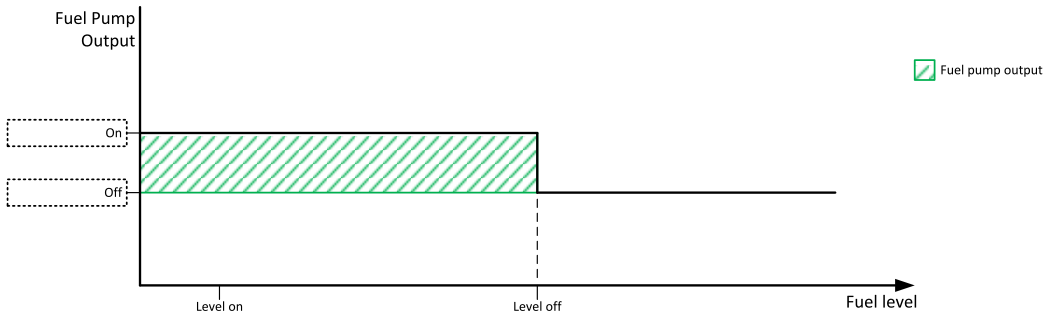



Image 8.14 Fuel Pump Off

> **IMPORTANT: When binary input FUEL PUMP ON/OFF (PAGE 616) is configured then binary output FUEL PUMP (PAGE 653) is control by this binary input. Setpoints Fuel Pump On (page 313) and Fuel Pump Off are not evaluated!**

***Note:*** *Value from analog input has higher priority than ECU.*

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## Transfer Wrn Delay

| | | | |
|---|---|---|---|
| **Setpoint group** | Engine settings | **Related FW** | 2.1.0 |
| **Range [units]** | Disabled / 1 .. 600 [s] | | |
| **Default value** | 30 s | **Alternative config** | NO |
| **Step** | 1 s | | |
| **Comm object** | 10685 | **Related applications** | MINT, SPtM |
| **Config level** | Advanced | | |
| **Setpoint visibility** | Visible only if the logical binary output **FUEL PUMP (PAGE 653)** is configured | | |
| **Description** | | | |
| If the controller does not see the fuel increase during fuel transfer within this time alarm **AL Fuel Transfer Failed (page 727)** will be displayed and the **FUEL PUMP (PAGE 653)** will be turned off. Alarm **AL Fuel Transfer Failed (page 727)** will be displayed but this alarm becomes immediately inactive and it will be possible to delete this message by the Fault reset button. If the fault is deleted the controller will initiate the transfer again. | | | |

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## Subgroup: Battery Protections

## Battery Undervoltage

| | | | |
|---|---|---|---|
| **Setpoint group** | Engine settings | **Related FW** | 2.1.0 |
| **Range [units]** | 8.0 V .. **Battery Overvoltage (page 316)** [V] | | |
| **Default value** | 18.0 V | **Alternative config** | NO |
| **Step** | 0.1 V | | |
| **Comm object** | 8387 | **Related applications** | MINT, SPtM |
| **Config level** | Standard | | |
| **Setpoint visibility** | Always | | |
| **Description** | | | |
| Warning threshold for low battery voltage. | | | |

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## Battery Overvoltage

| | | | |
|---|---|---|---|
| **Setpoint group** | Engine settings | **Related FW** | 2.1.0 |
| **Range [units]** | **Battery Undervoltage (page 315)** .. 40.0 [V] | | |
| **Default value** | 36.0 V | **Alternative config** | NO |
| **Step** | 0.1 V | | |
| **Comm object** | 9587 | **Related applications** | MINT, SPtM |
| **Config level** | Standard | | |
| **Setpoint visibility** | Always | | |
| **Description** | | | |
| Warning threshold for high battery voltage. | | | |

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## Battery <> Voltage Delay

| | | | |
|---|---|---|---|
| **Setpoint group** | Engine settings | **Related FW** | 2.1.0 |
| **Range [units]** | 0 .. 600 [s] | | |
| **Default value** | 5 s | **Alternative config** | NO |
| **Step** | 1 s | | |
| **Comm object** | 8383 | **Related applications** | MINT, SPtM |
| **Config level** | Standard | | |
| **Setpoint visibility** | Always | | |
| **Description** | | | |
| Delay for **Battery Undervoltage (page 315)** and **Battery Overvoltage (page 316)** protection.<br>**IMPORTANT: This is a fixed parameter, it isn't possible to adjust it in any manner. This parameter isn't visible either in controller or in PC tools.** | | | |

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## Battery Charger Fail Delay

| | | | |
|---|---|---|---|
| **Setpoint group** | Engine settings | **Related FW** | 2.1.0 |
| **Range [units]** | 0 .. 15 [min] | | |
| **Default value** | 5 min | **Alternative config** | NO |
| **Step** | 1 min | | |
| **Comm object** | 11374 | **Related applications** | MINT, SPtM |
| **Config level** | Advanced | | |
| **Setpoint visibility** | Conditioned with LBI **BATTERY CHARGER (PAGE 609)** | | |
| **Description** | | | |
| Delay for LBI **BATTERY CHARGER (PAGE 609)**. | | | |

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## Subgroup: Pulse Counters

## Conversion Coefficient Pulse 1

| | | | |
|---|---|---|---|
| **Setpoint group** | Engine settings | **Related FW** | 2.1.0 |
| **Range [units]** | 0 ... 999 999 [-] | | |
| **Default value** | 1 | **Alternative config** | NO |
| **Step** | 1 | | |
| **Comm object** | 10994 | **Related applications** | MINT, SPtM |
| **Config level** | Advanced | | |
| **Setpoint visibility** | Only if LBI **PULSE COUNTER 1 (PAGE 625)** is configured | | |
| **Description** | | | |
| This setpoint adjusts the rate of increasing of the Pulse Counter 1 function. The module counts pulses at the input **PULSE COUNTER 1 (PAGE 625)** and if the input pulses counter reaches value given by this setpoint, the counter value **Pulse Counter 1 (page 578)** is increased by 1 and input pulses counter is reset to 0. Both counter value and input pulses counter are stored in the nonvolatile memory. | | | |

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## Conversion Coefficient Pulse 2

| | | | |
|---|---|---|---|
| **Setpoint group** | Engine settings | **Related FW** | 2.1.0 |
| **Range [units]** | 0 ... 999 999 [-] | | |
| **Default value** | 1 | **Alternative config** | NO |
| **Step** | 1 | | |
| **Comm object** | 10995 | **Related applications** | MINT, SPtM |
| **Config level** | Advanced | | |
| **Setpoint visibility** | Only if LBI **PULSE COUNTER 2 (PAGE 626)** is configured | | |
| **Description** | | | |
| This setpoint adjusts the rate of increasing of the Pulse Counter 2 function. The module counts pulses at the input **PULSE COUNTER 2 (PAGE 626)** and if the input pulses counter reaches value given by this setpoint, the counter value **Pulse Counter 2 (page 578)** is increased by 1 and input pulses counter is reset to 0. Both counter value and input pulses counter are stored in the nonvolatile memory. | | | |

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## Subgroup: Ventilation

## Ventilation Pulse Time

| | | | |
|---|---|---|---|
| **Setpoint group** | Engine settings | **Related FW** | 2.1.0 |
| **Range [units]** | 0–3600 [s] | | |
| **Default value** | 30 s | **Alternative config** | NO |
| **Step** | 1 s | | |
| **Comm object** | 15767 | **Related applications** | MINT, SPtM |
| **Config level** | Advanced | | |
| **Setpoint visibility** | Only when logical binary output **VENTILATION ON PULSE (PAGE 687)** or **VENTILATION OFF PULSE (PAGE 687)** is configured. | | |
| **Description** | | | |
| This setpoint defines duration of pulse generated on logical binary outputs **VENTILATION ON PULSE (PAGE 687)** or **VENTILATION OFF PULSE (PAGE 687)** at the moment when logical binary output **VENTILATION (PAGE 686)** is activated or deactivated respectively. | | | |

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## Subgroup: ECU Settings

## Open Param Governor Speed Adjust

| | | | |
|---|---|---|---|
| **Setpoint group** | Engine settings | **Related FW** | 2.1.0 |
| **Range [units]** | 0.000 .. 10.000 [%] | | |
| **Default value** | 5.000 | **Alternative config** | NO |
| **Step** | 0.001 % | | |
| **Comm object** | 16617 | **Related applications** | MINT, SPtM |
| **Config level** | Advanced | | |
| **Setpoint visibility** | Visible only if ECU is configured | | |
| **Description** | | | |
| This parameter will adjust engine control characteristics to suit special requirements for stability or transient response.<br>Lower values will result in smaller control gains that offer improved steady state stability but decreased transient response.<br>Higher values will provide better transient response but will result in decreased steady state stability.<br>Nominal value of 5 provides a good balance for most applications. | | | |

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## Group: Maintenance Timers

### Subgroup: Maintenance Timer 1

### Maintenance Timer 1 RunHours

| | | | |
|---|---|---|---|
| **Setpoint group** | Maintenance Timers | **Related FW** | 2.1.0 |
| **Range [units]** | 0 ... 9 999 [h] / Disabled | | |
| **Default value** | Disabled | **Alternative config** | NO |
| **Step** | 1 h | | |
| **Comm object** | 13853 | **Related applications** | MINT, SPtM |
| **Config level** | Standard | | |
| **Setpoint visibility** | Always | | |
| **Description** | | | |
| Maintenance timer counts down when engine is running. If it reaches zero, an alarm appears, but the timer still counts down to negative values. When the value 10 000 (Disabled) is set, the Maintenance function is disabled and the counter value disappears from controllers statistics.<br>Reset of the timer can be done by adjusting this setpoint again. | | | |

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### Maintenance Timer 1 Interval

| | | | |
|---|---|---|---|
| **Setpoint group** | Maintenance Timers | **Related FW** | 2.1.0 |
| **Range [units]** | 1 .. 36 [month] / Disabled | | |
| **Default value** | Disabled | **Alternative config** | NO |
| **Step** | 1 month | | |
| **Comm object** | 20583 | **Related applications** | MINT, SPtM |
| **Config level** | Standard | | |
| **Setpoint visibility** | Always | | |
| **Description** | | | |
| Maintenance timer counts down all the time, setting is done in months, but actual **Maintenance Timer 1 Interval (page 574)** value is displayed and counted in days. If it reaches zero, an alarm appears, but the timer still counts down to negative values. When the value 37 (Disabled) is set, then the maintenance function is disabled and counter does not count and the counter value disappears from controllers statistics.<br>Reset of the timer can be done by adjusting this setpoint again. Setting of the setpoint does not change when the reset is done, only the **Maintenance Timer 1 Interval (page 574)** value changes to reflect reset of the maintenance timer. | | | |

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## Maintenance Timer 1 Protection

| | | | |
|---|---|---|---|
| **Setpoint group** | Maintenance Timers | **Related FW** | 2.1.0 |
| **Range [units]** | Warning / BOC [-] | | |
| **Default value** | Warning | **Alternative config** | NO |
| **Step** | [-] | | |
| **Comm object** | 20586 | **Related applications** | MINT, SPtM |
| **Config level** | Standard | | |
| **Setpoint visibility** | Always | | |
| **Description** | | | |
| Type of the maintenance alarm of both **Maintenance Timer 1 RunHours (page 319)** and **Maintenance Timer 1 Interval (page 319)**. | | | |

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## Subgroup: Maintenance Timer 2

## Maintenance Timer 2 RunHours

| | | | |
|---|---|---|---|
| **Setpoint group** | Maintenance Timers | **Related FW** | 2.1.0 |
| **Range [units]** | 0 ... 9 999 [h] / Disabled | | |
| **Default value** | Disabled | **Alternative config** | NO |
| **Step** | 1 h | | |
| **Comm object** | 13854 | **Related applications** | MINT, SPtM |
| **Config level** | Standard | | |
| **Setpoint visibility** | Always | | |
| **Description** | | | |
| Maintenance timer counts down when engine is running. If it reaches zero, an alarm appears, but the timer still counts down to negative values. When the value 10 000 (Disabled) is set, the Maintenance function is disabled and the counter value disappears from controllers statistics.<br>Reset of the timer can be done by adjusting this setpoint again. | | | |

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## Maintenance Timer 2 Interval

| | | | |
|---|---|---|---|
| **Setpoint group** | Maintenance Timers | **Related FW** | 2.1.0 |
| **Range [units]** | 1 .. 36 [month] / Disabled | | |
| **Default value** | Disabled | **Alternative config** | NO |
| **Step** | 1 month | | |
| **Comm object** | 20584 | **Related applications** | MINT, SPtM |
| **Config level** | Standard | | |
| **Setpoint visibility** | Always | | |
| **Description** | | | |
| Maintenance timer counts down all the time, setting is done in months, but actual **Maintenance Timer 2 Interval (page 574)** value is displayed and counted in days. If it reaches zero, an alarm appears, but the timer still counts down to negative values. When the value 37 (Disabled) is set, then the maintenance function is disabled and counter does not count and the counter value disappears from controllers statistics.<br>Reset of the timer can be done by adjusting this setpoint again. Setting of the setpoint does not change when the reset is done, only the **Maintenance Timer 2 Interval (page 574)** value changes to reflect reset of the maintenance timer. | | | |

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## Maintenance Timer 2 Protection

| | | | |
|---|---|---|---|
| **Setpoint group** | Maintenance Timers | **Related FW** | 2.1.0 |
| **Range [units]** | Warning / BOC [-] | | |
| **Default value** | Warning | **Alternative config** | NO |
| **Step** | [-] | | |
| **Comm object** | 20587 | **Related applications** | MINT, SPtM |
| **Config level** | Standard | | |
| **Setpoint visibility** | Always | | |
| **Description** | | | |
| Type of the maintenance alarm of both **Maintenance Timer 2 RunHours (page 320)** and **Maintenance Timer 2 Interval (page 321)**. | | | |

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## Subgroup: Maintenance Timer 3

## Maintenance Timer 3 RunHours

| | | | |
|---|---|---|---|
| **Setpoint group** | Maintenance Timers | **Related FW** | 2.1.0 |
| **Range [units]** | 0 ... 9 999 [h] / Disabled | | |
| **Default value** | Disabled | **Alternative config** | NO |
| **Step** | 1 h | | |
| **Comm object** | 13855 | **Related applications** | MINT, SPtM |
| **Config level** | Standard | | |
| **Setpoint visibility** | Always | | |
| **Description** | | | |
| Maintenance timer counts down when engine is running. If it reaches zero, an alarm appears, but the timer still counts down to negative values. When the value 10 000 (Disabled) is set, the Maintenance function is disabled and the counter value disappears from controllers statistics.<br>Reset of the timer can be done by adjusting this setpoint again. | | | |

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## Maintenance Timer 3 Interval

| | | | |
|---|---|---|---|
| **Setpoint group** | Maintenance Timers | **Related FW** | 2.1.0 |
| **Range [units]** | 1 .. 36 [month] / Disabled | | |
| **Default value** | Disabled | **Alternative config** | NO |
| **Step** | 1 month | | |
| **Comm object** | 20585 | **Related applications** | MINT, SPtM |
| **Config level** | Standard | | |
| **Setpoint visibility** | Always | | |
| **Description** | | | |
| Maintenance timer counts down all the time, setting is done in months, but actual **Maintenance Timer 3 Interval (page 575)** value is displayed and counted in days. If it reaches zero, an alarm appears, but the timer still counts down to negative values. When the value 37 (Disabled) is set, then the maintenance function is disabled and counter does not count and the counter value disappears from controllers statistics.<br>Reset of the timer can be done by adjusting this setpoint again. Setting of the setpoint does not change when the reset is done, only the **Maintenance Timer 3 Interval (page 575)** value changes to reflect reset of the maintenance timer. | | | |

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## Maintenance Timer 3 Protection

| | | | |
|---|---|---|---|
| **Setpoint group** | Maintenance Timers | **Related FW** | 2.1.0 |
| **Range [units]** | Warning / BOC [-] | | |
| **Default value** | Warning | **Alternative config** | NO |
| **Step** | [-] | | |
| **Comm object** | 20588 | **Related applications** | MINT, SPtM |
| **Config level** | Standard | | |
| **Setpoint visibility** | Always | | |
| **Description** | | | |
| Type of the maintenance alarm of both **Maintenance Timer 3 RunHours (page 322)** and **Maintenance Timer 3 Interval (page 322)**. | | | |

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# Group: Generator settings

## Subgroup: Overload Protection

## Overload BOC

| | | | |
|---|---|---|---|
| **Setpoint group** | Generator settings | **Related FW** | 2.1.0 |
| **Range [units]** | **Overload Wrn (page 324)** .. 200 [%] | | |
| **Default value** | 120 % | **Alternative config** | NO |
| **Step** | 1 % of **Nominal Power (page 274)** | | |
| **Comm object** | 8280 | **Related applications** | MINT, SPtM |
| **Config level** | Standard | | |
| **Setpoint visibility** | Always | | |
| **Description** | | | |
| Threshold level for overload of generator (in % of Nominal power) protection. Protection is BOC (Breaker Open and Gen-set Cooldown).<br>***Note:*** *When there is no control of breakers, the type of protection is Sd not BOC.* | | | |

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## Overload Wrn

| | | | |
|---|---|---|---|
| **Setpoint group** | Generator settings | **Related FW** | 2.1.0 |
| **Range [units]** | 0 .. **Overload BOC (page 323)** [%] | | |
| **Default value** | 120 % | **Alternative config** | NO |
| **Step** | 1 % of **Nominal Power (page 274)** | | |
| **Comm object** | 9685 | **Related applications** | MINT, SPtM |
| **Config level** | Standard | | |
| **Setpoint visibility** | Always | | |
| **Description** | | | |
| Threshold level for overload of generator (in % of **Nominal Power (page 274)**) protection. This is only warning. | | | |

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## Overload Delay

| | | | |
|---|---|---|---|
| **Setpoint group** | Generator settings | **Related FW** | 2.1.0 |
| **Range [units]** | 0.0 .. 600.0 [s] | | |
| **Default value** | 5.0 s | **Alternative config** | NO |
| **Step** | 0.1 s | | |
| **Comm object** | 8281 | **Related applications** | MINT, SPtM |
| **Config level** | Standard | | |
| **Setpoint visibility** | Always | | |
| **Description** | | | |
| Delay for protections **Overload BOC (page 323)** and **Overload Wrn (page 324)**. | | | |

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## Subgroup: Underload Protection

## Minimal Power PTM

| | | | |
|---|---|---|---|
| **Setpoint group** | Generator settings | **Related FW** | 2.1.0 |
| **Range [units]** | 0 .. 100 [%] | | |
| **Default value** | 5 % | **Alternative config** | NO |
| **Step** | 1 % of **Nominal Power (page 274)** | | |
| **Comm object** | 9241 | **Related applications** | MINT, SPtM |
| **Config level** | Standard | | |
| **Setpoint visibility** | Always | | |
| **Description** | | | |
| Minimal power of the Gen-set. Value of this setpoint is used in **Load Control PTM Mode (page 258)**. | | | |

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## Subgroup: Current Protection

## Short Circuit

| | | | |
|---|---|---|---|
| **Setpoint group** | Generator settings | **Related FW** | 2.1.0 |
| **Range [units]** | 100 .. 500 [%] | | |
| **Default value** | 250 % | **Alternative config** | NO |
| **Step** | 1 % of **Nominal Current (page 275)** | | |
| **Comm object** | 8282 | **Related applications** | MINT, SPtM |
| **Config level** | Standard | | |
| **Setpoint visibility** | Always | | |
| **Description** | | | |
| Protection occurs when generator current reaches this preset threshold. Type of the protection is BOC.<br>***Note:*** *When there is no control of breakers, the type of protection is Sd not BOC.* | | | |

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## Short Circuit Delay

| | | | |
|---|---|---|---|
| **Setpoint group** | Generator settings | **Related FW** | 2.1.0 |
| **Range [units]** | 0.00 .. 10.00 [s] | | |
| **Default value** | 0.04 s | **Alternative config** | NO |
| **Step** | 0.01 s | | |
| **Comm object** | 9991 | **Related applications** | MINT, SPtM |
| **Config level** | Advanced | | |
| **Setpoint visibility** | Always | | |
| **Description** | | | |
| Delay for **Short Circuit (page 325)** protection. | | | |

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## IDMT Generator >A Delay

| | | | |
|---|---|---|---|
| **Setpoint group** | Generator settings | **Related FW** | 2.1.0 |
| **Range [units]** | 1.0 .. 600.0 [s] | | |
| **Default value** | 4.0 s | **Alternative config** | NO |
| **Step** | 0.1 s | | |
| **Comm object** | 8283 | **Related applications** | MINT, SPtM |
| **Config level** | Standard | | |
| **Setpoint visibility** | Always | | |
| **Description** | | | |
| IDMT curve shape selection. IDMT is "very inverse" over current protection. Reaction time is not constant but depends on over current level according to the following formula:<br>$$\text{Reaction time} = \frac{Overcurrent\ IDMT\ Delay^{*}\ Nominal\ Current}{I_{gen} - Nominal\ Current}$$ | | | |

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

$I_{gen}$ is maximal value of all measured phases of generator current.

Table 8.1 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 |

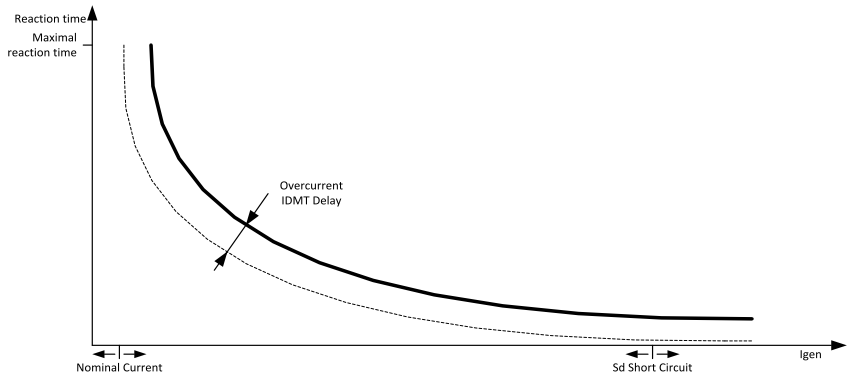



Image 8.15 IDMT Overcurrent Delay

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## Generator Current Unbalance

| | | | |
|---|---|---|---|
| **Setpoint group** | Generator settings | **Related FW** | 2.1.0 |
| **Range [units]** | 1 .. 200 [%] of **Nominal Current (page 275)** | | |
| **Default value** | 50 % | **Alternative config** | NO |
| **Step** | 1 % of **Nominal Current (page 275)** | | |
| **Comm object** | 8284 | **Related applications** | MINT, SPtM |
| **Config level** | Advanced | | |
| **Setpoint visibility** | Conditioned by the setpoint **Connection type (page 277)** | | |
| **Description** | | | |
| Threshold for generator current asymmetry (unbalance).<br>Protection is BOC (Breaker Open and Gen-set Cooldown). | | | |

***Note:*** *When there is no control of breakers, the type of protection is Sd not BOC.*

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## Generator Current Unbalance Delay

| | | | |
|---|---|---|---|
| **Setpoint group** | Generator settings | **Related FW** | 2.1.0 |
| **Range [units]** | 0.0 .. 600.0 [s] | | |
| **Default value** | 5.0 s | **Alternative config** | NO |
| **Step** | 0.1 s | | |
| **Comm object** | 8285 | **Related applications** | MINT, SPtM |
| **Config level** | Advanced | | |
| **Setpoint visibility** | Conditioned by the setpoint **Connection type (page 277)** | | |
| **Description** | | | |
| Delay for **Generator Current Unbalance (page 326)** protection. | | | |

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## Subgroup: Earth Fault Current Protection

## IDMT Earth Fault Current Sd

| | | | |
|---|---|---|---|
| **Setpoint group** | Process Control | **Related FW** | 2.1.0 |
| **Range [units]** | 0 .. 10000 [A] | | |
| **Default value** | 10 [A] | **Alternative config** | NO |
| **Step** | 1 [A] | | |
| **Comm object** | 20791 | **Related applications** | MINT, SPtM |
| **Config level** | Advanced | | |
| **Setpoint visibility** | Always | | |
| **Description** | | | |
| Level for earth fault current Sd protection. This protection is evaluated on 4th current measurement on controller. | | | |

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## IDMT Earth Fault Current Delay

| | | | |
|---|---|---|---|
| **Setpoint group** | Process Control | **Related FW** | 2.1.0 |
| **Range [units]** | 0.0 .. 600.0 [s] | | |
| **Default value** | 5.0 [s] | **Alternative config** | NO |
| **Step** | 0.1 [s] | | |
| **Comm object** | 20792 | **Related applications** | MINT, SPtM |
| **Config level** | Advanced | | |
| **Setpoint visibility** | Always | | |
| **Description** | | | |
| Delay for earth fault current Sd protection. This protection is evaluated on 4th current measurement on controller. | | | |

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## Subgroup: Voltage Protection

## Generator Overvoltage Sd

| | | | |
|---|---|---|---|
| **Setpoint group** | Generator settings | **Related FW** | 2.1.0 |
| **Range [units]** | **Generator Overvoltage Wrn (page 328)** .. 200 [%] | | |
| **Default value** | 110 % | **Alternative config** | NO |
| **Step** | 1 % of **Nominal Voltage Ph-N (page 278)** or **Nominal Voltage Ph-Ph (page 279)** | | |
| **Comm object** | 8291 | **Related applications** | MINT, SPtM |
| **Config level** | Standard | | |
| **Setpoint visibility** | Always | | |
| **Description** | | | |
| Threshold for generator overvoltage protection. All three phases are checked. Maximum out of three is used.<br>***Note:*** *Phase to phase and phase to neutral voltages are used for this protection.* | | | |

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## Generator Overvoltage Wrn

| | | | |
|---|---|---|---|
| **Setpoint group** | Generator settings | **Related FW** | 2.1.0 |
| **Range [units]** | **Generator Undervoltage Wrn (page 329)** .. **Generator Overvoltage Sd (page 328)** [%] | | |
| **Default value** | 110 % | **Alternative config** | NO |
| **Step** | 1 % of **Nominal Voltage Ph-N (page 278)** or **Nominal Voltage Ph-Ph (page 279)** | | |
| **Comm object** | 9686 | **Related applications** | MINT, SPtM |
| **Config level** | Standard | | |
| **Setpoint visibility** | Always | | |
| **Description** | | | |
| Threshold for generator overvoltage protection. All three phases are checked. Maximum out of three is used.<br>***Note:*** *Phase to phase and phase to neutral voltages are used for this protection.* | | | |

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## Generator Undervoltage Wrn

| | | | |
|---|---|---|---|
| **Setpoint group** | Generator settings | **Related FW** | 2.1.0 |
| **Range [units]** | **Generator Undervoltage BOC (page 329)** .. **Generator Overvoltage Wrn (page 328)** [%] | | |
| **Default value** | 70 % | **Alternative config** | NO |
| **Step** | 1 % of **Nominal Voltage Ph-N (page 278)** or **Nominal Voltage Ph-Ph (page 279)** | | |
| **Comm object** | 9687 | **Related applications** | MINT, SPtM |
| **Config level** | Standard | | |
| **Setpoint visibility** | Always | | |
| **Description** | | | |
| Threshold for generator undervoltage protection. All three phases are checked. Minimum out of three is used.<br>***Note:*** *Phase to phase and phase to neutral voltages are used for this protection.* | | | |

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## Generator Undervoltage BOC

| | | | |
|---|---|---|---|
| **Setpoint group** | Generator settings | **Related FW** | 2.1.0 |
| **Range [units]** | 0 .. **Generator Undervoltage Wrn (page 329)** [%] | | |
| **Default value** | 70 % | **Alternative config** | NO |
| **Step** | 1 % of **Nominal Voltage Ph-N (page 278)** or **Nominal Voltage Ph-Ph (page 279)** | | |
| **Comm object** | 8293 | **Related applications** | MINT, SPtM |
| **Config level** | Standard | | |
| **Setpoint visibility** | Always | | |
| **Description** | | | |
| Threshold for generator undervoltage protection. All three phases are checked. Minimum out of three is used.<br>***Note:*** *Phase to phase and phase to neutral voltages are used for this protection.*<br>***Note:*** *When there is no control of breakers, the type of protection is Sd not BOC.* | | | |

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## Generator <> Voltage Delay

| | | | |
|---|---|---|---|
| **Setpoint group** | Generator settings | **Related FW** | 2.1.0 |
| **Range [units]** | 0,0 .. 600,0 [s] | | |
| **Default value** | 3,0 s | **Alternative config** | NO |
| **Step** | 0,1 s | | |
| **Comm object** | 9103 | **Related applications** | MINT, SPtM |
| **Config level** | Standard | | |
| **Setpoint visibility** | Always | | |
| **Description** | | | |
| Delay for **Generator Overvoltage Sd (page 328)**, **Generator Overvoltage Wrn (page 328)**, **Generator Undervoltage BOC (page 329)** and **Generator Undervoltage Wrn (page 329)** protection. | | | |

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## Generator V Unbalance

| | | | |
|---|---|---|---|
| **Setpoint group** | Generator settings | **Related FW** | 2.1.0 |
| **Range [units]** | 1 .. 200 [%] of **Nominal Voltage Ph-Ph (page 279)** or **Nominal Voltage Ph-N (page 278)** | | |
| **Default value** | 10 % | **Alternative config** | NO |
| **Step** | 1 % | | |
| **Comm object** | 8288 | **Related applications** | MINT, SPtM |
| **Config level** | Advanced | | |
| **Setpoint visibility** | Conditioned by the setpoint **Connection type (page 277)** | | |
| **Description** | | | |
| Threshold for generator voltage unbalance alarm.<br>***Note:*** *When there is no control of breakers, the type of protection is Sd not BOC.* | | | |

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## Generator V Unbalance Delay

| | | | |
|---|---|---|---|
| **Setpoint group** | Generator settings | **Related FW** | 2.1.0 |
| **Range [units]** | 0.0 .. 600.0 [s] | | |
| **Default value** | 3.0 s | **Alternative config** | NO |
| **Step** | 0.1 s | | |
| **Comm object** | 8289 | **Related applications** | MINT, SPtM |
| **Config level** | Advanced | | |
| **Setpoint visibility** | Conditioned by the setpoint **Connection type (page 277)** | | |
| **Description** | | | |
| Delay for **Generator V Unbalance (page 330)** protection. | | | |

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## Subgroup: Frequency Protection

## Generator Overfrequency BOC

| | | | |
|---|---|---|---|
| **Setpoint group** | Generator settings | **Related FW** | 2.1.0 |
| **Range [units]** | **Generator Overfrequency Wrn (page 331)** .. 200,0 [%] | | |
| **Default value** | 110,0 % | **Alternative config** | NO |
| **Step** | 0,1 % of **Nominal Frequency (page 282)** | | |
| **Comm object** | 8296 | **Related applications** | MINT, SPtM |
| **Config level** | Standard | | |
| **Setpoint visibility** | Always | | |
| **Description** | | | |
| Threshold for generator phase L1 overfrequency.<br>***Note:*** *When there is no control of breakers, the type of protection is Sd not BOC.* | | | |

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## Generator Overfrequency Wrn

| | | | |
|---|---|---|---|
| **Setpoint group** | Generator settings | **Related FW** | 2.1.0 |
| **Range [units]** | **Generator Underfrequency Wrn (page 331)** .. **Generator Overfrequency BOC (page 331)** [%] | | |
| **Default value** | 110,0 % | **Alternative config** | NO |
| **Step** | 0,1 % of **Nominal Frequency (page 282)** | | |
| **Comm object** | 9688 | **Related applications** | MINT, SPtM |
| **Config level** | Standard | | |
| **Setpoint visibility** | Always | | |
| **Description** | | | |
| Threshold for generator phase L1 overfrequency. | | | |

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## Generator Underfrequency Wrn

| | | | |
|---|---|---|---|
| **Setpoint group** | Generator settings | **Related FW** | 2.1.0 |
| **Range [units]** | **Generator Underfrequency BOC (page 332)** .. **Generator Overfrequency Wrn (page 331)** [%] | | |
| **Default value** | 85,0 % | **Alternative config** | NO |
| **Step** | 0,1 % of **Nominal Frequency (page 282)** | | |
| **Comm object** | 9689 | **Related applications** | MINT, SPtM |
| **Config level** | Standard | | |
| **Setpoint visibility** | Always | | |
| **Description** | | | |
| Threshold for generator phase L1 underfrequency. | | | |

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## Generator Underfrequency BOC

| | | | |
|---|---|---|---|
| **Setpoint group** | Generator settings | **Related FW** | 2.1.0 |
| **Range [units]** | 0,0 .. **Generator Underfrequency Wrn (page 331)** [%] | | |
| **Default value** | 85,0 % | **Alternative config** | NO |
| **Step** | 0,1 % of **Nominal Frequency (page 282)** | | |
| **Comm object** | 8298 | **Related applications** | MINT, SPtM |
| **Config level** | Standard | | |
| **Setpoint visibility** | Always | | |
| **Description** | | | |
| Threshold for generator phase L1 underfrequency.<br>***Note:*** *When there is no control of breakers, the type of protection is Sd not BOC.* | | | |

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## Generator <> Frequency Delay

| | | | |
|---|---|---|---|
| **Setpoint group** | Generator settings | **Related FW** | 2.1.0 |
| **Range [units]** | 0,0 .. 600,0 [s] | | |
| **Default value** | 3,0 s | **Alternative config** | NO |
| **Step** | 0,1 s | | |
| **Comm object** | 8297 | **Related applications** | MINT, SPtM |
| **Config level** | Standard | | |
| **Setpoint visibility** | Always | | |
| **Description** | | | |
| Delay for **Generator Overfrequency BOC (page 331)**, **Generator Overfrequency Wrn (page 331)**, **Generator Underfrequency Wrn (page 331)** and **Generator Underfrequency BOC (page 332)** protection. | | | |

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## Subgroup: Reverse Power Protection

### Reverse Power Level

| | | | |
|---|---|---|---|
| **Setpoint group** | Generator settings | **Related FW** | 2.1.0 |
| **Range [units]** | 0 .. 50 [%] | | |
| **Default value** | 10 % | **Alternative config** | NO |
| **Step** | 1 % of **Nominal Power (page 274)** | | |
| **Comm object** | 8486 | **Related applications** | MINT, SPtM |
| **Config level** | Standard | | |
| **Setpoint visibility** | Conditioned by the setpoint **Reverse Power Protection (page 340)**All the time | | |
| **Description** | | | |
| Level for generator **Reverse Power Protection (page 340)Reverse Power Protection**. | | | |

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### Reverse Power Delay

| | | | |
|---|---|---|---|
| **Setpoint group** | Generator settings | **Related FW** | 2.1.0 |
| **Range [units]** | 0.0 .. 600 [s] | | |
| **Default value** | 5.0 s | **Alternative config** | NO |
| **Step** | 0.1 s | | |
| **Comm object** | 8552 | **Related applications** | MINT, SPtM |
| **Config level** | Standard | | |
| **Setpoint visibility** | Conditioned by the setpoint **Reverse Power Protection (page 340)**All the time | | |
| **Description** | | | |
| Delay for generator **Reverse Power Protection (page 340)Reverse Power Protection**. | | | |

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## Subgroup: Excitation Loss Protection

### Excitation Loss Level

| | | | |
|---|---|---|---|
| **Setpoint group** | Generator settings | **Related FW** | 2.1.0 |
| **Range [units]** | 0 .. 150 [%] | | |
| **Default value** | 30 % | **Alternative config** | NO |
| **Step** | 1 % of **Nominal Power (page 274)** | | |
| **Comm object** | 12486 | **Related applications** | MINT, SPtM |
| **Config level** | Standard | | |
| **Setpoint visibility** | Conditioned by the setpoint **Excitation Loss Protection (page 341)**. | | |
| **Description** | | | |
| Level for generator **Excitation Loss Protection (page 341)** | | | |

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## Excitation Loss Delay

| | | | |
|---|---|---|---|
| **Setpoint group** | Generator settings | **Related FW** | 2.1.0 |
| **Range [units]** | 0,0 .. 600,0 [s] | | |
| **Default value** | 5,0 s | **Alternative config** | NO |
| **Step** | 0,1 s | | |
| **Comm object** | 12487 | **Related applications** | MINT, SPtM |
| **Config level** | Standard | | |
| **Setpoint visibility** | Conditioned by the setpoint **Excitation Loss Protection (page 341)**. | | |
| **Description** | | | |
| Delay for generator **Excitation Loss Protection (page 341)**. | | | |

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# Group: Protections

## Subgroup: Overload Protection

## Overload Protection

| | | | |
|---|---|---|---|
| **Setpoint group** | Protections | **Related FW** | 2.1.0 |
| **Range [units]** | Enabled / Disabled / ExtDisable [-] | | |
| **Default value** | Enabled | **Alternative config** | NO |
| **Step** | [-] | | |
| **Comm object** | 15664 | **Related applications** | MINT, SPtM |
| **Config level** | Advanced | | |
| **Setpoint visibility** | Always | | |
| **Description** | | | |

This setpoint adjusts the behavior of generator Overload protection.

| | |
|---|---|
| Enabled | Protection is enabled. Behavior of protection is adjusted via setpoints **Overload BOC (page 323)**, **Overload Wrn (page 324)** and **Overload Delay (page 324)**. |
| Disabled | Protection is disabled. |
| ExtDisable | Protection is enabled or disabled by the state of LBI **Protection Force Disable (page 625)** |

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## Subgroup: Current Protection

## IDMT Generator >A Protection

| | | | |
|---|---|---|---|
| **Setpoint group** | Protections | **Related FW** | 2.1.0 |
| **Range [units]** | Enabled / Disabled / ExtDisable[-] | | |
| **Default value** | Enabled | **Alternative config** | NO |
| **Step** | [-] | | |
| **Comm object** | 15666 | **Related applications** | MINT, SPtM |
| **Config level** | Advanced | | |
| **Setpoint visibility** | Always | | |
| **Description** | | | |

This setpoint adjusts the behavior of generator IDMT Overcurrent protection.

| | |
|---|---|
| Enabled: | Protection is enabled. Behavior of protection is adjusted via setpoint **IDMT Generator >A Delay (page 325)**. |
| Disabled: | Protection is disabled. |
| ExtDisable: | Protection is enabled or disabled by the state of LBI **PROTECTION FORCE DISABLE (PAGE 625)**. |

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## Generator Current Unbalance Protection

| | | | |
|---|---|---|---|
| **Setpoint group** | Protections | **Related FW** | 2.1.0 |
| **Range [units]** | Enabled / Disabled / ExtDisable[-] | | |
| **Default value** | Enabled | **Alternative config** | NO |
| **Step** | [-] | | |
| **Comm object** | 15667 | **Related applications** | MINT, SPtM |
| **Config level** | Advanced | | |
| **Setpoint visibility** | Always | | |
| **Description** | | | |

This setpoint adjusts the behavior of generator Current Unbalance protection.

| | |
|---|---|
| Enabled: | Protection is enabled. Behavior of protection is adjusted via setpoints **Generator Current Unbalance (page 326)** and **Generator Current Unbalance Delay (page 327)**. |
| Disabled: | Protection is disabled. |
| ExtDisable: | Protection is enabled or disabled by the state of LBI **PROTECTION FORCE DISABLE (PAGE 625)**. |

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## Short Circuit Protection

| | | | |
|---|---|---|---|
| **Setpoint group** | Protections | **Related FW** | 2.1.0 |
| **Range [units]** | Enabled / Disabled / By LBI [-] | | |
| **Default value** | Enabled | **Alternative config** | NO |
| **Step** | [-] | | |
| **Comm object** | 15665 | **Related applications** | MINT, SPtM |
| **Config level** | Advanced | | |
| **Setpoint visibility** | Always | | |
| **Description** | | | |

This setpoint adjusts the behavior of generator Short Circuit protection.

| | |
|---|---|
| Enabled: | Protection is enabled. Behavior of protection is adjusted via setpoints **Short Circuit (page 325)** and **Short Circuit Delay (page 325)**. |
| Disabled: | Protection is disabled. |
| By LBI: | Protection is enabled or disabled by the state of LBI **PROTECTION FORCE DISABLE (PAGE 625)**. |

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## Subgroup: Earth Fault Current Protection

## IDMT Earth Fault Current Protection

| | | | |
|---|---|---|---|
| **Setpoint group** | Protections | **Related FW** | 2.1.0 |
| **Range [units]** | Enabled / Disabled / ExtDisable [-] | | |
| **Default value** | Disabled | **Alternative config** | NO |
| **Step** | [-] | | |
| **Comm object** | 15670 | **Related applications** | MINT, SPtM |
| **Config level** | Advanced | | |
| **Setpoint visibility** | Always | | |
| **Description** | | | |

This setpoint adjusts the behavior of Generator IDMT Earth Fault Current protection.

| | |
|---|---|
| Enabled | Protection is enabled. Behavior of protection is adjusted via setpoints **IDMT Earth Fault Current Sd (page 327)** and **IDMT Earth Fault Current Delay (page 327)**. |
| Disabled | Protection is disabled. |
| ExtDisable | Protection is enabled or disabled by the state of LBI **PROTECTION FORCE DISABLE (PAGE 625)**. |

GCB closing is disabled, if the parameter is set to Disabled. It is blocked as well, if the parameter is set to ExtDisable and LBI **PROTECTION FORCE DISABLE (PAGE 625)** is active.

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## Subgroup: Voltage Protection

## Generator <> Voltage Protection

| | | | |
|---|---|---|---|
| **Setpoint group** | Protections | **Related FW** | 2.1.0 |
| **Range [units]** | Enabled / Disabled / ExtDisable [-] | | |
| **Default value** | Enabled | **Alternative config** | NO |
| **Step** | [-] | | |
| **Comm object** | 15668 | **Related applications** | MINT, SPtM |
| **Config level** | Advanced | | |
| **Setpoint visibility** | Always | | |
| **Description** | | | |

This setpoint adjusts the behavior of generator Generator <> Voltage protection. GCB closing is blocked, if the protection is disabled!

| | |
|---|---|
| Enabled: | Protection is enabled. Behavior of protection is adjusted via setpoints **Generator Overvoltage Sd (page 328)**, **Generator Overvoltage Wrn (page 328)**, **Generator Undervoltage BOC (page 329)**, **Generator Undervoltage Wrn (page 329)** and **Generator <> Voltage Delay (page 330)**. |
| Disabled: | Protection is disabled. |
| ExtDisable: | Protection is enabled or disabled by the state of LBI **PROTECTION FORCE DISABLE (PAGE 625)** |

GCB closing is disabled, if the parameter is set to Disabled. It is blocked as well, if the parameter is set to ExtDisable and LBI **PROTECTION FORCE DISABLE (PAGE 625)** is active.

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## Generator V Unbalance Protection

| | | | |
|---|---|---|---|
| **Setpoint group** | Protections | **Related FW** | 2.1.0 |
| **Range [units]** | Enabled / Disabled / ExtDisable [-] | | |
| **Default value** | Enabled | **Alternative config** | NO |
| **Step** | [-] | | |
| **Comm object** | 15669 | **Related applications** | MINT, SPtM |
| **Config level** | Advanced | | |
| **Setpoint visibility** | Always | | |
| **Description** | | | |

This setpoint adjusts the behavior of generator Voltage Unbalance protection.

| | |
|---|---|
| Enabled: | Protection is enabled. Behavior of protection is adjusted via setpoints **Generator V Unbalance (page 330)** and **Generator V Unbalance Delay (page 330)**. |
| Disabled: | Protection is disabled. |
| ExtDisable: | Protection is enabled or disabled by the state of LBI **PROTECTION FORCE DISABLE (PAGE 625)**. |

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## Bus Measurement Error Protection

| | | | |
|---|---|---|---|
| **Setpoint group** | Protections | **Related FW** | 2.1.0 |
| **Range [units]** | Enabled / Disabled / ExtDisable [-] | | |
| **Default value** | Enabled | **Alternative config** | NO |
| **Step** | [-] | | |
| **Comm object** | 10558 | **Related applications** | MINT |
| **Config level** | Advanced | | |
| **Setpoint visibility** | Always | | |
| **Description** | | | |

This setpoint adjusts the behavior of bus measurement error protection.

| | |
|---|---|
| Enabled: | Bus Measurement error is detected when the voltage on controller's bus terminals is out of limits 20 seconds after:<br>› GCB (own) was closed in MAN or AUTO mode.<br>› MCB (feedback) was closed in AUTO mode.<br>› Any other GCB in power management group (on CAN bus) was closed.<br>The alarm is activated after 20 s. However, the GCB (own) closing is blocked immediately for safety reasons. |
| Disabled: | Protection is disabled. |
| ExtDisable: | Protection is enabled or disabled by the state of LBI **PROTECTION FORCE DISABLE** **(PAGE 625)**. |

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## Subgroup: Frequency Protection

## Generator Frequency Protection

| | | | |
|---|---|---|---|
| **Setpoint group** | Protections | **Related FW** | 2.1.0 |
| **Range [units]** | Enabled / Disabled / ExtDisable [-] | | |
| **Default value** | Enabled | **Alternative config** | NO |
| **Step** | [-] | | |
| **Comm object** | 15670 | **Related applications** | MINT, SPtM |
| **Config level** | Advanced | | |
| **Setpoint visibility** | Always | | |

**Description**

This setpoint adjusts the behavior of Generator Frequency protection. GCB closing is blocked, if the protection is disabled!.

| | |
|---|---|
| Enabled: | Protection is enabled. Behavior of protection is adjusted via setpoints **Generator Overfrequency BOC (page 331)**, **Generator Overfrequency Wrn (page 331)**, **Generator Underfrequency BOC (page 332)**, **Generator Underfrequency Wrn (page 331)**, and **Generator <> Frequency Delay (page 332)**. |
| Disabled: | Protection is disabled. |
| ExtDisable: | Protection is enabled or disabled by the state of LBI **PROTECTION FORCE DISABLE (PAGE 625)** |

GCB closing is disabled, if the parameter is set to Disabled. It is blocked as well, if the parameter is set to ExtDisable and LBI **PROTECTION FORCE DISABLE (PAGE 625)** is active.

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## Subgroup: Reverse Power Protection

## Reverse Power Protection

| | | | |
|---|---|---|---|
| **Setpoint group** | Protections | **Related FW** | 2.1.0 |
| **Range [units]** | Enabled / Disabled / ExtDisable [-] | | |
| **Default value** | Enabled | **Alternative config** | NO |
| **Step** | [-] | | |
| **Comm object** | 13230 | **Related applications** | MINT, SPtM |
| **Config level** | Standard | | |
| **Setpoint visibility** | Always | | |
| **Description** | | | |

The protection of the generator against the reverse (negative) active power. Protection gets active when the level of active power [kW] gets under limit given by setpoint **Reverse Power Level (page 333)** for time longer than the value of setpoint **Reverse Power Delay (page 333)**.

This setpoint adjusts behavior of generator Reverse power protection.

| | |
|---|---|
| Enabled: | Protection is enabled. Behavior of protection is adjusted via setpoints **Reverse Power Level (page 333)**, **Reverse Power Delay (page 333)** |
| Disabled: | Protection is disabled. |
| ExtDisable: | Protection is enabled or disabled by the state of LBI **PROTECTION FORCE DISABLE (PAGE 625)**. |

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## Subgroup: Excitation Loss Protection

## Excitation Loss Protection

| | | | |
|---|---|---|---|
| **Setpoint group** | Protections | **Related FW** | 2.1.0 |
| **Range [units]** | Enabled / Disabled / ExtDisable [-] | | |
| **Default value** | Enabled | **Alternative config** | NO |
| **Step** | [-] | | |
| **Comm object** | 13269 | **Related applications** | MINT, SPtM |
| **Config level** | Standard | | |
| **Setpoint visibility** | Always | | |
| **Description** | | | |

The protection protect the generator against negative value of reactive power. Protection gets active when the level of reactive power [kVAr] gets under limit given by setpoint **Excitation Loss Level (page 333)** for time longer than the value of setpoint **Excitation Loss Delay (page 334)**.

| | |
|---|---|
| Enabled: | Protection is enabled. Behavior of protection is adjusted via setpoints **Excitation Loss Level (page 333)**, **Excitation Loss Delay (page 334)** |
| Disabled: | Protection is disabled. |
| ExtDisable: | Protection is enabled or disabled by the state of LBI **PROTECTION FORCE DISABLE (PAGE 625)**. |

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## Subgroup: Speed Protection

## Underspeed Protection

| | | | |
|---|---|---|---|
| **Setpoint group** | Protections | **Related FW** | 2.1.0 |
| **Range [units]** | Enabled / Disabled / ExtDisable [-] | | |
| **Default value** | Enabled | **Alternative config** | NO |
| **Step** | [-] | | |
| **Comm object** | 15671 | **Related applications** | MINT, SPtM |
| **Config level** | Advanced | | |
| **Setpoint visibility** | Always | | |
| **Description** | | | |

This setpoint adjusts the behavior of generator Underspeed protection.

| | |
|---|---|
| Enabled: | Protection is enabled. Behavior of protection is adjusted via setpoint **Underspeed Sd (page 309)**. |
| Disabled: | Protection is disabled. |
| ExtDisable: | Protection is enabled or disabled by the state of LBI **PROTECTION FORCE DISABLE (PAGE 625)** |

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## Group: Mains Settings

### Subgroup: AMF Timers

## Emergency Start Delay

| | | | |
|---|---|---|---|
| **Setpoint group** | Mains Settings | **Related FW** | 2.1.0 |
| **Range [units]** | 0 .. 6 000 [s] | | |
| **Default value** | 5 s | **Alternative config** | NO |
| **Step** | 1 s | | |
| **Comm object** | 8301 | **Related applications** | SPtM |
| **Config level** | Standard | | |
| **Setpoint visibility** | Conditioned by the setpoint **Default Application Select (page 257)** | | |
| **Description** | | | |
| Delay after the mains failure to the start command of the Gen-set. | | | |

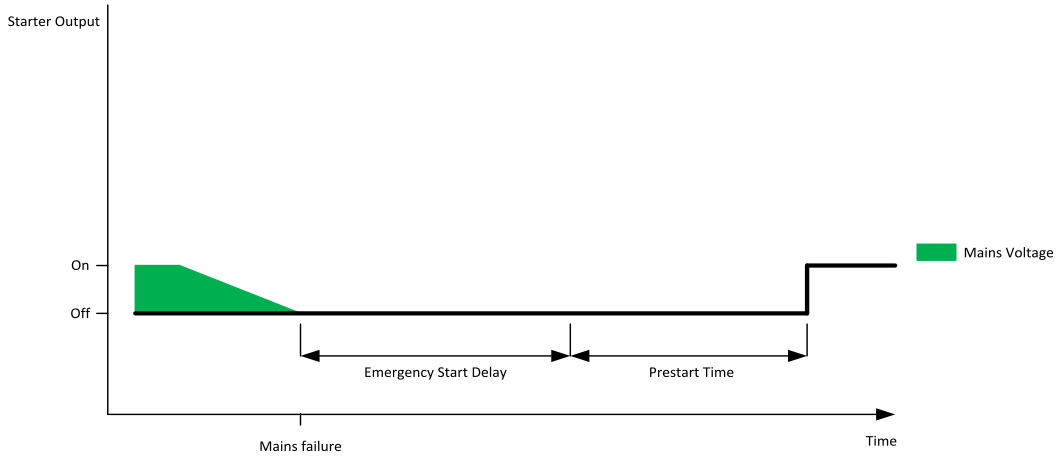



Image 8.16 Emergency Start Delay

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## Mains Return Delay

| | | | |
|---|---|---|---|
| **Setpoint group** | Mains Settings | **Related FW** | 2.1.0 |
| **Range [units]** | 1 .. 3 600 [s] | | |
| **Default value** | 20 s | **Alternative config** | NO |
| **Step** | 1 s | | |
| **Comm object** | 8302 | **Related applications** | SPtM |
| **Config level** | Standard | | |
| **Setpoint visibility** | Conditioned by the setpoint **Default Application Select (page 257)** | | |
| **Description** | | | |
| This setpoint adjust the delay, how long mains has to be returned after mains fail to start load transfer to mains. | | | |

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## MCB Close Delay

| | | | |
|---|---|---|---|
| **Setpoint group** | Mains Settings | **Related FW** | 2.1.0 |
| **Range [units]** | 0.0 .. 60.0 [s] | | |
| **Default value** | 1.0 s | **Alternative config** | NO |
| **Step** | 0.1 s | | |
| **Comm object** | 8389 | **Related applications** | SPtM |
| **Config level** | Standard | | |
| **Setpoint visibility** | Conditioned by the setpoint **Default Application Select (page 257)** | | |
| **Description** | | | |
| Delay after mains returns to MCB closing, if the Gen-set is not running (e.g. is in start-up procedure). | | | |

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## AMF Start

| | | | |
|---|---|---|---|
| **Setpoint group** | Mains Settings | **Related FW** | 2.1.0 |
| **Range [units]** | ENABLED / DISABLED [-] | | |
| **Default value** | ENABLED | **Alternative config** | NO |
| **Step** | [-] | | |
| **Comm object** | 9238 | **Related applications** | SPtM |
| **Config level** | Standard | | |
| **Setpoint visibility** | Conditioned by the setpoint **Default Application Select (page 257)** | | |
| **Description** | | | |
| Use this setpoint to enable or disable the **AMF operation (page 102)**. | | | |

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## Subgroup: Mains Voltage Limits

## Mains Overvoltage

| | | | |
|---|---|---|---|
| **Setpoint group** | Mains Settings | **Related FW** | 2.1.0 |
| **Range [units]** | **Mains Undervoltage (page 346)** .. 150 [%] | | |
| **Default value** | 110 % | **Alternative config** | NO |
| **Step** | 1 % of **Nominal Voltage Ph-Ph (page 279)** | | |
| **Comm object** | 8305 | **Related applications** | SPtM |
| **Config level** | Standard | | |
| **Setpoint visibility** | Conditioned by the setpoint **Default Application Select (page 257)** | | |
| **Description** | | | |
| Threshold for Mains overvoltage. All three phases are checked. Maximum out of three is used. | | | |

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## Mains Overvoltage Delay

| | | | |
|---|---|---|---|
| **Setpoint group** | Mains Settings | **Related FW** | 2.1.0 |
| **Range [units]** | 0.0 .. 600.0 [s] | | |
| **Default value** | 2.0 s | **Alternative config** | NO |
| **Step** | 0.1 s | | |
| **Comm object** | 8306 | **Related applications** | SPtM |
| **Config level** | Standard | | |
| **Setpoint visibility** | Conditioned by the setpoint **Default Application Select (page 257)** | | |
| **Description** | | | |
| Delay for **Mains Overvoltage (page 343)** protection. | | | |

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## Mains Overvoltage Hys

| | | | |
|---|---|---|---|
| **Setpoint group** | Mains Settings | **Related FW** | 2.1.0 |
| **Range [units]** | 100 .. **Mains Overvoltage (page 343)** [%] | | |
| **Default value** | 105 % | **Alternative config** | NO |
| **Step** | 1 % | | |
| **Comm object** | 14132 | **Related applications** | SPtM |
| **Config level** | Standard | | |
| **Setpoint visibility** | Conditioned by the setpoint **Default Application Select (page 257)** | | |
| **Description** | | | |

Threshold defines the level of turning off Mains overvoltage protection.

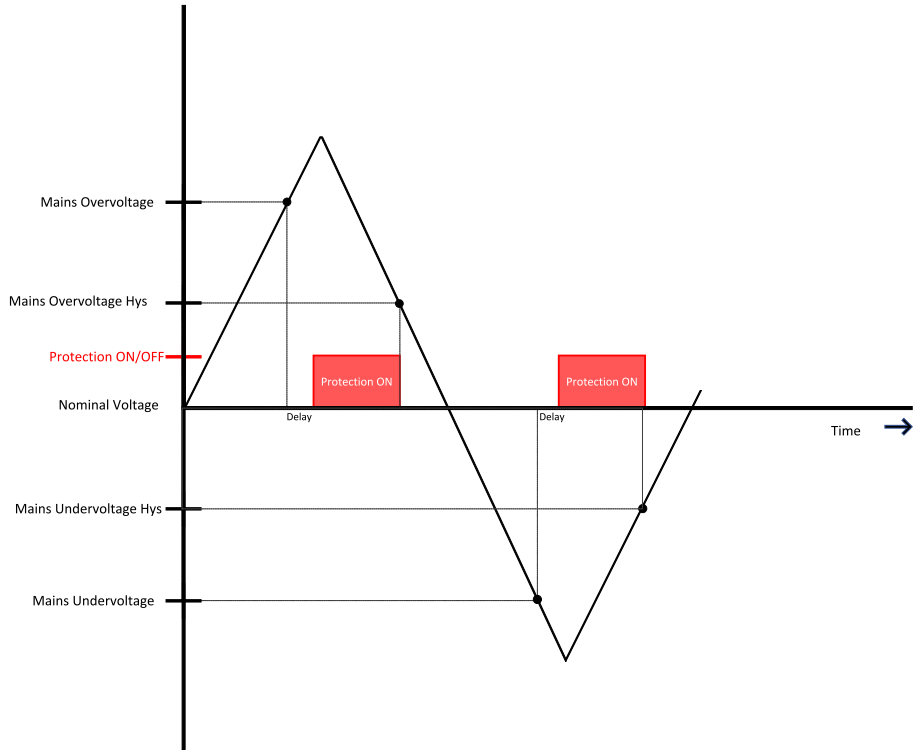



Image 8.17 Mains Overvoltage Hys

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## Mains Undervoltage

| | | | |
|---|---|---|---|
| **Setpoint group** | Mains Settings | **Related FW** | 2.1.0 |
| **Range [units]** | 50 .. **Mains Overvoltage (page 343)** [%] | | |
| **Default value** | 60 % | **Alternative config** | NO |
| **Step** | 1 % of **Nominal Voltage Ph-Ph (page 279)** | | |
| **Comm object** | 8307 | **Related applications** | SPtM |
| **Config level** | Standard | | |
| **Setpoint visibility** | Conditioned by the setpoint **Default Application Select (page 257)** | | |
| **Description** | | | |
| Threshold for Mains undervoltage. All three phases are checked. Minimum voltage out of three phases is used. | | | |

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## Mains Undervoltage Delay

| | | | |
|---|---|---|---|
| **Setpoint group** | Mains Settings | **Related FW** | 2.1.0 |
| **Range [units]** | 0.0 .. 600.0 [s] | | |
| **Default value** | 2.0 s | **Alternative config** | NO |
| **Step** | 0.1 s | | |
| **Comm object** | 8308 | **Related applications** | SPtM |
| **Config level** | Standard | | |
| **Setpoint visibility** | Conditioned by the setpoint **Default Application Select (page 257)** | | |
| **Description** | | | |
| Delay for **Mains Undervoltage (page 346)** protection. | | | |

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## Mains Undervoltage Hys

| | | | |
|---|---|---|---|
| **Setpoint group** | Mains Settings | **Related FW** | 2.1.0 |
| **Range [units]** | **Mains Undervoltage (page 346)** .. 100 [%] | | |
| **Default value** | 65 % | **Alternative config** | NO |
| **Step** | 1 % | | |
| **Comm object** | 14130 | **Related applications** | SPtM |
| **Config level** | Standard | | |
| **Setpoint visibility** | Conditioned by the setpoint **Default Application Select (page 257)** | | |
| **Description** | | | |

Threshold defines the level of turning off Mains undervoltage protection.

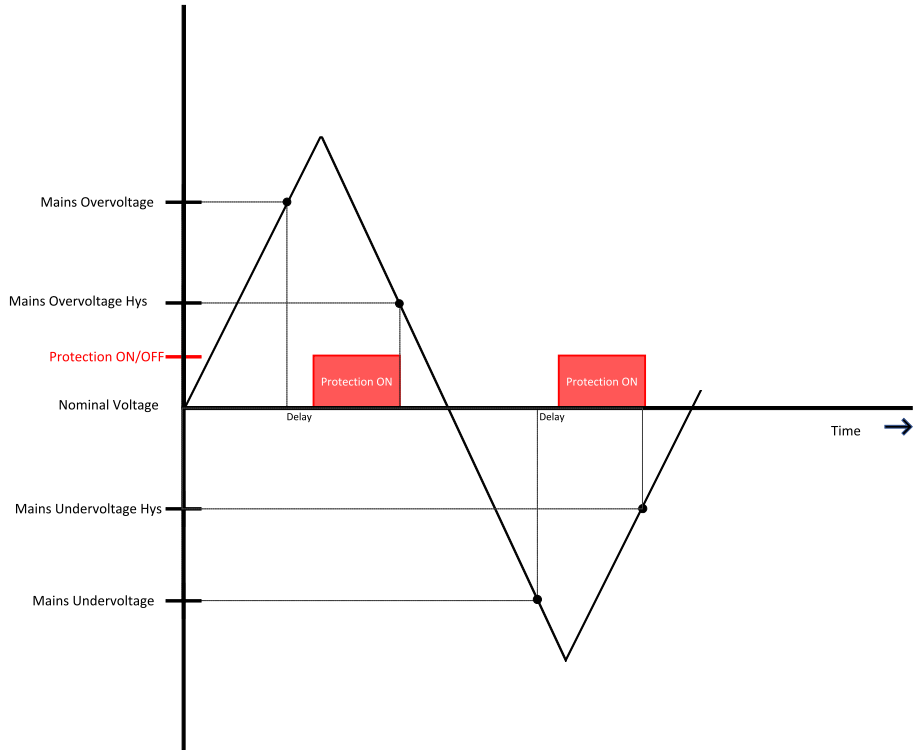



Image 8.18 Mains Undervoltage Hys

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## Mains Voltage Unbalance

| | | | |
|---|---|---|---|
| **Setpoint group** | Mains Settings | **Related FW** | 2.1.0 |
| **Range [units]** | 1 .. 150 [%] of **Nominal Voltage Ph-Ph (page 279)** or **Nominal Voltage Ph-N (page 278)** | | |
| **Default value** | 10 % | **Alternative config** | NO |
| **Step** | 1 % | | |
| **Comm object** | 8446 | **Related applications** | SPtM |
| **Config level** | Advanced | | |
| **Setpoint visibility** | Conditioned by the setpoint **Default Application Select (page 257)** | | |
| **Description** | | | |
| Threshold for Mains voltage unbalance. | | | |

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## Mains Voltage Unbalance Delay

| | | | |
|---|---|---|---|
| **Setpoint group** | Mains Settings | **Related FW** | 2.1.0 |
| **Range [units]** | 0.0 .. 600.0 [s] | | |
| **Default value** | 2.0 s | **Alternative config** | NO |
| **Step** | 0.1 s | | |
| **Comm object** | 8447 | **Related applications** | SPtM |
| **Config level** | Advanced | | |
| **Setpoint visibility** | Conditioned by the setpoint **Default Application Select (page 257)** | | |
| **Description** | | | |
| Delay for **Mains Voltage Unbalance (page 348)** protection. | | | |

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## Subgroup: Mains Frequency Limits

## Mains Overfrequency

| | | | |
|---|---|---|---|
| **Setpoint group** | Mains Settings | **Related FW** | 2.1.0 |
| **Range [units]** | **Mains Underfrequency (page 350)** .. 150 [%] | | |
| **Default value** | 102.0 % | **Alternative config** | NO |
| **Step** | 1.0 % of **Nominal Frequency (page 282)** | | |
| **Comm object** | 8310 | **Related applications** | SPtM |
| **Config level** | Standard | | |
| **Setpoint visibility** | Conditioned by the setpoint **Default Application Select (page 257)** | | |
| **Description** | | | |
| Threshold for Mains overfrequency. | | | |

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## Mains Overfrequency Hys

| | | | |
|---|---|---|---|
| **Setpoint group** | Mains Settings | **Related FW** | 2.1.0 |
| **Range [units]** | 100 .. **Mains Overfrequency (page 348)** [%] | | |
| **Default value** | 102.0 % | **Alternative config** | NO |
| **Step** | 0.1 % | | |
| **Comm object** | 14134 | **Related applications** | SPtM |
| **Config level** | Standard | | |
| **Setpoint visibility** | Conditioned by the setpoint **Default Application Select (page 257)** | | |
| **Description** | | | |

Threshold defines the level of turning off Mains overfrequency protection.

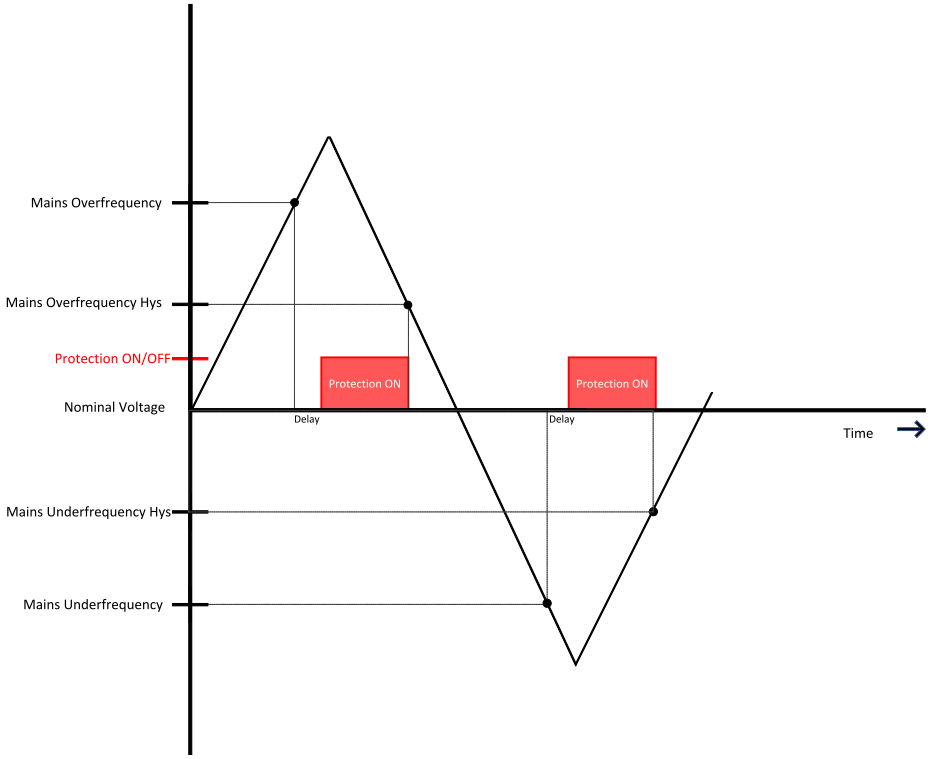



Image 8.19 Mains Overfrequency Hys

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## Mains Underfrequency

| | | | |
|---|---|---|---|
| **Setpoint group** | Mains Settings | **Related FW** | 2.1.0 |
| **Range [units]** | 50 .. **Mains Overfrequency (page 348)** [%] | | |
| **Default value** | 98.0 % | **Alternative config** | NO |
| **Step** | 1.0 % of **Nominal Frequency (page 282)** | | |
| **Comm object** | 8312 | **Related applications** | SPtM |
| **Config level** | Standard | | |
| **Setpoint visibility** | Conditioned by the setpoint **Default Application Select (page 257)** | | |
| **Description** | | | |
| Threshold for Mains underfrequency. | | | |

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## Mains Underfrequency Hys

| | | | |
|---|---|---|---|
| **Setpoint group** | Mains Settings | **Related FW** | 2.1.0 |
| **Range [units]** | **Mains Underfrequency (page 350)** .. 100 [%] | | |
| **Default value** | 98.0 % | **Alternative config** | NO |
| **Step** | 0.1 % | | |
| **Comm object** | 14135 | **Related applications** | SPtM |
| **Config level** | Standard | | |
| **Setpoint visibility** | Conditioned by the setpoint **Default Application Select (page 257)** | | |
| **Description** | | | |

Threshold defines the level of turning off Mains underfrequency protection.

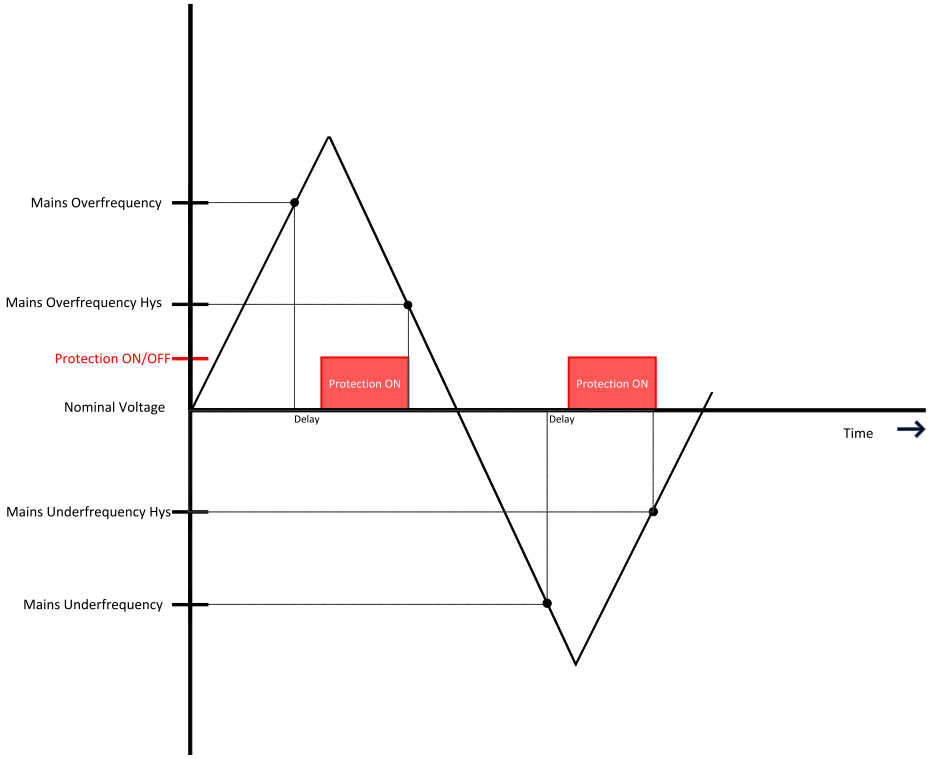



Image 8.20 Mains Underfrequency Hys

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## Mains < > Frequency Delay

| | | | |
|---|---|---|---|
| **Setpoint group** | Mains Settings | **Related FW** | 2.1.0 |
| **Range [units]** | 0.0 .. 600.0 [s] | | |
| **Default value** | 0.5 s | **Alternative config** | NO |
| **Step** | 0.1 s | | |
| **Comm object** | 8311 | **Related applications** | SPtM |
| **Config level** | Standard | | |
| **Setpoint visibility** | Conditioned by the setpoint **Default Application Select (page 257)** | | |
| **Description** | | | |
| Delay for **Mains Underfrequency (page 350)** and **Mains Overfrequency (page 348)** protection. | | | |

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## Subgroup: AMF Settings

## Return From Island

| | | | |
|---|---|---|---|
| **Setpoint group** | Mains Settings | **Related FW** | 2.1.0 |
| **Range [units]** | Manual / Auto [-] | | |
| **DefaultFixed value** | Auto | **Alternative config** | NO |
| **Step** | [-] | | |
| **Comm object** | 9590 | **Related applications** | SPtM |
| **Config level** | Advanced | | |
| **Setpoint visibility** | Conditioned by the setpoint **Default Application Select (page 257)** | | |
| **Description** | | | |

Setpoint adjust the behavior of closing MCB when the mains returns.

| | |
|---|---|
| Manual | Controller remains in AUT mode and the manual return to Mains is done via MCB button. **ALI Manual Restore (page 736)** message is displayed in alarmlist to notify operator – it will disappear automatically after MCB close button is pushed.<br>***Note:*** *Select MANUAL in case you need to manually control the moment when the load is transferred back to the mains.* |
| Auto | The MCB is closed automatically after the timer **Mains Return Delay (page 342)** elapses. The transfer of load from a generator to mains is given by the setpoint **Transfer Gen To Mains (page 387)**. |

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## MCB Logic

| | | | |
|---|---|---|---|
| **Setpoint group** | Mains Settings | **Related FW** | 2.1.0 |
| **Range [units]** | Close On / Close Off [-] | | |
| **Default value** | Close Off | **Alternative config** | NO |

| | | | |
|---|---|---|---|
| **Step** | [-] | | |
| **Comm object** | 8444 | **Related applications** | SPtM |
| **Config level** | Advanced | | |
| **Setpoint visibility** | Conditioned by the setpoint **Default Application Select (page 257)** | | |
| **Description** | | | |

The setpoint influences the behavior of the output **MCB CLOSE/OPEN (PAGE 668)**.

Close On When the output **MCB CLOSE/OPEN (PAGE 668)** is active – MCB should be closed.

Close Off When the output **MCB CLOSE/OPEN (PAGE 668)** is active – MCB should be opened.

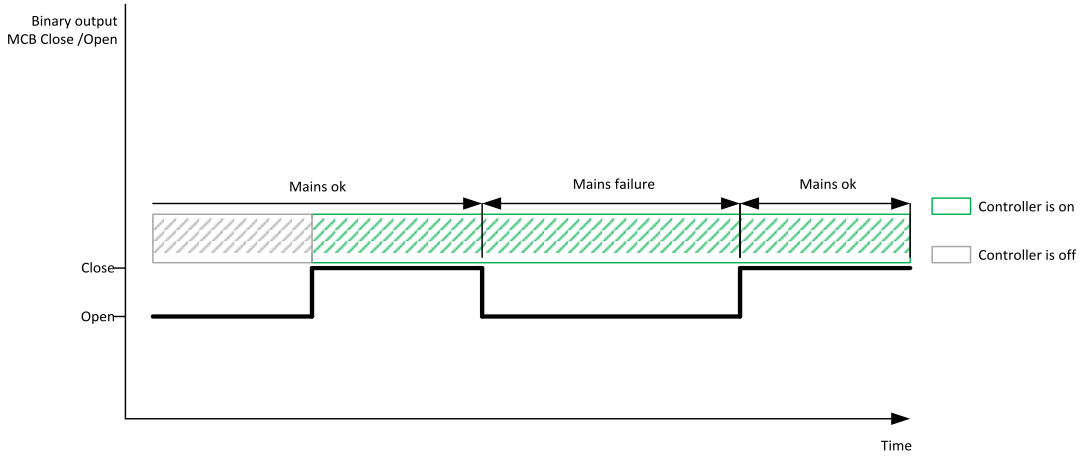



Image 8.21 MCB Logic 1

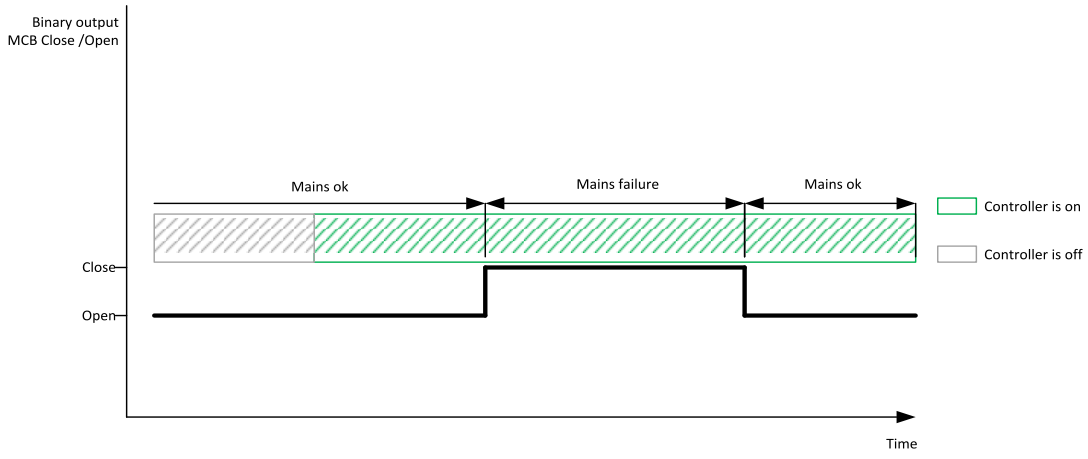



Image 8.22 MCB Logic 2

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## MCB Opens On

| | | | |
|---|---|---|---|
| **Setpoint group** | Mains Settings | **Related FW** | 2.1.0 |
| **Range [units]** | Mains Fail / Gen Run [-] | | |
| **Default value** | Gen Run | **Alternative config** | NO |
| **Step** | [-] | | |
| **Comm object** | 9850 | **Related applications** | SPtM |
| **Config level** | Advanced | | |
| **Setpoint visibility** | Conditioned by the setpoint **Default Application Select (page 257)** | | |
| **Description** | | | |

Setpoint adjust the behavior of opening MCB in AUTO mode when there is mains fail.

| | |
|---|---|
| Mains Fail | The command to open the MCB is given immediately after mains fail condition is evaluated. If the mains will return into parameters after MCB was opened and before GCB is closed, timer **MCB Close Delay (page 343)** is applied before MCB closing. |
| Gen Run | MCB will be opened when engine will be running and it will be possible to transfer load from Mains to Gen-set (after stabilization phase).<br>***Note:*** *This option should be used for MCBs using 230V control and not equipped with the undervoltage coil.* |

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## Subgroup: Mains Decoupling Protection

## Vector Shift Protection

| | | | |
|---|---|---|---|
| **Setpoint group** | Mains Settings | **Related FW** | 2.1.0 |
| **Range [units]** | Enabled / Parallel Only / Disabled [-] | | |
| **Default value** | Disabled | **Alternative config** | NO |
| **Step** | [-] | | |
| **Comm object** | 10551 | **Related applications** | SPtM |
| **Config level** | Standard | | |
| **Setpoint visibility** | Always | | |

**Description**

This setpoint selects the function of the built-in vector shift protection.

| | |
|---|---|
| Disabled | The vector shift protection is disabled. |
| Parallel Only | The vector shift protection is enabled only while the Gen-set is running parallel to the mains, i.e. the both MCB and GCB are closed. |
| Enabled | The vector shift protection is active always while the MCB is closed, regardless of the GCB position. |

***Note:*** *The vectorshift protection is recorded into the history file, however it is not indicated in the Alarm list. When it occurs the controller opens either MCB or GCB depending on the setpoint* ***Vector Shift CB Selector (page 358)****. If the MCB is not controlled in the particular application then GCB is opened.*

***Note:*** *If a vector shift is detected and consequently the MCB is opened, however mains voltage and frequency remain in limits, the MCB is then reclosed again after* ***Mains Return Delay (page 342)****, as the mains is evaluated as healthy.*

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## Vector Shift Limit

| | | | |
|---|---|---|---|
| **Setpoint group** | Mains Settings | **Related FW** | 2.1.0 |
| **Range [units]** | 1 .. 45 [°] | | |
| **Default value** | 10 ° | **Alternative config** | NO |
| **Step** | 1 ° | | |
| **Comm object** | 9843 | **Related applications** | SPtM |
| **Config level** | Standard | | |
| **Setpoint visibility** | Always | | |
| **Description** | | | |

This setpoint adjusts the threshold level for the vector shift protection.

***Note:*** *To adjust this setpoint properly, check the value* ***Vector Shift Limit (page 356)****. The value is available in InteliConfig, contains the maximal measured vector shift value since the gen-set has been synchronized to the mains and after opening of GCB or MCB it is "frozen". In normal conditions the value should not be higher than 3 ° and the most common setting of the threshold is about 7 °.*

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## ROCOF Protection

| | | | |
|---|---|---|---|
| **Setpoint group** | Mains Settings | **Related FW** | 2.1.0 |
| **Range [units]** | Enabled / Parallel Only / Disabled [-] | | |
| **Default value** | Disabled | **Alternative config** | NO |
| **Step** | [-] | | |
| **Comm object** | 9840 | **Related applications** | SPtM |
| **Config level** | Standard | | |
| **Setpoint visibility** | Always | | |
| **Description** | | | |

This setpoint selects the function of the built-in ROCOF protection.

| | |
|---|---|
| Disabled | The ROCOF protection is disabled. |
| Parallel Only | The ROCOF protection is enabled only while the Gen-set is running parallel to the mains, i.e. the both MCB and GCB are closed. |
| Enabled | The ROCOF protection is active always while the MCB is closed, regardless of the GCB position. |

***Note:*** *The ROCOF protection is recorded into the history file, however it is not indicated in the Alarm list. When it occurs the controller opens either MCB or GCB depending on the setpoint* ***Vector Shift CB Selector (page 358)****. If the MCB is not controlled in the particular application then GCB is opened.*

***Note:*** *If a ROCOF is detected and consequently the MCB is opened, however mains voltage and frequency remain in limits, the MCB is then reclosed again after* ***Mains Return Delay (page 342)****, as the mains is evaluated as healthy.*

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## ROCOF Windows Length

| | | | |
|---|---|---|---|
| **Setpoint group** | Mains Settings | **Related FW** | 2.1.0 |
| **Range [units]** | 3 .. 30 [-] | | |
| **Default value** | 5 | **Alternative config** | NO |
| **Step** | 1 [-] | | |
| **Comm object** | 9990 | **Related applications** | SPtM |
| **Config level** | Standard | | |
| **Setpoint visibility** | Always | | |
| **Description** | | | |
| This setpoint adjusts the averaging level for the **ROCOF Protection (page 356)**. It defines number of periods of the mains voltage in which the ROCOF protection is evaluated. The higher length of ROCOF window means less sensitive protection for short oscillations of the frequency to both directions from the nominal value. Also delay of evaluation is higher. | | | |

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## ROCOF df_dt

| | | | |
|---|---|---|---|
| **Setpoint group** | Mains Settings | **Related FW** | 2.1.0 |
| **Range [units]** | 0.01 .. 10.0 [Hz/s] | | |
| **Default value** | 1.0 Hz/s | **Alternative config** | NO |
| **Step** | 0.1 Hz/s | | |
| **Comm object** | 9844 | **Related applications** | SPtM |
| **Config level** | Standard | | |
| **Setpoint visibility** | Always | | |
| **Description** | | | |
| This setpoint adjusts the trip level for **ROCOF Protection (page 356)** (Rate Of Change Of Frequency). | | | |

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## Vector Shift CB Selector

| | | | |
|---|---|---|---|
| **Setpoint group** | Mains Settings | **Related FW** | 2.1.0 |
| **Range [units]** | MCB / GCB [-] | | |
| **Default value** | MCB | **Alternative config** | NO |
| **Step** | [-] | | |
| **Comm object** | 10552 | **Related applications** | SPtM |
| **Config level** | Standard | | |
| **Setpoint visibility** | Always | | |
| **Description** | | | |

This setpoint selects which breaker will be opened when the **Vector Shift Protection (page 355)** or **ROCOF Protection (page 356)** protection is detected.

> ***Note:*** *If the MGCB is selected and a mains failure occurs the MGCB will be opened immediately when the vectorshift or ROCOF is detected, however also MCB will be opened consequently due to other mains protection as underfrequency or undervoltage.*

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# Group: Load Management

## Subgroup: Dummy Load

## Dummy Load Active

| | | | |
|---|---|---|---|
| **Setpoint group** | Load Management | **Related FW** | 2.1.0 |
| **Range [units]** | GenOnly / Disable [-] | | |
| **Default value** | Disabled | **Alternative config** | YES |
| **Step** | [-] | | |
| **Comm object** | 11776 | **Related applications** | MINT, SPtM |
| **Config level** | Advanced | | |
| **Setpoint visibility** | Always | | |
| **Description** | | | |

This setpoint enables / disables Dummy Load function.

> **IMPORTANT: If Gen Only option is chosen, no dummy load will be activated when in parallel with mains.**

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## Dummy Load On

| | | | |
|---|---|---|---|
| **Setpoint group** | Load Management | **Related FW** | 2.1.0 |
| **Range [units]** | 0.0 .. **Dummy Load Off (page 359)** [%] | | |
| **Default value** | 20 % | **Alternative config** | YES |
| **Step** | 0.1 % | | |
| **Comm object** | 11772 | **Related applications** | MINT, SPtM |
| **Config level** | Advanced | | |
| **Setpoint visibility** | If **Dummy Load Active (page 358)** is not set to disabled | | |
| **Description** | | | |
| This setpoint determines power level which when not matched will trigger Dummy Load Function to activate additional power bank level (by activating additional Dummy Load Stage LBOs). | | | |

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## Dummy Load On Delay

| | | | |
|---|---|---|---|
| **Setpoint group** | Load Management | **Related FW** | 2.1.0 |
| **Range [units]** | 0.0 .. 600.0 [s] | | |
| **Default value** | 15 s | **Alternative config** | YES |
| **Step** | 0.1 s | | |
| **Comm object** | 14506 | **Related applications** | MINT, SPtM |
| **Config level** | Advanced | | |
| **Setpoint visibility** | If **Dummy Load Active (page 358)** is not set to disabled | | |
| **Description** | | | |
| This setpoint determines delay after which additional Dummy Load Stage will be activated. | | | |

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## Dummy Load Off

| | | | |
|---|---|---|---|
| **Setpoint group** | Load Management | **Related FW** | 2.1.0 |
| **Range [units]** | **Dummy Load On (page 359)** .. 200.0 [%] | | |
| **Default value** | 50 % | **Alternative config** | YES |
| **Step** | 0.1 % | | |
| **Comm object** | 11773 | **Related applications** | MINT, SPtM |
| **Config level** | Advanced | | |
| **Setpoint visibility** | If **Dummy Load Active (page 358)** is not set to disabled | | |
| **Description** | | | |
| This setpoint determines power level which when exceeded will trigger Dummy Load Function to remove/activate power bank stages (by deactivating additional Dummy Load Level LBOs). | | | |

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## Dummy Load Off Delay

| | | | |
|---|---|---|---|
| **Setpoint group** | Load Management | **Related FW** | 2.1.0 |
| **Range [units]** | 0.0 .. 600. [s] | | |
| **Default value** | 15 s | **Alternative config** | YES |
| **Step** | 0.1 s | | |
| **Comm object** | 14508 | **Related applications** | MINT, SPtM |
| **Config level** | Advanced | | |
| **Setpoint visibility** | If **Dummy Load Active (page 358)** is not set to disabled | | |
| **Description** | | | |
| This setpoint determines delay after which additional Dummy Load Stage will be deactivated. | | | |

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## Subgroup: Load Shedding

## Load Shedding Active

| | | | |
|---|---|---|---|
| **Setpoint group** | Load Management | **Related FW** | 2.1.0 |
| **Range [units]** | Disabled / Island Only / Isl+Trip Paral / All the time [-] | | |
| **Default value** | Disabled | **Alternative config** | NO |
| **Step** | [-] | | |
| **Comm object** | 11001 | **Related applications** | MINT, SPtM |
| **Config level** | Advanced | | |
| **Setpoint visibility** | Always | | |

**Description**

This setpoint is used for adjustment when the load shedding function is active.

| | |
|---|---|
| Disabled | The Load shedding function is disabled. All the outputs are open. |
| Island only | In Island operation (e.g. MCB is open and (M)GCB is closed) Load shedding outputs are controlled by load shedding function.<br>› Load shedding outputs are activated / deactivated one by one in island operation<br>› All Loadshedding outputs are tripped once the Gen-set comes into the island operation from "NO LOAD" operation (MCB and (M)GCB were opened -> Gen-set started and (M)GCB closed). |
| ISL+Trip paral | This setting adjusts the same behavior as ISLAND ONLY but in addition to it all load shedding outputs are closed when Gen-set group goes from parallel operation ino the island operation.<br>› Load shedding outputs are activated / Deactivated one by one in island operation.<br>› All Loadshedding outputs are tripped at once when the Gen-set comes into the island operation from "NO LOAD" operation (MCB and (M)GCB were opened -> Gen-set started and (M)GCB closed).<br>› All Load shedding outputs are tripped at once when the Gen-set comes from Parallel operation (MCB, (M)GCB closed) to island operation (MCB opens, (M)GCB stays closed). This scenario is also valid when Test On Load is taken. |
| All the time | Load shedding Outputs are controlled by the load shedding function regardless of breaker positions.<br>› Loadshedding is active in island operation, in parallel operation too.<br>› All Loadshedding outputs are never tripped at once. |

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## Load Shedding Level

| | | | |
|---|---|---|---|
| **Setpoint group** | Load Management | **Related FW** | 2.1.0 |
| **Range [units]** | Load Reconnection Level .. 200 [%] of **Nominal Power (page 274)** | | |
| **Default value** | 80 % | **Alternative config** | NO |
| **Step** | 1 % | | |
| **Comm object** | 8884 | **Related applications** | MINT, SPtM |
| **Config level** | Advanced | | |
| **Setpoint visibility** | Visible only if **Load Shedding Active (page 361)** is enabled | | |
| **Description** | | | |
| This setpoint is used to activates the next Load shedding stage.When Gen-set load exceeds this level for more than **Load Shedding Delay (page 362)** time. | | | |

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## Load Shedding Delay

| | | | |
|---|---|---|---|
| **Setpoint group** | Load Management | **Related FW** | 2.1.0 |
| **Range [units]** | 0.0 .. 600.0 [s] | | |
| **Default value** | 10 s | **Alternative config** | NO |
| **Step** | 1 s | | |
| **Comm object** | 8887 | **Related applications** | MINT, SPtM |
| **Config level** | Advanced | | |
| **Setpoint visibility** | Visible only if **Load Shedding Active (page 361)** is enabled | | |
| **Description** | | | |
| This setpoint is used to proceeds the next Load shedding stage. When Gen-set load exceeds **Load Shedding Level (page 362)** for more than this delay's time, the controller proceeds to the next Load shedding stage – the next binary output Load Shedding Stage 1-25 is active. | | | |

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## Subgroup: Load Reconnection Settings

## Load Reconnection Level

| | | | |
|---|---|---|---|
| **Setpoint group** | Load Management | **Related FW** | 2.1.0 |
| **Range [units]** | 0 .. **Load Shedding Level (page 362)** [%] | | |
| **Default value** | 20 % | **Alternative config** | NO |
| **Step** | 1 % | | |
| **Comm object** | 8890 | **Related applications** | MINT, SPtM |
| **Config level** | Advanced | | |
| **Setpoint visibility** | Visible only if **Load Shedding Active (page 361)** is enabled | | |
| **Description** | | | |
| This setpoint is used to proceed to the lower load shedding stage when the Gen-set load drops below this level for more than **Load Reconnection Delay (page 363)**. | | | |

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## Load Reconnection Delay

| | | | |
|---|---|---|---|
| **Setpoint group** | Load Management | **Related FW** | 2.1.0 |
| **Range [units]** | 0 .. 600 [s] | | |
| **Default value** | 10 s | **Alternative config** | NO |
| **Step** | 1 s | | |
| **Comm object** | 8893 | **Related applications** | MINT, SPtM |
| **Config level** | Advanced | | |
| **Setpoint visibility** | Visible only if **Load Shedding Active (page 361)** is enabled | | |
| **Description** | | | |
| This setpoint is used to proceeds the lower Load shedding stage. When Gen-set load drops under **Load Reconnection Level (page 363)** for more than this delay time, the binary output for higher stage is opened. Automatic load reconnection works only when **Auto Load Reconnection (page 364)** = Enabled. | | | |

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## Auto Load Reconnection

| | | | |
|---|---|---|---|
| **Setpoint group** | Load Management | **Related FW** | 2.1.0 |
| **Range [units]** | Disabled / Enabled [-] | | |
| **Default value** | Enabled | **Alternative config** | NO |
| **Step** | [-] | | |
| **Comm object** | 9649 | **Related applications** | MINT, SPtM |
| **Config level** | Advanced | | |
| **Setpoint visibility** | Visible only if **Load Shedding Active (page 361)** is enabled | | |
| **Description** | | | |

Switch between manual and automatic reconnection of shedded load..

| | |
|---|---|
| Disabled | Rising edge on binary input **MANUAL LOAD RECONNECTION (PAGE 621)** resets controller to the lower stage, but only if the load is under the **Load Reconnection Level (page 363)**. **Load Reconnection Delay (page 363)** is not taken into account in this case. |
| Enabled | Load reconnection is automatic depend on setpoints **Load Reconnection Level (page 363)** and **Load Reconnection Delay (page 363)**. Binary input **MANUAL LOAD RECONNECTION (PAGE 621)** has no function. |

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# Group: Power Management

## Subgroup: Power Management Control

## Power Management

| | | | |
|---|---|---|---|
| **Setpoint group** | Power Management | **Related FW** | 2.1.0 |
| **Range [units]** | Enabled / Disabled [-] | | |
| **Default value** | Enabled | **Alternative config** | NO |
| **Step** | [-] | | |
| **Comm object** | 8551 | **Related applications** | MINT |
| **Config level** | Standard | | |
| **Setpoint visibility** | Conditioned by the setpoint **Default Application Select (page 257)** | | |
| **Description** | | | |

This setpoint is used to enable or disable the **Power management (page 159)** function in the particular controller. It performs automatic load dependent starts and stops or load demand swap. If the function is disabled the Gen-set's nominal power is not part of the power management calculation and the start and stop of the Gen-set is performed only according to the position of the binary input **REMOTE START/STOP (PAGE 628)** i.e. if the input is active the Gen-set is running and vice versa.

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## Power Management Delay

| | | | |
|---|---|---|---|
| **Setpoint group** | Power Management | **Related FW** | 2.1.0 |
| **Range [units]** | 0 .. 3600 [s] | | |
| **Default value** | 0 s | **Alternative config** | NO |
| **Step** | 1 s | | |
| **Comm object** | 12488 | **Related applications** | SPtM |
| **Config level** | Standard | | |
| **Setpoint visibility** | Conditioned by the setpoint **Default Application Select (page 257)** | | |
| **Description** | | | |

Setpoint defines delay of the **Power Management (page 364)**. When **REMOTE START/STOP (PAGE 628)** signal is activated and the gen-sets should start, all the engines (where **Power Management (page 364)** is enabled) are started and stay running for time period specified by this parameter. After this period elapses, only the Gen-set(s) needed according to the Power Management calculation stay running and the rest is stopped.

> **Example:** This delay is useful, when you need to start gen-sets to an unknown load. Setting for example 360 s (6 minutes) and activating **REMOTE START/STOP (PAGE 628)** will force all gen-sets to start and run for 6 minutes despite of the power management setting.

***Note:*** *By setting "0" the Power Management function is enabled immediately.*

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## #Power Management Mode

| | | | |
|---|---|---|---|
| **Setpoint group** | Power Management | **Related FW** | 2.1.0 |
| **Range [units]** | ABS [kW] / REL [%] | | |
| **Default value** | ABS | **Alternative config** | NO |
| **Step** | [-] | | |
| **Comm object** | 9874 | **Related applications** | MINT |
| **Config level** | Standard | | |
| **Setpoint visibility** | Conditioned by the setpoint **Default Application Select (page 257)** | | |
| **Description** | | | |

This setpoint is used to select the **Power Management (page 364)**power management mode.

| | |
|---|---|
| ABS [kW] | The power management is based on actual active power and Gen-set nominal power. The reserves are calculated and adjusted in kW. |
| Not Available | This mode of Power Management is not supported in this controller. Alarm **Wrn Unsupported PMS Mode (page 746)** is active. |
| REL [%] | The power management is based on the relative load, i.e. ratio active power to nominal power. The reserves are calculated and adjusted in %. |

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## Dynamic Spinning Reserve

| | | | |
|---|---|---|---|
| **Setpoint group** | Power Management | **Related FW** | 2.1.0 |
| **Range [units]** | ENABLED, DISABLED [-] | | |
| **Default value** | ENABLED | **Alternative config** | NO |
| **Step** | - | | |
| **Comm object** | 14126 | **Related applications** | MINT |
| **Config level** | Standard | | |
| **Setpoint visibility** | Always | | |
| **Description** | | | |
| This setpoint is used to enable / disable use of the Dynamic Spinning Reserve functionality with power management. | | | |

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## Priority

| | | | |
|---|---|---|---|
| **Setpoint group** | Power Management | **Related FW** | 2.1.0 |
| **Range [units]** | 1 .. 32 [-] | | |
| **Default value** | 1 | **Alternative config** | NO |
| **Step** | 1 | | |
| **Comm object** | 8488 | **Related applications** | MINT |
| **Config level** | Standard | | |
| **Setpoint visibility** | Conditioned by the setpoint **Default Application Select (page 257)** | | |
| **Description** | | | |

This setpoint adjusts the priority of the Gen-set within the group. A lower number represents a "higher" priority, i.e. a gen-set with lower number will start before another one with higher number.

***Note:*** *If the binary input* ***TOP PRIORITY (PAGE 630)*** *is active, the gen-set gets the highest priority (0) independent of the setpoint setting.*

***Note:*** *If more than one gen-set have the same priority they will act as "one big" Gen-set.*

> **IMPORTANT: Value of the setpoint Priority is taken into account only for absolute mode of power management (#Power Management Mode (page 365) = ABS).**

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## #Priority Auto Swap

| | | | |
|---|---|---|---|
| **Setpoint group** | Power Management | **Related FW** | 2.1.0 |
| **Range [units]** | Disabled / Run Hours Equal / Efficient [-] | | |
| **Default value** | Disabled | **Alternative config** | NO |
| **Step** | [-] | | |
| **Comm object** | 10593 | **Related applications** | MINT |
| **Config level** | Standard | | |
| **Setpoint visibility** | Conditioned by the setpoint **Default Application Select (page 257)** | | |
| **Description** | | | |

This setpoint adjusts priority auto swapping.

| | |
|---|---|
| Disabled | Optimization is disabled. Priorities are given directly by the values adjusted in the setpoints **Priority (page 366)**. |
| Run Hours Equal | This method changes the priorities (not the setpoints itself) to equalize running hours of the Gen-sets or to keep constant difference of running hours by the controller (adjusted via setpoint **#Run Hours Max Difference (page 376)**). |
| Not Available | This mode of Priority Auto Swap is not supported in controller. |
| Efficient | This method changes the priorities (not the setpoints itself) to optimize which Gen-sets are running according to their capacities and actual load demand.<br>**IMPORTANT: This priority swapping function is only for absolute mode of power management (#Power Management Mode (page 365) = ABS).**<br>Optimal power band (number of running gen-sets) is calculated based on the nominal power of each Gen-set, their Run Hours and requested Load reserve. For Gen-sets with the same nominal power also run hour equalization is being performed. |

**IMPORTANT: Binary input TOP PRIORITY (PAGE 630) can be used only if #Priority Auto Swap (page 367) = Disabled.**

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## #System Start Delay

| | | | |
|---|---|---|---|
| **Setpoint group** | Power Management | **Related FW** | 2.1.0 |
| **Range [units]** | 0 .. 600 [s] | | |
| **Default value** | 5 | **Alternative config** | NO |
| **Step** | 1 | | |
| **Comm object** | 8549 | **Related applications** | MINT |
| **Config level** | Standard | | |
| **Setpoint visibility** | Conditioned by the setpoint **Default Application Select (page 257)** | | |
| **Description** | | | |
| This setpoint adjusts the delay of the system activation after the binary input **REMOTE START/STOP (PAGE 628)** has been activated. | | | |

**back to List of setpoints**

## #System Stop Delay

| | | | |
|---|---|---|---|
| **Setpoint group** | Power Management | **Related FW** | 2.1.0 |
| **Range [units]** | 0 .. 600 [s] | | |
| **Default value** | 30 | **Alternative config** | NO |
| **Step** | 1 | | |
| **Comm object** | 8550 | **Related applications** | MINT |
| **Config level** | Standard | | |
| **Setpoint visibility** | Conditioned by the setpoint **Default Application Select (page 257)** | | |
| **Description** | | | |
| This setpoint adjusts the delay of the system deactivation after the binary input **REMOTE START/STOP (PAGE 628)** has been deactivated. | | | |

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## Subgroup: Load Reserve Set 1

## #Starting Load Reserve 1

| | | | |
|---|---|---|---|
| **Setpoint group** | Power Management | **Related FW** | 2.1.0 |
| **Range [units]** | 0 .. **#Stopping Load Reserve 1 (page 369)** [-] | | |
| **Default value** | 60 kW | **Alternative config** | NO |
| **Step** | 1 kW | | |
| **Comm object** | 8489 | **Related applications** | MINT |
| **Config level** | Standard | | |
| **Setpoint visibility** | Always | | |
| **Description** | | | |

This setpoint is used to adjust the load reserve for start of next Gen-set in absolute mode. i.e. **#Power Management Mode (page 365)** = ABS.

> **IMPORTANT: Logical binary input LOAD RES 2 ACTIVE (PAGE 621) has to be deactivated, otherwise setpoints of Load Reserve Set 2 are used.**

***Note:*** *See **Power management (page 159)** chapter for more information.*

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## #Stopping Load Reserve 1

| | | | |
|---|---|---|---|
| **Setpoint group** | Power Management | **Related FW** | 2.1.0 |
| **Range [units]** | **#Starting Load Reserve 1 (page 369)** .. 32000 [-] | | |
| **Default value** | 110 kW | **Alternative config** | NO |
| **Step** | 1 kW | | |
| **Comm object** | 8491 | **Related applications** | MINT |
| **Config level** | Standard | | |
| **Setpoint visibility** | Always | | |
| **Description** | | | |

This setpoint is used to adjust the load reserve for stop of next Gen-set in absolute mode. i.e. **#Power Management Mode (page 365)** = ABS.

> **IMPORTANT: Logical binary input LOAD RES 2 ACTIVE (PAGE 621) has to be deactivated, otherwise setpoints of Load Reserve Set 2 are used.**

***Note:*** *See **Power management (page 159)** chapter for more information.*

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## #Starting Rel Load Reserve 1

| | | | |
|---|---|---|---|
| **Setpoint group** | Power Management | **Related FW** | 2.1.0 |
| **Range [units]** | 0 .. **#Stopping Rel Load Reserve 1 (page 370)** [%] | | |
| **Default value** | 60 % | **Alternative config** | NO |
| **Step** | 1 % | | |
| **Comm object** | 10648 | **Related applications** | MINT |
| **Config level** | Standard | | |
| **Setpoint visibility** | Always | | |
| **Description** | | | |

This setpoint is used to adjust the load reserve for start of next Gen-set in relative mode. i.e. **#Power Management Mode (page 365)** = REL.

> **IMPORTANT: Logical binary input LOAD RES 2 ACTIVE (PAGE 621) has to be deactivated, otherwise setpoints of Load Reserve Set 2 are used.**

***Note:*** *See **Power management (page 159)** chapter for more information.*

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## #Stopping Rel Load Reserve 1

| | | | |
|---|---|---|---|
| **Setpoint group** | Power Management | **Related FW** | 2.1.0 |
| **Range [units]** | **#Starting Rel Load Reserve 1 (page 370)** .. 110 [%] | | |
| **Default value** | 80 % | **Alternative config** | NO |
| **Step** | 1 % | | |
| **Comm object** | 10652 | **Related applications** | MINT |
| **Config level** | Standard | | |
| **Setpoint visibility** | Always | | |
| **Description** | | | |

This setpoint is used to adjust the load reserve for stop of next Gen-set in relative mode. i.e. **#Power Management Mode (page 365)** = REL.

> **IMPORTANT: Logical binary input LOAD RES 2 ACTIVE (PAGE 621) has to be deactivated, otherwise setpoints of Load Reserve Set 2 are used.**

***Note:*** *See **Power management (page 159)** chapter for more information.*

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## Subgroup: Load Reserve Set 2

## #Starting Load Reserve 2

| | | | |
|---|---|---|---|
| **Setpoint group** | Power Management | **Related FW** | 2.1.0 |
| **Range [units]** | 0 .. **#Stopping Load Reserve 2 (page 371)** [-] | | |
| **Default value** | 410 kW | **Alternative config** | NO |
| **Step** | 1 kW | | |
| **Comm object** | 8490 | **Related applications** | MINT |
| **Config level** | Standard | | |
| **Setpoint visibility** | Always | | |
| **Description** | | | |

This setpoint is used to adjust the load reserve for start of next Gen-set in absolute mode. i.e. **#Power Management Mode (page 365)** = ABS.

> **IMPORTANT: Logical binary input LOAD RES 2 ACTIVE (PAGE 621) has to be deactivated, otherwise setpoints of Load Reserve Set 1 are used.**

***Note:*** *See **Power management (page 159)** chapter for more information.*

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## #Stopping Load Reserve 2

| | | | |
|---|---|---|---|
| **Setpoint group** | Power Management | **Related FW** | 2.1.0 |
| **Range [units]** | **#Starting Load Reserve 2 (page 371)** .. 32000 [kW] | | |
| **Default value** | 460 kW | **Alternative config** | NO |
| **Step** | 1 kW | | |
| **Comm object** | 8633 | **Related applications** | MINT |
| **Config level** | Standard | | |
| **Setpoint visibility** | Always | | |
| **Description** | | | |

This setpoint is used to adjust the load reserve for stop of next Gen-set in absolute mode. i.e. **#Power Management Mode (page 365)** = ABS.

> **IMPORTANT: Logical binary input LOAD RES 2 ACTIVE (PAGE 621) has to be deactivated, otherwise setpoints of Load Reserve Set 1 are used.**

***Note:*** *See **Power management (page 159)** chapter for more information.*

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## #Starting Rel Load Reserve 2

| | | | |
|---|---|---|---|
| **Setpoint group** | Power Management | **Related FW** | 2.1.0 |
| **Range [units]** | 0 .. **#Stopping Rel Load Reserve 2 (page 372)** [%] | | |
| **Default value** | 60 % | **Alternative config** | NO |
| **Step** | 1 % | | |
| **Comm object** | 10649 | **Related applications** | MINT |
| **Config level** | Standard | | |
| **Setpoint visibility** | Always | | |
| **Description** | | | |

This setpoint is used to adjust the load reserve for start of next Gen-set in relative mode. i.e. **#Power Management Mode (page 365)** = REL.

> **IMPORTANT: Logical binary input LOAD RES 2 ACTIVE (PAGE 621) has to be deactivated, otherwise setpoints of Load Reserve Set 1 are used.**

***Note:*** *See **Power management (page 159)** chapter for more information.*

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## #Stopping Rel Load Reserve 2

| | | | |
|---|---|---|---|
| **Setpoint group** | Power Management | **Related FW** | 2.1.0 |
| **Range [units]** | **#Starting Rel Load Reserve 2 (page 372)** .. 110 [%] | | |
| **Default value** | 80 % | **Alternative config** | NO |
| **Step** | 1 % | | |
| **Comm object** | 10653 | **Related applications** | MINT |
| **Config level** | Standard | | |
| **Setpoint visibility** | Always | | |
| **Description** | | | |

This setpoint is used to adjust the load reserve for stop of next Gen-set in relative mode. i.e. **#Power Management Mode (page 365)** = REL.

> **IMPORTANT: Logical binary input LOAD RES 2 ACTIVE (PAGE 621) has to be deactivated, otherwise setpoints of Load Reserve Set 1 are used.**

***Note:*** *See **Power management (page 159)** chapter for more information.*

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## Subgroup: Minimal Running Power

### #Min Run Power 1*

| | | | |
|---|---|---|---|
| **Setpoint group** | Power Management | **Related FW** | 2.1.0 |
| **Range [units]** | 0 .. 65 000 [kW] | | |
| **Default value** | 210 kW | **Alternative config** | NO |
| **Step** | 1 kW | | |
| **Comm object** | 9584 | **Related applications** | MINT |
| **Config level** | Standard | | |
| **Setpoint visibility** | Always | | |
| **Description** | | | |
| This setpoint is used to adjust certain minimum value of the sum of nominal power of all running Gen-sets. If the function is active (by logical binary input **MIN RUN POWER ACT (PAGE 623)**), then the Gen-sets would not be stopped, although the reserve for stop is fulfilled, if the total remaining nominal power drops below this minimal value.<br>***Note:*** *Logical binary input **MIN RUN POWER ACT (PAGE 623)** needs to be activated on all Gen-sets in the same time.* | | | |

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## Subgroup: Start/Stop Timing

### #Next Engine Start Delay

| | | | |
|---|---|---|---|
| **Setpoint group** | Power Management | **Related FW** | 2.1.0 |
| **Range [units]** | 0 .. 3 600 [s] | | |
| **Default value** | 5 s | **Alternative config** | NO |
| **Step** | 1 s | | |
| **Comm object** | 8492 | **Related applications** | MINT |
| **Config level** | Standard | | |
| **Setpoint visibility** | Always | | |
| **Description** | | | |
| This setpoint adjusts the delay for starting the next Gen-set after the reserve has dropped below the reserve for start. | | | |

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## #Next Engine Stop Delay

| | | | |
|---|---|---|---|
| **Setpoint group** | Power Management | **Related FW** | 2.1.0 |
| **Range [units]** | 0 .. 3 600 [s] | | |
| **Default value** | 20 s | **Alternative config** | NO |
| **Step** | 1 s | | |
| **Comm object** | 8494 | **Related applications** | MINT |
| **Config level** | Standard | | |
| **Setpoint visibility** | Always | | |
| **Description** | | | |
| This setpoint adjusts the delay for stopping the Gen-set after the reserve has risen above the reserve for stop. | | | |

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## #Slow Stop Delay

| | | | |
|---|---|---|---|
| **Setpoint group** | Power Management | **Related FW** | 2.1.0 |
| **Range [units]** | 0 .. 600 [s] | | |
| **Default value** | 60 s | **Alternative config** | NO |
| **Step** | 1 s | | |
| **Comm object** | 8495 | **Related applications** | MINT |
| **Config level** | Standard | | |
| **Setpoint visibility** | Always | | |
| **Description** | | | |
| This setpoint is used to adjust how long the particular Gen-set will suppress it's own Slow stop alarm to give chance to another Gen-set to start and replace the defective one.<br>***Note:*** *If there isn't any available Gen-set to start, the alarm is not suppressed.* | | | |

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## Subgroup: Over Load Next Start Protection

## #Overload Next Start Protection

| | | | |
|---|---|---|---|
| **Setpoint group** | Power Management | **Related FW** | 2.1.0 |
| **Range [units]** | Enabled / Disabled [-] | | |
| **Default value** | Enabled | **Alternative config** | NO |
| **Step** | [-] | | |
| **Comm object** | 14942 | **Related applications** | MINT |
| **Config level** | Standard | | |
| **Setpoint visibility** | Always | | |
| **Description** | | | |
| This setpoint is intended for activation of the protection against the overloading of the system due to rapid change of the load. It makes the next Gen-set (in priority order) to start when the load excises the value given by the setpoint **#Overload Next Start Level (page 375)** right after the delay **#Overload Next Start Delay (page 375)**. | | | |

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## #Overload Next Start Level

| | | | |
|---|---|---|---|
| **Setpoint group** | Power Management | **Related FW** | 2.1.0 |
| **Range [units]** | 0 .. 100 [%] | | |
| **Default value** | 80 % | **Alternative config** | NO |
| **Step** | 1 % | | |
| **Comm object** | 14941 | **Related applications** | MINT |
| **Config level** | Standard | | |
| **Setpoint visibility** | Always | | |
| **Description** | | | |
| Threshold level for **#Overload Next Start Protection (page 375)**. | | | |

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## #Overload Next Start Delay

| | | | |
|---|---|---|---|
| **Setpoint group** | Power Management | **Related FW** | 2.1.0 |
| **Range [units]** | 0 .. 5 [s] | | |
| **Default value** | 1 s | **Alternative config** | NO |
| **Step** | 1 s | | |
| **Comm object** | 8493 | **Related applications** | MINT |
| **Config level** | Standard | | |
| **Setpoint visibility** | Always | | |
| **Description** | | | |
| Delay for **#Overload Next Start Protection (page 375)**. | | | |

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## Subgroup: Run Hours Equalization

## Run Hours Base

| | | | |
|---|---|---|---|
| **Setpoint group** | Power Management | **Related FW** | 2.1.0 |
| **Range [units]** | 0.0 .. 200000.0 [h] | | |
| **Default value** | 0.0 h | **Alternative config** | NO |
| **Step** | 0.1 h | | |
| **Comm object** | 10600 | **Related applications** | MINT |
| **Config level** | Standard | | |
| **Setpoint visibility** | Always | | |
| **Description** | | | |

Running hours base corrects actual Running hours differences between particular Gen-sets.

> **Example:**
> Gen-set 1 actual Running hours = 1000 h.
> Gen-set 2 actual Running hours = 2000 h.
> Adjust this setpoint for Gen-set 1 = 1000 h and for Gen-set 2 = 2000 h to be on the same base for Running Hours Equalization.

***Note:*** *This function is not supported in BTB application.*

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## #Run Hours Max Difference

| | | | |
|---|---|---|---|
| **Setpoint group** | Power Management | **Related FW** | 2.1.0 |
| **Range [units]** | 0 .. 65 000 [h] | | |
| **Default value** | 100 h | **Alternative config** | NO |
| **Step** | 1 h | | |
| **Comm object** | 9919 | **Related applications** | MINT |
| **Config level** | Standard | | |
| **Setpoint visibility** | Always | | |
| **Description** | | | |

This setpoint adjusts the "dead-band" for the running hours equalization function (**#Priority Auto Swap (page 367)** = Run Hours Equal). The priorities are swapped when engine hours difference is higher than this dead-band.

***Note:*** *The system calculates with whole hours.*

> **Example:** The difference in engine running hours has to be 11.0 hours, if #Run Hours Max Difference is set to 10. The priorities shuffling is not done with the difference just 10.1 hours.

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## Subgroup: Efficient Mode Settings

### #Power Band Change Up Delay

| | | | |
|---|---|---|---|
| **Setpoint group** | Power Management | **Related FW** | 2.1.0 |
| **Range [units]** | 0 .. 3 600 [s] | | |
| **Default value** | 10 s | **Alternative config** | NO |
| **Step** | 1 s | | |
| **Comm object** | 8896 | **Related applications** | MINT |
| **Config level** | Standard | | |
| **Setpoint visibility** | Always | | |
| **Description** | | | |
| This setpoint is used for adjusting the delay of changing the power band if the load demand rose above the upper limit of the current power band. Setpoint is taken into account only if **#Priority Auto Swap (page 367)** = Efficient. | | | |

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### #Power Band Change Down Delay

| | | | |
|---|---|---|---|
| **Setpoint group** | Power Management | **Related FW** | 2.1.0 |
| **Range [units]** | 0 .. 3 600 [s] | | |
| **Default value** | 10 s | **Alternative config** | NO |
| **Step** | 1 s | | |
| **Comm object** | 10795 | **Related applications** | MINT |
| **Config level** | Standard | | |
| **Setpoint visibility** | Always | | |
| **Description** | | | |
| This setpoint is used for adjusting the delay of changing the power band if the load demand drops below the lower limit of the current power band. Setpoint is taken into account only if **#Priority Auto Swap (page 367)** = Efficient. | | | |

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## Subgroup: Group Settings

## Control Group

| | | | |
|---|---|---|---|
| **Setpoint group** | Power Management | **Related FW** | 2.1.0 |
| **Range [units]** | 1,2 .. 32 [-] | | |
| **Default value** | 1 | **Alternative config** | NO |
| **Step** | 1 | | |
| **Comm object** | 10589 | **Related applications** | MINT |
| **Config level** | Standard | | |
| **Setpoint visibility** | Always | | |
| **Description** | | | |

This setpoint selects the control group(to get more information on this function please refer to the chapter **Control groups (page 112)** to which the particular Gen-set belongs. If there aren't logical groups at the site, adjust the setpoint to 1.

***Note:*** *This function is not supported in BTB application.*

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## Group Link L

| | | | |
|---|---|---|---|
| **Setpoint group** | Power Management | **Related FW** | 2.1.0 |
| **Range [units]** | 1,2 .. 32 [-] | | |
| **Default value** | 1 | **Alternative config** | NO |
| **Step** | 1 | | |
| **Comm object** | 10590 | **Related applications** | MINT |
| **Config level** | Standard | | |
| **Setpoint visibility** | Always | | |
| **Description** | | | |

If the input **GROUP LINK (PAGE 620)**Group Link of this particular controller is used to provide the "group link" information for two Control groups (to get more information refer to the chapter **Control groups (page 112)**), then this setpoint is used to select which group is located at the left side of the group link breaker (bus tie breaker). If this particular controller is not used for the group link function, adjust this setpoint to 1.

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## Group Link R

| | | | |
|---|---|---|---|
| **Setpoint group** | Power Management | **Related FW** | 2.1.0 |
| **Range [units]** | 1,2 .. 32 [-] | | |
| **Default value** | 1 | **Alternative config** | NO |
| **Step** | 1 | | |
| **Comm object** | 10591 | **Related applications** | MINT |
| **Config level** | Standard | | |
| **Setpoint visibility** | Always | | |
| **Description** | | | |
| If the input **GROUP LINK (PAGE 620)**Group Link of this particular controller is used to provide the "group link" information for two Control groups (to get more information refer to the chapter **Control groups (page 112)**), then this setpoint is used to select which group is located at the right side of the group link breaker (bus tie breaker). If this particular controller is not used for the group link function, adjust this setpoint to 1. | | | |

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### Group: Speed/Load Control

### Group: Speed/Load Control

## Speed Regulator Character

| | | | |
|---|---|---|---|
| **Setpoint group** | Speed/Load Control | **Related FW** | 2.1.0 |
| **Range [units]** | Positive / Negative [-] | | |
| **Default value** | Positive | **Alternative config** | NO |
| **Step** | [-] | | |
| **Comm object** | 9054 | **Related applications** | MINT, SPtM |
| **Config level** | Standard | | |
| **Setpoint visibility** | Always | | |
| **Description** | | | |

This setpoint selects the characteristic of the speed governor output of the controller. Adjust it according to the behavior of the remote speed input of the governor.

| | |
|---|---|
| Positive | Raising the voltage on the governor remote speed input causes engine speed to rise. |
| Negative | Raising the voltage on the governor remote speed input causes engine speed to go down. |

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## Speed Governor Bias

| | | | |
|---|---|---|---|
| **Setpoint group** | Speed/Load Control | **Related FW** | 2.1.0 |
| **Range [units]** | -10.00 .. 10.00 [V] | | |
| **Default value** | 0.00 V | **Alternative config** | YES* |
| **Step** | 0.01 V | | |
| **Comm object** | 8656 | **Related applications** | MINT, SPtM |
| **Config level** | Standard | | |
| **Setpoint visibility** | Always | | |
| **Description** | | | |
| This setpoint adjusts the initial voltage level for the speed governor output, which is present on the output, if no speed or power regulation loop is active.<br>***Note:*** *To make a fine adjustment, start the Gen-set in MAN mode, leave it running unloaded and then make fine adjustment of this setpoint to achieve nominal engine speed.* | | | |

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## Speed Governor Low Limit

| | | | |
|---|---|---|---|
| **Setpoint group** | Speed/Load Control | **Related FW** | 2.1.0 |
| **Range [units]** | -10.00 .. 10.00 [V] | | |
| **Default value** | -10.00 V | **Alternative config** | NO |
| **Step** | 0.01 V | | |
| **Comm object** | 10115 | **Related applications** | MINT, SPtM |
| **Config level** | Standard | | |
| **Setpoint visibility** | Always | | |
| **Description** | | | |
| Lower limit of the speed governor output. Use this setpoint to adjust the governor output range according to your governor type. | | | |

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## Speed Governor High Limit

| | | | |
|---|---|---|---|
| **Setpoint group** | Speed/Load Control | **Related FW** | 2.1.0 |
| **Range [units]** | -10.00 .. 10.00 [V] | | |
| **Default value** | 10.00 V | **Alternative config** | NO |
| **Step** | 0.01 V | | |
| **Comm object** | 10559 | **Related applications** | MINT, SPtM |
| **Config level** | Standard | | |
| **Setpoint visibility** | Always | | |
| **Description** | | | |
| Upper limit of the speed governor output. Use this setpoint to adjust the governor output range according to your governor type. | | | |

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## Speed Governor PWM Rate

| | | | |
|---|---|---|---|
| **Setpoint group** | Speed/Load Control | **Related FW** | 2.1.0 |
| **Range [units]** | 500 .. 2 900 [Hz] | | |
| **Default value** | 500 Hz | **Alternative config** | NO |
| **Step** | 1 Hz | | |
| **Comm object** | 10911 | **Related applications** | MINT, SPtM |
| **Config level** | Standard | | |
| **Setpoint visibility** | Always | | |
| **Description** | | | |
| This setpoint adjusts the frequency of the speed governor PWM output. | | | |

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## Tau Speed Governor Actuator

| | | | |
|---|---|---|---|
| **Setpoint group** | Speed/Load Control | **Related FW** | 2.1.0 |
| **Range [units]** | 1.0 .. 300.0 [s] | | |
| **Default value** | 10.0 s | **Alternative config** | NO |
| **Step** | 0.1 s | | |
| **Comm object** | 10784 | **Related applications** | MINT, SPtM |
| **Config level** | Standard | | |
| **Setpoint visibility** | Always | | |
| **Description** | | | |
| This setpoint is used to adjust the transformation ratio of the speed governor output to the pulses at the binary outputs **SPEED UP (PAGE 679)** and **SPEED DOWN (PAGE 679)**. Adjust the setpoint to the pulse duration which is needed for the speed control device to travel from minimal position to the maximal position. | | | |

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## Subgroup: Regulation Loops

## Frequency Gain

| | | | |
|---|---|---|---|
| **Setpoint group** | Speed/Load Control | **Related FW** | 2.1.0 |
| **Range [units]** | 0.0 .. 200.0 [%] | | |
| **Default value** | 10.0 % | **Alternative config** | NO |
| **Step** | 0.1 % | | |
| **Comm object** | 8715 | **Related applications** | MINT, SPtM |
| **Config level** | Standard | | |
| **Setpoint visibility** | Always | | |
| **Description** | | | |
| This setpoint adjusts the gain factor (P-factor) of the frequency control PI loop.<br>***Note:*** *See the chapter* ***Regulation loops (page 196)*** *for more information.* | | | |

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## Frequency Int

| | | | |
|---|---|---|---|
| **Setpoint group** | Speed/Load Control | **Related FW** | 2.1.0 |
| **Range [units]** | 0 .. 200 [%] | | |
| **Default value** | 50 % | **Alternative config** | NO |
| **Step** | 1 % | | |
| **Comm object** | 8716 | **Related applications** | MINT, SPtM |
| **Config level** | Standard | | |
| **Setpoint visibility** | Always | | |
| **Description** | | | |
| This setpoint adjusts the relative integration factor (I-factor) of the frequency control PI loop.<br>***Note:*** *See the chapter* ***Regulation loops (page 196)*** *for more information.* | | | |

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## Angle Gain

| | | | |
|---|---|---|---|
| **Setpoint group** | Speed/Load Control | **Related FW** | 2.1.0 |
| **Range [units]** | 0.0 .. 200.0 [%] | | |
| **Default value** | 10.0 % | **Alternative config** | NO |
| **Step** | 0.1 % | | |
| **Comm object** | 8718 | **Related applications** | MINT, SPtM |
| **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 generator frequency with the mains or bus and after that the phase angle loop is started to match the phase angle.*

***Note:*** *See the chapter **Regulation loops (page 196)** for more information.*

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## Load Gain

| | | | |
|---|---|---|---|
| **Setpoint group** | Speed/Load Control | **Related FW** | 2.1.0 |
| **Range [units]** | 0.0 .. 200.0 [%] | | |
| **Default value** | 10.0 % | **Alternative config** | NO |
| **Step** | 0.1 % | | |
| **Comm object** | 8659 | **Related applications** | MINT, SPtM |
| **Config level** | Standard | | |
| **Setpoint visibility** | Always | | |
| **Description** | | | |

This setpoint adjusts the gain factor (P-factor) of the load control PI loop.

***Note:*** *During synchronization, first the frequency loop is started to match the generator frequency with the mains or bus and after that the phase angle loop is started to match the phase angle.*

***Note:*** *See the chapter **Regulation loops (page 196)** for more information.*

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## Load Int

| | | | |
|---|---|---|---|
| **Setpoint group** | Speed/Load Control | **Related FW** | 2.1.0 |
| **Range [units]** | 0 .. 200 [%] | | |
| **Default value** | 50 % | **Alternative config** | NO |
| **Step** | 1 % | | |
| **Comm object** | 8713 | **Related applications** | MINT, SPtM |
| **Config level** | Standard | | |
| **Setpoint visibility** | Always | | |
| **Description** | | | |
| This setpoint adjusts the relative integration factor (I-factor) of the load control PI loop. | | | |
| ***Note:*** *See the chapter* ***Regulation loops (page 196)*** *for more information.* | | | |

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## Load Sharing Gain

| | | | |
|---|---|---|---|
| **Setpoint group** | Speed/Load Control | **Related FW** | 2.1.0 |
| **Range [units]** | 0.0 .. 200.0 [%] | | |
| **Default value** | 10.0 % | **Alternative config** | NO |
| **Step** | 0.1 % | | |
| **Comm object** | 8725 | **Related applications** | MINT |
| **Config level** | Standard | | |
| **Setpoint visibility** | Conditioned by the setpoint **Default Application Select (page 257)** | | |
| **Description** | | | |
| This setpoint adjusts the gain factor (P-factor) of the load sharing control PI loop. | | | |
| ***Note:*** *See the chapter* ***Regulation loops (page 196)*** *for more information.* | | | |

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## Load Sharing Int

| | | | |
|---|---|---|---|
| **Setpoint group** | Speed/Load Control | **Related FW** | 2.1.0 |
| **Range [units]** | 0 .. 200 [%] | | |
| **Default value** | 50 % | **Alternative config** | NO |
| **Step** | 1 % | | |
| **Comm object** | 9035 | **Related applications** | MINT |
| **Config level** | Standard | | |
| **Setpoint visibility** | Conditioned by the setpoint **Default Application Select (page 257)** | | |
| **Description** | | | |
| This setpoint adjusts the relative integration factor (I-factor) of the load sharing control PI loop. | | | |
| ***Note:*** *See the chapter* ***Regulation loops (page 196)*** *for more information.* | | | |

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## Subgroup: Load Transfer

## Close Transfer Max Duration

| | | | |
|---|---|---|---|
| **Setpoint group** | Speed/Load Control | **Related FW** | 2.1.0 |
| **Range [units]** | < 0.1 = 0.0; 0.1 .. 600.0 [s] | | |
| **Default value** | 5.0 s | **Alternative config** | NO |
| **Step** | 0.1 s | | |
| **Comm object** | 8661 | **Related applications** | SPtM |
| **Config level** | Standard | | |
| **Setpoint visibility** | Only if **Active Application (page 578)** = SPTM | | |
| **Description** | | | |
| The time of parallel work of generator and mains in close transition.<br>***Note:*** *Minimal time of parallel operation is 300 ms.* | | | |

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## Open Transfer Min Break

| | | | |
|---|---|---|---|
| **Setpoint group** | Mains Settings | **Related FW** | 2.1.0 |
| **Range [units]** | 0.0 .. 600.0 [s] | | |
| **Default value** | 1.0 s | **Alternative config** | NO |
| **Step** | 0.1 s | | |
| **Comm object** | 8303 | **Related applications** | SPtM |
| **Config level** | Standard | | |
| **Setpoint visibility** | Conditioned by the setpoint **Default Application Select (page 257)** | | |
| **Description** | | | |
| Minimal duration of break in open transition when **Transfer Gen To Mains (page 387)** or **Transfer Mains To Gen (page 386)** is chosen as open transfer. | | | |

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## Transfer Mains To Gen

| | | | |
|---|---|---|---|
| **Setpoint group** | Speed/Load Control | **Related FW** | 2.1.0 |
| **Range [units]** | Open / Close Only / Close Prim / SoftTransf [-] | | |
| **Default value** | SoftTransf | **Alternative config** | NO |
| **Step** | [-] | | |
| **Comm object** | 12969 | **Related applications** | SPtM |
| **Config level** | Standard | | |
| **Setpoint visibility** | Only if **Active Application (page 578)** = SPTM | | |
| **Description** | | | |

This setpoint defines the type of transfer of load from mains to generator.

| | |
|---|---|
| Open | Transfer of the load from mains to generator without parallel work and synchronization (one breaker opens and second is closed – checking feedbacks). The setpoint **Open Transfer Min Break (page 385)** sets the minimal duration of break. |
| Close Only | Transfer of the load from mains to generator with synchronization and parallel work. The time of parallel work is given by setpoint **Close Transfer Max Duration (page 385)**.<br>In case of synchronization fail, MCB stays close and Gen-set is stopped. |
| Close Prim | Transfer of the load from mains to generator with synchronization and parallel work. The time of parallel work is given by setpoint **Close Transfer Max Duration (page 385)**.<br>In case of synchronization fail, open transfer is done. |
| SoftTransf | Transfer of the load from mains to generator with parallel work and soft loading of the Gen-set. This function is proceeded like the closed transfer, but there is time limitation of loading of the Gen-set adjusted via setpoint **Load Ramp (page 389)**. The transfer is succeed only when the Gen-set is fully loaded – mains is fully unloaded (level of load when mains is considered as unloaded is adjusted via setpoint **Mains Unload MCB Open Window (page 388)**). |

***Note:*** *Close transfer of load is also affected by setpoint* ***Subgroup: Mains Import Measurement (page 267)****.*

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## Transfer Gen To Mains

| | | | |
|---|---|---|---|
| **Setpoint group** | Speed/Load Control | **Related FW** | 2.1.0 |
| **Range [units]** | Open / Close Only / Close Prim / SoftTransf [-] | | |
| **Default value** | SoftTransf | **Alternative config** | NO |
| **Step** | [-] | | |
| **Comm object** | 14688 | **Related applications** | SPtM |
| **Config level** | Standard | | |
| **Setpoint visibility** | Only if **Active Application (page 578)** = SPTM | | |
| **Description** | | | |

This setpoint defines the type of transfer of load from generator to mains.

| | |
|---|---|
| Open | Transfer of the load from generator to mains without parallel work and synchronization (one breaker opens and second is closed – checking feedbacks). The setpoint **Open Transfer Min Break (page 385)** sets the minimal duration of break. |
| Close Only | Transfer of the load from generator to mains with synchronization and parallel work. The time of parallel work is given by setpoint **Close Transfer Max Duration (page 385)**. |
| Close Prim | Transfer of the load from generator to mains with synchronization and parallel work. The time of parallel work is given by setpoint **Close Transfer Max Duration (page 385)**.<br>In case of synchronization fail, open transfer is done. |
| SoftTransf | Transfer of the load from generator to mains with parallel work and soft unloading of the Gen-set. This function is proceeded like the closed transfer, but there is time limitation of unloading of the Gen-set adjusted via setpoint **Load Ramp (page 389)**. The transfer is succeed only when the Gen-set is fully unloaded (level of load when Gen-set is considered as unloaded is adjusted via setpoint **Generator Unload GCB Open Level (page 388)**). |

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## Generator Unload GCB Open Level

| | | | |
|---|---|---|---|
| **Setpoint group** | Speed/Load Control | **Related FW** | 2.1.0 |
| **Range [units]** | 0 .. 100 [%] of **Nominal Power (page 274)** | | |
| **Default value** | 10 % of **Nominal Power (page 274)** | **Alternative config** | NO |
| **Step** | 1 % of **Nominal Power (page 274)** | | |
| **Comm object** | 8547 | **Related applications** | MINT, SPtM |
| **Config level** | Standard | | |
| **Setpoint visibility** | Only if **Default Application Select (page 257)** = MGCB | | |
| **Description** | | | |

This setpoint adjusts the required value of the **Total Running P (page 569)** (power of all Gen-sets connected to the bus) when the GCB is opened during unloading of the (Gen-sets).

***Note:*** *This setpoint is usually higher than 0 to prevent the engine going to reverse power.*

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## Mains Unload MCB Open Window

| | | | |
|---|---|---|---|
| **Setpoint group** | Speed/Load Control | **Related FW** | 2.1.0 |
| **Range [units]** | 0 .. 100 [%] of **Nominal Power (page 274)** | | |
| **Default value** | 10 % of **Nominal Power (page 274)** | **Alternative config** | NO |
| **Step** | 1 % of **Nominal Power (page 274)** | | |
| **Comm object** | 14694 | **Related applications** | SPtM |
| **Config level** | Standard | | |
| **Setpoint visibility** | Only if **Active Application (page 578)** = SPTM | | |
| **Description** | | | |

This setpoint adjusts the value which defines the level where the mains is considered as unloaded.

***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** | Speed/Load Control | **Related FW** | 2.1.0 |
| **Range [units]** | 0 .. 600 [s] | | |
| **Default value** | 5 s | **Alternative config** | YES |
| **Step** | 1 s | | |
| **Comm object** | 8658 | **Related applications** | MINT, SPtM |
| **Config level** | Standard | | |
| **Setpoint visibility** | Always | | |
| **Description** | | | |
| This setpoint adjusts the ramping time of **Required P Target (page 571)** while loading/unloading.<br>The ramping time is set for ΔP which is given by the setpoint **Nominal Power (page 274)**. | | | |

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# Group: Voltage/PF Control

## Subgroup: Voltage Control

## Voltage Regulator Character

| | | | |
|---|---|---|---|
| **Setpoint group** | Voltage/PF Control | **Related FW** | 2.1.0 |
| **Range [units]** | Positive / Negative [-] | | |
| **Default value** | Positive | **Alternative config** | NO |
| **Step** | [-] | | |
| **Comm object** | 9055 | **Related applications** | MINT, SPtM |
| **Config level** | Standard | | |
| **Setpoint visibility** | Always | | |
| **Description** | | | |

This setpoint selects the characteristic of the voltage governor output of the controller. Adjust it according to the behavior of the remote voltage input of the governor.

| | |
|---|---|
| Positive | Raising the voltage on the remote voltage adjustment input causes the generator voltage to raise. |
| Negative | Raising the voltage on the governor remote speed input causes engine speed to go down. |

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## Voltage Regulator Bias

| | | | |
|---|---|---|---|
| **Setpoint group** | Voltage/PF Control | **Related FW** | 2.1.0 |
| **Range [units]** | -10.00 .. 10.00 [V] | | |
| **Default value** | 0.00 V | **Alternative config** | YES |
| **Step** | 0.01 V | | |
| **Comm object** | 8500 | **Related applications** | MINT, SPtM |
| **Config level** | Standard | | |
| **Setpoint visibility** | Always | | |
| **Description** | | | |
| This setpoint adjusts the initial level for the voltage governor output. This level is present on the output if no regulation loop is active. | | | |

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## Voltage Regulator Low Limit

| | | | |
|---|---|---|---|
| **Setpoint group** | Voltage/PF Control | **Related FW** | 2.1.0 |
| **Range [units]** | -10.00 .. 10.00 [V] | | |
| **Default value** | -10.00 V | **Alternative config** | NO |
| **Step** | 0.01 V | | |
| **Comm object** | 14792 | **Related applications** | MINT, SPtM |
| **Config level** | Standard | | |
| **Setpoint visibility** | Always | | |
| **Description** | | | |
| Lower limit of the voltage governor output. Use this setpoint to adjust the governor output range according to your governor type. | | | |

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## Voltage Regulator High Limit

| | | | |
|---|---|---|---|
| **Setpoint group** | Voltage/PF Control | **Related FW** | 2.1.0 |
| **Range [units]** | -10.00 .. 10.00 [V] | | |
| **Default value** | 10.00 V | **Alternative config** | NO |
| **Step** | 0.01 V | | |
| **Comm object** | 14793 | **Related applications** | MINT, SPtM |
| **Config level** | Standard | | |
| **Setpoint visibility** | Always | | |
| **Description** | | | |
| Upper limit of the voltage governor output. Use this setpoint to adjust the governor output range according to your governor type. | | | |

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## Tau Voltage Regulator Actuator

| | | | |
|---|---|---|---|
| **Setpoint group** | Voltage/PF Control | **Related FW** | 2.1.0 |
| **Range [units]** | 1.0 .. 300.0 [s] | | |
| **Default value** | 10.0 s | **Alternative config** | NO |
| **Step** | 0.1 s | | |
| **Comm object** | 10785 | **Related applications** | MINT, SPtM |
| **Config level** | Standard | | |
| **Setpoint visibility** | Always | | |
| **Description** | | | |
| This setpoint is used to adjust the transformation ratio of the voltage regulator output to the pulses at the binary outputs **AVR Up (page 646)** and **AVR Down (page 646)**. Adjust the setpoint to the pulse duration which is needed for the voltage control device to travel from minimal position to the maximal position. | | | |

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## Subgroup: Regulation Loops

## Voltage Gain

| | | | |
|---|---|---|---|
| **Setpoint group** | Voltage/PF Control | **Related FW** | 2.1.0 |
| **Range [units]** | 0.0 .. 200.0 [%] | | |
| **Default value** | 10.0 % | **Alternative config** | NO |
| **Step** | 0.01 % | | |
| **Comm object** | 8501 | **Related applications** | MINT, SPtM |
| **Config level** | Standard | | |
| **Setpoint visibility** | Always | | |
| **Description** | | | |
| This setpoint adjusts the gain factor (P-factor) of the voltage control PI loop.<br>***Note:*** *See the chapter **Regulation loops (page 196)** for more information.* | | | |

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## Voltage Int

| | | | |
|---|---|---|---|
| **Setpoint group** | Voltage/PF Control | **Related FW** | 2.1.0 |
| **Range [units]** | 0 .. 200 [%] | | |
| **Default value** | 50 % | **Alternative config** | NO |
| **Step** | 1 % | | |
| **Comm object** | 8720 | **Related applications** | MINT, SPtM |
| **Config level** | Standard | | |
| **Setpoint visibility** | Always | | |
| **Description** | | | |
| This setpoint adjusts the relative integration factor (I-factor) of the voltage control PI loop.<br>***Note:*** *See the chapter* ***Regulation loops (page 196)*** *for more information.* | | | |

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## PF Gain

| | | | |
|---|---|---|---|
| **Setpoint group** | Voltage/PF Control | **Related FW** | 2.1.0 |
| **Range [units]** | 0.0 .. 200.0 [%] | | |
| **Default value** | 10.0 % | **Alternative config** | NO |
| **Step** | 0.1 % | | |
| **Comm object** | 8503 | **Related applications** | MINT, SPtM |
| **Config level** | Standard | | |
| **Setpoint visibility** | Always | | |
| **Description** | | | |
| This setpoint adjusts the gain factor (P-factor) of the PF control PI loop.<br>***Note:*** *See the chapter* ***Regulation loops (page 196)*** *for more information.* | | | |

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## PF Int

| | | | |
|---|---|---|---|
| **Setpoint group** | Voltage/PF Control | **Related FW** | 2.1.0 |
| **Range [units]** | 0 .. 200 [%] | | |
| **Default value** | 50 % | **Alternative config** | NO |
| **Step** | 1 % | | |
| **Comm object** | 8721 | **Related applications** | MINT, SPtM |
| **Config level** | Standard | | |
| **Setpoint visibility** | Always | | |
| **Description** | | | |
| This setpoint adjusts the relative integration factor (I-factor) of the PF control PI loop.<br>***Note:*** *See the chapter* ***Regulation loops (page 196)*** *for more information.* | | | |

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## VAr Sharing Gain

| | | | |
|---|---|---|---|
| **Setpoint group** | Voltage/PF Control | **Related FW** | 2.1.0 |
| **Range [units]** | 0.0 .. 200.0 [%] | | |
| **Default value** | 10.00 % | **Alternative config** | NO |
| **Step** | 0.1 % | | |
| **Comm object** | 8777 | **Related applications** | MINT, SPtM |
| **Config level** | Standard | | |
| **Setpoint visibility** | Always | | |
| **Description** | | | |
| This setpoint adjusts the gain factor (P-factor) of the VAr sharing control PI loop.<br>***Note:*** *See the chapter* ***Regulation loops (page 196)*** *for more information.* | | | |

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## VAr Sharing Int

| | | | |
|---|---|---|---|
| **Setpoint group** | Voltage/PF Control | **Related FW** | 2.1.0 |
| **Range [units]** | 0 .. 200 [%] | | |
| **Default value** | 50 % | **Alternative config** | NO |
| **Step** | 1 % | | |
| **Comm object** | 9036 | **Related applications** | MINT, SPtM |
| **Config level** | Standard | | |
| **Setpoint visibility** | Always | | |
| **Description** | | | |
| This setpoint adjusts the relative integration factor (I-factor) of the VAr sharing control PI loop.<br>***Note:*** *See the chapter* ***Regulation loops (page 196)*** *for more information.* | | | |

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## Group: Synchronization

## Subgroup: Synchronisation

# Synchronization Type

| | | | |
|---|---|---|---|
| **Setpoint group** | Synchronization | **Related FW** | 2.1.0 |
| **Range [units]** | Phase Match / Slip Synchro [-] | | |
| **Default value** | Phase Match | **Alternative config** | NO |
| **Step** | [-] | | |
| **Comm object** | 14802 | **Related applications** | MINT, SPtM |
| **Config level** | Standard | | |
| **Setpoint visibility** | Always | | |

**Description**

This setpoint adjusts the type of synchronization.

| | |
|---|---|
| Phase Match | This type of synchronization is based on voltage and phase shift match. Limits are adjusted via setpoints **Voltage Window (page 395)** and **Phase Window (page 396)**. When voltage and phase shift are match, **Dwell Time (page 396)** starts countdown. After that the command for breaker closing is activated. |
| Slip Synchro | This type of synchronization regulates the value of frequency to the value Mains/Bus frequency + **Slip Frequency (page 396)** (Mains frequency in SPtM, Bus frequency in MINT application). When this frequency is reached, **Dwell Time (page 396)** starts countdown. After that the command for breaker closing is activated. The closing breaker command is issued in advance due to latency of breakers (adjusted via setpoints **GCB Latency (page 397)** and **MCB Latency (page 397)**.<br>***Note:*** *Condition of **Voltage Window (page 395)** has to be also fulfilled.*<br>***Note:*** *Slip synchronization can not be used for synchronization of Mains to Mains.*<br>***Note:*** *Synchronization is not allowed if there is already synchronized any Mains CU in the control group.* |

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## Synchronization Timeout

| | | | |
|---|---|---|---|
| **Setpoint group** | Synchronization | **Related FW** | 2.1.0 |
| **Range [units]** | OFF / 1 .. 1800 [s] | | |
| **Default value** | 60 s | **Alternative config** | NO |
| **Step** | 1 s | | |
| **Comm object** | 8657 | **Related applications** | MINT, SPtM |
| **Config level** | Standard | | |
| **Setpoint visibility** | Always | | |
| **Description** | | | |
| This setpoint adjusts the maximum duration of synchronizing.<br>***Note:*** *If this setpoint is adjusted to OFF then automatic restart of synchronization occurs every 180 s. This method helps to synchronize successfully even in difficult conditions.* | | | |

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## Voltage Window

| | | | |
|---|---|---|---|
| **Setpoint group** | Synchronization | **Related FW** | 2.1.0 |
| **Range [units]** | 0.0 .. 100.0 [%] | | |
| **Default value** | 10.0 % | **Alternative config** | NO |
| **Step** | 0.1 % | | |
| **Comm object** | 8650 | **Related applications** | MINT, SPtM |
| **Config level** | Standard | | |
| **Setpoint visibility** | Always | | |
| **Description** | | | |
| This setpoint adjusts maximum difference between generator and mains/bus voltage in respective phases for synchronization. | | | |

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## Phase Window

| | | | |
|---|---|---|---|
| **Setpoint group** | Synchronization | **Related FW** | 2.1.0 |
| **Range [units]** | 0 .. 90 [°] | | |
| **Default value** | 10 ° | **Alternative config** | NO |
| **Step** | 1 ° | | |
| **Comm object** | 8652 | **Related applications** | MINT, SPtM |
| **Config level** | Standard | | |
| **Setpoint visibility** | Always | | |
| **Description** | | | |
| This setpoint adjusts the maximum absolute value of difference between actual phase angle and between the generator and mains/bus voltages for synchronization. In order to disable breaker close command, adjust this setpoint to zero degree. Synchronisation procedure will go on for set timeout or till breaker is closed from an external device. | | | |

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## Dwell Time

| | | | |
|---|---|---|---|
| **Setpoint group** | Synchronization | **Related FW** | 2.1.0 |
| **Range [units]** | 0.0 .. 25.0 [s] | | |
| **Default value** | 0.3 s | **Alternative config** | NO |
| **Step** | 0.1 s | | |
| **Comm object** | 8653 | **Related applications** | MINT, SPtM |
| **Config level** | Standard | | |
| **Setpoint visibility** | Always | | |
| **Description** | | | |
| The period of time, during which the phase angle difference must be within **Phase Window (page 396)** and voltage difference within **Voltage Window (page 395)**, before the breaker is closed. | | | |

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## Slip Frequency

| | | | |
|---|---|---|---|
| **Setpoint group** | Synchronization | **Related FW** | 2.1.0 |
| **Range [units]** | -0.50 .. 0.50 [Hz] | | |
| **Default value** | -0.25 Hz | **Alternative config** | NO |
| **Step** | 0.1 Hz | | |
| **Comm object** | 14798 | **Related applications** | MINT, SPtM |
| **Config level** | Standard | | |
| **Setpoint visibility** | Always | | |
| **Description** | | | |
| Slip frequency for slip synchronization (**Synchronization Type (page 394)** = Slip Synchro). | | | |

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## Slip Frequency Window

| | | | |
|---|---|---|---|
| **Setpoint group** | Synchronization | **Related FW** | 2.1.0 |
| **Range [units]** | 0.01 .. 0.50 [Hz] | | |
| **Default value** | 0.15 Hz | **Alternative config** | NO |
| **Step** | 0.01 Hz | | |
| **Comm object** | 14799 | **Related applications** | MINT, SPtM |
| **Config level** | Standard | | |
| **Setpoint visibility** | Always | | |
| **Description** | | | |
| Window of slip frequency for slip synchronization (**Synchronization Type (page 394)** = Slip Synchro). | | | |

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## GCB Latency

| | | | |
|---|---|---|---|
| **Setpoint group** | Synchronization | **Related FW** | 2.1.0 |
| **Range [units]** | 20 .. 1 000 [ms] | | |
| **Default value** | 80 ms | **Alternative config** | NO |
| **Step** | 1 ms | | |
| **Comm object** | 14800 | **Related applications** | MINT, SPtM |
| **Config level** | Standard | | |
| **Setpoint visibility** | Always | | |
| **Description** | | | |
| Latency of GCB.<br>**IMPORTANT: This setpoint is enable, when Synchronization Type has Split Synchro value.** | | | |

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## MCB Latency

| | | | |
|---|---|---|---|
| **Setpoint group** | Synchronization | **Related FW** | 2.1.0 |
| **Range [units]** | 20 .. 1 000 [ms] | | |
| **Default value** | 80 ms | **Alternative config** | NO |
| **Step** | 1 ms | | |
| **Comm object** | 14801 | **Related applications** | SPtM |
| **Config level** | Standard | | |
| **Setpoint visibility** | Always | | |
| **Description** | | | |
| Latency of MCB.<br>**IMPORTANT: This setpoint is enable, when Synchronization Type has Split Synchro value.** | | | |

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## Group: Droop Settings

### Subgroup: Droop Settings

## Load/Var Sharing Regulation Type

| | | | |
|---|---|---|---|
| **Setpoint group** | Droop Settings | **Related FW** | 2.1.0 |
| **Range [units]** | Isochronous / Droop / Emergency Droop [-] | | |
| **Default value** | Isonchronous | **Alternative config** | NO |
| **Step** | [-] | | |
| **Comm object** | 13212 | **Related applications** | MINT |
| **Config level** | Advanced | | |
| **Setpoint visibility** | Visible only if ECU is configured | | |
| **Description** | | | |

This setpoint adjusts how the active and reactive power is regulated. The droop is primarily intended for multiple parallel operation in island to ensure the load sharing and VAr sharing when intercontroller communication fails.

| | |
|---|---|
| Isochronous | The active and reactive power is regulated based on data communicated between the controller units (intercontroller communication). |
| Droop | The active and reactive power is not regulated based on data communicated between the units but the speed request and voltage request is calculated from actual voltage and actual frequency of the system.<br>The speed request is correlative to active power and the voltage request is correlative to reactive power. |
| Emrg Droop | Regulation of active and reactive power is based on standard isochronous regulation based on intercontroller communication but it can be conditionally turned to droop |

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## Dead Bus GCB Close Master

| | | | |
|---|---|---|---|
| **Setpoint group** | Droop Settings | **Related FW** | 2.1.0 |
| **Range [units]** | Disabled / Enabled [-] | | |
| **Default value** | Disabled | **Alternative config** | NO |
| **Step** | [-] | | |
| **Comm object** | 13952 | **Related applications** | MINT |
| **Config level** | Advanced | | |
| **Setpoint visibility** | Always | | |
| **Description** | | | |

This setpoint adjusts the behavior of GCB for droop regulation in AUTO mode. If the bus values are without the limits then the controller is prohibited to close it's GCB because of safety reasons.

| | |
|---|---|
| Disabled | If the bus values are without the limits then the controller is prohibited to close it's GCB because of safety reasons. Closing of GCB can be done manually in MAN mode. |
| Enabled | If the bus values are without the limits, controller is allowed to close it´s GCB to the dead bus. |

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## Subgroup: Frequency Droop

## Frequency Droop Slope

| | | | |
|---|---|---|---|
| **Setpoint group** | Droop Settings | **Related FW** | 2.1.0 |
| **Range [units]** | 0.0 .. 20.0 [%] | | |
| **Default value** | 4.0 % | **Alternative config** | NO |
| **Step** | 0.1 % | | |
| **Comm object** | 10032 | **Related applications** | MINT |
| **Config level** | Advanced | | |
| **Setpoint visibility** | Always | | |
| **Description** | | | |

This setpoint defines the slope of the load droop correlation. The slope is set as a droop of frequency in percentages of the requested system frequency (Basic settings: **Nominal Frequency (page 282)**) on the range of the requested power from 0 to 100% of Basic settings: **Nominal Power (page 274)**.

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## Frequency Droop Offset

| | | | |
|---|---|---|---|
| **Setpoint group** | Droop Settings | **Related FW** | 2.1.0 |
| **Range [units]** | 0 .. 100 [%] | | |
| **Default value** | 100 % | **Alternative config** | NO |
| **Step** | 1 % | | |
| **Comm object** | 13213 | **Related applications** | MINT |
| **Config level** | Advanced | | |
| **Setpoint visibility** | Always | | |
| **Description** | | | |
| This setpoint defines the value of requested power on the requested system frequency (Basic settings: **Nominal Frequency (page 282)**). Allows to shift the droop correlation line up or down. | | | |

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## Subgroup: Voltage Droop

## Voltage Droop Slope

| | | | |
|---|---|---|---|
| **Setpoint group** | Droop Settings | **Related FW** | 2.1.0 |
| **Range [units]** | 0.0 .. 20.0 [%] | | |
| **Default value** | 4.0 % | **Alternative config** | NO |
| **Step** | 0.1 % | | |
| **Comm object** | 10033 | **Related applications** | MINT |
| **Config level** | Advanced | | |
| **Setpoint visibility** | Always | | |
| **Description** | | | |
| This setpoint defines the slope of the VAr droop correlation. The slope is set as a droop of voltage in percentages of the generator nominal voltage (Basic settings: **Nominal Voltage Ph-N (page 278)**) on the range of the requested reactive power from 0 to 100% of nominal reactive power (value of nominal reactive power is not given by setpoint but it is calculated from setpoint **Nominal Voltage Ph-Ph (page 279)** whilst the PF=0,8). | | | |

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## Voltage Droop Offset

| | | | |
|---|---|---|---|
| **Setpoint group** | Droop Settings | **Related FW** | 2.1.0 |
| **Range [units]** | 0 .. 100 [%] | | |
| **Default value** | 100 % | **Alternative config** | NO |
| **Step** | 1 % | | |
| **Comm object** | 13214 | **Related applications** | MINT |
| **Config level** | Advanced | | |
| **Setpoint visibility** | Always | | |
| **Description** | | | |
| This setpoint defines the value of requested reactive power on the nominal voltage (Basic settings: **Nominal Voltage Ph-N (page 278)**). Allows to shift the droop correlation line up or down. | | | |

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## Subgroup: Emergency Droop Settings

## #Number Of Controllers On CAN

| | | | |
|---|---|---|---|
| **Setpoint group** | Droop Settings | **Related FW** | 2.1.0 |
| **Range [units]** | 1 .. 32 [-] | | |
| **Default value** | 1 | **Alternative config** | NO |
| **Step** | 1 | | |
| **Comm object** | 13953 | **Related applications** | MINT |
| **Config level** | Advanced | | |
| **Setpoint visibility** | Always | | |
| **Description** | | | |
| This setpoint defines the minimum number of units supposed to be connected to CAN2. See values CAN16 and CAN32 for information about number of controllers on CAN2 bus. Controller counts itself as well, the number is always 1 or higher, it is never 0. If the number of controllers detected by the controller on CAN2 is lower than the number in this setpoint, the system falls in emergency droop, it means that regulations are switched to droop after delay defined by **#Emergency Droop On Delay (page 403)**. If the intercontroller communication recovers (the number of controllers detected on CAN2 gets equal or higher than value in this setpoint), then the system turns the regulations back to isochronous mode after delay defined by setpoint **#Emergency Droop Off Delay (page 403)**.<br>***Note:*** *This function is available only when* ***Load/Var Sharing Regulation Type (page 398)*** *= Emergency Droop.* | | | |

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## #Number Of Controller On Delay

| | | | |
|---|---|---|---|
| **Setpoint group** | Droop Settings | **Related FW** | 2.1.0 |
| **Range [units]** | 0.0 .. 10.0 [s] | | |
| **Default value** | 10.0 [s] | **Alternative config** | NO |
| **Step** | 0.1 [s] | | |
| **Comm object** | | **Related applications** | MINT |
| **Config level** | Advanced | | |
| **Setpoint visibility** | Always | | |
| **Description** | | | |
| This setpoint adjusts the delay for switching from isochronous regulation to droop regulation when number of controller detected by the controller on CAN2 is lower than the number in the setpoint **#Number Of Controllers On CAN (page 401)**. | | | |

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## #Number Of Controller Off Delay

| | | | |
|---|---|---|---|
| **Setpoint group** | Droop Settings | **Related FW** | 2.1.0 |
| **Range [units]** | 0.0 .. 10.0 [s] | | |
| **Default value** | 10.0 [s] | **Alternative config** | NO |
| **Step** | 0.1 [s] | | |
| **Comm object** | | **Related applications** | MINT |
| **Config level** | Advanced | | |
| **Setpoint visibility** | Always | | |
| **Description** | | | |
| This setpoint adjusts the delay for switching from droop regulation to isochronous regulation when number of controller detected by the controller on CAN2 is equal or higher than the number in the setpoint **#Number Of Controller On CAN (page 291)**. | | | |

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## #Emergency Droop On Delay

| | | | |
|---|---|---|---|
| **Setpoint group** | Droop Settings | **Related FW** | 2.1.0 |
| **Range [units]** | 0.0 .. 10.0 [s] | | |
| **Default value** | 10.0 s | **Alternative config** | NO |
| **Step** | 0.1 s | | |
| **Comm object** | 13954 | **Related applications** | MINT |
| **Config level** | Advanced | | |
| **Setpoint visibility** | Always | | |
| **Description** | | | |

This setpoint adjusts the delay for switching from isochronous regulation to droop regulation when number of controller detected by the controller on CAN2 is lower than the number in the setpoint **#Number Of Controllers On CAN (page 401)**.

> ***Note:*** *This function is available only when **Load/Var Sharing Regulation Type (page 398)** = Emergency Droop.*

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## #Emergency Droop Off Delay

| | | | |
|---|---|---|---|
| **Setpoint group** | Droop Settings | **Related FW** | 2.1.0 |
| **Range [units]** | 0.0 .. 10.0 [s] | | |
| **Default value** | 10.0 s | **Alternative config** | NO |
| **Step** | 0.1 s | | |
| **Comm object** | 13955 | **Related applications** | MINT |
| **Config level** | Advanced | | |
| **Setpoint visibility** | Always | | |
| **Description** | | | |

This setpoint adjusts the delay for switching from droop regulation to isochronous regulation when number of controller detected by the controller on CAN2 is equal or higher than the number in the setpoint **#Number Of Controllers On CAN (page 401)**.

> ***Note:*** *This function is available only when **Load/Var Sharing Regulation Type (page 398)** = Emergency Droop.*

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## Group: User Buttons

## Subgroup: User Buttons

# User Button 1

| | | | |
|---|---|---|---|
| **Setpoint group** | User Buttons | **Related FW** | 2.1.0 |
| **Range [units]** | COMMAND / MAN OFF / MAN ON [-] | | |
| **Default value** | COMMAND | **Alternative config** | NO |
| **Step** | - | | |
| **Comm object** | 20826 | **Related applications** | MINT, SPtM |
| **Config level** | Standard | | |
| **Setpoint visibility** | Always | | |

**Description**

User button is a binary signal which value can be set by its setpoint or by remote connection (WebSupervisor or by third party device(Modbus).

| Option | Description |
|---|---|
| **COMMAND** | The LBO User Button 1 is controlled by command from WebSupervisor or third party device. |
| **MAN OFF** | The LBO User Button 1 is controlled manually via the setpoint, value of the user button is still 0. |
| **MAN ON** | The LBO User Button 1 is controlled manually via the setpoint, value of the user button is still 1.<br>***Note:*** *You should always switch from MAN ON to MAN OFF before switching to COMMAND, otherwise value of the LBO User Button will be 1 until command is received.* |

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## User Button 2

| | | | |
|---|---|---|---|
| **Setpoint group** | User Buttons | **Related FW** | 2.1.0 |
| **Range [units]** | COMMAND / MAN OFF / MAN ON [-] | | |
| **Default value** | COMMAND | **Alternative config** | NO |
| **Step** | - | | |
| **Comm object** | 20827 | **Related applications** | MINT, SPtM |
| **Config level** | Standard | | |
| **Setpoint visibility** | Always | | |

**Description**

User button is a binary signal which value can be set by its setpoint or by remote connection (WebSupervisor or by third party device(Modbus).

| Option | Description |
|---|---|
| **COMMAND** | The LBO User Button 2 is controlled by command from WebSupervisor or third party device. |
| **MAN OFF** | The LBO User Button 2 is controlled manually via the setpoint, value of the user button is still 0. |
| **MAN ON** | The LBO User Button 2 is controlled manually via the setpoint, value of the user button is still 1.<br>***Note:*** *You should always switch from MAN ON to MAN OFF before switching to COMMAND, otherwise value of the LBO User Button will be 1 until command is received.* |

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## User Button 3

| | | | |
|---|---|---|---|
| **Setpoint group** | User Buttons | **Related FW** | 2.1.0 |
| **Range [units]** | COMMAND / MAN OFF / MAN ON [-] | | |
| **Default value** | COMMAND | **Alternative config** | NO |
| **Step** | - | | |
| **Comm object** | 20828 | **Related applications** | MINT, SPtM |
| **Config level** | Standard | | |
| **Setpoint visibility** | Always | | |

**Description**

User button is a binary signal which value can be set by its setpoint or by remote connection (WebSupervisor or by third party device(Modbus).

| Option | Description |
|---|---|
| **COMMAND** | The LBO User Button 3 is controlled by command from WebSupervisor or third party device. |
| **MAN OFF** | The LBO User Button 3 is controlled manually via the setpoint, value of the user button is still 0. |
| **MAN ON** | The LBO User Button 3 is controlled manually via the setpoint, value of the user button is still 1.<br>***Note:*** *You should always switch from MAN ON to MAN OFF before switching to COMMAND, otherwise value of the LBO User Button will be 1 until command is received.* |

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## User Button 4

| | | | |
|---|---|---|---|
| **Setpoint group** | User Buttons | **Related FW** | 2.1.0 |
| **Range [units]** | COMMAND / MAN OFF / MAN ON [-] | | |
| **Default value** | COMMAND | **Alternative config** | NO |
| **Step** | - | | |
| **Comm object** | 20829 | **Related applications** | MINT, SPtM |
| **Config level** | Standard | | |
| **Setpoint visibility** | Always | | |

**Description**

User button is a binary signal which value can be set by its setpoint or by remote connection (WebSupervisor or by third party device(Modbus).

| Option | Description |
|---|---|
| **COMMAND** | The LBO User Button 4 is controlled by command from WebSupervisor or third party device. |
| **MAN OFF** | The LBO User Button 4 is controlled manually via the setpoint, value of the user button is still 0. |
| **MAN ON** | The LBO User Button 4 is controlled manually via the setpoint, value of the user button is still 1.<br>***Note:*** *You should always switch from MAN ON to MAN OFF before switching to COMMAND, otherwise value of the LBO User Button will be 1 until command is received.* |

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## User Button 5

| | | | |
|---|---|---|---|
| **Setpoint group** | User Buttons | **Related FW** | 2.1.0 |
| **Range [units]** | COMMAND / MAN OFF / MAN ON [-] | | |
| **Default value** | COMMAND | **Alternative config** | NO |
| **Step** | - | | |
| **Comm object** | 20830 | **Related applications** | MINT, SPtM |
| **Config level** | Standard | | |
| **Setpoint visibility** | Always | | |

**Description**

User button is a binary signal which value can be set by its setpoint or by remote connection (WebSupervisor or by third party device(Modbus).

| Option | Description |
|---|---|
| **COMMAND** | The LBO User Button 5 is controlled by command from WebSupervisor or third party device. |
| **MAN OFF** | The LBO User Button 5 is controlled manually via the setpoint, value of the user button is still 0. |
| **MAN ON** | The LBO User Button 5 is controlled manually via the setpoint, value of the user button is still 1.<br>***Note:*** *You should always switch from MAN ON to MAN OFF before switching to COMMAND, otherwise value of the LBO User Button will be 1 until command is received.* |

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## User Button 6

| | | | |
|---|---|---|---|
| **Setpoint group** | User Buttons | **Related FW** | 2.1.0 |
| **Range [units]** | COMMAND / MAN OFF / MAN ON [-] | | |
| **Default value** | COMMAND | **Alternative config** | NO |
| **Step** | - | | |
| **Comm object** | 20831 | **Related applications** | MINT, SPtM |
| **Config level** | Standard | | |
| **Setpoint visibility** | Always | | |

**Description**

User button is a binary signal which value can be set by its setpoint or by remote connection (WebSupervisor or by third party device(Modbus).

| Option | Description |
|---|---|
| **COMMAND** | The LBO User Button 6 is controlled by command from WebSupervisor or third party device. |
| **MAN OFF** | The LBO User Button 6 is controlled manually via the setpoint, value of the user button is still 0. |
| **MAN ON** | The LBO User Button 6 is controlled manually via the setpoint, value of the user button is still 1.<br>***Note:*** *You should always switch from MAN ON to MAN OFF before switching to COMMAND, otherwise value of the LBO User Button will be 1 until command is received.* |

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## User Button 7

| | | | |
|---|---|---|---|
| **Setpoint group** | User Buttons | **Related FW** | 2.1.0 |
| **Range [units]** | COMMAND / MAN OFF / MAN ON [-] | | |
| **Default value** | COMMAND | **Alternative config** | NO |
| **Step** | - | | |
| **Comm object** | 20832 | **Related applications** | MINT, SPtM |
| **Config level** | Standard | | |
| **Setpoint visibility** | Always | | |

**Description**

User button is a binary signal which value can be set by its setpoint or by remote connection (WebSupervisor or by third party device(Modbus).

| Option | Description |
|---|---|
| **COMMAND** | The LBO User Button 7 is controlled by command from WebSupervisor or third party device. |
| **MAN OFF** | The LBO User Button 7 is controlled manually via the setpoint, value of the user button is still 0. |
| **MAN ON** | The LBO User Button 7 is controlled manually via the setpoint, value of the user button is still 1.<br>***Note:*** *You should always switch from MAN ON to MAN OFF before switching to COMMAND, otherwise value of the LBO User Button will be 1 until command is received.* |

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## User Button 8

| | | | |
|---|---|---|---|
| **Setpoint group** | User Buttons | **Related FW** | 2.1.0 |
| **Range [units]** | COMMAND / MAN OFF / MAN ON [-] | | |
| **Default value** | COMMAND | **Alternative config** | NO |
| **Step** | - | | |
| **Comm object** | 20833 | **Related applications** | MINT, SPtM |
| **Config level** | Standard | | |
| **Setpoint visibility** | Always | | |

**Description**

User button is a binary signal which value can be set by its setpoint or by remote connection (WebSupervisor or by third party device(Modbus).

| Option | Description |
|---|---|
| **COMMAND** | The LBO User Button 8 is controlled by command from WebSupervisor or third party device. |
| **MAN OFF** | The LBO User Button 8 is controlled manually via the setpoint, value of the user button is still 0. |
| **MAN ON** | The LBO User Button 8 is controlled manually via the setpoint, value of the user button is still 1.<br>***Note:*** *You should always switch from MAN ON to MAN OFF before switching to COMMAND, otherwise value of the LBO User Button will be 1 until command is received.* |

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## User Button 9

| | | | |
|---|---|---|---|
| **Setpoint group** | User Buttons | **Related FW** | 2.1.0 |
| **Range [units]** | COMMAND / MAN OFF / MAN ON [-] | | |
| **Default value** | COMMAND | **Alternative config** | NO |
| **Step** | - | | |
| **Comm object** | 20834 | **Related applications** | MINT, SPtM |
| **Config level** | Standard | | |
| **Setpoint visibility** | Always | | |

**Description**

User button is a binary signal which value can be set by its setpoint or by remote connection (WebSupervisor or by third party device(Modbus).

| Option | Description |
|---|---|
| **COMMAND** | The LBO User Button 9 is controlled by command from WebSupervisor or third party device. |
| **MAN OFF** | The LBO User Button 9 is controlled manually via the setpoint, value of the user button is still 0. |
| **MAN ON** | The LBO User Button 9 is controlled manually via the setpoint, value of the user button is still 1.<br>***Note:*** *You should always switch from MAN ON to MAN OFF before switching to COMMAND, otherwise value of the LBO User Button will be 1 until command is received.* |

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## User Button 10

| | | | |
|---|---|---|---|
| **Setpoint group** | User Buttons | **Related FW** | 2.1.0 |
| **Range [units]** | COMMAND / MAN OFF / MAN ON [-] | | |
| **Default value** | COMMAND | **Alternative config** | NO |
| **Step** | - | | |
| **Comm object** | 20835 | **Related applications** | MINT, SPtM |
| **Config level** | Standard | | |
| **Setpoint visibility** | Always | | |

**Description**

User button is a binary signal which value can be set by its setpoint or by remote connection (WebSupervisor or by third party device(Modbus).

| Option | Description |
|---|---|
| **COMMAND** | The LBO User Button 10 is controlled by command from WebSupervisor or third party device. |
| **MAN OFF** | The LBO User Button 10 is controlled manually via the setpoint, value of the user button is still 0. |
| **MAN ON** | The LBO User Button 10 is controlled manually via the setpoint, value of the user button is still 1.<br>***Note:*** *You should always switch from MAN ON to MAN OFF before switching to COMMAND, otherwise value of the LBO User Button will be 1 until command is received.* |

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## User Button 11

| | | | |
|---|---|---|---|
| **Setpoint group** | User Buttons | **Related FW** | 2.1.0 |
| **Range [units]** | COMMAND / MAN OFF / MAN ON [-] | | |
| **Default value** | COMMAND | **Alternative config** | NO |
| **Step** | - | | |
| **Comm object** | 20836 | **Related applications** | MINT, SPtM |
| **Config level** | Standard | | |
| **Setpoint visibility** | Always | | |

**Description**

User button is a binary signal which value can be set by its setpoint or by remote connection (WebSupervisor or by third party device(Modbus).

| Option | Description |
|---|---|
| **COMMAND** | The LBO User Button 11 is controlled by command from WebSupervisor or third party device. |
| **MAN OFF** | The LBO User Button 11 is controlled manually via the setpoint, value of the user button is still 0. |
| **MAN ON** | The LBO User Button 11 is controlled manually via the setpoint, value of the user button is still 1.<br>***Note:*** *You should always switch from MAN ON to MAN OFF before switching to COMMAND, otherwise value of the LBO User Button will be 1 until command is received.* |

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## User Button 12

| | | | |
|---|---|---|---|
| **Setpoint group** | User Buttons | **Related FW** | 2.1.0 |
| **Range [units]** | COMMAND / MAN OFF / MAN ON [-] | | |
| **Default value** | COMMAND | **Alternative config** | NO |
| **Step** | - | | |
| **Comm object** | 20837 | **Related applications** | MINT, SPtM |
| **Config level** | Standard | | |
| **Setpoint visibility** | Always | | |

**Description**

User button is a binary signal which value can be set by its setpoint or by remote connection (WebSupervisor or by third party device(Modbus).

| Option | Description |
|---|---|
| **COMMAND** | The LBO User Button 12 is controlled by command from WebSupervisor or third party device. |
| **MAN OFF** | The LBO User Button 12 is controlled manually via the setpoint, value of the user button is still 0. |
| **MAN ON** | The LBO User Button 12 is controlled manually via the setpoint, value of the user button is still 1.<br>***Note:*** *You should always switch from MAN ON to MAN OFF before switching to COMMAND, otherwise value of the LBO User Button will be 1 until command is received.* |

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## User Button 13

| | | | |
|---|---|---|---|
| **Setpoint group** | User Buttons | **Related FW** | 2.1.0 |
| **Range [units]** | COMMAND / MAN OFF / MAN ON [-] | | |
| **Default value** | COMMAND | **Alternative config** | NO |
| **Step** | - | | |
| **Comm object** | 20838 | **Related applications** | MINT, SPtM |
| **Config level** | Standard | | |
| **Setpoint visibility** | Always | | |

**Description**

User button is a binary signal which value can be set by its setpoint or by remote connection (WebSupervisor or by third party device(Modbus).

| Option | Description |
|---|---|
| **COMMAND** | The LBO User Button 13 is controlled by command from WebSupervisor or third party device. |
| **MAN OFF** | The LBO User Button 13 is controlled manually via the setpoint, value of the user button is still 0. |
| **MAN ON** | The LBO User Button 13 is controlled manually via the setpoint, value of the user button is still 1.<br>***Note:*** *You should always switch from MAN ON to MAN OFF before switching to COMMAND, otherwise value of the LBO User Button will be 1 until command is received.* |

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## User Button 14

| | | | |
|---|---|---|---|
| **Setpoint group** | User Buttons | **Related FW** | 2.1.0 |
| **Range [units]** | COMMAND / MAN OFF / MAN ON [-] | | |
| **Default value** | COMMAND | **Alternative config** | NO |
| **Step** | - | | |
| **Comm object** | 20839 | **Related applications** | MINT, SPtM |
| **Config level** | Standard | | |
| **Setpoint visibility** | Always | | |

**Description**

User button is a binary signal which value can be set by its setpoint or by remote connection (WebSupervisor or by third party device(Modbus).

| Option | Description |
|---|---|
| **COMMAND** | The LBO User Button 14 is controlled by command from WebSupervisor or third party device. |
| **MAN OFF** | The LBO User Button 14 is controlled manually via the setpoint, value of the user button is still 0. |
| **MAN ON** | The LBO User Button 14 is controlled manually via the setpoint, value of the user button is still 1.<br>***Note:*** *You should always switch from MAN ON to MAN OFF before switching to COMMAND, otherwise value of the LBO User Button will be 1 until command is received.* |

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## User Button 15

| | | | |
|---|---|---|---|
| **Setpoint group** | User Buttons | **Related FW** | 2.1.0 |
| **Range [units]** | COMMAND / MAN OFF / MAN ON [-] | | |
| **Default value** | COMMAND | **Alternative config** | NO |
| **Step** | - | | |
| **Comm object** | 20840 | **Related applications** | MINT, SPtM |
| **Config level** | Standard | | |
| **Setpoint visibility** | Always | | |

**Description**

User button is a binary signal which value can be set by its setpoint or by remote connection (WebSupervisor or by third party device(Modbus).

| Option | Description |
|---|---|
| **COMMAND** | The LBO User Button 15 is controlled by command from WebSupervisor or third party device. |
| **MAN OFF** | The LBO User Button 15 is controlled manually via the setpoint, value of the user button is still 0. |
| **MAN ON** | The LBO User Button 15 is controlled manually via the setpoint, value of the user button is still 1.<br>***Note:*** *You should always switch from MAN ON to MAN OFF before switching to COMMAND, otherwise value of the LBO User Button will be 1 until command is received.* |

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## User Button 16

| | | | |
|---|---|---|---|
| **Setpoint group** | User Buttons | **Related FW** | 2.1.0 |
| **Range [units]** | COMMAND / MAN OFF / MAN ON [-] | | |
| **Default value** | COMMAND | **Alternative config** | NO |
| **Step** | - | | |
| **Comm object** | 20841 | **Related applications** | MINT, SPtM |
| **Config level** | Standard | | |
| **Setpoint visibility** | Always | | |
| **Description** | | | |

User button is a binary signal which value can be set by its setpoint or by remote connection (WebSupervisor or by third party device(Modbus).

| Option | Description |
|---|---|
| **COMMAND** | The LBO User Button 16 is controlled by command from WebSupervisor or third party device. |
| **MAN OFF** | The LBO User Button 16 is controlled manually via the setpoint, value of the user button is still 0. |
| **MAN ON** | The LBO User Button 16 is controlled manually via the setpoint, value of the user button is still 1.<br>***Note:*** *You should always switch from MAN ON to MAN OFF before switching to COMMAND, otherwise value of the LBO User Button will be 1 until command is received.* |

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## Group: Analog Switches

### Subgroup: Analog Switches 1

## AIN Switch01 On

| | | | |
|---|---|---|---|
| **Setpoint group** | Analog Switches | **Related FW** | 2.1.0 |
| **Range [units]** | the range is defined by an analog sensor curve | | |
| **Default value** | the value is defined by an analog sensor curve | **Alternative config** | NO |
| **Step** | the step is defined by an analog sensor curve | | |
| **Comm object** | 11407 | **Related applications** | MINT, SPtM |
| **Config level** | Standard | | |
| **Setpoint visibility** | Visible only if the logical binary output **AIN SWITCH01 (PAGE 635)** is configured | | |
| **Description** | | | |

Threshold level for switching the binary output **AIN SWITCH01 (PAGE 635)** on. The value is measured from **AIN SWITCH 01 (PAGE 690)** analog input.




Image 8.23 General analog input 1 switch

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## AIN Switch01 Off

| | | | |
|---|---|---|---|
| **Setpoint group** | Analog Switches | **Related FW** | 2.1.0 |
| **Range [units]** | the range is defined by an analog sensor curve | | |
| **Default value** | the value is defined by an analog sensor curve | **Alternative config** | NO |
| **Step** | the step is defined by an analog sensor curve | | |
| **Comm object** | 11410 | **Related applications** | MINT, SPtM |
| **Config level** | Standard | | |
| **Setpoint visibility** | Visible only if the logical binary output **AIN SWITCH01 (PAGE 635)** is configured | | |
| **Description** | | | |

Threshold level for switching the binary output **AIN SWITCH01 (PAGE 635)** off. The value is measured from **AIN SWITCH 01 (PAGE 690)** analog input.

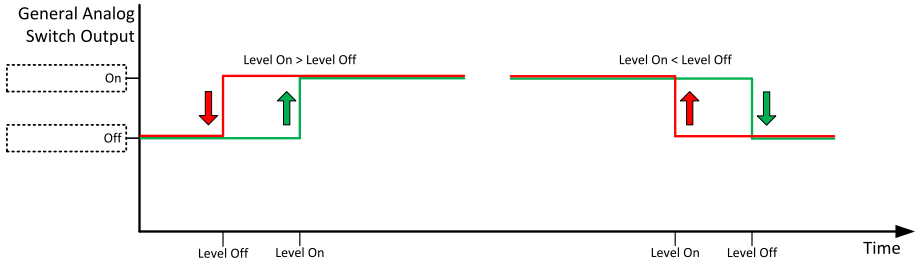



Image 8.24 General analog input 1 switch

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## Subgroup: Analog Switches 2

## AIN Switch02 On

| | | | |
|---|---|---|---|
| **Setpoint group** | Analog Switches | **Related FW** | 2.1.0 |
| **Range [units]** | the range is defined by an analog sensor curve | | |
| **Default value** | the value is defined by an analog sensor curve | **Alternative config** | NO |
| **Step** | the step is defined by an analog sensor curve | | |
| **Comm object** | 11408 | **Related applications** | MINT, SPtM |
| **Config level** | Standard | | |
| **Setpoint visibility** | Visible only if the logical binary output **AIN SWITCH02 (PAGE 636)** is configured | | |
| **Description** | | | |

Threshold level for switching the binary output **AIN SWITCH02 (PAGE 636)** on. The value is measured from **AIN SWITCH 02 (PAGE 690)** analog input.

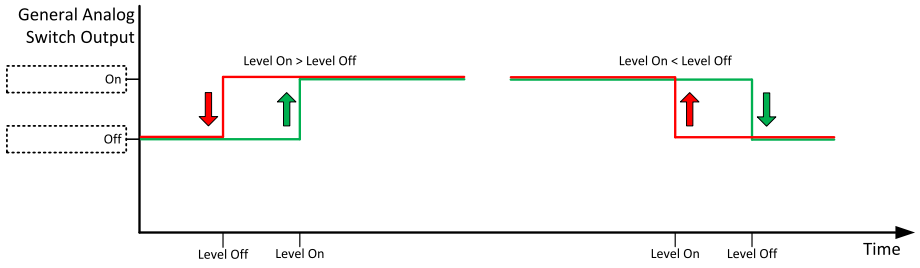



Image 8.25 General analog input 2 switch

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## AIN Switch02 Off

| | | | |
|---|---|---|---|
| **Setpoint group** | Analog Switches | **Related FW** | 2.1.0 |
| **Range [units]** | the range is defined by an analog sensor curve | | |
| **Default value** | the value is defined by an analog sensor curve | **Alternative config** | NO |
| **Step** | the step is defined by an analog sensor curve | | |
| **Comm object** | 11411 | **Related applications** | MINT, SPtM |
| **Config level** | Standard | | |
| **Setpoint visibility** | Visible only if the logical binary output **AIN SWITCH02 (PAGE 636)** is configured | | |
| **Description** | | | |

Threshold level for switching the binary output **AIN SWITCH02 (PAGE 636)** off. The value is measured from **AIN SWITCH 02 (PAGE 690)** analog input.

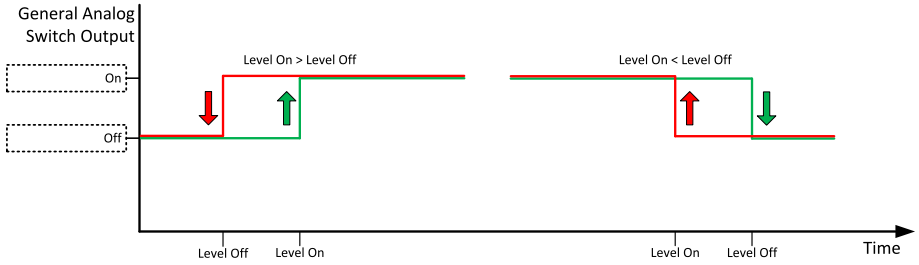



Image 8.26 General analog input 2 switch

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## Subgroup: Analog Switches 3

## AIN Switch03 On

| | | | |
|---|---|---|---|
| **Setpoint group** | Analog Switches | **Related FW** | 2.1.0 |
| **Range [units]** | the range is defined by an analog sensor curve | | |
| **Default value** | the value is defined by an analog sensor curve | **Alternative config** | NO |
| **Step** | the step is defined by an analog sensor curve | | |
| **Comm object** | 11409 | **Related applications** | MINT, SPtM |
| **Config level** | Standard | | |
| **Setpoint visibility** | Visible only if the logical binary output **AIN SWITCH03 (PAGE 636)** is configured | | |
| **Description** | | | |

Threshold level for switching the binary output **AIN SWITCH03 (PAGE 636)** on. The value is measured from **AIN SWITCH 03 (PAGE 690)** analog input.

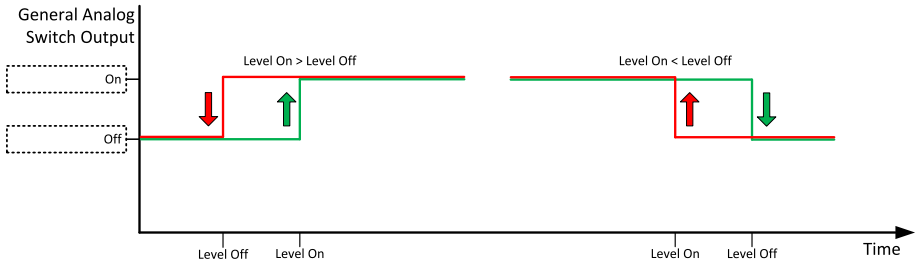



Image 8.27 General analog input 3 switch

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## AIN Switch03 Off

| | | | |
|---|---|---|---|
| **Setpoint group** | Analog Switches | **Related FW** | 2.1.0 |
| **Range [units]** | the range is defined by an analog sensor curve | | |
| **Default value** | the value is defined by an analog sensor curve | **Alternative config** | NO |
| **Step** | the step is defined by an analog sensor curve | | |
| **Comm object** | 11412 | **Related applications** | MINT, SPtM |
| **Config level** | Standard | | |
| **Setpoint visibility** | Visible only if the logical binary output **AIN SWITCH03 (PAGE 636)** is configured | | |
| **Description** | | | |

Threshold level for switching the binary output **AIN SWITCH03 (PAGE 636)** off. The value is measured from **AIN SWITCH 03 (PAGE 690)** analog input.

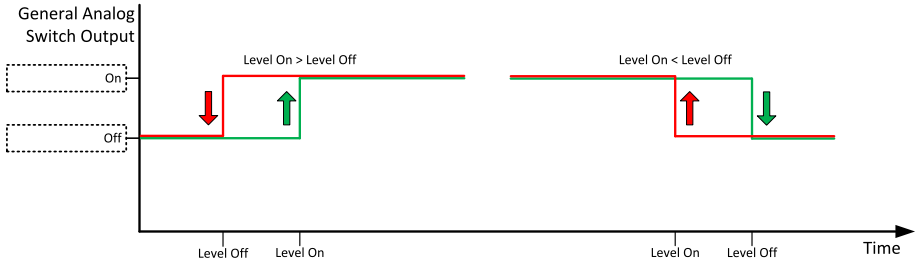



Image 8.28 General analog input 3 switch

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## Subgroup: Analog Switches 4

## AIN Switch04 On

| | | | |
|---|---|---|---|
| **Setpoint group** | Analog Switches | **Related FW** | 2.1.0 |
| **Range [units]** | the range is defined by an analog sensor curve | | |
| **Default value** | the value is defined by an analog sensor curve | **Alternative config** | NO |
| **Step** | the step is defined by an analog sensor curve | | |
| **Comm object** | 14385 | **Related applications** | MINT, SPtM |
| **Config level** | Standard | | |
| **Setpoint visibility** | Visible only if the logical binary output **AIN SWITCH04 (PAGE 637)** is configured | | |
| **Description** | | | |

Threshold level for switching the binary output **AIN SWITCH04 (PAGE 637)** on. The value is measured from **AIN SWITCH 04 (PAGE 691)** analog input.

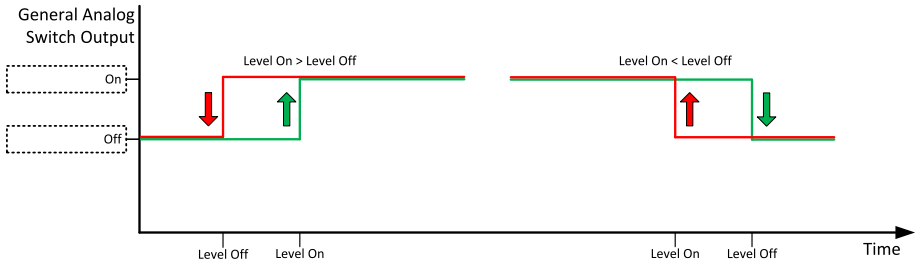



Image 8.29 General analog input 4 switch

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## AIN Switch04 Off

| | | | |
|---|---|---|---|
| **Setpoint group** | Analog Switches | **Related FW** | 2.1.0 |
| **Range [units]** | the range is defined by an analog sensor curve | | |
| **Default value** | the value is defined by an analog sensor curve | **Alternative config** | NO |
| **Step** | the step is defined by an analog sensor curve | | |
| **Comm object** | 14386 | **Related applications** | MINT, SPtM |
| **Config level** | Standard | | |
| **Setpoint visibility** | Visible only if the logical binary output **AIN SWITCH04 (PAGE 637)** is configured | | |
| **Description** | | | |

Threshold level for switching the binary output **AIN SWITCH04 (PAGE 637)** off. The value is measured from **AIN SWITCH 04 (PAGE 691)** analog input.

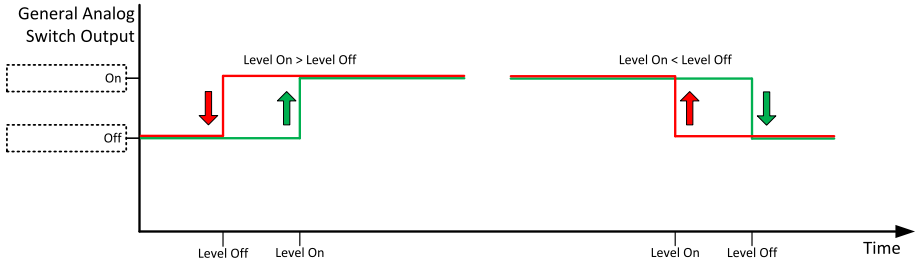



Image 8.30 General analog input 4 switch

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## Subgroup: Analog Switches 5

## AIN Switch05 On

| | | | |
|---|---|---|---|
| **Setpoint group** | Analog Switches | **Related FW** | 2.1.0 |
| **Range [units]** | the range is defined by an analog sensor curve | | |
| **Default value** | the value is defined by an analog sensor curve | **Alternative config** | NO |
| **Step** | the step is defined by an analog sensor curve | | |
| **Comm object** | 14963 | **Related applications** | MINT, SPtM |
| **Config level** | Standard | | |
| **Setpoint visibility** | Visible only if the logical binary output **AIN SWITCH05 (PAGE 637)** is configured | | |
| **Description** | | | |

Threshold level for switching the binary output **AIN SWITCH05 (PAGE 637)** on. The value is measured from **AIN SWITCH 05 (PAGE 691)** analog input.

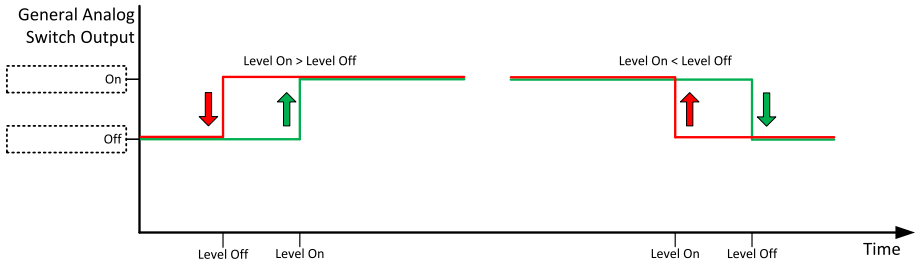



Image 8.31 General analog input 5 switch

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## AIN Switch05 Off

| | | | |
|---|---|---|---|
| **Setpoint group** | Analog Switches | **Related FW** | 2.1.0 |
| **Range [units]** | the range is defined by an analog sensor curve | | |
| **Default value** | the value is defined by an analog sensor curve | **Alternative config** | NO |
| **Step** | the step is defined by an analog sensor curve | | |
| **Comm object** | 14979 | **Related applications** | MINT, SPtM |
| **Config level** | Standard | | |
| **Setpoint visibility** | Visible only if the logical binary output **AIN SWITCH05 (PAGE 637)** is configured | | |
| **Description** | | | |

Threshold level for switching the binary output **AIN SWITCH05 (PAGE 637)** off. The value is measured from **AIN SWITCH 05 (PAGE 691)** analog input.

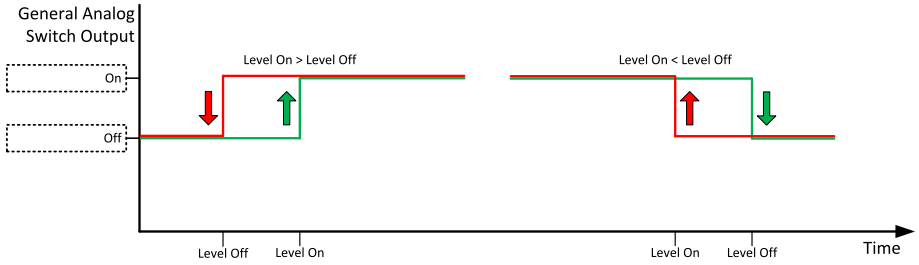



Image 8.32 General analog input 5 switch

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## Subgroup: Analog Switches 6

## AIN Switch06 On

| | | | |
|---|---|---|---|
| **Setpoint group** | Analog Switches | **Related FW** | 2.1.0 |
| **Range [units]** | the range is defined by an analog sensor curve | | |
| **Default value** | the value is defined by an analog sensor curve | **Alternative config** | NO |
| **Step** | the step is defined by an analog sensor curve | | |
| **Comm object** | 14964 | **Related applications** | MINT, SPtM |
| **Config level** | Standard | | |
| **Setpoint visibility** | Visible only if the logical binary output **AIN SWITCH06 (PAGE 638)** is configured | | |
| **Description** | | | |

Threshold level for switching the binary output **AIN SWITCH06 (PAGE 638)** on. The value is measured from **AIN SWITCH 06 (PAGE 691)** analog input.

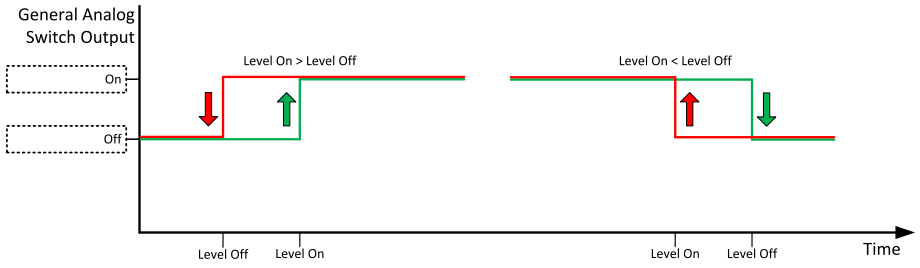



Image 8.33 General analog input 6 switch

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## AIN Switch06 Off

| | | | |
|---|---|---|---|
| **Setpoint group** | Analog Switches | **Related FW** | 2.1.0 |
| **Range [units]** | the range is defined by an analog sensor curve | | |
| **Default value** | the value is defined by an analog sensor curve | **Alternative config** | NO |
| **Step** | the step is defined by an analog sensor curve | | |
| **Comm object** | 14980 | **Related applications** | MINT, SPtM |
| **Config level** | Standard | | |
| **Setpoint visibility** | Visible only if the logical binary output **AIN SWITCH06 (PAGE 638)** is configured | | |
| **Description** | | | |

Threshold level for switching the binary output **AIN SWITCH06 (PAGE 638)** off. The value is measured from **AIN SWITCH 06 (PAGE 691)** analog input.

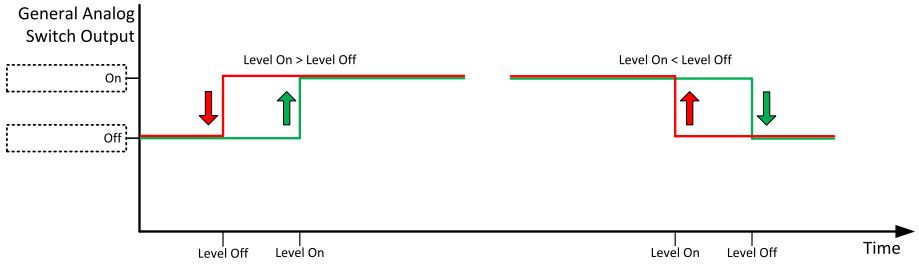



Image 8.34 General analog input 6 switch

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# Group: Scheduler

## Subgroup: Time & Date

## Time

| | | | |
|---|---|---|---|
| **Setpoint group** | Scheduler | **Related FW** | 2.1.0 |
| **Range [units]** | HH:MM:SS [-] | | |
| **Default value** | 00:00:00 | **Alternative config** | NO |
| **Step** | [-] | | |
| **Comm object** | 24554 | **Related applications** | MINT, SPtM |
| **Config level** | Standard | | |
| **Setpoint visibility** | Always | | |
| **Description** | | | |

Real time clock adjustment.

***Note:*** *RTC has backup battery.*

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## Date

| | | | |
|---|---|---|---|
| **Setpoint group** | Scheduler | **Related FW** | 2.1.0 |
| **Range [units]** | DD/MM/YYYY [-] | | |
| **Default value** | 1.1.2015 | **Alternative config** | NO |
| **Step** | [-] | | |
| **Comm object** | 24553 | **Related applications** | MINT, SPtM |
| **Config level** | Standard | | |
| **Setpoint visibility** | Always | | |
| **Description** | | | |
| Actual date adjustment. | | | |

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## Time Stamp Period

| | | | |
|---|---|---|---|
| **Setpoint group** | Scheduler | **Related FW** | 2.1.0 |
| **Range [units]** | 0 .. 240 [min] | | |
| **Default value** | 60 min | **Alternative config** | NO |
| **Step** | 1 min | | |
| **Comm object** | 8979 | **Related applications** | MINT, SPtM |
| **Config level** | Standard | | |
| **Setpoint visibility** | Always | | |
| **Description** | | | |
| Time interval for periodic history records.<br>***Note:*** *History record is made only when engine is running.* | | | |

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## #Summer Time Mode

| | | | |
|---|---|---|---|
| **Setpoint group** | Scheduler | **Related FW** | 2.1.0 |
| **Range [units]** | Disabled / Winter / Summer / Winter - S / Summer - S [-] | | |
| **Default value** | Disabled | **Alternative config** | NO |
| **Step** | [-] | | |
| **Comm object** | 8727 | **Related applications** | MINT, SPtM |
| **Config level** | Advanced | | |
| **Setpoint visibility** | Always | | |
| **Description** | | | |

Behavior of switching between winter and summer time.

| | |
|---|---|
| Disable | Automatic switching between summer and wintertime is disabled. |
| Winter (Summer) | Automatic switching between summer and wintertime is enabled and it is set to winter (summer) season. |
| Winter - S (Summer - S) | Modification for southern hemisphere. |

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## Subgroup: Timer 1

## Timer 1 Function

| | | | |
|---|---|---|---|
| **Setpoint group** | Scheduler | **Related FW** | 2.1.0 |
| **Range [units]** | Disable / Manual On / No Func / Mode OFF / Rem Start/Stop / TEST / Test OnLd / MFail Blk [-] | | |
| **Default value** | Disable | **Alternative config** | NO |
| **Step** | [-] | | |
| **Comm object** | 15358 | **Related applications** | MINT, SPtM |
| **Config level** | Standard | | |
| **Setpoint visibility** | Always | | |

**Description**

It is possible to choose from following timer functions. Binary output **EXERCISE TIMER 1 (PAGE 652)** is always activated when Timer is active regardless of chosen timer function. Timer functions require controller running in AUTO mode.

Timer 1 has higher priority over Timer 2. So if **Timer 1 Function (page 434)** is configured for OFF mode and **Timer 2 Function (page 442)** is over the same time configured for AUTO mode, controller will work in OFF mode.

Controller activates timer whenever it is powered up even in period, where timer should be already running.

| | |
|---|---|
| Disable | The Timer is disabled. |
| Manual On | LBO Timer is active, but the Timer itself is disabled.<br>***Note:*** *This function serves for testing purposes.* |
| No Func | There is no any other function, only binary output of timer is activated. |
| Mode OFF | When this option is chosen then the binary output of timer is internally connected to the **REMOTE OFF (PAGE 628)** binary input. |
| Rem Start/Stop | When this option is chosen then the binary output of timer is internally connected to the **REMOTE START/STOP (PAGE 628)** binary input. |
| TEST | When this option is chosen then the binary output of timer is internally connected to the binary input **REMOTE TEST (PAGE 629)**. |
| TEST OnLd | When this option is chosen then the binary output of timer is internally connected to the **REM TEST ON LOAD (PAGE 626)** binary input. |
| MFail Blk | When this option is chosen then the binary output of timer is internally connected to the **MAINS FAIL BLOCK (PAGE 621)** binary input. |

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## Timer 1 Setup

| | | | |
|---|---|---|---|
| **Setpoint group** | Scheduler | **Related FW** | 2.1.0 |
| **Range [units]** | [-] | | |
| **Default value** | [-] | **Alternative config** | NO |
| **Step** | [-] | | |
| **Comm object** | 10969 | **Related applications** | MINT, SPtM |
| **Config level** | Standard | | |
| **Setpoint visibility** | Always | | |
| **Description** | | | |

Related setpoints for timer 1 are:

- **Timer 1 Function (page 434)**
- **Timer 1 Repetition (page 436)**
- **Timer 1 First Occur. Date (page 435)**
- **Timer 1 First Occur. Time (page 436)**
- **Timer 1 Duration (page 436)**
- **Timer 1 Repeated (page 437)**
- **Timer 1 Repeat Day (page 437)**
- **Timer 1 Day (page 438)**
- **Timer 1 Repeated Day In Week (page 438)**
- **Timer 1 Repeat Day In Month (page 438)**
- **Timer 1 Repeat Week In Month (page 439)**
- **Timer 1 Refresh Period (page 440)**
- **Timer 1 Weekends (page 441)**

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## Timer 1 First Occur. Date

| | | | |
|---|---|---|---|
| **Setpoint group** | Scheduler | **Related FW** | 2.1.0 |
| **Range [units]** | [DD/MM/YYYY] | | |
| **Default value** | 01/01/2000 | **Alternative config** | NO |
| **Step** | [-] | | |
| **Comm object** | 0 | **Related applications** | MINT, SPtM |
| **Config level** | Standard | | |
| **Setpoint visibility** | Conditioned by the setpoint **Timer 1 Function (page 434)** | | |
| **Description** | | | |

Date of first occurrence of **Timer 1 Function (page 434)**.

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## Timer 1 First Occur. Time

| | | | |
|---|---|---|---|
| **Setpoint group** | Scheduler | **Related FW** | 2.1.0 |
| **Range [units]** | [HH:MM] | | |
| **Default value** | 00:00 | **Alternative config** | NO |
| **Step** | [-] | | |
| **Comm object** | 0 | **Related applications** | MINT, SPtM |
| **Config level** | Standard | | |
| **Setpoint visibility** | Conditioned by the setpoint **Timer 1 Function (page 434)** | | |
| **Description** | | | |
| Time of first occurrence of **Timer 1 Function (page 434)**. | | | |

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## Timer 1 Duration

| | | | |
|---|---|---|---|
| **Setpoint group** | Scheduler | **Related FW** | 2.1.0 |
| **Range [units]** | [HH:MM] | | |
| **Default value** | 00:00 | **Alternative config** | NO |
| **Step** | [-] | | |
| **Comm object** | 0 | **Related applications** | MINT, SPtM |
| **Config level** | Standard | | |
| **Setpoint visibility** | Conditioned by the setpoint **Timer 1 Function (page 434)** | | |
| **Description** | | | |
| **Timer 1 Function (page 434)** duration time. | | | |

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## Timer 1 Repetition

| | | | |
|---|---|---|---|
| **Setpoint group** | Scheduler | **Related FW** | 2.1.0 |
| **Range [units]** | Off / Once / Repeated [-] | | |
| **Default value** | Off | **Alternative config** | NO |
| **Step** | [-] | | |
| **Comm object** | 0 | **Related applications** | MINT, SPtM |
| **Config level** | Standard | | |
| **Setpoint visibility** | Conditioned by the setpoint **Timer 1 Function (page 434)** | | |
| **Description** | | | |

Defines repetition of **Timer 1 Function (page 434)**.

| | |
|---|---|
| Off | **Timer 1 Function (page 434)** will not be activated. |
| Once | **Timer 1 Function (page 434)** will be activated only one time. |
| Repeated | **Timer 1 Function (page 434)** will be repeatedly activated. |

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## Timer 1 Repeated

| | | | |
|---|---|---|---|
| **Setpoint group** | Scheduler | **Related FW** | 2.1.0 |
| **Range [units]** | Daily / Weekly / Monthly / Short Period [-] | | |
| **Default value** | Daily | **Alternative config** | NO |
| **Step** | [-] | | |
| **Comm object** | 0 | **Related applications** | MINT, SPtM |
| **Config level** | Standard | | |
| **Setpoint visibility** | Conditioned by the setpoint **Timer 1 Function (page 434)** | | |
| **Description** | | | |

Repeated interval of **Timer 1 Function (page 434)**.

| | |
|---|---|
| Daily | **Timer 1 Function (page 434)** is repeated every day. |
| Weekly | **Timer 1 Function (page 434)** is repeated every week in chosen days. |
| Monthly | **Timer 1 Function (page 434)** is repeated in chosen day every month or in chosen days of chosen week of month |
| Short Period | **Timer 1 Function (page 434)** is repeated in adjusted period. |

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## Timer 1 Repeat Day

| | | | |
|---|---|---|---|
| **Setpoint group** | Scheduler | **Related FW** | 2.1.0 |
| **Range [units]** | Repeated Day / Repeated Day In Week [-] | | |
| **Default value** | Repeated Day | **Alternative config** | NO |
| **Step** | [-] | | |
| **Comm object** | 0 | **Related applications** | MINT, SPtM |
| **Config level** | Standard | | |
| **Setpoint visibility** | Conditioned by the setpoint **Timer 1 Function (page 434)** | | |
| **Description** | | | |

Use this setpoint to adjust behavior of monthly repetition of the **Timer 1 Function (page 434)**.

| | |
|---|---|
| Repeated Day | Chose one day in month when **Timer 1 Function (page 434)** will be activated. |
| Repeated Day In Week | Chose days in one week when **Timer 1 Function (page 434)** will be activated. |

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## Timer 1 Day

| | | | |
|---|---|---|---|
| **Setpoint group** | Scheduler | **Related FW** | 2.1.0 |
| **Range [units]** | Monday / Tuesday / Wednesday / Thursday / Friday / Saturday/ Sunday[-] | | |
| **Default value** | All OFF | **Alternative config** | NO |
| **Step** | [-] | | |
| **Comm object** | 0 | **Related applications** | MINT, SPtM |
| **Config level** | Standard | | |
| **Setpoint visibility** | Conditioned by the setpoint **Timer 1 Function (page 434)** | | |
| **Description** | | | |
| Use this setpoint to include or exclude individual days of week. To select the day use Up and Down buttons. To change the value of day use Enter button. | | | |

**back to List of setpoints**

## Timer 1 Repeated Day In Week

| | | | |
|---|---|---|---|
| **Setpoint group** | Scheduler | **Related FW** | 2.1.0 |
| **Range [units]** | Monday / Tuesday / Wednesday / Thursday / Friday / Saturday/ Sunday[-] | | |
| **Default value** | All OFF | **Alternative config** | NO |
| **Step** | [-] | | |
| **Comm object** | 0 | **Related applications** | MINT, SPtM |
| **Config level** | Standard | | |
| **Setpoint visibility** | Conditioned by the setpoint **Timer 1 Function (page 434)** | | |
| **Description** | | | |
| Use this setpoint to select the day of week when timer will be activated.<br>***Note:*** *More day can be selected. Timer will be activated on the day which happened like the first.* | | | |

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## Timer 1 Repeat Day In Month

| | | | |
|---|---|---|---|
| **Setpoint group** | Scheduler | **Related FW** | 2.1.0 |
| **Range [units]** | 1..31 [day] | | |
| **Default value** | 0 | **Alternative config** | NO |
| **Step** | [-] | | |
| **Comm object** | 0 | **Related applications** | MINT, SPtM |
| **Config level** | Standard | | |
| **Setpoint visibility** | Conditioned by the setpoint **Timer 1 Function (page 434)** | | |
| **Description** | | | |
| Use this setpoint to chose the day in month when the **Timer 1 Function (page 434)** will be activated. | | | |

**back to List of setpoints**

## Timer 1 Repeat Week In Month

| | | | |
|---|---|---|---|
| **Setpoint group** | Scheduler | **Related FW** | 2.1.0 |
| **Range [units]** | 1 .. 5 [week] | | |
| **Default value** | 1 week | **Alternative config** | NO |
| **Step** | 1 week | | |
| **Comm object** | 0 | **Related applications** | MINT, SPtM |
| **Config level** | Standard | | |
| **Setpoint visibility** | Conditioned by the setpoint **Timer 1 Function (page 434)** | | |
| **Description** | | | |
| This setpoint adjust the week of month in which the **Timer 1 Function (page 434)** will be activated. | | | |

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## Timer 1 Refresh Period

| | | | |
|---|---|---|---|
| **Setpoint group** | Scheduler | **Related FW** | 2.1.0 |
| **Range [units]** | [-] | | |
| **Default value** | [-] | **Alternative config** | NO |
| **Step** | [-] | | |
| **Comm object** | 0 | **Related applications** | MINT, SPtM |
| **Config level** | Standard | | |
| **Setpoint visibility** | Conditioned by the setpoint **Timer 1 Function (page 434)** | | |
| **Description** | | | |

Refresh period of **Timer 1 Function (page 434)**. Meaning of this setpoint depends on type of repetition adjusted in **Timer 1 Repeated (page 437)**.

| | |
|---|---|
| Daily | Range [units]: 1 .. 1000 [day]. This setpoint adjust that every X day the timer will be activated.<br>**Example:** If you have daily repetition and you set this setpoint to 2, then every second day from first occurrence of **Timer 1 Function (page 434)**, the **Timer 1 Function (page 434)** will be activated. |
| Weekly | Range [units]: 1 .. 60 [week]. This setpoint adjust that every X week the timer will be activated.<br>**Example:** If you have weekly repetition and you set this setpoint to 2, then every second week from first occurrence of **Timer 1 Function (page 434)**, the **Timer 1 Function (page 434)** will be activated in selected days adjusted by **Timer 1 Day (page 438)**. |
| Monthly | Range [units]: 1 .. 12 [month]. This setpoint adjust that every X month the timer will be activated.<br>**Example:** If you have monthly repetition and you set this setpoint to 2, then every second month from first occurrence of **Timer 1 Function (page 434)**, the **Timer 1 Function (page 434)** will be activated in selected day of month adjusted by **Timer 1 Repeat Day In Month (page 438)** or in selected days of week of month adjusted by **Timer 1 Day (page 438)** and **Timer 1 Repeat Week In Month (page 439)**. |
| Short Period | Range [units]: [HH:MM]. This setpoint adjust that every X short period the timer will be activated.<br>**Example:** If you have short period repetition and you set this setpoint to 2, then every second minute from first occurrence of **Timer 1 Function (page 434)**, the **Timer 1 Function (page 434)** will be activated. |

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## Timer 1 Weekends

| | | | |
|---|---|---|---|
| **Setpoint group** | Scheduler | **Related FW** | 2.1.0 |
| **Range [units]** | Including / Skip / Postpone [-] | | |
| **Default value** | Including | **Alternative config** | NO |
| **Step** | [-] | | |
| **Comm object** | 0 | **Related applications** | MINT, SPtM |
| **Config level** | Standard | | |
| **Setpoint visibility** | Conditioned by the setpoint **Timer 1 Function (page 434)** | | |
| **Description** | | | |

Behavior of **Timer 1 Function (page 434)** on weekends.

| | |
|---|---|
| Including | **Timer 1 Function (page 434)** counter is running on the weekends and **Timer 1 Function (page 434)** can be active. |
| Skip | **Timer 1 Function (page 434)** counter is running on the weekends but **Timer 1 Function (page 434)** isn't active. |
| Postpone | **Timer 1 Function (page 434)** counter isn't running on the weekends and **Timer 1 Function (page 434)** isn't active. If the activation of timer is counted on the weekend, than timer will be activated after weekend. Another activation of timer is counted from original date of first occurrence date. |

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## Subgroup: Timer 2

## Timer 2 Function

| | | | |
|---|---|---|---|
| **Setpoint group** | Scheduler | **Related FW** | 2.1.0 |
| **Range [units]** | Disable / Manual On / No Func / Mode OFF / Rem Start/Stop / TEST / Test OnLd / MFail Blk [-] | | |
| **Default value** | No Func | **Alternative config** | NO |
| **Step** | [-] | | |
| **Comm object** | 15359 | **Related applications** | MINT, SPtM |
| **Config level** | Standard | | |
| **Setpoint visibility** | Always | | |
| **Description** | | | |

***Note:*** *It is possible to choose from following Timer functions. Binary output* ***EXERCISE TIMER 2 (PAGE 652)*** *is always activated when Timer is active regardless of chosen timer function. Timer functions require controller running in AUTO mode.*

Timer 1 has higher priority over Timer 2. So if **Timer 1 Function (page 434)** is configured for OFF mode and **Timer 2 Function (page 442)** is over the same time configured for AUTO mode, controller will work in OFF mode.

Controller activates timer whenever it is powered up even in period, where timer should be already running.

| | |
|---|---|
| Disable | The Timer is disabled. |
| Manual On | LBO Timer is active, but the Timer itself is disabled.<br>***Note:*** *This function serves for testing purposes.* |
| No Func | There is no any other function, only binary output of timer is activated. |
| Mode OFF | When this option is chosen then the binary output of timer is internally connected to the **REMOTE OFF (PAGE 628)** binary input. |
| Rem Start/Stop | When this option is chosen then the binary output of timer is internally connected to the **REMOTE START/STOP (PAGE 628)** binary input. |
| TEST | When this option is chosen then the binary output of timer is internally connected to the binary input **REMOTE TEST (PAGE 629)**. |
| TEST OnLd | When this option is chosen then the binary output of timer is internally connected to the **REM TEST ON LOAD (PAGE 626)** binary input. |
| MFail Blk | When this option is chosen then the binary output of timer is internally connected to the **MAINS FAIL BLOCK (PAGE 621)** binary input. |

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## Timer 2 Setup

| | | | |
|---|---|---|---|
| **Setpoint group** | Scheduler | **Related FW** | 2.1.0 |
| **Range [units]** | [-] | | |
| **Default value** | [-] | **Alternative config** | NO |
| **Step** | [-] | | |
| **Comm object** | 10970 | **Related applications** | MINT, SPtM |
| **Config level** | Standard | | |
| **Setpoint visibility** | Always | | |
| **Description** | | | |

Related setpoints for timer 2 are:

- **Timer 2 Function (page 442)**
- **Timer 2 Repetition (page 444)**
- **Timer 2 First Occur. Date (page 443)**
- **Timer 2 First Occur. Time (page 444)**
- **Timer 2 Duration (page 444)**
- **Timer 2 Repeated (page 445)**
- **Timer 2 Repeat Day (page 445)**
- **Timer 2 Day (page 446)**
- **Timer 2 Repeated Day In Week (page 446)**
- **Timer 2 Repeat Day In Month (page 446)**
- **Timer 2 Repeat Week In Month (page 447)**
- **Timer 2 Refresh Period (page 448)**
- **Timer 2 Weekends (page 449)**

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## Timer 2 First Occur. Date

| | | | |
|---|---|---|---|
| **Setpoint group** | Scheduler | **Related FW** | 2.1.0 |
| **Range [units]** | [DD/MM/YYYY] | | |
| **Default value** | 01/01/2000 | **Alternative config** | NO |
| **Step** | [-] | | |
| **Comm object** | 0 | **Related applications** | MINT, SPtM |
| **Config level** | Standard | | |
| **Setpoint visibility** | Conditioned by the setpoint **Timer 2 Function (page 442)** | | |
| **Description** | | | |

Date of first occurrence of**Timer 2 Function (page 442)**.

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## Timer 2 First Occur. Time

| | | | |
|---|---|---|---|
| **Setpoint group** | Scheduler | **Related FW** | 2.1.0 |
| **Range [units]** | [HH:MM] | | |
| **Default value** | 00:00 | **Alternative config** | NO |
| **Step** | [-] | | |
| **Comm object** | 0 | **Related applications** | MINT, SPtM |
| **Config level** | Standard | | |
| **Setpoint visibility** | Conditioned by the setpoint **Timer 2 Function (page 442)** | | |
| **Description** | | | |
| Time of first occurrence of **Timer 2 Function (page 442)**. | | | |

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## Timer 2 Duration

| | | | |
|---|---|---|---|
| **Setpoint group** | Scheduler | **Related FW** | 2.1.0 |
| **Range [units]** | [HH:MM] | | |
| **Default value** | 00:00 | **Alternative config** | NO |
| **Step** | [-] | | |
| **Comm object** | 0 | **Related applications** | MINT, SPtM |
| **Config level** | Standard | | |
| **Setpoint visibility** | Conditioned by the setpoint **Timer 2 Function (page 442)** | | |
| **Description** | | | |
| **Timer 2 Function (page 442)** duration time. | | | |

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## Timer 2 Repetition

| | | | |
|---|---|---|---|
| **Setpoint group** | Scheduler | **Related FW** | 2.1.0 |
| **Range [units]** | Off / Once / Repeated [-] | | |
| **Default value** | Off | **Alternative config** | NO |
| **Step** | [-] | | |
| **Comm object** | 0 | **Related applications** | MINT, SPtM |
| **Config level** | Standard | | |
| **Setpoint visibility** | Conditioned by the setpoint **Timer 2 Function (page 442)** | | |
| **Description** | | | |

Defines repetition of **Timer 2 Function (page 442)**.

| | |
|---|---|
| Off | **Timer 2 Function (page 442)** will not be activated. |
| Once | **Timer 2 Function (page 442)** will be activated only one time. |
| Repeated | **Timer 2 Function (page 442)** will be repeatedly activated. |

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## Timer 2 Repeated

| | | | |
|---|---|---|---|
| **Setpoint group** | Scheduler | **Related FW** | 2.1.0 |
| **Range [units]** | Daily / Weekly / Monthly / Short Period [-] | | |
| **Default value** | Daily | **Alternative config** | NO |
| **Step** | [-] | | |
| **Comm object** | 0 | **Related applications** | MINT, SPtM |
| **Config level** | Standard | | |
| **Setpoint visibility** | Conditioned by the setpoint **Timer 2 Function (page 442)** | | |
| **Description** | | | |

Repeated interval of **Timer 2 Function (page 442)**.

| | |
|---|---|
| Daily | **Timer 2 Function (page 442)** is repeated every day. |
| Weekly | **Timer 2 Function (page 442)** is repeated every week in chosen days. |
| Monthly | **Timer 2 Function (page 442)** is repeated in chosen day every month or in chosen days of chosen week of month |
| Short Period | **Timer 2 Function (page 442)** is repeated in adjusted period. |

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## Timer 2 Repeat Day

| | | | |
|---|---|---|---|
| **Setpoint group** | Scheduler | **Related FW** | 2.1.0 |
| **Range [units]** | Repeated Day / Repeated Day In Week [-] | | |
| **Default value** | Repeated Day | **Alternative config** | NO |
| **Step** | [-] | | |
| **Comm object** | 0 | **Related applications** | MINT, SPtM |
| **Config level** | Standard | | |
| **Setpoint visibility** | Conditioned by the setpoint **Timer 2 Function (page 442)** | | |
| **Description** | | | |

Use this setpoint to adjust behavior of monthly repetition of the **Timer 2 Function (page 442)**.

| | |
|---|---|
| Repeated Day | Chose one day in month when **Timer 2 Function (page 442)** will be activated. |
| Repeated Day In Week | Chose days in one week when **Timer 2 Function (page 442)** will be activated. |

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## Timer 2 Day

| | | | |
|---|---|---|---|
| **Setpoint group** | Scheduler | **Related FW** | 2.1.0 |
| **Range [units]** | Monday / Tuesday / Wednesday / Thursday / Friday / Saturday/ Sunday[-] | | |
| **Default value** | All OFF | **Alternative config** | NO |
| **Step** | [-] | | |
| **Comm object** | 0 | **Related applications** | MINT, SPtM |
| **Config level** | Standard | | |
| **Setpoint visibility** | Conditioned by the setpoint **Timer 2 Function (page 442)** | | |
| **Description** | | | |
| Use this setpoint to include or exclude individual days of week. To select the day use Up and Down buttons. To change the value of day use Enter button. | | | |

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## Timer 2 Repeated Day In Week

| | | | |
|---|---|---|---|
| **Setpoint group** | Scheduler | **Related FW** | 2.1.0 |
| **Range [units]** | Monday / Tuesday / Wednesday / Thursday / Friday / Saturday/ Sunday[-] | | |
| **Default value** | All OFF | **Alternative config** | NO |
| **Step** | [-] | | |
| **Comm object** | 0 | **Related applications** | MINT, SPtM |
| **Config level** | Standard | | |
| **Setpoint visibility** | Conditioned by the setpoint **Timer 2 Function (page 442)** | | |
| **Description** | | | |
| Use this setpoint to select the day of week when timer will be activated.<br>***Note:*** *More day can be selected. Timer will be activated on the day which happened like the first.* | | | |

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## Timer 2 Repeat Day In Month

| | | | |
|---|---|---|---|
| **Setpoint group** | Scheduler | **Related FW** | 2.1.0 |
| **Range [units]** | 1..31 [day] | | |
| **Default value** | 0 | **Alternative config** | NO |
| **Step** | [-] | | |
| **Comm object** | 0 | **Related applications** | MINT, SPtM |
| **Config level** | Standard | | |
| **Setpoint visibility** | Conditioned by the setpoint **Timer 2 Function (page 442)** | | |
| **Description** | | | |
| Use this setpoint to chose the day in month when the **Timer 2 Function (page 442)** will be activated. | | | |

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## Timer 2 Repeat Week In Month

| | | | |
|---|---|---|---|
| **Setpoint group** | Scheduler | **Related FW** | 2.1.0 |
| **Range [units]** | 1 .. 5 [week] | | |
| **Default value** | 1 week | **Alternative config** | NO |
| **Step** | 1 week | | |
| **Comm object** | 0 | **Related applications** | MINT, SPtM |
| **Config level** | Standard | | |
| **Setpoint visibility** | Conditioned by the setpoint **Timer 2 Function (page 442)** | | |
| **Description** | | | |
| This setpoint adjust the week of month in which the **Timer 2 Function (page 442)** will be activated. | | | |

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## Timer 2 Refresh Period

| | | | |
|---|---|---|---|
| **Setpoint group** | Scheduler | **Related FW** | 2.1.0 |
| **Range [units]** | [-] | | |
| **Default value** | [-] | **Alternative config** | NO |
| **Step** | [-] | | |
| **Comm object** | 0 | **Related applications** | MINT, SPtM |
| **Config level** | Standard | | |
| **Setpoint visibility** | Conditioned by the setpoint **Timer 2 Function (page 442)** | | |
| **Description** | | | |

Refresh period of **Timer 2 Function (page 442)**. Meaning of this setpoint depends on type of repetition adjusted in **Timer 2 Repeated (page 445)**.

| | |
|---|---|
| Daily | Range [units]: 1 .. 1000 [day]. This setpoint adjust that every X day the timer will be activated.<br>**Example:** If you have daily repetition and you set this setpoint to 2, then every second day from first occurrence of **Timer 2 Function (page 442)**, the **Timer 2 Function (page 442)** will be activated. |
| Weekly | Range [units]: 1 .. 60 [week]. This setpoint adjust that every X week the timer will be activated.<br>**Example:** If you have weekly repetition and you set this setpoint to 2, then every second week from first occurrence of **Timer 2 Function (page 442)**, the **Timer 2 Function (page 442)** will be activated in selected days adjusted by **Timer 2 Day (page 446)**. |
| Monthly | Range [units]: 1 .. 12 [month]. This setpoint adjust that every X month the timer will be activated.<br>**Example:** If you have monthly repetition and you set this setpoint to 2, then every second month from first occurrence of **Timer 2 Function (page 442)**, the **Timer 2 Function (page 442)** will be activated in selected day of month adjusted by **Timer 2 Repeat Day In Month (page 446)** or in selected days of week of month adjusted by **Timer 2 Day (page 446)** and **Timer 2 Repeat Week In Month (page 447)**. |
| Short Period | Range [units]: [HH:MM]. This setpoint adjust that every X short period the timer will be activated.<br>**Example:** If you have short period repetition and you set this setpoint to 2, then every second minute from first occurrence of **Timer 2 Function (page 442)**, the **Timer 2 Function (page 442)** will be activated. |

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## Timer 2 Weekends

| | | | |
|---|---|---|---|
| **Setpoint group** | Scheduler | **Related FW** | 2.1.0 |
| **Range [units]** | Including / Skip / Postpone [-] | | |
| **Default value** | Including | **Alternative config** | NO |
| **Step** | [-] | | |
| **Comm object** | 0 | **Related applications** | MINT, SPtM |
| **Config level** | Standard | | |
| **Setpoint visibility** | Conditioned by the setpoint **Timer 2 Function (page 442)** | | |
| **Description** | | | |

Behavior of **Timer 2 Function (page 442)** on weekends.

| | |
|---|---|
| Including | **Timer 2 Function (page 442)** counter is running on the weekends and **Timer 2 Function (page 442)** can be active. |
| Skip | **Timer 2 Function (page 442)** counter is running on the weekends but **Timer 2 Function (page 442)** isn't active. |
| Postpone | **Timer 2 Function (page 442)** counter isn't running on the weekends and **Timer 2 Function (page 442)** isn't active. If the activation of timer is counted on the weekend, than timer will be activated after weekend. Another activation of timer is counted from original date of first occurrence date. |

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## Subgroup: Timer 3

## Timer 3 Function

| | | | |
|---|---|---|---|
| **Setpoint group** | Scheduler | **Related FW** | 2.1.0 |
| **Range [units]** | Disable / Manual On / No Func / Mode OFF / Rem Start/Stop / TEST / Test OnLd / MFail Blk [-] | | |
| **Default value** | No Func | **Alternative config** | NO |
| **Step** | [-] | | |
| **Comm object** | 15360 | **Related applications** | MINT, SPtM |
| **Config level** | Standard | | |
| **Setpoint visibility** | Always | | |

**Description**

It is possible to choose from following Timer functions. Binary output **EXERCISE TIMER 3 (PAGE 652)** is always activated when Timer is active regardless of chosen timer function. Timer functions require controller running in AUTO mode.

Timer 1 has higher priority over Timer 3. So if **Timer 3 Function (page 450)** is configured for OFF mode and **Timer 3 Function (page 450)** is over the same time configured for AUTO mode, controller will work in OFF mode.

Controller activates timer whenever it is powered up even in period, where timer should be already running.

| | |
|---|---|
| Disable | The Timer is disabled. |
| Manual On | LBO Timer is active, but the Timer itself is disabled.<br>***Note:*** *This function serves for testing purposes.* |
| No Func | There is no any other function, only binary output of timer is activated. |
| Mode OFF | When this option is chosen then the binary output of timer is internally connected to the **REMOTE OFF (PAGE 628)** binary input. |
| Rem Start/Stop | When this option is chosen then the binary output of timer is internally connected to the **REMOTE START/STOP (PAGE 628)** binary input. |
| TEST | When this option is chosen then the binary output of timer is internally connected to the binary input **REMOTE TEST (PAGE 629)**. |
| TEST OnLd | When this option is chosen then the binary output of timer is internally connected to the **REM TEST ON LOAD (PAGE 626)** binary input. |
| MFail Blk | When this option is chosen then the binary output of timer is internally connected to the **MAINS FAIL BLOCK (PAGE 621)** binary input. |

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## Timer 3 Setup

| | | | |
|---|---|---|---|
| **Setpoint group** | Scheduler | **Related FW** | 2.1.0 |
| **Range [units]** | [-] | | |
| **Default value** | [-] | **Alternative config** | NO |
| **Step** | [-] | | |
| **Comm object** | 10971 | **Related applications** | MINT, SPtM |
| **Config level** | Standard | | |
| **Setpoint visibility** | Always | | |
| **Description** | | | |

Related setpoints for timer 3 are:

- **Timer 3 Function (page 450)**
- **Timer 3 Repetition (page 452)**
- **Timer 3 First Occur. Date (page 451)**
- **Timer 3 Duration (page 452)**
- **Timer 3 Repeated (page 453)**
- **Timer 3 Repeat Day (page 453)**
- **Timer 3 Day (page 454)**
- **Timer 3 Repeated Day In Week (page 454)**
- **Timer 3 Repeat Day In Month (page 454)**
- **Timer 3 Repeat Week In Month (page 455)**
- **Timer 3 Refresh Period (page 456)**
- **Timer 3 Weekends (page 457)**

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## Timer 3 First Occur. Date

| | | | |
|---|---|---|---|
| **Setpoint group** | Scheduler | **Related FW** | 2.1.0 |
| **Range [units]** | [DD/MM/YYYY] | | |
| **Default value** | 01/01/2000 | **Alternative config** | NO |
| **Step** | [-] | | |
| **Comm object** | 0 | **Related applications** | MINT, SPtM |
| **Config level** | Standard | | |
| **Setpoint visibility** | Conditioned by the setpoint **Timer 3 Function (page 450)** | | |
| **Description** | | | |

Date of first occurrence of**Timer 3 Function (page 450)**.

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## Timer 3 First Occur. Time

| | | | |
|---|---|---|---|
| **Setpoint group** | Scheduler | **Related FW** | 2.1.0 |
| **Range [units]** | [HH:MM] | | |
| **Default value** | 00:00 | **Alternative config** | NO |
| **Step** | [-] | | |
| **Comm object** | 0 | **Related applications** | MINT, SPtM |
| **Config level** | Standard | | |
| **Setpoint visibility** | Conditioned by the setpoint **Timer 3 Function (page 450)** | | |
| **Description** | | | |
| Time of first occurrence of **Timer 3 Function (page 450)**. | | | |

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## Timer 3 Duration

| | | | |
|---|---|---|---|
| **Setpoint group** | Scheduler | **Related FW** | 2.1.0 |
| **Range [units]** | [HH:MM] | | |
| **Default value** | 00:00 | **Alternative config** | NO |
| **Step** | [-] | | |
| **Comm object** | 0 | **Related applications** | MINT, SPtM |
| **Config level** | Standard | | |
| **Setpoint visibility** | Conditioned by the setpoint **Timer 3 Function (page 450)** | | |
| **Description** | | | |
| **Timer 3 Function (page 450)** duration time. | | | |

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## Timer 3 Repetition

| | | | |
|---|---|---|---|
| **Setpoint group** | Scheduler | **Related FW** | 2.1.0 |
| **Range [units]** | Off / Once / Repeated [-] | | |
| **Default value** | Off | **Alternative config** | NO |
| **Step** | [-] | | |
| **Comm object** | 0 | **Related applications** | MINT, SPtM |
| **Config level** | Standard | | |
| **Setpoint visibility** | Conditioned by the setpoint **Timer 3 Function (page 450)** | | |
| **Description** | | | |

Defines repetition of **Timer 3 Function (page 450)**.

| | |
|---|---|
| Off | **Timer 3 Function (page 450)** will not be activated. |
| Once | **Timer 3 Function (page 450)** will be activated only one time. |
| Repeated | **Timer 3 Function (page 450)** will be repeatedly activated. |

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## Timer 3 Repeated

| | | | |
|---|---|---|---|
| **Setpoint group** | Scheduler | **Related FW** | 2.1.0 |
| **Range [units]** | Daily / Weekly / Monthly / Short Period [-] | | |
| **Default value** | Daily | **Alternative config** | NO |
| **Step** | [-] | | |
| **Comm object** | 0 | **Related applications** | MINT, SPtM |
| **Config level** | Standard | | |
| **Setpoint visibility** | Conditioned by the setpoint **Timer 3 Function (page 450)** | | |
| **Description** | | | |

Repeated interval of **Timer 3 Function (page 450)**.

| | |
|---|---|
| Daily | **Timer 3 Function (page 450)** is repeated every day. |
| Weekly | **Timer 3 Function (page 450)** is repeated every week in chosen days. |
| Monthly | **Timer 3 Function (page 450)** is repeated in chosen day every month or in chosen days of chosen week of month |
| Short Period | **Timer 3 Function (page 450)** is repeated in adjusted period. |

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## Timer 3 Repeat Day

| | | | |
|---|---|---|---|
| **Setpoint group** | Scheduler | **Related FW** | 2.1.0 |
| **Range [units]** | Repeated Day / Repeated Day In Week [-] | | |
| **Default value** | Repeated Day | **Alternative config** | NO |
| **Step** | [-] | | |
| **Comm object** | 0 | **Related applications** | MINT, SPtM |
| **Config level** | Standard | | |
| **Setpoint visibility** | Conditioned by the setpoint **Timer 3 Function (page 450)** | | |
| **Description** | | | |

Use this setpoint to adjust behavior of monthly repetition of the **Timer 3 Function (page 450)**.

| | |
|---|---|
| Repeated Day | Chose one day in month when **Timer 3 Function (page 450)** will be activated. |
| Repeated Day In Week | Chose days in one week when **Timer 3 Function (page 450)** will be activated. |

**back to List of setpoints**

## Timer 3 Day

| | | | |
|---|---|---|---|
| **Setpoint group** | Scheduler | **Related FW** | 2.1.0 |
| **Range [units]** | Monday / Tuesday / Wednesday / Thursday / Friday / Saturday/ Sunday[-] | | |
| **Default value** | All OFF | **Alternative config** | NO |
| **Step** | [-] | | |
| **Comm object** | 0 | **Related applications** | MINT, SPtM |
| **Config level** | Standard | | |
| **Setpoint visibility** | Conditioned by the setpoint **Timer 3 Function (page 450)** | | |
| **Description** | | | |
| Use this setpoint to include or exclude individual days of week. To select the day use Up and Down buttons. To change the value of day use Enter button. | | | |

**back to List of setpoints**

## Timer 3 Repeated Day In Week

| | | | |
|---|---|---|---|
| **Setpoint group** | Scheduler | **Related FW** | 2.1.0 |
| **Range [units]** | Monday / Tuesday / Wednesday / Thursday / Friday / Saturday/ Sunday[-] | | |
| **Default value** | All OFF | **Alternative config** | NO |
| **Step** | [-] | | |
| **Comm object** | 0 | **Related applications** | MINT, SPtM |
| **Config level** | Standard | | |
| **Setpoint visibility** | Conditioned by the setpoint **Timer 3 Function (page 450)** | | |
| **Description** | | | |
| Use this setpoint to select the day of week when timer will be activated.<br>***Note:*** *More day can be selected. Timer will be activated on the day which happened like the first.* | | | |

**back to List of setpoints**

## Timer 3 Repeat Day In Month

| | | | |
|---|---|---|---|
| **Setpoint group** | Scheduler | **Related FW** | 2.1.0 |
| **Range [units]** | 1..31 [day] | | |
| **Default value** | 0 | **Alternative config** | NO |
| **Step** | [-] | | |
| **Comm object** | 0 | **Related applications** | MINT, SPtM |
| **Config level** | Standard | | |
| **Setpoint visibility** | Conditioned by the setpoint **Timer 3 Function (page 450)** | | |
| **Description** | | | |
| Use this setpoint to chose the day in month when the **Timer 3 Function (page 450)** will be activated. | | | |

**back to List of setpoints**

## Timer 3 Repeat Week In Month

| | | | |
|---|---|---|---|
| **Setpoint group** | Scheduler | **Related FW** | 2.1.0 |
| **Range [units]** | 1 .. 5 [week] | | |
| **Default value** | 1 week | **Alternative config** | NO |
| **Step** | 1 week | | |
| **Comm object** | 0 | **Related applications** | MINT, SPtM |
| **Config level** | Standard | | |
| **Setpoint visibility** | Conditioned by the setpoint **Timer 3 Function (page 450)** | | |
| **Description** | | | |
| This setpoint adjust the week of month in which the **Timer 3 Function (page 450)** will be activated. | | | |

**back to List of setpoints**

## Timer 3 Refresh Period

| | | | |
|---|---|---|---|
| **Setpoint group** | Scheduler | **Related FW** | 2.1.0 |
| **Range [units]** | [-] | | |
| **Default value** | [-] | **Alternative config** | NO |
| **Step** | [-] | | |
| **Comm object** | 0 | **Related applications** | MINT, SPtM |
| **Config level** | Standard | | |
| **Setpoint visibility** | Conditioned by the setpoint **Timer 3 Function (page 450)** | | |
| **Description** | | | |

Refresh period of **Timer 3 Function (page 450)**. Meaning of this setpoint depends on type of repetition adjusted in **Timer 3 Repeated (page 453)**.

| | |
|---|---|
| Daily | Range [units]: 1 .. 1000 [day]. This setpoint adjust that every X day the timer will be activated.<br>**Example:** If you have daily repetition and you set this setpoint to 3, then every second day from first occurrence of **Timer 3 Function (page 450)**, the **Timer 3 Function (page 450)** will be activated. |
| Weekly | Range [units]: 1 .. 60 [week]. This setpoint adjust that every X week the timer will be activated.<br>**Example:** If you have weekly repetition and you set this setpoint to 3, then every second week from first occurrence of **Timer 3 Function (page 450)**, the **Timer 3 Function (page 450)** will be activated in selected days adjusted by **Timer 3 Day (page 454)**. |
| Monthly | Range [units]: 1 .. 12 [month]. This setpoint adjust that every X month the timer will be activated.<br>**Example:** If you have monthly repetition and you set this setpoint to 3, then every second month from first occurrence of **Timer 3 Function (page 450)**, the **Timer 3 Function (page 450)** will be activated in selected day of month adjusted by **Timer 3 Repeat Day In Month (page 454)** or in selected days of week of month adjusted by **Timer 3 Day (page 454)** and **Timer 3 Repeat Week In Month (page 455)**. |
| Short Period | Range [units]: [HH:MM]. This setpoint adjust that every X short period the timer will be activated.<br>**Example:** If you have short period repetition and you set this setpoint to 3, then every second minute from first occurrence of **Timer 3 Function (page 450)**, the **Timer 3 Function (page 450)** will be activated. |

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## Timer 3 Weekends

| | | | |
|---|---|---|---|
| **Setpoint group** | Scheduler | **Related FW** | 2.1.0 |
| **Range [units]** | Including / Skip / Postpone [-] | | |
| **Default value** | Including | **Alternative config** | NO |
| **Step** | [-] | | |
| **Comm object** | 0 | **Related applications** | MINT, SPtM |
| **Config level** | Standard | | |
| **Setpoint visibility** | Conditioned by the setpoint **Timer 3 Function (page 450)** | | |
| **Description** | | | |

Behavior of **Timer 3 Function (page 450)** on weekends.

| | |
|---|---|
| Including | **Timer 3 Function (page 450)** counter is running on the weekends and **Timer 3 Function (page 450)** can be active. |
| Skip | **Timer 3 Function (page 450)** counter is running on the weekends but **Timer 3 Function (page 450)** isn't active. |
| Postpone | **Timer 3 Function (page 450)** counter isn't running on the weekends and **Timer 3 Function (page 450)** isn't active. If the activation of timer is counted on the weekend, than timer will be activated after weekend. Another activation of timer is counted from original date of first occurrence date. |

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## Subgroup: Timer 4

## Timer 4 Function

| | | | |
|---|---|---|---|
| **Setpoint group** | Scheduler | **Related FW** | 2.1.0 |
| **Range [units]** | Disable / Manual On / No Func / Mode OFF / Rem Start/Stop / TEST / Test OnLd / MFail Blk [-] | | |
| **Default value** | No Func | **Alternative config** | NO |
| **Step** | [-] | | |
| **Comm object** | 15361 | **Related applications** | MINT, SPtM |
| **Config level** | Standard | | |
| **Setpoint visibility** | Always | | |

**Description**

It is possible to choose from following Timer functions. Binary output **EXERCISE TIMER 4 (PAGE 652)** is always activated when Timer is active regardless of chosen timer function. Timer functions require controller running in AUTO mode.

Timer 1 has higher priority over Timer 2. So if **Timer 4 Function (page 458)** is configured for OFF mode and **Timer 4 Function (page 458)** is over the same time configured for AUTO mode, controller will work in OFF mode.

Controller activates timer whenever it is powered up even in period, where timer should be already running.

| | |
|---|---|
| Disable | The Timer is disabled. |
| Manual On | LBO Timer is active, but the Timer itself is disabled.<br>***Note:*** *This function serves for testing purposes.* |
| No Func | There is no any other function, only binary output of timer is activated. |
| Mode OFF | When this option is chosen then the binary output of timer is internally connected to the **REMOTE OFF (PAGE 628)** binary input. |
| Rem Start/Stop | When this option is chosen then the binary output of timer is internally connected to the **REMOTE START/STOP (PAGE 628)** binary input. |
| TEST | When this option is chosen then the binary output of timer is internally connected to the binary input **REMOTE TEST (PAGE 629)**. |
| TEST OnLd | When this option is chosen then the binary output of timer is internally connected to the **REM TEST ON LOAD (PAGE 626)** binary input. |
| MFail Blk | When this option is chosen then the binary output of timer is internally connected to the **MAINS FAIL BLOCK (PAGE 621)** binary input. |

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## Timer 4 Setup

| | | | |
|---|---|---|---|
| **Setpoint group** | Scheduler | **Related FW** | 2.1.0 |
| **Range [units]** | [-] | | |
| **Default value** | [-] | **Alternative config** | NO |
| **Step** | [-] | | |
| **Comm object** | 10973 | **Related applications** | MINT, SPtM |
| **Config level** | Standard | | |
| **Setpoint visibility** | Always | | |
| **Description** | | | |

Related setpoints for timer 4 are:

- **Timer 4 Function (page 458)**
- **Timer 4 Repetition (page 460)**
- **Timer 4 First Occur. Date (page 459)**
- **Timer 4 First Occur. Time (page 460)**
- **Timer 4 Duration (page 460)**
- **Timer 4 Repeated (page 461)**
- **Timer 4 Repeat Day (page 461)**
- **Timer 4 Day (page 462)**
- **Timer 4 Repeated Day In Week (page 462)**
- **Timer 4 Repeat Day In Month (page 462)**
- **Timer 4 Repeat Week In Month (page 463)**
- **Timer 4 Refresh Period (page 464)**
- **Timer 4 Weekends (page 465)**

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## Timer 4 First Occur. Date

| | | | |
|---|---|---|---|
| **Setpoint group** | Scheduler | **Related FW** | 2.1.0 |
| **Range [units]** | [DD/MM/YYYY] | | |
| **Default value** | 01/01/2000 | **Alternative config** | NO |
| **Step** | [-] | | |
| **Comm object** | 0 | **Related applications** | MINT, SPtM |
| **Config level** | Standard | | |
| **Setpoint visibility** | Conditioned by the setpoint **Timer 4 Function (page 458)** | | |
| **Description** | | | |

Date of first occurrence of**Timer 4 Function (page 458)**.

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## Timer 4 First Occur. Time

| | | | |
|---|---|---|---|
| **Setpoint group** | Scheduler | **Related FW** | 2.1.0 |
| **Range [units]** | [HH:MM] | | |
| **Default value** | 00:00 | **Alternative config** | NO |
| **Step** | [-] | | |
| **Comm object** | 0 | **Related applications** | MINT, SPtM |
| **Config level** | Standard | | |
| **Setpoint visibility** | Conditioned by the setpoint **Timer 4 Function (page 458)** | | |
| **Description** | | | |
| Time of first occurrence of **Timer 4 Function (page 458)**. | | | |

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## Timer 4 Duration

| | | | |
|---|---|---|---|
| **Setpoint group** | Scheduler | **Related FW** | 2.1.0 |
| **Range [units]** | [HH:MM] | | |
| **Default value** | 00:00 | **Alternative config** | NO |
| **Step** | [-] | | |
| **Comm object** | 0 | **Related applications** | MINT, SPtM |
| **Config level** | Standard | | |
| **Setpoint visibility** | Conditioned by the setpoint **Timer 4 Function (page 458)** | | |
| **Description** | | | |
| **Timer 4 Function (page 458)** duration time. | | | |

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## Timer 4 Repetition

| | | | |
|---|---|---|---|
| **Setpoint group** | Scheduler | **Related FW** | 2.1.0 |
| **Range [units]** | Off / Once / Repeated [-] | | |
| **Default value** | Off | **Alternative config** | NO |
| **Step** | [-] | | |
| **Comm object** | 0 | **Related applications** | MINT, SPtM |
| **Config level** | Standard | | |
| **Setpoint visibility** | Conditioned by the setpoint **Timer 4 Function (page 458)** | | |
| **Description** | | | |

Defines repetition of **Timer 4 Function (page 458)**.

| | |
|---|---|
| Off | **Timer 4 Function (page 458)** will not be activated. |
| Once | **Timer 4 Function (page 458)** will be activated only one time. |
| Repeated | **Timer 4 Function (page 458)** will be repeatedly activated. |

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## Timer 4 Repeated

| | | | |
|---|---|---|---|
| **Setpoint group** | Scheduler | **Related FW** | 2.1.0 |
| **Range [units]** | Daily / Weekly / Monthly / Short Period [-] | | |
| **Default value** | Daily | **Alternative config** | NO |
| **Step** | [-] | | |
| **Comm object** | 0 | **Related applications** | MINT, SPtM |
| **Config level** | Standard | | |
| **Setpoint visibility** | Conditioned by the setpoint **Timer 4 Function (page 458)** | | |
| **Description** | | | |

Repeated interval of **Timer 4 Function (page 458)**.

| | |
|---|---|
| Daily | **Timer 4 Function (page 458)** is repeated every day. |
| Weekly | **Timer 4 Function (page 458)** is repeated every week in chosen days. |
| Monthly | **Timer 4 Function (page 458)** is repeated in chosen day every month or in chosen days of chosen week of month |
| Short Period | **Timer 4 Function (page 458)** is repeated in adjusted period. |

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## Timer 4 Repeat Day

| | | | |
|---|---|---|---|
| **Setpoint group** | Scheduler | **Related FW** | 2.1.0 |
| **Range [units]** | Repeated Day / Repeated Day In Week [-] | | |
| **Default value** | Repeated Day | **Alternative config** | NO |
| **Step** | [-] | | |
| **Comm object** | 0 | **Related applications** | MINT, SPtM |
| **Config level** | Standard | | |
| **Setpoint visibility** | Conditioned by the setpoint **Timer 4 Function (page 458)** | | |
| **Description** | | | |

Use this setpoint to adjust behavior of monthly repetition of the **Timer 4 Function (page 458)**.

| | |
|---|---|
| Repeated Day | Chose one day in month when **Timer 4 Function (page 458)** will be activated. |
| Repeated Day In Week | Chose days in one week when **Timer 4 Function (page 458)** will be activated. |

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## Timer 4 Day

| | | | |
|---|---|---|---|
| **Setpoint group** | Scheduler | **Related FW** | 2.1.0 |
| **Range [units]** | Monday / Tuesday / Wednesday / Thursday / Friday / Saturday/ Sunday[-] | | |
| **Default value** | All OFF | **Alternative config** | NO |
| **Step** | [-] | | |
| **Comm object** | 0 | **Related applications** | MINT, SPtM |
| **Config level** | Standard | | |
| **Setpoint visibility** | Conditioned by the setpoint **Timer 4 Function (page 458)** | | |
| **Description** | | | |
| Use this setpoint to include or exclude individual days of week. To select the day use Up and Down buttons. To change the value of day use Enter button. | | | |

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## Timer 4 Repeated Day In Week

| | | | |
|---|---|---|---|
| **Setpoint group** | Scheduler | **Related FW** | 2.1.0 |
| **Range [units]** | Monday / Tuesday / Wednesday / Thursday / Friday / Saturday/ Sunday[-] | | |
| **Default value** | All OFF | **Alternative config** | NO |
| **Step** | [-] | | |
| **Comm object** | 0 | **Related applications** | MINT, SPtM |
| **Config level** | Standard | | |
| **Setpoint visibility** | Conditioned by the setpoint **Timer 4 Function (page 458)** | | |
| **Description** | | | |
| Use this setpoint to select the day of week when timer will be activated.<br>***Note:*** *More day can be selected. Timer will be activated on the day which happened like the first.* | | | |

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## Timer 4 Repeat Day In Month

| | | | |
|---|---|---|---|
| **Setpoint group** | Scheduler | **Related FW** | 2.1.0 |
| **Range [units]** | 1..31 [day] | | |
| **Default value** | 0 | **Alternative config** | NO |
| **Step** | [-] | | |
| **Comm object** | 0 | **Related applications** | MINT, SPtM |
| **Config level** | Standard | | |
| **Setpoint visibility** | Conditioned by the setpoint **Timer 4 Function (page 458)** | | |
| **Description** | | | |
| Use this setpoint to chose the day in month when the **Timer 4 Function (page 458)** will be activated. | | | |

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## Timer 4 Repeat Week In Month

| | | | |
|---|---|---|---|
| **Setpoint group** | Scheduler | **Related FW** | 2.1.0 |
| **Range [units]** | 1 .. 5 [week] | | |
| **Default value** | 1 week | **Alternative config** | NO |
| **Step** | 1 week | | |
| **Comm object** | 0 | **Related applications** | MINT, SPtM |
| **Config level** | Standard | | |
| **Setpoint visibility** | Conditioned by the setpoint **Timer 4 Function (page 458)** | | |
| **Description** | | | |
| This setpoint adjust the week of month in which the **Timer 4 Function (page 458)** will be activated. | | | |

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## Timer 4 Refresh Period

| | | | |
|---|---|---|---|
| **Setpoint group** | Scheduler | **Related FW** | 2.1.0 |
| **Range [units]** | [-] | | |
| **Default value** | [-] | **Alternative config** | NO |
| **Step** | [-] | | |
| **Comm object** | 0 | **Related applications** | MINT, SPtM |
| **Config level** | Standard | | |
| **Setpoint visibility** | Conditioned by the setpoint **Timer 4 Function (page 458)** | | |
| **Description** | | | |

Refresh period of **Timer 4 Function (page 458)**. Meaning of this setpoint depends on type of repetition adjusted in **Timer 4 Repeated (page 461)**.

| | |
|---|---|
| Daily | Range [units]: 1 .. 1000 [day]. This setpoint adjust that every X day the timer will be activated.<br>**Example:** If you have daily repetition and you set this setpoint to 4, then every second day from first occurrence of **Timer 4 Function (page 458)**, the **Timer 4 Function (page 458)** will be activated. |
| Weekly | Range [units]: 1 .. 60 [week]. This setpoint adjust that every X week the timer will be activated.<br>**Example:** If you have weekly repetition and you set this setpoint to 4, then every second week from first occurrence of **Timer 4 Function (page 458)**, the **Timer 4 Function (page 458)** will be activated in selected days adjusted by **Timer 4 Day (page 462)**. |
| Monthly | Range [units]: 1 .. 12 [month]. This setpoint adjust that every X month the timer will be activated.<br>**Example:** If you have monthly repetition and you set this setpoint to 4, then every second month from first occurrence of **Timer 4 Function (page 458)**, the **Timer 4 Function (page 458)** will be activated in selected day of month adjusted by **Timer 4 Repeat Day In Month (page 462)** or in selected days of week of month adjusted by **Timer 4 Day (page 462)** and **Timer 4 Repeat Week In Month (page 463)**. |
| Short Period | Range [units]: [HH:MM]. This setpoint adjust that every X short period the timer will be activated.<br>**Example:** If you have short period repetition and you set this setpoint to 4, then every second minute from first occurrence of **Timer 4 Function (page 458)**, the **Timer 4 Function (page 458)** will be activated. |

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## Timer 4 Weekends

| | | | |
|---|---|---|---|
| **Setpoint group** | Scheduler | **Related FW** | 2.1.0 |
| **Range [units]** | Including / Skip / Postpone [-] | | |
| **Default value** | Including | **Alternative config** | NO |
| **Step** | [-] | | |
| **Comm object** | 0 | **Related applications** | MINT, SPtM |
| **Config level** | Standard | | |
| **Setpoint visibility** | Conditioned by the setpoint **Timer 4 Function (page 458)** | | |
| **Description** | | | |

Behavior of **Timer 4 Function (page 458)** on weekends.

| | |
|---|---|
| Including | **Timer 4 Function (page 458)** counter is running on the weekends and **Timer 4 Function (page 458)** can be active. |
| Skip | **Timer 4 Function (page 458)** counter is running on the weekends but **Timer 4 Function (page 458)** isn't active. |
| Postpone | **Timer 4 Function (page 458)** counter isn't running on the weekends and **Timer 4 Function (page 458)** isn't active. If the activation of timer is counted on the weekend, than timer will be activated after weekend. Another activation of timer is counted from original date of first occurrence date. |

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## Subgroup: Rental Timers

## Rental Timer 1

| | | | |
|---|---|---|---|
| **Setpoint group** | Scheduler | **Related FW** | 2.1.0 |
| **Range [units]** | Disabled / 1 .. 8 760 [h] | | |
| **Default value** | Disabled | **Alternative config** | NO |
| **Step** | 1 h | | |
| **Comm object** | 14326 | **Related applications** | MINT, SPtM |
| **Config level** | Advanced | | |
| **Setpoint visibility** | Always | | |
| **Description** | | | |

Another engine start is not allowed when this timer elapsed. This timer is based on engine running hours. The alarm **AHI Rental Timer 1 Elapsed (page 740)** will be recorded in alarm list.

> **IMPORTANT: To reset Rental Timer 1 (page 465) we have to set up Rental Timer 1 (page 465) again. It means go to setpoint group Scheduler and to the setpoint Rental Timer 1 (page 465). Then press enter button ↵, change the value if it is necessary and press enter button ↵ again.**

When the **Rental Timer 1 (page 465)** elapsed during engine run the Gen-set will not stop immediately. The adjustable **Rental Timer BOC (page 469)** timer will start in this moment. The engine will be cooled and stopped when the **Rental Timer BOC (page 469)** time elapsed.

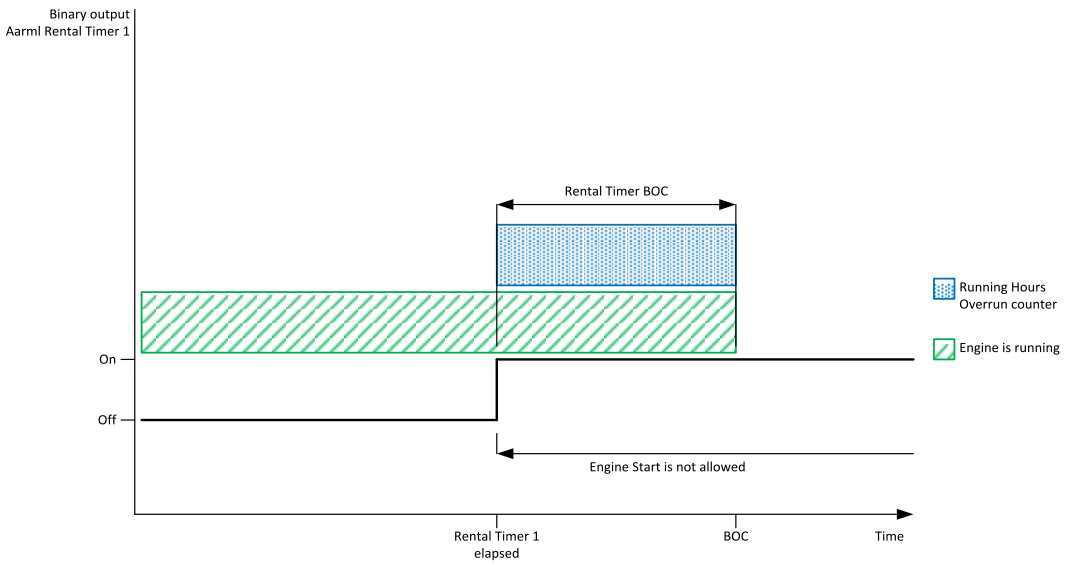



Image 8.35 Rental Timer 1

The Running Hours Overrun counter will start increment when the engine is continue running after the **Rental Timer 1 (page 465)** elapsed.

> ***Note:*** *There is no priority between Rental Timer 1 and Rental Timer 2. The sooner timer will activated the **Rental Timer BOC (page 469)** protection.*

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## Rental Timer 1 Wrn

| | | | |
|---|---|---|---|
| **Setpoint group** | Scheduler | **Related FW** | 2.1.0 |
| **Range [units]** | Disabled / 1.. **Rental Timer 1 (page 465)** [h] | | |
| **Default value** | Disabled | **Alternative config** | NO |
| **Step** | 1 h | | |
| **Comm object** | 14332 | **Related applications** | MINT, SPtM |
| **Config level** | Advanced | | |
| **Setpoint visibility** | Conditioned by the setpoint **Rental Timer 1 (page 465)** | | |
| **Description** | | | |

Alarm **Wrn Rental Timer 1 (page 737)** comes up after xx running hours from adjusting the **Rental Timer 1 (page 465)**. Hours are adjusted by this setpoint.

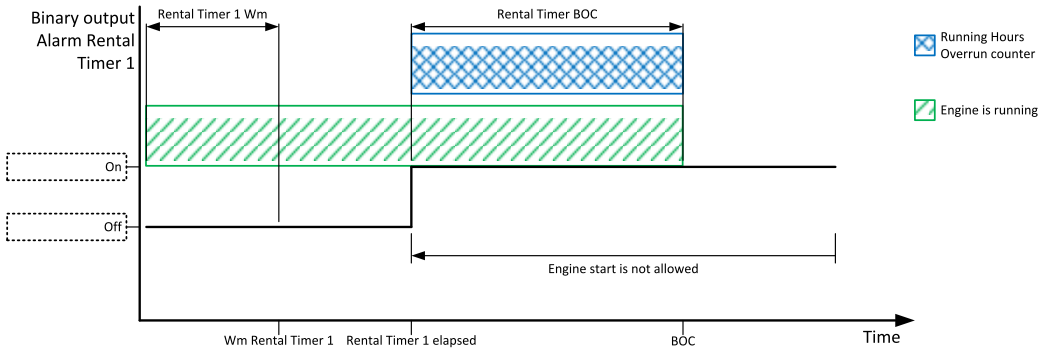



Image 8.36 Rental Timer 1 Wrn

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## Rental Timer 2

| | | | |
|---|---|---|---|
| **Setpoint group** | Scheduler | **Related FW** | 2.1.0 |
| **Range [units]** | [DD/MM/YYYY] | | |
| **Default value** | 01/01/2015 | **Alternative config** | NO |
| **Step** | 1 day | | |
| **Comm object** | 14367 | **Related applications** | MINT, SPtM |
| **Config level** | Advanced | | |
| **Setpoint visibility** | Always | | |
| **Description** | | | |

Another engine start is not allowed when this timer elapsed. This timer is based on date. At the midnight of the last day the alarm **AHl Rental Timer 2 Elapsed (page 740)** will be recorded in alarm list.

**IMPORTANT: To reset Rental Timer 2 (page 467) we have to set up Rental Timer 2 (page 467) again. It means go to setpoint group Scheduler and to the setpoint Rental Timer 2 (page 467). Then press enter button , change the value if it is necessary and press enter button again.**

**IMPORTANT: To disable Rental Timer 2 (page 467) set date to 01/01/2015.**

When the **Rental Timer 2 (page 467)** elapsed during engine run the Gen-set will not stop immediately. The adjustable **Rental Timer BOC (page 469)** timer will start in this moment. The engine will be cooled and stopped when the **Rental Timer BOC (page 469)** time elapsed.

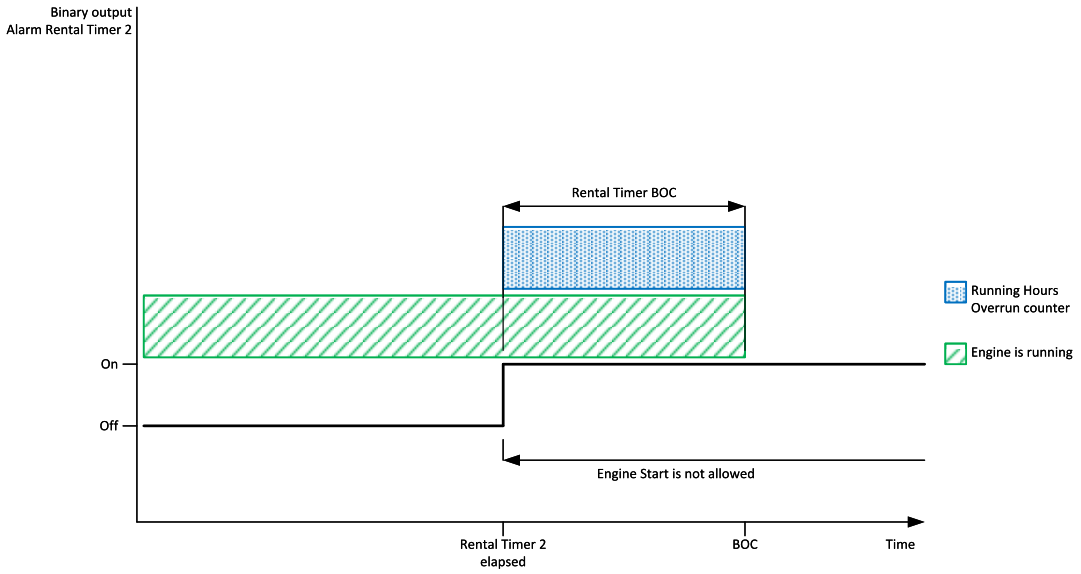



Image 8.37 Rental Timer 2

The Running Hours Overrun counter will start increment when the engine is continue running after the **Rental Timer 2 (page 467)** elapsed.

***Note:** There is no priority between Rental Timer 1 and Rental Timer 2. The sooner timer will activated the **Rental Timer BOC (page 469)** protection.*

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## Rental Timer 2 Wrn

| | | | |
|---|---|---|---|
| **Setpoint group** | Scheduler | **Related FW** | 2.1.0 |
| **Range [units]** | Disabled / 01/01/2015 .. **Rental Timer 2 (page 467)** [DD/MM/YYYY] | | |
| **Default value** | 01/01/2015 | **Alternative config** | NO |
| **Step** | 1 day | | |
| **Comm object** | 14368 | **Related applications** | MINT, SPtM |
| **Config level** | Advanced | | |
| **Setpoint visibility** | Conditioned by the setpoint **Rental Timer 2 (page 467)** | | |
| **Description** | | | |

Alarm **Wrn Rental Timer 2 (page 737)** comes up xx days before the **Rental Timer 2 (page 467)**. Days are adjusted by this setpoint.

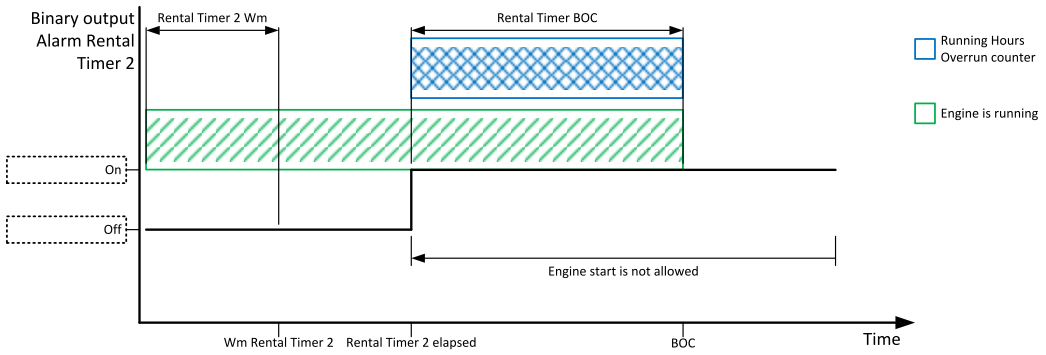



Image 8.38 Rental Timer 2 Wrn

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## Rental Timer BOC

| | | | |
|---|---|---|---|
| **Setpoint group** | Scheduler | **Related FW** | 2.1.0 |
| **Range [units]** | Disabled / 1 .. 210 [h] | | |
| **Default value** | 24 h | **Alternative config** | NO |
| **Step** | 1 h | | |
| **Comm object** | 14334 | **Related applications** | MINT, SPtM |
| **Config level** | Advanced | | |
| **Setpoint visibility** | Conditioned by the setpoints **Rental Timer 1 (page 465)** and **Rental Timer 2 (page 467)** | | |
| **Description** | | | |

This timer will start after **Rental Timer 1 (page 465)** or **Rental Timer 2 (page 467)** elapsed in case that the engine is still running. When this timer elapsed the engine is cooled and stopped.

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## Group: Geo-Fencing

### Subgroup: Geo Fencing

### Geo-Fencing

| | | | |
|---|---|---|---|
| **Setpoint group** | Geo-Fencing | **Related FW** | 2.1.0 |
| **Range [units]** | Disabled / Enabled / LBI Enable [-] | | |
| **Default value** | Disabled | **Alternative config** | NO |
| **Step** | [-] | | |
| **Comm object** | 11681 | **Related applications** | MINT, SPtM |
| **Config level** | Standard | | |
| **Setpoint visibility** | Only if relevant module is installed | | |
| **Description** | | | |

This setpoint enables or disables geo-fencing function.

| | |
|---|---|
| Disabled | **Fence 1 Protection (page 472)** and **Fence 2 Protection (page 474)** are disabled. |
| Enabled | **Fence 1 Protection (page 472)** and **Fence 2 Protection (page 474)** are enabled. |
| LBI Enable | **Fence 1 Protection (page 472)** and **Fence 2 Protection (page 474)** are enabled only when logical binary input .**GEO-FENCING ENABLE (PAGE 620)** is active. |

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### Subgroup: Position

### Home Latitude

| | | | |
|---|---|---|---|
| **Setpoint group** | Geo-Fencing | **Related FW** | 2.1.0 |
| **Range [units]** | -90,0000..90,0000 [°] | | |
| **Default value** | 0,0000 ° | **Alternative config** | NO |
| **Step** | 0,0001 ° | | |
| **Comm object** | 14606 | **Related applications** | MINT, SPtM |
| **Config level** | Standard | | |
| **Setpoint visibility** | Only if relevant module is installed | | |
| **Description** | | | |

This setpoint adjust latitude of "home" position. Home is position where gen-set should runs. Positions on north hemisphere have positive value, position on south hemisphere have negative value.

***Note:*** *This value with **Home Longitude (page 471)** are used for counting **Fence 1 Radius (page 473)** and **Fence 2 Radius (page 475)**.*

***Note:*** *This value can be also obtained automatically via logical binary input **GEO HOME POSITION (PAGE 619)**. In case of activation of this binary input for at least 2 seconds, setpoint will be adjusted automatically from actual coordinates from GPS signal.*

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## Home Longitude

| | | | |
|---|---|---|---|
| **Setpoint group** | Geo-Fencing | **Related FW** | 2.1.0 |
| **Range [units]** | -180,0000..180,0000 [°] | | |
| **Default value** | 0,0000 ° | **Alternative config** | NO |
| **Step** | 0,0001 ° | | |
| **Comm object** | 14607 | **Related applications** | MINT, SPtM |
| **Config level** | Standard | | |
| **Setpoint visibility** | Only if relevant module is installed | | |
| **Description** | | | |

This setpoint adjust longitude of "home" position. Home is position where gen-set should runs. Positions on east hemisphere have positive value, position on west hemisphere have negative value.

***Note:*** *This value with* ***Home Latitude (page 470)*** *are used for counting* ***Fence 1 Radius (page 473)*** *and* ***Fence 2 Radius (page 475)****.*

***Note:*** *This value can be also obtained automatically via logical binary input* ***GEO HOME POSITION (PAGE 619)****. In case of activation of this binary input for at least 2 seconds, setpoint will be adjusted automatically from actual coordinates from GPS signal.*

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## Subgroup: Fence 1

## Fence 1 Protection

| | | | |
|---|---|---|---|
| **Setpoint group** | Geo-Fencing | **Related FW** | 2.1.0 |
| **Range [units]** | HistRecOnl / Wrn / Sd / BOC[-] | | |
| **Default value** | HistRecOnl | **Alternative config** | NO |
| **Step** | [-] | | |
| **Comm object** | 14610 | **Related applications** | MINT, SPtM |
| **Config level** | Standard | | |
| **Setpoint visibility** | Only if relevant module is installed | | |

**Description**

Protection type for geo-fencing 1 protection. Fence of circle area is adjusted by setpoint **Fence 1 Radius (page 473)**. Delay for protection is adjusted by setpoint **Fence 1 Delay (page 473)**.

### Protection types

| | |
|---|---|
| HistRecOnl | Position of gen-set is only measured and displayed on the LCD screen but not used for protection. History record is made if position is out of **Fence 1 Radius (page 473)**. |
| Wrn | Position of Gen-set is used for warning protection only. Protection is activated when position of the Gen-set is out of **Fence 1 Radius (page 473)**. |
| Sd | Position of Gen-set is used for shutdown protection. Protection is activated when position of the Gen-set is out of **Fence 1 Radius (page 473)**. |
| BOC | Position of Gen-set is used for BOC (Breaker Open and Cooling) protection. Protection is activated when position of the Gen-set is out of **Fence 1 Radius (page 473)**. |

***Note:*** *Protection is activated also when GPS signal is lost for **Fence 1 Delay (page 473)**.*

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## Fence 1 Radius

| | | | |
|---|---|---|---|
| **Setpoint group** | Geo-Fencing | **Related FW** | 2.1.0 |
| **Range [units]** | 0,0..99,9 [km] | | |
| **Default value** | 0,0 km | **Alternative config** | NO |
| **Step** | 0,1 km | | |
| **Comm object** | 11677 | **Related applications** | MINT, SPtM |
| **Config level** | Standard | | |
| **Setpoint visibility** | Only if relevant module is installed | | |
| **Description** | | | |
| Radius for circle area 1. When the Gen-set leaves this area, **Fence 1 Protection (page 472)** is activated after **Fence 1 Delay (page 473)**.<br>***Note:*** *The center of this circle area is defined by "Home" position – setpoints* ***Home Longitude (page 471)*** *and* ***Home Latitude (page 470)****.* | | | |

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## Fence 1 Delay

| | | | |
|---|---|---|---|
| **Setpoint group** | Geo-Fencing | **Related FW** | 2.1.0 |
| **Range [units]** | 0..3600 [s] | | |
| **Default value** | 0 s | **Alternative config** | NO |
| **Step** | 1 s | | |
| **Comm object** | 11682 | **Related applications** | MINT, SPtM |
| **Config level** | Standard | | |
| **Setpoint visibility** | Only if relevant module is installed | | |
| **Description** | | | |
| Delay for **Fence 1 Protection (page 472)**. | | | |

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## Subgroup: Fence 2

## Fence 2 Protection

| | | | |
|---|---|---|---|
| **Setpoint group** | Geo-Fencing | **Related FW** | 2.1.0 |
| **Range [units]** | HistRecOnl / Wrn / Sd / BOC[-] | | |
| **Default value** | HistRecOnl | **Alternative config** | NO |
| **Step** | [-] | | |
| **Comm object** | 14611 | **Related applications** | MINT, SPtM |
| **Config level** | Standard | | |
| **Setpoint visibility** | Only if relevant module is installed | | |

**Description**

Protection type for geo-fencing 2 protection. Fence of circle area is adjusted by setpoint **Fence 2 Radius (page 475)**. Delay for protection is adjusted by setpoint **Fence 2 Delay (page 475)**.

### Protection types

| | |
|---|---|
| HistRecOnl | Position of gen-set is only measured and displayed on the LCD screen but not used for protection. History record is made if position is out of **Fence 2 Radius (page 475)**. |
| Wrn | Position of Gen-set is used for warning protection only. Protection is activated when position of the Gen-set is out of **Fence 2 Radius (page 475)**. |
| Sd | Position of Gen-set is used for shutdown protection. Protection is activated when position of the Gen-set is out of **Fence 2 Radius (page 475)**. |
| BOC | Position of Gen-set is used for BOC (Breaker Open and Cooling) protection. Protection is activated when position of the Gen-set is out of **Fence 2 Radius (page 475)**. |

***Note:*** *Protection is activated also when GPS signal is lost for **Fence 2 Delay (page 475)**.*

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## Fence 2 Radius

| | | | |
|---|---|---|---|
| **Setpoint group** | Geo-Fencing | **Related FW** | 2.1.0 |
| **Range [units]** | 0,0..99,9 [km] | | |
| **Default value** | 0,0 km | **Alternative config** | NO |
| **Step** | 0,1 km | | |
| **Comm object** | 14608 | **Related applications** | MINT, SPtM |
| **Config level** | Standard | | |
| **Setpoint visibility** | Only if relevant module is installed | | |
| **Description** | | | |
| Radius for circle area 2. When the Gen-set leaves this area, **Fence 2 Protection (page 474)** is activated after **Fence 2 Delay (page 475)**.<br>***Note:*** *The center of this circle area is defined by "Home" position - setpoints* ***Home Longitude (page 471)*** *and* ***Home Latitude (page 470)****.* | | | |

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## Fence 2 Delay

| | | | |
|---|---|---|---|
| **Setpoint group** | Geo-Fencing | **Related FW** | 2.1.0 |
| **Range [units]** | 0..3600 [s] | | |
| **Default value** | 0 s | **Alternative config** | NO |
| **Step** | 1 s | | |
| **Comm object** | 14609 | **Related applications** | MINT, SPtM |
| **Config level** | Standard | | |
| **Setpoint visibility** | Only if relevant module is installed | | |
| **Description** | | | |
| Delay for **Fence 2 Protection (page 474)**. | | | |

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# Group: Plug-In Modules

## Subgroup: Slot A

## Slot A

| | | | |
|---|---|---|---|
| **Setpoint group** | Plug-In Modules | **Related FW** | 2.1.0 |
| **Range [units]** | ENABLED / DISABLED [-] | | |
| **Default value** | ENABLED | **Alternative config** | NO |
| **Step** | [-] | | |
| **Comm object** | 24280 | **Related applications** | MINT, SPtM |
| **Config level** | Standard | | |
| **Setpoint visibility** | Always | | |

| Description |
| --- |
| This setpoint enable or disable module in slot A. |

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### Subgroup: Slot B

## Slot B

| | | | |
| --- | --- | --- | --- |
| **Setpoint group** | Plug-In Modules | **Related FW** | 2.1.0 |
| **Range [units]** | ENABLED / DISABLED [-] | | |
| **Default value** | ENABLED | **Alternative config** | NO |
| **Step** | [-] | | |
| **Comm object** | 24279 | **Related applications** | MINT, SPtM |
| **Config level** | Standard | | |
| **Setpoint visibility** | Always | | |
| **Description** | | | |
| This setpoint enable or disable module in slot B. | | | |

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### Group: CM-RS232-485

### Subgroup: COM1 Setting

## COM1 Mode

| | | | |
| --- | --- | --- | --- |
| **Setpoint group** | CM-RS232-485 | **Related FW** | 2.1.0 |
| **Range [units]** | Direct / MODBUS [-] | | |
| **Default value** | Direct | **Alternative config** | NO |
| **Step** | [-] | | |
| **Comm object** | 24522 | **Related applications** | MINT, SPtM |
| **Config level** | Standard | | |
| **Setpoint visibility** | Only if relevant module is installed | | |
| **Description** | | | |
| Communication protocol switch for the COM1 channel. | | | |

| | |
| --- | --- |
| Direct | InteliConfig communication protocol via serial cable. |
| MODBUS | MODBUS protocol. |

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## COM1 Communication Speed

| | | | |
|---|---|---|---|
| **Setpoint group** | CM-RS232-485 | **Related FW** | 2.1.0 |
| **Range [units]** | 9600 / 19200 / 38400 / 57600 / 115200[bps] | | |
| **Default value** | 57600 bps | **Alternative config** | NO |
| **Step** | [-] | | |
| **Comm object** | 24341 | **Related applications** | MINT, SPtM |
| **Config level** | Standard | | |
| **Setpoint visibility** | Only if relevant module is installed + conditioned by the setpoint **COM1 Mode (page 476)** | | |
| **Description** | | | |
| If the direct mode is selected on COM1 channel, the direct communication speed of controller part of line can be adjusted here. Speed of second part of line has to be adjusted to the same value. | | | |

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## COM1 MODBUS Communication Speed

| | | | |
|---|---|---|---|
| **Setpoint group** | CM-RS232-485 | **Related FW** | 2.1.0 |
| **Range [units]** | 9600 / 19200 / 38400 / 57600 / 115200 [bps] | | |
| **Default value** | 9600 bps | **Alternative config** | NO |
| **Step** | [-] | | |
| **Comm object** | 24477 | **Related applications** | MINT, SPtM |
| **Config level** | Standard | | |
| **Setpoint visibility** | Only if relevant module is installed + conditioned by the setpoint **COM1 Mode (page 476)** | | |
| **Description** | | | |
| If the MODBUS mode is selected on COM1 channel, the MODBUS communication speed can be adjusted here. | | | |

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## Subgroup: COM2 Setting

## COM2 Mode

| | | | |
|---|---|---|---|
| **Setpoint group** | CM-RS232-485 | **Related FW** | 2.1.0 |
| **Range [units]** | Direct / MODBUS [-] | | |
| **Default value** | Direct | **Alternative config** | NO |
| **Step** | [-] | | |
| **Comm object** | 24451 | **Related applications** | MINT, SPtM |
| **Config level** | Standard | | |
| **Setpoint visibility** | Only if relevant module is installed | | |
| **Description** | | | |

Communication protocol switch for the COM2 channel.

| | |
|---|---|
| Direct | InteliConfig communication protocol via serial cable. |
| MODBUS | MODBUS protocol. |

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## COM2 Communication Speed

| | | | |
|---|---|---|---|
| **Setpoint group** | CM-RS232-485 | **Related FW** | 2.1.0 |
| **Range [units]** | 9600 / 19200 / 38400 / 57600 / 115200[bps] | | |
| **Default value** | 57600 bps | **Alternative config** | NO |
| **Step** | [-] | | |
| **Comm object** | 24340 | **Related applications** | MINT, SPtM |
| **Config level** | Standard | | |
| **Setpoint visibility** | Only if relevant module is installed + conditioned by the setpoint **COM2 Mode (page 478)** | | |
| **Description** | | | |

If the direct mode is selected on COM2 channel, the direct communication speed of controller part of line can be adjusted here. Speed of second part of line has to be adjusted to the same value.

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## COM2 MODBUS Communication Speed

| | | | |
|---|---|---|---|
| **Setpoint group** | CM-RS232-485 | **Related FW** | 2.1.0 |
| **Range [units]** | 9600 / 19200 / 38400 / 57600 / 115200 [bps] | | |
| **Default value** | 9600 bps | **Alternative config** | NO |
| **Step** | [-] | | |
| **Comm object** | 24420 | **Related applications** | MINT, SPtM |
| **Config level** | Standard | | |
| **Setpoint visibility** | Only if relevant module is installed + conditioned by the setpoint **COM2 Mode (page 478)** | | |
| **Description** | | | |
| If the MODBUS mode is selected on COM2 channel, the MODBUS communication speed can be adjusted here. | | | |

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# Group: CM-4G-GPS

## Subgroup: Cellular Interface

## Internet Connection

| | | | |
|---|---|---|---|
| **Setpoint group** | CM-4G-GPS | **Related FW** | 2.1.0 |
| **Range [units]** | Enabled / Disabled [-] | | |
| **Default value** | Enabled | **Alternative config** | NO |
| **Step** | [-] | | |
| **Comm object** | 24315 | **Related applications** | MINT, SPtM |
| **Config level** | Standard | | |
| **Setpoint visibility** | Only if relevant module is installed | | |
| **Description** | | | |
| This setpoint adjust the communication mode of module. | | | |

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## Network Mode

| | | | |
|---|---|---|---|
| **Setpoint group** | CM-4G-GPS | **Related FW** | 2.1.0 |
| **Range [units]** | 2G / 3G / 4G / Automatic [-] | | |
| **Default value** | Automatic | **Alternative config** | NO |
| **Step** | [-] | | |
| **Comm object** | 24132 | **Related applications** | MINT, SPtM |
| **Config level** | Standard | | |
| **Setpoint visibility** | Only if relevant module is installed | | |
| **Description** | | | |
| This setpoint adjusts preferred connection type of CM2-4G-GPS module. | | | |

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## Access Point Name

| | | | |
|---|---|---|---|
| **Setpoint group** | CM-4G-GPS | **Related FW** | 2.1.0 |
| **Range [units]** | 0 .. 31 characters [-] | | |
| **Default value** | internet | **Alternative config** | NO |
| **Step** | [-] | | |
| **Comm object** | 24363 | **Related applications** | MINT, SPtM |
| **Config level** | Standard | | |
| **Setpoint visibility** | Only if relevant module is installed + conditioned by the setpoint **Internet Connection (page 479)** | | |
| **Description** | | | |
| APN (Access Point Name) of the network, provided by GSM operator. | | | |

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## Connection Check IP1

| | | | |
|---|---|---|---|
| **Setpoint group** | CM-4G-GPS | **Related FW** | 2.1.0 |
| **Range [units]** | [-] | | |
| **Default value** | "empty" | **Alternative config** | NO |
| **Step** | [-] | | |
| **Comm object** | 23978 | **Related applications** | MINT, SPtM |
| **Config level** | Standard | | |
| **Setpoint visibility** | Only if relevant module is installed + conditioned by the setpoint **Internet Connection (page 479)** | | |

**Description**

IP address of reliable server in the internet.

To provide maximal reliability of wireless cellular connection the module is equipped with function that periodically checks the data connection over the cellular network is working.

This function is based on periodical sending of ICMP messages (known as "ping") to reliable servers in the internet and checking of their responses. If there is not any response received from any of the servers (at least one setpoint Connection Check IP1, IP2, IP3 is filled with IP address) for certain time period, the cellular connection is considered as non-working and the module will close and reestablish the connection.

If all three servers are not defined (setpoints Connection Check IP1, IP2, IP3 have empty addresses) then the cellular connection check is disabled

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## Connection Check IP2

| | | | |
|---|---|---|---|
| **Setpoint group** | CM-4G-GPS | **Related FW** | 2.1.0 |
| **Range [units]** | [-] | | |
| **Default value** | "empty" | **Alternative config** | NO |
| **Step** | [-] | | |
| **Comm object** | 23977 | **Related applications** | MINT, SPtM |
| **Config level** | Standard | | |
| **Setpoint visibility** | Only if relevant module is installed + conditioned by the setpoint **Internet Connection (page 479)** | | |

**Description**

IP address of reliable server in the internet.

To provide maximal reliability of wireless cellular connection the module is equipped with function that periodically checks the data connection over the cellular network is working.

This function is based on periodical sending of ICMP messages (known as "ping") to reliable servers in the internet and checking of their responses. If there is not any response received from any of the servers (at least one setpoint Connection Check IP1, IP2, IP3 is filled with IP address) for certain time period, the cellular connection is considered as non-working and the module will close and reestablish the connection.

If all three servers are not defined (setpoints Connection Check IP1, IP2, IP3 have empty addresses) then the cellular connection check is disabled

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## Connection Check IP3

| | | | |
|---|---|---|---|
| **Setpoint group** | CM-4G-GPS | **Related FW** | 2.1.0 |
| **Range [units]** | [-] | | |
| **Default value** | "empty" | **Alternative config** | NO |
| **Step** | [-] | | |
| **Comm object** | 23976 | **Related applications** | MINT, SPtM |
| **Config level** | Standard | | |
| **Setpoint visibility** | Only if relevant module is installed + conditioned by the setpoint **Internet Connection (page 479)** | | |

**Description**

IP address of reliable server in the internet.

To provide maximal reliability of wireless cellular connection the module is equipped with function that periodically checks the data connection over the cellular network is working.

This function is based on periodical sending of ICMP messages (known as "ping") to reliable servers in the internet and checking of their responses. If there is not any response received from any of the servers (at least one setpoint Connection Check IP1, IP2, IP3 is filled with IP address) for certain time period, the cellular connection is considered as non-working and the module will close and reestablish the connection.

If all three servers are not defined (setpoints Connection Check IP1, IP2, IP3 have empty addresses) then the cellular connection check is disabled

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## Subgroup: TCP/IP Settings

## DNS Mode

| | | | |
|---|---|---|---|
| **Setpoint group** | CM-4G-GPS | **Related FW** | 2.1.0 |
| **Range [units]** | Automatic / Manual [-] | | |
| **Default value** | Automatic | **Alternative config** | NO |
| **Step** | [-] | | |
| **Comm object** | 23988 | **Related applications** | MINT, SPtM |
| **Config level** | Standard | | |
| **Setpoint visibility** | Only if relevant module is installed | | |
| **Description** | | | |

This setpoint enables to enter DNS server addresses manually, even with the **Internet Connection (page 479)** set to Automatic.

| | |
|---|---|
| Automatic | DNS server addresses automatically obtained from a DHCP server are used |
| Manual | **DNS IP Address 1 (page 484)** and **DNS IP Address 2 (page 485)** can be adjusted manually. Use this option to resolve e.g. internet access policy related issue, if local DNS server addresses automatically obtained from a DHCP server do not work |

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## DNS IP Address 1

| | | | |
|---|---|---|---|
| **Setpoint group** | CM-4G-GPS | **Related FW** | 2.1.0 |
| **Range [units]** | Valid IP address [-] | | |
| **Default value** | 8.8.8.8 | **Alternative config** | NO |
| **Step** | [-] | | |
| **Comm object** | 24314 | **Related applications** | MINT, SPtM |
| **Config level** | Standard | | |
| **Setpoint visibility** | Only if relevant module is installed | | |
| **Description** | | | |

The setpoint is used to select the method how the DNS Address 1 is adjusted.

If **DNS Mode (page 484)** is MANUAL this setpoint is used to adjust the domain name server (DNS), which is needed to translate domain names in email addresses and server names into correct IP addresses.

If **DNS Mode (page 484)** is AUTOMATIC this setpoint is inactive. The DNS server IP address is assigned by the DHCP server.

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## DNS IP Address 2

| | | | |
|---|---|---|---|
| **Setpoint group** | CM-4G-GPS | **Related FW** | 2.1.0 |
| **Range [units]** | Valid IP address [-] | | |
| **Default value** | 8.8.8.8 | **Alternative config** | NO |
| **Step** | [-] | | |
| **Comm object** | 23986 | **Related applications** | MINT, SPtM |
| **Config level** | Standard | | |
| **Setpoint visibility** | Only if relevant module is installed | | |
| **Description** | | | |

The setpoint is used to select the method how the DNS Address 2 is adjusted.

If **DNS Mode (page 484)** is FIXED this setpoint is used to adjust the domain name server (DNS), which is needed to translate domain names in email addresses and server names into correct IP addresses.

If **DNS Mode (page 484)** is AUTOMATIC this setpoint is inactive. The DNS server IP address is assigned by the DHCP server.

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## IP Firewall

| | | | |
|---|---|---|---|
| **Setpoint group** | CM-4G-GPS | **Related FW** | 2.1.0 |
| **Range [units]** | ENABLED / DISABLED [-] | | |
| **Default value** | DISABLED | **Alternative config** | NO |
| **Step** | [-] | | |
| **Comm object** | 23959 | **Related applications** | MINT, SPtM |
| **Config level** | Standard | | |
| **Setpoint visibility** | Only if relevant module is installed | | |
| **Description** | | | |

This setpoints enables to switch on the built-in Firewall functionality.

| | |
|---|---|
| DISABLED | The firewall function is switched off |
| ENABLED | The firewall function is switched on, use InteliConfig to setup the firewall rules (configuration card Others – Firewall) |

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## Subgroup: AirGate Settings

## AirGate Connection

| | | | |
|---|---|---|---|
| **Setpoint group** | CM-4G-GPS | **Related FW** | 2.1.0 |
| **Range [units]** | Disabled/ Enabled [-] | | |
| **Default value** | Enabled | **Alternative config** | NO |
| **Step** | [-] | | |
| **Comm object** | 23968 | **Related applications** | MINT, SPtM |
| **Config level** | Standard | | |
| **Setpoint visibility** | Only if relevant module is installed + conditioned by the setpoint **Internet Connection (page 479)** | | |
| **Description** | | | |

This setpoint enable or disable AirGate connection via CM2-4G-GPS.

| | |
|---|---|
| DISABLED: | Only SMS are sent. Internet-enabled SIM card is not required. AirGate is not used. |
| ENABLED | This mode uses the "AirGate" service. Internet-enabled SIM card must be used. The AirGate server address is adjusted by the setpoint **AirGate Address (page 506)**. |

> **IMPORTANT: When this setpoint is changed the controller has to be restarted to apply changes.**

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## AirGate Address

| | | | |
|---|---|---|---|
| **Setpoint group** | CM-4G-GPS; CM-Ethernet | **Related FW** | 2.1.0 |
| **Range [units]** | [-] | | |
| **Default value** | global.airgate.link | **Alternative config** | NO |
| **Step** | [-] | | |
| **Comm object** | 24364 | **Related applications** | MINT, SPtM |
| **Config level** | Standard | | |
| **Setpoint visibility** | Only if relevant module is installed + conditioned by the setpoint **Internet Connection (page 479)** | | |
| **Description** | | | |

This setpoint is used for entering the domain name or IP address of the AirGate server. Use the free AirGate server provided by ComAp at global.airgate.link.

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## Airgate Port

| | | | |
|---|---|---|---|
| **Setpoint group** | CM-4G-GPS | **Related FW** | 2.1.0 |
| **Range [units]** | 1 .. 65535 [-] | | |
| **Default value** | 54440 | **Alternative config** | NO |
| **Step** | 1 | | |
| **Comm object** | 24091 | **Related applications** | MINT, SPtM |
| **Config level** | Standard | | |
| **Setpoint visibility** | Only if relevant module is installed + conditioned by the setpoint **Internet Connection (page 479)** | | |
| **Description** | | | |
| This port is used for TCP communication with the AirGate server.<br>***Note:*** *Use port 54440 for standard ComAp AirGate service.* | | | |

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## Subgroup: ComAp Client Settings

## Direct Connection

| | | | |
|---|---|---|---|
| **Setpoint group** | CM-4G-GPS | **Related FW** | 2.1.0 |
| **Range [units]** | Disabled / Enabled [-] | | |
| **Default value** | Enabled | **Alternative config** | NO |
| **Step** | [-] | | |
| **Comm object** | 23961 | **Related applications** | MINT, SPtM |
| **Config level** | Standard | | |
| **Setpoint visibility** | Only if relevant module is installed | | |
| **Description** | | | |
| Use this to enable/disable direct connection of a ComAp client (e.g. InteliConfig) to the IP address of the controller.<br>***Note:*** *For Direct connection the controller IP address must be reachable from the client IP address.* | | | |

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## Direct Connection Port

| | | | |
|---|---|---|---|
| **Setpoint group** | CM-4G-GPS | **Related FW** | 2.1.0 |
| **Range [units]** | 1 .. 65535 [-] | | |
| **Default value** | 23 | **Alternative config** | NO |
| **Step** | [-] | | |
| **Comm object** | 23960 | **Related applications** | MINT, SPtM |
| **Config level** | Standard | | |
| **Setpoint visibility** | Only if relevant module is installed | | |
| **Description** | | | |
| This port is used to listen for an incoming TCP connection if Direct Connection is ENABLED. | | | |

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## ComAp Client Inactivity Timeout

| | | | |
|---|---|---|---|
| **Setpoint group** | CM-4G-GPS | **Related FW** | 2.1.0 |
| **Range [units]** | 0 .. 600 [s] | | |
| **Default value** | 60 s | **Alternative config** | NO |
| **Step** | 1 s | | |
| **Comm object** | 24098 | **Related applications** | MINT, SPtM |
| **Config level** | Standard | | |
| **Setpoint visibility** | Only if relevant module is installed | | |
| **Description** | | | |
| Connection (TCP socket) is closed by controller, if a client (e.g. InteliConfig) does not communicate for this time. This timeout applies to both direct and AirGate connection. | | | |

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## Subgroup: E-mail Settings

## SMTP Server Address

| | | | |
|---|---|---|---|
| **Setpoint group** | CM-4G-GPS | **Related FW** | 2.1.0 |
| **Range [units]** | 0 .. 31 characters [-] | | |
| **Default value** | global.airgate.link:9925 | **Alternative config** | NO |
| **Step** | [-] | | |
| **Comm object** | 23962 | **Related applications** | MINT, SPtM |
| **Config level** | Standard | | |
| **Setpoint visibility** | Only if relevant module is installed | | |
| **Description** | | | |

This setpoint is used for entering the domain name (e.g. smtp.yourprovider.com) or IP address (e.g. 74.125.39.109) or number of port (with colon like a first mark) of the SMTP server. Ask your internet provider or IT manager for this information.

> ***Note:*** *You may use also any public SMTP server which does not require connection over SSL/TLS channels. If the device is connected to AirGate the AirGate SMTP server at "global.airgate.link" may be used. Ports 25 and 9925 are supported. After controller connects to AirGate for the first time (or with new public IP address), it may not be able to send emails for first 5-10 minutes.*

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## SMTP Sender Address

| | | | |
|---|---|---|---|
| **Setpoint group** | CM-4G-GPS | **Related FW** | 2.1.0 |
| **Range [units]** | 0 .. 31 characters [-] | | |
| **Default value** | [-] | **Alternative config** | NO |
| **Step** | [-] | | |
| **Comm object** | 24310 | **Related applications** | MINT, SPtM |
| **Config level** | Standard | | |
| **Setpoint visibility** | Only if relevant module is installed | | |
| **Description** | | | |

Enter an existing email address into this setpoint. This address will be used as sender address in active e-mails that will be sent from the controller.

> ***Note:*** *It is not needed to enter an existing email address, nevertheless valid email format needs to be followed.*

> **IMPORTANT: This item is obligatory when emails are configured.**

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## SMTP User Name

| | | | |
|---|---|---|---|
| **Setpoint group** | CM-4G-GPS | **Related FW** | 2.1.0 |
| **Range [units]** | 0 .. 31 characters [-] | | |
| **Default value** | [-] | **Alternative config** | NO |
| **Step** | [-] | | |
| **Comm object** | 24313 | **Related applications** | MINT, SPtM |
| **Config level** | Standard | | |
| **Setpoint visibility** | Only if relevant module is installed | | |
| **Description** | | | |
| Use this setpoint to enter the username for the SMTP server. Leave the setpoint blank if the SMTP server does not require authentication. | | | |

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## SMTP User Password

| | | | |
|---|---|---|---|
| **Setpoint group** | CM-4G-GPS | **Related FW** | 2.1.0 |
| **Range [units]** | 0 .. 15 characters [-] | | |
| **Default value** | [-] | **Alternative config** | NO |
| **Step** | [-] | | |
| **Comm object** | 24312 | **Related applications** | MINT, SPtM |
| **Config level** | Standard | | |
| **Setpoint visibility** | Only if relevant module is installed | | |
| **Description** | | | |
| Use this setpoint to enter the password for the SMTP server. Leave the setpoint blank if the SMTP server does not require authentication. | | | |

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## SMTP Encryption

| | | | |
|---|---|---|---|
| **Setpoint group** | CM-4G-GPS | **Related FW** | 2.1.0 |
| **Range [units]** | None / SSL-TLS / STARTTLS [-] | | |
| **Default value** | None | **Alternative config** | NO |
| **Step** | [-] | | |
| **Comm object** | 23965 | **Related applications** | MINT, SPtM |
| **Config level** | Standard | | |
| **Setpoint visibility** | Only if relevant module is installed + conditioned by the setpoint **Internet Connection (page 479)** | | |
| **Description** | | | |

Encryption settings of SMTP communication.

| | |
|---|---|
| NONE | E-SMTP protocol without encryption is used. |
| STARTTLS | Communication is started without encryption and then is switched to TLS encryption. |
| TLS | Communication runs in TLS encryption. |

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## Email Address 1

| | | | |
|---|---|---|---|
| **Setpoint group** | CM-4G-GPS<br>CM-Ethernet<br>Ethernet | **Related FW** | 2.1.0 |
| **Range [units]** | 0 .. 63 characters [-] | | |
| **Default value** | [-] | **Alternative config** | NO |
| **Step** | [-] | | |
| **Comm object** | 24298 | **Related applications** | MINT, SPtM |
| **Config level** | Standard | | |
| **Setpoint visibility** | Only if relevant module is installed | | |
| **Description** | | | |

Enter in this setpoint a valid e-mail address where the alarm and event e-mails shall be sent. Leave this setpoint blank if alarm and event email should not be send.

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## Email Address 2

| | | | |
|---|---|---|---|
| **Setpoint group** | CM-4G-GPS<br>CM-Ethernet<br>Ethernet | **Related FW** | 2.1.0 |
| **Range [units]** | 0 .. 63 characters [-] | | |
| **Default value** | [-] | **Alternative config** | NO |
| **Step** | [-] | | |
| **Comm object** | 24297 | **Related applications** | MINT, SPtM |
| **Config level** | Standard | | |
| **Setpoint visibility** | Only if relevant module is installed | | |
| **Description** | | | |
| Enter in this setpoint a valid e-mail address where the alarm and event e-mails shall be sent. Leave this setpoint blank if alarm and event email should not be send. | | | |

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## Email Address 3

| | | | |
|---|---|---|---|
| **Setpoint group** | CM-4G-GPS<br>CM-Ethernet<br>Ethernet | **Related FW** | 2.1.0 |
| **Range [units]** | 0 .. 63 characters [-] | | |
| **Default value** | [-] | **Alternative config** | NO |
| **Step** | [-] | | |
| **Comm object** | 24145 | **Related applications** | MINT, SPtM |
| **Config level** | Standard | | |
| **Setpoint visibility** | Only if relevant module is installed | | |
| **Description** | | | |
| Enter in this setpoint a valid e-mail address where the alarm and event e-mails shall be sent. Leave this setpoint blank if alarm and event email should not be send. | | | |

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## Email Address 4

| | | | |
|---|---|---|---|
| **Setpoint group** | CM-4G-GPS<br>CM-Ethernet<br>Ethernet | **Related FW** | 2.1.0 |
| **Range [units]** | 0 .. 63 characters [-] | | |
| **Default value** | [-] | **Alternative config** | NO |
| **Step** | [-] | | |
| **Comm object** | 24144 | **Related applications** | MINT, SPtM |
| **Config level** | Standard | | |
| **Setpoint visibility** | Only if relevant module is installed | | |
| **Description** | | | |
| Enter in this setpoint a valid e-mail address where the alarm and event e-mails shall be sent. Leave this setpoint blank if alarm and event email should not be send. | | | |

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## Subgroup: Message Settings

## E-mail/SMS Language

| | | | |
|---|---|---|---|
| **Setpoint group** | CM-4G-GPS<br>CM-Ethernet | **Related FW** | 2.1.0 |
| **Range [units]** | Depends on CU languages [-] | | |
| **Default value** | English | **Alternative config** | NO |
| **Step** | [-] | | |
| **Comm object** | 24299 | **Related applications** | MINT, SPtM |
| **Config level** | Standard | | |
| **Setpoint visibility** | Only if relevant module is installed | | |
| **Description** | | | |
| Use this setpoint to set the language of SMS and e-mail.<br>This setpoint is common for CM3-Ethernet and CM2-4G-GPS modules. | | | |

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## Event Message

| | | | |
|---|---|---|---|
| **Setpoint group** | CM-4G-GPS<br>CM-Ethernet | **Related FW** | 2.1.0 |
| **Range [units]** | ON / OFF [-] | | |
| **Default value** | ON | **Alternative config** | NO |
| **Step** | [-] | | |
| **Comm object** | 10926 | **Related applications** | MINT, SPtM |
| **Config level** | Standard | | |
| **Setpoint visibility** | Only if relevant module is installed | | |
| **Description** | | | |
| This setpoint enables or disables Event Messages.<br>This setpoint is common for CM3-Ethernet and CM2-4G-GPS modules. | | | |

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## Wrn Message

| | | | |
|---|---|---|---|
| **Setpoint group** | CM-4G-GPS<br>CM-Ethernet | **Related FW** | 2.1.0 |
| **Range [units]** | ON / OFF [-] | | |
| **Default value** | ON | **Alternative config** | NO |
| **Step** | [-] | | |
| **Comm object** | 8482 | **Related applications** | MINT, SPtM |
| **Config level** | Standard | | |
| **Setpoint visibility** | Only if relevant module is installed | | |
| **Description** | | | |
| This setpoint enables or disables Wrn Messages.<br>This setpoint is common for CM3-Ethernet and CM2-4G-GPS modules. | | | |

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## BOC Message

| | | | |
|---|---|---|---|
| **Setpoint group** | CM-4G-GPS<br>CM-Ethernet | **Related FW** | 2.1.0 |
| **Range [units]** | ON / OFF [-] | | |
| **Default value** | ON | **Alternative config** | NO |
| **Step** | [-] | | |
| **Comm object** | 10566 | **Related applications** | MINT, SPtM |
| **Config level** | Standard | | |
| **Setpoint visibility** | Only if relevant module is installed | | |
| **Description** | | | |
| This setpoint enables or disables BOC Messages.<br>This setpoint is common for CM3-Ethernet and CM2-4G-GPS modules. | | | |

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## Sd Message

| | | | |
|---|---|---|---|
| **Setpoint group** | CM-4G-GPS<br>CM-Ethernet | **Related FW** | 2.1.0 |
| **Range [units]** | ON / OFF [-] | | |
| **Default value** | ON | **Alternative config** | NO |
| **Step** | [-] | | |
| **Comm object** | 8484 | **Related applications** | MINT, SPtM |
| **Config level** | Standard | | |
| **Setpoint visibility** | Only if relevant module is installed | | |
| **Description** | | | |
| This setpoint enables or disables Sd Message.<br>This setpoint is common for CM3-Ethernet and CM2-4G-GPS modules. | | | |

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## Telephone Number 1

| | | | |
|---|---|---|---|
| **Setpoint group** | CM-4G-GPS | **Related FW** | 2.1.0 |
| **Range [units]** | 0 .. 31 characters [-] | | |
| **Default value** | [-] | **Alternative config** | NO |
| **Step** | [-] | | |
| **Comm object** | 24296 | **Related applications** | MINT, SPtM |
| **Config level** | Standard | | |
| **Setpoint visibility** | Only if relevant module is installed | | |
| **Description** | | | |

Enter in this setpoint a valid GSM phone number where the alarm messages shall be sent. For GSM numbers use either the national format (i.e. the number you would dial if you wanted to make a local call) or the full international format beginning with a "+" character followed by the country prefix.

> **IMPORTANT: Telephone number has to be entered without spaces.**

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## Telephone Number 2

| | | | |
|---|---|---|---|
| **Setpoint group** | CM-4G-GPS | **Related FW** | 2.1.0 |
| **Range [units]** | 0 .. 31 characters [-] | | |
| **Default value** | [-] | **Alternative config** | NO |
| **Step** | [-] | | |
| **Comm object** | 24295 | **Related applications** | MINT, SPtM |
| **Config level** | Standard | | |
| **Setpoint visibility** | Only if relevant module is installed | | |
| **Description** | | | |

Enter in this setpoint a valid GSM phone number where the alarm messages shall be sent. For GSM numbers use either the national format (i.e. the number you would dial if you wanted to make a local call) or the full international format beginning with a "+" character followed by the country prefix.

> **IMPORTANT: Telephone number has to be entered without spaces.**

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## Telephone Number 3

| | | | |
|---|---|---|---|
| **Setpoint group** | CM-4G-GPS | **Related FW** | 2.1.0 |
| **Range [units]** | 0 .. 31 characters [-] | | |
| **Default value** | [-] | **Alternative config** | NO |
| **Step** | [-] | | |
| **Comm object** | 24143 | **Related applications** | MINT, SPtM |
| **Config level** | Standard | | |
| **Setpoint visibility** | Only if relevant module is installed | | |
| **Description** | | | |
| Enter in this setpoint a valid GSM phone number where the alarm messages shall be sent. For GSM numbers use either the national format (i.e. the number you would dial if you wanted to make a local call) or the full international format beginning with a "+" character followed by the country prefix.<br>**IMPORTANT: Telephone number has to be entered without spaces.** | | | |

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## Telephone Number 4

| | | | |
|---|---|---|---|
| **Setpoint group** | CM-4G-GPS | **Related FW** | 2.1.0 |
| **Range [units]** | 0 .. 31 characters [-] | | |
| **Default value** | [-] | **Alternative config** | NO |
| **Step** | [-] | | |
| **Comm object** | 24142 | **Related applications** | MINT, SPtM |
| **Config level** | Standard | | |
| **Setpoint visibility** | Only if relevant module is installed | | |
| **Description** | | | |
| Enter in this setpoint a valid GSM phone number where the alarm messages shall be sent. For GSM numbers use either the national format (i.e. the number you would dial if you wanted to make a local call) or the full international format beginning with a "+" character followed by the country prefix.<br>**IMPORTANT: Telephone number has to be entered without spaces.** | | | |

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## Subgroup: GPS Settings

### GPS Tracking

| | | | |
|---|---|---|---|
| **Setpoint group** | CM-4G-GPS | **Related FW** | 2.1.0 |
| **Range [units]** | Enabled / Disabled [-] | | |
| **Default value** | Enabled | **Alternative config** | NO |
| **Step** | [-] | | |
| **Comm object** | 23975 | **Related applications** | MINT, SPtM |
| **Config level** | Standard | | |
| **Setpoint visibility** | Only if relevant module is installed + conditioned by the setpoint **Internet Connection (page 479)** | | |
| **Description** | | | |
| If GPS tracking is enabled the module sends position/speed data to the controller with period 10 s. | | | |

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## Subgroup: RTC Synchronization

### NTP Clock Sync

| | | | |
|---|---|---|---|
| **Setpoint group** | CM-4G-GPS | **Related FW** | 2.1.0 |
| **Range [units]** | DISABLED / ENABLED [-] | | |
| **Default value** | DISABLED | **Alternative config** | NO |
| **Step** | [-] | | |
| **Comm object** | 23964 | **Related applications** | MINT, SPtM |
| **Config level** | Standard | | |
| **Setpoint visibility** | Only if relevant module is installed | | |
| **Description** | | | |
| This setpoint is used to enable/disable controller time synchronization with exact time from an NTP server.<br>The period of synchronization is 1 hour or when the cotnroller is reset or when the setpoint is reset (Enabled->Disabled->Enabled). | | | |

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## NTP Server

| | | | |
|---|---|---|---|
| **Setpoint group** | CM-4G-GPS | **Related FW** | 2.1.0 |
| **Range [units]** | [-] | | |
| **Default value** | pool.ntp.org | **Alternative config** | NO |
| **Step** | [-] | | |
| **Comm object** | 23963 | **Related applications** | MINT, SPtM |
| **Config level** | Standard | | |
| **Setpoint visibility** | Only if relevant module is installed | | |
| **Description** | | | |
| NTP server address. | | | |

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## GPS Clock Sync

| | | | |
|---|---|---|---|
| **Setpoint group** | CM-4G-GPS | **Related FW** | 2.1.0 |
| **Range [units]** | Enabled / Disabled [-] | | |
| **Default value** | Enabled | **Alternative config** | NO |
| **Step** | [-] | | |
| **Comm object** | 23974 | **Related applications** | MINT, SPtM |
| **Config level** | Standard | | |
| **Setpoint visibility** | Only if relevant module is installed + conditioned by the setpoint **Internet Connection (page 479)** | | |
| **Description** | | | |
| This setpoint is used to enable/disable synchronization of the controller's time with the exact time from GPS.<br>The module sends UTC timestamp to the controller after reset/power on and then in period of 60 minutes. | | | |

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## Time Zone

| | | | |
|---|---|---|---|
| **Setpoint group** | CM-4G-GPS<br>CM-Ethernet | **Related FW** | 2.1.0 |
| **Range [units]** | GMT-12:00 .. GMT+13:00 [hours] | | |
| **Default value** | GMT+1:00 hour | **Alternative config** | NO |
| **Step** | [-] | | |
| **Comm object** | 24366 | **Related applications** | MINT, SPtM |
| **Config level** | Standard | | |
| **Setpoint visibility** | Only if relevant module is installed | | |
| **Description** | | | |

This setpoint is used to select the time zone where the controller is located. See your computer time zone setting (click on the time indicator located in the rightmost position of the Windows task bar) if you are not sure about your time zone.

> ***Note:*** *If the time zone is not selected properly the active e-mails may contain incorrect information about sending time, which may result in confusion when the respective problem actually occurred.*

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## Group: CM-Ethernet

## Subgroup: TCP/IP Settings

# IP Address Mode

| | | | |
|---|---|---|---|
| **Setpoint group** | CM-Ethernet | **Related FW** | 2.1.0 |
| **Range [units]** | MANUAL / AUTOMATIC / DISABLED [-] | | |
| **Default value** | AUTOMATIC | **Alternative config** | NO |
| **Step** | [-] | | |
| **Comm object** | 23939 | **Related applications** | MINT, SPtM |
| **Config level** | Standard | | |
| **Setpoint visibility** | Only if relevant module is installed | | |

**Description**

The setpoint is used to select the method how the ethernet connection is adjusted.

| | |
|---|---|
| MANUAL | The Ethernet connection is fixed by means of the setpoints IP Addr, NetMask, GateIP, DNS IP Address.<br>This method should be used for a classic Ethernet or internet connection. When this type of connection opens, the controller is specified by its IP address. This means that it would be inconvenient if the IP address were not fixed (static). |
| AUTOMATIC | The Ethernet connection setting is obtained **automatically from the DHCP server**. The obtained settings are then copied to the related setpoints. If the process of obtaining the settings from the DHCP server is not successful, the value *000.000.000.000* is copied to the setpoint IP address and the module continues to try to obtain the settings. |
| DISABLED | The Ethernet terminal is disabled. |

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## IP Address

| | | | |
|---|---|---|---|
| **Setpoint group** | CM-Ethernet | **Related FW** | 2.1.0 |
| **Range [units]** | 0 .. 15 characters [-] | | |
| **Default value** | 192.168.1.254 | **Alternative config** | NO |
| **Step** | [-] | | |
| **Comm object** | 23950 | **Related applications** | MINT, SPtM |
| **Config level** | Standard | | |
| **Setpoint visibility** | Only if relevant module is installed + conditioned by the setpoint **IP Address Mode (page 501)** | | |
| **Description** | | | |

The setpoint is used to set the address when you are in static mode .

If **IP Address Mode (page 501)** is MANUAL this setpoint is used to adjust the IP address of the ethernet interface of the controller. Ask your IT specialist for help with this setting.

If **IP Address Mode (page 501)** is AUTOMATIC this setpoint is inactive. The IP address is assigned by the DHCP server.

If **IP Address Mode (page 501)** is DISABLED Ethernet terminal is disabled.

> ***Note:*** *Only valid IP address can be inserted.*

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## Subnet Mask

| | | | |
|---|---|---|---|
| **Setpoint group** | CM-Ethernet | **Related FW** | 2.1.0 |
| **Range [units]** | Valid IP address [-] | | |
| **Default value** | 255.255.255.0 | **Alternative config** | NO |
| **Step** | [-] | | |
| **Comm object** | 23949 | **Related applications** | MINT, SPtM |
| **Config level** | Standard | | |
| **Setpoint visibility** | Only if relevant module is installed + conditioned by the setpoint **IP Address Mode (page 501)** | | |
| **Description** | | | |

The setpoint is used to select the method how the Subnet Mask is adjusted.

If **IP Address Mode (page 501)** is MANUAL this setpoint is used to adjust the Subnet Mask. Ask your IT specialist for help with this setting.

If **IP Address Mode (page 501)** is AUTOMATIC this setpoint is inactive. The Subnet Mask is assigned by the DHCP server.

If **IP Address Mode (page 501)** is DISABLED Ethernet terminal is disabled.

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## Gateway IP

| | | | |
|---|---|---|---|
| **Setpoint group** | CM-Ethernet | **Related FW** | 2.1.0 |
| **Range [units]** | Valid IP address [-] | | |
| **Default value** | 192.168.1.1 | **Alternative config** | NO |
| **Step** | [-] | | |
| **Comm object** | 23948 | **Related applications** | MINT, SPtM |
| **Config level** | Standard | | |
| **Setpoint visibility** | Only if relevant module is installed + conditioned by the setpoint **IP Address Mode (page 501)** | | |
| **Description** | | | |

The setpoint is used to select the method how the Gateway IP is adjusted.

If **IP Address Mode (page 501)** is MANUAL this setpoint is used to adjust the Subnet Mask. Ask your IT specialist for help with this setting.

If **IP Address Mode (page 501)** is AUTOMATIC this setpoint is inactive. The Subnet Mask is assigned by the DHCP server.

If **IP Address Mode (page 501)** is DISABLED Ethernet terminal is disabled.

A gateway is a device which connects the respective segment with the other segments and/or Internet.

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## DNS Mode

| | | | |
|---|---|---|---|
| **Setpoint group** | CM-Ethernet | **Related FW** | 2.1.0 |
| **Range [units]** | Automatic / Manual [-] | | |
| **Default value** | Automatic | **Alternative config** | NO |
| **Step** | [-] | | |
| **Comm object** | 23921 | **Related applications** | MINT, SPtM |
| **Config level** | Standard | | |
| **Setpoint visibility** | Only if relevant module is installed | | |
| **Description** | | | |

This setpoint enables to enter DNS server addresses manually, even with the **IP Address Mode (page 501)** set to Automatic.

| | |
|---|---|
| Automatic | DNS server addresses automatically obtained from a DHCP server are used |
| Manual | **DNS IP Address 1 (page 504)** and **DNS IP Address 2 (page 504)** can be adjusted manually. Use this option to resolve e.g. internet access policy related issue, if local DNS server addresses automatically obtained from a DHCP server do not work |

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## DNS IP Address 1

| | | | |
|---|---|---|---|
| **Setpoint group** | CM-Ethernet | **Related FW** | 2.1.0 |
| **Range [units]** | Valid IP address [-] | | |
| **Default value** | 8.8.8.8 | **Alternative config** | NO |
| **Step** | [-] | | |
| **Comm object** | 23947 | **Related applications** | MINT, SPtM |
| **Config level** | Standard | | |
| **Setpoint visibility** | Only if relevant module is installed | | |
| **Description** | | | |
| The setpoint is used to select the method how the DNS Address 1 is adjusted .<br>If **IP Address Mode (page 501)** is MANUAL this setpoint is used to adjust the domain name server (DNS), which is needed to translate domain names in email addresses and server names into correct IP addresses.<br>If **IP Address Mode (page 501)** is AUTOMATIC this setpoint is inactive. The DNS server IP address is assigned by the DHCP server.<br>If **IP Address Mode (page 501)** is DISABLED Ethernet terminal is disabled. | | | |

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## DNS IP Address 2

| | | | |
|---|---|---|---|
| **Setpoint group** | CM-Ethernet | **Related FW** | 2.1.0 |
| **Range [units]** | Valid IP address [-] | | |
| **Default value** | 8.8.8.8 | **Alternative config** | NO |
| **Step** | [-] | | |
| **Comm object** | 23946 | **Related applications** | MINT, SPtM |
| **Config level** | Standard | | |
| **Setpoint visibility** | Only if relevant module is installed | | |
| **Description** | | | |
| The setpoint is used to select the method how the DNS Address 2 is adjusted.<br>If **IP Address Mode (page 501)** is MANUAL this setpoint is used to adjust the domain name server (DNS), which is needed to translate domain names in email addresses and server names into correct IP addresses.<br>If **IP Address Mode (page 501)** is AUTOMATIC this setpoint is inactive. The DNS server IP address is assigned by the DHCP server.<br>If **IP Address Mode (page 501)** is DISABLED Ethernet terminal is disabled. | | | |

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## IP Firewall

| | | | |
|---|---|---|---|
| **Setpoint group** | CM-Ethernet | **Related FW** | 2.1.0 |
| **Range [units]** | ENABLED / DISABLED [-] | | |
| **Default value** | DISABLED | **Alternative config** | NO |
| **Step** | [-] | | |
| **Comm object** | 23920 | **Related applications** | MINT, SPtM |
| **Config level** | Standard | | |
| **Setpoint visibility** | Only if relevant module is installed | | |
| **Description** | | | |

This setpoints enables to switch on the built-in Firewall functionality.

| | |
|---|---|
| DISABLED | The firewall function is switched off |
| ENABLED | The firewall function is switched on, use InteliConfig to setup the firewall rules (configuration card Others – Firewall) |

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## Subgroup: AirGate Settings

## AirGate Connection

| | | | |
|---|---|---|---|
| **Setpoint group** | CM-Ethernet | **Related FW** | 2.1.0 |
| **Range [units]** | DISABLED / ENABLED [-] | | |
| **Default value** | ENABLED | **Alternative config** | NO |
| **Step** | [-] | | |
| **Comm object** | 23935 | **Related applications** | MINT, SPtM |
| **Config level** | Standard | | |
| **Setpoint visibility** | Only if relevant module is installed | | |
| **Description** | | | |

This setpoint selects the AirGate connection mode.

| | |
|---|---|
| DISABLED: | This is a standard mode in which the controller listens to the incoming traffic and answers the TCP/IP queries addressed to it. This mode requires the controller to be accessible from the remote device (PC), i.e. it must be accessible at a public and static IP address if you want to connect to it from the internet. |
| ENABLED | This mode enables the AirGate service. The AirGate server address is adjusted by the setpoint **AirGate Address (page 506)**. Also the standard TCP/IP is enabled. |

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## AirGate Address

| | | | |
|---|---|---|---|
| **Setpoint group** | CM-4G-GPS; CM-Ethernet | **Related FW** | 2.1.0 |
| **Range [units]** | [-] | | |
| **Default value** | global.airgate.link | **Alternative config** | NO |
| **Step** | [-] | | |
| **Comm object** | 24364 | **Related applications** | MINT, SPtM |
| **Config level** | Standard | | |
| **Setpoint visibility** | Only if relevant module is installed + conditioned by the setpoint **Internet Connection (page 479)** | | |
| **Description** | | | |
| This setpoint is used for entering the domain name or IP address of the AirGate server. Use the free AirGate server provided by ComAp at global.airgate.link. | | | |

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## AirGate Port

| | | | |
|---|---|---|---|
| **Setpoint group** | CM-Ethernet | **Related FW** | 2.1.0 |
| **Range [units]** | 1 .. 65535 [-] | | |
| **Default value** | 23 | **Alternative config** | NO |
| **Step** | 1 | | |
| **Comm object** | 23919 | **Related applications** | MINT, SPtM |
| **Config level** | Standard | | |
| **Setpoint visibility** | Only if relevant module is installed | | |
| **Description** | | | |
| This port is used for TCP data communication with the AirGate server.<br>***Note:*** *Use port 21, 23 or 6127 for standard ComAp AirGate service.* | | | |

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## Subgroup: ComAp Client Settings

## Direct Connection

| | | | |
|---|---|---|---|
| **Setpoint group** | CM-Ethernet | **Related FW** | 2.1.0 |
| **Range [units]** | Disabled / Enabled [-] | | |
| **Default value** | Enabled | **Alternative config** | NO |
| **Step** | [-] | | |
| **Comm object** | 23917 | **Related applications** | MINT, SPtM |
| **Config level** | Standard | | |
| **Setpoint visibility** | Only if relevant module is installed | | |
| **Description** | | | |
| Use this to enable/disable direct connection of a ComAp client (e.g. InteliConfig) to the IP address of the controller.<br>***Note:*** *For Direct connection the controller IP address must be reachable from the client IP address.* | | | |

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## Direct Connection Port

| | | | |
|---|---|---|---|
| **Setpoint group** | CM-Ethernet | **Related FW** | 2.1.0 |
| **Range [units]** | 1 .. 65535 [-] | | |
| **Default value** | 23 | **Alternative config** | NO |
| **Step** | [-] | | |
| **Comm object** | 23918 | **Related applications** | MINT, SPtM |
| **Config level** | Standard | | |
| **Setpoint visibility** | Only if relevant module is installed | | |
| **Description** | | | |
| This port is used to listen for an incoming TCP connection if Direct Connection is ENABLED. | | | |

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## ComAp Client Inactivity Timeout

| | | | |
|---|---|---|---|
| **Setpoint group** | CM-4G-GPS | **Related FW** | 2.1.0 |
| **Range [units]** | 0 .. 600 [s] | | |
| **Default value** | 60 s | **Alternative config** | NO |
| **Step** | 1 s | | |
| **Comm object** | 24098 | **Related applications** | MINT, SPtM |
| **Config level** | Standard | | |
| **Setpoint visibility** | Only if relevant module is installed | | |
| **Description** | | | |
| Connection (TCP socket) is closed by controller, if a client (e.g. InteliConfig) does not communicate for this time. This timeout applies to both direct and AirGate connection. | | | |

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## Subgroup: MODBUS Settings

### MODBUS Server

| | | | |
|---|---|---|---|
| **Setpoint group** | CM-Ethernet | **Related FW** | 2.1.0 |
| **Range [units]** | DISABLED / ENABLED [-] | | |
| **Default value** | Disabled | **Alternative config** | NO |
| **Step** | [-] | | |
| **Comm object** | 24337 | **Related applications** | MINT, SPtM |
| **Config level** | Standard | | |
| **Setpoint visibility** | Only if relevant module is installed | | |
| **Description** | | | |
| Enable or disable Modbus communication via ethernet interface. | | | |

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### MODBUS Client Inactivity Timeout

| | | | |
|---|---|---|---|
| **Setpoint group** | CM-Ethernet<br>Ethernet | **Related FW** | 2.1.0 |
| **Range [units]** | 0 .. 600 [s] | | |
| **Default value** | 60 s | **Alternative config** | NO |
| **Step** | 1 s | | |
| **Comm object** | 24097 | **Related applications** | MINT, SPtM |
| **Config level** | Standard | | |
| **Setpoint visibility** | Only if relevant module is installed | | |
| **Description** | | | |
| Modbus connection (TCP socket) is closed by controller, if a Modbus client does not communicate for this time. | | | |

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## Subgroup: SNMP Settings

### SNMP Agent

| | | | |
|---|---|---|---|
| **Setpoint group** | CM-Ethernet | **Related FW** | 2.1.0 |
| **Range [units]** | DISABLED / ENABLED [-] | | |
| **Default value** | DISABLED | **Alternative config** | NO |
| **Step** | [-] | | |
| **Comm object** | 23936 | **Related applications** | MINT, SPtM |
| **Config level** | Standard | | |
| **Setpoint visibility** | Only if relevant module is installed | | |
| **Description** | | | |
| Enable or disable SNMP Agent. | | | |

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## SNMP Trap Format

| | | | |
|---|---|---|---|
| **Setpoint group** | CM-Ethernet | **Related FW** | 2.1.0 |
| **Range [units]** | v1Trap / v2Notif / v2Inform [-] | | |
| **Default value** | v1Trap | **Alternative config** | NO |
| **Step** | [-] | | |
| **Comm object** | 23922 | **Related applications** | MINT, SPtM |
| **Config level** | Standard | | |
| **Setpoint visibility** | Only if relevant module is installed | | |
| **Description** | | | |
| This setpoint adjusts type of SNMP traps. | | | |

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## SNMP Traps IP Address 1

| | | | |
|---|---|---|---|
| **Setpoint group** | CM-Ethernet | **Related FW** | 2.1.0 |
| **Range [units]** | Valid IP address [-] | | |
| **Default value** | DISABLED | **Alternative config** | NO |
| **Step** | [-] | | |
| **Comm object** | 24095 | **Related applications** | MINT, SPtM |
| **Config level** | Standard | | |
| **Setpoint visibility** | Only if relevant module is installed | | |
| **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** | CM-Ethernet | **Related FW** | 2.1.0 |
| **Range [units]** | Valid IP address [-] | | |
| **Default value** | DISABLED | **Alternative config** | NO |
| **Step** | [-] | | |
| **Comm object** | 24094 | **Related applications** | MINT, SPtM |
| **Config level** | Standard | | |
| **Setpoint visibility** | Only if relevant module is installed | | |
| **Description** | | | |
| IP address 2 for receiving SNMP Traps. Leave this setpoint blank if SNMP traps should not be send. | | | |

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## SNMP RD Community String

| | | | |
|---|---|---|---|
| **Setpoint group** | CM-Ethernet | **Related FW** | 2.1.0 |
| **Range [units]** | 0 .. 31 characters [-] | | |
| **Default value** | public | **Alternative config** | NO |
| **Step** | [-] | | |
| **Comm object** | 23941 | **Related applications** | MINT, SPtM |
| **Config level** | Standard | | |
| **Setpoint visibility** | Only if relevant module is installed + conditioned by the setpoint **SNMP Agent (page 508)** | | |
| **Description** | | | |
| SNMP Community String only for reading. | | | |

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## SNMP WR Community String

| | | | |
|---|---|---|---|
| **Setpoint group** | CM-Ethernet | **Related FW** | 2.1.0 |
| **Range [units]** | 0..31 characters [-] | | |
| **Default value** | private | **Alternative config** | NO |
| **Step** | [-] | | |
| **Comm object** | 23940 | **Related applications** | MINT, SPtM |
| **Config level** | Standard | | |
| **Setpoint visibility** | Only if relevant module is installed + conditioned by the setpoint **SNMP Agent (page 508)** | | |
| **Description** | | | |
| SNMP Community String for writing and reading. | | | |

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## Subgroup: E-mail Settings

## SMTP Server Address

| | | | |
|---|---|---|---|
| **Setpoint group** | CM-Ethernet | **Related FW** | 2.1.0 |
| **Range [units]** | 0 .. 31 characters [-] | | |
| **Default value** | global.airgate.link:9925 | **Alternative config** | NO |
| **Step** | [-] | | |
| **Comm object** | 23942 | **Related applications** | MINT, SPtM |
| **Config level** | Standard | | |
| **Setpoint visibility** | Only if relevant module is installed | | |
| **Description** | | | |

This setpoint is used for entering the domain name (e.g. smtp.yourprovider.com) or IP address (e.g. 74.125.39.109) or number of port (with colon like a first mark) of the SMTP server. Ask your internet provider or IT manager for this information.

> ***Note:*** *You may use also any public SMTP server which does not require connection over SSL/TLS channels. If the device is connected to AirGate the AirGate SMTP server at "global.airgate.link" may be used. Ports 25 and 9925 are supported. After controller connects to AirGate for the first time (or with new public IP address), it may not be able to send emails for first 5-10 minutes.*

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## SMTP Sender Address

| | | | |
|---|---|---|---|
| **Setpoint group** | CM-Ethernet | **Related FW** | 2.1.0 |
| **Range [units]** | 0 .. 31 characters [-] | | |
| **Default value** | [-] | **Alternative config** | NO |
| **Step** | [-] | | |
| **Comm object** | 23881 | **Related applications** | MINT, SPtM |
| **Config level** | Standard | | |
| **Setpoint visibility** | Only if relevant module is installed | | |
| **Description** | | | |

Enter an existing email address into this setpoint. This address will be used as sender address in active e-mails that will be sent from the controller.

> ***Note:*** *It is not needed to enter an existing email address, nevertheless valid email format needs to be followed.*

> **IMPORTANT: This item is obligatory when emails are configured.**

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## SMTP UserName

| | | | |
|---|---|---|---|
| **Setpoint group** | CM-Ethernet | **Related FW** | 2.1.0 |
| **Range [units]** | 0 .. 31 characters [-] | | |
| **Default value** | [-] | **Alternative config** | NO |
| **Step** | [-] | | |
| **Comm object** | 23880 | **Related applications** | MINT, SPtM |
| **Config level** | Standard | | |
| **Setpoint visibility** | Only if relevant module is installed | | |
| **Description** | | | |
| Use this setpoint to enter the username for the SMTP server. Leave the setpoint blank if the SMTP server does not require authentication. | | | |

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## SMTP User Password

| | | | |
|---|---|---|---|
| **Setpoint group** | CM-Ethernet | **Related FW** | 2.1.0 |
| **Range [units]** | 0 .. 15 characters [-] | | |
| **Default value** | [-] | **Alternative config** | NO |
| **Step** | [-] | | |
| **Comm object** | 23879 | **Related applications** | MINT, SPtM |
| **Config level** | Standard | | |
| **Setpoint visibility** | Only if relevant module is installed | | |
| **Description** | | | |
| Use this setpoint to enter the password for the SMTP server. Leave the setpoint blank if the SMTP server does not require authentication. | | | |

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## SMTP Encryption

| | | | |
|---|---|---|---|
| **Setpoint group** | CM-Ethernet | **Related FW** | 2.1.0 |
| **Range [units]** | None / SSL-TLS / STARTTLS [-] | | |
| **Default value** | None | **Alternative config** | NO |
| **Step** | [-] | | |
| **Comm object** | 23938 | **Related applications** | MINT, SPtM |
| **Config level** | Standard | | |
| **Setpoint visibility** | Only if relevant module is installed + conditioned by the setpoint **Internet Connection (page 479)** | | |
| **Description** | | | |

Encryption settings of SMTP communication.

| | |
|---|---|
| NONE | E-SMTP protocol without encryption is used. |
| STARTTLS | Communication is started without encryption and then is switched to TLS encryption. |
| TLS | Communication runs in TLS encryption. |

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## Email Address 1

| | | | |
|---|---|---|---|
| **Setpoint group** | CM-4G-GPS<br>CM-Ethernet<br>Ethernet | **Related FW** | 2.1.0 |
| **Range [units]** | 0 .. 63 characters [-] | | |
| **Default value** | [-] | **Alternative config** | NO |
| **Step** | [-] | | |
| **Comm object** | 24298 | **Related applications** | MINT, SPtM |
| **Config level** | Standard | | |
| **Setpoint visibility** | Only if relevant module is installed | | |
| **Description** | | | |

Enter in this setpoint a valid e-mail address where the alarm and event e-mails shall be sent. Leave this setpoint blank if alarm and event email should not be send.

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## Email Address 2

| | | | |
|---|---|---|---|
| **Setpoint group** | CM-4G-GPS<br>CM-Ethernet<br>Ethernet | **Related FW** | 2.1.0 |
| **Range [units]** | 0 .. 63 characters [-] | | |
| **Default value** | [-] | **Alternative config** | NO |
| **Step** | [-] | | |
| **Comm object** | 24297 | **Related applications** | MINT, SPtM |
| **Config level** | Standard | | |
| **Setpoint visibility** | Only if relevant module is installed | | |
| **Description** | | | |
| Enter in this setpoint a valid e-mail address where the alarm and event e-mails shall be sent. Leave this setpoint blank if alarm and event email should not be send. | | | |

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## Email Address 3

| | | | |
|---|---|---|---|
| **Setpoint group** | CM-4G-GPS<br>CM-Ethernet<br>Ethernet | **Related FW** | 2.1.0 |
| **Range [units]** | 0 .. 63 characters [-] | | |
| **Default value** | [-] | **Alternative config** | NO |
| **Step** | [-] | | |
| **Comm object** | 24145 | **Related applications** | MINT, SPtM |
| **Config level** | Standard | | |
| **Setpoint visibility** | Only if relevant module is installed | | |
| **Description** | | | |
| Enter in this setpoint a valid e-mail address where the alarm and event e-mails shall be sent. Leave this setpoint blank if alarm and event email should not be send. | | | |

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## Email Address 4

| | | | |
|---|---|---|---|
| **Setpoint group** | CM-4G-GPS<br>CM-Ethernet<br>Ethernet | **Related FW** | 2.1.0 |
| **Range [units]** | 0 .. 63 characters [-] | | |
| **Default value** | [-] | **Alternative config** | NO |
| **Step** | [-] | | |
| **Comm object** | 24144 | **Related applications** | MINT, SPtM |
| **Config level** | Standard | | |
| **Setpoint visibility** | Only if relevant module is installed | | |
| **Description** | | | |
| Enter in this setpoint a valid e-mail address where the alarm and event e-mails shall be sent. Leave this setpoint blank if alarm and event email should not be send. | | | |

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## Subgroup: Messages Settings

## BOC Message

| | | | |
|---|---|---|---|
| **Setpoint group** | CM-4G-GPS<br>CM-Ethernet | **Related FW** | 2.1.0 |
| **Range [units]** | ON / OFF [-] | | |
| **Default value** | ON | **Alternative config** | NO |
| **Step** | [-] | | |
| **Comm object** | 10566 | **Related applications** | MINT, SPtM |
| **Config level** | Standard | | |
| **Setpoint visibility** | Only if relevant module is installed | | |
| **Description** | | | |
| This setpoint enables or disables BOC Messages.<br>This setpoint is common for CM3-Ethernet and CM2-4G-GPS modules. | | | |

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## E-mail/SMS Language

| | | | |
|---|---|---|---|
| **Setpoint group** | CM-4G-GPS<br>CM-Ethernet | **Related FW** | 2.1.0 |
| **Range [units]** | Depends on CU languages [-] | | |
| **Default value** | English | **Alternative config** | NO |
| **Step** | [-] | | |
| **Comm object** | 24299 | **Related applications** | MINT, SPtM |
| **Config level** | Standard | | |
| **Setpoint visibility** | Only if relevant module is installed | | |
| **Description** | | | |
| Use this setpoint to set the language of SMS and e-mail.<br>This setpoint is common for CM3-Ethernet and CM2-4G-GPS modules. | | | |

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## Event Message

| | | | |
|---|---|---|---|
| **Setpoint group** | CM-4G-GPS<br>CM-Ethernet | **Related FW** | 2.1.0 |
| **Range [units]** | ON / OFF [-] | | |
| **Default value** | ON | **Alternative config** | NO |
| **Step** | [-] | | |
| **Comm object** | 10926 | **Related applications** | MINT, SPtM |
| **Config level** | Standard | | |
| **Setpoint visibility** | Only if relevant module is installed | | |
| **Description** | | | |
| This setpoint enables or disables Event Messages.<br>This setpoint is common for CM3-Ethernet and CM2-4G-GPS modules. | | | |

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## Sd Message

| | | | |
|---|---|---|---|
| **Setpoint group** | CM-4G-GPS<br>CM-Ethernet | **Related FW** | 2.1.0 |
| **Range [units]** | ON / OFF [-] | | |
| **Default value** | ON | **Alternative config** | NO |
| **Step** | [-] | | |
| **Comm object** | 8484 | **Related applications** | MINT, SPtM |
| **Config level** | Standard | | |
| **Setpoint visibility** | Only if relevant module is installed | | |
| **Description** | | | |
| This setpoint enables or disables Sd Message.<br>This setpoint is common for CM3-Ethernet and CM2-4G-GPS modules. | | | |

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## Wrn Message

| | | | |
|---|---|---|---|
| **Setpoint group** | CM-4G-GPS<br>CM-Ethernet | **Related FW** | 2.1.0 |
| **Range [units]** | ON / OFF [-] | | |
| **Default value** | ON | **Alternative config** | NO |
| **Step** | [-] | | |
| **Comm object** | 8482 | **Related applications** | MINT, SPtM |
| **Config level** | Standard | | |
| **Setpoint visibility** | Only if relevant module is installed | | |
| **Description** | | | |
| This setpoint enables or disables Wrn Messages.<br>This setpoint is common for CM3-Ethernet and CM2-4G-GPS modules. | | | |

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## Subgroup: NTP Settings

## NTP Clock Synchronization

| | | | |
|---|---|---|---|
| **Setpoint group** | CM-Ethernet | **Related FW** | 2.1.0 |
| **Range [units]** | DISABLED / ENABLED [-] | | |
| **Default value** | DISABLED | **Alternative config** | NO |
| **Step** | [-] | | |
| **Comm object** | 23934 | **Related applications** | MINT, SPtM |
| **Config level** | Standard | | |
| **Setpoint visibility** | Only if relevant module is installed | | |
| **Description** | | | |
| This setpoint is used to enable/disable controller time synchronization with exact time from an NTP server. | | | |

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## NTP Server

| | | | |
|---|---|---|---|
| **Setpoint group** | CM-Ethernet | **Related FW** | 2.1.0 |
| **Range [units]** | [-] | | |
| **Default value** | pool.ntp.org | **Alternative config** | NO |
| **Step** | [-] | | |
| **Comm object** | 23933 | **Related applications** | MINT, SPtM |
| **Config level** | Standard | | |
| **Setpoint visibility** | Only if relevant module is installed | | |
| **Description** | | | |
| NTP server address. | | | |

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## Time Zone

| | | | |
|---|---|---|---|
| **Setpoint group** | CM-4G-GPS<br>CM-Ethernet | **Related FW** | 2.1.0 |
| **Range [units]** | GMT-12:00 .. GMT+13:00 [hours] | | |
| **Default value** | GMT+1:00 hour | **Alternative config** | NO |
| **Step** | [-] | | |
| **Comm object** | 24366 | **Related applications** | MINT, SPtM |
| **Config level** | Standard | | |
| **Setpoint visibility** | Only if relevant module is installed | | |
| **Description** | | | |

This setpoint is used to select the time zone where the controller is located. See your computer time zone setting (click on the time indicator located in the rightmost position of the Windows task bar) if you are not sure about your time zone.

> ***Note:*** *If the time zone is not selected properly the active e-mails may contain incorrect information about sending time, which may result in confusion when the respective problem actually occurred.*

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# Group: EM-BIO8-EFCP

## Subgroup: EFCP Settings

## Earth Fault Current Protection

| | | | |
|---|---|---|---|
| **Setpoint group** | EM-BIO8-EFCP | **Related FW** | 2.1.0 |
| **Range [units]** | DISABLED / ENABLED [-] | | |
| **Default value** | ENABLED | **Alternative config** | NO |
| **Step** | [-] | | |
| **Comm object** | 11631 | **Related applications** | MINT, SPtM |
| **Config level** | Standard | | |
| **Setpoint visibility** | Only if relevant module is installed | | |
| **Description** | | | |

This setpoint can block or allow Earth fault Current protection.

| | |
|---|---|
| DISABLED | Earth fault current protection is blocked. |
| ENABLED | Earth fault current protection is allowed. Behavior of Earth fault current protection is set by these setpoints: **Earth Fault CT Input Range (page 520)**, **Earth Fault CT Ratio (page 520)**, **IDMT Earth Fault Current Delay (page 520)** and **IDMT Earth Fault Current Sd (page 521)**. |

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## IDMT Earth Fault Current Delay

| | | | |
|---|---|---|---|
| **Setpoint group** | EM-BIO8-EFCP | **Related FW** | 2.1.0 |
| **Range [units]** | 0.03 .. 5.00 [s] | | |
| **Default value** | 0.10 s | **Alternative config** | NO |
| **Step** | 0.01 s | | |
| **Comm object** | 11633 | **Related applications** | MINT, SPtM |
| **Config level** | Standard | | |
| **Setpoint visibility** | Only if relevant module is installed | | |
| **Description** | | | |
| Delay for Earth Fault Current protection. | | | |

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## Earth Fault CT Input Range

| | | | |
|---|---|---|---|
| **Setpoint group** | EM-BIO8-EFCP | **Related FW** | 2.1.0 |
| **Range [units]** | 1 [A] / 5 [A] | | |
| **Default value** | 5 A | **Alternative config** | NO |
| **Step** | [-] | | |
| **Comm object** | 14340 | **Related applications** | MINT, SPtM |
| **Config level** | Standard | | |
| **Setpoint visibility** | Only if relevant module is installed | | |
| **Description** | | | |
| There are 2 physical inputs for **Earth Fault Current Protection (page 519)**. Value of this setpoint has to be set on value of physical input which is presently in use. | | | |

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## Earth Fault CT Ratio

| | | | |
|---|---|---|---|
| **Setpoint group** | EM-BIO8-EFCP | **Related FW** | 2.1.0 |
| **Range [units]** | 1 .. 2000 [1/(1or5) A] | | |
| **Default value** | 500 1/(1or5)A | **Alternative config** | NO |
| **Step** | 1 A/ 1A; 1 A/5 A | | |
| **Comm object** | 14339 | **Related applications** | MINT, SPtM |
| **Config level** | Standard | | |
| **Setpoint visibility** | Only if relevant module is installed | | |
| **Description** | | | |
| Earth Fault current transformer ratio.<br>***Note:*** *Type of units depends on setpoint **Earth Fault CT Input Range (page 520)** which have to be set before this setpoint.* | | | |

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## IDMT Earth Fault Current Sd

| | | | |
|---|---|---|---|
| **Setpoint group** | EM-BIO8-EFCP | **Related FW** | 2.1.0 |
| **Range [units]** | 0.03 .. 200.00 [A] | | |
| **Default value** | 0.30 A | **Alternative config** | NO |
| **Step** | 0.01 [A] | | |
| **Comm object** | 11632 | **Related applications** | MINT, SPtM |
| **Config level** | Standard | | |
| **Setpoint visibility** | Only if relevant module is installed | | |
| **Description** | | | |
| Limit value for Earth Fault Current protection. | | | |

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# Group: Alternate Config

## Subgroup: Configuration 1

## Voltage Regulator Bias 1

| | | | |
|---|---|---|---|
| **Setpoint group** | Alternate Config | **Related FW** | 2.1.0 |
| **Range [units]** | -10.00 .. 10.00 [V] | | |
| **Default value** | 0.00 V | **Alternative config** | YES |
| **Step** | 0.01 V | | |
| **Comm object** | 20361 | **Related applications** | MINT, SPtM |
| **Config level** | Advanced | | |
| **Setpoint visibility** | Always | | |
| **Description** | | | |
| This setpoint adjusts the initial level for the voltage governor output. This level is present on the output if no regulation loop is active.<br>***Note:*** *This value is used when any other alternate configuration is not active.* | | | |

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## Speed Governor Bias 1

| | | | |
|---|---|---|---|
| **Setpoint group** | Alternate Config | **Related FW** | 2.1.0 |
| **Range [units]** | -10.00 .. 10.00 [V] | | |
| **Default value** | 10.00 V | **Alternative config** | YES |
| **Step** | 0.01 V | | |
| **Comm object** | 20364 | **Related applications** | MINT, SPtM |
| **Config level** | Advanced | | |
| **Setpoint visibility** | Always | | |
| **Description** | | | |

This setpoint adjusts the initial voltage level for the speed governor output, which is present on the output, if no speed or power regulation loop is active.

***Note:*** *To make a fine adjustment, start the Gen-set in MAN mode, leave it running unloaded and then make fine adjustment of this setpoint to achieve nominal engine speed.*

***Note:*** *This value is used when any other alternate configuration is not active.*

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## Nominal RPM 1

| | | | |
|---|---|---|---|
| **Setpoint group** | Alternate Config | **Related FW** | 2.1.0 |
| **Range [units]** | 100 .. 4000 [RPM] | | |
| **Default value** | 1 500 RPM | **Alternative config** | YES |
| **Step** | 1 RPM | | |
| **Comm object** | 9915 | **Related applications** | MINT, SPtM |
| **Config level** | Advanced | | |
| **Setpoint visibility** | Always | | |
| **Description** | | | |

Nominal engine speed (RPM revolutions per minute).

***Note:*** *This value is used when any other alternate configuration is not active.*

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## Nominal Frequency 1

| | | | |
|---|---|---|---|
| **Setpoint group** | Alternate Config | **Related FW** | 2.1.0 |
| **Range [units]** | 30 .. 65 [Hz] | | |
| **Default value** | 50 Hz | **Alternative config** | YES |
| **Step** | 1 Hz | | |
| **Comm object** | 9913 | **Related applications** | MINT, SPtM |
| **Config level** | Standard | | |
| **Setpoint visibility** | Always | | |
| **Description** | | | |
| Nominal system frequency (usually 50 or 60 Hz).<br>***Note:*** *This value is used when any other alternate configuration is not active.* | | | |

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## Nominal Voltage Ph-N 1

| | | | |
|---|---|---|---|
| **Setpoint group** | Alternate Config | **Related FW** | 2.1.0 |
| **Range [units]** | 80 .. 20000 [V] | | |
| **Default value** | 231 V | **Alternative config** | YES |
| **Step** | 1 V | | |
| **Comm object** | 12052 | **Related applications** | MINT, SPtM |
| **Config level** | Standard | | |
| **Setpoint visibility** | Conditioned by the setpoint **Connection type (page 277)**. | | |
| **Description** | | | |
| Nominal system voltage (phase to neutral).<br>***Note:*** *This value is used when any other alternate configuration is not active.* | | | |

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## Nominal Voltage Ph-Ph 1

| | | | |
|---|---|---|---|
| **Setpoint group** | Alternate Config | **Related FW** | 2.1.0 |
| **Range [units]** | 80 .. 40000 [V] | | |
| **Default value** | 400 V | **Alternative config** | YES |
| **Step** | 1 V | | |
| **Comm object** | 12055 | **Related applications** | MINT, SPtM |
| **Config level** | Standard | | |
| **Setpoint visibility** | Conditioned by the setpoint **Connection Type 1 (page 524)**. | | |
| **Description** | | | |
| Nominal system voltage (phase to phase).<br>***Note:*** *This value is used when any other alternate configuration is not active.* | | | |

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## Nominal Current 1

| | | | |
|---|---|---|---|
| **Setpoint group** | Alternate Config | **Related FW** | 2.1.0 |
| **Range [units]** | 1 .. 10 000 [A] | | |
| **Default value** | 350 A | **Alternative config** | YES |
| **Step** | 1 A | | |
| **Comm object** | 12049 | **Related applications** | MINT, SPtM |
| **Config level** | Standard | | |
| **Setpoint visibility** | Always | | |
| **Description** | | | |

It is current limit for generator current protections and means maximal continuous generator current. Nominal Current can be different from generator rated current value.

***Note:*** *This value is used when any other alternate configuration is not active.*

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## Connection Type 1

| | | | |
|---|---|---|---|
| **Setpoint group** | Alternate Config | **Related FW** | 2.1.0 |
| **Range [units]** | Mono Phase / SplPhL1L2 / SplPhL1L3 / 3Ph3Wire / 3Ph4Wire / High Leg D / Autodetect [-] | | |
| **Default value** | 3Ph4Wire | **Alternative config** | YES |
| **Step** | [-] | | |
| **Comm object** | 12058 | **Related applications** | MINT, SPtM |
| **Config level** | Standard | | |
| **Setpoint visibility** | Always | | |
| **Description** | | | |

Connection type:

| | |
|---|---|
| Mono Phase | Single phase voltage measurement L1-N<br>1x CT (Current Transformer) |
| SplPhL1L2 | Double Delta connection<br>Split Phase<br>Two phase voltage measurement L1,L2 with 180° phase shift<br>2x CT (Current Transformer) |
| SplPhL1L3 | Double Delta connection<br>Split Phase<br>Two phase voltage measurement L1,L3 with 180° phase shift<br>2x CT (Current Transformer) |
| 3Ph3Wire | Ungrounded Delta connection<br>Open Delta<br>Ungrounded Wye |

| | |
|---|---|
| | Corner-Grounded Delta<br>Split Phase Delta<br>Three phase voltage measurement L1,L2,L3 with 120° phase shift<br>No neutral is available 3x CT (Current Transformer) |
| 3Ph4Wire | Grounded Star (Grounded Wye) connection – 3PY<br>Three phase voltage measurement L1,L2,L3 with 120° phase shift<br>3x CT (Current Transformer) |
| High Leg D | High Leg Delta connection<br>Three phase voltage measurement L1,L2,L3<br>3x CT (Current Transformer) |
| Autodetect | |

| | |
|---|---|
| High Leg Delta | L1 >=100 V; L1 <=140 V<br>L2 >=140 V<br>L3 >=100 V; L3 <=140 V |
| 3Ph Low Y | L1 <=160 V<br>L2 <=160 V<br>L3 <=160 V |
| 3Ph High Y | L1 >160 V<br>L2 >160 V<br>L3 >160 V |
| SplPhL1L3 | L1 >=100 V<br>L2 <= 20 V<br>L3 >=100 V |
| SplPhL1L2 | L1 >=100 V<br>L2 >= 100 V<br>L3 <= 20 V |
| Mono Phase | L1 >=100 V<br>L2 <= 20 V<br>L3 <= 20 V |
| **Voltage Autodetect shutdown** | |

***Note:*** *This value is used when any other alternate configuration is not active.*

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## Nominal Power 1

| | | | |
|---|---|---|---|
| **Setpoint group** | Alternate Config | **Related FW** | 2.1.0 |
| **Range [units]** | 1 .. 5 000 [kW] | | |
| **Default value** | 200 kW | **Alternative config** | YES |
| **Step** | 1 kW | | |
| **Comm object** | 12046 | **Related applications** | MINT, SPtM |
| **Config level** | Standard | | |
| **Setpoint visibility** | Always | | |
| **Description** | | | |

Nominal power of the Gen-set. Generator **Overload BOC (page 323)** protection is based on this setpoint.

***Note:*** *This setpoint is used when setpoint* ***Connection type (page 277)*** *is adjusted to Monophase or SplitphaseL1L2 or SplitphaseL1L3 or 3Ph3Wire or High Leg D or 3Ph4Wire or when Autodetect detects connection type as 3Ph3Wire or High Leg D or 3Ph4Wire.*

***Note:*** *This value is used when any other alternate configuration is not active.*

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## Nominal Power Split Phase 1

| | | | |
|---|---|---|---|
| **Setpoint group** | Alternate Config | **Related FW** | 2.1.0 |
| **Range [units]** | 1 .. 5 000 [kW] | | |
| **Default value** | 200 kW | **Alternative config** | YES |
| **Step** | 1 kW | | |
| **Comm object** | 15771 | **Related applications** | MINT, SPtM |
| **Config level** | Standard | | |
| **Setpoint visibility** | Conditioned by the setpoint **Connection type (page 277)** | | |
| **Description** | | | |

Nominal power of the Gen-set for detected split-phase or mono phase connection. Generator **Overload BOC (page 323)** protection is based on this setpoint.

***Note:*** *This setpoint is used when setpoint* ***Connection type (page 277)*** *is adjusted to Autodetect and Autodetect detects connection type as Monophase or SplitphaseL1L2 or SplitphaseL1L3.*

***Note:*** *This value is used when any other alternate configuration is not active.*

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## Subgroup: Configuration 2

## Voltage Regulator Bias 2

| | | | |
|---|---|---|---|
| **Setpoint group** | Alternate Config | **Related FW** | 2.1.0 |
| **Range [units]** | -10.00 .. 10.00 [V] | | |
| **Default value** | 0.00 V | **Alternative config** | YES |
| **Step** | 0.01 V | | |
| **Comm object** | 20360 | **Related applications** | MINT, SPtM |
| **Config level** | Advanced | | |
| **Setpoint visibility** | Always | | |
| **Description** | | | |

This setpoint adjusts the initial level for the voltage governor output. This level is present on the output if no regulation loop is active.

***Note:*** *This value is used when binary input* ***ALTERNATE CONFIG 2 (PAGE 604)*** *is active.*

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## Speed Governor Bias 2

| | | | |
|---|---|---|---|
| **Setpoint group** | Alternate Config | **Related FW** | 2.1.0 |
| **Range [units]** | -10.00 .. 10.00 [V] | | |
| **Default value** | 10.00 V | **Alternative config** | YES |
| **Step** | 0.01 V | | |
| **Comm object** | 20363 | **Related applications** | MINT, SPtM |
| **Config level** | Advanced | | |
| **Setpoint visibility** | Always | | |
| **Description** | | | |

This setpoint adjusts the initial voltage level for the speed governor output, which is present on the output, if no speed or power regulation loop is active.

***Note:*** *To make a fine adjustment, start the Gen-set in MAN mode, leave it running unloaded and then make fine adjustment of this setpoint to achieve nominal engine speed.*

***Note:*** *This value is used when binary input* ***ALTERNATE CONFIG 2 (PAGE 604)*** *is active.*

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## Nominal RPM 2

| | | | |
|---|---|---|---|
| **Setpoint group** | Alternate Config | **Related FW** | 2.1.0 |
| **Range [units]** | 100 .. 4000 [RPM] | | |
| **Default value** | 1 500 RPM | **Alternative config** | YES |
| **Step** | 1 RPM | | |
| **Comm object** | 9916 | **Related applications** | MINT, SPtM |
| **Config level** | Advanced | | |
| **Setpoint visibility** | Always | | |
| **Description** | | | |
| Nominal engine speed (RPM - revolutions per minute).<br>***Note:*** *This value is used when binary input* ***ALTERNATE CONFIG 2 (PAGE 604)*** *is active.* | | | |

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## Nominal Frequency 2

| | | | |
|---|---|---|---|
| **Setpoint group** | Alternate Config | **Related FW** | 2.1.0 |
| **Range [units]** | 30 .. 65 [Hz] | | |
| **Default value** | 50 Hz | **Alternative config** | YES |
| **Step** | 1 Hz | | |
| **Comm object** | 9914 | **Related applications** | MINT, SPtM |
| **Config level** | Standard | | |
| **Setpoint visibility** | Always | | |
| **Description** | | | |
| Nominal system frequency (usually 50 or 60 Hz).<br>***Note:*** *This value is used when binary input* ***ALTERNATE CONFIG 2 (PAGE 604)*** *is active.* | | | |

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## Nominal Voltage Ph-N 2

| | | | |
|---|---|---|---|
| **Setpoint group** | Alternate Config | **Related FW** | 2.1.0 |
| **Range [units]** | 80 .. 20000 [V] | | |
| **Default value** | 231 V | **Alternative config** | YES |
| **Step** | 1 V | | |
| **Comm object** | 12053 | **Related applications** | MINT, SPtM |
| **Config level** | Standard | | |
| **Setpoint visibility** | Conditioned by the setpoint **Connection type 2 (page 529)**. | | |
| **Description** | | | |
| Nominal system voltage (phase to neutral).<br>***Note:*** *This value is used when binary input* ***ALTERNATE CONFIG 2 (PAGE 604)*** *is active.* | | | |

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## Nominal Voltage Ph-Ph 2

| | | | |
|---|---|---|---|
| **Setpoint group** | Alternate Config | **Related FW** | 2.1.0 |
| **Range [units]** | 80 .. 40000 [V] | | |
| **Default value** | 400 V | **Alternative config** | YES |
| **Step** | 1 V | | |
| **Comm object** | 12056 | **Related applications** | MINT, SPtM |
| **Config level** | Standard | | |
| **Setpoint visibility** | Conditioned by the setpoint **Connection type 2 (page 529)**. | | |
| **Description** | | | |
| Nominal system voltage (phase to phase).<br>***Note:*** *This value is used when binary input* ***ALTERNATE CONFIG 2 (PAGE 604)*** *is active.* | | | |

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## Nominal Current 2

| | | | |
|---|---|---|---|
| **Setpoint group** | Alternate Config | **Related FW** | 2.1.0 |
| **Range [units]** | 1 .. 10000 [A] | | |
| **Default value** | 350 A | **Alternative config** | YES |
| **Step** | 1 A | | |
| **Comm object** | 12050 | **Related applications** | MINT, SPtM |
| **Config level** | Standard | | |
| **Setpoint visibility** | Always | | |
| **Description** | | | |
| It is current limit for generator current protections and means maximal continuous generator current. Nominal Current can be different from generator rated current value.<br>***Note:*** *This value is used when binary input* ***ALTERNATE CONFIG 2 (PAGE 604)*** *is active.* | | | |

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## Connection type 2

| | | | |
|---|---|---|---|
| **Setpoint group** | Alternate Config | **Related FW** | 2.1.0 |
| **Range [units]** | Mono Phase / SplPhL1L2 / SplPhL1L3 / 3Ph3Wire / 3Ph4Wire / High Leg D / Autodetect [-] | | |
| **Default value** | 3Ph4Wire | **Alternative config** | YES |
| **Step** | [-] | | |
| **Comm object** | 12059 | **Related applications** | MINT, SPtM |
| **Config level** | Standard | | |
| **Setpoint visibility** | Always | | |
| **Description** | | | |
| Connection type: | | | |

<table>
<tr><td>Mono Phase</td><td>Single phase voltage measurement L1-N<br>1x CT (Current Transformer)</td></tr>
<tr><td>SplPhL1L2</td><td>Double Delta connection<br>Split Phase<br>Two phase voltage measurement L1,L2 with 180° phase shift<br>2x CT (Current Transformer)</td></tr>
<tr><td>SplPhL1L3</td><td>Double Delta connection<br>Split Phase<br>Two phase voltage measurement L1,L3 with 180° phase shift<br>2x CT (Current Transformer)</td></tr>
<tr><td>3Ph3Wire</td><td>Ungrounded Delta connection<br>Open Delta<br>Ungrounded Wye<br>Corner-Grounded Delta<br>Split Phase Delta<br>Three phase voltage measurement L1,L2,L3 with 120° phase shift<br>No neutral is available 3x CT (Current Transformer)</td></tr>
<tr><td>3Ph4Wire</td><td>Grounded Star (Grounded Wye) connection – 3PY<br>Three phase voltage measurement L1,L2,L3 with 120° phase shift<br>3x CT (Current Transformer)</td></tr>
<tr><td>High Leg D</td><td>High Leg Delta connection<br>Three phase voltage measurement L1,L2,L3<br>3x CT (Current Transformer)</td></tr>
<tr><td>Autodetect</td><td><table>
<tr><td>High Leg Delta</td><td>L1 >=100 V; L1 <=140 V<br>L2 >=140 V<br>L3 >=100 V; L3 <=140 V</td></tr>
<tr><td>3Ph Low Y</td><td>L1 <=160 V<br>L2 <=160 V<br>L3 <=160 V</td></tr>
<tr><td>3Ph High Y</td><td>L1 >160 V<br>L2 >160 V<br>L3 >160 V</td></tr>
<tr><td>SplPhL1L3</td><td>L1 >=100 V<br>L2 <= 20 V<br>L3 >=100 V</td></tr>
</table></td></tr>
</table>

| | |
|---|---|
| SplPhL1L2 | L1 >=100 V<br>L2 >= 100 V<br>L3 <= 20 V |
| Mono Phase | L1 >=100 V<br>L2 <= 20 V<br>L3 <= 20 V |
| **Voltage Autodetect shutdown** | |

***Note:*** *This value is used when binary input* ***ALTERNATE CONFIG 2 (PAGE 604)*** *is active.*

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## Nominal Power 2

| | | | |
|---|---|---|---|
| **Setpoint group** | Alternate Config | **Related FW** | 2.1.0 |
| **Range [units]** | 1 .. 5 000 [kW] | | |
| **Default value** | 200 kW | **Alternative config** | YES |
| **Step** | 1 kW | | |
| **Comm object** | 12047 | **Related applications** | MINT, SPtM |
| **Config level** | Standard | | |
| **Setpoint visibility** | Always | | |
| **Description** | | | |

Nominal power of the Gen-set. Generator **Overload BOC (page 323)** protection is based on this setpoint.

***Note:*** *This setpoint is used when setpoint* ***Connection type 2 (page 529)*** *is adjusted to Monophase or SplitphaseL1L2 or SplitphaseL1L3 or 3Ph3Wire or High Leg D or 3Ph4Wire or when Autodetect detects connection type as 3Ph3Wire or High Leg D or 3Ph4Wire.*

***Note:*** *This value is used when binary input* ***ALTERNATE CONFIG 2 (PAGE 604)*** *is active.*

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## Nominal Power Split Phase 2

| | | | |
|---|---|---|---|
| **Setpoint group** | Alternate Config | **Related FW** | 2.1.0 |
| **Range [units]** | 1 .. 5 000 [kW] | | |
| **Default value** | 200 kW | **Alternative config** | YES |
| **Step** | 1 kW | | |
| **Comm object** | 15772 | **Related applications** | MINT, SPtM |
| **Config level** | Standard | | |
| **Setpoint visibility** | Conditioned by the setpoint **Connection type 2 (page 529)** | | |
| **Description** | | | |

Nominal power of the Gen-set for detected split-phase or mono phase connection. Generator **Overload BOC (page 323)** protection is based on this setpoint.

***Note:*** *This setpoint is used when setpoint* ***Connection type 2 (page 529)*** *is adjusted to Autodetect and Autodetect detects connection type as Monophase or SplitphaseL1L2 or SplitphaseL1L3.*

***Note:*** *This value is used when binary input* ***ALTERNATE CONFIG 2 (PAGE 604)*** *is active.*

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## Subgroup: Configuration 3

## Voltage Regulator Bias 3

| | | | |
|---|---|---|---|
| **Setpoint group** | Alternate Config | **Related FW** | 2.1.0 |
| **Range [units]** | -10.00 .. 10.00 [V] | | |
| **Default value** | 0.00 V | **Alternative config** | YES |
| **Step** | 0.01 V | | |
| **Comm object** | 20359 | **Related applications** | MINT, SPtM |
| **Config level** | Advanced | | |
| **Setpoint visibility** | Always | | |
| **Description** | | | |

This setpoint adjusts the initial level for the voltage governor output. This level is present on the output if no regulation loop is active.

***Note:*** *This value is used when binary input* ***ALTERNATE CONFIG 3 (PAGE 604)*** *is active.*

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## Speed Governor Bias 3

| | | | |
|---|---|---|---|
| **Setpoint group** | Alternate Config | **Related FW** | 2.1.0 |
| **Range [units]** | -10.00 .. 10.00 [V] | | |
| **Default value** | 10.00 V | **Alternative config** | YES |
| **Step** | 0.01 V | | |
| **Comm object** | 20362 | **Related applications** | MINT, SPtM |
| **Config level** | Advanced | | |
| **Setpoint visibility** | Always | | |
| **Description** | | | |

This setpoint adjusts the initial voltage level for the speed governor output, which is present on the output, if no speed or power regulation loop is active.

***Note:*** *To make a fine adjustment, start the Gen-set in MAN mode, leave it running unloaded and then make fine adjustment of this setpoint to achieve nominal engine speed.*

***Note:*** *This value is used when binary input* ***ALTERNATE CONFIG 3 (PAGE 604)*** *is active.*

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## Nominal RPM 3

| | | | |
|---|---|---|---|
| **Setpoint group** | Alternate Config | **Related FW** | 2.1.0 |
| **Range [units]** | 100 .. 4 000 [RPM] | | |
| **Default value** | 1 500 RPM | **Alternative config** | YES |
| **Step** | 1 RPM | | |
| **Comm object** | 15196 | **Related applications** | MINT, SPtM |
| **Config level** | Advanced | | |
| **Setpoint visibility** | Always | | |
| **Description** | | | |

Nominal engine speed (RPM - revolutions per minute).

***Note:*** *This value is used when binary input* ***ALTERNATE CONFIG 3 (PAGE 604)*** *is active.*

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## Nominal Frequency 3

| | | | |
|---|---|---|---|
| **Setpoint group** | Alternate Config | **Related FW** | 2.1.0 |
| **Range [units]** | 30 .. 65 [Hz] | | |
| **Default value** | 50 Hz | **Alternative config** | YES |
| **Step** | 1 Hz | | |
| **Comm object** | 15197 | **Related applications** | MINT, SPtM |
| **Config level** | Standard | | |
| **Setpoint visibility** | Always | | |
| **Description** | | | |
| Nominal system frequency (usually 50 or 60 Hz).<br>***Note:*** *This value is used when binary input* ***ALTERNATE CONFIG 3 (PAGE 604)*** *is active.* | | | |

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## Nominal Voltage Ph-N 3

| | | | |
|---|---|---|---|
| **Setpoint group** | Alternate Config | **Related FW** | 2.1.0 |
| **Range [units]** | 80 .. 20 000 [V] | | |
| **Default value** | 231 V | **Alternative config** | YES |
| **Step** | 1 V | | |
| **Comm object** | 12054 | **Related applications** | MINT, SPtM |
| **Config level** | Standard | | |
| **Setpoint visibility** | Conditioned by the setpoint **Connection type 3 (page 535)**. | | |
| **Description** | | | |
| Nominal system voltage (phase to neutral).<br>***Note:*** *This value is used when binary input* ***ALTERNATE CONFIG 3 (PAGE 604)*** *is active.* | | | |

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## Nominal Voltage Ph-Ph 3

| | | | |
|---|---|---|---|
| **Setpoint group** | Alternate Config | **Related FW** | 2.1.0 |
| **Range [units]** | 80 .. 40 000 [V] | | |
| **Default value** | 400 V | **Alternative config** | YES |
| **Step** | 1 V | | |
| **Comm object** | 12057 | **Related applications** | MINT, SPtM |
| **Config level** | Standard | | |
| **Setpoint visibility** | Conditioned by the setpoint **Connection type 3 (page 535)**. | | |
| **Description** | | | |
| Nominal system voltage (phase to phase).<br>***Note:*** *This value is used when binary input* ***ALTERNATE CONFIG 3 (PAGE 604)*** *is active.* | | | |

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## Nominal Current 3

| | | | |
|---|---|---|---|
| **Setpoint group** | Alternate Config | **Related FW** | 2.1.0 |
| **Range [units]** | 1 .. 10 000 [A] | | |
| **Default value** | 350 A | **Alternative config** | YES |
| **Step** | 1 A | | |
| **Comm object** | 12051 | **Related applications** | MINT, SPtM |
| **Config level** | Standard | | |
| **Setpoint visibility** | Always | | |
| **Description** | | | |

It is current limit for generator current protections and means maximal continuous generator current. Nominal Current can be different from generator rated current value.

***Note:*** *This value is used when binary input* ***ALTERNATE CONFIG 3 (PAGE 604)*** *is active.*

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## Connection type 3

| | | | |
|---|---|---|---|
| **Setpoint group** | Alternate Config | **Related FW** | 2.1.0 |
| **Range [units]** | Mono Phase / SplPhL1L2 / SplPhL1L3 / 3Ph3Wire / 3Ph4Wire / High Leg D / Autodetect [-] | | |
| **Default value** | 3Ph4Wire | **Alternative config** | YES |
| **Step** | [-] | | |
| **Comm object** | 12060 | **Related applications** | MINT, SPtM |
| **Config level** | Standard | | |
| **Setpoint visibility** | Always | | |
| **Description** | | | |

Connection type:

| | |
|---|---|
| Mono Phase | Single phase voltage measurement L1-N<br>1x CT (Current Transformer) |
| SplPhL1L2 | Double Delta connection<br>Split Phase<br>Two phase voltage measurement L1,L2 with 180° phase shift<br>2x CT (Current Transformer) |
| SplPhL1L3 | Double Delta connection<br>Split Phase<br>Two phase voltage measurement L1,L3 with 180° phase shift<br>2x CT (Current Transformer) |
| 3Ph3Wire | Ungrounded Delta connection<br>Open Delta<br>Ungrounded Wye |

<table>
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<tr><td>3Ph Low Y</td><td>L1 <=160 V<br>L2 <=160 V<br>L3 <=160 V</td></tr>
<tr><td>3Ph High Y</td><td>L1 >160 V<br>L2 >160 V<br>L3 >160 V</td></tr>
<tr><td>SplPhL1L3</td><td>L1 >=100 V<br>L2 <= 20 V<br>L3 >=100 V</td></tr>
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<tr><td colspan="2">Voltage Autodetect shutdown</td></tr>
</table></td></tr>
</table>

***Note:*** *This value is used when binary input* ***ALTERNATE CONFIG 3 (PAGE 604)*** *is active.*

**back to List of setpoints**

### Nominal Power 3

| | | | |
|---|---|---|---|
| **Setpoint group** | Alternate Config | **Related FW** | 2.1.0 |
| **Range [units]** | 1 .. 5 000 [kW] | | |
| **Default value** | 200 kW | **Alternative config** | YES |
| **Step** | 1 kW | | |
| **Comm object** | 12048 | **Related applications** | MINT, SPtM |
| **Config level** | Standard | | |
| **Setpoint visibility** | Always | | |
| **Description** | | | |

Nominal power of the Gen-set. Generator **Overload BOC (page 323)** protection is based on this setpoint.

***Note:*** *This setpoint is used when setpoint* ***Connection type 3 (page 535)*** *is adjusted to Monophase or SplitphaseL1L2 or SplitphaseL1L3 or 3Ph3Wire or High Leg D or 3Ph4Wire or when Autodetect detects connection type as 3Ph3Wire or High Leg D or 3Ph4Wire.*

***Note:*** *This value is used when binary input* ***ALTERNATE CONFIG 3 (PAGE 604)*** *is active.*

**back to List of setpoints**

### Nominal Power Split Phase 3

| | | | |
|---|---|---|---|
| **Setpoint group** | Alternate Config | **Related FW** | 2.1.0 |
| **Range [units]** | 1 .. 5 000 [kW] | | |
| **Default value** | 200 kW | **Alternative config** | YES |
| **Step** | 1 kW | | |
| **Comm object** | 15773 | **Related applications** | MINT, SPtM |
| **Config level** | Standard | | |
| **Setpoint visibility** | Conditioned by the setpoint **Connection type 3 (page 535)** | | |
| **Description** | | | |

Nominal power of the Gen-set for detected split-phase or mono phase connection. Generator **Overload BOC (page 323)** protection is based on this setpoint.

***Note:*** *This setpoint is used when setpoint* ***Connection type 3 (page 535)*** *is adjusted to Autodetect and Autodetect detects connection type as Monophase or SplitphaseL1L2 or SplitphaseL1L3.*

***Note:*** *This value is used when binary input* ***ALTERNATE CONFIG 3 (PAGE 604)*** *is active.*

**back to List of setpoints**

## 8.1.3 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 a full list of values go to the chapter **List of values (page 539)**.

## 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 failure has been detected on an analog input.
- The configured ECU or extension module does not provide the particular value.
- The communication with the ECU or extension module is interrupted.

A value containing the invalid flag is displayed as "####" in InteliConfig and on the controller screen. If such a value is read out via MODBUS, it will contain the data 32768 in the case of signed values and 65535 in the case of unsigned values.

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## Group: Engine

### RPM

| | | | |
|---|---|---|---|
| **Value group** | Engine | **Related FW** | 2.1.0 |
| **Units** | RPM | | |
| **Comm object** | 10123 | **Related applications** | MINT, SPtM |
| **Description** | | | |
| This value contains the current engine speed. The value is obtained from one of the following sources:<br>› ECU, if an ECU is configured<br>› Pickup input<br>› Generator frequency | | | |

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### ECU State

| | | | |
|---|---|---|---|
| **Value group** | Engine | **Related FW** | 2.1.0 |
| **Units** | - | | |
| **Comm object** | 10034 | **Related applications** | MINT, SPtM |
| **Description** | | | |
| Shows binary status (0 or 1) of ECU:<br>› ECU Yellow Lamp<br>› ECU Red Lamp<br>› Wait To Start | | | |

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### ECU Frequency Select

| | | | |
|---|---|---|---|
| **Value group** | Engine | **Related FW** | 2.1.0 |
| **Units** | - | | |
| **Comm object** | 12926 | **Related applications** | MINT, SPtM |
| **Description** | | | |
| Shows selected frequency of ECU. The value is calculated from setpoint **Nominal Frequency (page 282)**<br>› If is **Nominal Frequency (page 282)** in range from 45 Hz to 54 Hz, is considered as 50 Hz application. The value is set to 0.<br>› If is **Nominal Frequency (page 282)** in range from 55 Hz to 65 Hz, is considered as 60 Hz application. The value is set to 1. | | | |

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## ECU AIN 1

| Value group | Engine | Related FW | 2.1.0 |
|---|---|---|---|
| Units | Depends on ECU value | | |
| Comm object | 10153 | Related applications | MINT, SPtM |
| Description | | | |
| This is one of the inputs, which are defined by ECU. Order of values depends on type of ECU.<br>***Note:*** *Usually there are engine speed[RPM], fuel rate[L/h], coolant temperature[°C], intake temperature[°C], oil pressure[bar], boost pressure[bar], load[%], oil temperature[°C] etc.* | | | |

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## ECU AIN 2

| Value group | Engine | Related FW | 2.1.0 |
|---|---|---|---|
| Units | Depends on ECU value | | |
| Comm object | 10154 | Related applications | MINT, SPtM |
| Description | | | |
| This is one of the inputs, which are defined by ECU. Order of values depends on type of ECU.<br>***Note:*** *Usually there are engine speed[RPM], fuel rate[L/h], coolant temperature[°C], intake temperature[°C], oil pressure[bar], boost pressure[bar], load[%], oil temperature[°C] etc.* | | | |

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## ECU AIN 3

| Value group | Engine | Related FW | 2.1.0 |
|---|---|---|---|
| Units | Depends on ECU value | | |
| Comm object | 10155 | Related applications | MINT, SPtM |
| Description | | | |
| This is one of the inputs, which are defined by ECU. Order of values depends on type of ECU.<br>***Note:*** *Usually there are engine speed[RPM], fuel rate[L/h], coolant temperature[°C], intake temperature[°C], oil pressure[bar], boost pressure[bar], load[%], oil temperature[°C] etc.* | | | |

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## ECU AIN 4

| Value group | Engine | Related FW | 2.1.0 |
|---|---|---|---|
| Units | Depends on ECU value | | |
| Comm object | 10156 | Related applications | MINT, SPtM |
| Description | | | |
| This is one of the inputs, which are defined by ECU. Order of values depends on type of ECU.<br>***Note:*** *Usually there are engine speed[RPM], fuel rate[L/h], coolant temperature[°C], intake temperature[°C], oil pressure[bar], boost pressure[bar], load[%], oil temperature[°C] etc.* | | | |

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## ECU AIN 5

| Value group | Engine | Related FW | 2.1.0 |
|---|---|---|---|
| Units | Depends on ECU value | | |
| Comm object | 10157 | Related applications | MINT, SPtM |
| Description | | | |
| This is one of the inputs, which are defined by ECU. Order of values depends on type of ECU.<br>***Note:*** *Usually there are engine speed[RPM], fuel rate[L/h], coolant temperature[°C], intake temperature[°C], oil pressure[bar], boost pressure[bar], load[%], oil temperature[°C] etc.* | | | |

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## ECU AIN 6

| Value group | Engine | Related FW | 2.1.0 |
|---|---|---|---|
| Units | Depends on ECU value | | |
| Comm object | 10158 | Related applications | MINT, SPtM |
| Description | | | |
| This is one of the inputs, which are defined by ECU. Order of values depends on type of ECU.<br>***Note:*** *Usually there are engine speed[RPM], fuel rate[L/h], coolant temperature[°C], intake temperature[°C], oil pressure[bar], boost pressure[bar], load[%], oil temperature[°C] etc.* | | | |

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## ECU AIN 7

| Value group | Engine | Related FW | 2.1.0 |
|---|---|---|---|
| Units | Depends on ECU value | | |
| Comm object | 10159 | Related applications | MINT, SPtM |
| Description | | | |
| This is one of the inputs, which are defined by ECU. Order of values depends on type of ECU.<br>***Note:*** *Usually there are engine speed[RPM], fuel rate[L/h], coolant temperature[°C], intake temperature[°C], oil pressure[bar], boost pressure[bar], load[%], oil temperature[°C] etc.* | | | |

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## ECU AIN 8

| Value group | Engine | Related FW | 2.1.0 |
|---|---|---|---|
| Units | Depends on ECU value | | |
| Comm object | 10160 | Related applications | MINT, SPtM |
| Description | | | |
| This is one of the inputs, which are defined by ECU. Order of values depends on type of ECU.<br>***Note:*** *Usually there are engine speed[RPM], fuel rate[L/h], coolant temperature[°C], intake temperature[°C], oil pressure[bar], boost pressure[bar], load[%], oil temperature[°C] etc.* | | | |

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## ECU AIN 9

| Value group | Engine | Related FW | 2.1.0 |
|---|---|---|---|
| Units | Depends on ECU value | | |
| Comm object | 10161 | Related applications | MINT, SPtM |
| Description | | | |
| This is one of the inputs, which are defined by ECU. Order of values depends on type of ECU.<br>***Note:*** *Usually there are engine speed[RPM], fuel rate[L/h], coolant temperature[°C], intake temperature[°C], oil pressure[bar], boost pressure[bar], load[%], oil temperature[°C] etc.* | | | |

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## ECU AIN 10

| Value group | Engine | Related FW | 2.1.0 |
|---|---|---|---|
| Units | Depends on ECU value | | |
| Comm object | 10162 | Related applications | MINT, SPtM |
| Description | | | |
| This is one of the inputs, which are defined by ECU. Order of values depends on type of ECU.<br>***Note:*** *Usually there are engine speed[RPM], fuel rate[L/h], coolant temperature[°C], intake temperature[°C], oil pressure[bar], boost pressure[bar], load[%], oil temperature[°C] etc.* | | | |

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## ECU AIN 11

| Value group | Engine | Related FW | 2.1.0 |
|---|---|---|---|
| Units | Depends on ECU value | | |
| Comm object | 10163 | Related applications | MINT, SPtM |
| Description | | | |
| This is one of the inputs, which are defined by ECU. Order of values depends on type of ECU.<br>***Note:*** *Usually there are engine speed[RPM], fuel rate[L/h], coolant temperature[°C], intake temperature[°C], oil pressure[bar], boost pressure[bar], load[%], oil temperature[°C] etc.* | | | |

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## ECU AIN 12

| Value group | Engine | Related FW | 2.1.0 |
|---|---|---|---|
| Units | Depends on ECU value | | |
| Comm object | 10164 | Related applications | MINT, SPtM |
| Description | | | |
| This is one of the inputs, which are defined by ECU. Order of values depends on type of ECU.<br>***Note:*** *Usually there are engine speed[RPM], fuel rate[L/h], coolant temperature[°C], intake temperature[°C], oil pressure[bar], boost pressure[bar], load[%], oil temperature[°C] etc.* | | | |

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## ECU AIN 13

| Value group | Engine | Related FW | 2.1.0 |
|---|---|---|---|
| Units | Depends on ECU value | | |
| Comm object | 10165 | Related applications | MINT, SPtM |
| Description | | | |
| This is one of the inputs, which are defined by ECU. Order of values depends on type of ECU.<br>***Note:*** *Usually there are engine speed[RPM], fuel rate[L/h], coolant temperature[°C], intake temperature[°C], oil pressure[bar], boost pressure[bar], load[%], oil temperature[°C] etc.* | | | |

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## ECU AIN 14

| Value group | Engine | Related FW | 2.1.0 |
|---|---|---|---|
| Units | Depends on ECU value | | |
| Comm object | 10166 | Related applications | MINT, SPtM |
| Description | | | |
| This is one of the inputs, which are defined by ECU. Order of values depends on type of ECU.<br>***Note:*** *Usually there are engine speed[RPM], fuel rate[L/h], coolant temperature[°C], intake temperature[°C], oil pressure[bar], boost pressure[bar], load[%], oil temperature[°C] etc.* | | | |

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## ECU AIN 15

| Value group | Engine | Related FW | 2.1.0 |
|---|---|---|---|
| Units | Depends on ECU value | | |
| Comm object | 10167 | Related applications | MINT, SPtM |
| Description | | | |
| This is one of the inputs, which are defined by ECU. Order of values depends on type of ECU.<br>***Note:*** *Usually there are engine speed[RPM], fuel rate[L/h], coolant temperature[°C], intake temperature[°C], oil pressure[bar], boost pressure[bar], load[%], oil temperature[°C] etc.* | | | |

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## ECU AIN 16

| Value group | Engine | Related FW | 2.1.0 |
|---|---|---|---|
| Units | Depends on ECU value | | |
| Comm object | 10168 | Related applications | MINT, SPtM |
| Description | | | |
| This is one of the inputs, which are defined by ECU. Order of values depends on type of ECU.<br>***Note:*** *Usually there are engine speed[RPM], fuel rate[L/h], coolant temperature[°C], intake temperature[°C], oil pressure[bar], boost pressure[bar], load[%], oil temperature[°C] etc.* | | | |

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## ECU AIN 17

| Value group | Engine | Related FW | 2.1.0 |
|---|---|---|---|
| Units | Depends on ECU value | | |
| Comm object | 10169 | Related applications | MINT, SPtM |
| Description | | | |
| This is one of the inputs, which are defined by ECU. Order of values depends on type of ECU.<br>***Note:*** *Usually there are engine speed[RPM], fuel rate[L/h], coolant temperature[°C], intake temperature[°C], oil pressure[bar], boost pressure[bar], load[%], oil temperature[°C] etc.* | | | |

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## ECU AIN 18

| Value group | Engine | Related FW | 2.1.0 |
|---|---|---|---|
| Units | Depends on ECU value | | |
| Comm object | 10170 | Related applications | MINT, SPtM |
| Description | | | |
| This is one of the inputs, which are defined by ECU. Order of values depends on type of ECU.<br>***Note:*** *Usually there are engine speed[RPM], fuel rate[L/h], coolant temperature[°C], intake temperature[°C], oil pressure[bar], boost pressure[bar], load[%], oil temperature[°C] etc.* | | | |

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## ECU AIN 19

| Value group | Engine | Related FW | 2.1.0 |
|---|---|---|---|
| Units | Depends on ECU value | | |
| Comm object | 10171 | Related applications | MINT, SPtM |
| Description | | | |
| This is one of the inputs, which are defined by ECU. Order of values depends on type of ECU.<br>***Note:*** *Usually there are engine speed[RPM], fuel rate[L/h], coolant temperature[°C], intake temperature[°C], oil pressure[bar], boost pressure[bar], load[%], oil temperature[°C] etc.* | | | |

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## ECU AIN 20

| Value group | Engine | Related FW | 2.1.0 |
|---|---|---|---|
| Units | Depends on ECU value | | |
| Comm object | 10172 | Related applications | MINT, SPtM |
| Description | | | |
| This is one of the inputs, which are defined by ECU. Order of values depends on type of ECU.<br>***Note:*** *Usually there are engine speed[RPM], fuel rate[L/h], coolant temperature[°C], intake temperature[°C], oil pressure[bar], boost pressure[bar], load[%], oil temperature[°C] etc.* | | | |

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## ECU-AIN-EXT-1

| Value group | Engine | Related FW | 2.1.0 |
|---|---|---|---|
| Units | Depends on ECU value | | |
| Comm object | 10173 | Related applications | MINT, SPtM |
| Description | | | |

This is one of the inputs, which are defined by ECU. Order of values depends on type of ECU.

***Note:*** *Usually there are engine speed[RPM], fuel rate[L/h], coolant temperature[°C], intake temperature[°C], oil pressure[bar], boost pressure[bar], load[%], oil temperature[°C] etc.*

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## ECU-AIN-EXT-2

| Value group | Engine | Related FW | 2.1.0 |
|---|---|---|---|
| Units | Depends on ECU value | | |
| Comm object | 10174 | Related applications | MINT, SPtM |
| Description | | | |

This is one of the inputs, which are defined by ECU. Order of values depends on type of ECU.

***Note:*** *Usually there are engine speed[RPM], fuel rate[L/h], coolant temperature[°C], intake temperature[°C], oil pressure[bar], boost pressure[bar], load[%], oil temperature[°C] etc.*

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## Speed Request

| Value group | Engine | Related FW | 2.1.0 |
|---|---|---|---|
| Units | % | | |
| Comm object | 10137 | Related applications | MINT, SPtM |
| Description | | | |

This value contains the speed control signal expressed in %.

| Speed request | Requested speed | Accelerator pedal position |
|---|---|---|
| 0% | 1350 RPM | 0% |
| 50% | 1500 RPM | 50% |
| 100% | 1650 RPM | 100% |

***Note:*** *Accelerator pedal position will be 0 if the engine is not running or loaded.*

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## Requested RPM

| Value group | Engine | Related FW | 2.1.0 |
|---|---|---|---|
| Units | RPM | | |
| Comm object | 10006 | Related applications | MINT, SPtM |
| Description | | | |
| This value contains the speed which is currently requested by the controller from the attached ECU.<br>This value is used for digital interfacing (via a communication bus) with ECUs that require the requested speed directly in RPM. | | | |

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## DPF Soot Load

| Value group | Engine | Related FW | 2.1.0 |
|---|---|---|---|
| Units | % | | |
| Comm object | 12484 | Related applications | MINT, SPtM |
| Description | | | |
| Indicates the soot load percentage of diesel particulate filter (DPF). | | | |

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## DPF Ash Load

| Value group | Engine | Related FW | 2.1.0 |
|---|---|---|---|
| Units | % | | |
| Comm object | 12483 | Related applications | MINT, SPtM |
| Description | | | |
| Indicates the ash load percentage of diesel particulate filter (DPF). | | | |

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## DEF Level

| Value group | Engine | Related FW | 2.1.0 |
|---|---|---|---|
| Units | % | | |
| Comm object | 14522 | Related applications | MINT, SPtM |
| Description | | | |
| The level of diesel exhaust fluid tank. | | | |

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## Group: Generator

### Earth Fault Current

| | | | |
|---|---|---|---|
| **Value group** | Generator | **Related FW** | 2.1.0 |
| **Units** | A | | |
| **Comm object** | 14325 | **Related applications** | MINT, SPtM |
| **Description** | | | |
| Measured value of fault for evaluation of earth fault protection. | | | |

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### Generator Frequency

| | | | |
|---|---|---|---|
| **Value group** | Generator | **Related FW** | 2.1.0 |
| **Units** | Hz | | |
| **Comm object** | 8210 | **Related applications** | MINT, SPtM |
| **Description** | | | |
| Frequency of generator. | | | |

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### Generator Voltage L1-L2

| | | | |
|---|---|---|---|
| **Value group** | Generator | **Related FW** | 2.1.0 |
| **Units** | V | | |
| **Comm object** | 9628 | **Related applications** | MINT, SPtM |
| **Description** | | | |
| Generator phase to phase voltage between L1 and L2 phases. | | | |

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### Generator Voltage L1-N

| | | | |
|---|---|---|---|
| **Value group** | Generator | **Related FW** | 2.1.0 |
| **Units** | V | | |
| **Comm object** | 8192 | **Related applications** | MINT, SPtM |
| **Description** | | | |
| Generator voltage on phase 1. | | | |

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### Generator Voltage L2-L3

| | | | |
|---|---|---|---|
| **Value group** | Generator | **Related FW** | 2.1.0 |
| **Units** | V | | |
| **Comm object** | 9629 | **Related applications** | MINT, SPtM |
| **Description** | | | |
| Generator phase to phase voltage between L2 and L3 phases. | | | |

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## Generator Voltage L2-N

| Value group | Generator | Related FW | 2.1.0 |
|---|---|---|---|
| Units | V | | |
| Comm object | 8193 | Related applications | MINT, SPtM |
| Description | | | |
| Generator voltage on phase 2. | | | |

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## Generator Voltage L3-L1

| Value group | Generator | Related FW | 2.1.0 |
|---|---|---|---|
| Units | V | | |
| Comm object | 9630 | Related applications | MINT, SPtM |
| Description | | | |
| Generator phase to phase voltage between L3 and L1 phases. | | | |

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## Generator Voltage L3-N

| Value group | Generator | Related FW | 2.1.0 |
|---|---|---|---|
| Units | V | | |
| Comm object | 8194 | Related applications | MINT, SPtM |
| Description | | | |
| Generator voltage on phase 3. | | | |

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## Nominal Current

| Value group | Generator | Related FW | 2.1.0 |
|---|---|---|---|
| Units | A | | |
| Comm object | 9978 | Related applications | MINT, SPtM |
| Description | | | |

Generator nominal current.

Calculation of value Nominal Current in Autodetect:

- For Connection Type: SplPhL1L2 and SplPhL1L3 power factor 1 is used in the formula of calculation of value Nominal Current.

For the other types: High Leg Delta, 3Ph Low Y, 3Ph High Y, Mono Phase power factor 0.8 is used.

***Note:*** *Visible only when* ***Connection type (page 277)*** *= Autodetect.*

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## Nominal Power

| Value group | Generator | Related FW | 2.1.0 |
|---|---|---|---|
| Units | V | | |
| Comm object | 9018 | Related applications | MINT, SPtM |
| Description | | | |
| Generator nominal power.<br>***Note:*** *Visible only when* ***Connection type (page 277)*** *= Autodetect.* | | | |

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## Nominal Voltage

| Value group | Generator | Related FW | 2.1.0 |
|---|---|---|---|
| Units | V | | |
| Comm object | 9917 | Related applications | MINT, SPtM |
| Description | | | |
| Generator nominal voltage.<br>***Note:*** *Visible only when* ***Connection type (page 277)*** *= Autodetect.* | | | |

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## Slip Angle

| Value group | Generator | Related FW | 2.1.0 |
|---|---|---|---|
| Units | ° | | |
| Comm object | 8225 | Related applications | MINT, SPtM |
| Description | | | |
| Slip angle during synchronization. | | | |

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## Slip Frequency

| Value group | Generator | Related FW | 2.1.0 |
|---|---|---|---|
| Units | Hz | | |
| Comm object | 8224 | Related applications | MINT, SPtM |
| Description | | | |
| Slip frequency during synchronization. | | | |

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## Generator Current L1

| | | | |
|---|---|---|---|
| **Value group** | Generator | **Related FW** | 2.1.0 |
| **Units** | A | | |
| **Comm object** | 8198 | **Related applications** | MINT, SPtM |
| **Description** | | | |
| Current phase L1 of Generator . | | | |

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## Generator Load Current L2

| | | | |
|---|---|---|---|
| **Value group** | Generator | **Related FW** | 2.1.0 |
| **Units** | A | | |
| **Comm object** | 8199 | **Related applications** | MINT, SPtM |
| **Description** | | | |
| Current phase L2 of Generator . | | | |

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## Load Current L3

| | | | |
|---|---|---|---|
| **Value group** | Generator | **Related FW** | 2.1.0 |
| **Units** | A | | |
| **Comm object** | 8200 | **Related applications** | MINT, SPtM |
| **Description** | | | |
| Current phase L3 of Generator . | | | |

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## Generator P

| | | | |
|---|---|---|---|
| **Value group** | Generator | **Related FW** | 2.1.0 |
| **Units** | kW | | |
| **Comm object** | 8202 | **Related applications** | MINT, SPtM |
| **Description** | | | |
| Generator active power. | | | |

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## Generator P L1

| | | | |
|---|---|---|---|
| **Value group** | Generator | **Related FW** | 2.1.0 |
| **Units** | kW | | |
| **Comm object** | 8524 | **Related applications** | MINT, SPtM |
| **Description** | | | |
| Generator active power in phase L1. | | | |

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## Generator P L2

| Value group | Generator | Related FW | 2.1.0 |
|---|---|---|---|
| Units | kW | | |
| Comm object | 8525 | Related applications | MINT, SPtM |
| Description | | | |
| Generator active power in phase L2. | | | |

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## Generator P L3

| Value group | Generator | Related FW | 2.1.0 |
|---|---|---|---|
| Units | kW | | |
| Comm object | 8526 | Related applications | MINT, SPtM |
| Description | | | |
| Generator active power in phase L3. | | | |

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## Generator Q

| Value group | Generator | Related FW | 2.1.0 |
|---|---|---|---|
| Units | kVAr | | |
| Comm object | 8203 | Related applications | MINT, SPtM |
| Description | | | |
| Generator reactive power. | | | |

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## Generator Q L1

| Value group | Generator | Related FW | 2.1.0 |
|---|---|---|---|
| Units | kVAr | | |
| Comm object | 8527 | Related applications | MINT, SPtM |
| Description | | | |
| Generator reactive power in phase L1. | | | |

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## Generator Q L2

| Value group | Generator | Related FW | 2.1.0 |
|---|---|---|---|
| Units | kVAr | | |
| Comm object | 8528 | Related applications | MINT, SPtM |
| Description | | | |
| Generator reactive power in phase L2. | | | |

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## Generator Q L3

| Value group | Generator | Related FW | 2.1.0 |
|---|---|---|---|
| Units | kVAr | | |
| Comm object | 8529 | Related applications | MINT, SPtM |
| Description | | | |
| Generator reactive power in phase L3. | | | |

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## Generator S

| Value group | Generator | Related FW | 2.1.0 |
|---|---|---|---|
| Units | kVA | | |
| Comm object | 8565 | Related applications | MINT, SPtM |
| Description | | | |
| Apparent power of Generator. | | | |

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## Generator S L1

| Value group | Generator | Related FW | 2.1.0 |
|---|---|---|---|
| Units | kVA | | |
| Comm object | 8530 | Related applications | MINT, SPtM |
| Description | | | |
| Generator apparent power L1. | | | |

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## Generator S L2

| Value group | Generator | Related FW | 2.1.0 |
|---|---|---|---|
| Units | kVA | | |
| Comm object | 8531 | Related applications | MINT, SPtM |
| Description | | | |
| Generator apparent power L2. | | | |

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## Generator S L3

| Value group | Generator | Related FW | 2.1.0 |
|---|---|---|---|
| Units | kVA | | |
| Comm object | 8532 | Related applications | MINT, SPtM |
| Description | | | |
| Generator apparent power L3. | | | |

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## Generator Power Factor

| | | | |
|---|---|---|---|
| **Load** | Generator | **Related FW** | 2.1.0 |
| **Units** | [-] | | |
| **Comm object** | 8204 | **Related applications** | MINT, SPtM |
| **Description** | | | |
| Generator power factor.<br>***Note:*** *This value stands for Load Power Factor as well.* | | | |

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## Generator Power Factor L1

| | | | |
|---|---|---|---|
| **Value group** | Generator | **Related FW** | 2.1.0 |
| **Units** | [-] | | |
| **Comm object** | 8533 | **Related applications** | MINT, SPtM |
| **Description** | | | |
| Generator power factor in phase L1. | | | |

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## Generator Power Factor L2

| | | | |
|---|---|---|---|
| **Value group** | Generator | **Related FW** | 2.1.0 |
| **Units** | [-] | | |
| **Comm object** | 8534 | **Related applications** | MINT, SPtM |
| **Description** | | | |
| Generator power factor in phase L2. | | | |

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## Generator Power Factor L3

| | | | |
|---|---|---|---|
| **Value group** | Generator | **Related FW** | 2.1.0 |
| **Units** | [-] | | |
| **Comm object** | 8535 | **Related applications** | MINT, SPtM |
| **Description** | | | |
| Generator power factor in phase L3. | | | |

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## Generator Load Character

| Value group | Generator | Related FW | 2.1.0 |
|---|---|---|---|
| Units | [-] | | |
| Comm object | 8395 | Related applications | MINT, SPtM |
| Description | | | |
| Character of the generator load. "L" means inductive load, "C" is capacitive and "R" is resistive load (power factor = 1). | | | |

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## Generator Load Character L1

| Value group | Generator | Related FW | 2.1.0 |
|---|---|---|---|
| Units | [-] | | |
| Comm object | 8626 | Related applications | MINT, SPtM |
| Description | | | |
| Character of the generator load in the L1 phase. "L" means inductive load, "C" is capacitive and "R" is resistive load (power factor = 1). | | | |

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## Generator Load Character L2

| Value group | Generator | Related FW | 2.1.0 |
|---|---|---|---|
| Units | [-] | | |
| Comm object | 8627 | Related applications | MINT, SPtM |
| Description | | | |
| Character of the generator load in the L2 phase. "L" means inductive load, "C" is capacitive and "R" is resistive load (power factor = 1). | | | |

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## Generator Load Character L3

| Value group | Generator | Related FW | 2.1.0 |
|---|---|---|---|
| Units | [-] | | |
| Comm object | 8628 | Related applications | MINT, SPtM |
| Description | | | |
| Character of the generator load in the L3 phase. "L" means inductive load, "C" is capacitive and "R" is resistive load (power factor = 1). | | | |

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## Group: Load

### Load P

| | | | |
|---|---|---|---|
| **Value group** | Load | **Related FW** | 2.1.0 |
| **Units** | kW | | |
| **Comm object** | 10601 | **Related applications** | MINT, SPtM |
| **Description** | | | |
| Load active power. | | | |

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### Load Q

| | | | |
|---|---|---|---|
| **Value group** | Load | **Related FW** | 2.1.0 |
| **Units** | kVAr | | |
| **Comm object** | 10644 | **Related applications** | MINT, SPtM |
| **Description** | | | |
| Load reactive power. | | | |

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### Load Power Factor

| | | | |
|---|---|---|---|
| **Load** | Load | **Related FW** | 2.1.0 |
| **Units** | [-] | | |
| **Comm object** | 9025 | **Related applications** | MINT, SPtM |
| **Description** | | | |
| Load power factor. | | | |

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## Group: Mains

### Mains Frequency

| | | | |
|---|---|---|---|
| **Value group** | Mains | **Related FW** | 2.1.0 |
| **Units** | Hz | | |
| **Comm object** | 8211 | **Related applications** | MINT, SPtM |
| **Description** | | | |
| Frequency of Mains. | | | |

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## Mains Voltage L1-N

| Value group | Mains | Related FW | 2.1.0 |
|---|---|---|---|
| Units | V | | |
| Comm object | 8195 | Related applications | MINT, SPtM |
| Description | | | |
| Mains voltage on phase 1. | | | |

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## Mains Voltage L2-N

| Value group | Mains | Related FW | 2.1.0 |
|---|---|---|---|
| Units | V | | |
| Comm object | 8196 | Related applications | MINT, SPtM |
| Description | | | |
| Mains voltage on phase 2. | | | |

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## Mains Voltage L3-N

| Value group | Mains | Related FW | 2.1.0 |
|---|---|---|---|
| Units | V | | |
| Comm object | 8197 | Related applications | MINT, SPtM |
| Description | | | |
| Mains voltage on phase 3. | | | |

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## Mains Voltage L1-L2

| Value group | Mains | Related FW | 2.1.0 |
|---|---|---|---|
| Units | V | | |
| Comm object | 9631 | Related applications | MINT, SPtM |
| Description | | | |
| Mains phase to phase voltage between L1 and L2 phases. | | | |

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## Mains Voltage L2-L3

| Value group | Mains | Related FW | 2.1.0 |
|---|---|---|---|
| Units | V | | |
| Comm object | 9632 | Related applications | MINT, SPtM |
| Description | | | |
| Mains phase to phase voltage between L2 and L3 phases. | | | |

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## Mains Voltage L3-L1

| Value group | Mains | Related FW | 2.1.0 |
|---|---|---|---|
| Units | V | | |
| Comm object | 9633 | Related applications | MINT, SPtM |
| Description | | | |
| Mains phase to phase voltage between L3 and L1 phases. | | | |

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## Mains L1 Current

| Value group | Mains | Related FW | 2.1.0 |
|---|---|---|---|
| Units | A | | |
| Comm object | 8208 | Related applications | SPtM |
| Description | | | |
| Mains current in phase L1. | | | |

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## Max Vector Shift

| Value group | Mains | Related FW | 2.1.0 |
|---|---|---|---|
| Units | Hz | | |
| Comm object | 9847 | Related applications | SPtM |
| Description | | | |
| This is maximal measured value of vector shift of the generator voltage. It is set to zero always when Controller goes to parallel to mains operation (When Vector Shift Protection = PARALLEL ONLY) or when MCB gets closed (when Vector shift protection = ENABLED). | | | |

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## Mains Import P

| Value group | Mains | Related FW | 2.1.0 |
|---|---|---|---|
| Units | kW | | |
| Comm object | 8703 | Related applications | SPtM |
| Description | | | |
| Imported P from Mains. | | | |

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## Mains Import Q

| Value group | Mains | Related FW | 2.1.0 |
|---|---|---|---|
| Units | kVAr | | |
| Comm object | 8704 | Related applications | SPtM |
| Description | | | |
| Imported Q from Mains. | | | |

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## Mains PF

| Value group | Mains | Related FW | 2.1.0 |
|---|---|---|---|
| Units | Hz | | |
| Comm object | 8705 | Related applications | SPtM |
| Description | | | |
| Mains power factor. | | | |

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## Mains Load Character

| Value group | Mains | Related FW | 2.1.0 |
|---|---|---|---|
| Units | Hz | | |
| Comm object | 8709 | Related applications | SPtM |
| Description | | | |
| Character of Mains load. "L" means inductive load, "C" is capacitive and "R" is resistive load (power factor = 1). | | | |

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## Mains Load Character L1

| Value group | Mains | Related FW | 2.1.0 |
|---|---|---|---|
| Units | Hz | | |
| Comm object | 8818 | Related applications | SPtM |
| Description | | | |
| Character of Mains load in phase L1. "L" means inductive load, "C" is capacitive and "R" is resistive load (power factor = 1). | | | |

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## Mains Load Character L2

| Value group | Mains | Related FW | 2.1.0 |
|---|---|---|---|
| Units | Hz | | |
| Comm object | 8819 | Related applications | SPtM |
| Description | | | |
| Character of Mains load in phase L2. "L" means inductive load, "C" is capacitive and "R" is resistive load (power factor = 1). | | | |

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### Mains Load Character L3

| | | | |
|---|---|---|---|
| **Value group** | Mains | **Related FW** | 2.1.0 |
| **Units** | Hz | | |
| **Comm object** | 8820 | **Related applications** | SPtM |
| **Description** | | | |
| Character of Mains load in phase L3. "L" means inductive load, "C" is capacitive and "R" is resistive load (power factor = 1). | | | |

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### ROCOF

| | | | |
|---|---|---|---|
| **Value group** | Mains | **Related FW** | 2.1.0 |
| **Units** | Hz/s | | |
| **Comm object** | 9848 | **Related applications** | SPtM |
| **Description** | | | |
| This value show actual measured value of ROCOF. | | | |

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### Max ROCOF

| | | | |
|---|---|---|---|
| **Value group** | Mains | **Related FW** | 2.1.0 |
| **Units** | Hz/s | | |
| **Comm object** | 10049 | **Related applications** | SPtM |
| **Description** | | | |
| This value show maximal measured value of ROCOF. | | | |

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## Group: User Buttons

### User Button 1

| | | | |
|---|---|---|---|
| **Value group** | User Buttons | **Related FW** | 2.1.0 |
| **Units** | [-] | | |
| **Comm object** | 20743 | **Related applications** | MINT, SPtM |
| **Description** | | | |
| State of User Button 1.<br>***Note:*** *For more information* ***see User Buttons on page 209****.* | | | |

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## Group: Controller I/O

### Battery Volts

| | | | |
|---|---|---|---|
| **Value group** | Controller I/O | **Related FW** | 2.1.0 |
| **Units** | V | | |
| **Comm object** | 8213 | **Related applications** | MINT, SPtM |
| **Description** | | | |
| Controller supply voltage. | | | |

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### D+

| | | | |
|---|---|---|---|
| **Value group** | Controller I/O | **Related FW** | 2.1.0 |
| **Units** | V | | |
| **Comm object** | 10603 | **Related applications** | MINT, SPtM |
| **Description** | | | |
| D+ terminal voltage. | | | |

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### Analog Input 1

| | | | |
|---|---|---|---|
| **Value group** | Controller I/O | **Related FW** | 2.1.0 |
| **Units** | Configurable | | |
| **Comm object** | 9151 | **Related applications** | MINT, SPtM |
| **Description** | | | |
| This is the value of the analog input 1 of the controller. | | | |

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### Analog Input 2

| | | | |
|---|---|---|---|
| **Value group** | Controller I/O | **Related FW** | 2.1.0 |
| **Units** | Configurable | | |
| **Comm object** | 9152 | **Related applications** | MINT, SPtM |
| **Description** | | | |
| This is the value of the analog input 2 of the controller. | | | |

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### Analog Input 3

| | | | |
|---|---|---|---|
| **Value group** | Controller I/O | **Related FW** | 2.1.0 |
| **Units** | Configurable | | |
| **Comm object** | 9153 | **Related applications** | MINT, SPtM |
| **Description** | | | |
| This is the value of the analog input 3 of the controller. | | | |

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## Analog Input 4

| | | | |
|---|---|---|---|
| **Value group** | Controller I/O | **Related FW** | 2.1.0 |
| **Units** | Configurable | | |
| **Comm object** | 9154 | **Related applications** | MINT, SPtM |
| **Description** | | | |
| This is the value of the analog input 4 of the controller. | | | |

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## Binary Inputs

| | | | |
|---|---|---|---|
| **Value group** | Controller I/O | **Related FW** | 2.1.0 |
| **Units** | [-] | | |
| **Comm object** | 8235 | **Related applications** | MINT, SPtM |
| **Description** | | | |
| State of the binary inputs of the controller. | | | |

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## Coolant Temp

| | | | |
|---|---|---|---|
| **Value group** | Controller I/O | **Related FW** | 2.1.0 |
| **Units** | | | |
| **Comm object** | 9152 | **Related applications** | MINT, SPtM |
| **Description** | | | |
| . | | | |

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## Fuel Level

| | | | |
|---|---|---|---|
| **Value group** | Controller I/O | **Related FW** | 2.1.0 |
| **Units** | | | |
| **Comm object** | 9153 | **Related applications** | MINT, SPtM |
| **Description** | | | |
| . | | | |

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## E-Stop

| | | | |
|---|---|---|---|
| **Value group** | Controller I/O | **Related FW** | 2.1.0 |
| **Units** | % | | |
| **Comm object** | 15780 | **Related applications** | MINT, SPtM |
| **Description** | | | |
| Shows number of E-STOP input – the same principle of visualization like binary inputs.<br>Principle of value (principle of normally close binary input):<br>› 1 – E-STOP has voltage – state is OK<br>› 0 – E-STOP has no voltage – protection is active | | | |

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### Binary Outputs

| | | | |
|---|---|---|---|
| **Value group** | Controller I/O | **Related FW** | 2.1.0 |
| **Units** | [-] | | |
| **Comm object** | 8239 | **Related applications** | MINT, SPtM |
| **Description** | | | |
| State of the binary outputs of the controller. | | | |

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## Group: Power Management

### Actual Power Band

| | | | |
|---|---|---|---|
| **Value group** | Power Management | **Related FW** | 2.1.0 |
| **Units** | - | | |
| **Comm object** | 8974 | **Related applications** | MINT |
| **Description** | | | |
| State of all Gen-sets in actual power band of power management. 1 means that Gen-set is running, 0 means that Gen-set is stopped.<br>***Note:*** *This value is evaluated only in controller with the lowest CAN address.* | | | |

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### Next Power Band

| | | | |
|---|---|---|---|
| **Value group** | Power Management | **Related FW** | 2.1.0 |
| **Units** | - | | |
| **Comm object** | 8975 | **Related applications** | MINT |
| **Description** | | | |
| State of all Gen-sets in next higher power band of power management. 1 means that Gen-set is running, 0 means that Gen-set is stopped.<br>***Note:*** *This value is evaluated only in controller with the lowest CAN address.* | | | |

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### Actual Relative Reserve

| | | | |
|---|---|---|---|
| **Value group** | Power Management | **Related FW** | 2.1.0 |
| **Units** | % | | |
| **Comm object** | 10788 | **Related applications** | MINT |
| **Description** | | | |
| Actual relative reserve in power management. | | | |

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## Actual Reserve

| | | | |
|---|---|---|---|
| **Value group** | Power Management | **Related FW** | 2.1.0 |
| **Units** | kW | | |
| **Comm object** | 15805 | **Related applications** | MINT |
| **Description** | | | |
| Actual absolute reserve in power management. | | | |

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## Start Relative Reserve

| | | | |
|---|---|---|---|
| **Value group** | Power Management | **Related FW** | 2.1.0 |
| **Units** | % | | |
| **Comm object** | 10786 | **Related applications** | MINT |
| **Description** | | | |
| Actual relative reserve for start. | | | |

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## Start Reserve

| | | | |
|---|---|---|---|
| **Value group** | Power Management | **Related FW** | 2.1.0 |
| **Units** | kW | | |
| **Comm object** | 15806 | **Related applications** | MINT |
| **Description** | | | |
| Actual absolute reserve for start. | | | |

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## Stop Relative Reserve

| | | | |
|---|---|---|---|
| **Value group** | Power Management | **Related FW** | 2.1.0 |
| **Units** | % | | |
| **Comm object** | 10787 | **Related applications** | MINT |
| **Description** | | | |
| Actual relative reserve – when the relative reserve is higher than this value the last started Gen-set (the Gen-set with the highest priority) is stopped. | | | |

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## Stop Reserve

| | | | |
|---|---|---|---|
| **Value group** | Power Management | **Related FW** | 2.1.0 |
| **Units** | kW | | |
| **Comm object** | 15807 | **Related applications** | MINT |
| **Description** | | | |
| Actual absolute reserve – when the reserve is higher than this value the last started Gen-set (the Gen-set with the highest priority) is stopped. | | | |

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## Dynamic Spinning Reserve

| | | | |
|---|---|---|---|
| **Value group** | Power Management | **Related FW** | 2.1.0 |
| **Units** | kW | | |
| **Comm object** | 15673 | **Related applications** | MINT |
| **Description** | | | |

**Dynamic Spinning Reserve** – DSR is a value, which is used to influence standard power management operation by adding DSR to currently used starting and stopping thresholds given by parameters **#Starting Load Reserve 1 (page 369)**, **#Starting Load Reserve 2 (page 371)** and **#Stopping Load Reserve 1 (page 369)**, **#Stopping Load Reserve 2 (page 371)**.

Actual thresholds used by power management are then values **Start Reserve (page 566)** and **Stop Reserve (page 566)**. DSR is used by power management, if **Dynamic Spinning Reserve (page 366)** is set to ENABLED and valid value is received from the IS-NTC HYBRID controller. DSR is 0, if **Dynamic Spinning Reserve (page 366)** is set to DISABLED or the value received from the IS-NTC HYBRID controller is invalid (#####).

> **Example:** Power management operates with **#Starting Load Reserve 1 (page 369)** = 100 kW and **#Stopping Load Reserve 1 (page 369)** = 200 kW. DSR value received from the IS-NTC HYBRID controller is 50 kW. It means that actual starting threshold **Start Reserve (page 566)** is 150 kW and actual stopping threshold **Stop Reserve (page 566)** is 250 kW.

***Note:*** *DSR is used by power management only when it operates in the absolute mode (**#Power Management Mode (page 365)** is set to ABS (kW)).*

***Note:*** *DSR is received automatically from the IS-NTC HYBRID controller via CAN2 bus.*

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## Dynamic Spinning Reserve Offset

| | | | |
|---|---|---|---|
| **Value group** | Power Management | **Related FW** | 2.1.0 |
| **Units** | kW | | |
| **Comm object** | 15674 | **Related applications** | MINT |
| **Description** | | | |

**Dynamic Spinning Reserve Offset** – DSRO is a value, which is used to influence standard power management operation by adding DSRO together with **Dynamic Spinning Reserve (page 567)** to currently used stopping threshold given by parameter **#Stopping Load Reserve 1 (page 369)**, **#Stopping Load Reserve 2 (page 371)**, #LoadResStop 3 or #LoadResStop 4.

Actual threshold used by power management is then value **Stop Reserve (page 566)**. DSRO is used by power management, if **Dynamic Spinning Reserve (page 366)** is set to ENABLED and valid value is received from the IS-NTC HYBRID controller. DSRO is 0, if **Dynamic Spinning Reserve (page 366)** is set to DISABLED or the value received from the IS-NTC HYBRID controller is invalid (#####).

> **Example:** Power management operates with **#Stopping Load Reserve 1 (page 369)** = 200 kW. DSRO received from the IS-NTC HYBRID controller is 20 kW and DSR value received from the IS-NTC HYBRID controller is 50 kW. It means that actual stopping threshold **Stop Reserve (page 566)** is 270 kW (**#Stopping Load Reserve 1 (page 369)** + **Dynamic Spinning Reserve (page 567)** + **Dynamic Spinning Reserve Offset (page 568)** = 200 + 50 + 20 = 270).

***Note:*** *DSRO is used by power management only when it operates in the absolute mode (**#Power Management Mode (page 365)** is set to ABS (kW)).*

***Note:*** *DSRO is received automatically from the IS-NTC HYBRID controller via CAN2 bus.*

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## Engine Priority

| | | | |
|---|---|---|---|
| **Value group** | Power Management | **Related FW** | 2.1.0 |
| **Units** | - | | |
| **Comm object** | 8624 | **Related applications** | MINT |
| **Description** | | | |

This value shows current priority number. It corresponds to the setpoint **Priority (page 366)** except following situations:

- If at least one of binary inputs **Top Priority (page 630)** is configured on some source and is active
- **#Priority Auto Swap (page 367)** is active

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## Minimal Running Power

| | | | |
|---|---|---|---|
| **Value group** | Power Management | **Related FW** | 2.1.0 |
| **Units** | kW | | |
| **Comm object** | 10012 | **Related applications** | MINT |
| **Description** | | | |

Actual minimal nominal power of all Gen-sets, which are running.

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## Total Running Q

| Value group | Power Management | Related FW | 2.1.0 |
|---|---|---|---|
| Units | kVAr | | |
| Comm object | 10656 | Related applications | MINT |
| Description | | | |
| Actual value of reactive power from all Gen-sets running in power management. | | | |

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## Total Running P

| Value group | Power Management | Related FW | 2.1.0 |
|---|---|---|---|
| Units | kW | | |
| Comm object | 10657 | Related applications | MINT |
| Description | | | |
| Actual value of active power from all Gen-sets running in power management. | | | |

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## Total Running S

| Value group | Power Management | Related FW | 2.1.0 |
|---|---|---|---|
| Units | kVA | | |
| Comm object | 16424 | Related applications | MINT, SPtM |
| Description | | | |
| Actual value of apparent power from all Gen-sets running in **Power management (page 159)**. | | | |

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## Total Running P 10min Avg

| Value group | Power Management | Related FW | 2.1.0 |
|---|---|---|---|
| Units | kW | | |
| Comm object | 20365 | Related applications | MINT, SPtM |
| Description | | | |
| This value contains 10-minutes average of **Total Running P (page 569)**. | | | |

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## Total Running Q 10min Avg

| Value group | Power Management | Related FW | 2.1.0 |
|---|---|---|---|
| Units | kVAr | | |
| Comm object | 20366 | Related applications | MINT, SPtM |
| Description | | | |
| This value contains 10-minutes average of **Total Running Q (page 569)**. | | | |

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## Total Running S 10min Avg

| Value group | Power Management | Related FW | 2.1.0 |
|---|---|---|---|
| Units | kVA | | |
| Comm object | 20367 | Related applications | MINT, SPtM |
| Description | | | |
| This value contains 10-minutes average of **Total Running S (page 569)**. | | | |

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## Running Nominal Power In PM

| Value group | Power Management | Related FW | 2.1.0 |
|---|---|---|---|
| Units | kW | | |
| Comm object | 10999 | Related applications | MINT |
| Description | | | |
| Actual nominal power of all Gen-sets, which are running. | | | |

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## Running Nominal Power Of All

| Value group | Power Management | Related FW | 2.1.0 |
|---|---|---|---|
| Units | kW | | |
| Comm object | 10658 | Related applications | MINT |
| Description | | | |
| Actual nominal power of all Gen-sets in power management, which are running. | | | |

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## Available Nominal Power In PM

| Value group | Power Management | Related FW | 2.1.0 |
|---|---|---|---|
| Units | kW | | |
| Comm object | 10998 | Related applications | MINT |
| Description | | | |
| Available nominal power of all Gen-sets in power management. | | | |

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## Group: Speed/Load Control

### Required P Target

| | | | |
|---|---|---|---|
| **Value group** | Speed/Load Control | **Related FW** | 2.1.0 |
| **Units** | kW | | |
| **Comm object** | 8663 | **Related applications** | MINT, SPtM |
| **Description** | | | |
| This value contains actual required load level, which is used as the input into the load regulation loop in the parallel to mains operation. | | | |

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### Loadsharing Output

| | | | |
|---|---|---|---|
| **Value group** | Speed/Load Control | **Related FW** | 2.1.0 |
| **Units** | % | | |
| **Comm object** | 10924 | **Related applications** | MINT, SPtM |
| **Description** | | | |
| Load sharing regulation loop output. | | | |

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### Speed Regulator Output

| | | | |
|---|---|---|---|
| **Value group** | Speed/Load Control | **Related FW** | 2.1.0 |
| **Units** | Hz | | |
| **Comm object** | 9052 | **Related applications** | MINT, SPtM |
| **Description** | | | |
| This is the actual voltage on the speed governor output of the controller. In case the output is switched to PWM mode, the relation is 10 V ~ 100 % PWM. -10 V is 0 % PWM | | | |

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## Group: Voltage/PF Control

### Required P

| | | | |
|---|---|---|---|
| **Value group** | Voltage/PF Control | **Related FW** | 2.1.0 |
| **Units** | kW | | |
| **Comm object** | 13105 | **Related applications** | MINT, SPtM |
| **Description** | | | |
| Requested active power. | | | |

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## Reactive Q

| | | | |
|---|---|---|---|
| **Value group** | Voltage/PF Control | **Related FW** | 2.1.0 |
| **Units** | kVAr | | |
| **Comm object** | 12877 | **Related applications** | MINT, SPtM |
| **Description** | | | |
| Requested reactive power. | | | |

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## Required PF Character

| | | | |
|---|---|---|---|
| **Value group** | Voltage/PF Control | **Related FW** | 2.1.0 |
| **Units** | [-] | | |
| **Comm object** | 9033 | **Related applications** | MINT, SPtM |
| **Description** | | | |
| Required Power Factor Character. | | | |

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## Required Qrel

| | | | |
|---|---|---|---|
| **Value group** | Voltage/PF Control | **Related FW** | 2.1.0 |
| **Units** | % | | |
| **Comm object** | 13169 | **Related applications** | MINT, SPtM |
| **Description** | | | |
| Required relative reactive power. | | | |

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## Varsharing Output

| | | | |
|---|---|---|---|
| **Value group** | Voltage/PF Control | **Related FW** | 2.1.0 |
| **Units** | kVAr | | |
| **Comm object** | 10925 | **Related applications** | MINT, SPtM |
| **Description** | | | |
| Varsharing regulation loop output. | | | |

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## Voltage Regulator Output

| | | | |
|---|---|---|---|
| **Value group** | Voltage/PF Control | **Related FW** | 2.1.0 |
| **Units** | V | | |
| **Comm object** | 9053 | **Related applications** | MINT, SPtM |
| **Description** | | | |
| Actual voltage between the AVR OUT and AVR COM terminals. | | | |

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### Voltage Request

| Value group | Voltage/PF Control | Related FW | 2.1.0 |
|---|---|---|---|
| Units | % | | |
| Comm object | 14997 | Related applications | MINT, SPtM |
| Description | | | |
| Internal Voltage request of internal Voltage regulator. | | | |

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## Group: Statistics

### Genset kWh

| Value group | Statistics | Related FW | 2.1.0 |
|---|---|---|---|
| Units | kWh | | |
| Comm object | 8205 | Related applications | MINT, SPtM |
| Description | | | |
| Counter of Gen-set active power. | | | |

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### Genset kVArh

| Value group | Statistics | Related FW | 2.1.0 |
|---|---|---|---|
| Units | kVArh | | |
| Comm object | 8539 | Related applications | MINT, SPtM |
| Description | | | |
| Counter of Gen-set reactive power. | | | |

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### Mains kWh

| Value group | Statistics | Related FW | 2.1.0 |
|---|---|---|---|
| Units | kWh | | |
| Comm object | 11025 | Related applications | MINT, SPtM |
| Description | | | |
| Counter of mains active power . | | | |

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### Mains kVArh

| Value group | Statistics | Related FW | 2.1.0 |
|---|---|---|---|
| Units | kVArh | | |
| Comm object | 11026 | Related applications | MINT, SPtM |
| Description | | | |
| Counter of mains reactive power. | | | |

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## Maintenance Timer 1 RunHours

| Value group | Statistics | Related FW | 2.1.0 |
|---|---|---|---|
| Units | hours | | |
| Comm object | 11616 | Related applications | MINT, SPtM |
| Description | | | |
| Countdown until next maintenance 1.<br>Statistic value for **Maintenance Timer 1 RunHours (page 319)**. | | | |

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## Maintenance Timer 1 Interval

| Value group | Statistics | Related FW | 2.1.0 |
|---|---|---|---|
| Units | days | | |
| Comm object | 16387 | Related applications | MINT, SPtM |
| Description | | | |
| Countdown until next maintenance 1.<br>Statistic value for **Maintenance Timer 1 Interval (page 319)**. | | | |

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## Maintenance Timer 2 RunHours

| Value group | Statistics | Related FW | 2.1.0 |
|---|---|---|---|
| Units | hours | | |
| Comm object | 11617 | Related applications | MINT, SPtM |
| Description | | | |
| Countdown until next maintenance 2.<br>Statistic value for **Maintenance Timer 2 RunHours (page 320)**. | | | |

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## Maintenance Timer 2 Interval

| Value group | Statistics | Related FW | 2.1.0 |
|---|---|---|---|
| Units | days | | |
| Comm object | 16388 | Related applications | MINT, SPtM |
| Description | | | |
| Countdown until next maintenance 2.<br>Statistic value for **Maintenance Timer 2 Interval (page 321)**. | | | |

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## Maintenance Timer 3 RunHours

| Value group | Statistics | Related FW | 2.1.0 |
|---|---|---|---|
| Units | hours | | |
| Comm object | 11618 | Related applications | MINT, SPtM |
| Description | | | |
| Countdown until next maintenance 3.<br>Statistic value for **Maintenance Timer 3 RunHours (page 322)**. | | | |

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## Maintenance Timer 3 Interval

| Value group | Statistics | Related FW | 2.1.0 |
|---|---|---|---|
| Units | days | | |
| Comm object | 16389 | Related applications | MINT, SPtM |
| Description | | | |
| Countdown until next maintenance 3.<br>Statistic value for **Maintenance Timer 3 Interval (page 322)**. | | | |

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## Rental 1

| Value group | Statistics | Related FW | 2.1.0 |
|---|---|---|---|
| Units | hours | | |
| Comm object | 14328 | Related applications | MINT, SPtM |
| Description | | | |
| Remaining hours of **Rental Timer 1 (page 465)**. | | | |

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## Rental 2

| Value group | Statistics | Related FW | 2.1.0 |
|---|---|---|---|
| Units | days | | |
| Comm object | 14369 | Related applications | MINT, SPtM |
| Description | | | |
| Remaining days of **Rental Timer 2 (page 467)**. | | | |

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## Num E-Stops

| Value group | Statistics | Related FW | 2.1.0 |
|---|---|---|---|
| Units | [-] | | |
| Comm object | 11195 | Related applications | MINT, SPtM |
| Description | | | |
| Emergency stop alarms counter.<br>***Note:*** *This value counts only in case that Gen-set was stopped due to E-Stop or Emergency Stop.* | | | |

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## Shutdowns

| Value group | Statistics | Related FW | 2.1.0 |
|---|---|---|---|
| Units | [-] | | |
| Comm object | 11196 | Related applications | MINT, SPtM |
| Description | | | |
| Shutdown alarms counter. This counter counts all occurrences of a shutdown alarm, not only real shutdowns of the Gen-set, i.e. the counter is increased by 2 if two shutdown alarms appear simultaneously. | | | |

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## Total Fuel Consumption

| Value group | Statistics | Related FW | 2.1.0 |
|---|---|---|---|
| Units | L | | |
| Comm object | 9040 | Related applications | MINT, SPtM |
| Description | | | |
| Value containing total amount of consumed fuel by engine. The controller automatically updates this value every 30 s. The controller can calculate it in three ways:<br>› Direct reading from ECU<br>› Calculation based on actual fuel consumption reading from ECU<br>› Calculation from fuel level drop in tank (using Fuel Level Analog Input + **Fuel Tank Volume (page 311)** setpoint)<br>***Note:*** *The accuracy of Total Fuel Consumption depends on the precision of ECU values or precision of **Fuel Tank Volume (page 311)** and fuel level sensor.* | | | |

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## Time Till Empty 1

| Value group | Statistics | Related FW | 2.1.0 |
|---|---|---|---|
| Units | days | | |
| Comm object | 13770 | Related applications | MINT, SPtM |
| Description | | | |
| Assessment in days when the fuel tank will be empty.<br>***Note:*** *This value is based on setpoint* ***Fuel Tank Volume (page 311)*** *and value from ECU Fuel Rate. For correct calculation of this value is necessary to have configured ECU which send Fuel Rate value, otherwise this value can't be calculated.* | | | |

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## Time Till Empty 2

| Value group | Statistics | Related FW | 2.1.0 |
|---|---|---|---|
| Units | hours | | |
| Comm object | 13771 | Related applications | MINT, SPtM |
| Description | | | |
| Assessment in hours when the fuel tank will be empty.<br>***Note:*** *This value is based on setpoint* ***Fuel Tank Volume (page 311)*** *and value from ECU Fuel Rate. For correct calculation of this value is necessary to have configured ECU which send Fuel Rate value, otherwise this value can't be calculated.* | | | |

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## Time Till Empty 3

| Value group | Statistics | Related FW | 2.1.0 |
|---|---|---|---|
| Units | minutes | | |
| Comm object | 13772 | Related applications | MINT, SPtM |
| Description | | | |
| Assessment in minutes when the fuel tank will be empty.<br>***Note:*** *This value is based on setpoint* ***Fuel Tank Volume (page 311)*** *and value from ECU Fuel Rate. For correct calculation of this value is necessary to have configured ECU which send Fuel Rate value, otherwise this value can't be calculated.* | | | |

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## Num Starts

| Value group | Statistics | Related FW | 2.1.0 |
|---|---|---|---|
| Units | [-] | | |
| Comm object | 8207 | Related applications | MINT, SPtM |
| Description | | | |
| Engine start commands counter. The counter is increased by 1 even if the particular start command will take more than one attempt. | | | |

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### Pulse Counter 1

| Value group | Statistics | Related FW | 2.1.0 |
|---|---|---|---|
| Units | - | | |
| Comm object | 10986 | Related applications | MINT, SPtM |
| Description | | | |
| This is the value of **PULSE COUNTER 1 (PAGE 625)** function.<br>***Note:*** *Maximum value is 1000000.* | | | |

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### Pulse Counter 2

| Value group | Statistics | Related FW | 2.1.0 |
|---|---|---|---|
| Units | - | | |
| Comm object | 10987 | Related applications | MINT, SPtM |
| Description | | | |
| This is the value of **PULSE COUNTER 2 (PAGE 626)** function.<br>***Note:*** *Maximum value is 1000000.* | | | |

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### Running Hours

| Value group | Statistics | Related FW | 2.1.0 |
|---|---|---|---|
| Units | hours | | |
| Comm object | 8206 | Related applications | MINT, SPtM |
| Description | | | |
| Engine operation hours counter. The engine hours are incremented in the controller while the engine is running.<br>***Note:*** *If an ECU is configured and it provides engine hours value, the value is taken from the ECU.* | | | |

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## Group: Info

### Active Application

| Value group | Info | Related FW | 2.1.0 |
|---|---|---|---|
| Units | [-] | | |
| Comm object | 14446 | Related applications | MINT, SPtM |
| Description | | | |
| This Value mirrors the active application in the controller.<br>**Example:** MINT or SPtM. | | | |

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## Application

| Value group | Info | Related FW | 2.1.0 |
|---|---|---|---|
| Units | [-] | | |
| Comm object | 8480 | Related applications | MINT, SPtM |
| Description | | | |
| The value contains actual application in controller. | | | |

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## Breaker State

| Value group | Info | Related FW | 2.1.0 |
|---|---|---|---|
| Units | [-] | | |
| Comm object | 9245 | Related applications | MINT, SPtM |
| Description | | | |
| The value contains actual "breaker state" message which is shown on the main screen of the controller. | | | |

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## Connection Type

| Value group | Info | Related FW | 2.1.0 |
|---|---|---|---|
| Units | [-] | | |
| Comm object | 12944 | Related applications | MINT, SPtM |
| Description | | | |
| The text of this value represents the connection type which is adjusted in setpoint **Connection type (page 277)**. | | | |

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## Engine State

| Value group | Info | Related FW | 2.1.0 |
|---|---|---|---|
| Units | [-] | | |
| Comm object | 9244 | Related applications | MINT, SPtM |
| Description | | | |
| The value contains actual "engine state" message which is shown on the main screen of the controller. | | | |

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## CAN16

| Value group | IL Info | Related FW | 2.1.0 |
|---|---|---|---|
| Units | [-] | | |
| Comm object | 8546 | Related applications | MINT, SPtM |
| Description | | | |
| Bits of this value show "1" if the controller receives messages from the controller which has address corresponding with the bit position. Bit 0 represents address 1 etc. This value contains information about controllers with addresses 1-16. | | | |

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## CAN32

| Value group | IL Info | Related FW | 2.1.0 |
|---|---|---|---|
| Units | [-] | | |
| Comm object | 8827 | Related applications | MINT, SPtM |
| Description | | | |
| Bits of this value show "1" if the controller receives messages from the controller which has address corresponding with the bit position. Bit 0 represents address 17 etc. This value contains information about controllers with addresses 17-32. | | | |

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## CAN48

| Value group | Info | Related FW | 2.1.0 |
|---|---|---|---|
| Units | [-] | | |
| Comm object | 16684 | Related applications | MINT, SPtM |
| Description | | | |

This value contains information about controllers connected via CAN2A and/or CAN2B with **Subgroup: Controller Address (page 289)** = <33,48>.

- Log. 1 – this controller receives messages from the controller with specific CAN address
- Log. 0 – this controller does not receive messages from the controller with specific CAN address

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## CAN64

| Value group | Info | Related FW | 2.1.0 |
|---|---|---|---|
| Units | [-] | | |
| Comm object | 16685 | Related applications | MINT, SPtM |
| Description | | | |

This value contains information about controllers connected via CAN2A and/or CAN2B with **Subgroup: Controller Address (page 289)** = <49,64>.

- 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 | IL Info | Related FW | 2.1.0 |
|---|---|---|---|
| Units | - | | |
| Comm object | 11081 | Related applications | MINT, SPtM |
| Description | | | |
| Bits of this value show "1" if the controller which has address corresponding with the bit position plays active role in the power management. Bit 0 represents address 1 etc. This value contains information about controllers with addresses 1-16. | | | |

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## Reg32

| Value group | IL Info | Related FW | 2.1.0 |
|---|---|---|---|
| Units | - | | |
| Comm object | 11082 | Related applications | MINT, SPtM |
| Description | | | |
| Bits of this value show "1" if the controller which has address corresponding with the bit position plays active role in the power management. Bit 0 represents address 17 etc. This value contains information about controllers with addresses 17-32. | | | |

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## FW Branch

| Value group | Info | Related FW | 2.1.0 |
|---|---|---|---|
| Units | [-] | | |
| Comm object | 8707 | Related applications | MINT, SPtM |
| Description | | | |
| The value contains actual branch of firmware in controller. | | | |

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## FW Version

| Value group | Info | Related FW | 2.1.0 |
|---|---|---|---|
| Units | [-] | | |
| Comm object | 24339 | Related applications | MINT, SPtM |
| Description | | | |
| Major and minor firmware version number. | | | |

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## HW Version

| Value group | Info | Related FW | 2.1.0 |
|---|---|---|---|
| Units | [-] | | |
| Comm object | 23887 | Related applications | MINT, SPtM |
| Description | | | |
| Major and minor hardware version number.<br>***Note:*** *This value is invisible in standard configuration.* | | | |

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## Gen Loaded 16

| Value group | IL Info | Related FW | 2.1.0 |
|---|---|---|---|
| Units | [-] | | |
| Comm object | 10196 | Related applications | MINT, SPtM |
| Description | | | |
| Bits of this value show "1" if the controller which has address corresponding with the bit position is loaded (GCB closed). Bit 0 represents address 1 etc. This value contains information about controllers with addresses 1-16. | | | |

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## Gen Loaded 32

| Value group | IL Info | Related FW | 2.1.0 |
|---|---|---|---|
| Units | [-] | | |
| Comm object | 10197 | Related applications | MINT, SPtM |
| Description | | | |
| Bits of this value show "1" if the controller which has address corresponding with the bit position is loaded (GCB closed). Bit 0 represents address 17 etc. This value contains information about controllers with addresses 17-32. | | | |

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## ID String

| Value group | Info | Related FW | 2.1.0 |
|---|---|---|---|
| Units | [-] | | |
| Comm object | 24501 | Related applications | MINT, SPtM |
| Description | | | |
| Name of controller which is used in InteliConfig in command bar. | | | |

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## Load Shedding Status

| Value group | Info | Related FW | 2.1.0 |
|---|---|---|---|
| Units | [-] | | |
| Comm object | 9591 | Related applications | MINT, SPtM |
| Description | | | |
| The value contains actual "load shedding stage". The Value can get the values of the range 0 to 52, where 0 means no load shedding stage is active and 1, 2, 3, 4 or 5 means that the corresponding load shedding stage is active. | | | |

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## SPI Module A

| Value group | Info | Related FW | 2.1.0 |
|---|---|---|---|
| Units | [-] | | |
| Comm object | 14447 | Related applications | MINT, SPtM |
| Description | | | |
| The name of plug-in module which is inserted in slot A. | | | |

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## SPI Module B

| Value group | Info | Related FW | 2.1.0 |
|---|---|---|---|
| Units | [-] | | |
| Comm object | 14448 | Related applications | MINT, SPtM |
| Description | | | |
| The name of plug-in module which is inserted in slot B. | | | |

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## Timer Text

| Value group | Info | Related FW | 2.1.0 |
|---|---|---|---|
| Units | [-] | | |
| Comm object | 10040 | Related applications | MINT, SPtM |
| Description | | | |
| The value contains the "Current process timer" text which is shown on the main screen of the controller. | | | |

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## Timer Value

| Value group | Info | Related FW | 2.1.0 |
|---|---|---|---|
| Units | [HH:MM:SS] | | |
| Comm object | 14147 | Related applications | MINT, SPtM |
| Description | | | |
| The value contains the "Current process timer" value which is shown on the main screen of the controller. | | | |

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## Group: Log Bout

### Log Bout 1

| | | | |
|---|---|---|---|
| **Value group** | Log Bout | **Related FW** | 2.1.0 |
| **Units** | [-] | | |
| **Comm object** | 9143 | **Related applications** | MINT, SPtM |
| **Description** | | | |
| State of binary outputs. | | | |

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### Log Bout 2

| | | | |
|---|---|---|---|
| **Value group** | Log Bout | **Related FW** | 2.1.0 |
| **Units** | [-] | | |
| **Comm object** | 9144 | **Related applications** | MINT, SPtM |
| **Description** | | | |
| State of binary outputs. | | | |

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### Log Bout 3

| | | | |
|---|---|---|---|
| **Value group** | Log Bout | **Related FW** | 2.1.0 |
| **Units** | [-] | | |
| **Comm object** | 9145 | **Related applications** | MINT, SPtM |
| **Description** | | | |
| State of binary outputs. | | | |

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### Log Bout 4

| | | | |
|---|---|---|---|
| **Value group** | Log Bout | **Related FW** | 2.1.0 |
| **Units** | [-] | | |
| **Comm object** | 9146 | **Related applications** | MINT, SPtM |
| **Description** | | | |
| State of binary outputs. | | | |

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### Log Bout 5

| | | | |
|---|---|---|---|
| **Value group** | Log Bout | **Related FW** | 2.1.0 |
| **Units** | [-] | | |
| **Comm object** | 9147 | **Related applications** | MINT, SPtM |
| **Description** | | | |
| State of binary outputs. | | | |

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## Log Bout 6

| Value group | Log Bout | Related FW | 2.1.0 |
|---|---|---|---|
| Units | [-] | | |
| Comm object | 9148 | Related applications | MINT, SPtM |
| Description | | | |
| State of binary outputs. | | | |

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## Log Bout 7

| Value group | Log Bout | Related FW | 2.1.0 |
|---|---|---|---|
| Units | [-] | | |
| Comm object | 9149 | Related applications | MINT, SPtM |
| Description | | | |
| State of binary outputs. | | | |

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## Log Bout 8

| Value group | Log Bout | Related FW | 2.1.0 |
|---|---|---|---|
| Units | [-] | | |
| Comm object | 9150 | Related applications | MINT, SPtM |
| Description | | | |
| State of binary outputs. | | | |

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## Log Bout 9

| Value group | Log Bout | Related FW | 2.1.0 |
|---|---|---|---|
| Units | [-] | | |
| Comm object | 11896 | Related applications | MINT, SPtM |
| Description | | | |
| State of binary outputs. | | | |

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## Group: Fixed Protection States

### Fixed Protections States 1

| | | | |
|---|---|---|---|
| **Value group** | Fixed Protection States | **Related FW** | 2.1.0 |
| **Units** | [-] | | |
| **Comm object** | 20744 | **Related applications** | MINT, SPtM |
| **Description** | | | |
| Values of LBO Fixed Protections State. | | | |

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### Fixed Protections States 2

| | | | |
|---|---|---|---|
| **Value group** | Fixed Protection States | **Related FW** | 2.1.0 |
| **Units** | [-] | | |
| **Comm object** | 20745 | **Related applications** | MINT, SPtM |
| **Description** | | | |
| Values of LBO Fixed Protections State. | | | |

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### Fixed Protections States 3

| | | | |
|---|---|---|---|
| **Value group** | Fixed Protection States | **Related FW** | 2.1.0 |
| **Units** | [-] | | |
| **Comm object** | 20746 | **Related applications** | MINT, SPtM |
| **Description** | | | |
| Values of LBO Fixed Protections State. | | | |

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### Fixed Protections States 4

| | | | |
|---|---|---|---|
| **Value group** | Fixed Protection States | **Related FW** | 2.1.0 |
| **Units** | [-] | | |
| **Comm object** | 20747 | **Related applications** | MINT, SPtM |
| **Description** | | | |
| Values of LBO Fixed Protections State. | | | |

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### Fixed Protections States 5

| | | | |
|---|---|---|---|
| **Value group** | Fixed Protection States | **Related FW** | 2.1.0 |
| **Units** | [-] | | |
| **Comm object** | 20748 | **Related applications** | MINT, SPtM |
| **Description** | | | |
| Values of LBO Fixed Protections State. | | | |

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## Group: User Protection States

### User Protections States 1

| | | | |
|---|---|---|---|
| **Value group** | User Protection States | **Related FW** | 2.1.0 |
| **Units** | [-] | | |
| **Comm object** | 20759 | **Related applications** | MINT, SPtM |
| **Description** | | | |
| Values of LBO User Protections State. | | | |

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## Group: CM-4G-GPS

### Signal Strength

| | | | |
|---|---|---|---|
| **Value group** | CM-4G-GPS | **Related FW** | 2.1.0 |
| **Units** | % | | |
| **Comm object** | 24302 | **Related applications** | MINT, SPtM |
| **Description** | | | |
| This value contains information about relative strength of the cellular signal received by the CM2-4G-GPS module. It is a relative value helping to find the best signal and for troubleshooting cases. | | | |

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### Network Status

| | | | |
|---|---|---|---|
| **Value group** | CM-4G-GPS | **Related FW** | 2.1.0 |
| **Units** | [-] | | |
| **Comm object** | 24290 | **Related applications** | MINT, SPtM |
| **Description** | | | |

The text of this value represents the status of the GSM modem.

| Code | Description |
|---|---|
| Not availab | Not available |
| Available | Available |
| Attached | Attached |

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## Last Email Result

| Value group | CM-4G-GPS | Related FW | 2.1.0 |
|---|---|---|---|
| Units | [-] | | |
| Comm object | 24307 | Related applications | MINT, SPtM |
| Description | | | |

Result of last email, which was sent by controller.

| Code | Description |
|---|---|
| 0 | Email was successfully sent. |
| 2 | It is not possible to establish connection with SMTP server. |
| 3 | SMTP server is not ready for communication. |
| 4 | Maximum length of data can't be read. |
| 5 | No appeal to send command. |
| 6 | Command can't be send. |
| 7 | Command can't be send. |
| 8 | HELO command was refused. |
| 11 | AUTH LOGIN command was refused. |
| 12 | Wrong user name. |
| 13 | Wrong password. |
| 14 | MAIL FROM command was refused. |
| 15 | RCPT TO command was refused. |
| 16 | DATA command was refused. |
| 17 | Sending of email failed. |
| 18 | SMTP server refused the data of email. |
| 19 | SMTP server refused the data of email. |
| 20 | QUIT command was refused. |
| 21 | Lost of connection. |
| 23 | Error during closing the connection. |
| 24 | No answer from server. |
| 25 | It is impossible to create data for command DATA. |
| 26 | It is impossible to read data for command DATA. |
| 28 | Error of encoding. |
| 29 | There was no attempt to send email. |

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## Network Name

| | | | |
|---|---|---|---|
| **Value group** | CM-4G-GPS | **Related FW** | 2.1.0 |
| **Units** | [-] | | |
| **Comm object** | 24147 | **Related applications** | MINT, SPtM |
| **Description** | | | |
| The name of operator which to SIM card is connected.<br>***Note:*** *If roaming service is used then prefix "R" is added before the name of operator.* | | | |

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## Network Mode

| | | | |
|---|---|---|---|
| **Value group** | CM-4G-GPS | **Related FW** | 2.1.0 |
| **Units** | [-] | | |
| **Comm object** | 24146 | **Related applications** | MINT, SPtM |
| **Description** | | | |
| The type of data connection. | | | |

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## GPS Status

| | | | |
|---|---|---|---|
| **Value group** | CM-4G-GPS | **Related FW** | 2.1.0 |
| **Units** | [-] | | |
| **Comm object** | 23973 | **Related applications** | MINT, SPtM |
| **Description** | | | |

Value describing the GPS signal.

| Code | Description |
|---|---|
| Undefined | GPS signal is not available. Check antenna connection. |
| Searching | Looking up for signal from available satellites. |
| Fixed | GPS signal available. |

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## Latitude

| | | | |
|---|---|---|---|
| **Value group** | CM-4G-GPS | **Related FW** | 2.1.0 |
| **Units** | [-] | | |
| **Comm object** | 24268 | **Related applications** | MINT, SPtM |
| **Description** | | | |
| Actual GPS latitude. Positions on north hemisphere have positive value, position on south hemisphere have negative value. | | | |

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## Longitude

| | | | |
|---|---|---|---|
| **Value group** | CM-4G-GPS | **Related FW** | 2.1.0 |
| **Units** | [-] | | |
| **Comm object** | 24267 | **Related applications** | MINT, SPtM |
| **Description** | | | |
| Actual GPS longitude. Positions on east hemisphere have positive value, position on west hemisphere have negative value. | | | |

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## Active Satellites

| | | | |
|---|---|---|---|
| **Value group** | CM-4G-GPS | **Related FW** | 2.1.0 |
| **Units** | [-] | | |
| **Comm object** | 24265 | **Related applications** | MINT, SPtM |
| **Description** | | | |
| Number of available satellites for GPS location. | | | |

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## Speed

| | | | |
|---|---|---|---|
| **Value group** | CM-4G-GPS | **Related FW** | 2.1.0 |
| **Units** | [-] | | |
| **Comm object** | 24227 | **Related applications** | MINT, SPtM |
| **Description** | | | |
| Actual speed of the controller calculated from the GPS coordinates. | | | |

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## HomePosDist

| | | | |
|---|---|---|---|
| **Value group** | CM-4G-GPS | **Related FW** | 2.1.0 |
| **Units** | km | | |
| **Comm object** | 11680 | **Related applications** | MINT, SPtM |
| **Description** | | | |
| Actual distance from home position. Home position is adjusted via setpoints **Home Latitude (page 470)** and **Home Longitude (page 471)** or by binary input **GEO HOME POSITION (PAGE 619)**. | | | |

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## AirGate Status

| Value group | CM-4G-GPS | Related FW | 2.1.0 |
|---|---|---|---|
| Units | [-] | | |
| Comm object | 24308 | Related applications | MINT, SPtM |
| Description | | | |
| Diagnostic code for AirGate connection. Helps in troubleshooting. | | | |

### AirGate Status

| Code | Description |
|---|---|
| Not defined | Setpoint AirGate Connection is Disabled |
| Wait to connect | Waiting to connect |
| Resolving | Resolving |
| Connecting | Connecting |
| Creat sec chan | Creating secure channel |
| Registering | Registering |
| Conn inoperable | Connected, inoperable |
| Conn operable | Connected, operable |
| Susp AGkeyEmpty | AirGate is not set in the controller |

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## AirGate ID

| Value group | CM-4G-GPS | Related FW | 2.1.0 |
|---|---|---|---|
| Units | [-] | | |
| Comm object | 24309 | Related applications | MINT, SPtM |
| Description | | | |
| Identification string generated by AirGate server for the purpose of establishing communication via InteliConfig or any other supported PC tool. | | | |

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## AirGate Servicing Node

| Value group | CM-4G-GPS | Related FW | 2.1.0 |
|---|---|---|---|
| Units | [-] | | |
| Comm object | 24087 | Related applications | MINT, SPtM |
| Description | | | |
| IP address of AirGate 2 node to which the module is currently attached. | | | |

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## Current IP Address

| Value group | CM-Ethernet | Related FW | 2.1.0 |
|---|---|---|---|
| Units | [-] | | |
| Comm object | 24184 | Related applications | MINT, SPtM |
| Description | | | |
| Current IP address of the controller. | | | |

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## Primary DNS

| Value group | CM-Ethernet<br>CM-4G-GPS | Related FW | 2.1.0 |
|---|---|---|---|
| Units | [-] | | |
| Comm object | 24181 | Related applications | MINT, SPtM |
| Description | | | |
| Current domain name server. | | | |

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## Secondary DNS

| Value group | CM-Ethernet | Related FW | 2.1.0 |
|---|---|---|---|
| Units | [-] | | |
| Comm object | 24100 | Related applications | MINT, SPtM |
| Description | | | |
| Backup domain name server. | | | |

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## Modem Status

| Value group | CM-4G-GPS | Related FW | 2.1.0 |
|---|---|---|---|
| Units | [-] | | |
| Comm object | 24288 | Related applications | MINT, SPtM |
| Description | | | |
| The text of this value represents the status of the modem. | | | |

### Modem Status

| Code | Description |
|---|---|
| OK | Module successfully initialized and connected to the cellular network |
| E01 | Unsuccessful restore to the factory settings |
| E02 | Modem configuration error |
| E SIM | SIM not inserted or locked by PIN.<br>› Use another device (e.g. mobile phone) to disable the option for SIM to be locked by PIN |

| | |
|---|---|
| E04 | It is not possible to set manually chosen network mode 2G/3G/4G/Automatic |
| E registration | It is not possible to register into cellular network. Possible reasons:<br>› No signal (no coverage, broken or unconnected antenna)<br>› Manually chosen network mode 2G/3G/4G is not available |
| E context | It is not possible to set PDP (Packet Data Protocol) context for defined APN (Access Point Name). Possible reasons:<br>› Setpoint Access Point Name is not correctly set (format)<br>› Wrong PDP context number |
| E connect | It is not possible to connect to cellular network (ATD*99***context) Possible reasons:<br>› Setpoint Access Point Name is not correctly set (wrong text) |
| E08 | Modem configuration error |
| E09 | It is not possible to get signal strength |
| E10 | It is not possible to get operator name |
| E11 | Loss of registration into cellular network was detected |
| E12 | Data error |
| E13 | Data error |
| E14 | Modem was restarted |
| E SMS send | It is not possible to send SMS. Possible reasons:<br>› Wrong number<br>› SIM doesn't support SMS |
| E18 | Modem hardware configuration error |
| E conn lost | Loss of connection with cellular network |
| E19 | Modem configuration error |
| Restart-config | Modem was restarted due to the change of controller setpoint |
| Restart-app | Modem was restarted due to the performed cellular connection check |

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## Group: CM-Ethernet

### ETH Interface Status

| | | | |
|---|---|---|---|
| **Value group** | CM-Ethernet | **Related FW** | 2.1.0 |
| **Units** | [-] | | |
| **Comm object** | 24180 | **Related applications** | MINT, SPtM |
| **Description** | | | |
| Current status of ethernet communication. | | | |

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## Current IP Address

| | | | |
|---|---|---|---|
| **Value group** | CM-Ethernet | **Related FW** | 2.1.0 |
| **Units** | [-] | | |
| **Comm object** | 24184 | **Related applications** | MINT, SPtM |
| **Description** | | | |
| Current IP address of the controller. | | | |

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## Current Subnet Mask

| | | | |
|---|---|---|---|
| **Value group** | CM-Ethernet | **Related FW** | 2.1.0 |
| **Units** | [-] | | |
| **Comm object** | 24183 | **Related applications** | MINT, SPtM |
| **Description** | | | |
| Current subnet mask. | | | |

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## Current Gateway

| | | | |
|---|---|---|---|
| **Value group** | CM-Ethernet | **Related FW** | 2.1.0 |
| **Units** | [-] | | |
| **Comm object** | 24182 | **Related applications** | MINT, SPtM |
| **Description** | | | |
| Current gateway address. | | | |

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## Primary DNS

| | | | |
|---|---|---|---|
| **Value group** | CM-Ethernet<br>CM-4G-GPS | **Related FW** | 2.1.0 |
| **Units** | [-] | | |
| **Comm object** | 24181 | **Related applications** | MINT, SPtM |
| **Description** | | | |
| Current domain name server. | | | |

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## Secondary DNS

| | | | |
|---|---|---|---|
| **Value group** | CM-Ethernet | **Related FW** | 2.1.0 |
| **Units** | [-] | | |
| **Comm object** | 24100 | **Related applications** | MINT, SPtM |
| **Description** | | | |
| Backup domain name server. | | | |

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## AirGate ID

| Value group | CM-Ethernet | Related FW | 2.1.0 |
|---|---|---|---|
| Units | [-] | | |
| Comm object | 24345 | Related applications | MINT, SPtM |
| Description | | | |
| Identification string generated by AirGate server for the purpose of establishing communication via InteliConfig or any other supported PC tool. | | | |

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## AirGate Servicing Node

| Value group | CM-Ethernet | Related FW | 2.1.0 |
|---|---|---|---|
| Units | [-] | | |
| Comm object | 24087 | Related applications | MINT, SPtM |
| Description | | | |
| IP address of AirGate 2 node to which the module is currently attached. | | | |

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## AirGate Status

| Value group | CM-Ethernet | Related FW | 2.1.0 |
|---|---|---|---|
| Units | [-] | | |
| Comm object | 24344 | Related applications | MINT, SPtM |
| Description | | | |

Diagnostic code for AirGate connection. Helps in troubleshooting.

| Code | Description |
|---|---|
| Not defined | Setpoint AirGate Connection is Disabled |
| Wait to connect | Waiting to connect |
| Resolving | Resolving |
| Connecting | Connecting |
| Creat sec chan | Creating secure channel |
| Registering | Registering |
| Conn inoperable | Connected, inoperable |
| Conn operable | Connected, operable |

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## Last Email Results

| Value group | CM-Ethernet | Related FW | 2.1.0 |
|---|---|---|---|
| Units | [-] | | |
| Comm object | 24332 | Related applications | MINT, SPtM |
| Description | | | |

Result of last email, which was sent by controller.

| Code | Description |
|---|---|
| 0 | Email was successfully sent. |
| 2 | It is not possible to establish connection with SMTP server. |
| 3 | SMTP server is not ready for communication. |
| 8 | HELO command was refused. |
| 9 | EHLO command was refused. |
| 11 | AUTH LOGIN command was refused. |
| 12 | Wrong user name. |
| 13 | Wrong password. |
| 14 | MAIL FROM command was refused. |
| 15 | RCPT TO command was refused. |
| 16 | DATA command was refused. |
| 17 | Sending of email failed. |
| 20 | QUIT command was refused. |
| 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. |
| 30 | SMTP server address translation error (from DNS server). |
| 31 | Error reading email content data (24327). |

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## MAC Address

| Value group | CM-Ethernet | Related FW | 2.1.0 |
|---|---|---|---|
| Units | [-] | | |
| Comm object | 24333 | Related applications | MINT, SPtM |
| Description | | | |

Current MAC address of the controller ethernet interface.

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### Ethernet PHY Mode

| | | | |
|---|---|---|---|
| **Value group** | CM-Ethernet | **Related FW** | 2.1.0 |
| **Units** | [-] | | |
| **Comm object** | 24088 | **Related applications** | MINT, SPtM |
| **Description** | | | |

Ethernet interface mode:

| | |
|---|---|
| 10- HD | 10 Mbit Half-Duplex |
| 10- FD | 10 Mbit Full-Duplex |
| 100- HD | 100 Mbit Half-Duplex |
| 10- FD | 100 Mbit Full-Duplex |

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## Group: Date/Time

### Date

| | | | |
|---|---|---|---|
| **Value group** | Date/Time | **Related FW** | 2.1.0 |
| **Units** | DD.MM.YYYY | | |
| **Comm object** | 24553 | **Related applications** | MINT, SPtM |
| **Description** | | | |
| Shows setup date. | | | |

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### Time

| | | | |
|---|---|---|---|
| **Value group** | Date/Time | **Related FW** | 2.1.0 |
| **Units** | HH:MM:SS | | |
| **Comm object** | 24554 | **Related applications** | MINT, SPtM |
| **Description** | | | |
| Shows setup time. | | | |

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## Group: Plug-In I/O

### EM BIO A

| | | | |
|---|---|---|---|
| **Value group** | Plug-In I/O | **Related FW** | 2.1.0 |
| **Units** | [-] | | |
| **Comm object** | 14291 | **Related applications** | MINT, SPtM |
| **Description** | | | |
| Binary inputs from extension module in slot A. | | | |

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### EM BIO B

| Value group | Plug-In I/O | Related FW | 2.1.0 |
|---|---|---|---|
| Units | [-] | | |
| Comm object | 14292 | Related applications | MINT, SPtM |
| Description | | | |
| Binary inputs from extension module in slot B. | | | |

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## Group: PLC

### PLC-BOUT 1

| Value group | PLC | Related FW | 2.1.0 |
|---|---|---|---|
| Units | [-] | | |
| Comm object | 10424 | Related applications | MINT, SPtM |
| Description | | | |
| State of binary outputs of PLC. | | | |

back to List of values

### PLC-BOUT 2

| Value group | PLC | Related FW | 2.1.0 |
|---|---|---|---|
| Units | [-] | | |
| Comm object | 10425 | Related applications | MINT, SPtM |
| Description | | | |
| State of binary outputs of PLC. | | | |

back to List of values

### PLC-BOUT 3

| Value group | PLC | Related FW | 2.1.0 |
|---|---|---|---|
| Units | [-] | | |
| Comm object | 10426 | Related applications | MINT, SPtM |
| Description | | | |
| State of binary outputs of PLC. | | | |

back to List of values

### PLC-BOUT 4

| Value group | PLC | Related FW | 2.1.0 |
|---|---|---|---|
| Units | [-] | | |
| Comm object | 10427 | Related applications | MINT, SPtM |
| Description | | | |
| State of binary outputs of PLC. | | | |

back to List of values

## PLC-BOUT 5

| Value group | PLC | Related FW | 2.1.0 |
|---|---|---|---|
| Units | [-] | | |
| Comm object | 10428 | Related applications | MINT, SPtM |
| Description | | | |
| State of binary outputs of PLC. | | | |

back to List of values

## PLC-BOUT 6

| Value group | PLC | Related FW | 2.1.0 |
|---|---|---|---|
| Units | [-] | | |
| Comm object | 10429 | Related applications | MINT, SPtM |
| Description | | | |
| State of binary outputs of PLC. | | | |

back to List of values

## PLC-BOUT 7

| Value group | PLC | Related FW | 2.1.0 |
|---|---|---|---|
| Units | [-] | | |
| Comm object | 10430 | Related applications | MINT, SPtM |
| Description | | | |
| State of binary outputs of PLC. | | | |

back to List of values

## PLC Resource 1

| Value group | PLC | Related FW | 2.1.0 |
|---|---|---|---|
| Units | [-] | | |
| Comm object | 10504 | Related applications | MINT, SPtM |
| Description | | | |
| Internal state of PLC countdowns (e.g. state of block Timer etc.). | | | |

back to List of values

## PLC Resource 2

| Value group | PLC | Related FW | 2.1.0 |
|---|---|---|---|
| Units | [-] | | |
| Comm object | 10505 | Related applications | MINT, SPtM |
| Description | | | |
| Internal state of PLC countdowns (e.g. state of block Timer etc.). | | | |

back to List of values

## PLC Resource 3

| Value group | PLC | Related FW | 2.1.0 |
|---|---|---|---|
| Units | [-] | | |
| Comm object | 10506 | Related applications | MINT, SPtM |
| Description | | | |
| Internal state of PLC countdowns (e.g. state of block Timer etc.). | | | |

back to List of values

## PLC Resource 4

| Value group | PLC | Related FW | 2.1.0 |
|---|---|---|---|
| Units | [-] | | |
| Comm object | 10507 | Related applications | MINT, SPtM |
| Description | | | |
| Internal state of PLC countdowns (e.g. state of block Timer etc.). | | | |

back to List of values

## PLC Resource 5

| Value group | PLC | Related FW | 2.1.0 |
|---|---|---|---|
| Units | [-] | | |
| Comm object | 10508 | Related applications | MINT, SPtM |
| Description | | | |
| Internal state of PLC countdowns (e.g. state of block Timer etc.). | | | |

back to List of values

## PLC Resource 6

| Value group | PLC | Related FW | 2.1.0 |
|---|---|---|---|
| Units | [-] | | |
| Comm object | 10509 | Related applications | MINT, SPtM |
| Description | | | |
| Internal state of PLC countdowns (e.g. state of block Timer etc.). | | | |

back to List of values

## PLC Resource 7

| Value group | PLC | Related FW | 2.1.0 |
|---|---|---|---|
| Units | [-] | | |
| Comm object | 10510 | Related applications | MINT, SPtM |
| Description | | | |
| Internal state of PLC countdowns (e.g. state of block Timer etc.). | | | |

back to List of values

## PLC Resource 8

| Value group | PLC | Related FW | 2.1.0 |
|---|---|---|---|
| Units | [-] | | |
| Comm object | 10511 | Related applications | MINT, SPtM |
| Description | | | |
| Internal state of PLC countdowns (e.g. state of block Timer etc.). | | | |

back to List of values

## 8.1.4 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: A ..... 604
LBI: B ..... 609
LBI: D ..... 609
LBI: E ..... 609
LBI: F ..... 613
LBI: G ..... 617
LBI: H ..... 620
LBI: I ..... 620
LBI: L ..... 621
LBI: M ..... 621
LBI: N ..... 624
LBI: O ..... 624
LBI: P ..... 625
LBI: R ..... 626
LBI: S ..... 629
LBI: T ..... 630


For a full list of Logical binary inputs go to the chapter **Logical binary inputs alphabetically (page 603)**.

# Logical binary inputs alphabetically


Access Lock ..... 604
Alternate Config 2 ..... 604
Alternate Config 3 ..... 604
AMF Start Block ..... 604
Application MINT ..... 605
Application SPTM ..... 605
ATT DEF Level Lamp Blink ..... 605
ATT DEF Level Lamp Fast Blink ..... 605
ATT DEF Level Lamp Solid ..... 605
ATT DPF Lamp Blink ..... 606
ATT DPF Lamp Fast Blink 606
ATT DPF Lamp Solid ..... 606
ATT Force Regen ..... 606
ATT HEST Lamp Blink ..... 606
ATT HEST Lamp Fast Blink ..... 607
ATT HEST Lamp Solid ..... 607
ATT Inhibit Regen ..... 607
ATT Inhibited Lamp Blink 607
ATT Inhibited Lamp Fast Blink ..... 607
ATT Inhibited Lamp Solid 608
ATT Interlock ..... 608
ATT SCR Error Lamp Blink ..... 608
ATT SCR Error Lamp Fast Blink ..... 608
ATT SCR Error Lamp Solid ..... 608
Battery Charger ..... 609
Droop Unload Disabled ..... 609
ECU Key Switch ..... 610
ECU Red Lamp Blink ..... 610
ECU Red Lamp Fast Blink ..... 611
ECU Red Lamp Solid ..... 611
ECU Wait To Start Blink ..... 611
ECU Wait To Start Fast Blink ..... 611
ECU Wait To Start Solid ..... 611
ECU Yellow Lamp Blink ..... 612
ECU Yellow Lamp Fast Blink ..... 612
ECU Yellow Lamp Solid ..... 612
Emergency MAN ..... 612
Emergency Stop ..... 613
External Mains Fail Relay 613
Fault Reset Button ..... 613
Force Droop Oper ..... 614
Force Island ..... 616
Force Parallel ..... 616
Fuel Pump On/Off ..... 616
GCB Button ..... 617
GCB Disable ..... 617
GCB Feedback ..... 618
GCB Feedback Negative 619
Geo Home Position ..... 619
Geo-Fencing Enable ..... 620
Group Link ..... 620
Horn Reset Button ..... 620
Idle Speed ..... 620
Load Res 2 Active ..... 621
Mains Fail Block ..... 621
Manual Load Reconnection ..... 621
MCB Button ..... 621
MCB Disable ..... 622
MCB Feedback ..... 622
MCB Feedback Negative 623
Min Run Power Act ..... 623
NCB Feedback ..... 624
Oil Pressure ..... 624
Open Transfer Gen To Mains ..... 624
Open Transfer Mains To Gen ..... 624
Prestart Bypass ..... 625
Protection Force Disable 625
Pulse Counter 1 ..... 625
Pulse Counter 2 ..... 626
Rem TEST On Load ..... 626
Remote AUTO ..... 627
Remote Ctrl Lock ..... 627
Remote MAN ..... 627
Remote OFF ..... 628
Remote Start/Stop ..... 628
Remote TEST ..... 629
Sd Override ..... 629
Start Button ..... 629
Starter 1 Disabled ..... 629
Starter 2 Disabled ..... 630
Starter Priority ..... 630
Stop Button ..... 630
Top Priority ..... 630
Total Emergency Stop ..... 631


**back to Controller objects**

# LBI: A

## Access Lock

| Related FW | 2.1.0 | Related applications | MINT, SPtM |
|---|---|---|---|
| Comm object | 1 | | |
| Description | | | |
| When this input is active, no setpoints can be adjusted from controller's front panel and controller mode (OFF / MAN / AUTO / TEST) cannot be changed. The front panel buttons can not be used as well.<br>***Note:*** *Access Lock does not protect setpoints and mode changing from InteliConfig. To avoid unqualified changes the selected setpoints have to be password protected.*<br>*Also the buttons Fault Reset and Horn Reset are not blocked at all and buttons Start and Stop in MAN mode are not blocked.* | | | |

back to Logical binary inputs alphabetically

## Alternate Config 2

| Related FW | 2.1.0 | Related applications | MINT, SPtM |
|---|---|---|---|
| Comm object | 859 | | |
| Description | | | |
| This binary input can switch between configuration sets. When this binary input is active, setpoints in Alternate Config group are switched to the second set (setpoints with number 2).<br>**IMPORTANT: If LBO ECU POWER RELAY (PAGE 650) is used, change of alternate configuration can be made only in prestart phase. So prestart has to be set up for enough long time.** | | | |

back to Logical binary inputs alphabetically

## Alternate Config 3

| Related FW | 2.1.0 | Related applications | MINT, SPtM |
|---|---|---|---|
| Comm object | 860 | | |
| Description | | | |
| This binary input can switch between configuration sets. When this binary input is active, setpoints in Alternate Config group are switched to the third set (setpoints with number 3).<br>**IMPORTANT: If LBO ECU POWER RELAY (PAGE 650) is used, change of alternate configuration can be made only in prestart phase. So prestart has to be set up for enough long time.** | | | |

back to Logical binary inputs alphabetically

## AMF Start Block

| Related FW | 2.1.0 | Related applications | MINT, SPtM |
|---|---|---|---|
| Comm object | 211 | | |
| Description | | | |
| This binary input can allow or block the AMF start. In case of running Gen-set in AUTO mode Gen-set goes to cooling procedure and stops. | | | |

back to Logical binary inputs alphabetically

## Application MINT

| | | | |
|---|---|---|---|
| **Related FW** | 2.1.0 | **Related applications** | MINT, SPtM |
| **Comm object** | 1007 | | |
| **Description** | | | |
| Activation of this binary input switches the controller **Active Application (page 578)** to MINT.<br>***Note:*** *This binary input has lower priority than LBI* ***Application SPTM*** *(page 605).* | | | |

back to Logical binary inputs alphabetically

## Application SPTM

| | | | |
|---|---|---|---|
| **Related FW** | 2.1.0 | **Related applications** | MINT, SPtM |
| **Comm object** | 1006 | | |
| **Description** | | | |
| Activation of this binary input switches the controller **Active Application (page 578)** to SPTM.<br>***Note:*** *This binary input has higher priority than LBI* ***Application MINT*** *(page 605).* | | | |

back to Logical binary inputs alphabetically

## ATT DEF Level Lamp Blink

| | | | |
|---|---|---|---|
| **Related FW** | 2.1.0 | **Related applications** | MINT, SPtM |
| **Comm object** | 1076 | | |
| **Description** | | | |
| When this LBI is active, there is active alarm **Wrn ATT DEF Level Lamp (page 724)** in alarmlist and DEF Level Lamp icon in Aftertreatment HMI screen is blinking. | | | |

back to Logical binary inputs alphabetically

## ATT DEF Level Lamp Fast Blink

| | | | |
|---|---|---|---|
| **Related FW** | 2.1.0 | **Related applications** | MINT, SPtM |
| **Comm object** | 1077 | | |
| **Description** | | | |
| When this LBI is active, there is active alarm **Wrn ATT DEF Level Lamp (page 724)** in alarmlist and ATT DEF Level Lamp icon in Aftertreatment HMI screen is blinking fast. | | | |

back to Logical binary inputs alphabetically

## ATT DEF Level Lamp Solid

| | | | |
|---|---|---|---|
| **Related FW** | 2.1.0 | **Related applications** | MINT, SPtM |
| **Comm object** | 1075 | | |
| **Description** | | | |
| When this LBI is active, there is active alarm **Wrn ATT DEF Level Lamp (page 724)** in alarmlist and ATT DEF Level Lamp icon in Aftertreatment HMI screen is shown. | | | |

back to Logical binary inputs alphabetically

## ATT DPF Lamp Blink

| Related FW | 2.1.0 | Related applications | MINT, SPtM |
|---|---|---|---|
| Comm object | 1067 | | |
| Description | | | |
| When this LBI is active, there is active alarm Wrn ATT DPF Lamp (page 724) in alarmlist and ECU DPF Lamp icon in Aftertreatment HMI screen is blinking. | | | |

back to Logical binary inputs alphabetically

## ATT DPF Lamp Fast Blink

| Related FW | 2.1.0 | Related applications | MINT, SPtM |
|---|---|---|---|
| Comm object | 1068 | | |
| Description | | | |
| When this LBI is active, there is active alarm Wrn ATT DPF Lamp (page 724) in alarmlist and ATT DPF Lamp icon in Aftertreatment HMI screen is blinking fast. | | | |

back to Logical binary inputs alphabetically

## ATT DPF Lamp Solid

| Related FW | 2.1.0 | Related applications | MINT, SPtM |
|---|---|---|---|
| Comm object | 1066 | | |
| Description | | | |
| When this LBI is active, there is active alarm Wrn ATT DPF Lamp (page 724) in alarmlist and ATT DPF Lamp icon in Aftertreatment HMI screen is shown. | | | |

back to Logical binary inputs alphabetically

## ATT Force Regen

| Related FW | 2.1.0 | Related applications | MINT, SPtM |
|---|---|---|---|
| Comm object | 680 | | |
| Description | | | |

Aftertreatment Regeneration Force Switch

- User manually activates regeneration function
- Push-button control – function activated by pulse (signals longer than 5 seconds will be carried as long as the input is active)

back to Logical binary inputs alphabetically

## ATT HEST Lamp Blink

| Related FW | 2.1.0 | Related applications | MINT, SPtM |
|---|---|---|---|
| Comm object | 1070 | | |
| Description | | | |
| When this LBI is active, there is active alarm Wrn ATT HEST Lamp (page 724) in alarmlist and ECU HEST Lamp icon in Aftertreatment HMI screen is blinking. | | | |

back to Logical binary inputs alphabetically

## ATT HEST Lamp Fast Blink

| Related FW | 2.1.0 | Related applications | MINT, SPtM |
|---|---|---|---|
| Comm object | 1071 | | |
| Description | | | |
| When this LBI is active, there is active alarm Wrn ATT HEST Lamp (page 724) in alarmlist and ATT HEST Lamp icon in Aftertreatment HMI screen is blinking fast. | | | |

back to Logical binary inputs alphabetically

## ATT HEST Lamp Solid

| Related FW | 2.1.0 | Related applications | MINT, SPtM |
|---|---|---|---|
| Comm object | 1069 | | |
| Description | | | |
| When this LBI is active, there is active alarm Wrn ATT HEST Lamp (page 724) in alarmlist and ATT HEST Lamp icon in Aftertreatment HMI screen is shown. | | | |

back to Logical binary inputs alphabetically

## ATT Inhibit Regen

| Related FW | 2.1.0 | Related applications | MINT, SPtM |
|---|---|---|---|
| Comm object | 679 | | |
| Description | | | |
| Aftertreatment Regeneration Inhibit Switch<br>› User blocks automatic regeneration function<br>› 2 state switch control – function activated by still signal | | | |

back to Logical binary inputs alphabetically

## ATT Inhibited Lamp Blink

| Related FW | 2.1.0 | Related applications | MINT, SPtM |
|---|---|---|---|
| Comm object | 1079 | | |
| Description | | | |
| When this LBI is active, there is active alarm Wrn ATT Inhibited Lamp (page 725) in alarmlist and Inhibited Lamp icon in Aftertreatment HMI screen is blinking. | | | |

back to Logical binary inputs alphabetically

## ATT Inhibited Lamp Fast Blink

| Related FW | 2.1.0 | Related applications | MINT, SPtM |
|---|---|---|---|
| Comm object | 1080 | | |
| Description | | | |
| When this LBI is active, there is active alarm Wrn ATT Inhibited Lamp (page 725) in alarmlist and Inhibited Lamp icon in Aftertreatment HMI screen is blinking fast. | | | |

back to Logical binary inputs alphabetically

## ATT Inhibited Lamp Solid

| Related FW | 2.1.0 | Related applications | MINT, SPtM |
|---|---|---|---|
| Comm object | 1078 | | |
| Description | | | |
| When this LBI is active, there is active alarm Wrn ATT Inhibited Lamp (page 725) in alarmlist and ATT Inhibited Lamp icon in Aftertreatment HMI screen is shown. | | | |

back to Logical binary inputs alphabetically

## ATT Interlock

| Related FW | 2.1.0 | Related applications | MINT, SPtM |
|---|---|---|---|
| Comm object | 956 | | |
| Description | | | |

ATT Regeneration Interlock

- acts as acknowledgment for the ECU that everything is prepared for the DPF regeneration
- User manually allows the regeneration (not same as Regen Force)
- 2-state switch control – function activated by still signal
- Interlock activates Regeneration State after set of conditions is met, only after that the signal is activated

back to Logical binary inputs alphabetically

## ATT SCR Error Lamp Blink

| Related FW | 2.1.0 | Related applications | MINT, SPtM |
|---|---|---|---|
| Comm object | 1073 | | |
| Description | | | |
| When this LBI is active, there is active alarm Wrn ATT SCR Error Lamp (page 724) in alarmlist and SCR Error Lamp icon in Aftertreatment HMI screen is blinking. | | | |

back to Logical binary inputs alphabetically

## ATT SCR Error Lamp Fast Blink

| Related FW | 2.1.0 | Related applications | MINT, SPtM |
|---|---|---|---|
| Comm object | 1074 | | |
| Description | | | |
| When this LBI is active, there is active alarm Wrn ATT SCR Error Lamp (page 724) in alarmlist and SCR Error Lamp icon in Aftertreatment HMI screen is blinking fast. | | | |

back to Logical binary inputs alphabetically

## ATT SCR Error Lamp Solid

| Related FW | 2.1.0 | Related applications | MINT, SPtM |
|---|---|---|---|
| Comm object | 1072 | | |
| Description | | | |
| When this LBI is active, there is active alarm Wrn ATT SCR Error Lamp (page 724) in alarmlist and SCR Error Lamp icon in Aftertreatment HMI screen is shown. | | | |

back to Logical binary inputs alphabetically

# LBI: B

## Battery Charger

| Related FW | 2.1.0 | Related applications | MINT, SPtM |
|---|---|---|---|
| Comm object | 623 | | |
| Description | | | |
| When binary input is active and its delay **Battery Charger Fail Delay (page 316)** is out of time then alarm **Wrn Battery Charger Fail (page 736)** is activated. | | | |

back to Logical binary inputs alphabetically

# LBI: D

## Droop Unload Disabled

| Related FW | 2.1.0 | Related applications | MINT |
|---|---|---|---|
| Comm object | 597 | | |
| Description | | | |
| Activation of this logical binary input avoids the soft unload function of the Gen-set if it is running in droop. GCB is opened immediately after the stop request or pressing of GCB button. If this input is not active the unloading is given by the setpoint **Load Ramp (page 389)**.<br>***Note:*** *This function is used when there is no other Gen-set to take over the load of the Gen-set which is being unloaded.* | | | |

back to Logical binary inputs alphabetically

# LBI: E

## ECU Communication Fail Block

| Related FW | 2.1.0 | Related applications | MINT, SPtM |
|---|---|---|---|
| Comm object | 141 | | |
| Description | | | |
| Activation of this binary input blocks all protections (including user protections) for every single configured ECU. | | | |

back to Logical binary inputs alphabetically

## ECU Communication Fail Block 1

| Related FW | 2.1.0 | Related applications | MINT, SPtM |
|---|---|---|---|
| Comm object | 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 726)** is deactivated while this LBI is active. | | | |

back to Logical binary inputs alphabetically

### ECU Communication Fail Block 2

| Related FW | 2.1.0 | Related applications | MINT, SPtM |
|---|---|---|---|
| Comm object | 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 726) is deactivated while this LBI is active. | | | |

back to Logical binary inputs alphabetically

### ECU Communication Fail Block 3

| Related FW | 2.1.0 | Related applications | MINT, SPtM |
|---|---|---|---|
| Comm object | 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 726) is deactivated while this LBI is active. | | | |

back to Logical binary inputs alphabetically

### ECU Communication Fail Block 4

| Related FW | 2.1.0 | Related applications | MINT, SPtM |
|---|---|---|---|
| Comm object | 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 726) is deactivated while this LBI is active. | | | |

back to Logical binary inputs alphabetically

## ECU Key Switch

| Related FW | 2.1.0 | Related applications | MINT, SPtM |
|---|---|---|---|
| Comm object | 951 | | |
| Description | | | |
| This binary input is used to switch on ECU Power Relay (page 650), when engine start is not requested. It is intended to enable engine values reading, when engine doesn't run.<br>When this binary input is active, binary output ECU Power Relay (page 650) is active too.<br>When this binary input is inactive, function of ECU Power Relay (page 650) is not affected. | | | |

back to Logical binary inputs alphabetically

## ECU Red Lamp Blink

| Related FW | 2.1.0 | Related applications | MINT, SPtM |
|---|---|---|---|
| Comm object | 1061 | | |
| Description | | | |
| When this LBI is active, there is active alarm Wrn ECU Red Lamp (page 723) in alarmlist and ECU Red Lamp icon in Aftertreatment HMI screen is blinking. | | | |

back to Logical binary inputs alphabetically

## ECU Red Lamp Fast Blink

| | | | |
|---|---|---|---|
| **Related FW** | 2.1.0 | **Related applications** | MINT, SPtM |
| **Comm object** | 1062 | | |
| **Description** | | | |
| When this LBI is active, there is active alarm **Wrn ECU Red Lamp (page 723)** in alarmlist and ECU Red Lamp icon in Aftertreatment HMI screen is blinking fast. | | | |

back to Logical binary inputs alphabetically

## ECU Red Lamp Solid

| | | | |
|---|---|---|---|
| **Related FW** | 2.1.0 | **Related applications** | MINT, SPtM |
| **Comm object** | 1060 | | |
| **Description** | | | |
| When this LBI is active, there is active alarm **Wrn ECU Red Lamp (page 723)** in alarmlist and ECU Red Lamp icon in Aftertreatment HMI screen is shown. | | | |

back to Logical binary inputs alphabetically

## ECU Wait To Start Blink

| | | | |
|---|---|---|---|
| **Related FW** | 2.1.0 | **Related applications** | MINT, SPtM |
| **Comm object** | 1064 | | |
| **Description** | | | |
| When this LBI is active, there is active alarm **Wrn ECU Wait To Start (page 724)** in alarmlist and ECU Wait To Start Lamp icon in Aftertreatment HMI screen is blinking. | | | |

back to Logical binary inputs alphabetically

## ECU Wait To Start Fast Blink

| | | | |
|---|---|---|---|
| **Related FW** | 2.1.0 | **Related applications** | MINT, SPtM |
| **Comm object** | 1065 | | |
| **Description** | | | |
| When this LBI is active, there is active alarm **Wrn ECU Wait To Start (page 724)** in alarmlist and ECU Wait To Start Lamp icon in Aftertreatment HMI screen is blinking fast. | | | |

back to Logical binary inputs alphabetically

## ECU Wait To Start Solid

| | | | |
|---|---|---|---|
| **Related FW** | 2.1.0 | **Related applications** | MINT, SPtM |
| **Comm object** | 1063 | | |
| **Description** | | | |
| When this LBI is active, there is active alarm **Wrn ECU Wait To Start (page 724)** in alarmlist and ECU Wait to Start Lamp icon in Aftertreatment HMI screen is shown. | | | |

back to Logical binary inputs alphabetically

## ECU Yellow Lamp Blink

| Related FW | 2.1.0 | Related applications | MINT, SPtM |
|---|---|---|---|
| Comm object | 1058 | | |
| Description | | | |
| When this LBI is active, there is active alarm Wrn ECU Yellow Lamp (page 723) in alarmlist and ECU Yellow Lamp icon in Aftertreatment HMI screen is blinking. | | | |

back to Logical binary inputs alphabetically

## ECU Yellow Lamp Fast Blink

| Related FW | 2.1.0 | Related applications | MINT, SPtM |
|---|---|---|---|
| Comm object | 1059 | | |
| Description | | | |
| When this LBI is active, there is active alarm Wrn ECU Yellow Lamp (page 723) in alarmlist and ECU Yellow Lamp icon in Aftertreatment HMI screen is blinking fast. | | | |

back to Logical binary inputs alphabetically

## ECU Yellow Lamp Solid

| Related FW | 2.1.0 | Related applications | MINT, SPtM |
|---|---|---|---|
| Comm object | 1057 | | |
| Description | | | |
| When this LBI is active, there is active alarm Wrn ECU Yellow Lamp (page 723) in alarmlist and ECU Yellow Lamp icon in Aftertreatment HMI screen is shown. | | | |

back to Logical binary inputs alphabetically

## Emergency MAN

| Related FW | 2.1.0 | Related applications | MINT, SPtM |
|---|---|---|---|
| Comm object | 45 | | |
| Description | | | |

This input is designed to allow the Gen-set system or breakers to be controlled externally, not by the controller. This feature can be useful in case of some failure, which disables the Gen-set or breakers to be controlled by the controller, but the Gen-set itself is operational.

The controller behaves in the following way:

- Shows the text EmergMan in the engine status on the main screen.
- Stops all functions regarding the Gen-set or breaker control, deactivates all outputs related to it.
- Stop Fail alarm is not being evaluated and stop solenoid is not activated if nonzero speed is detected.
- When the input is deactivated, the controller takes control according to the situation in the moment of deactivation, i.e. the Gen-set remains running loaded if it was running and GCB was closed in the moment the input was deactivated.

back to Logical binary inputs alphabetically

## Emergency Stop

| Related FW | 2.1.0 | Related applications | MINT, SPtM |
|---|---|---|---|
| Comm object | 40 | | |
| Description | | | |

The shutdown procedure will start immediately when this input is activated.

> ***Note:*** *In case of controller hardware or software fail, safe stop of the engine doesn't have to be ensured. To back-up the Emergency Stop function it is recommended to connect separate circuit for disconnection of Fuel Solenoid and Starter signals.*

For more detail see chapter Recommended wiring.

back to Logical binary inputs alphabetically

## External Mains Fail Relay

| Related FW | 2.1.0 | Related applications | SPtM |
|---|---|---|---|
| Comm object | 197 | | |
| Description | | | |

Binary input for external mains fail indication.

When the LBI: External Mains Fail Relay is active:

- Controller accepts that MCB was opened by an external mains fail relay, it means that it does not try to close MCB
- It behaves like in case of a standard mains failure, which is evaluated from the mains voltages measurement (the front panel mains icon is red, LBO: **AL MAINS FAIL (PAGE 642)** is active, Gen-set is started when controller is in the AUT mode etc.)
- Controller displays alarm **ALI External Mains Fail (page 727)**

When the LBI: External Mains Fail Relay is deactivated:

- Controller automatically closes MCB, if it is in the OFF/AUT mode and mains is healthy
- It behaves like in case of a standard mains return (if healthy mains voltage is detected)
- Alarm **ALI External Mains Fail (page 727)** automatically disappears

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# LBI: F

## Fault Reset Button

| Related FW | 2.1.0 | Related applications | MINT, SPtM |
|---|---|---|---|
| Comm object | 191 | | |
| Description | | | |

Binary input has the same function as Fault Reset button on the InteliGen4 200 front panel.

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## Force Droop Oper

| Related FW | 2.1.0 | Related applications | MINT |
|---|---|---|---|
| **Comm object** | 788 | | |
| **Description** | | | |
| When this logical binary input is active, the regulations is forced to droop (the same behavior like the setpoint **Load/Var Sharing Regulation Type (page 398)** = Droop). | | | |

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## Force Idle

| Related FW | 2.1.0 | Related applications | MINT, SPtM |
|---|---|---|---|
| LBI ID | 604 | | |

**Description**

Activation of this LBI activates the Force Idle function.

**Activation of Force Idle**

| Mode | Reaction | |
|---|---|---|
| OFF | No reaction | |
| MAN+AUTO | Engine starts | Engine is running |
| | 1. Engine starts<br>2. Idle state is active<br>3. after the idle state is counted down there is checked whether the LBI: Force Idle is active<br>4. In case of active LBI: Force Idle the engine stays in Idle – the AHI Manual Idle is present in alarm list and history record issued<br>5. LBO **IDLE/NOMINAL (PAGE 663)** stays switched to idle state and value **Requested RPM (page 549)** stays to Idle RPM value | 1. Controller is in running state<br>2. In case of active LBI: Force Idle the engine goes in Idle – the AHI Manual Idle is present in alarm list and history record issued<br>3. LBO **IDLE/NOMINAL (PAGE 663)** is switched to idle state and value **Requested RPM (page 549)** goes to Idle RPM value<br>4. Underfrequency protection and undervoltage protection are not evaluated (other protections are evaluated)<br>5. Controller is in Manual Idle state until deactivation of this LBI |

**Deactivation of Force Idle**

| Mode | Reaction |
|---|---|
| OFF | No reaction |
| MAN | 1. Controller goes to MinStab state (then Max stab, etc.)<br>2. AHI Manual Idle is not present in alarm list<br>3. LBO **IDLE/NOMINAL (PAGE 663)** is switched to nominal state and value **Requested RPM (page 549)** goes to nominal value<br>4. Controller is in Running state<br>5. Underfrequency protection and undervoltage protection are evaluated<br>6. GCB stays open |
| AUTO | 1. Controller goes to MinStab state (then Max stab, etc.)<br>2. AHI Manual Idle is not present in alarm list<br>3. LBO **Requested RPM (page 549)** is switched to nominal state and value **Requested RPM (page 549)** goes to nominal value |

| | |
|---|---|
| | 4. Controller is in Running state<br>5. Underfrequency protection and undervoltage protection are evaluated<br>6. GCB is closed |

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## Force Island

| | | | |
|---|---|---|---|
| **Related FW** | 2.1.0 | **Related applications** | SPtM |
| **Comm object** | 787 | | |
| **Description** | | | |
| Activation of this logical binary input start the Gen-set system and go to island operation. Transition of load from mains is adjusted via setpoint **Transfer Mains To Gen (page 386)**. | | | |

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## Force Parallel

| | | | |
|---|---|---|---|
| **Related FW** | 2.1.0 | **Related applications** | MINT, SPtM |
| **Comm object** | 786 | | |
| **Description** | | | |
| Activation of this logical binary input start the Gen-set system and go to parallel operation if mains is healthy. Island operation is not allowed. | | | |

back to Logical binary inputs alphabetically

## Fuel Pump On/Off

| | | | |
|---|---|---|---|
| **Related FW** | 2.1.0 | **Related applications** | MINT, SPtM |
| **Comm object** | 694 | | |
| **Description** | | | |

This binary input is used for manual control of binary output **FUEL PUMP (PAGE 653)**. The output is deactivated automatically as soon as fuel level reaches 100 %.

***Note:*** *This binary input is basically designed for ON and OFF switch (switch with arrestment in these positions) because controller reacts to rising and falling edge of signal in this input.*

**IMPORTANT: When binary input FUEL PUMP ON/OFF (PAGE 616) is configured then binary output FUEL PUMP (PAGE 653) is control by this binary input.**

**IMPORTANT: It is necessary to configure analog input FUEL LEVEL (PAGE 692) for proper function of this binary input.**

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# LBI: G

## GCB Button

| | | | |
|---|---|---|---|
| **Related FW** | 2.1.0 | **Related applications** | MINT, SPtM |
| **Comm object** | 193 | | |
| **Description** | | | |
| Binary input has the same function as the GCB button I/O on the InteliGen4 200 front panel. It is evaluated in MAN mode only. | | | |

**back to Logical binary inputs alphabetically**

## GCB Disable

| | | | |
|---|---|---|---|
| **Related FW** | 2.1.0 | **Related applications** | MINT, SPtM |
| **Comm object** | 62 | | |
| **Description** | | | |
| When this LBI is active, it is not possible to close GCB – LBO GCB Close/Open, GCB ON Coil cannot be activated by panel GCB close button, or close command or by auto command. | | | |

**back to Logical binary inputs alphabetically**

## GCB Feedback

| Related FW | 2.1.0 | Related applications | MINT, SPtM |
|---|---|---|---|
| Comm object | 63 | | |

**Description**

Use this input for indication whether the generator circuit breaker is open or closed.

- If the feedback does not respond to a change of the control output **GCB CLOSE/OPEN (PAGE 655)** within 2 or 5 seconds (2 sec if synchro is used, 5 sec if synchro is not used – open transfer, dead bus, etc.), the specific alarm based on current breaker position is issued.
- If the feedback changes it's position unexpectedly without any command given by the control output, the alarm **Stp GCB Fail (page 772)** will be issued immediately.

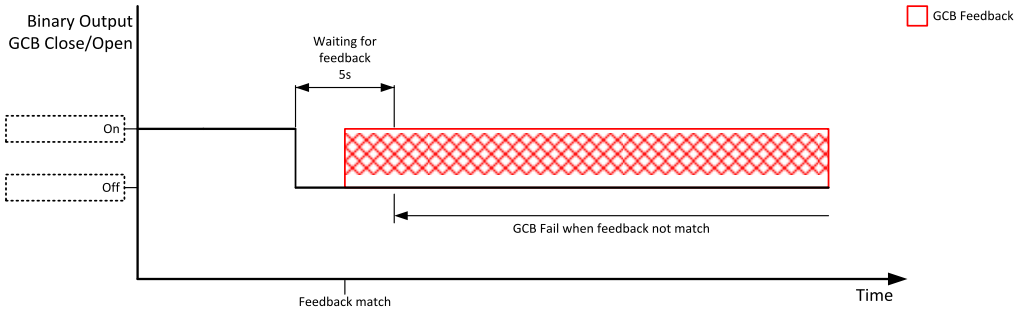



Image 8.39 GCB Feedback 1

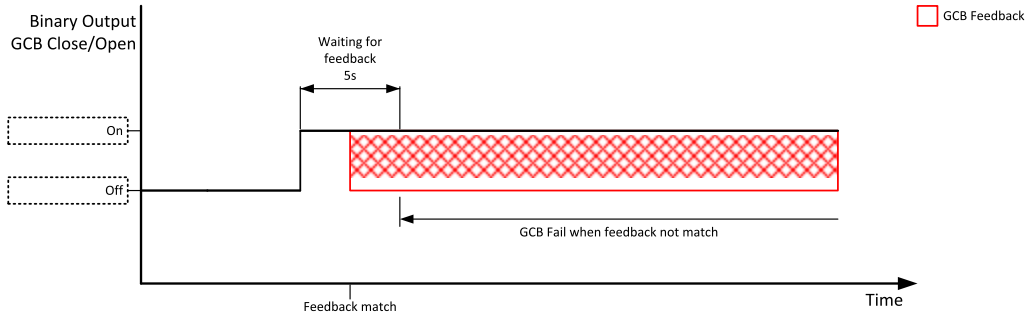



Image 8.40 GCB Feedback 2

***Note:*** *InteliGen4 200 controllers require the breaker feedback to be configured.*

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## GCB Feedback Negative

| Related FW | 2.1.0 | Related applications | MINT, SPtM |
|---|---|---|---|
| Comm object | 64 | | |

**Description**

Use this input to indicate whether the generator circuit breaker is opened or closed.

Maximal allowed time the both inputs are in the same position is 500 ms, after this time the alarm **Stp GCB Fail (page 772)** is issued.

This input is logically inverted against LBI **GCB FEEDBACK (PAGE 618)**.

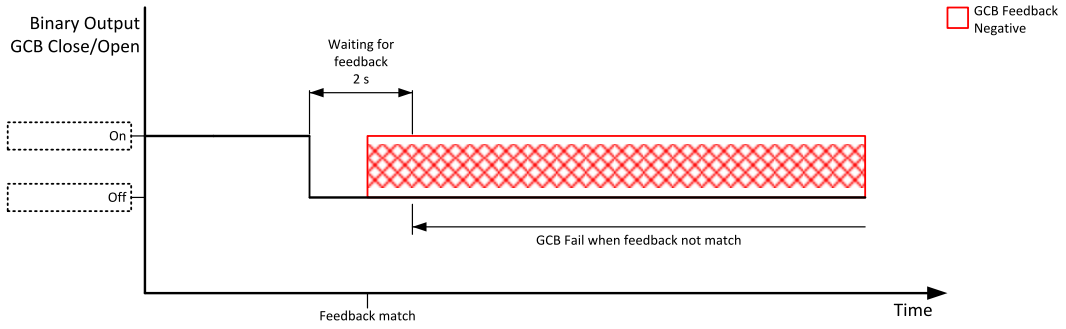



Image 8.41 GCB Feedback Negative 1

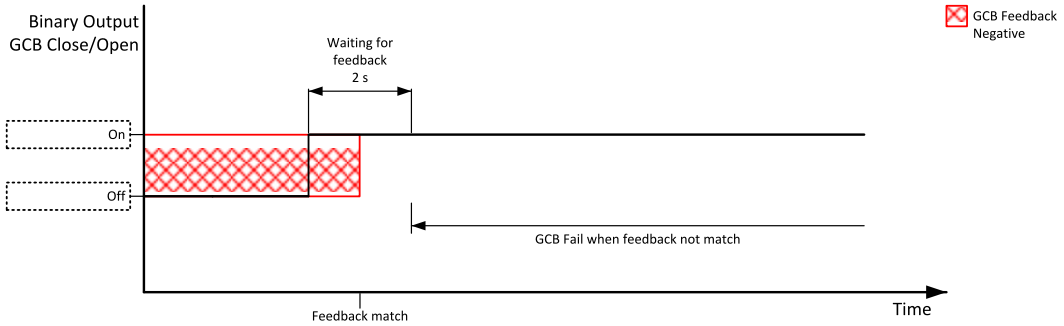



Image 8.42 GCB Feedback Negative 2

back to Logical binary inputs alphabetically

## Geo Home Position

| Related FW | 2.1.0 | Related applications | MINT, SPtM |
|---|---|---|---|
| Comm object | 219 | | |

**Description**

This binary input can be used to adjust home position of gen-set. In case that binary input is active, setpoints **Home Latitude (page 470)** and **Home Longitude (page 471)** are adjusted automatically from actual coordinates from GPS signal.

***Note:*** *Input has to be activated for at least 2 seconds.*

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## Geo-Fencing Enable

| Related FW | 2.1.0 | Related applications | MINT, SPtM |
|---|---|---|---|
| Comm object | 218 | | |
| Description | | | |
| This binary input enables or disables **Fence 1 Protection (page 472)** and **Fence 2 Protection (page 474)** if **Group: Geo-Fencing (page 470)** is adjusted to value "LBI Enable". | | | |

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## Group Link

| Related FW | 2.1.0 | Related applications | MINT, SPtM |
|---|---|---|---|
| Comm object | 193 | | |
| Description | | | |
| This input is used for logical connection and disconnection of two Gen-set groups selected with setpoints **Group Link L (page 378)** and **Group Link R (page 379)**. If the input is active, then the two selected groups will perform power management, load sharing and kVAr sharing together as one large group.<br>***Note:*** *This function is independent on the group which the particular controller belongs to, i.e. the controller can provide linking function e.g. for groups 3,4 although it belongs to group 2.* | | | |

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# LBI: H

## Horn Reset Button

| Related FW | 2.1.0 | Related applications | MINT, SPtM |
|---|---|---|---|
| Comm object | 192 | | |
| Description | | | |
| Binary input has the same function as Horn reset button on the InteliGen4 200 front panel. | | | |

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# LBI: I

## Idle Speed

| Related FW | 2.1.0 | Related applications | MINT, SPtM |
|---|---|---|---|
| Comm object | 624 | | |
| Description | | | |
| This binary input changes cooling speed from nominal to idle. | | | |

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# LBI: L

## Load Res 2 Active

| | | | |
|---|---|---|---|
| **Related FW** | 2.1.0 | **Related applications** | MINT |
| **Comm object** | 49 | | |
| **Description** | | | |
| Activation of this logical binary input changes the set of load reserve setpoint, which are used in **Power management (page 159)**. This input is used to activate the load reserve set 2 instead of the set 1, which is active by default. | | | |

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# LBI: M

## Mains Fail Block

| | | | |
|---|---|---|---|
| **Related FW** | 2.1.0 | **Related applications** | SPtM |
| **Comm object** | 622 | | |
| **Description** | | | |
| If the input is active, the automatic start of the Gen-set at Mains failure is blocked. In case of running Gen-set in AUTO mode, timer **Mains Return Delay (page 342)** is started and when it elapses GCB is opened, Gen-set goes to cooling procedure and stops. When GCB is opened after **Open Transfer Min Break (page 385)** the MCB is closed.<br>***Note:*** *This input simulates healthy Mains.* | | | |

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## Manual Load Reconnection

| | | | |
|---|---|---|---|
| **Related FW** | 2.1.0 | **Related applications** | MINT, SPtM |
| **Comm object** | 60 | | |
| **Description** | | | |
| This input is used for manual reconnection of the last disconnected part of the load, if the load has dropped below the setpoint **Load Reconnection Level (page 363)**. This works only if automatic reconnection is disabled, i.e. the setpoint **Auto Load Reconnection (page 364)** = Disabled. | | | |

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## MCB Button

| | | | |
|---|---|---|---|
| **Related FW** | 2.1.0 | **Related applications** | MINT, SPtM |
| **Comm object** | 194 | | |
| **Description** | | | |
| This binary input has the same function as MCB button I/O on the InteliGen4 200 front panel. It is evaluated in MAN mode only. | | | |

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## MCB Disable

| Related FW | 2.1.0 | Related applications | MINT, SPtM |
|---|---|---|---|
| Comm object | 124 | | |
| Description | | | |
| When this LBI is active, it is not possible to close MCB – LBO MCB Close/Open, MCB ON Coil cannot be activated by panel MCB close button, or close command or by auto command. | | | |

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## MCB Feedback

| Related FW | 2.1.0 | Related applications | MINT, SPtM |
|---|---|---|---|
| Comm object | 65 | | |
| Description | | | |
| Use this input for indication whether the mains circuit breaker is open or closed. | | | |

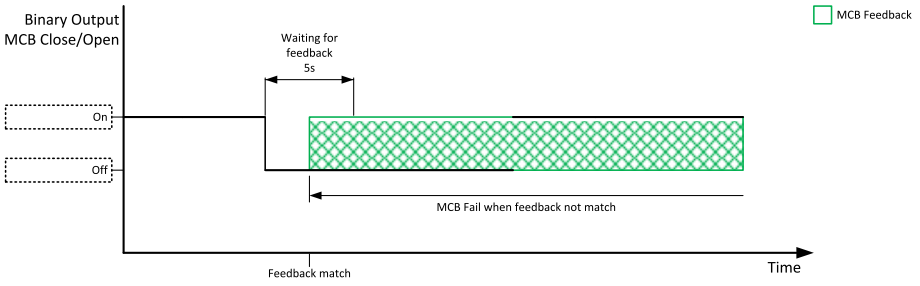



Image 8.43 MCB Feedback 1

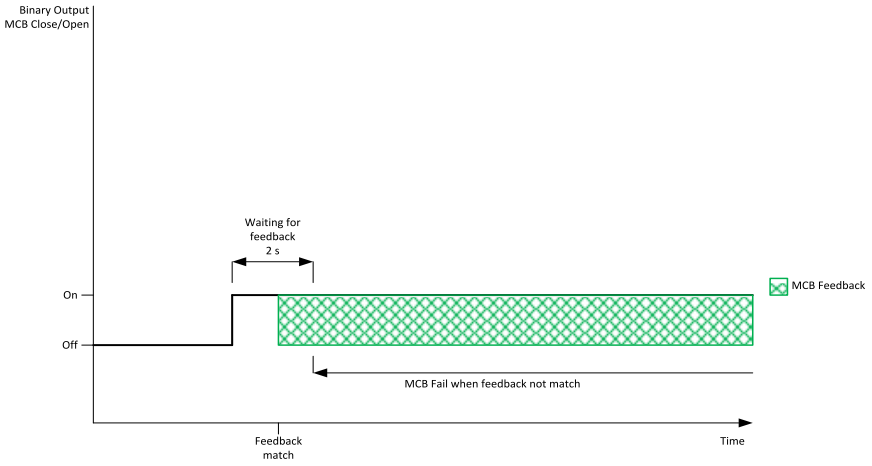



Image 8.44 MCB Feedback 2

***Note:*** *InteliGen4 200 controllers require the breaker feedback to be configured.*

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## MCB Feedback Negative

| Related FW | 2.1.0 | Related applications | MINT, SPtM |
|---|---|---|---|
| Comm object | 66 | | |

**Description**

Use this input to indicate whether the mains circuit breaker is opened or closed.

This input is logically inverted against LBI **MCB FEEDBACK (PAGE 622)**.

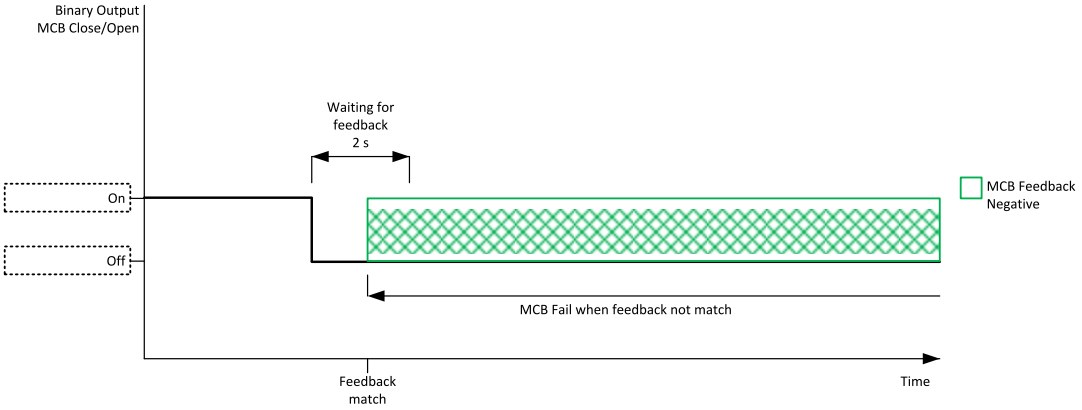



Image 8.45 MCB Feedback 1

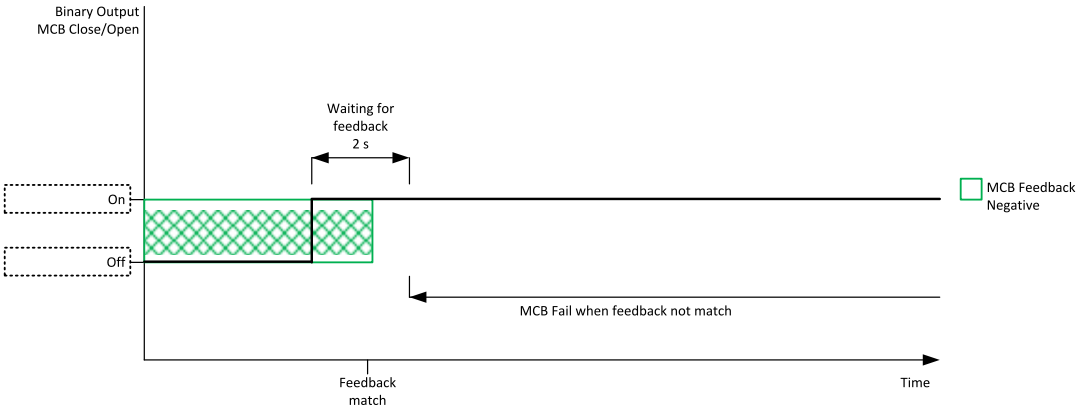



Image 8.46 MCB Feedback 2

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## Min Run Power Act

| Related FW | 2.1.0 | Related applications | MINT |
|---|---|---|---|
| Comm object | 52 | | |

**Description**

This input is used to activate the function minimal running power, which is adjusted via setpoint **#Min Run Power 1* (page 373)**.

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# LBI: N

## NCB Feedback

| Related FW | 2.1.0 | Related applications | MINT |
|---|---|---|---|
| Comm object | 67 | | |
| Description | | | |
| This input is used for connection of feedback contact from the neutral contactor. If the input is active, the controller will consider the neutral contactor as closed and vice versa. See also setpoint **#Neutral Contactor Control (page 265)**. | | | |

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# LBI: O

## Oil Pressure

| Related FW | 2.1.0 | Related applications | MINT, SPtM |
|---|---|---|---|
| Comm object | 43 | | |
| Description | | | |

Binary input for Oil Pressure indication.

> **IMPORTANT: This binary input is also used for evaluating engine running condition.**

> **Example:** Normally close connection – when LBI is active then oil pressure is OK and is higher than starting oil pressure.

***Note:*** *In case that you want to use binary input Oil Pressure just for protection please create new binary input with User protection.*

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## Open Transfer Gen To Mains

| Related FW | 2.1.0 | Related applications | MINT, SPtM |
|---|---|---|---|
| Comm object | | | |
| Description | | | |
| Setpoint Transfer Gen To Mains option Open is used when the LBI: OPEN TRANSFER GEN TO MAINS function is active. Actual Transfer Gen To Mains setting is used only if the LBI: OPEN TRANSFER GEN TO MAINS is not active. | | | |

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## Open Transfer Mains To Gen

| Related FW | 2.1.0 | Related applications | MINT, SPtM |
|---|---|---|---|
| Comm object | | | |
| Description | | | |
| Setpoint Transfer Mains To Gen option Open is used when the LBI: OPEN TRANSFER MAINS TO GEN function is active. Actual Transfer Mains To Gen setting is used only if the LBI: OPEN TRANSFER MAINS TO GEN is not active. | | | |

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# LBI: P

## Prestart Bypass

| | | | |
|---|---|---|---|
| **Related FW** | 2.1.0 | **Related applications** | MINT, SPtM |
| **Comm object** | 42 | | |
| **Description** | | | |
| While this LBI is active, Gen-set skips prestart phase. | | | |

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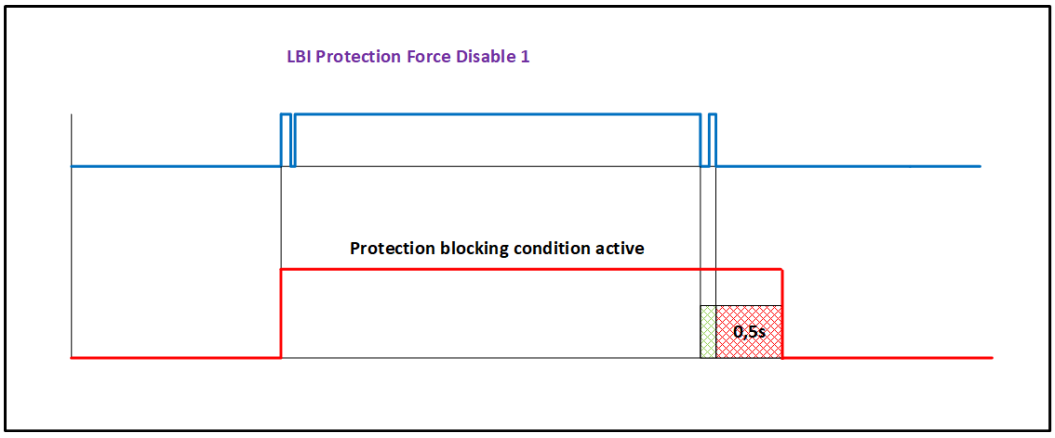
## Protection Force Disable

| | | | |
|---|---|---|---|
| **Related FW** | 2.1.0 | **Related applications** | MINT, SPtM |
| **Comm object** | 16 | | |
| **Description** | | | |

Activation of this LBI disables selected protections.

Proper history record is written to the history log.

- Protection Force Disable active
- Protection Force Disable inactive




***Note:*** *Some of the fixed protections has possibility to turn off. These protections has dedicated setpoints located in setpoint group Protections. Setpoints have options: Enabled, Disabled (protection is turned off), ExtDisabled (protection is turned off by LBI).*

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## Pulse Counter 1

| | | | |
|---|---|---|---|
| **Related FW** | 2.1.0 | **Related applications** | MINT, SPtM |
| **Comm object** | 87 | | |
| **Description** | | | |

This is the input of the Pulse Counter 1 function. The module counts pulses at the input and if the input pulses counter reaches value given by the setpoint **Conversion Coefficient Pulse 1 (page 317)** the counter value **Pulse Counter 1 (page 578)** is increased by 1 and input pulses counter is reset to 0. Both counter value and input pulses counter are stored in the nonvolatile memory.

***Note:*** *Recommended length of the pulse is 500 ms.*

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## Pulse Counter 2

| Related FW | 2.1.0 | Related applications | MINT, SPtM |
|---|---|---|---|
| Comm object | 88 | | |
| Description | | | |
| This is the input of the Pulse Counter 2 function. The module counts pulses at the input and if the input pulses counter reaches value given by the setpoint **Conversion Coefficient Pulse 2 (page 317)** the counter value **Pulse Counter 2 (page 578)** is increased by 1 and input pulses counter is reset to 0. Both counter value and input pulses counter are stored in the nonvolatile memory.<br>***Note:*** *Recommended length of the pulse is 500 ms.* | | | |

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# LBI: R

## Rem TEST On Load

| Related FW | 2.1.0 | Related applications | MINT, SPtM |
|---|---|---|---|
| Comm object | 61 | | |
| Description | | | |

Closing of the GCB in SPtM or transferring of the load from the mains to Gen-set in MINT.

| Application | TEST | Remote TEST On Load |
|---|---|---|
| SPtM | Gen-set started and running until the TEST mode deactivated. | **Active:** Gen-set is put to TEST mode. On the top of it the GCB is closed. The same behavior like the **REMOTE START/STOP (PAGE 628)**.<br>**Inactive:** Gen-set comes back to the original mode and behaves accordingly to this mode and other conditions. |
| MINT | Gen-set started and running until the TEST mode deactivated. | **Active:** Gen-set is put to TEST mode. On the top of it the load is transferred to the Gen-set.<br>**Inactive:** Gen-set comes back to the original mode and behaves accordingly to this mode and other conditions. (the load can be transferred back to the mains (OFF, AUTO) or stay on the Gen-set (MAN). |

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## Remote AUTO

| Related FW | 2.1.0 | Related applications | MINT, SPtM |
|---|---|---|---|
| Comm object | 620 | | |
| Description | | | |
| The controller is switched to the AUTO mode (there are fourthree modes OFF / MAN / AUTO / TEST) when this binary input is active. When opens controller is switched back to previous mode.<br>This binary input has the lowest priority from Remote OFF / MAN / AUTO / TEST binary inputs<br>Remote control priority:<br>› Remote OFF (Highest priority)<br>› Remote TEST<br>› Remote MAN<br>› Remote AUTO (Lowest Priority) | | | |

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## Remote Ctrl Lock

| Related FW | 2.1.0 | Related applications | MINT, SPtM |
|---|---|---|---|
| Comm object | 4 | | |
| Description | | | |
| If the input is active, the controller will not accept any actions regarding the system control – e.g. writing of commands and setpoint changes via remote communication interfaces. | | | |

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## Remote MAN

| Related FW | 2.1.0 | Related applications | MINT, SPtM |
|---|---|---|---|
| Comm object | 618 | | |
| Description | | | |
| The controller is switched to the MAN mode (there are fourthree modes OFF / MAN / AUTO / TEST) when this binary input is active. When opens controller is switched back to previous mode.<br>Remote control priority:<br>› Remote OFF (Highest priority)<br>› Remote TEST<br>› Remote MAN<br>› Remote AUTO (Lowest Priority) | | | |

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## Remote OFF

| Related FW | 2.1.0 | Related applications | MINT, SPtM |
|---|---|---|---|
| Comm object | 617 | | |
| Description | | | |

The controller is switched to the OFF mode (there are fourthree modes OFF / MAN / AUTO / TEST) when this binary input is active. When opens controller is switched back to previous mode.

Remote control priority:

- Remote OFF (Highest priority)
- Remote TEST
- Remote MAN
- Remote AUTO (Lowest Priority)

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## Remote Start/Stop

| Related FW | 2.1.0 | Related applications | MINT, SPtM |
|---|---|---|---|
| Comm object | 38 | | |
| Description | | | |

Use this input to start and stop the Gen-set in AUTO and TEST mode.

***Note:*** *If the binary input Remote Start/Stop is active and engine is running and mains failure occurs, the MCB breaker opens, after* ***Open Transfer Min Break (page 385)*** *the GCB breaker is closed. Once the mains is OK, the* ***Mains Return Delay (page 342)*** *elapses and the GCB breaker is opened. Then after* ***Open Transfer Min Break (page 385)*** *is MCB breaker closed. Gen-set remains running as long as binary input Rem Start/Stop is active. For more details see timing diagram below.*

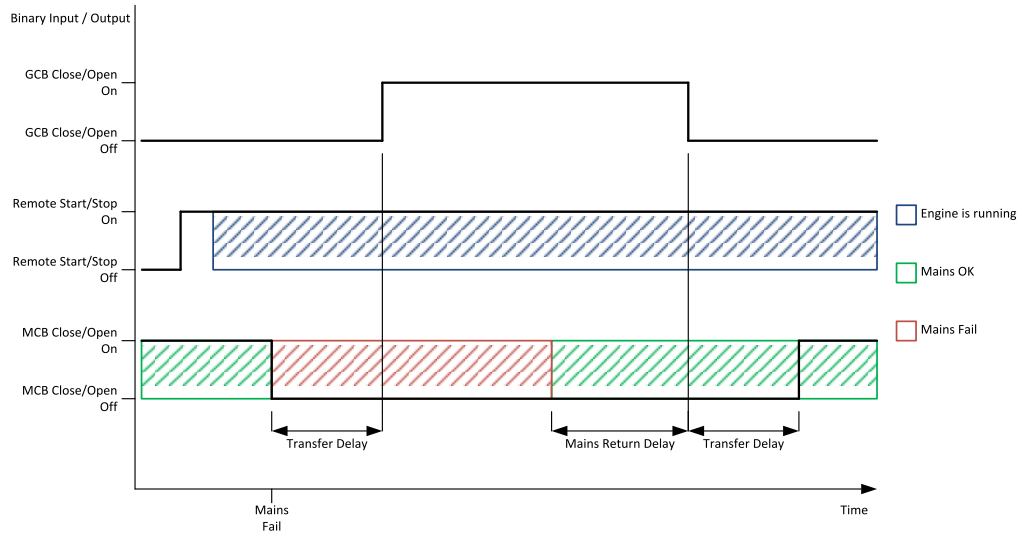



Image 8.47 Remote Start/Stop

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## Remote TEST

| Related FW | 2.1.0 | Related applications | MINT, SPtM |
|---|---|---|---|
| Comm object | 621 | | |
| Description | | | |
| The controller is switched to the TEST mode (there are fourthree modes OFF / MAN / AUTO / TEST) when this binary input is active. When opens controller is switched back to previous mode.<br>Remote control priority:<br>› Remote OFF (Highest priority)<br>› Remote TEST<br>› Remote MAN<br>› Remote AUTO (Lowest Priority) | | | |

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# LBI: S

## Sd Override

| Related FW | 2.1.0 | Related applications | MINT, SPtM |
|---|---|---|---|
| Comm object | 44 | | |
| Description | | | |
| If this input is active, all alarms except Emergency Stop and Overspeed are suppressed. The suppressed alarms will be displayed in the alarm list, but they will not take effect regarding the Gen-set control.<br>***Note:*** *Sd Override (page 629) is indicated in the alarm list if Sd Override mode is active to inform the operator that the engine is not protected.*<br>**IMPORTANT: MISUSE OF THIS INPUT CAN CAUSE DAMAGE TO THE GEN-SET!**<br>***Note:*** *User protection Sd Override is not blocked* | | | |

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## Start Button

| Related FW | 2.1.0 | Related applications | MINT, SPtM |
|---|---|---|---|
| Comm object | 189 | | |
| Description | | | |
| Binary input has the same function as Start Button on the InteliGen4 200 front panel. It is evaluated in MAN mode only. | | | |

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## Starter 1 Disabled

| Related FW | 2.1.0 | Related applications | MINT, SPtM |
|---|---|---|---|
| Comm object | 1011 | | |
| Description | | | |
| When Gen-set has two starters available this LBI is used to disable starter 1. | | | |

back to Logical binary inputs alphabetically

### Starter 2 Disabled

| | | | |
|---|---|---|---|
| **Related FW** | 2.1.0 | **Related applications** | MINT, SPtM |
| **Comm object** | 1012 | | |
| **Description** | | | |
| When Gen-set has two starters available this LBI is used to disable starter 2. | | | |

back to Logical binary inputs alphabetically

### Starter Priority

| | | | |
|---|---|---|---|
| **Related FW** | 2.1.0 | **Related applications** | MINT, SPtM |
| **Comm object** | 1010 | | |
| **Description** | | | |
| By activating this LBI, **STARTER 2 (PAGE 681)** has higher priority in dual starter operation. | | | |

back to Logical binary inputs alphabetically

### Stop Button

| | | | |
|---|---|---|---|
| **Related FW** | 2.1.0 | **Related applications** | MINT, SPtM |
| **Comm object** | 190 | | |
| **Description** | | | |
| Binary input has the same function as Stop Button O on the InteliGen4 200 front panel. It is evaluated in MAN Mode only. | | | |

back to Logical binary inputs alphabetically

## LBI: T

### Top Priority

| | | | |
|---|---|---|---|
| **Related FW** | 2.1.0 | **Related applications** | MINT |
| **Comm object** | 199 | | |
| **Description** | | | |
| If this input is active, the controller will have the highest priority in the group independent of the setpoint **Priority (page 366)**.<br>**IMPORTANT: This binary input can be used only if setpoint #Priority Auto Swap (page 367) = Disabled.** | | | |

back to Logical binary inputs alphabetically

## Total Emergency Stop

| Related FW | 2.1.0 | Related applications | MINT, SPtM |
|---|---|---|---|
| Comm object | 995 | | |
| Description | | | |

This binary input is used for stopping the engine and opening all breakers.

Activation of Total Emergency Stop leads to:

- Alarm Total Emergency Stop is activated and history record TOTAL EMERGENCY STOP is created
- Controller will open MCB and GCB
- Controller will keep MCB and GCB open as long as alarm is present in alarm list
- Engine is stopped

back to Logical binary inputs alphabetically

## 8.1.5 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 ..... 635
LBO: B ..... 646
LBO: C ..... 646
LBO: D ..... 647
LBO: E ..... 648
LBO: F ..... 653
LBO: G ..... 655
LBO: H ..... 662
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LBO: L ..... 666
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LBO: N ..... 672
LBO: P ..... 674
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LBO: S ..... 678
LBO: U ..... 685
LBO: V ..... 686


For a full list of Logical binary inputs go to the chapter **Logical binary outputs alphabetically (page 633)**.

# Logical binary outputs alphabetically


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AIN Switch03 ..... 636
AIN Switch04 ..... 637
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**back to Controller objects**

# LBO: A

## Alarm Generator Overcurrent

| | | | |
|---|---|---|---|
| **Related FW** | 2.1.0 | **Related applications** | MINT, SPtM |
| **Comm object** | 109 | | |
| **Description** | | | |
| This output is active while at least one of the following overcurrent protection is active **Short Circuit Protection (page 336)** or **IDMT Generator >A Protection (page 335)**. | | | |

back to Logical binary outputs alphabetically

## AIN Switch01

| | | | |
|---|---|---|---|
| **Related FW** | 2.1.0 | **Related applications** | MINT, SPtM |
| **Comm object** | 1400 | | |
| **Description** | | | |

This is an output from the General Analog Input 1 switch function. The behavior of the switch depends on the adjustment of the setpoints **AIN Switch01 On (page 420)** and **AIN Switch01 Off (page 421)**. The value is measured from **AIN SWITCH 01 (PAGE 690)** analog input.




Image 8.48 General analog input 1 switch

back to Logical binary outputs alphabetically

## AIN Switch02

| Related FW | 2.1.0 | Related applications | MINT, SPtM |
|---|---|---|---|
| Comm object | 1401 | | |
| Description | | | |

This is an output from the General Analog Input 2 switch function. The behavior of the switch depends on the adjustment of the setpoints **AIN Switch02 On (page 422)** and **AIN Switch02 Off (page 423)**. The value is measured from **AIN SWITCH 02 (PAGE 690)** analog input.




Image 8.49 General analog input 2 switch

back to Logical binary outputs alphabetically

## AIN Switch03

| Related FW | 2.1.0 | Related applications | MINT, SPtM |
|---|---|---|---|
| Comm object | 1402 | | |
| Description | | | |

This is an output from the General Analog Input 3 switch function. The behavior of the switch depends on the adjustment of the setpoints **AIN Switch03 On (page 424)** and **AIN Switch03 Off (page 425)**. The value is measured from **AIN SWITCH 03 (PAGE 690)** analog input.

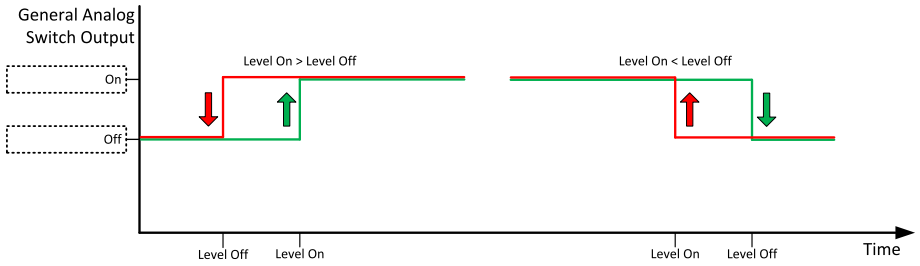



Image 8.50 General analog input 3 switch

back to Logical binary outputs alphabetically

## AIN Switch04

| Related FW | 2.1.0 | Related applications | MINT, SPtM |
|---|---|---|---|
| Comm object | 1403 | | |
| Description | | | |

This is an output from the General Analog Input 4 switch function. The behavior of the switch depends on the adjustment of the setpoints **AIN Switch04 On (page 426)** and **AIN Switch04 Off (page 427)**. The value is measured from **AIN SWITCH 04 (PAGE 691)** analog input.




Image 8.51 General analog input 4 switch

back to Logical binary outputs alphabetically

## AIN Switch05

| Related FW | 2.1.0 | Related applications | MINT, SPtM |
|---|---|---|---|
| Comm object | 1787 | | |
| Description | | | |

This is an output from the General Analog Input 5 switch function. The behavior of the switch depends on the adjustment of the setpoints **AIN Switch05 On (page 428)** and **AIN Switch05 Off (page 429)**. The value is measured from **AIN SWITCH 05 (PAGE 691)** analog input.

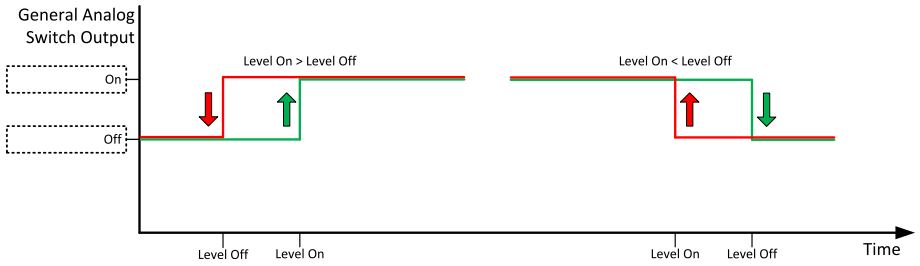



Image 8.52 General analog input 5 switch

back to Logical binary outputs alphabetically

## AIN Switch06

| Related FW | 2.1.0 | Related applications | MINT, SPtM |
|---|---|---|---|
| Comm object | 1788 | | |

**Description**

This is an output from the General Analog Input 6 switch function. The behavior of the switch depends on the adjustment of the setpoints **AIN Switch06 On (page 430)** and **AIN Switch06 Off (page 431)**. The value is measured from **AIN SWITCH 06 (PAGE 691)** analog input.

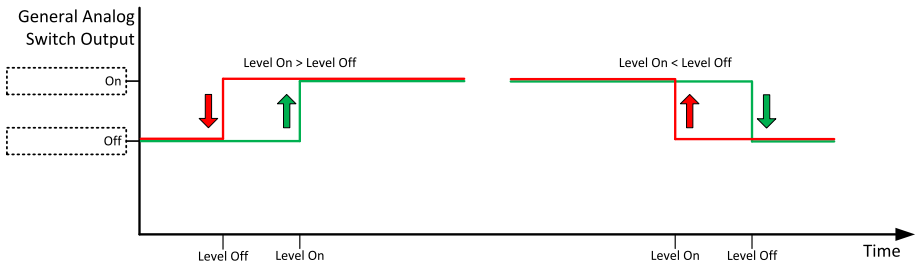



Image 8.53 General analog input 6 switch

back to Logical binary outputs alphabetically

## Air Valves

| Related FW | 2.1.0 | Related applications | MINT, SPtM |
|---|---|---|---|
| Comm object | 1247 | | |

**Description**

This output is activated together with binary output **PRESTART (PAGE 674)** and opens after the engine is stopped or in case that engine is not ready.

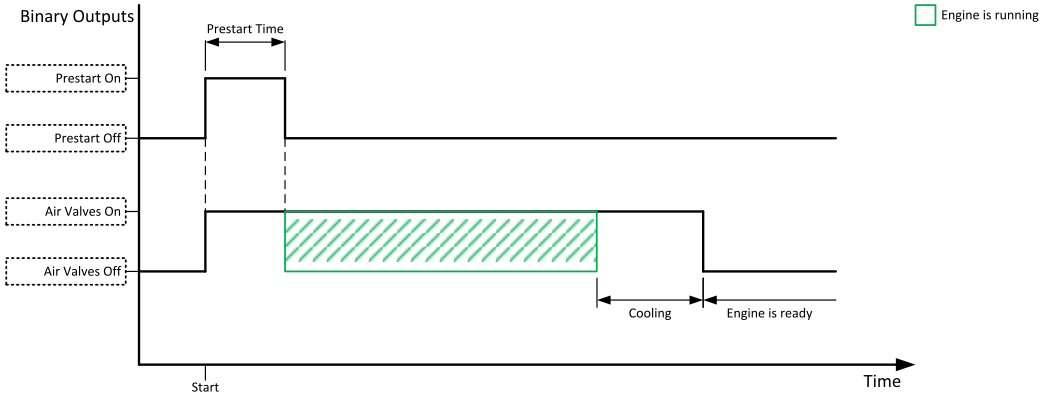



Image 8.54 Air Valves

back to Logical binary outputs alphabetically

## AL Battery Overvoltage

| Related FW | 2.1.0 | Related applications | MINT, SPtM |
|---|---|---|---|
| Comm object | 1995 | | |
| Description | | | |
| This output is active when the Wrn Battery Overvoltage (page 735) alarm is present in the alarmlist or isn't confirm. | | | |

back to Logical binary outputs alphabetically

## AL Battery Undervoltage

| Related FW | 2.1.0 | Related applications | MINT, SPtM |
|---|---|---|---|
| Comm object | 1994 | | |
| Description | | | |
| This output is active when the Wrn Battery Undervoltage (page 735) alarm is present in the alarmlist or isn't confirm. | | | |

back to Logical binary outputs alphabetically

## AL Battery Voltage

| Related FW | 2.1.0 | Related applications | MINT, SPtM |
|---|---|---|---|
| Comm object | 1293 | | |
| Description | | | |
| This output is active when the Wrn Battery Overvoltage (page 735) or Wrn Battery Undervoltage (page 735) alarm is present in the alarmlist or isn't confirm. | | | |

back to Logical binary outputs alphabetically

## AL Common BOC

| Related FW | 2.1.0 | Related applications | MINT, SPtM |
|---|---|---|---|
| Comm object | 9 | | |
| Description | | | |
| Output is activated when any BOC alarm appears.<br>The output opens, if:<br>› No BOC alarm is active and<br>› Fault reset button is pressed | | | |

back to Logical binary outputs alphabetically

## AL Common Fls

| Related FW | 2.1.0 | Related applications | MINT, SPtM |
|---|---|---|---|
| Comm object | 6 | | |
| Description | | | |
| Output is activated when any sensor fail alarm appears.<br>The output opens, if:<br>› No sensor fail alarm is active and<br>› Fault reset button is pressed | | | |

back to Logical binary outputs alphabetically

## AL Common Sd

| Related FW | 2.1.0 | Related applications | MINT, SPtM |
|---|---|---|---|
| Comm object | 4 | | |
| Description | | | |
| Output is activated when any shutdown alarm appears .<br>The output opens, if:<br>› No shutdown alarm is active and<br>› Fault reset button is pressed | | | |

back to Logical binary outputs alphabetically

## AL Common Stp

| Related FW | 2.1.0 | Related applications | MINT, SPtM |
|---|---|---|---|
| Comm object | 4 | | |
| Description | | | |
| Output closes when any slow stop alarm appears.<br>The output opens, if:<br>› No slow stop alarm is active and<br>› Fault reset button is pressed | | | |

back to Logical binary outputs alphabetically

## AL Common Wrn

| Related FW | 2.1.0 | Related applications | MINT, SPtM |
|---|---|---|---|
| Comm object | 3 | | |
| Description | | | |
| Output is activated when any warning alarm appears.<br>The output opens, if:<br>› No warning alarm is active and<br>› Fault reset button is pressed | | | |

back to Logical binary outputs alphabetically

### Common Alarm Only

| | | | |
|---|---|---|---|
| **Related FW** | 2.1.0 | **Related applications** | MINT, SPtM |
| **Comm object** | 11 | | |
| **Description** | | | |
| This output is closed when there is at least one alarm of type *Alarm Only* present in the alarmlist. | | | |

**back to Logical binary outputs alphabetically**

### Common History Record

| | | | |
|---|---|---|---|
| **Related FW** | 2.1.0 | **Related applications** | MINT, SPtM |
| **Comm object** | 12 | | |
| **Description** | | | |
| This output is closed for 1 second every time alarm of type *History Record Only* occurs. | | | |

**back to Logical binary outputs alphabetically**

### Common Shutdown Override

| | | | |
|---|---|---|---|
| **Related FW** | 2.1.0 | **Related applications** | MINT, SPtM |
| **Comm object** | 251 | | |
| **Description** | | | |
| This output is closed 2 seconds after there is at least one alarm of type *Shutdown Override* present in the alarmlist. | | | |

**back to Logical binary outputs alphabetically**

## AL Gen Freq Wrn

| | | | |
|---|---|---|---|
| **Related FW** | 2.1.0 | **Related applications** | MINT, SPtM |
| **Comm object** | 1267 | | |
| **Description** | | | |
| This output is active generator frequency warning alarm is present in alarmlist or isn't confirm. | | | |

**back to Logical binary outputs alphabetically**

## AL Gen Frequency

| | | | |
|---|---|---|---|
| **Related FW** | 2.1.0 | **Related applications** | MINT, SPtM |
| **Comm object** | 1266 | | |
| **Description** | | | |
| This output is active when at least one generator frequency alarm is present in alarmlist or isn't confirm. | | | |

**back to Logical binary outputs alphabetically**

## AL Overcurrent

| Related FW | 2.1.0 | Related applications | MINT, SPtM |
|---|---|---|---|
| Comm object | 109 | | |
| Description | | | |
| This output is active when the BOC Overcurrent IDMT (page 768) or BOC Short Circuit (page 767) alarm is present in alarmlist or isn't confirm. | | | |

back to Logical binary outputs alphabetically

## AL Gen Voltage

| Related FW | 2.1.0 | Related applications | MINT, SPtM |
|---|---|---|---|
| Comm object | 1263 | | |
| Description | | | |
| This output is active when at least one generator voltage alarm is present in alarmlist or isn’t confirm. | | | |

back to Logical binary outputs alphabetically

## AL Gen Voltage Wrn

| Related FW | 2.1.0 | Related applications | MINT, SPtM |
|---|---|---|---|
| Comm object | 1289 | | |
| Description | | | |
| This output is active when at least one generator voltage warning alarm is present in alarmlist or isn’t confirm. | | | |

back to Logical binary outputs alphabetically

## AL Mains Fail

| Related FW | 2.1.0 | Related applications | MINT, SPtM |
|---|---|---|---|
| Comm object | 197 | | |
| Description | | | |
| This output is active when at least one mains frequency BOC or SD Alarm is present in alarmlist or in case of Mains undervoltage and Mains underfrequency (doesn’t appear in the alarm list). | | | |

back to Logical binary outputs alphabetically

## AL Mains Frequency

| Related FW | 2.1.0 | Related applications | MINT, SPtM |
|---|---|---|---|
| Comm object | 1271 | | |
| Description | | | |
| This output is active when at least one mains frequency BOC or Sd alarm is present in alarmlist or isn’t confirm. | | | |

back to Logical binary outputs alphabetically

## AL Mains Voltage

| Related FW | 2.1.0 | Related applications | MINT, SPtM |
|---|---|---|---|
| Comm object | 1270 | | |
| Description | | | |
| This output is active when at least one mains voltage BOC or Sd alarm is present in the alarmlist or isn't confirm. | | | |

back to Logical binary outputs alphabetically

## AL Maintenance 1

| Related FW | 2.1.0 | Related applications | MINT, SPtM |
|---|---|---|---|
| Comm object | 2211 | | |
| Description | | | |
| Alarm is active when **Wrn Maintenance Timer 1 RunHours (page 729)** or **BOC Maintenance Timer 1 RunHours (page 769)** or **Wrn Maintenance Timer 1 Interval (page 729)** or **BOC Maintenance Timer 1 Interval (page 769)** is active. | | | |

back to Logical binary outputs alphabetically

## AL Maintenance 2

| Related FW | 2.1.0 | Related applications | MINT, SPtM |
|---|---|---|---|
| Comm object | 2212 | | |
| Description | | | |
| Alarm is active when **Wrn Maintenance Timer 2 RunHours (page 729)** or **BOC Maintenance Timer 2 RunHours (page 770)** or **Wrn Maintenance Timer 2 Interval (page 729)** or **BOC Maintenance Timer 2 Interval (page 770)** is active. | | | |

back to Logical binary outputs alphabetically

## AL Maintenance 3

| Related FW | 2.1.0 | Related applications | MINT, SPtM |
|---|---|---|---|
| Comm object | 2213 | | |
| Description | | | |
| Alarm is active when **Wrn Maintenance Timer 3 RunHours (page 730)** or **BOC Maintenance Timer 3 RunHours (page 770)** or **Wrn Maintenance Timer 3 Interval (page 730)** or **BOC Maintenance Timer 3 Interval (page 771)** is active. | | | |

back to Logical binary outputs alphabetically

## Alarm

| Related FW | 2.1.0 | Related applications | MINT, SPtM |
|---|---|---|---|
| Comm object | 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

### Any GCB Closed

| | | | |
|---|---|---|---|
| **Related FW** | 2.1.0 | **Related applications** | MINT, SPtM |
| **Comm object** | 222 | | |
| **Description** | | | |
| This output is active when a GCB of any controller connected via CAN2A and/or CAN2B is closed.<br>***Note:*** *This function works on* ***CAN16 (page 580) - CAN64 (page 580)*** *values, therefore it ignores* ***Control groups (page 112)****.* | | | |

**back to Logical binary outputs alphabetically**

### Any Other GCB Closed

| | | | |
|---|---|---|---|
| **Related FW** | 2.1.0 | **Related applications** | MINT, SPtM |
| **Comm object** | 1827 | | |
| **Description** | | | |
| This output is active when a GCB of any other controller connected via CAN2A and/or CAN2B is closed.<br>***Note:*** *This function works on* ***CAN16 (page 580) - CAN64 (page 580)*** *values, therefore it ignores* ***Control groups (page 112)****.* | | | |

**back to Logical binary outputs alphabetically**

## ATT DEF Level Lamp

| | | | |
|---|---|---|---|
| **Related FW** | 2.1.0 | **Related applications** | MINT, SPtM |
| **Comm object** | 2154 | | |
| **Description** | | | |
| This output is active when ATT DEF Level Lamp is active. | | | |

**back to Logical binary outputs alphabetically**

## ATT DPF Lamp

| | | | |
|---|---|---|---|
| **Related FW** | 2.1.0 | **Related applications** | MINT, SPtM |
| **Comm object** | 2152 | | |
| **Description** | | | |
| This output is active when ATT DPF Lamp is active. | | | |

**back to Logical binary outputs alphabetically**

## ATT HEST Lamp

| | | | |
|---|---|---|---|
| **Related FW** | 2.1.0 | **Related applications** | MINT, SPtM |
| **Comm object** | 1373 | | |
| **Description** | | | |
| This output is closed if ECU send signal HEST Lamp. If ECU stop send HEST LAMP signal binary input will be opened without no matter if alarms in alarmlist are confirmed or not. | | | |

**back to Logical binary outputs alphabetically**

## ATT Inhibited Lamp

| Related FW | 2.1.0 | Related applications | MINT, SPtM |
|---|---|---|---|
| Comm object | 2155 | | |
| Description | | | |
| This output is active when ATT Inhibited Lamp is active. | | | |

back to Logical binary outputs alphabetically

## ATT Interlock Status

| Related FW | 2.1.0 | Related applications | MINT, SPtM |
|---|---|---|---|
| Comm object | | | |
| Description | | | |
| This output is active when ATT Interlock Status is active. | | | |

back to Logical binary outputs alphabetically

## ATT SCR Error Lamp

| Related FW | 2.1.0 | Related applications | MINT, SPtM |
|---|---|---|---|
| Comm object | 2153 | | |
| Description | | | |
| This output is active when ATT SCR Error Lamp is active. | | | |

back to Logical binary outputs alphabetically

## ATT Regen ACK Lamp

| Related FW | 2.1.0 | Related applications | MINT, SPtM |
|---|---|---|---|
| Comm object | 2231 | | |
| Description | | | |
| This LBO is active when the engine requires to confirm the start of aftertreatment regeneration.<br>***Note:*** *LBO is required in Yanmar engine types* | | | |

back to Logical binary outputs alphabetically

## ATT PCD Lamp

| Related FW | 2.1.0 | Related applications | MINT, SPtM |
|---|---|---|---|
| Comm object | 2446 | | |
| Description | | | |
| This LBO is active when the engine Particulate Control Diagnostic System detects removal of DPF, loss of DPF function or failure of PCD itself.<br>***Note:*** *LBO is required in Yanmar engine types* | | | |

back to Logical binary outputs alphabetically

### AVR Down

| Related FW | 2.1.0 | Related applications | MINT, SPtM |
|---|---|---|---|
| Comm object | 55 | | |
| Description | | | |
| This output together with the complementary output **AVR Up (page 646)** is designed for voltage and power factor control at Gen-sets, where the AVR does not support analog control. | | | |

back to Logical binary outputs alphabetically

### AVR Up

| Related FW | 2.1.0 | Related applications | MINT, SPtM |
|---|---|---|---|
| Comm object | 54 | | |
| Description | | | |
| This output together with the complementary output **AVR Down (page 646)** is designed for voltage and power factor control at Gen-sets, where the AVR does not support analog control. | | | |

back to Logical binary outputs alphabetically

## LBO: B

### Bus Healthy

| Related FW | 2.1.0 | Related applications | MINT |
|---|---|---|---|
| Comm object | 79 | | |
| Description | | | |
| This output is active when the bus voltage and frequency are within limits. The limits for under/overvoltage and under/overfrequency are the same as for generator voltage / frequency and can be found in the Generator Settings setpoint group.<br>It works only with **Default Application Select (page 257)**= MINT, the output is always inactive with **Default Application Select (page 257)** = SPTM. | | | |

back to Logical binary outputs alphabetically

## LBO: C

### Common Alarm Active Level 1

| Related FW | 2.1.0 | Related applications | MINT, SPtM |
|---|---|---|---|
| Comm object | 13 | | |
| Description | | | |
| This output is closed when there is at least one **Alarms level 1 (page 709)** in the alarmlis. | | | |

back to Logical binary outputs alphabetically

## Common Alarm Active Level 2

| Related FW | 2.1.0 | Related applications | MINT, SPtM |
|---|---|---|---|
| Comm object | 15 | | |
| Description | | | |
| This output is closed when there is at least one **Alarms level 2 (page 746)** in the alarmlis. | | | |

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## Common Alarm Level 1

| Related FW | 2.1.0 | Related applications | MINT, SPtM |
|---|---|---|---|
| Comm object | 14 | | |
| Description | | | |
| This output is closed when there is at least one **unconfirmed Alarms level 1 (page 709)** in the alarmlist. | | | |

back to Logical binary outputs alphabetically

## Common Alarm Level 2

| Related FW | 2.1.0 | Related applications | MINT, SPtM |
|---|---|---|---|
| Comm object | 16 | | |
| Description | | | |
| This output is closed when there is at least one **unconfirmed Alarms level 2 (page 746)** in the alarmlist. | | | |

back to Logical binary outputs alphabetically

## Cooling

| Related FW | 2.1.0 | Related applications | MINT, SPtM |
|---|---|---|---|
| Comm object | 74 | | |
| Description | | | |
| The output is active when Gen-set is in Cooling state. | | | |

back to Logical binary outputs alphabetically

## Cooling Pump

| Related FW | 2.1.0 | Related applications | MINT, SPtM |
|---|---|---|---|
| Comm object | | | |
| Description | | | |
| LBO is active as long as it's button is pressed or it's LBI is active. | | | |

back to Logical binary outputs alphabetically

# LBO: D

## Dummy Load Stage 1

| Related FW | 2.1.0 | Related applications | MINT, SPtM |
|---|---|---|---|
| Comm object | 1439 | | |
| Description | | | |
| This LBO is used to activate corresponding stage of external load bank. | | | |

back to Logical binary outputs alphabetically

## Dummy Load Stage 2

| | | | |
|---|---|---|---|
| **Related FW** | 2.1.0 | **Related applications** | MINT, SPtM |
| **Comm object** | 1440 | | |
| **Description** | | | |
| This LBO is used to activate corresponding stage of external load bank. | | | |

back to Logical binary outputs alphabetically

## Dummy Load Stage 3

| | | | |
|---|---|---|---|
| **Related FW** | 2.1.0 | **Related applications** | MINT, SPtM |
| **Comm object** | 1441 | | |
| **Description** | | | |
| This LBO is used to activate corresponding stage of external load bank. | | | |

back to Logical binary outputs alphabetically

## Dummy Load Stage 4

| | | | |
|---|---|---|---|
| **Related FW** | 2.1.0 | **Related applications** | MINT, SPtM |
| **Comm object** | 1442 | | |
| **Description** | | | |
| This LBO is used to activate corresponding stage of external load bank. | | | |

back to Logical binary outputs alphabetically

## Dummy Load Stage 5

| | | | |
|---|---|---|---|
| **Related FW** | 2.1.0 | **Related applications** | MINT, SPtM |
| **Comm object** | 1443 | | |
| **Description** | | | |
| This LBO is used to activate corresponding stage of external load bank. | | | |

back to Logical binary outputs alphabetically

# LBO: E

### ECU 1 Comm Fail

| | | | |
|---|---|---|---|
| **Related FW** | 2.1.0 | **Related applications** | MINT, SPtM |
| **Comm object** | 1999 | | |
| **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** | 2.1.0 | **Related applications** | MINT, SPtM |
| **Comm object** | 2000 | | |
| **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** | 2.1.0 | **Related applications** | MINT, SPtM |
| **Comm object** | 2001 | | |
| **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** | 2.1.0 | **Related applications** | MINT, SPtM |
| **Comm object** | 2002 | | |
| **Description** | | | |
| This output is closed when there is no communication with ECU configured in ECU slot 4. | | | |

**back to Logical binary outputs alphabetically**

### ECU Comm OK

| | | | |
|---|---|---|---|
| **Related FW** | 2.1.0 | **Related applications** | MINT, SPtM |
| **Comm object** | 347 | | |
| **Description** | | | |

This output is active when an ECU is configured, connected and the communication with the ECU is established.

> ***Note:*** *When **ECU POWER RELAY (PAGE 650)** is not configured, output is evaluated all the time. If **ECU POWER RELAY (PAGE 650)** is configured, output is evaluated only when engine is not stop (**ECU POWER RELAY (PAGE 650)** is active).*

**back to Logical binary outputs alphabetically**

### ECU Comm Error

| | | | |
|---|---|---|---|
| **Related FW** | 2.1.0 | **Related applications** | MINT, SPtM |
| **Comm object** | 114 | | |
| **Description** | | | |

This output is active when an ECU is configured, but the communication with the ECU is not established or has dropped out.

> ***Note:*** *When **ECU POWER RELAY (PAGE 650)** is not configured, output is evaluated all the time. If **ECU POWER RELAY (PAGE 650)** is configured, output is evaluated only when engine is not stop (**ECU POWER RELAY (PAGE 650)** is active).*

**back to Logical binary outputs alphabetically**

## ECU Power Relay

| Related FW | 2.1.0 | Related applications | MINT, SPtM |
|---|---|---|---|
| Comm object | 116 | | |
| Description | | | |

This output is to be used for control of "keyswitch" input of an ECU. If the particular ECU does not have keyswitch or a similar input, it can be used for control of DC power for the ECU.

The output is activated together with **PRESTART (PAGE 674)** and remains active for the entire duration that the engine is running. It is deactivated at the moment that the engine comes to a stop (i.e. together with the **FUEL SOLENOID (PAGE 653)**).

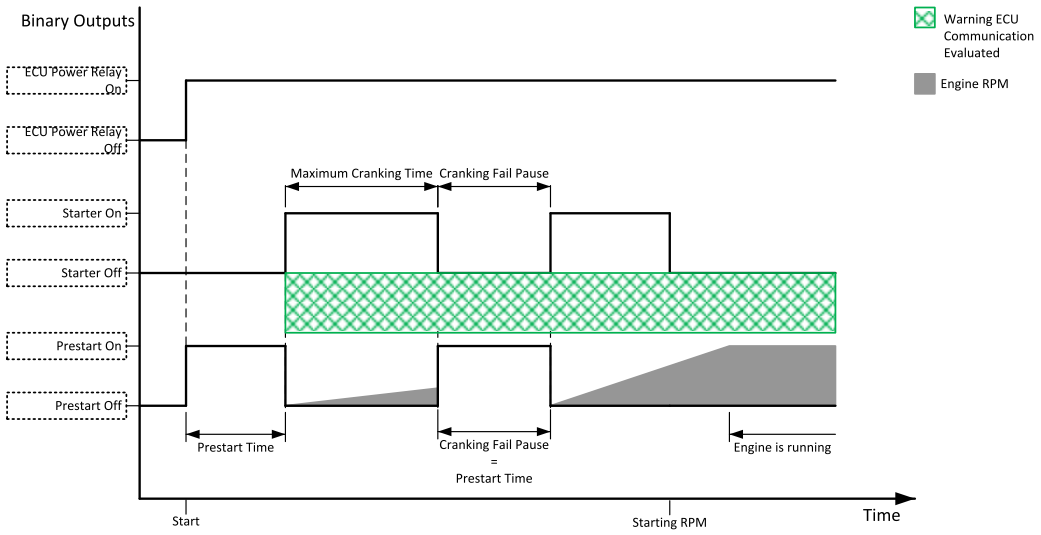



Image 8.55 ECU Power Relay

> **IMPORTANT: This LBO also affects evaluation of Sd ECU Communication Fail (page 754) or Wrn ECU Communication Fail (page 722) alarms. With configured LBO ECU Power Relay, these alarms are evaluated only when this LBO is active. Without configured LBO ECU Power Relay, these alarm are evaluated all the time.**

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## ECU Red Lamp

| Related FW | 2.1.0 | Related applications | MINT, SPtM |
|---|---|---|---|
| Comm object | 350 | | |
| Description | | | |

This output is active when the ECU sends an active “red lamp” flag, i.e. it has detected a critical malfunction and the engine should not be operated until a service check is performed. This flag is taken from the DM1 frame on standard J1939 ECUs. Some ECUs provide this flag in their own proprietary frames and some do not provide the flag at all.

back to Logical binary outputs alphabetically

## ECU Run Stop

| | | | |
|---|---|---|---|
| **Related FW** | 2.1.0 | **Related applications** | MINT, SPtM |
| **Comm object** | 958 | | |
| **Description** | | | |
| Signal for starting and stopping of ECU. | | | |

back to Logical binary outputs alphabetically

## ECU Wait To Start

| | | | |
|---|---|---|---|
| **Related FW** | 2.1.0 | **Related applications** | MINT, SPtM |
| **Comm object** | 959 | | |
| **Description** | | | |
| This output is active when ECU Wait To Start Lamp is active. | | | |

back to Logical binary outputs alphabetically

## ECU Yellow Lamp

| | | | |
|---|---|---|---|
| **Related FW** | 2.1.0 | **Related applications** | MINT, SPtM |
| **Comm object** | 349 | | |
| **Description** | | | |
| This output is active when the ECU sends an active “yellow lamp” flag, i.e. it has detected a non-critical malfunction. This flag is taken from the DM1 frame on standard J1939 ECUs. Some ECUs provide this flag in their own proprietary frames and some do not provide the flag at all. | | | |

back to Logical binary outputs alphabetically

## Electrical Alarm

| | | | |
|---|---|---|---|
| **Related FW** | 2.1.0 | **Related applications** | MINT, SPtM |
| **Comm object** | 2410 | | |
| **Description** | | | |
| LBO Electrical Alarm is active when any of generator protections of any alarm level type (Overload, Short Circuit, IDMT Overcurrent, Current Unbalance, Overvoltage, Undervoltage, Voltage Unbalance, Overfrequency, Underfrequency, Reverse Power) is active.<br>LBO Electrical Alarm is deactivated by confirmation of generator protection alarms in alarmlist and simultaneously generator protections alarms has to be inactive. | | | |

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## Engines Swapped

| | | | |
|---|---|---|---|
| **Related FW** | 2.1.0 | **Related applications** | MINT |
| **Comm object** | 208 | | |
| **Description** | | | |
| When the master controller (controller with the lowest Controller Address) swaps priority of two Gen-sets, it generates 100ms pulse with the output. The output works with the **#Priority Auto Swap (page 367)** option RunHourEql. | | | |

back to Logical binary outputs alphabetically

## Exercise Timer 1

| Related FW | 2.1.0 | Related applications | MINT, SPtM |
|---|---|---|---|
| Comm object | 1250 | | |
| Description | | | |
| This is an output from the Exercise timer 1. This output makes it easy to make periodic tests of the Gen-set and its activation depends on the setpoints in the **Subgroup: Timer 1 (page 434)** subgroup. This output is active when Timer 1 is active.<br>***Note:*** *In the event that both Timers are active at the same time,* ***Subgroup: Timer 1 (page 434)*** *has a higher priority than* ***Subgroup: Timer 2 (page 442)****.* | | | |

**back to Logical binary outputs alphabetically**

## Exercise Timer 2

| Related FW | 2.1.0 | Related applications | MINT, SPtM |
|---|---|---|---|
| Comm object | 1251 | | |
| Description | | | |
| This is an output from the Exercise timer 2. This output makes it easy to make periodic tests of the gen-set and its activation depends on the setpoints in the **Subgroup: Timer 2 (page 442)** subgroup. This output is active when Timer 2 is active.<br>***Note:*** *In the event that both Timers are active at the same time,* ***Subgroup: Timer 1 (page 434)*** *has a higher priority than* ***Subgroup: Timer 2 (page 442)****.* | | | |

**back to Logical binary outputs alphabetically**

## Exercise Timer 3

| Related FW | 2.1.0 | Related applications | MINT, SPtM |
|---|---|---|---|
| Comm object | 1946 | | |
| Description | | | |
| This is an output from the Exercise timer 3. This output makes it easy to make periodic tests of the Gen-set and its activation depends on the setpoints in the **Subgroup: Timer 3 (page 450)** subgroup. This output is active when Timer 3 is active.<br>***Note:*** *In the event that both Timers are active at the same time,* ***Subgroup: Timer 3 (page 450)*** *has a higher priority than* ***Subgroup: Timer 3 (page 450)****.* | | | |

**back to Logical binary outputs alphabetically**

## Exercise Timer 4

| Related FW | 2.1.0 | Related applications | MINT, SPtM |
|---|---|---|---|
| Comm object | 1947 | | |
| Description | | | |
| This is an output from the Exercise timer 4. This output makes it easy to make periodic tests of the Gen-set and its activation depends on the setpoints in the **Subgroup: Timer 4 (page 458)** subgroup. This output is active when Timer 4 is active.<br>***Note:*** *In the event that both Timers are active at the same time,* ***Subgroup: Timer 4 (page 458)*** *has a higher priority than* ***Subgroup: Timer 4 (page 458)****.* | | | |

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# LBO: F

## FltRes Button Echo

| Related FW | 2.1.0 | Related applications | MINT, SPtM |
|---|---|---|---|
| Comm object | 592 | | |
| Description | | | |

This output provides 1s pulse when:

- Fault Reset button is pressed on the controller front facia or
- Fault Reset button is pressed on any of external local/remote terminals or
- Fault Reset command is received via communication line or
- The input **FAULT RESET BUTTON (PAGE 613)** is activated.

back to Logical binary outputs alphabetically

## Forward Synchronization

| Related FW | 2.1.0 | Related applications | MINT, SPtM, SPI |
|---|---|---|---|
| Comm object | 68 | | |
| Description | | | |

The output is active during forward synchronization and is opened when GCB is closed or forward synchronization is interrupted.

***Note:*** *The output can be used to control of an external synchronizing module.*

back to Logical binary outputs alphabetically

## Frequency Select

| Related FW | 2.1.0 | Related applications | MINT, SPtM |
|---|---|---|---|
| Comm object | 1815 | | |
| Description | | | |

The Frequency select output is active when Nominal Frequency (Frequency Settings) is equal to 50 Hz and is deactivated when Nominal Frequency (Frequency Settings) is equal to 60 Hz.

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## Fuel Pump

| Related FW | 2.1.0 | Related applications | MINT, SPtM |
|---|---|---|---|
| Comm object | 1253 | | |
| Description | | | |

Output is activated when the value of Fuel Level lies under the value of setpoint **Fuel Pump On (page 313)** and is deactivated when value of **Fuel Pump Off (page 314)** is reached.

This output also can be activated by binary input **FUEL PUMP ON/OFF (PAGE 616)**. In this case the binary output is active until the binary input **FUEL PUMP ON/OFF (PAGE 616)** is active or until the value of Fuel Level reaches 100 % or the time set by setpoint **Transfer Wrn Delay (page 315)** elapsed.

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## Fuel Solenoid

| Related FW | 2.1.0 | Related applications | MINT, SPtM |
|---|---|---|---|

| Comm object | 22 |
|---|---|

**Description**

This output controls the fuel solenoid valve. The Fuel Solenoid output has two different behaviors depending on engine type – gas or diesel. This setting is done by **Fuel Solenoid (page 293)** setpoint in Engine Settings group.

**Diesel:**

The output is activated before binary output **STARTER 1 (PAGE 680)**.The lead time is adjusted by setpoint **Fuel Solenoid Lead (page 298)**.

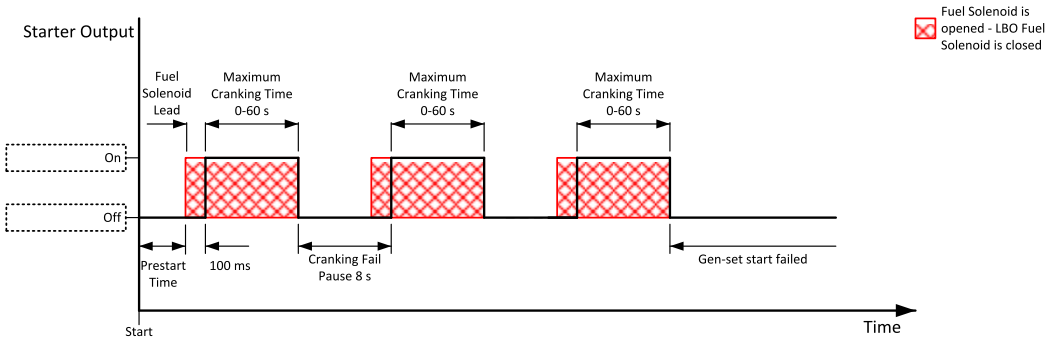



Image 8.56 Fuel Solenoid 1

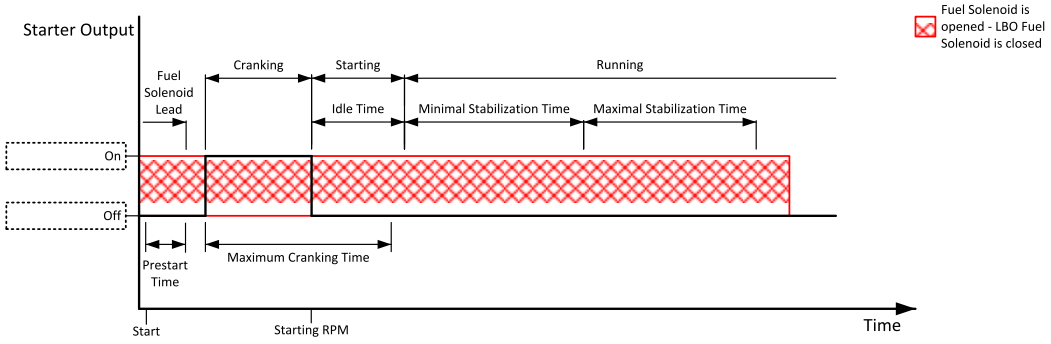



Image 8.57 Fuel Solenoid 2

The output is deactivated when:

- Emergency Stop comes
- Cooled Gen-set is stopped
- In pause between repeated starts

**Gas:**

The output closes together with binary output **IGNITION (PAGE 663)** when engine RPM exceed 30 RPM (fix value).

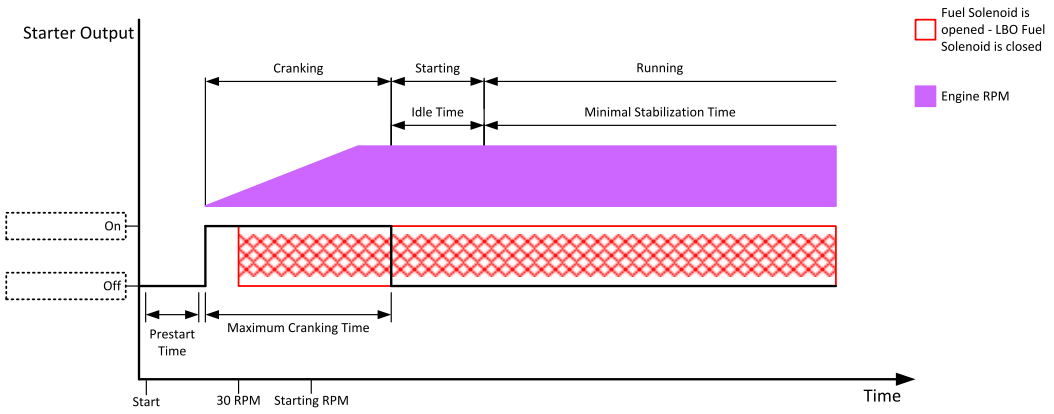



Image 8.58 Fuel Solenoid 3

The output is deactivated when:

- Emergency Stop comes
- Cooled Gen-set is stopped
- In pause between repeated starts

**back to Logical binary outputs alphabetically**

# LBO: G

## GCB Button Echo

| | | | |
|---|---|---|---|
| **Related FW** | 2.1.0 | **Related applications** | MINT, SPtM |
| **Comm object** | 35 | | |
| **Description** | | | |

This output provides 1s pulse when:

- GCB button is pressed on the controller front facia or
- GCB button is pressed on any of external local/remote terminals or
- GCB command is received via communication line or
- the input GCB BUTTON is activated.

**back to Logical binary outputs alphabetically**

## GCB Close/Open

| | | | |
|---|---|---|---|
| **Related FW** | 2.1.0 | **Related applications** | MINT, SPtM |
| **Comm object** | 41 | | |
| **Description** | | | |

The output controls the generator circuit breaker. Its state represents the breaker position requested by the controller. The breaker must react within 5 seconds to a close or open command, otherwise an alarm is issued.

***Note:*** *InteliGen4 200 controllers require the breaker feedback to be configured.*

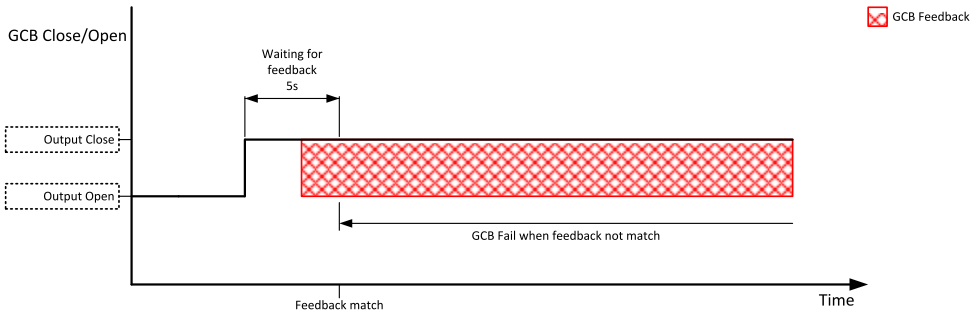



Image 8.59 GCB Close command

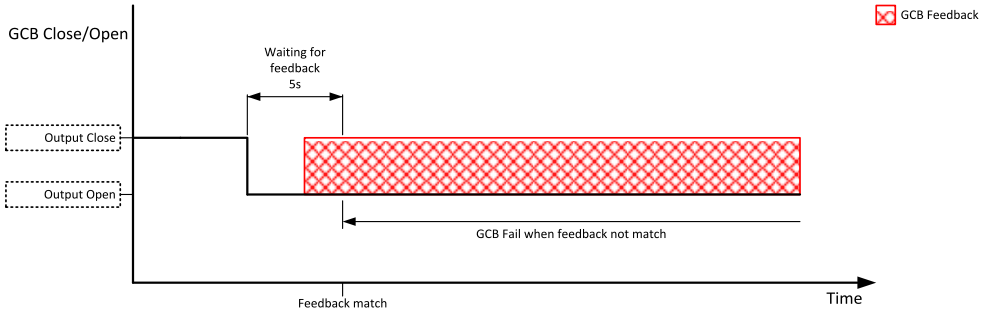



Image 8.60 GCB Open command

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## GCB OFF Coil

| Related FW | 2.1.0 | Related applications | MINT, SPtM |
|---|---|---|---|
| Comm object | 43 | | |

**Description**

The output is intended for control of open coil of generator circuit breaker. The output gives a pulse in the moment the breaker has to be opened. The pulse lasts until the feedback deactivates, but at least for 5 seconds.

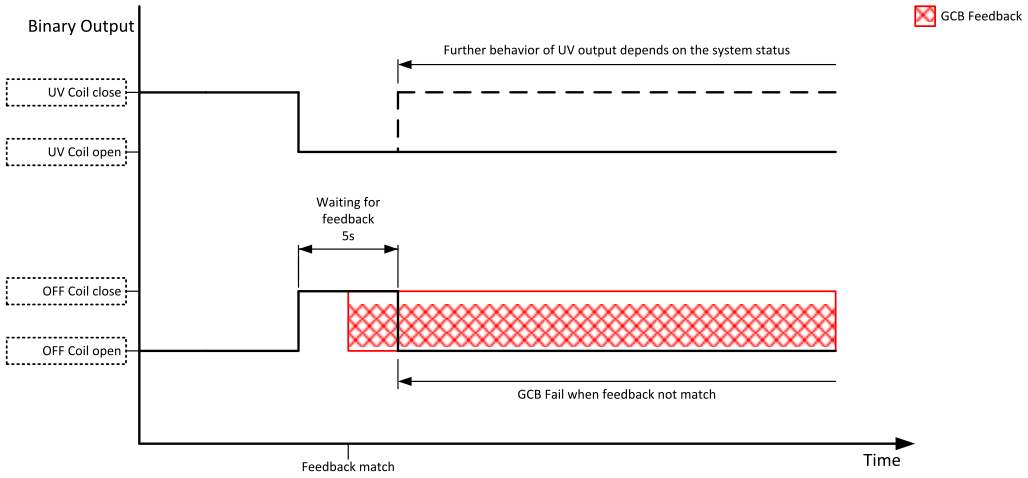



Image 8.61 GCB OFF Coil command

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## GCB ON Coil

| Related FW | 2.1.0 | Related applications | MINT, SPtM |
|---|---|---|---|
| Comm object | 42 | | |
| Description | | | |
| The output is intended for control of close coil of generator circuit breaker. The output gives at least 5 second pulse in the moment the breaker has to be closed. | | | |

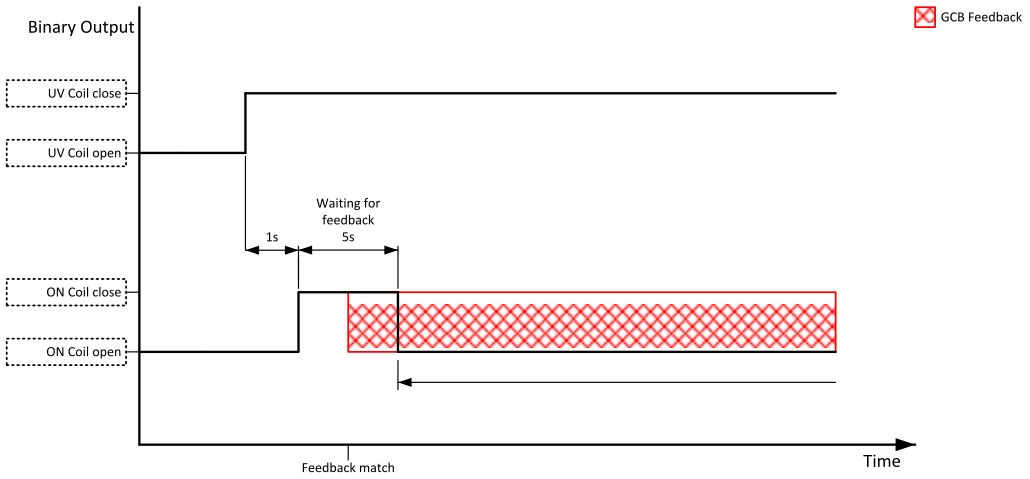



Image 8.62 GCB ON Coil close command

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## GCB Status

| Related FW | 2.1.0 | Related applications | MINT, SPtM |
|---|---|---|---|
| Comm object | 84 | | |
| Description | | | |

This output indicates the GCB position as it is internally considered by the controller.

The position is based on **GCB FEEDBACK (PAGE 618)** and **GCB FEEDBACK NEGATIVE (PAGE 619)**.

- In case that only **GCB FEEDBACK (PAGE 618)** is used, this output mirrors the input.
- In case that both **GCB FEEDBACK (PAGE 618)** and **GCB FEEDBACK NEGATIVE (PAGE 619)** are used and
  - Feedbacks match – output indicates GCB position according to feedbacks.
  - Feedbacks do not match – output indicates last position when feedbacks matched.

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## GCB UV Coil

| Related FW | 2.1.0 | Related applications | MINT, SPtM |
|---|---|---|---|
| Comm object | 44 | | |
| Description | | | |
| The output is intended for control of undervoltage coil of generator circuit breaker. The output is active the whole time when the generator is running. The output is deactivated for at least 5 seconds in the moment the breaker has to be switched off. | | | |

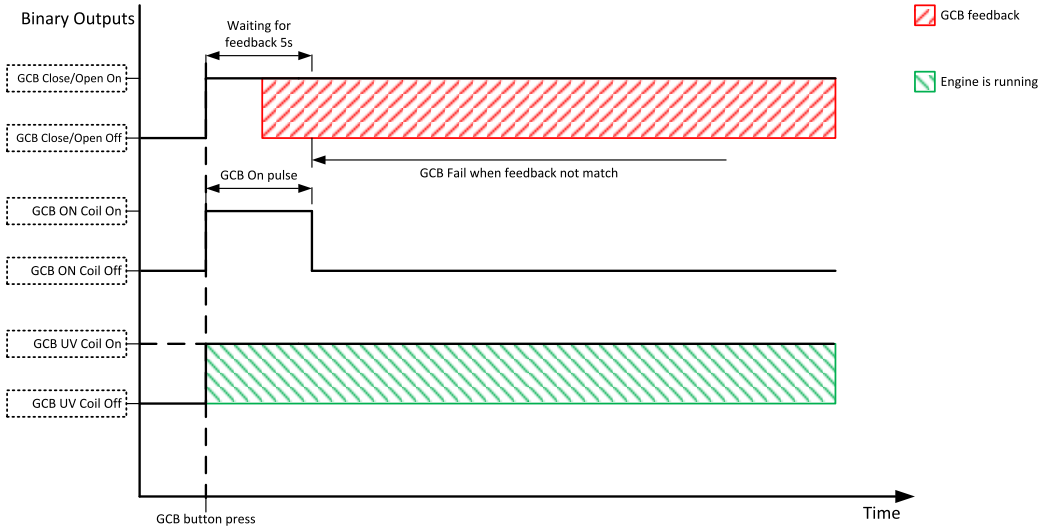



Image 8.63 GCB UV Coil close command

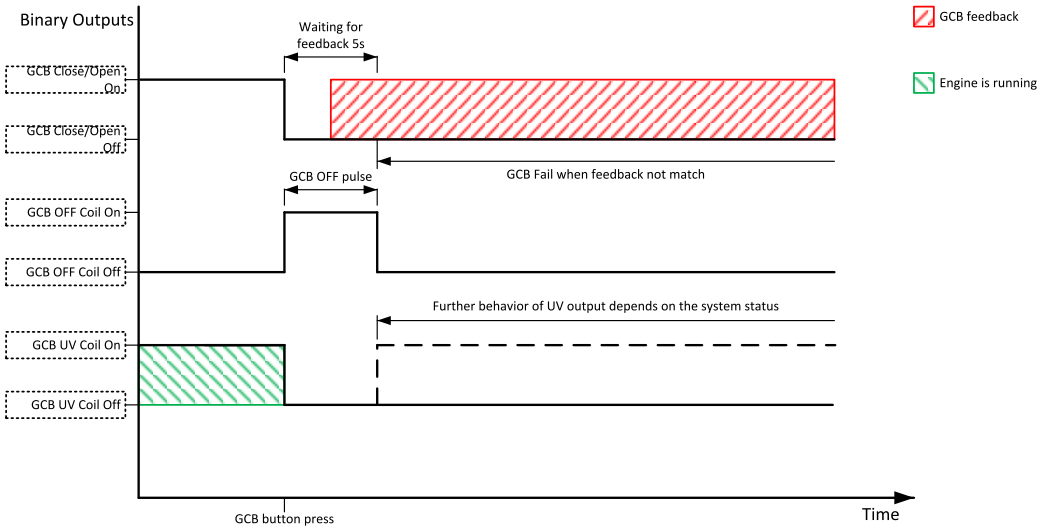



Image 8.64 GCB UV Coil open command

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## Generator Healthy

| Related FW | 2.1.0 | Related applications | MINT, SPtM |
|---|---|---|---|
| Comm object | 77 | | |
| Description | | | |

This output is active when the generator voltage, frequency and voltage unbalance is within limits. It is deactivated:

- immediately when the voltage/frequency/voltage unbalance gets out of limits (when GCB is not closed)
  or
- with an appropriate delay after the voltage/frequency/voltage unbalance has got out of limits (when GCB is closed)

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## Glow Plugs

| Related FW | 2.1.0 | Related applications | MINT, SPtM |
|---|---|---|---|
| Comm object | 1252 | | |
| Description | | | |

This output is dedicated for diesel engine only. This output will be active for exact time pre-set by setpoint **Glow Plugs Time (page 297)** before every starting attempt. The output is deactivated at the same time as the **STARTER 1 (PAGE 680)** output is activated (100 ms after **PRESTART (PAGE 674)** output is deactivated).

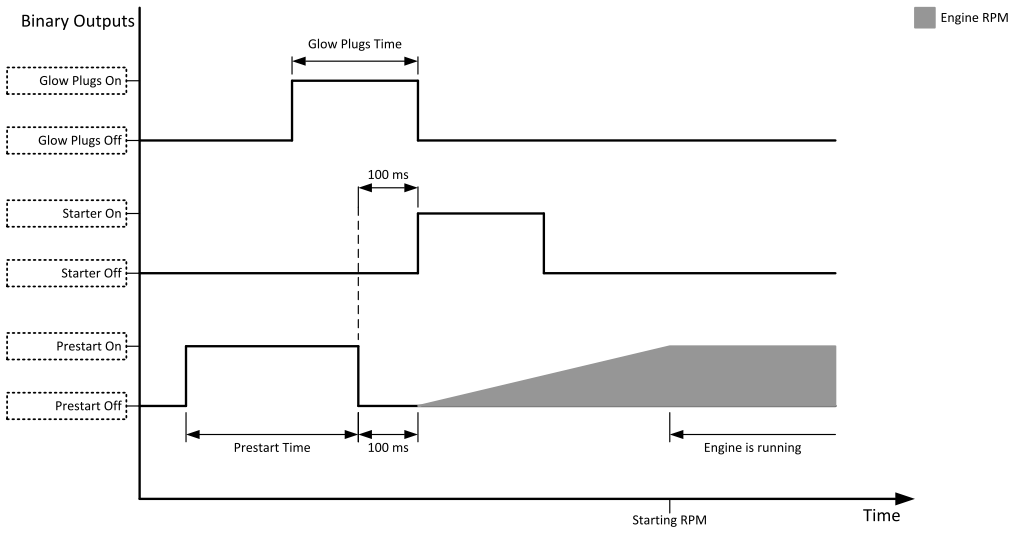



Image 8.65 Glow Plugs

When the **Glow Plugs Time (page 297)** is longer than **Cranking Fail Pause (page 295)** then the **Glow Plugs Time (page 297)** in **Cranking Fail Pause (page 295)** as long as **Cranking Fail Pause (page 295)**.

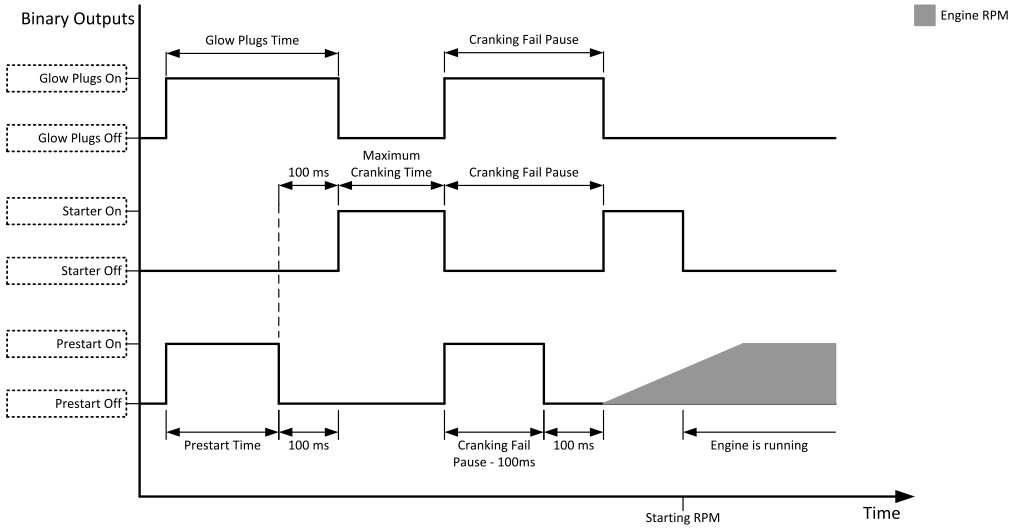



Image 8.66 Glow Plugs in Cranking Fail Pause 1

When the **Glow Plugs Time (page 297)** is shorter than **Cranking Fail Pause (page 295)** then the **Glow Plugs Time (page 297)** in **Cranking Fail Pause (page 295)** as long as the normal **Glow Plugs Time (page 297)**.

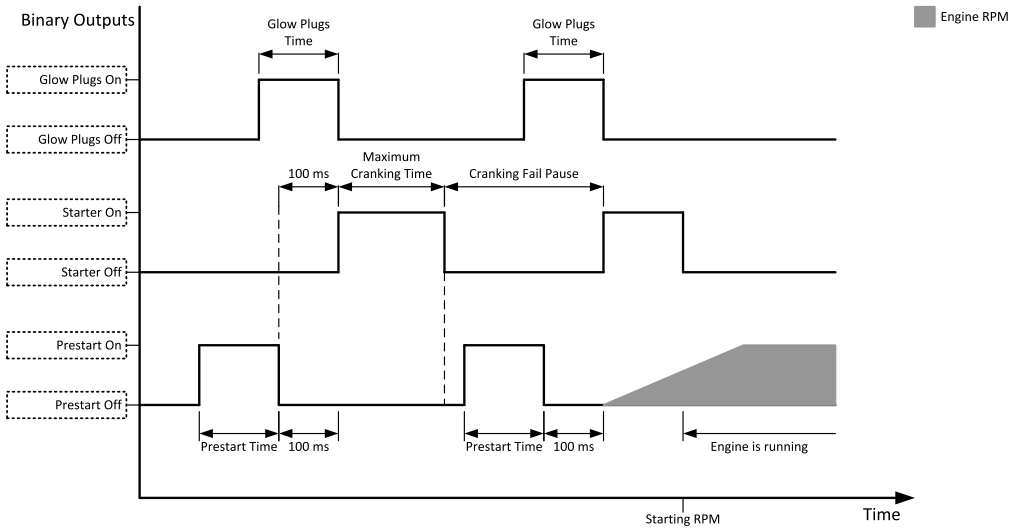



Image 8.67 Glow Plugs in Cranking Fail Pause 2

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# LBO: H

## Heartbeat

| | | | |
|---|---|---|---|
| **Related FW** | 2.1.0 | **Related applications** | MINT, SPtM |
| **Comm object** | 81 | | |
| **Description** | | | |
| This output toggles on/off in a period of 500 ms whenever the controller is switched on and functional. | | | |

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## Horn

| | | | |
|---|---|---|---|
| **Related FW** | 2.1.0 | **Related applications** | MINT, SPtM |
| **Comm object** | 1 | | |
| **Description** | | | |

The output designed to be used for acoustic indication of a newly appeared alarm. The output is activated each time a new alarm has appeared and remains active until one of the following events occurs:

- Fault reset is pressed
- Horn reset is pressed
- **Horn Timeout (page 286)** has elapsed

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## HornRes Button Echo

| | | | |
|---|---|---|---|
| **Related FW** | 2.1.0 | **Related applications** | MINT, SPtM |
| **Comm object** | 31 | | |
| **Description** | | | |

This output provides 1s pulse when:

- Horn Reset button is pressed on the controller front facia or
- Horn Reset button is pressed on any of external local/remote terminals or
- Horn Reset command is received via communication line or
- the input HORN RESET BUTTON is activated.

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# LBO: I

## Idle/Nominal

| Related FW | 2.1.0 | Related applications | MINT, SPtM |
|---|---|---|---|
| Comm object | 39 | | |
| Description | | | |

This output is used for switching between idle speed and nominal speed of the engine during the startup phase, if this feature (input) is available on the particular engine. In the case of some EFI engines, the idle/nominal switching is performed over the communication bus.

The output Idle/Nominal is activated after the timer **Idle Time (page 299)** elapses. The **Idle Time (page 299)** starts to countdown when **Starting RPM (page 296)** reached. The underspeed protection is not evaluated during fixed 5 seconds period after reaching **Starting RPM (page 296)**. A Start Fail protection occurs if the RPM drop below 2RPM during idle.

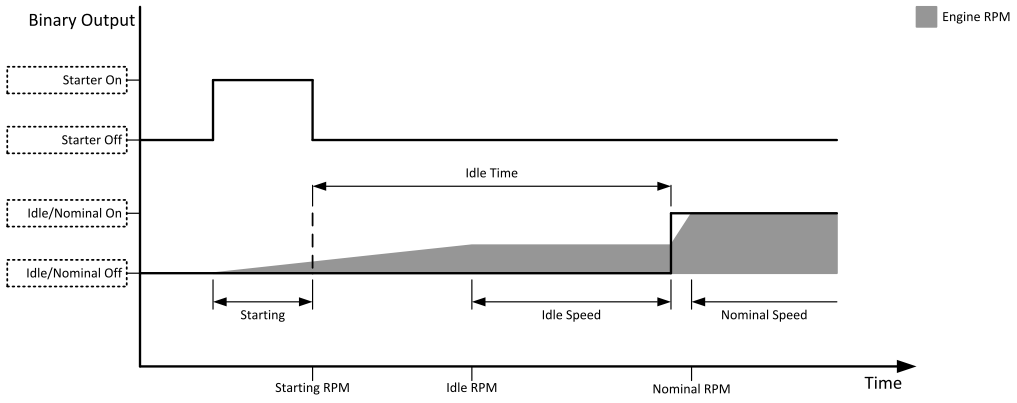



Image 8.68 Idle/Nominal

***Note:*** *Connect binary output Idle/Nominal to speed governor to switch the speed:*
*opened = Idle*
*closed = Nominal*
*(for normally open contact type)*

**back to Logical binary outputs alphabetically**

## Idle/Nominal Pulse

| Related FW | 2.1.0 | Related applications | MINT, SPtM |
|---|---|---|---|
| Comm object | 39 | | |
| Description | | | |

200ms pulse is generated when transition from the Starting to the Running state is done. It means that the pulse is generated when the LBO: **IDLE/NOMINAL (PAGE 663)** is activated.

**back to Logical binary outputs alphabetically**

## Ignition

| Related FW | 2.1.0 | Related applications | MINT, SPtM |
|---|---|---|---|
| Comm object | 37 | | |

| Description |
|---|
| This output is dedicated to controlling the ignition at a gas engine. the output is active together with binary output **FUEL SOLENOID (PAGE 653)** in the moment when the timer **Sd Ventilation Time (page 304)** elapsed and the Gen-set reaches at least 30 RPM during cranking. The timer **Sd Ventilation Time (page 304)** become active when the Gen-set has been stopped for any Sd protection or the controller has been turned on only before first cranking attempt. The output is deactivated 500 ms after all **Additional running engine indications (page 97)** will be inactive. the output is deactivated when the Gen-set has to be stopped or in pause during repeated starts. |

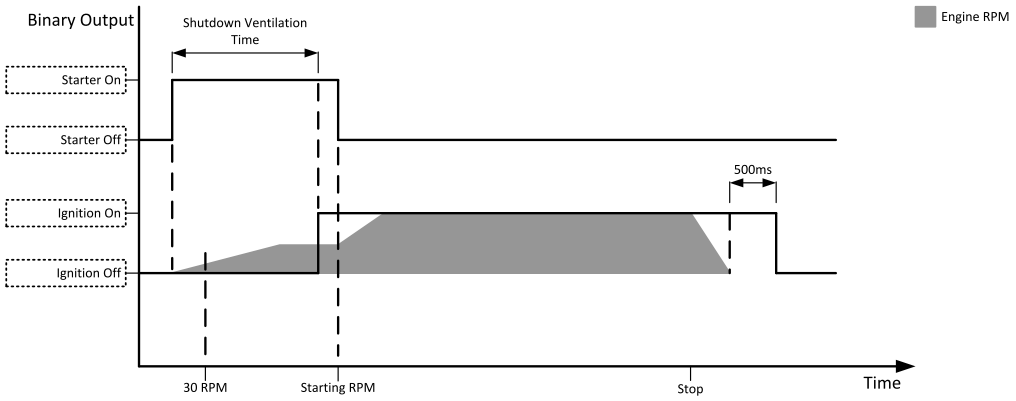



Image 8.69 Ignition 1

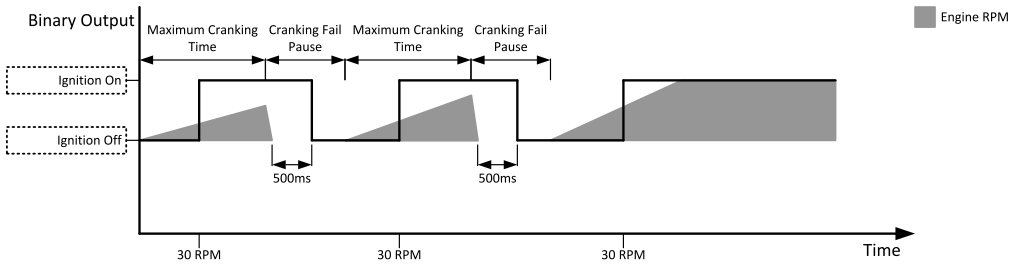



Image 8.70 Ignition 2

back to Logical binary outputs alphabetically

## Ignition On

| | | | |
|---|---|---|---|
| **Related FW** | 2.1.0 | **Related applications** | MINT, SPtM |
| **Comm object** | 1257 | | |
| **Description** | | | |
| This output is on since start button is pressed till the unit is completely stopped (or the engine doesn't start or Sd or E-Stop is active)<br>***Note:*** *This function is the same as **ECU POWER RELAY (PAGE 650)**. Ignition ON stays there from historical reasons.* | | | |

back to Logical binary outputs alphabetically

### In Synchronism

| | | | |
|---|---|---|---|
| **Related FW** | 2.1.0 | **Related applications** | MINT, SPtM |
| **Comm object** | 80 | | |
| **Description** | | | |
| This output is closed **during synchronization** when all synchro conditions have been fulfilled.<br>The output is deactivated either when:<br>› The synchro conditions are lost **or**<br>› The corresponding breaker has been closed **or**<br>› The sychronizing was interrupted or timed out.<br>Synchro conditions are following:<br>› Phase shift between generator and mains (bus) voltage must be within range of **±Phase Window (page 396)** for period longer than **Dwell Time (page 396)**.<br>› Voltage difference between generator and mains (bus) voltage (in all phases) must be lower or equal to **Voltage Window (page 395)** for period longer than **Dwell Time (page 396)**. | | | |

**back to Logical binary outputs alphabetically**

### Initialized

| | | | |
|---|---|---|---|
| **Related FW** | 2.1.0 | **Related applications** | MINT, SPtM |
| **Comm object** | 1222 | | |
| **Description** | | | |
| This output is activated when the engine proceeded through initialization phase. (Initialization phase is restart or power up of the controller.) | | | |

**back to Logical binary outputs alphabetically**

## LBO: K

### kWh Pulse

| | | | |
|---|---|---|---|
| **Related FW** | 2.1.0 | **Related applications** | MINT, SPtM |
| **Comm object** | 206 | | |
| **Description** | | | |
| This output generates a 100ms pulse whenever the internal kWh counter is incremented. | | | |

**back to Logical binary outputs alphabetically**

# LBO: L

## Load Shedding Stage 1

| | | | |
|---|---|---|---|
| **Related FW** | 2.1.0 | **Related applications** | MINT, SPtM |
| **Comm object** | 51 | | |
| **Description** | | | |
| Particular instances of the load shedding functionality<br>The load shedding outputs are activated (load is being shedd) in the order 1, 2, 3, 4, 5.<br>The load shedding outputs are deactivated (load is being reconnected) in the order 5, 4, 3, 2, 1.<br>The load disconnected by the LBO Nr.1 is the less essential load of these three possible loads instances. | | | |

back to Logical binary outputs alphabetically

## Load Shedding Stage 2

| | | | |
|---|---|---|---|
| **Related FW** | 2.1.0 | **Related applications** | MINT, SPtM |
| **Comm object** | 52 | | |
| **Description** | | | |
| Particular instances of the load shedding functionality<br>The load shedding outputs are activated (load is being shedd) in the order 1, 2, 3, 4, 5.<br>The load shedding outputs are deactivated (load is being reconnected) in the order 5, 4, 3, 2, 1.<br>The load disconnected by the LBO Nr.1 is the less essential load of these three possible loads instances. | | | |

back to Logical binary outputs alphabetically

## Load Shedding Stage 3

| | | | |
|---|---|---|---|
| **Related FW** | 2.1.0 | **Related applications** | MINT, SPtM |
| **Comm object** | 53 | | |
| **Description** | | | |
| Particular instances of the load shedding functionality<br>The load shedding outputs are activated (load is being shedd) in the order 1, 2, 3, 4, 5.<br>The load shedding outputs are deactivated (load is being reconnected) in the order 5, 4, 3, 2, 1.<br>The load disconnected by the LBO Nr.1 is the less essential load of these three possible loads instances. | | | |

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## Load Shedding Stage 4

| | | | |
|---|---|---|---|
| **Related FW** | 2.1.0 | **Related applications** | MINT, SPtM |
| **Comm object** | 54 | | |
| **Description** | | | |
| Particular instances of the load shedding functionality<br>The load shedding outputs are activated (load is beeing shedd) in the order 1, 2, 3, 4, 5.<br>The load shedding outputs are deactivated (load is beeing reconnected) in the order 5, 4, 3, 2, 1.<br>The load disconnected by the LBO Nr.1 is the less essential load of these three possible loads instances. | | | |

back to Logical binary outputs alphabetically

## Load Shedding Stage 5

| Related FW | 2.1.0 | Related applications | MINT, SPtM |
|---|---|---|---|
| Comm object | 55 | | |
| Description | | | |
| Particular instances of the load shedding functionality<br>The load shedding outputs are activated (load is beeing shedd) in the order 1, 2, 3, 4, 5.<br>The load shedding outputs are deactivated (load is beeing reconnected) in the order 5, 4, 3, 2, 1.<br>The load disconnected by the LBO Nr.1 is the less essential load of these three possible loads instances. | | | |

back to Logical binary outputs alphabetically

# LBO: M

## Mains Healthy

| Related FW | 2.1.0 | Related applications | MINT, SPtM |
|---|---|---|---|
| Comm object | 78 | | |
| Description | | | |

This output is active while mains failure is not detected and mains voltage and frequency is within limits.

- Mains Healthy is active when mains f and V are within the protection limits
- Mains Healthy deactivates when there is active mains protection level 2
- Mains Healthy cannot be activated when there is inactive not confirmed alarm **Sd Emergency Stop (page 754)** in the alarmlist

***Note:*** *Mains Healthy cannot be activated when there is active **ALI Mains Ph Rotation Opposite (page 743)** or **ALI Mains Ph L1 Inverted (page 742)**, **ALI Mains Ph L2 Inverted (page 742)** or **ALI Mains Ph L3 Inverted (page 742)**.*

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## Manual Ready

| Related FW | 2.1.0 | Related applications | MINT, SPtM |
|---|---|---|---|
| Comm object | 1258 | | |
| Description | | | |
| This output is active when controller is in MAN mode and the engine is stopped and it is possible to start it i.e. no red alarm is activated or **SD OVERRIDE (PAGE 629)** is active (Output **READY (PAGE 676)** is active). | | | |

back to Logical binary outputs alphabetically

## MCB Button Echo

| Related FW | 2.1.0 | Related applications | MINT, SPtM |
|---|---|---|---|
| Comm object | 34 | | |
| Description | | | |

This output provides 1s pulse when:

- MCB button is pressed on the controller front facia or
- MCB button is pressed on any of external local/remote terminals or
- MCB command is received via communication line or
- the input MCB BUTTON is activated.

back to Logical binary outputs alphabetically

## MCB Close/Open

| Related FW | 2.1.0 | Related applications | MINT, SPtM |
|---|---|---|---|
| Comm object | 45 | | |
| Description | | | |

The output controls the mains circuit breaker. Its state represents the breaker position requested by the controller. The breaker must react within 5 seconds to a close or open command, otherwise an alarm is issued.

***Note:*** *InteliGen4 200 controllers require the breaker feedback to be configured.*

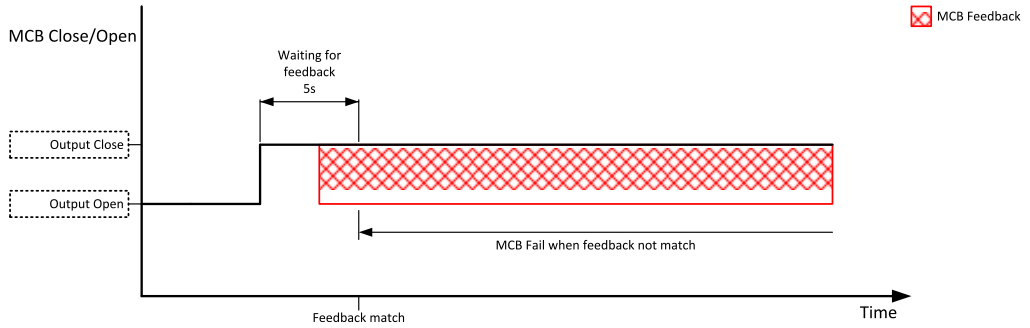



Image 8.71 MCB Close command

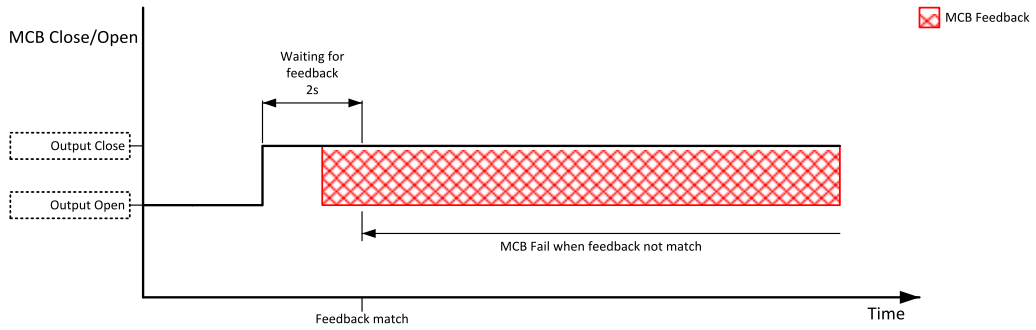



Image 8.72 MCB Close command

back to Logical binary outputs alphabetically

## MCB OFF Coil

| Related FW | 2.1.0 | Related applications | MINT, SPtM |
|---|---|---|---|
| Comm object | 47 | | |

**Description**

The output is intended for control of open coil of mainsbus circuit breaker. The output gives a pulse in the moment the breaker has to be opened. The pulse lasts until the feedback deactivates, but at least for 5 seconds.

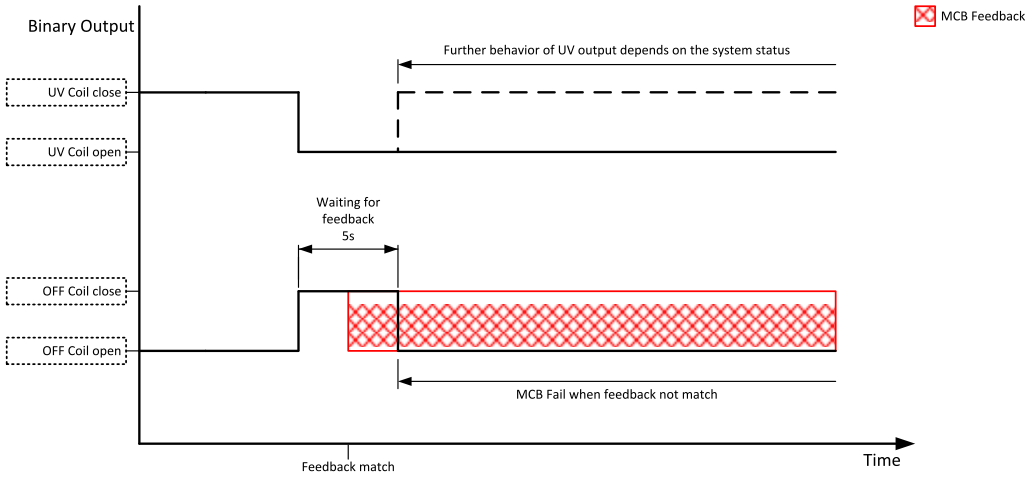



Image 8.73 MCB OFF Coil command

back to Logical binary outputs alphabetically

## MCB ON Coil

| Related FW | 2.1.0 | Related applications | MINT, SPtM |
|---|---|---|---|
| Comm object | 46 | | |
| Description | | | |

The output is intended for control of close coil of mainsbus circuit breaker. The output gives at least 5 second pulse in the moment the breaker has to be closed.

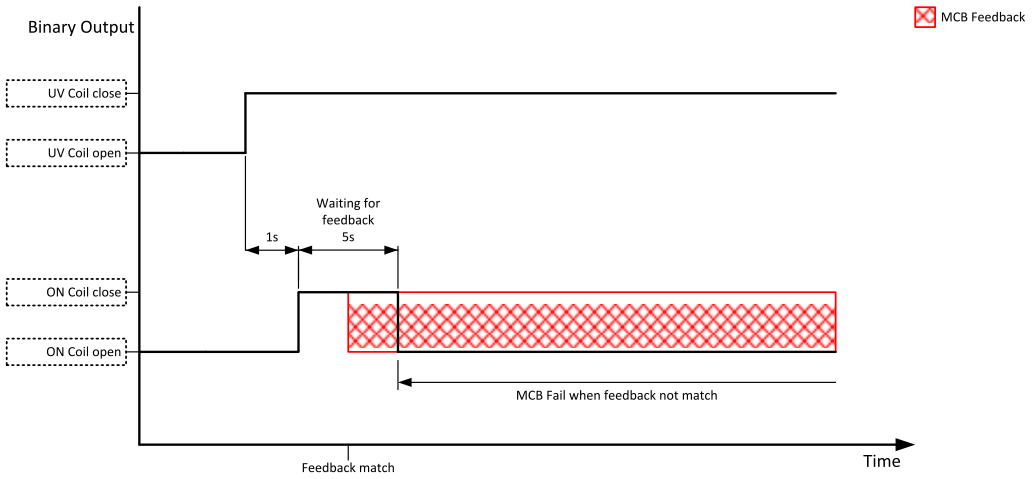



Image 8.74 MCB ON Coil close command

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## MCB Status

| Related FW | 2.1.0 | Related applications | MINT, SPtM |
|---|---|---|---|
| Comm object | 85 | | |
| Description | | | |

This output indicates the MCB position as it is internally considered by the controller. The position is based on **MCB Feedback (page 622)** and **MCB Feedback Negative (page 623)**.

- In case that only **MCB Feedback (page 622)** is used, this output mirrors the input.
- In case that both **MCB Feedback (page 622)** and **MCB Feedback Negative (page 623)** are used and
  - Feedback match – output indicates MCBposition according to feedbacks.
  - Feedback do not match – output indicates last position when feedbacks matched.

back to Logical binary outputs alphabetically

## MCB UV Coil

| Related FW | 2.1.0 | Related applications | MINT, SPtM |
|---|---|---|---|
| Comm object | 48 | | |

**Description**

The output is intended for control of undervoltage coil of mainsbus circuit breaker. The output is active the whole time when the controller is switched on. The output is deactivated for at least 5 seconds in the moment the breaker has to be switched off.

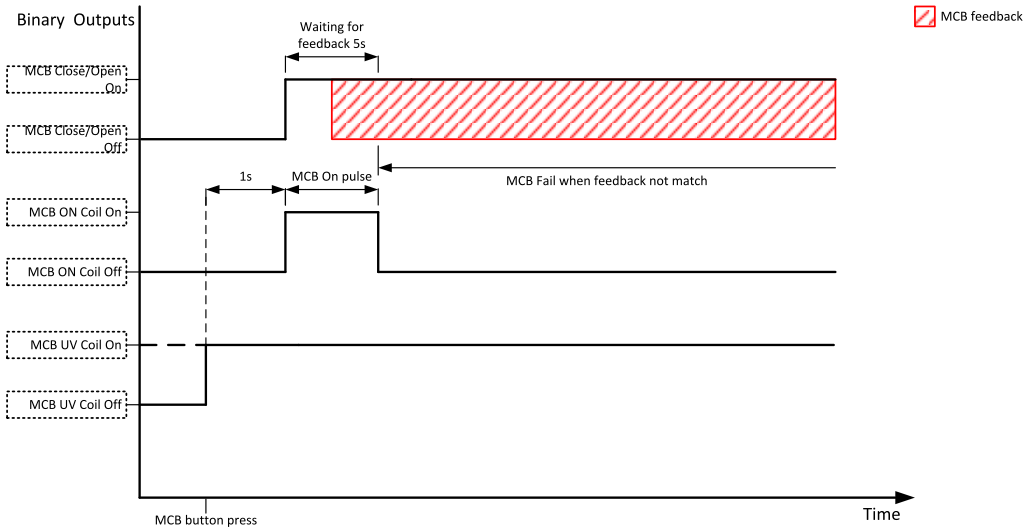



Image 8.75 MCB UV Coil close command

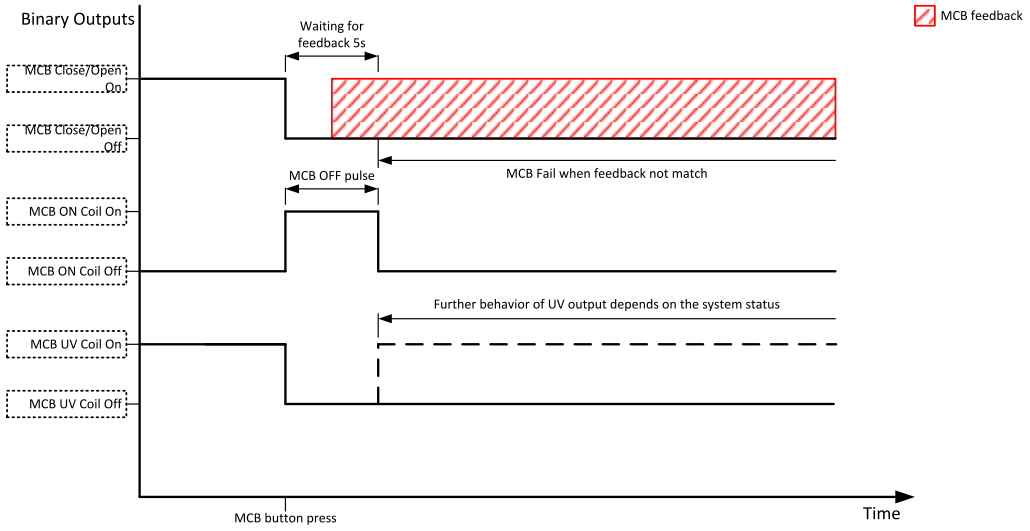



Image 8.76 MCB UV Coil open command

back to Logical binary outputs alphabetically

## Mode AUTO

| Related FW | 2.1.0 | Related applications | MINT, SPtM |
|---|---|---|---|
| Comm object | 19 | | |
| Description | | | |
| This output is active whenever the controller is in AUTO mode. | | | |

back to Logical binary outputs alphabetically

## Mode MAN

| Related FW | 2.1.0 | Related applications | MINT, SPtM |
|---|---|---|---|
| Comm object | 18 | | |
| Description | | | |
| This output is active whenever the controller is in MAN mode. | | | |

back to Logical binary outputs alphabetically

## Mode OFF

| Related FW | 2.1.0 | Related applications | MINT, SPtM |
|---|---|---|---|
| Comm object | 17 | | |
| Description | | | |
| This output is active whenever the controller is in OFF mode. | | | |

back to Logical binary outputs alphabetically

## Mode TEST

| Related FW | 2.1.0 | Related applications | MINT, SPtM |
|---|---|---|---|
| Comm object | 20 | | |
| Description | | | |
| This output is active whenever the controller is in TEST mode. | | | |

back to Logical binary outputs alphabetically

# LBO: N

## NCB Close/Open

| Related FW | 2.1.0 | Related applications | MINT |
|---|---|---|---|
| Comm object | 50 | | |
| Description | | | |
| Neutral circuit breaker Close/Open output controls the generator neutral circuit breaker. It is intended for contactors – provides a continual active signal if NCB should be closed. | | | |

back to Logical binary outputs alphabetically

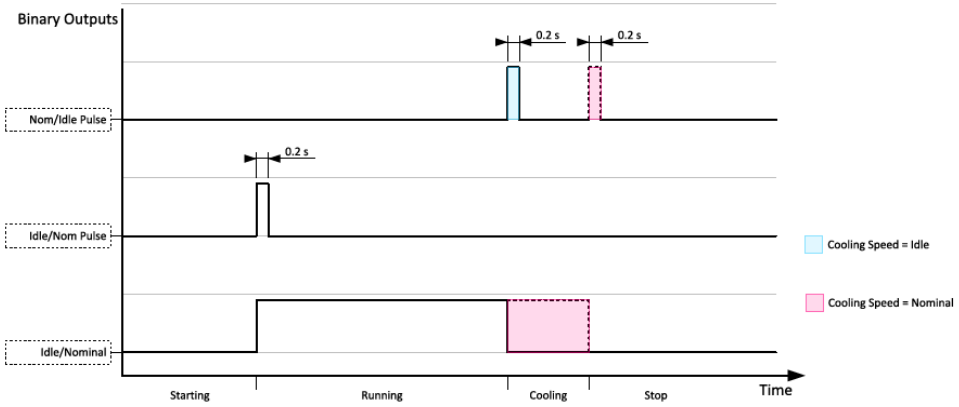
## Nominal/Idle Pulse

| Related FW | 2.1.0 | Related applications | MINT, SPtM |
|---|---|---|---|
| Comm object | 1903 | | |
| Description | | | |

This function generates a pulse when transition to the Cooling or Stop state is done.

- **Cooling Speed (page 304)** = Idle
  - 200 ms pulse is generated when transition from the Running to the Cooling state is done.
- **Cooling Speed (page 304)**= Nominal
  - 200 ms pulse is generated when transition from the Cooling to the Stop state is done.

It means that the pulse is generated when the LBO:**IDLE/NOMINAL (PAGE 663)** is deactivated.




back to Logical binary outputs alphabetically

## Not In AUTO

| Related FW | 2.1.0 | Related applications | MINT, SPtM |
|---|---|---|---|
| Comm object | 1248 | | |
| Description | | | |

This output is active when controller isn't in AUTO mode.

back to Logical binary outputs alphabetically

## Not Used

| Related FW | 2.1.0 | Related applications | MINT, SPtM |
|---|---|---|---|
| Comm object | 286 | | |
| Description | | | |

Output has no function.

back to Logical binary outputs alphabetically

# LBO: P

## Peak Shaving Active

| | | | |
|---|---|---|---|
| **Related FW** | 2.1.0 | **Related applications** | MINT, SPtM |
| **Comm object** | 2118 | | |
| **Description** | | | |
| Active anytime, when the peak shaving start condition is fulfilled. | | | |

back to Logical binary outputs alphabetically

## Prestart

| | | | |
|---|---|---|---|
| **Related FW** | 2.1.0 | **Related applications** | MINT, SPtM |
| **Comm object** | 36 | | |
| **Description** | | | |

This output can be used for control of any device, which has to be activated just before start. the output is active for time period of **Prestart Time (page 296)**. The output is deactivated 100 ms before the **STARTER 1 (PAGE 680)** output is activated.

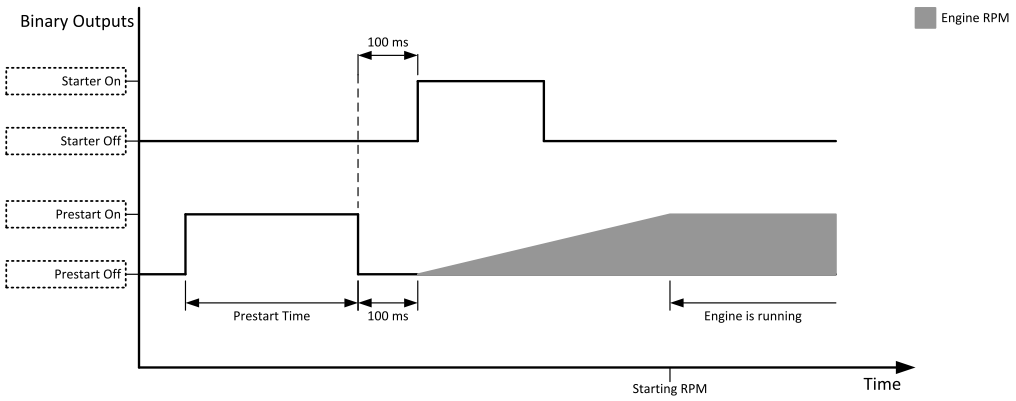



Image 8.77 Engine start

When the **Prestart Time (page 296)** is longer than **Cranking Fail Pause (page 295)** then the **Prestart Time (page 296)** in **Cranking Fail Pause (page 295)** is long as **Cranking Fail Pause (page 295)** minus 100 ms.

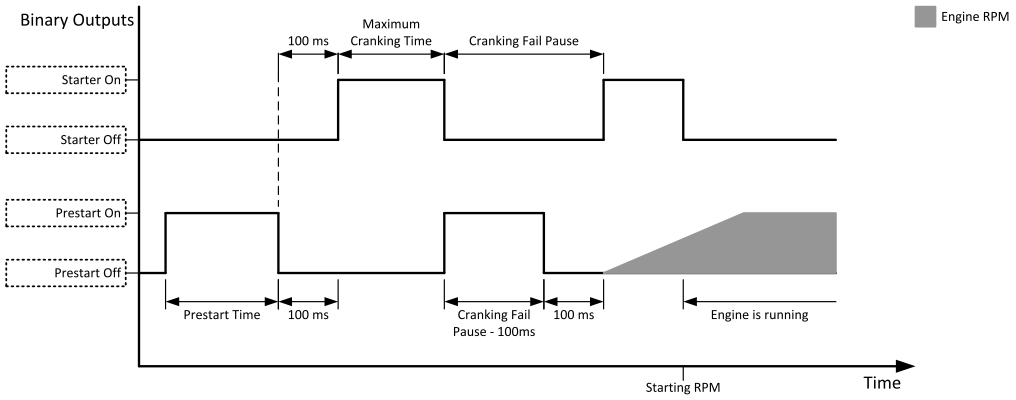



Image 8.78 Prestart in Cranking Fail Pause 1

When the **Prestart Time (page 296)** is shorter than **Cranking Fail Pause (page 295)** then the **Prestart Time (page 296)** in **Cranking Fail Pause (page 295)** is long as normal **Prestart Time (page 296)**.

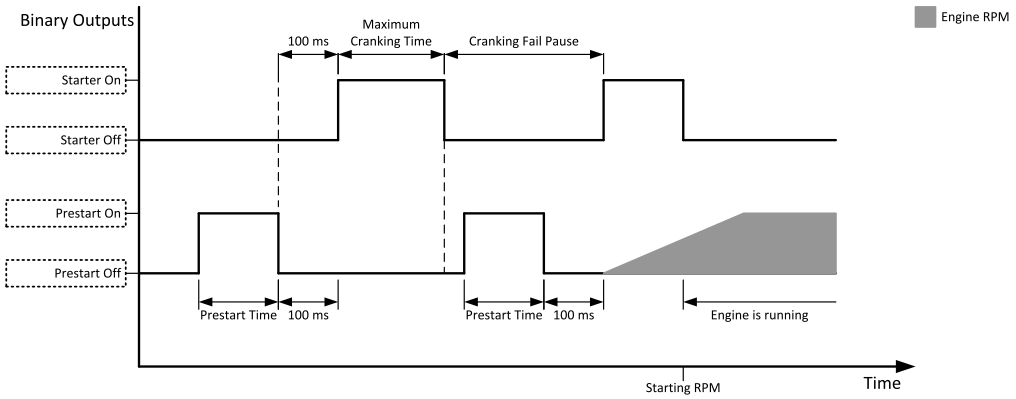



Image 8.79 Prestart in Cranking Fail Pause 2

**back to Logical binary outputs alphabetically**

# LBO: R

## Ready

| Related FW | 2.1.0 | Related applications | MINT, SPtM |
|---|---|---|---|
| Comm object | 62 | | |
| Description | | | |
| The binary output is active when the engine is stopped and it is possible to start it i.e. no red alarm is activated or SD OVERRIDE (PAGE 629) is active.<br>The binary output is switch on when the Ready state occurs.<br>The binary output is switch off when the Prestart or the Not Ready or the Stop state occurs i.e. always except Ready state. | | | |

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## Ready/AUTO

| Related FW | 2.1.0 | Related applications | MINT, SPtM |
|---|---|---|---|
| Comm object | 2350 | | |
| Description | | | |
| This LBO is available in a configuration as standard LBO. It is active when controller in Ready state and in AUTO mode simultaneously. | | | |

back to Logical binary outputs alphabetically

## Ready To AMF

| Related FW | 2.1.0 | Related applications | MINT, SPtM |
|---|---|---|---|
| Comm object | 324 | | |
| Description | | | |
| the output is active if the Gen-set is ready to start automatically and take the load if the mains fails, i.e.:<br>› the controller is in SPtM operating mode<br>› the controller is in AUTO controller mode and<br>› no red alarm is present in the alarmlist<br>› when the red alarm is confirmed during Stop Valve and other requirements are fulfilled then the LBO is still inactive until the state ready | | | |

back to Logical binary outputs alphabetically

## Ready To Load

| Related FW | 2.1.0 | Related applications | MINT, SPtM |
|---|---|---|---|
| Comm object | 58 | | |
| Description | | | |
| the output is active whenever the GCB is closed or can be closed i.e. the stabilization phase is finished, the Gen-set is running and the **Minimal Stabilization Time (page 301)** timer has elapsed and the Gen-set voltage and frequency are within limits.<br>If GCB is open then Gen-set voltage and frequency must be in limits.<br>If GCB is close then Gen-set voltage and frequency can be out of limits, but protection delay can't be count down. If Gen-set voltage and frequency will return into limits until delay is count down then output is still active. | | | |

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## RegenerationNeeded

| Related FW | 2.1.0 | Related applications | MINT, SPtM |
|---|---|---|---|
| Comm object | 1372 | | |
| Description | | | |
| This output is active when DPF lamp from ECU is active. | | | |

back to Logical binary outputs alphabetically

## Reverse Synchronization

| Related FW | 2.1.0 | Related applications | MINT, SPtM, SPI |
|---|---|---|---|
| Comm object | 69 | | |
| Description | | | |
| The output is active during reverse synchronization and is deactivated when MCB is closed or reverse synchronization is interrupted.<br>***Note:*** *The output can be used for external synchronizing module control.* | | | |

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## Running

| Related FW | 2.1.0 | Related applications | MINT, SPtM |
|---|---|---|---|
| Comm object | 67 | | |
| Description | | | |
| The output is designed to be used as an indication that the Gen-set is running. The output is activated if **FUEL SOLENOID (PAGE 653)** is active and **STARTER 1 (PAGE 680)** and **PRESTART (PAGE 674)** are deactivated. The out remains active until engine stop and cooling period elapses. | | | |

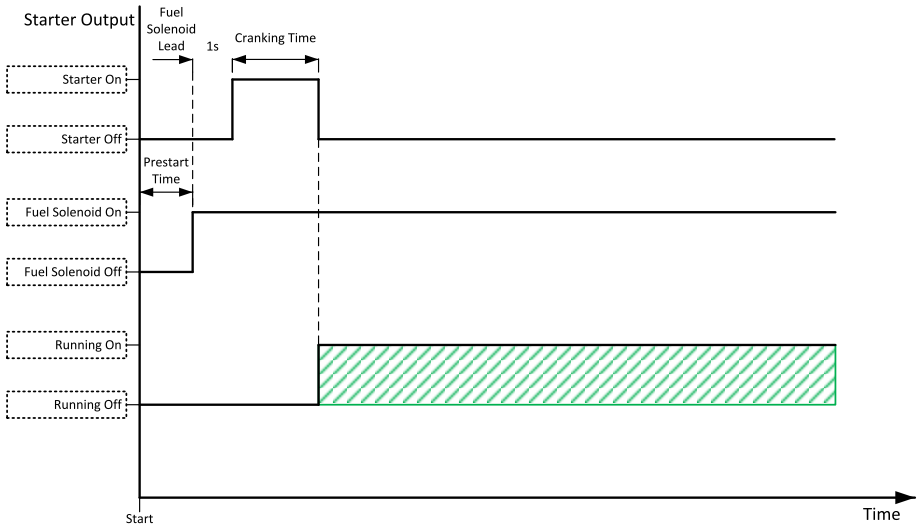



Image 8.80 Running

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# LBO: S

## Sd Override

| Related FW | 2.1.0 | Related applications | MINT, SPtM |
|---|---|---|---|
| Comm object | 962 | | |
| Description | | | |
| The output is active if **SD OVERRIDE (PAGE 629)** input is active and open if **SD OVERRIDE (PAGE 629)** input is inactive. This output is usually used to send information about **SD OVERRIDE (PAGE 629)** input into ECU. | | | |

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## Soft Unload

| Related FW | 2.1.0 | Related applications | MINT, SPtM |
|---|---|---|---|
| Comm object | 73 | | |
| Description | | | |
| The output is active when generator is unloaded – controller is in the Soft unload state. | | | |

back to Logical binary outputs alphabetically

## Speed Down

| Related FW | 2.1.0 | Related applications | MINT, SPtM |
|---|---|---|---|
| Comm object | 57 | | |
| Description | | | |
| This output together with the complementary output SPEED UP (PAGE 679) are designed for speed and power control at Gen-sets where the speed governor does not support analogue control. | | | |

back to Logical binary outputs alphabetically

## Speed Up

| Related FW | 2.1.0 | Related applications | MINT, SPtM |
|---|---|---|---|
| Comm object | 56 | | |
| Description | | | |
| This output together with the complementary output SPEED DOWN (PAGE 679) are designed for speed and power control at Gen-sets where the speed governor does not support analogue control. | | | |

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## Start Button Echo

| Related FW | 2.1.0 | Related applications | MINT, SPtM |
|---|---|---|---|
| Comm object | 33 | | |
| Description | | | |

This output provides 1s pulse when:

- Start button is pressed on the controller front facia or
- Start button is pressed on any of external local/remote terminals or
- Start command is received via communication line or
- the input START BUTTON is activated.

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## Starter 1

| Related FW | 2.1.0 | Related applications | MINT, SPtM |
|---|---|---|---|
| Comm object | 24 | | |

**Description**

This output is dedicated for starter motor control. The number of cranking attempts is adjusted by setpoint **Cranking Attempts (page 294)** in Engine Settings group. Cranking fail pause is adjusted by setpoint **Cranking Fail Pause (page 295)**.

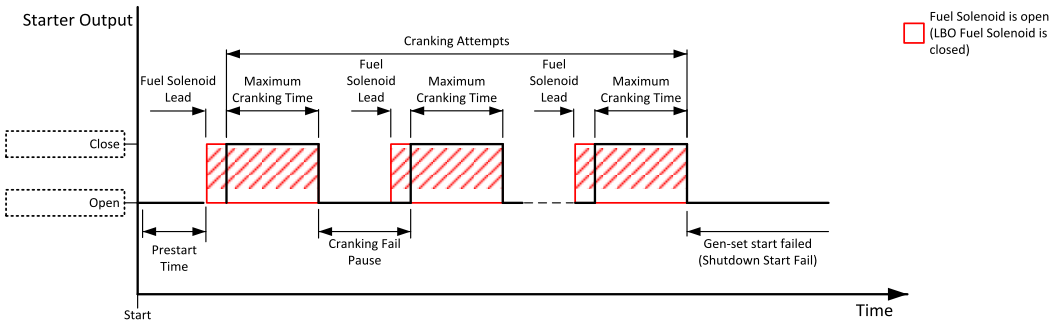



Image 8.81 Starter

The starter output opens when:

- Starting RPM are reached
- the "firing" speed is reached (gas engines only)
- maximum time of cranking is exceeded
- request to stop comes up
- D+ value is higher than **D+ Threshold (page 308)**
- Oil pressure value is higher than **Starting Oil Pressure (page 297)**
- Generator voltage >25 % of **Nominal Voltage Ph-N (page 278)** or **Nominal Voltage Ph-Ph (page 279)** (any phase)

**back to Logical binary outputs alphabetically**

## Starter 2

| Related FW | 2.1.0 | Related applications | MINT, SPtM |
|---|---|---|---|
| Comm object | 2415 | | |
| Description | | | |

This output is dedicated for starter motor control. The number of cranking attempts is adjusted by setpoint **Cranking Attempts (page 294)** in Engine Settings group. Cranking fail pause is adjusted by setpoint **Cranking Fail Pause (page 295)**.

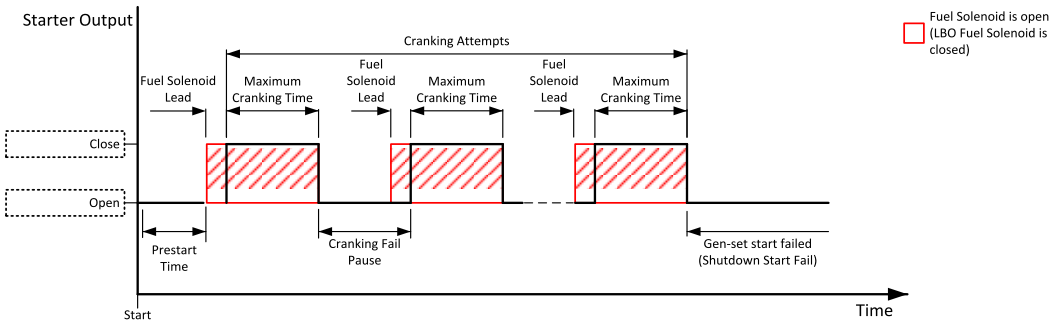



Image 8.82 Starter

The starter output opens when:

- Starting RPM are reached
- the "firing" speed is reached (gas engines only)
- maximum time of cranking is exceeded
- request to stop comes up
- D+ value is higher than **D+ Threshold (page 308)**
- Oil pressure value is higher than **Starting Oil Pressure (page 297)**
- Generator voltage >25 % of **Nominal Voltage Ph-N (page 278)** or **Nominal Voltage Ph-Ph (page 279)** (any phase)

**back to Logical binary outputs alphabetically**

## Still Log 0

| Related FW | 2.1.0 | Related applications | MINT, SPtM |
|---|---|---|---|
| Comm object | 26 | | |
| Description | | | |

Logical binary output which is still in logical 0.

**back to Logical binary outputs alphabetically**

## Still Log 1

| Related FW | 2.1.0 | Related applications | MINT, SPtM |
|---|---|---|---|
| Comm object | 27 | | |
| Description | | | |

Logical binary output which is still in logical 1.

**back to Logical binary outputs alphabetically**

## Stop Button Echo

| Related FW | 2.1.0 | Related applications | MINT, SPtM |
|---|---|---|---|
| Comm object | 32 | | |
| Description | | | |

This output provides 1s pulse when:

- Stop button is pressed on the controller front facia or
- Stop button is pressed on any of external local/remote terminals or
- Stop command is received via communication line or
- the input STOP BUTTON is activated.

back to Logical binary outputs alphabetically

## Stop Pulse

| Related FW | 2.1.0 | Related applications | MINT, SPtM |
|---|---|---|---|
| Comm object | 25 | | |
| Description | | | |

Output is active for 1 second after **STOP SOLENOID (PAGE 682)** output activation. This signal is sent to ECU in case of engine stop request.

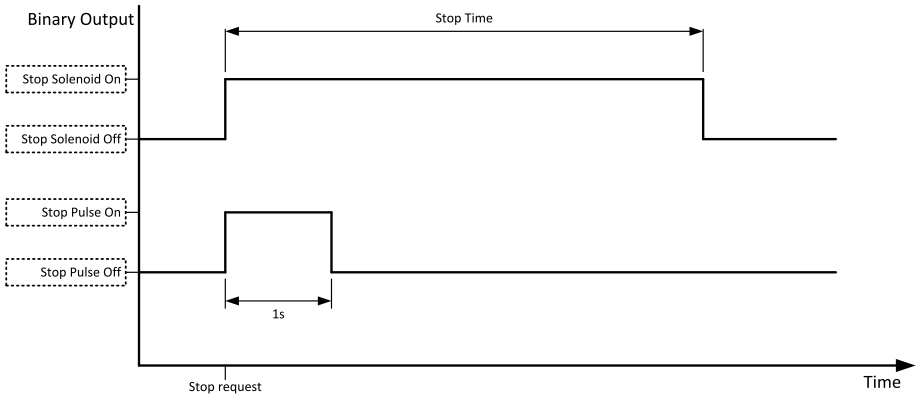



Image 8.83 Stop Pulse

back to Logical binary outputs alphabetically

## Stop Solenoid

| Related FW | 2.1.0 | Related applications | MINT, SPtM |
|---|---|---|---|
| Comm object | 23 | | |
| Description | | | |

This output is dedicated to control the stop solenoid (valve). The output is activated when an engine stop command is received and is deactivated 12 s after last running engine indication went off, i.e. engine is stopped.

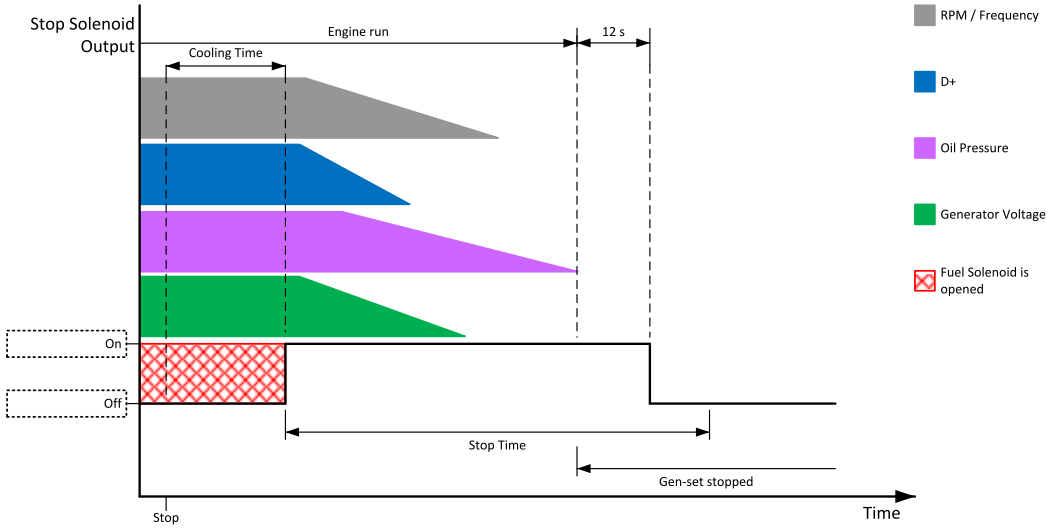



Image 8.84 Stop Solenoid 1

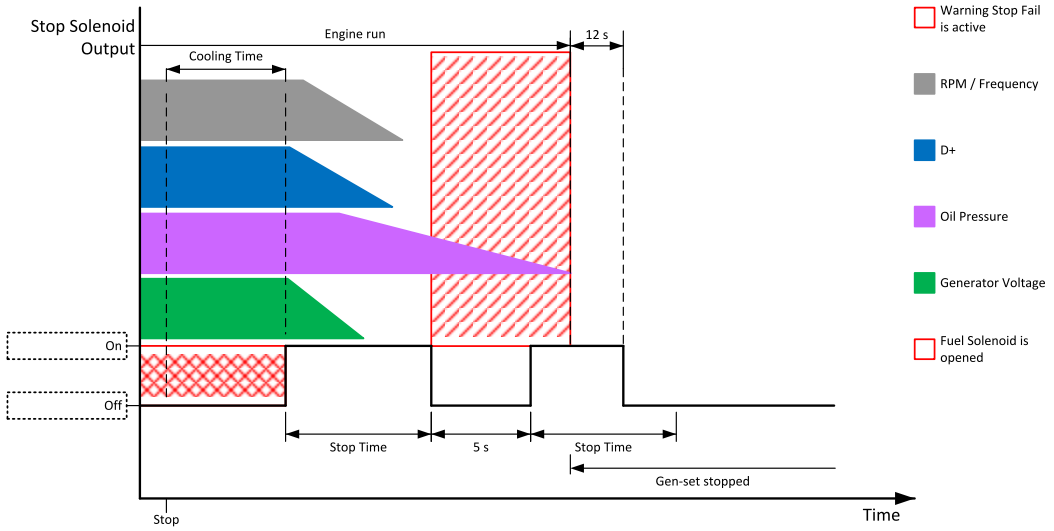



Image 8.85 Stop Solenoid 2

***Note:*** *If **Additional running engine indications (page 97)** went off during 5 s pause than Stop Solenoid is not activated again otherwise stop solenoid is activated again.*

**back to Logical binary outputs alphabetically**

## Supplying Load

| | | | |
|---|---|---|---|
| **Related FW** | 2.1.0 | **Related applications** | MINT, SPtM |
| **Comm object** | 1249 | | |
| **Description** | | | |
| The binary output depends on measured generator active power. Power is compared with generator nominal active power with use of hysteresis and with delay of switch 1 s.<br>When the measured active power is equal to or bigger than 5 % of **Nominal Power (page 274)** for 1 s then the binary output is active.<br>When the measured active power is equal to or lower than 3 % of **Nominal Power (page 274)** for 1 s then the binary output is inactive. | | | |

back to Logical binary outputs alphabetically

## Synchronizing

| | | | |
|---|---|---|---|
| **Related FW** | 2.1.0 | **Related applications** | MINT, SPtM |
| **Comm object** | 325 | | |
| **Description** | | | |
| The output is active during synchronization. output is active when GCB is closed or synchronization is interrupted. | | | |

back to Logical binary outputs alphabetically

## System Ready

| | | | |
|---|---|---|---|
| **Related FW** | 2.1.0 | **Related applications** | MINT, SPtM, SPI |
| **Comm object** | 325 | | |
| **Description** | | | |
| The output is active, if a group of Gen-sets is able to cover the **Start Reserve (page 566)**. The output is inactive, if the group of Gen-sets does not have enough capacity to cover the **Start Reserve (page 566)**<br>The output is active, if the **Actual Reserve (page 566)** is higher than the **Start Reserve (page 566)** or system is able to increase the **Actual Reserve (page 566)** by starting another Gen-set, which is available with power management. It means that the output can be active even with the **Actual Reserve (page 566)** lower than the **Start Reserve (page 566)**. | | | |

back to Logical binary outputs alphabetically

## System Reserve OK

| | | | |
|---|---|---|---|
| **Related FW** | 2.1.0 | **Related applications** | MINT, SPtM |
| **Comm object** | 32 | | |
| **Description** | | | |
| This LBO is active when System Reserve is higher than the actual reserve for start of next Gen-sets. | | | |

back to Logical binary outputs alphabetically

### Sys Start/Stop

| Related FW | 2.1.0 | Related applications | MINT, SPtM |
|---|---|---|---|
| Comm object | 190 | | |
| Description | | | |
| The output is main signal which indicates the active role of controller in following situations:<br>› Binary inputs REMOTE START/STOP (PAGE 628), FORCE PARALLEL (PAGE 616), FORCE ISLAND (PAGE 616) are active<br>› TEST mode is active<br>› AMF condition is sensed (mains fail, mains protection...)<br>› Peakshaving function is activated and condition for start are fulfilled<br>› Start Button is pressed (only in MAN mode) | | | |

back to Logical binary outputs alphabetically

## LBO: U

### Unloading

| Related FW | 2.1.0 | Related applications | MINT, SPtM |
|---|---|---|---|
| Comm object | 73 | | |
| Description | | | |
| The output is active when generator is unloaded – controller is in the Soft unld state. | | | |

back to Logical binary outputs alphabetically

### User button 1

| Related FW | 2.1.0 | Related applications | MINT, SPtM |
|---|---|---|---|
| Comm object | | | |
| Description | | | |
| . | | | |

back to Logical binary outputs alphabetically

### User button 2

| Related FW | 2.1.0 | Related applications | MINT, SPtM |
|---|---|---|---|
| Comm object | | | |
| Description | | | |
| . | | | |

back to Logical binary outputs alphabetically

### User button 3

| Related FW | 2.1.0 | Related applications | MINT, SPtM |
|---|---|---|---|
| Comm object | | | |
| Description | | | |
| . | | | |

back to Logical binary outputs alphabetically

## User button 4

| Related FW | 2.1.0 | Related applications | MINT, SPtM |
|---|---|---|---|
| Comm object | | | |
| Description | | | |
| . | | | |

back to Logical binary outputs alphabetically

## User button 5

| Related FW | 2.1.0 | Related applications | MINT, SPtM |
|---|---|---|---|
| Comm object | | | |
| Description | | | |
| . | | | |

back to Logical binary outputs alphabetically

## User button 6

| Related FW | 2.1.0 | Related applications | MINT, SPtM |
|---|---|---|---|
| Comm object | | | |
| Description | | | |
| . | | | |

back to Logical binary outputs alphabetically

## User button 7

| Related FW | 2.1.0 | Related applications | MINT, SPtM |
|---|---|---|---|
| Comm object | | | |
| Description | | | |
| . | | | |

back to Logical binary outputs alphabetically

## User button 8

| Related FW | 2.1.0 | Related applications | MINT, SPtM |
|---|---|---|---|
| Comm object | | | |
| Description | | | |
| . | | | |

back to Logical binary outputs alphabetically

# LBO: V

## Ventilation

| Related FW | 2.1.0 | Related applications | MINT, SPtM |
|---|---|---|---|
| Comm object | 38 | | |
| Description | | | |
| This logical binary output is activated at the beginning of start procedure together with **PRESTART (PAGE 674)** LBO. Ventilation output is deactivated when engine stops revolving. | | | |

Ventilation LBO is also deactivated immediately when **EMERGENCY STOP (PAGE 613)** (or E-Stop) is activated or when controller is switched to OFF mode.

***Note:*** *The output is intended for control of an engine room ventilation fan, engine container ventilation fan, container louvres or similar running gen-set technology.*

**back to Logical binary outputs alphabetically**

## Ventilation Off Pulse

| | | | |
|---|---|---|---|
| **Related FW** | 2.1.0 | **Related applications** | MINT, SPtM |
| **Comm object** | 2090 | | |
| **Description** | | | |

This logical binary output is activated on falling edge of **VENTILATION (PAGE 686)** LBO (when engine stops). The pulse duration is adjusted by **Ventilation Pulse Time (page 318)** setpoint.

***Note:*** *The output is intended for control of an engine room ventilation fan, engine container ventilation fan, container louvres or similar running gen-set technology.*

**back to Logical binary outputs alphabetically**

## Ventilation On Pulse

| | | | |
|---|---|---|---|
| **Related FW** | 2.1.0 | **Related applications** | MINT, SPtM |
| **Comm object** | 2089 | | |
| **Description** | | | |

This logical binary output is activated on rising edge of **VENTILATION (PAGE 686)** LBO (at the begining of prestart period). The pulse duration is adjusted by **Ventilation Pulse Time (page 318)** setpoint.

***Note:*** *The output is intended for control of an engine room ventilation fan, engine container ventilation fan, container louvres or similar running gen-set technology.*

**back to Logical binary outputs alphabetically**

## 8.1.6 Logical analog inputs

**What Logical analog inputs are:**

Logical analog inputs are inputs for analog values.

### Alphabetical groups of Logical analog inputs


LAI: A ..... 690
LAI: C ..... 692
LAI: E ..... 692
LAI: F ..... 692
LAI: M ..... 692
LAI: N ..... 693
LAI: O ..... 693


For a full list of Logical analog inputs go to the chapter **Logical analog inputs alphabetically (page 689)**.

# Logical analog inputs alphabetically


AIN Switch 01 ..... 690
AIN Switch 02 ..... 690
AIN Switch 03 ..... 690
AIN Switch 04 ..... 691
AIN Switch 05 ..... 691
AIN Switch 06 ..... 691
Coolant Temp ..... 692
Engine Speed ..... 692
Fuel Level ..... 692
Mains Import Measurement P ..... 692
Not Used ..... 693
Oil Pressure ..... 693
Oil Temp ..... 693


**back to Controller objects**

# LAI: A

## AIN Switch 01

| | | | |
|---|---|---|---|
| **Related FW** | 2.1.0 | **Related applications** | MINT, SPtM |
| **Comm object** | 209 | | |
| **Description** | | | |

Logical analog input designed for general value received from analog sensor. For more information about wiring of analog inputs **see Analog inputs on page 44**. This analog input controls logical binary output **AIN SWITCH01 (PAGE 635)**. The behavior of the switch depends on the adjustment of the setpoints **AIN Switch01 On (page 420)** and **AIN Switch01 Off (page 421)**.

***Note:*** *This function is not suitable for tristate or binary analog sensors.*

**back to Logical analog inputs alphabetically**

## AIN Switch 02

| | | | |
|---|---|---|---|
| **Related FW** | 2.1.0 | **Related applications** | MINT, SPtM |
| **Comm object** | 210 | | |
| **Description** | | | |

Logical analog input designed for general value received from analog sensor. For more information about wiring of analog inputs **see Analog inputs on page 44**. This analog input controls logical binary output **AIN SWITCH02 (PAGE 636)**. The behavior of the switch depends on the adjustment of the setpoints **AIN Switch02 On (page 422)** and **AIN Switch02 Off (page 423)**.

***Note:*** *This function is not suitable for tristate or binary analog sensors.*

**back to Logical analog inputs alphabetically**

## AIN Switch 03

| | | | |
|---|---|---|---|
| **Related FW** | 2.1.0 | **Related applications** | MINT, SPtM |
| **Comm object** | 211 | | |
| **Description** | | | |

Logical analog input designed for general value received from analog sensor. For more information about wiring of analog inputs **see Analog inputs on page 44**. This analog input controls logical binary output **AIN SWITCH03 (PAGE 636)**. The behavior of the switch depends on the adjustment of the setpoints **AIN Switch03 On (page 424)** and **AIN Switch03 Off (page 425)**.

***Note:*** *This function is not suitable for tristate or binary analog sensors.*

**back to Logical analog inputs alphabetically**

## AIN Switch 04

| Related FW | 2.1.0 | Related applications | MINT, SPtM |
|---|---|---|---|
| Comm object | 212 | | |
| Description | | | |

Logical analog input designed for general value received from analog sensor. For more information about wiring of analog inputs **see Analog inputs on page 44**. This analog input controls logical binary output **AIN Switch04 (page 637)**. The behavior of the switch depends on the adjustment of the setpoints **AIN Switch04 On (page 426)** and **AIN Switch04 Off (page 427)**.

***Note:*** *This function is not suitable for tristate or binary analog sensors.*

**back to Logical analog inputs alphabetically**

## AIN Switch 05

| Related FW | 2.1.0 | Related applications | MINT, SPtM |
|---|---|---|---|
| Comm object | 278 | | |
| Description | | | |

Logical analog input designed for general value received from analog sensor. For more information about wiring of analog inputs **see Analog inputs on page 44**. This analog input controls logical binary output **AIN Switch05 (page 637)**. The behavior of the switch depends on the adjustment of the setpoints **AIN Switch05 On (page 428)** and **AIN Switch05 Off (page 429)**.

***Note:*** *This function is not suitable for tristate or binary analog sensors.*

**IMPORTANT: This analog input has no protection. Input is designed only to control appropriate logical binary output.**

**back to Logical analog inputs alphabetically**

## AIN Switch 06

| Related FW | 2.1.0 | Related applications | MINT, SPtM |
|---|---|---|---|
| Comm object | 279 | | |
| Description | | | |

Logical analog input designed for general value received from analog sensor. For more information about wiring of analog inputs **see Analog inputs on page 44**. This analog input controls logical binary output **AIN Switch06 (page 638)**. The behavior of the switch depends on the adjustment of the setpoints **AIN Switch06 On (page 430)** and **AIN Switch06 Off (page 431)**.

***Note:*** *This function is not suitable for tristate or binary analog sensors.*

**IMPORTANT: This analog input has no protection. Input is designed only to control appropriate logical binary output.**

**back to Logical analog inputs alphabetically**

# LAI: C

## Coolant Temp

| | | | |
|---|---|---|---|
| **Related FW** | 2.1.0 | **Related applications** | MINT, SPtM |
| **Comm object** | 67 | | |
| **Description** | | | |
| Logical analog input designed for coolant temperature value received from analog sensor. | | | |

back to Logical analog inputs alphabetically

# LAI: E

## Engine Speed

| | | | |
|---|---|---|---|
| **Related FW** | 2.1.0 | **Related applications** | MINT, SPtM |
| **Comm object** | 8 | | |
| **Description** | | | |
| This LAI selects the source of RPM. | | | |

back to Logical analog inputs alphabetically

# LAI: F

## Fuel Level

| | | | |
|---|---|---|---|
| **Related FW** | 2.1.0 | **Related applications** | MINT, SPtM |
| **Comm object** | 78 | | |
| **Description** | | | |
| Logical analog input designed for fuel level value received from analog sensor.<br>**IMPORTANT: For right behavior of this function, curve for analog input has to be in percentage and setpoint Fuel Tank Volume (page 311) has to be adjusted correctly.** | | | |

back to Logical analog inputs alphabetically

# LAI: M

## Mains Import Measurement P

| | | | |
|---|---|---|---|
| **Related FW** | 2.1.0 | **Related applications** | MINT, SPtM |
| **Comm object** | 67 | | |
| **Description** | | | |
| Logical analog input designed for **Mains import measurement (page 143)**. Load transfer is considered to be finished when this value is lower then **Mains Unload MCB Open Window (page 388)**. | | | |

back to Logical analog inputs alphabetically

### Mains Measurement Q

| Related FW | 2.1.0 | Related applications | MINT, SPtM |
|---|---|---|---|
| Comm object | 6 | | |
| Description | | | |
| This LAI is designed for Mains import measurement, when **Mains Measurement Q (page 268)** = Analog Input. Value from this input is used in load transfer from mains to generator.<br>Load transfer is considered to be finished when this value is lower than **Mains Unload MCB Open Window (page 388)**. | | | |

back to Logical analog inputs alphabetically

## LAI: N

### Not Used

| Related FW | 2.1.0 | Related applications | MINT, SPtM |
|---|---|---|---|
| Comm object | 230 | | |
| Description | | | |
| Input has no function. | | | |

back to Logical analog inputs alphabetically

## LAI: O

### Oil Pressure

| Related FW | 2.1.0 | Related applications | MINT, SPtM |
|---|---|---|---|
| Comm object | 9 | | |
| Description | | | |
| Logical analog input designed for oil pressure value received from analog sensor.<br>***Note:*** *This analog function can by also configured on binary input as binary function. In this case choose* ***Oil Pressure (page 624)*** *binary input in the list of binary inputs. Delay of this binary input is adjusted via the same setpoint like for analog function.* | | | |

back to Logical analog inputs alphabetically

### Oil Temp

| Related FW | 2.1.0 | Related applications | MINT, SPtM |
|---|---|---|---|
| Comm object | 77 | | |
| Description | | | |
| Logical analog input designed for oil temperature value received from analog sensor. | | | |

back to Logical analog inputs alphabetically

## 8.1.7 PLC

### List of PLC blocks

**Group: Basic logical functions**

OR/AND ..... 695
Ext. XOR/RS ..... 697

**Group: Comparison of analog inputs**

Comparator With Hysteresis ..... 698
Comparator With Delay ..... 699

**Group: Math operations**

**Group: Time functions**

Timer ..... 700
Delay ..... 702

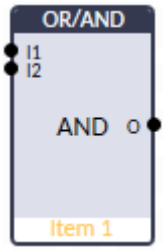
**Group: Other functions**

Counter ..... 704
Decomp. 4 ..... 705
Convert ..... 705
Analog Switch ..... 706

## Group: Basic Logical functions

# OR/AND

| | |
|---|---|
| **PLC group** | Basic logical functions |
| **Related FW** | 2.1.0 |
| **Related applications** | MINT, SPtM |
| **Comm object** | 1 |




**Inputs**

| Input | Type | Negation | Range | Function |
|---|---|---|---|---|
| Input 1 .. 8 | Binary | Yes | 0/1 | Inputs 1 .. 8 |

**Outputs**

| Output | Type | Negation | Range | Function |
|---|---|---|---|---|
| Output | Binary | Yes | 0/1 | Result of the logical operation |

**Description**

The block performs logical operation OR / AND of 2 – 8 binary operands. The inputs as well as the output can be inverted.

## Function OR

| Input 1 | Input 2 | Output |
|---|---|---|
| 0 | 0 | 0 |
| 0 | 1 | 1 |
| 1 | 0 | 1 |
| 1 | 1 | 1 |

## Function AND

| Input 1 | Input 2 | Output |
|---|---|---|
| 0 | 0 | 0 |
| 0 | 1 | 0 |
| 1 | 0 | 0 |
| 1 | 1 | 1 |

There have to be at least 2 inputs every time. There may be up to 8 inputs configured.

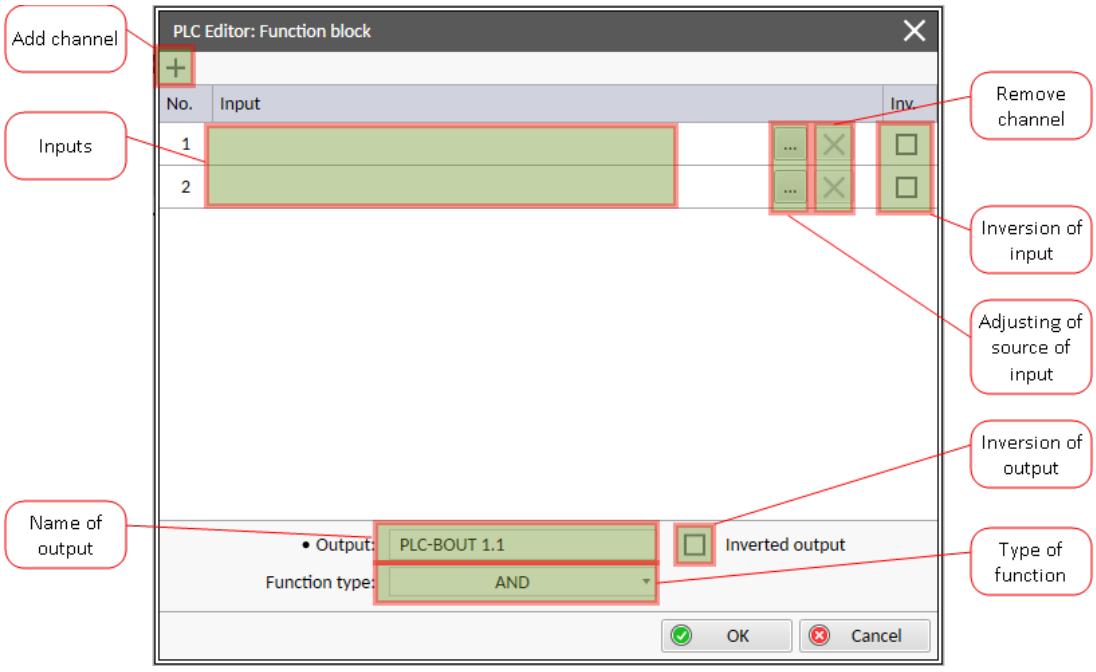
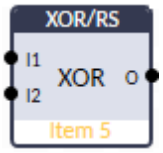



Image 8.86 Configuration of OR/AND block

back to List of PLC blocks

## Ext. XOR/RS

| | |
|---|---|
| **PLC group** | Basic logical functions |
| **Related FW** | 2.1.0 |
| **Related applications** | MINT, SPtM |
| **Comm object** | 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 provides logical function of two values - XOR or RS flip-flop. Both inputs and output can be inverted.

### Function XOR

| Input 1 | Input 2 | Output |
|---|---|---|
| 0 | 0 | 0 |
| 0 | 1 | 1 |
| 1 | 0 | 1 |
| 1 | 1 | 0 |

The block contains a setting for RS dominance. This setting is available in the block dialog window (i.e. this setting is constantly set by configuration and cannot be changed dynamically in operation).

### Function RS

| Input 1 (S) | Input 2 (R) | R-latch | S-latch | E-latch | JK-latch |
|---|---|---|---|---|---|
| | | Q | | | |
| 0 | 0 | $Q^{-1}$ | $Q^{-1}$ | $Q^{-1}$ | $Q^{-1}$ |
| 0 | 1 | 0 | 0 | 0 | 0 |
| 1 | 0 | 1 | 1 | 1 | 1 |
| 1 | 1 | 0 | 1 | $Q^{-1}$ | NOT($Q^{-1}$) |

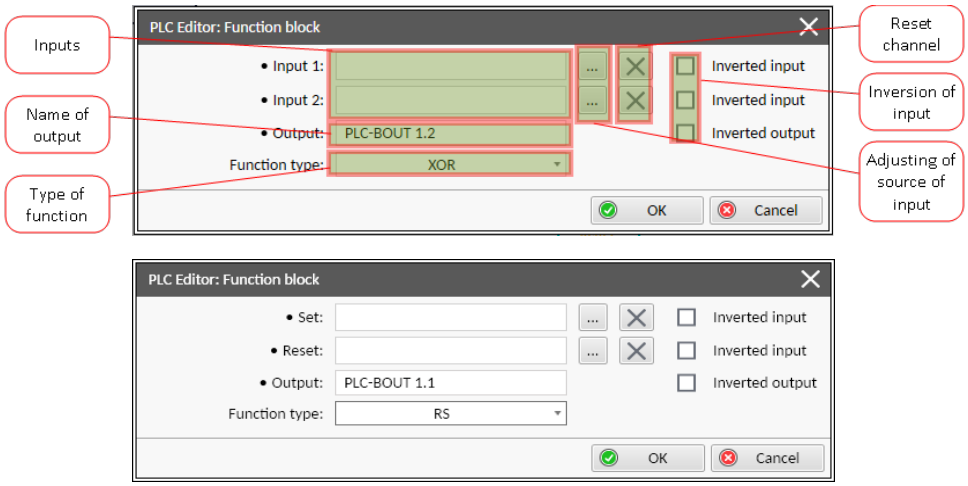


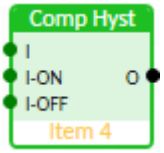

Image 8.87 Configuration of XOR/RS block

back to List of PLC blocks

## Group: Comparison of analog inputs

## Comparator With Hysteresis

| | |
|---|---|
| **PLC group** | Comparison of analog inputs |
| **Related FW** | 2.1.0 |
| **Related applications** | MINT, SPtM |
| **Comm object** | 3 |




**Inputs**

| Input | Type | Negation | Range | Function |
|---|---|---|---|---|
| Input | Analog | No | Any | Compared value |
| Input ON | Analog | No | Same as Input | Comparative level for switching on |
| Input OFF | Analog | No | Same as Input | Comparative level for switching off |

**Outputs**

| Output | Type | Negation | Range | Function |
|---|---|---|---|---|
| Output | Binary | No | 0/1 | Comparator output |

**Description**

The block compares the input value with the comparative levels. The behavior depends on whether the ON level is higher than OFF level or vice versa.

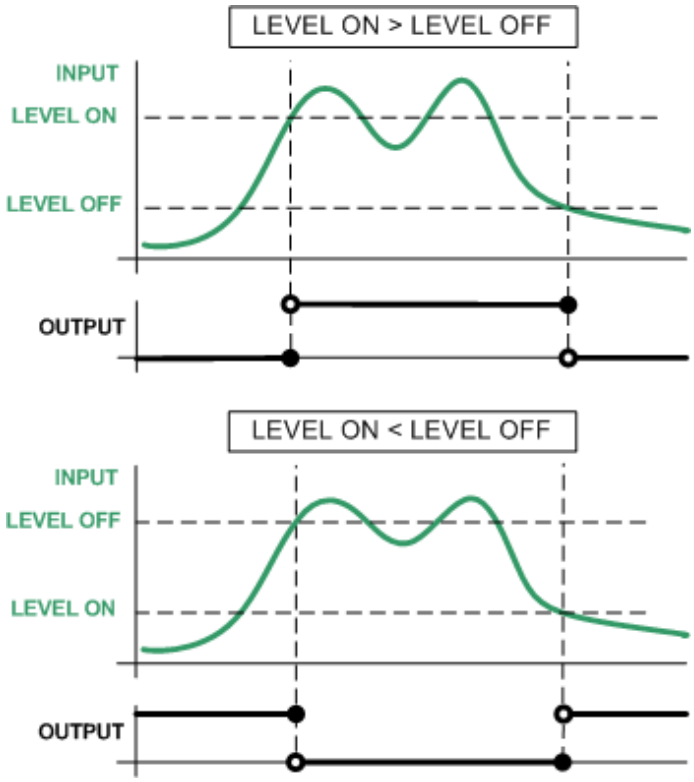



Image 8.88 Different On and Off levels

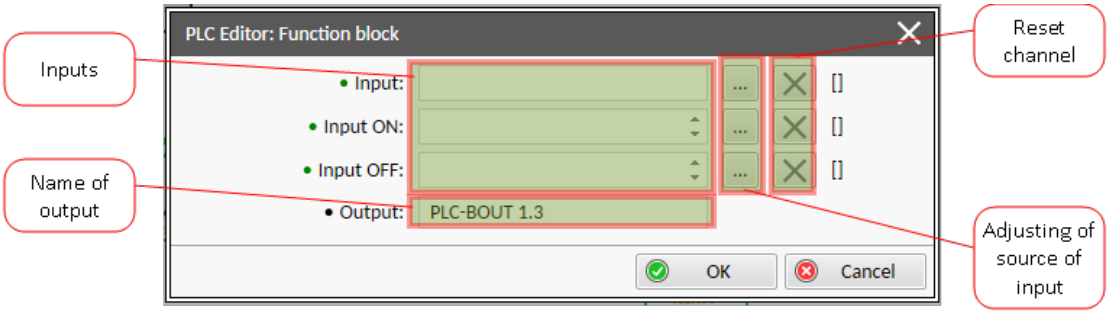


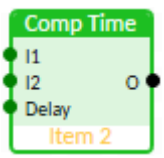

Image 8.89 Configuration of Comp Hyst block

***Note:*** *Level On and Level Off can be constants or values from controller.*

> **IMPORTANT: In case that the values on inputs have different decimal numbers, then the values are converted and the name of block is red. It is strongly recommended to use values with the same decimal numbers.**

back to List of PLC blocks

## Comparator With Delay

| | | |
|---|---|---|
| **PLC group** | Comparison of analog inputs |  |
| **Related FW** | 2.1.0 | |
| **Related applications** | MINT, SPtM | |
| **Comm object** | 4 | |
| **Inputs** | | |

| Input | Type | Negation | Range | Function |
|---|---|---|---|---|
| Input 1 | Analog | No | Any | Compared value |
| Input 2 | Analog | No | Same as Input 1 | Comparative level |
| Delay | Analog | No | 0.0..3000,0 [s] | Comparative delay |

**Outputs**

| Output | Type | Negation | Range | Function |
|---|---|---|---|---|
| Output | Binary | No | 0/1 | Comparator output |

**Description**

The block works as an analog switch. It compares the input value with the comparative level. The output will switch on if the input is equal or higher than the comparative level for time longer than the delay.

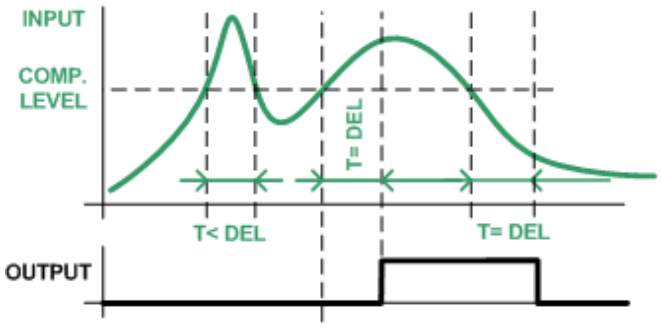



Image 8.90 Principle of delay

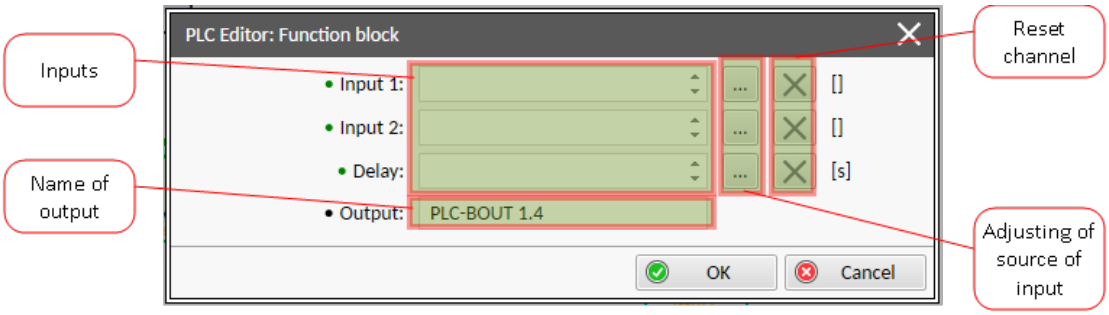



Image 8.91 Configuration of Comp Time block

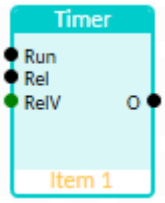
***Note:*** *Input 2 and Delay can be constants or values from controller.*

**back to List of PLC blocks**

## Group: Time functions

## Timer

| | |
|---|---|
| **PLC group** | Time functions |
| **Related FW** | 2.1.0 |
| **Related applications** | MINT, SPtM |
| **Comm object** | 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..3276.7 [s] | Initial value of the timer |

**Outputs**

| Output | Type | Negation | Range | Function |
|---|---|---|---|---|
| Output | Binary | No | 0/1 | Timer output |

**Description**

The block works as a countdown timer which is decreased by 1 every PLC cycle. The timer initial value is adjustable by the "Reload value" input. The timer is automatically reloaded with the initial value when it reaches zero or it can be reloaded at any other time using the "reload" input. The timer remains at reload value until the reload input is deactivated. The timer output is inverted always when the timer is reloaded.

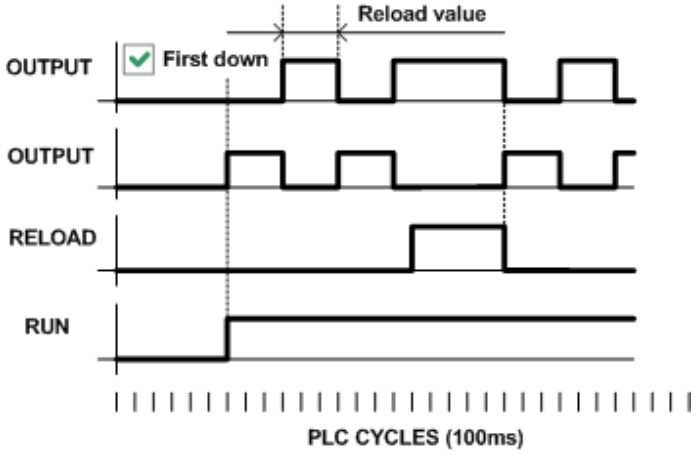



Image 8.92 Principle of timer

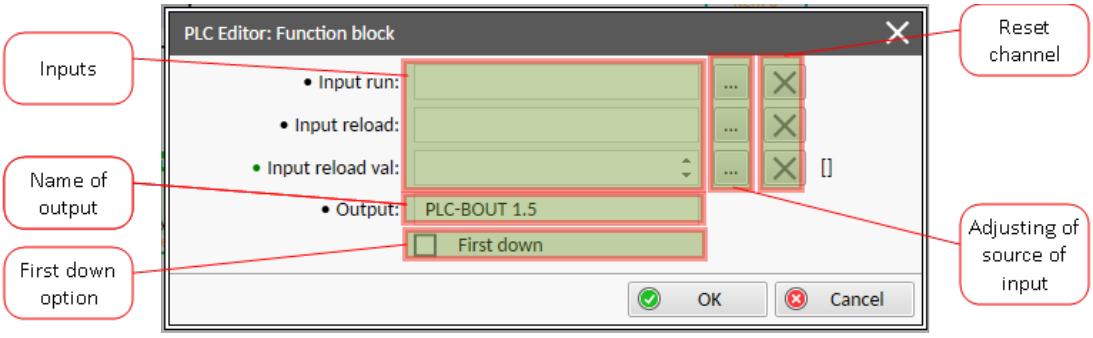



Image 8.93 Configuration of Timer block

***Note:*** *Input reload value can be constant or value from controller.*

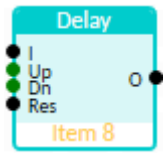
***Note:*** *If you want the output to start at logical 0, tick First down option. Otherwise the output will start at logical 1.*

> **IMPORTANT: If the inputs are not connected and First down option is not ticked, then the output is active.**

back to List of PLC blocks

## Delay

| | |
|---|---|
| **PLC group** | Time functions |
| **Related FW** | 2.1.0 |
| **Related applications** | MINT, SPtM |
| **Comm object** | 33 |




**Inputs**

| Input | Type | Negation | Range | Function |
|---|---|---|---|---|
| Input | Binary | No | 0/1 | Input signal to be delayed |
| Input time up | Analog | No | -3200.0 .. 3200.0 [s, m, h] | Delay of the rising edge resp. pulse length generated by rising edge of the input |
| Input time down | Analog | No | -3200.0 .. 3200.0 [s, m, h] | Delay of the falling edge resp. pulse length generated by falling edge of the input |
| Input reset | Binary | No | 0/1 | Resets the output to logical 0. The output remains in logical 0 until new rising edge appears on Input (when Input reset is deactivated already) |

**Outputs**

| Output | Type | Negation | Range | Function |
|---|---|---|---|---|
| Output | Binary | No | 0/1 | Output signal |

**Description**

This block can work in two modes of operation:

- Delay mode – the rising edge at the output is generated with delay of "input time up" when a rising edge at the input is detected. The falling edge at the output is generated with delay of "input time down" when a falling edge at the input is detected. If the delayed falling edge at the output came earlier than 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.

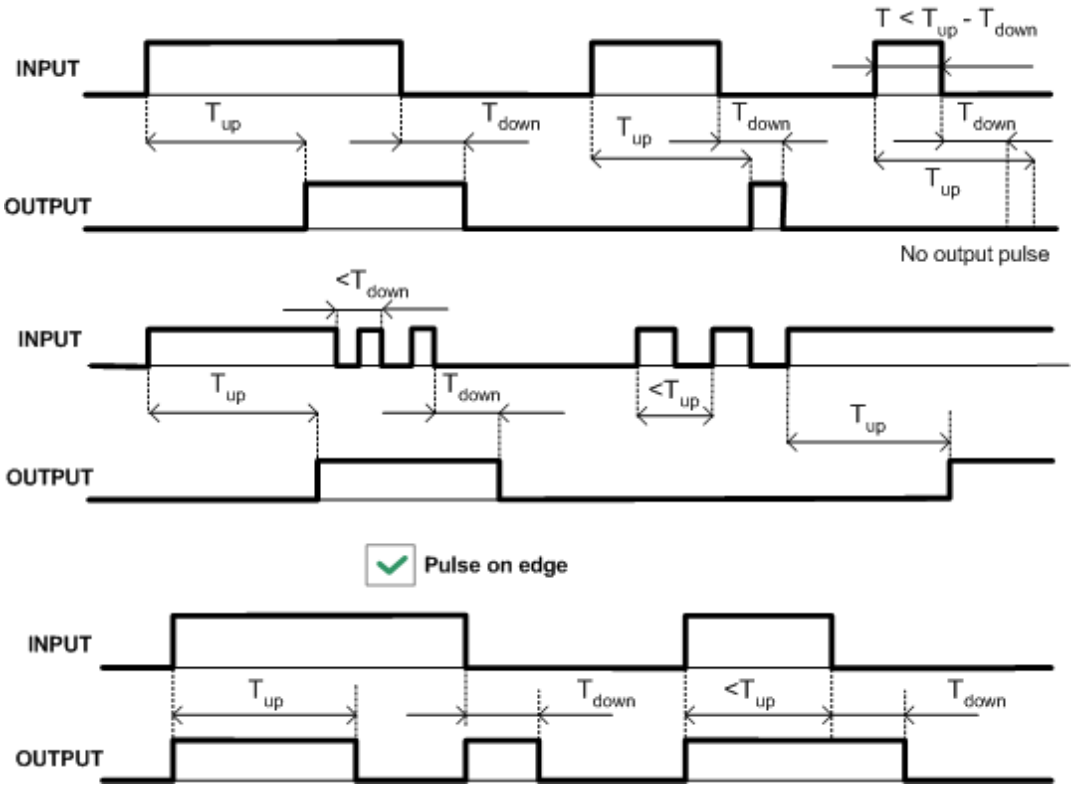



Image 8.94 Delay modes principles

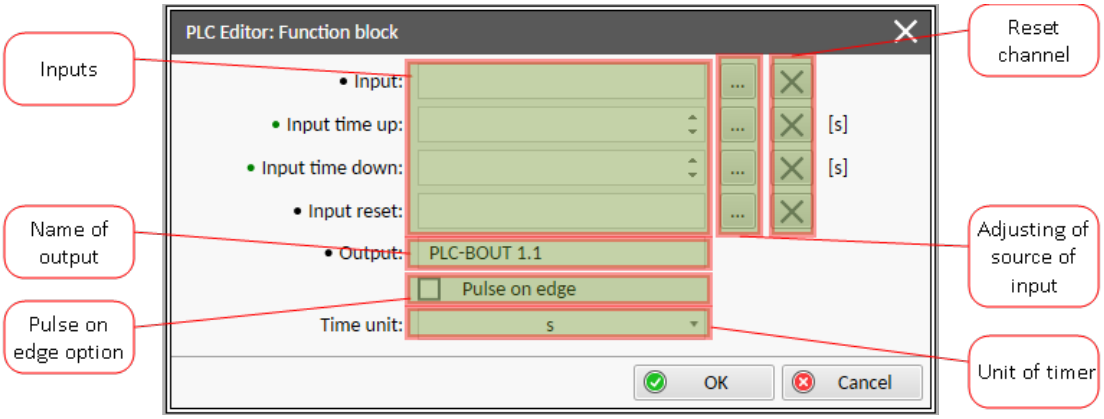



Image 8.95 Configuration of Delay block

***Note:*** *If Input time up or Input time down value is <0, this input is internally set to zero.*

***Note:*** *Input time up and Input time down values can be constants or values from controller.*

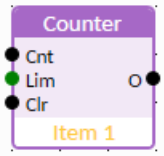
***Note:*** *Use Pulse on edge option to choose between delay and pulse mode.*

**back to List of PLC blocks**

## Group: Other functions

# Counter

| | |
|---|---|
| **PLC group** | Other functions |
| **Related FW** | 2.1.0 |
| **Related applications** | MINT, SPtM |
| **Comm object** | 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 .. 32767 [-] | 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 |

**Description**

The block works as a counter of edges (selectable rising, falling or both) with reset input and adjustable counting limit. The maximal counter value is 32767. The counter value is lost when the controller is switched off. The output is activated when the counter value is equal or higher than Input Preset Limit and stays active until the block reset is done using Input Clear. Activating of the Input Clear resets the counter value to 0 and deactivates the output. Holding the Input Clear active blocks the counting.

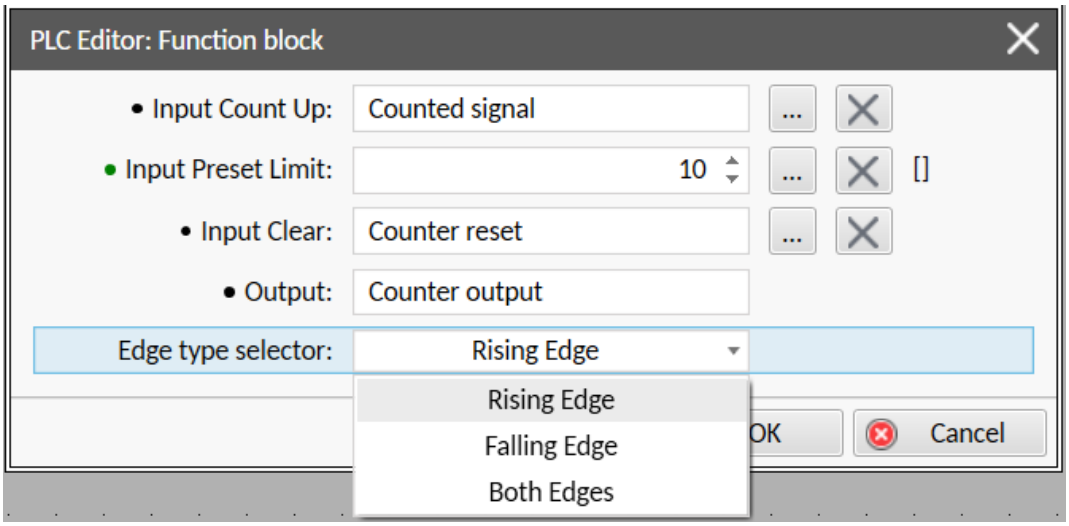
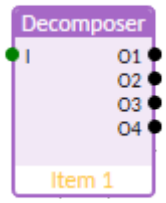



Image 8.96 Configuration of the Counter block

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## Decomp. 4

| | |
|---|---|
| **PLC group** | Other functions |
| **Related FW** | 2.1.0 |
| **Related applications** | MINT, SPtM |
| **Comm object** | 24 |




**Inputs**

| Input | Type | Negation | Range | Function |
|---|---|---|---|---|
| Input | Analog | No | -2 147 483 647 .. 2 147 483 647 | 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.

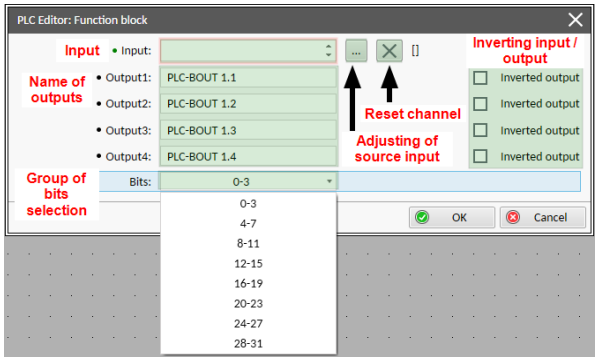
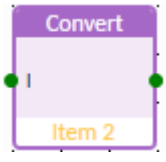



Image 8.97 Configuration of Decomp. 4 block

back to List of PLC blocks

## Convert

| | |
|---|---|
| **PLC group** | Other functions |
| **Related FW** | 2.1.0 |
| **Related applications** | MINT, SPtM |
| **Comm object** | 25 |




**Inputs**

| Input | Type | Negation | Range | Function |
|---|---|---|---|---|
| Input | Analog | No | -2 147 483 647 .. 2 147 483 647 | Input value |

**Outputs**

| Output | Type | Negation | Range | Function |
|---|---|---|---|---|
| Output | Analog | No | -2 147 483 647 .. 2 147 483 647 | Converted Input value |

**Description**

The block converts Input based on selected resolution and dimension and reflects this to Output .

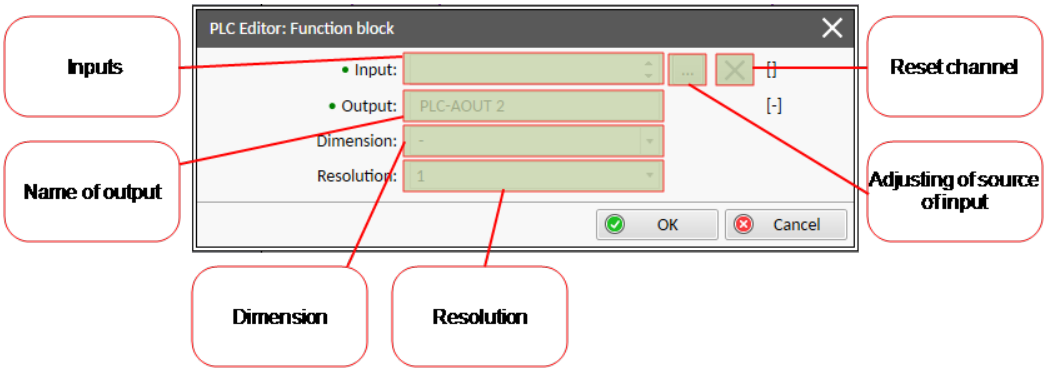


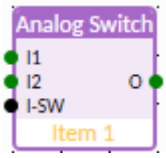

Image 8.98 Configuration of Convert block

***Note:*** *Conversion is done to Integer32, if the input value is out of Integer32 range, output value is set to invalid status.*

back to List of PLC blocks

## Analog Switch

| | |
|---|---|
| **PLC group** | Other functions |
| **Related FW** | 2.1.0 |
| **Related applications** | MINT, SPtM |
| **Comm object** | 5 |




**Inputs**

| Input | Type | Negation | Range | Function |
|---|---|---|---|---|
| Input 1 | Analog | No | -2 147 483 647 .. 2 147 483 647 | Input value 1 |
| Input 2 | Analog | No | Same as Input 1 | 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 | -2 147 483 647 .. 2 147 483 647 | 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.

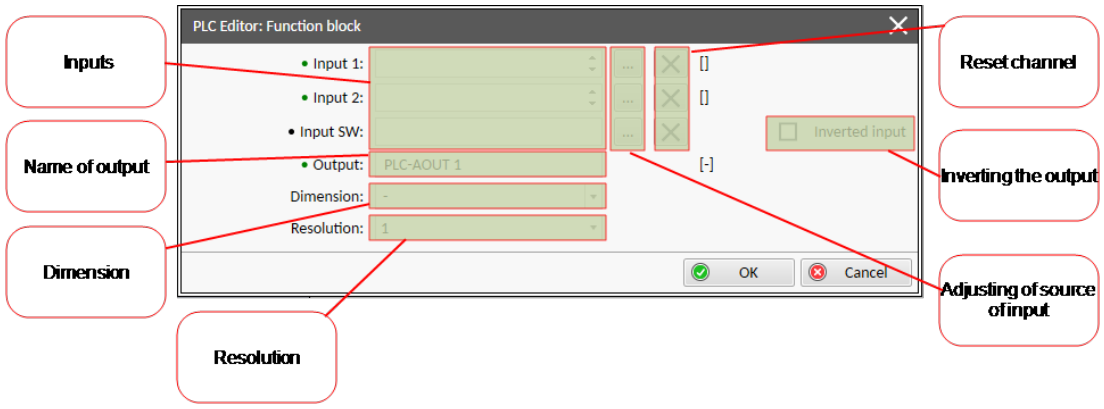


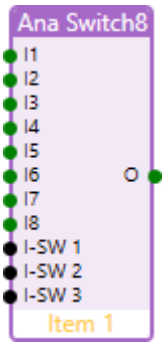

Image 8.99 Configuration of Analog Switch block

> **IMPORTANT: In case that values on inputs have different decimal numbers or dimensions than the values are converted and the name of block is red. It is strongly recommended to use values with the same decimal numbers.**

back to List of PLC blocks

## Analog Switch 8

| | |
|---|---|
| **PLC group** | Other functions |
| **Related FW** | 2.1.0 |
| **Related applications** | MINT, SPtM |
| **PLC Block ID** | 45 |




**Inputs**

| Input | Type | Negation | Range | Function |
|---|---|---|---|---|
| Input 1 | Analog | No | $-2^{32}$ .. $2^{32}$ | Input value 1 |
| Input 2 | Analog | No | $-2^{32}$ .. $2^{32}$ | Input value 2 |
| Input 3 | Analog | No | $-2^{32}$ .. $2^{32}$ | Input value 3 (optional) |
| Input 4 | Analog | No | $-2^{32}$ .. $2^{32}$ | Input value 4 (optional) |
| Input 5 | Analog | No | $-2^{32}$ .. $2^{32}$ | Input value 5 (optional) |
| Input 6 | Analog | No | $-2^{32}$ .. $2^{32}$ | Input value 6 (optional) |
| Input 7 | Analog | No | $-2^{32}$ .. $2^{32}$ | Input value 7 (optional) |
| Input 8 | Analog | No | $-2^{32}$ .. $2^{32}$ | Input value 8 (optional) |

| | | | | |
|---|---|---|---|---|
| Input SW 1 | Binary | No | 0/1 | Switch input 1 |
| Input SW 2 | Binary | No | 0/1 | Switch input 2 |
| Input SW 3 | Binary | No | 0/1 | Switch input 3 |

**Outputs**

| Output | Type | Negation | Range | Function |
|---|---|---|---|---|
| Output | Analog | No | $-2^{32}$ .. $2^{32}$ | Switch output according to the SW 1, SW 2 and SW 3 |

**Description**

The block works as an analog multiplexer. The output value could be selected from up to 8 inputs according to the 'Input SW 3', 'Input SW 2' and 'Input SW 1' state is appropriate input value copied to the output, see the table below.

| Input SW 3 | Input SW 2 | Input SW 1 | Output |
|---|---|---|---|
| 0 | 0 | 0 | Input 1 |
| 0 | 0 | 1 | Input 2 |
| 0 | 1 | 0 | Input 3 |
| 0 | 1 | 1 | Input 4 |
| 1 | 0 | 0 | Input 5 |
| 1 | 0 | 1 | Input 6 |
| 1 | 1 | 0 | Input 7 |
| 1 | 1 | 1 | Input 8 |

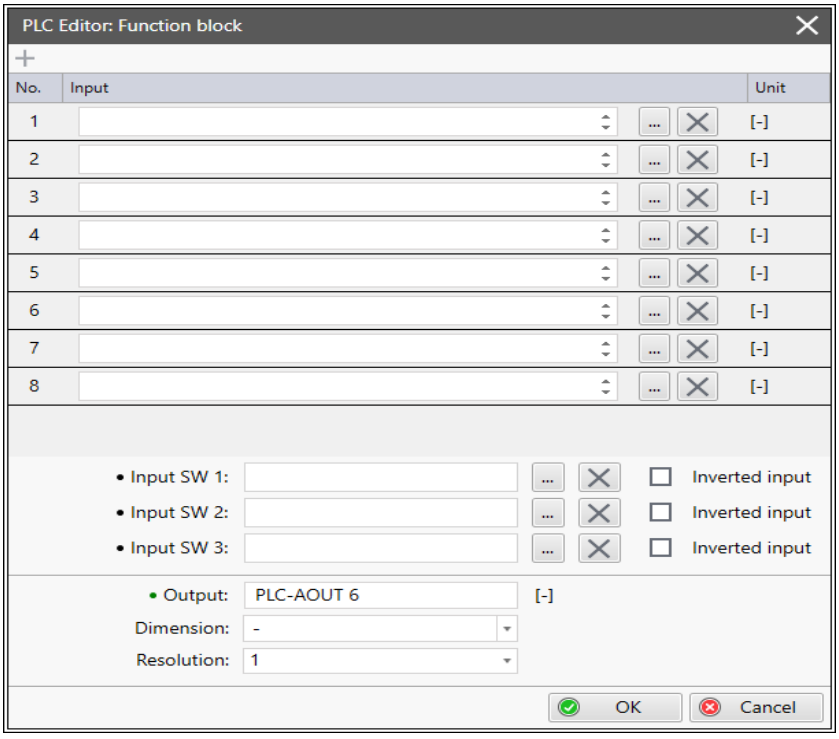



Image 8.100 Configuration of Analog Switch 8 block

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 189**.

## 8.2.1 Alarm levels in the controller

8.2.2 Alarms level 1 ..... 709
8.2.3 Alarms level 2 ..... 746

## 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


Wrn CAN 2 Units Missing 711
Wrn Module: Slot 1 ..... 713
Wrn Module: Slot 2 ..... 713
Wrn Module: Slot 3 ..... 713
Wrn Module: Slot 4 ..... 713
Wrn Module: Slot 5 ..... 714
Wrn Module(slotA) - false module ..... 714
Wrn Module(slotB) - false module ..... 714
Wrn Module(slotA) - unknown module ..... 714
Wrn Module(slotB) - unknown module ..... 714
Wrn Module(slotA) - unattended ..... 715
Wrn Module(slotB) - unattended ..... 715
Wrn Module(slotA) - comm. outage ..... 715
Wrn Module(slotB) - comm. outage ..... 715
Wrn Module(slotA) - unexpected ..... 716
Wrn Module(slotB) - unexpected ..... 716
Wrn EM(A) - a message lost ..... 716
Wrn EM(B) - a message lost ..... 716
Wrn EM(A) - configuration mistake ..... 717
Wrn EM(B) - configuration mistake ..... 717
Wrn EM(A) - insufficient .. 717
Wrn EM(B) - insufficient .. 717
Wrn EM(A) - missing or damaged ..... 717
Wrn EM(B) - missing or damaged ..... 718
Wrn Event Email 1 Fail ... 718
Wrn Event Email 2 Fail ... 718
Wrn Event Email 3 Fail ... 718
Wrn Event Email 4 Fail ... 718
Wrn Event SMS 1 Fail .... 719
Wrn Event SMS 2 Fail .... 719
Wrn Event SMS 3 Fail .... 719
Wrn Event SMS 4 Fail .... 719
Wrn Alarm Email 1 Fail ... 720
Wrn Alarm Email 2 Fail ... 720
Wrn Alarm Email 3 Fail ... 720
Wrn Alarm Email 4 Fail ... 720
Wrn Alarm SMS 1 Fail .... 721
Wrn Alarm SMS 2 Fail .... 721
Wrn Alarm SMS 3 Fail .... 721
Wrn Alarm SMS 4 Fail .... 721
Wrn SNMP TRAP 1 Fail .. 721
Wrn SNMP TRAP 2 Fail .. 722
Wrn ECUDiagBlocked .... 722
Wrn ECU Communication Fail ..... 722
Wrn ECU Communication Timeout ..... 722
Wrn PasswEnterBlock .... 723
Wrn Default Password .... 723
Wrn ECU Yellow Lamp ... 723
Wrn ECU Red Lamp ..... 723
Wrn ECU Wait To Start ... 724
Wrn ATT DPF Lamp ..... 724
Wrn ATT HEST Lamp ..... 724
Wrn ATT SCR Error Lamp ..... 724
Wrn ATT DEF Level Lamp ..... 724
Wrn ATT Inhibited Lamp . 725
Wrn ATT Interlock Active 725
Hst ATT Force Regen Active ..... 725
Hst ATT Inhib Regen Active ..... 725
AL Transferring Fuel ..... 727
ALI External Mains Fail ... 727
Wrn Coolant Temp ..... 727
Wrn Coolant Temp Low .. 727
Wrn Fuel Level ..... 727
Wrn Charging Alternator Fail ..... 728
Wrn Stop Fail ..... 728
Wrn Maintenance Timer 1 RunHours ..... 729
Wrn Maintenance Timer 1 Interval ..... 729
Wrn Maintenance Timer 2 RunHours ..... 729
Wrn Maintenance Timer 2 Interval ..... 729
Wrn Maintenance Timer 3 RunHours ..... 730
Wrn Maintenance Timer 3 Interval ..... 730
Wrn MCB Fail ..... 730
Wrn Generator L1 Overvoltage ..... 731
Wrn Generator L2 Overvoltage ..... 731
Wrn Generator L3 Overvoltage ..... 731
Wrn Generator L1L2 Overvoltage ..... 732
Wrn Generator L2L3 Overvoltage ..... 732
Wrn Generator L3L1 Overvoltage ..... 732
Wrn Generator L1 Undervoltage ..... 732
Wrn Generator L2 Undervoltage ..... 733
Wrn Generator L3 733

Undervoltage .....
Wrn Generator L1L2 Undervoltage ..... 733
Wrn Generator L2L3 Undervoltage ..... 733
Wrn Generator L3L1 Undervoltage ..... 734
Wrn Generator Overfrequency ..... 734
Wrn Generator Uderfrequency ..... 734
Wrn Oil Pressure ..... 734
Wrn Overload ..... 735
Wrn Battery Overvoltage 735
Wrn Battery Undervoltage735
Wrn Password reset e-mail addr is not set ..... 735
Wrn Battery Charger Fail 736
ALI Manual Restore ..... 736
Wrn Override All Sd ..... 736
Wrn Production Mode .....736
Wrn Brute Force Protection Active ..... 736
Wrn Rental Timer 1 .....737
Wrn Rental Timer 2 .....737
Wrn AI/Hist.msg. 1 .....737
Wrn AI/Hist.msg. 2 .....737
Wrn AI/Hist.msg. 3 .....737
Wrn AI/Hist.msg. 4 .....738
Wrn AI/Hist.msg. 5 .....738
Wrn AI/Hist.msg. 6 .....738
Wrn AI/Hist.msg. 7 .....738
Wrn AI/Hist.msg. 8 .....738
Wrn AI/Hist.msg. 9 .....739
Wrn AI/Hist.msg. 10 .....739
Wrn AI/Hist.msg. 11 .....739
Wrn AI/Hist.msg. 12 .....739
Wrn AI/Hist.msg. 13 .....739
Wrn AI/Hist.msg. 14 .....740
Wrn AI/Hist.msg. 15 .....740
Wrn AI/Hist.msg. 16 .....740
AHI Rental Timer 1 Elapsed .....740
AHI Rental Timer 2 Elapsed .....740
ALI Gen Ph L1 Inverted ..740
ALI Gen Ph L2 Inverted ..741
ALI Gen Ph L3 Inverted ..741
ALI Gen Ph Rotation Opposite .....741
ALI Bus Ph L1 Inverted ...741
ALI Bus Ph L2 Inverted ...741
ALI Bus Ph L3 Inverted ...742
ALI Bus Ph Rotation Opposite .....742
ALI Mains Ph L1 Inverted 742
ALI Mains Ph L2 Inverted 742
ALI Mains Ph L3 Inverted 742
ALI Mains Ph Rotation Opposite .....743
Mains Voltage Unbalance ph-n .....743
Mains Voltage Unbalance ph-ph .....743
Mains Overfrequency .....743
Mains Underfrequency ...744
Wrn Rental Timer Block Start .....744
Wrn Mains Voltage Detected .....744
Wrn Wrong GCB Control Mode .....744
Wrn Wrong MCB Control Mode .....744
Wrn Fence 1 Alarm .....745
Wrn Fence 2 Alarm .....745
Wrn Fuel Theft ..... 745
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Wrn Unsupported PMS Mode .....746
Stp Synchronisation Fail .772
Stp GCB Fail .....772
Stp GCB Fail To Close ... 772
Stp GCB Fail To Open ....773

back to Alarms

## Wrn CAN 2 Units Missing

| | |
|---|---|
| **Alarm Type** | WRN |
| **Alarmlist message** | All the time |
| **Alarm evaluated** | Wrn CAN 2 Units Missing |
| **Related applications** | MINT, SPtM |
| **Description** | This alarm is activated when actual number of unit on CAN2 is lower than value adjusted in setpoint **#Number Of Controller On CAN (page 291)**, **#Number Of Units On CAN2 Check (page 292)** is Enabled and **#CAN2 Units Missing Protection (page 291)** is adjusted |

| | |
|---|---|
| | to Warning. |

**back to List of alarms level 1**

## Wrn Module: Slot 1

| | |
|---|---|
| **Alarm Type** | WRN |
| **Alarmlist message** | Module: Slot 1 |
| **Alarm evaluated** | All the time |
| **Related applications** | MINT, SPtM |
| **Description** | This alarm is issued if controller will not be able to communicate with preconfigured module 1. |

back to List of alarms level 1

## Wrn Module: Slot 2

| | |
|---|---|
| **Alarm Type** | WRN |
| **Alarmlist message** | Module: Slot 2 |
| **Alarm evaluated** | All the time |
| **Related applications** | MINT, SPtM |
| **Description** | This alarm is issued if controller will not be able to communicate with preconfigured module 2. |

back to List of alarms level 1

## Wrn Module: Slot 3

| | |
|---|---|
| **Alarm Type** | WRN |
| **Alarmlist message** | Module: Slot 3 |
| **Alarm evaluated** | All the time |
| **Related applications** | MINT, SPtM |
| **Description** | This alarm is issued if controller will not be able to communicate with preconfigured module 3. |

back to List of alarms level 1

## Wrn Module: Slot 4

| | |
|---|---|
| **Alarm Type** | WRN |
| **Alarmlist message** | Module: Slot 4 |
| **Alarm evaluated** | All the time |
| **Related applications** | MINT, SPtM |
| **Description** | This alarm is issued if controller will not be able to communicate with preconfigured module 4. |

back to List of alarms level 1

## Wrn Module: Slot 5

| | |
|---|---|
| **Alarm Type** | WRN |
| **Alarmlist message** | Module: Slot 5 |
| **Alarm evaluated** | All the time |
| **Related applications** | MINT, SPtM |
| **Description** | This alarm is issued if controller will not be able to communicate with preconfigured module 5. |

back to List of alarms level 1

## Wrn Module(slotA) - false module

| | |
|---|---|
| **Alarm Type** | WRN |
| **Alarmlist message** | Module(slotA) - fake module |
| **Alarm evaluated** | All the time |
| **Related applications** | MINT, SPtM |
| **Description** | This alarm indicates that false module is inserted in slot. |

back to List of alarms level 1

## Wrn Module(slotB) - false module

| | |
|---|---|
| **Alarm Type** | WRN |
| **Alarmlist message** | Module(slotB) - fake module |
| **Alarm evaluated** | All the time |
| **Related applications** | MINT, SPtM |
| **Description** | This alarm indicates that false module is inserted in slot. |

back to List of alarms level 1

## Wrn Module(slotA) - unknown module

| | |
|---|---|
| **Alarm Type** | WRN |
| **Alarmlist message** | Module(slotA) - unknown module |
| **Alarm evaluated** | All the time |
| **Related applications** | MINT, SPtM |
| **Description** | This alarm indicates that unknown module is inserted in slot. |

back to List of alarms level 1

## Wrn Module(slotB) - unknown module

| | |
|---|---|
| **Alarm Type** | WRN |
| **Alarmlist message** | Module(slotB) - unknown module |
| **Alarm evaluated** | All the time |
| **Related applications** | MINT, SPtM |
| **Description** | This alarm indicates that unknown module is inserted in slot. |

back to List of alarms level 1

## Wrn Module(slotA) - unattended

| | |
|---|---|
| **Alarm Type** | WRN |
| **Alarmlist message** | Module(slotA) - unattended |
| **Alarm evaluated** | All the time |
| **Related applications** | MINT, SPtM |
| **Description** | This alarm indicates that two same communication modules are inserted in slots and one of them will be inactive. |

back to List of alarms level 1

## Wrn Module(slotB) - unattended

| | |
|---|---|
| **Alarm Type** | WRN |
| **Alarmlist message** | Module(slotB) - unattended |
| **Alarm evaluated** | All the time |
| **Related applications** | MINT, SPtM |
| **Description** | This alarm indicates that two same communication modules are inserted in slots and one of them will be inactive. |

back to List of alarms level 1

## Wrn Module(slotA) - comm. outage

| | |
|---|---|
| **Alarm Type** | WRN |
| **Alarmlist message** | Module(slotA) - comm. outage |
| **Alarm evaluated** | All the time |
| **Related applications** | MINT, SPtM |
| **Description** | This alarm indicates that there is a problem with communication between controller and module in slot. |

back to List of alarms level 1

## Wrn Module(slotB) - comm. outage

| | |
|---|---|
| **Alarm Type** | WRN |
| **Alarmlist message** | Module(slotB) - comm. outage |
| **Alarm evaluated** | All the time |
| **Related applications** | MINT, SPtM |
| **Description** | This alarm indicates that there is a problem with communication between controller and module in slot. |

back to List of alarms level 1

## Wrn Module(slotA) - unexpected

| | |
|---|---|
| **Alarm Type** | WRN |
| **Alarmlist message** | Module(slotA) - unexpected |
| **Alarm evaluated** | All the time |
| **Related applications** | MINT, SPtM |
| **Description** | This alarm indicates that in slot is inserted different module than which is configured or the module is unconfigured and has to be configured for proper function. |

back to List of alarms level 1

## Wrn Module(slotB) - unexpected

| | |
|---|---|
| **Alarm Type** | WRN |
| **Alarmlist message** | Module(slotB) - unexpected |
| **Alarm evaluated** | All the time |
| **Related applications** | MINT, SPtM |
| **Description** | This alarm indicates that in slot is inserted different module than which is configured or the module is unconfigured and has to be configured for proper function. |

back to List of alarms level 1

## Wrn EM(A) - a message lost

| | |
|---|---|
| **Alarm Type** | WRN |
| **Alarmlist message** | EM(A) - a message lost |
| **Alarm evaluated** | All the time |
| **Related applications** | MINT, SPtM |
| **Description** | This alarm indicates that there is a problem with communication between controller and module in slot. |

back to List of alarms level 1

## Wrn EM(B) - a message lost

| | |
|---|---|
| **Alarm Type** | WRN |
| **Alarmlist message** | EM(B) - a message lost |
| **Alarm evaluated** | All the time |
| **Related applications** | MINT, SPtM |
| **Description** | This alarm indicates that there is a problem with communication between controller and module in slot. |

back to List of alarms level 1

## Wrn EM(A) - configuration mistake

| | |
|---|---|
| **Alarm Type** | WRN |
| **Alarmlist message** | EM(A) - configuration mistake |
| **Alarm evaluated** | All the time |
| **Related applications** | MINT, SPtM |
| **Description** | This alarm indicates that there is a problem with configuration of binary input or output of module in slot. |

back to List of alarms level 1

## Wrn EM(B) - configuration mistake

| | |
|---|---|
| **Alarm Type** | WRN |
| **Alarmlist message** | EM(B) - configuration mistake |
| **Alarm evaluated** | All the time |
| **Related applications** | MINT, SPtM |
| **Description** | This alarm indicates that there is a problem with configuration of binary input or output of module in slot. |

back to List of alarms level 1

## Wrn EM(A) - insufficient

| | |
|---|---|
| **Alarm Type** | WRN |
| **Alarmlist message** | EM(A) - insufficient |
| **Alarm evaluated** | All the time |
| **Related applications** | MINT, SPtM |
| **Description** | This alarm indicates that module does not support all required features. |

back to List of alarms level 1

## Wrn EM(B) - insufficient

| | |
|---|---|
| **Alarm Type** | WRN |
| **Alarmlist message** | EM(B) - insufficient |
| **Alarm evaluated** | All the time |
| **Related applications** | MINT, SPtM |
| **Description** | This alarm indicates that module does not support all required features. |

back to List of alarms level 1

## Wrn EM(A) - missing or damaged

| | |
|---|---|
| **Alarm Type** | WRN |
| **Alarmlist message** | EM(A) - missing or damaged |
| **Alarm evaluated** | All the time |
| **Related applications** | MINT, SPtM |
| **Description** | This alarm indicates that there is a problem with communication with module in slot (in first 5 second there was no communication and module is configured in slot). |

back to List of alarms level 1

## Wrn EM(B) - missing or damaged

| | |
|---|---|
| **Alarm Type** | WRN |
| **Alarmlist message** | EM(B) - missing or damaged |
| **Alarm evaluated** | All the time |
| **Related applications** | MINT, SPtM |
| **Description** | This alarm indicates that there is a problem with communication with module in slot (if first 5 second there was no communication and module is configured in slot). |

back to List of alarms level 1

## Wrn Event Email 1 Fail

| | |
|---|---|
| **Alarm Type** | WRN |
| **Alarmlist message** | Event Email 1 Fail |
| **Alarm evaluated** | All the time |
| **Related applications** | MINT, SPtM |
| **Description** | The alarm indicates that there was a request to send an event email to email address which is adjusted in setpoint **Email Address 1 (page 513)** and email wasn't send. |

back to List of alarms level 1

## Wrn Event Email 2 Fail

| | |
|---|---|
| **Alarm Type** | WRN |
| **Alarmlist message** | Event Email 2 Fail |
| **Alarm evaluated** | All the time |
| **Related applications** | MINT, SPtM |
| **Description** | The alarm indicates that there was a request to send an event email to email address which is adjusted in setpoint **Email Address 2 (page 514)** and email wasn't send. |

back to List of alarms level 1

## Wrn Event Email 3 Fail

| | |
|---|---|
| **Alarm Type** | WRN |
| **Alarmlist message** | Event Email 3 Fail |
| **Alarm evaluated** | All the time |
| **Related applications** | MINT, SPtM |
| **Description** | The alarm indicates that there was a request to send an event email to email address which is adjusted in setpoint **Email Address 3 (page 514)** and email wasn't send. |

back to List of alarms level 1

## Wrn Event Email 4 Fail

| | |
|---|---|
| **Alarm Type** | WRN |
| **Alarmlist message** | Event Email 4 Fail |

| | |
|---|---|
| **Alarm evaluated** | All the time |
| **Related applications** | MINT, SPtM |
| **Description** | The alarm indicates that there was a request to send an event email to email address which is adjusted in setpoint **Email Address 4 (page 515)** and email wasn't send. |

back to List of alarms level 1

## Wrn Event SMS 1 Fail

| | |
|---|---|
| **Alarm Type** | WRN |
| **Alarmlist message** | Event SMS 1 Fail |
| **Alarm evaluated** | All the time |
| **Related applications** | MINT, SPtM |
| **Description** | The alarm indicates that there was a request to send an event SMS to telephone number which is adjusted in setpoint **Telephone Number 1 (page 496)** and SMS wasn't send. |

back to List of alarms level 1

## Wrn Event SMS 2 Fail

| | |
|---|---|
| **Alarm Type** | WRN |
| **Alarmlist message** | Event SMS 2 Fail |
| **Alarm evaluated** | All the time |
| **Related applications** | MINT, SPtM |
| **Description** | The alarm indicates that there was a request to send an event SMS to telephone number which is adjusted in setpoint **Telephone Number 2 (page 496)** and SMS wasn't send. |

back to List of alarms level 1

## Wrn Event SMS 3 Fail

| | |
|---|---|
| **Alarm Type** | WRN |
| **Alarmlist message** | Event SMS 3 Fail |
| **Alarm evaluated** | All the time |
| **Related applications** | MINT, SPtM |
| **Description** | The alarm indicates that there was a request to send an event SMS to telephone number which is adjusted in setpoint **Telephone Number 3 (page 497)** and SMS wasn't send. |

back to List of alarms level 1

## Wrn Event SMS 4 Fail

| | |
|---|---|
| **Alarm Type** | WRN |
| **Alarmlist message** | Event SMS 4 Fail |
| **Alarm evaluated** | All the time |
| **Related applications** | MINT, SPtM |
| **Description** | The alarm indicates that there was a request to send an event SMS to telephone number which is adjusted in setpoint **Telephone Number 4 (page 497)** and |

| | |
|---|---|
| | SMS wasn't send. |

back to List of alarms level 1

## Wrn Alarm Email 1 Fail

| | |
|---|---|
| **Alarm Type** | WRN |
| **Alarmlist message** | Alarm Email 1 Fail |
| **Alarm evaluated** | All the time |
| **Related applications** | MINT, SPtM |
| **Description** | The alarm indicates that there was a request to send an alarm email to email address which is adjusted in setpoint **Email Address 1 (page 513)** and email wasn't send. |

back to List of alarms level 1

## Wrn Alarm Email 2 Fail

| | |
|---|---|
| **Alarm Type** | WRN |
| **Alarmlist message** | Alarm Email 2 Fail |
| **Alarm evaluated** | All the time |
| **Related applications** | MINT, SPtM |
| **Description** | The alarm indicates that there was a request to send an alarm email to email address which is adjusted in setpoint **Email Address 2 (page 514)** and email wasn't send. |

back to List of alarms level 1

## Wrn Alarm Email 3 Fail

| | |
|---|---|
| **Alarm Type** | WRN |
| **Alarmlist message** | Alarm Email 3 Fail |
| **Alarm evaluated** | All the time |
| **Related applications** | MINT, SPtM |
| **Description** | The alarm indicates that there was a request to send an alarm email to email address which is adjusted in setpoint **Email Address 3 (page 514)** and email wasn't send. |

back to List of alarms level 1

## Wrn Alarm Email 4 Fail

| | |
|---|---|
| **Alarm Type** | WRN |
| **Alarmlist message** | Alarm Email 4 Fail |
| **Alarm evaluated** | All the time |
| **Related applications** | MINT, SPtM |
| **Description** | The alarm indicates that there was a request to send an alarm email to email address which is adjusted in setpoint **Email Address 4 (page 515)** and email wasn't send. |

back to List of alarms level 1

## Wrn Alarm SMS 1 Fail

| | |
|---|---|
| **Alarm Type** | WRN |
| **Alarmlist message** | Alarm SMS 1 Fail |
| **Alarm evaluated** | All the time |
| **Related applications** | MINT, SPtM |
| **Description** | The alarm indicates that there was a request to send an alarm SMS to telephone number which is adjusted in setpoint **Telephone Number 1 (page 496)** and SMS wasn't sent. |

back to List of alarms level 1

## Wrn Alarm SMS 2 Fail

| | |
|---|---|
| **Alarm Type** | WRN |
| **Alarmlist message** | Alarm SMS 2 Fail |
| **Alarm evaluated** | All the time |
| **Related applications** | MINT, SPtM |
| **Description** | The alarm indicates that there was a request to send an alarm SMS to telephone number which is adjusted in setpoint **Telephone Number 2 (page 496)** and SMS wasn't sent. |

back to List of alarms level 1

## Wrn Alarm SMS 3 Fail

| | |
|---|---|
| **Alarm Type** | WRN |
| **Alarmlist message** | Alarm SMS 3 Fail |
| **Alarm evaluated** | All the time |
| **Related applications** | MINT, SPtM |
| **Description** | The alarm indicates that there was a request to send an alarm SMS to telephone number which is adjusted in setpoint **Telephone Number 3 (page 497)** and SMS wasn't sent. |

back to List of alarms level 1

## Wrn Alarm SMS 4 Fail

| | |
|---|---|
| **Alarm Type** | WRN |
| **Alarmlist message** | Alarm SMS 4 Fail |
| **Alarm evaluated** | All the time |
| **Related applications** | MINT, SPtM |
| **Description** | The alarm indicates that there was a request to send an alarm SMS to telephone number which is adjusted in setpoint **Telephone Number 4 (page 497)** and SMS wasn't sent. |

back to List of alarms level 1

## Wrn SNMP TRAP 1 Fail

| | |
|---|---|
| **Alarm Type** | WRN |
| **Alarmlist message** | SNMP TRAP 1 Fail |

| | |
|---|---|
| **Alarm evaluated** | All the time |
| **Related applications** | MINT, SPtM |
| **Description** | This alarm is issued if TRAP will not be able to reach server. |

back to List of alarms level 1

## Wrn SNMP TRAP 2 Fail

| | |
|---|---|
| **Alarm Type** | WRN |
| **Alarmlist message** | SNMP TRAP 2 Fail |
| **Alarm evaluated** | All the time |
| **Related applications** | MINT, SPtM |
| **Description** | This alarm is issued if TRAP will not be able to reach server, or in case there is no reply for the server |

back to List of alarms level 1

## Wrn ECUDiagBlocked

| | |
|---|---|
| **Alarm Type** | ALI |
| **Alarmlist message** | ECUDiagBlocked |
| **Alarm evaluated** | All the time |
| **Related applications** | MINT, SPtM |
| **Description** | LBO **ALARM (PAGE 643)** is not activated, after deactivation of lamp, alarm automatically disappears. |

back to List of alarms level 1

## Wrn ECU Communication Fail

| | |
|---|---|
| **Alarm Type** | WRN |
| **Alarmlist message** | ECU Communication Fail |
| **Alarm evaluated** | With configured LBO **ECU POWER RELAY (PAGE 650)** – only when this LBO is active<br>Without configured LBO **ECU POWER RELAY (PAGE 650)** – all the time |
| **Related applications** | MINT, SPtM |
| **Description** | This alarm occurs when an ECU is configured, but the communication with the ECU is not established or has dropped out. LBO **ALARM (PAGE 643)** is not activated, after deactivation of lamp, alarm automatically disappears. |

back to List of alarms level 1

## Wrn ECU Communication Timeout

| | |
|---|---|
| **Alarm Type** | WRN |
| **Alarmlist message** | ECU Communication Timeout |
| **Alarm evaluated** | With configured LBO **ECU POWER RELAY (PAGE 650)** – only when this LBO is active<br>Without configured LBO **ECU POWER RELAY (PAGE 650)** – all the time |
| **Related applications** | MINT, SPtM |
| **Description** | Alarm is active when time for ECU communication elapsed. |

| | |
|---|---|
| | ***Note:*** *During cranking, delay for ECU Communication Timeout (counted by default option or adjusted by user) should is prolonged by 1 s.* |

back to List of alarms level 1

## Wrn PasswEnterBlock

| | |
|---|---|
| **Alarm Type** | WRN |
| **Alarmlist message** | PasswEnterBlock |
| **Alarm evaluated** | All the time |
| **Related applications** | MINT, SPtM |
| **Description** | This alarm is issued to indicate that user will not be able to type in password for set amount of time.<br>***Note:*** *This is cause by too many invalid attempts.* |

back to List of alarms level 1

## Wrn Default Password

| | |
|---|---|
| **Alarm Type** | WRN |
| **Alarmlist message** | Default Password |
| **Alarm evaluated** | All the time |
| **Related applications** | MINT, SPtM |
| **Description** | The alarm is issued if the factory default password and/or access code are used and engine is running. Factory default password and access code are "0". |

back to List of alarms level 1

## Wrn ECU Yellow Lamp

| | |
|---|---|
| **Alarm Type** | AHI |
| **Alarmlist message** | Wrn ECU Yellow Lamp |
| **Alarm evaluated** | All the time |
| **Related applications** | MINT, SPtM |
| **Description** | This alarm is activated when ECU send information that ECU Yellow lamp is activated. LBO **ALARM (PAGE 643)** is not activated, after deactivation of lamp, alarm automatically disappears. |

back to List of alarms level 1

## Wrn ECU Red Lamp

| | |
|---|---|
| **Alarm Type** | AHI |
| **Alarmlist message** | Wrn ECU Red Lamp |
| **Alarm evaluated** | All the time |
| **Related applications** | MINT, SPtM |
| **Description** | This alarm is activated when ECU send information that ECU Red lamp is activated. LBO **ALARM (PAGE 643)** is not activated, after deactivation of lamp, alarm automatically disappears.<br>***Note:*** *This lamp can be ignored during prestart phase. Use InteliConfig to enable this function.* |

back to List of alarms level 1

## Wrn ECU Wait To Start

| | |
|---|---|
| **Alarm Type** | AHI |
| **Alarmlist message** | Wrn ECU Wait To Start |
| **Alarm evaluated** | Only when ECU is connected |
| **Related applications** | MINT, SPtM |
| **Description** | This alarm is activated when ECU send information that ECU Wait To Start lamp is activated. LBO **ALARM (PAGE 643)** is not activated, after deactivation of lamp, alarm automatically disappears. |

back to List of alarms level 1

## Wrn ATT DPF Lamp

| | |
|---|---|
| **Alarm Type** | AHI |
| **Alarmlist message** | Wrn ATT DPF Lamp |
| **Alarm evaluated** | All the time |
| **Related applications** | MINT, SPtM |
| **Description** | This alarm is activated when ECU send information that ECU ATT DPF Lamp is activated. LBO **ALARM (PAGE 643)** is not activated, after deactivation of lamp, alarm automatically disappears. |

back to List of alarms level 1

## Wrn ATT HEST Lamp

| | |
|---|---|
| **Alarm Type** | AHI |
| **Alarmlist message** | Wrn ATT HEST Lamp |
| **Alarm evaluated** | All the time |
| **Related applications** | MINT, SPtM |
| **Description** | This alarm is activated when ECU send information that ECU ATT Hest Lamp is activated. LBO **ALARM (PAGE 643)** is not activated, after deactivation of lamp, alarm automatically disappears. |

back to List of alarms level 1

## Wrn ATT SCR Error Lamp

| | |
|---|---|
| **Alarm Type** | AHI |
| **Alarmlist message** | Wrn ATT SCR Error Lamp |
| **Alarm evaluated** | All the time |
| **Related applications** | MINT, SPtM |
| **Description** | This alarm is activated when ECU send information that ECU ATT SCR Error Lamp is activated. LBO **ALARM (PAGE 643)** is not activated, after deactivation of lamp, alarm automatically disappears. |

back to List of alarms level 1

## Wrn ATT DEF Level Lamp

| | |
|---|---|
| **Alarm Type** | AHI |

| | |
|---|---|
| **Alarmlist message** | Wrn ATT DEF Level Lamp |
| **Alarm evaluated** | All the time |
| **Related applications** | MINT, SPtM |
| **Description** | This alarm is activated when ECU send information that ECU ATT DEF Level Lamp is activated. LBO **ALARM (PAGE 643)** is not activated, after deactivation of lamp, alarm automatically disappears. |

back to List of alarms level 1

## Wrn ATT Inhibited Lamp

| | |
|---|---|
| **Alarm Type** | AHI |
| **Alarmlist message** | Wrn ATT Inhibited Lamp |
| **Alarm evaluated** | All the time |
| **Related applications** | MINT, SPtM |
| **Description** | This alarm is activated when ECU send information that ECU ATT Inhibited Lamp is activated. LBO **ALARM (PAGE 643)** is not activated, after deactivation of lamp, alarm automatically disappears. |

back to List of alarms level 1

## Wrn ATT Interlock Active

| | |
|---|---|
| **Alarm Type** | AHI |
| **Alarmlist message** | ATT interlock Active |
| **Alarm evaluated** | All the time |
| **Related applications** | MINT, SPtM |
| **Description** | This message is written in the history when LBI **ATT INTERLOCK (PAGE 608)** is active. LBO **ALARM (PAGE 643)** is not activated, after deactivation of lamp, alarm automatically disappears. |

back to List of alarms level 1

## Hst ATT Force Regen Active

| | |
|---|---|
| **Alarm Type** | AHI |
| **Alarmlist message** | Hst ATT Force Regen Active |
| **Alarm evaluated** | All the time |
| **Related applications** | MINT, SPtM |
| **Description** | This message is written in the history when LBI **ATT FORCE REGEN (PAGE 606)** is active. LBO **ALARM (PAGE 643)** is not activated, after deactivation of lamp, alarm automatically disappears. |

back to List of alarms level 1

## Hst ATT Inhib Regen Active

| | |
|---|---|
| **Alarm Type** | AHI |
| **Alarmlist message** | Hst ATT Inhib Regen Active |
| **Alarm evaluated** | All the time |
| **Related applications** | MINT, SPtM |

| | |
|---|---|
| **Description** | This message is written in the history when LBI **ATT INHIBIT REGEN (PAGE 607)** is active. LBO **ALARM (PAGE 643)** is not activated, after deactivation of lamp, alarm automatically disappears. |

**back to List of alarms level 1**

### Wrn ECU 1 Comm Fail

| | |
|---|---|
| **Alarm Type** | WRN |
| **Alarmlist message** | Wrn ECU 1 Comm Fail |
| **Alarm evaluated** | ECU 1 is configured |
| **Related applications** | MINT, SPtM |
| **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** | WRN |
| **Alarmlist message** | Wrn ECU 2 Comm Fail |
| **Alarm evaluated** | ECU 2 is configured |
| **Related applications** | MINT, SPtM |
| **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** | WRN |
| **Alarmlist message** | Wrn ECU 3 Comm Fail |
| **Alarm evaluated** | ECU 3 is configured |
| **Related applications** | MINT, SPtM |
| **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** | WRN |
| **Alarmlist message** | Wrn ECU 4 Comm Fail |
| **Alarm evaluated** | ECU 4 is configured |
| **Related applications** | MINT, SPtM |
| **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**

## AL Transferring Fuel

| | |
|---|---|
| **Alarm Type** | ALI |
| **Alarmlist message** | Transferring Fuel |
| **Alarm evaluated** | All the time |
| **Related applications** | MINT, SPtM |
| **Description** | This alarm is issued if **FUEL PUMP (PAGE 653)** is active. |

back to List of alarms level 1

## ALI External Mains Fail

| | |
|---|---|
| **Alarm Type** | ALI |
| **Alarmlist message** | External Mains Fail |
| **Alarm evaluated** | All the time |
| **Related applications** | MINT, SPtM |
| **Description** | This alarm is active when LBI **EXTERNAL MAINS FAIL RELAY (PAGE 613)** is active. |

back to List of alarms level 1

## Wrn Coolant Temp

| | |
|---|---|
| **Alarm Type** | WRN |
| **Alarmlist message** | All the time |
| **Alarm evaluated** | Wrn Coolant Temp |
| **Related applications** | MINT, SPtM |
| **Description** | Warning alarm for Coolant Temp user protection. |

back to List of alarms level 1

## Wrn Coolant Temp Low

| | |
|---|---|
| **Alarm Type** | WRN |
| **Alarmlist message** | All the time |
| **Alarm evaluated** | Wrn Coolant Temp Low |
| **Related applications** | MINT, SPtM |
| **Description** | Warning alarm for Coolant Temp Low user protection. |

back to List of alarms level 1

## Wrn Fuel Level

| | |
|---|---|
| **Alarm Type** | WRN |
| **Alarmlist message** | All the time |
| **Alarm evaluated** | Wrn Fuel Level |
| **Related applications** | MINT, SPtM |
| **Description** | Warning alarm for Coolant Temp Low user protection. |

back to List of alarms level 1

## AL Fuel Transfer Failed

| | |
|---|---|
| **Alarm Type** | Warning |

| | |
|---|---|
| **Alarmlist message** | Wrn Fuel Transfer Failed |
| **Alarm evaluated** | When **FUEL PUMP (PAGE 653)** is active |
| **Related applications** | MINT, SPtM |
| **Description** | This alarm will occur when there is no increase of fuel level when **FUEL PUMP (PAGE 653)** is active. |

back to List of alarms level 1

## Wrn Charging Alternator Fail

| | |
|---|---|
| **Alarm Type** | SD |
| **Alarmlist message** | Sd Charging Alternator Fail |
| **Alarm evaluated** | Engine running only |
| **Related applications** | MINT, SPtM |
| **Description** | This alarm is issued if the engine is running and the voltage on the D+ terminal is lower than **D+ Threshold (page 308)** of the controller supply voltage. This alarm works similar to the red "battery" alarm indicator on a vehicle dashboard. The setpoint has to be in Charge Fail or Enabled position to enable this alarm. |

back to List of alarms level 2

## Wrn Stop Fail

| | |
|---|---|
| **Alarm Type** | WRN |
| **Alarmlist message** | Wrn Stop Fail |
| **Alarm evaluated** | While the engine shall be stopped |
| **Related applications** | MINT, SPtM |
| **Description** | This alarm occurs if the Gen-set shall be stopped, but some symptom indicates that it is not stopped. The period when the Gen-set shall be stopped begins after the **FUEL SOLENOID (PAGE 653)** has been switched off and time delay **Stop Time (page 305)** has elapsed and lasts for the entire time the **FUEL SOLENOID (PAGE 653)** or **STARTER 1 (PAGE 680)** are off. |

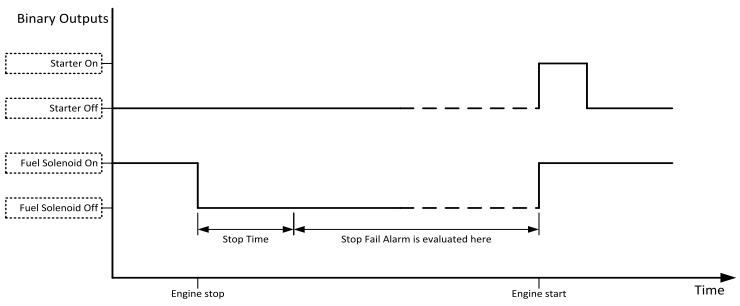



Image 8.101 Stop Fail

***Note:*** *Gen-set cannot be started until this alarm is inactive and reset.*

back to List of alarms level 1

## Wrn Maintenance Timer 1 RunHours

| | |
|---|---|
| **Alarm Type** | WRN |
| **Alarmlist message** | Wrn Maintenance Timer 1 RunHours |
| **Alarm evaluated** | All the time |
| **Related applications** | MINT, SPtM |
| **Description** | The alarm is active when the value **Maintenance Timer 1 RunHours (page 574)** reaches 0.<br>The value is adjustable by setpoint **Maintenance Timer 1 RunHours (page 319)** (unit is hours-h) and it counts down in hours while engine is running. Setpoint **Maintenance Timer 1 Protection (page 320)** has to be set to: Warning |

back to List of alarms level 1

## Wrn Maintenance Timer 1 Interval

| | |
|---|---|
| **Alarm Type** | WRN |
| **Alarmlist message** | Wrn Maintenance Timer 1 Interval |
| **Alarm evaluated** | All the time |
| **Related applications** | MINT, SPtM |
| **Description** | The alarm is active when the value **Maintenance Timer 1 Interval (page 574)** Interval reaches 0.<br>The value is adjustable by setpoint **Maintenance Timer 1 Interval (page 319)** (unit is in months-m) and it counts down in days based on actual date (No matter if engine is running or not). Setpoint **Maintenance Timer 1 Protection (page 320)** has to be set to: Warning |

back to List of alarms level 1

## Wrn Maintenance Timer 2 RunHours

| | |
|---|---|
| **Alarm Type** | WRN |
| **Alarmlist message** | Wrn Maintenance Timer 2 RunHours |
| **Alarm evaluated** | All the time |
| **Related applications** | MINT, SPtM |
| **Description** | The alarm is active when the value **Maintenance Timer 2 RunHours (page 574)** reaches 0.<br>The value is adjustable by setpoint **Maintenance Timer 2 RunHours (page 320)** (unit is hours-h) and it counts down in hours while engine is running. Setpoint **Maintenance Timer 2 Protection (page 321)** has to be set to: Warning |

back to List of alarms level 1

## Wrn Maintenance Timer 2 Interval

| | |
|---|---|
| **Alarm Type** | WRN |
| **Alarmlist message** | Wrn Maintenance Timer 2 Interval |
| **Alarm evaluated** | All the time |
| **Related applications** | MINT, SPtM |
| **Description** | The alarm is active when the value **Maintenance Timer 2 Interval (page 574)** |

| | |
|---|---|
| | reaches 0.<br>The value is adjustable by setpoint **Maintenance Timer 2 Interval (page 321)** (unit is in months-m) and it counts down in days based on actual date (No matter if engine is running or not). Setpoint **Maintenance Timer 2 Protection (page 321)** has to be set to: Warning |

back to List of alarms level 1

## Wrn Maintenance Timer 3 RunHours

| | |
|---|---|
| **Alarm Type** | WRN |
| **Alarmlist message** | Wrn Maintenance Timer 3 RunHours |
| **Alarm evaluated** | All the time |
| **Related applications** | MINT, SPtM |
| **Description** | The alarm is active when the value **Maintenance Timer 3 RunHours (page 575)** reaches 0.<br>The value is adjustable by setpoint **Maintenance Timer 3 RunHours (page 322)** (unit is hours-h) and it counts down in hours while engine is running. Setpoint **Maintenance Timer 3 Protection (page 323)** has to be set to: Warning |

back to List of alarms level 1

## Wrn Maintenance Timer 3 Interval

| | |
|---|---|
| **Alarm Type** | WRN |
| **Alarmlist message** | Wrn Maintenance Timer 3 Interval |
| **Alarm evaluated** | All the time |
| **Related applications** | MINT, SPtM |
| **Description** | The alarm is active when the value **Maintenance Timer 3 Interval (page 575)** reaches 0.<br>The value is adjustable by setpoint **Maintenance Timer 3 Interval (page 322)** (unit is in months-m) and it counts down in days based on actual date (No matter if engine is running or not). Setpoint **Maintenance Timer 3 Protection (page 323)** has to be set to: Warning |

back to List of alarms level 1

## Wrn MCB Fail

| | |
|---|---|
| **Alarm Type** | WRN |
| **Alarmlist message** | Wrn MCB Fail |
| **Alarm evaluated** | All the time |
| **Related applications** | MINT, SPtM |
| **Description** | This alarm will occur when the **MCB Feedback (page 622)** input does not match the expected position given by the **MCB Close/Open (page 668)** output. It stays active until the mismatch between the output and feedback disappears.<br>› If there was no command issued by the controller and the breaker (feedback) changes suddenly the position itself, the alarm will be issued immediately.<br>› Self-opening of the breaker is not considered a fault and if all mains |

| | |
|---|---|
| | values are within limits, the command to reclose the breaker is issued after delay given by the setpoint **Mains Return Delay (page 342)** has elapsed.<br>› The alarm will be also issued, if the breaker does not respond to the close command within 5 seconds. After this period has elapsed the output MCB Close/Open is deactivated again and the next attempt to close the breaker will occur first after the alarm is reset.<br>› The alarm will be also issued if the breaker does not respond to the open command within 5 seconds. The output MCB Close/Open will stay deactivated. Closing of GCB is blocked until this alarm becomes inactive. |

back to List of alarms level 1

## Wrn Generator L1 Overvoltage

| | |
|---|---|
| **Alarm Type** | WRN |
| **Alarmlist message** | Generator L1 > Voltage |
| **Alarm evaluated** | Generator excited only |
| **Related applications** | MINT, SPtM |
| **Description** | This alarm evaluates the generator phase voltage in phase 1. The following setpoints are related to it:<br>› **Generator Overvoltage Wrn (page 328)**<br>› **Generator <> Voltage Delay (page 330)** |

back to List of alarms level 1

## Wrn Generator L2 Overvoltage

| | |
|---|---|
| **Alarm Type** | WRN |
| **Alarmlist message** | Generator L2 > Voltage |
| **Alarm evaluated** | Generator excited only |
| **Related applications** | MINT, SPtM |
| **Description** | This alarm evaluates the generator phase voltage in phase 2. The following setpoints are related to it:<br>› **Generator Overvoltage Wrn (page 328)**<br>› **Generator <> Voltage Delay (page 330)** |

back to List of alarms level 1

## Wrn Generator L3 Overvoltage

| | |
|---|---|
| **Alarm Type** | WRN |
| **Alarmlist message** | Generator L3 > Voltage |
| **Alarm evaluated** | Generator excited only |
| **Related applications** | MINT, SPtM |
| **Description** | This alarm evaluates the generator phase voltage in phase 3. The following setpoints are related to it:<br>› **Generator Overvoltage Wrn (page 328)**<br>› **Generator <> Voltage Delay (page 330)** |

back to List of alarms level 1

## Wrn Generator L1L2 Overvoltage

| | |
|---|---|
| **Alarm Type** | WRN |
| **Alarmlist message** | Generator L1L2 > Voltage |
| **Alarm evaluated** | Generator excited only |
| **Related applications** | MINT, SPtM |
| **Description** | This alarm evaluates the generator phase to phase voltage between phases 1 and 2. The following setpoints are related to it:<br>› **Generator Overvoltage Wrn (page 328)**<br>› **Generator <> Voltage Delay (page 330)** |

**back to List of alarms level 1**

## Wrn Generator L2L3 Overvoltage

| | |
|---|---|
| **Alarm Type** | WRN |
| **Alarmlist message** | Generator L2L3 > Voltage |
| **Alarm evaluated** | Generator excited only |
| **Related applications** | MINT, SPtM |
| **Description** | This alarm evaluates the generator phase to phase voltage between phases 2 and 3. The following setpoints are related to it:<br>› **Generator Overvoltage Wrn (page 328)**<br>› **Generator <> Voltage Delay (page 330)** |

**back to List of alarms level 1**

## Wrn Generator L3L1 Overvoltage

| | |
|---|---|
| **Alarm Type** | WRN |
| **Alarmlist message** | Generator L3L1 > Voltage |
| **Alarm evaluated** | Generator excited only |
| **Related applications** | MINT, SPtM |
| **Description** | This alarm evaluates the generator phase to phase voltage between phases 3 and 1. The following setpoints are related to it:<br>› **Generator Overvoltage Wrn (page 328)**<br>› **Generator <> Voltage Delay (page 330)** |

**back to List of alarms level 1**

## Wrn Generator L1 Undervoltage

| | |
|---|---|
| **Alarm Type** | WRN |
| **Alarmlist message** | Generator L1 < Voltage |
| **Alarm evaluated** | Generator excited only |
| **Related applications** | MINT, SPtM |
| **Description** | This alarm evaluates the generator phase voltage in phase 1. The following setpoints are related to it:<br>› **Generator Undervoltage Wrn (page 329)**<br>› **Generator <> Voltage Delay (page 330)** |

back to List of alarms level 1

## Wrn Generator L2 Undervoltage

| | |
|---|---|
| **Alarm Type** | WRN |
| **Alarmlist message** | Generator L2 < Voltage |
| **Alarm evaluated** | Generator excited only |
| **Related applications** | MINT, SPtM |
| **Description** | This alarm evaluates the generator phase voltage in phase 2. The following setpoints are related to it:<br>› **Generator Undervoltage Wrn (page 329)**<br>› **Generator <> Voltage Delay (page 330)** |

back to List of alarms level 1

## Wrn Generator L3 Undervoltage

| | |
|---|---|
| **Alarm Type** | WRN |
| **Alarmlist message** | Generator L3 < Voltage |
| **Alarm evaluated** | Generator excited only |
| **Related applications** | MINT, SPtM |
| **Description** | This alarm evaluates the generator phase voltage in phase 3. The following setpoints are related to it:<br>› **Generator Undervoltage Wrn (page 329)**<br>› **Generator <> Voltage Delay (page 330)** |

back to List of alarms level 1

## Wrn Generator L1L2 Undervoltage

| | |
|---|---|
| **Alarm Type** | WRN |
| **Alarmlist message** | Generator L1L2 < Voltage |
| **Alarm evaluated** | Generator excited only |
| **Related applications** | MINT, SPtM |
| **Description** | This alarm evaluates the generator phase to phase voltage between phases 1 and 2. The following setpoints are related to it:<br>› **Generator Undervoltage Wrn (page 329)**<br>› **Generator <> Voltage Delay (page 330)** |

back to List of alarms level 1

## Wrn Generator L2L3 Undervoltage

| | |
|---|---|
| **Alarm Type** | WRN |
| **Alarmlist message** | Generator L2L3 < Voltage |
| **Alarm evaluated** | Generator excited only |
| **Related applications** | MINT, SPtM |
| **Description** | This alarm evaluates the generator phase to phase voltage between phases 2 and 3. The following setpoints are related to it:<br>› **Generator Undervoltage Wrn (page 329)** |

| | |
|---|---|
| | › **Generator <> Voltage Delay (page 330)** |

back to List of alarms level 1

## Wrn Generator L3L1 Undervoltage

| | |
|---|---|
| **Alarm Type** | WRN |
| **Alarmlist message** | Generator L3L1 < Voltage |
| **Alarm evaluated** | Generator excited only |
| **Related applications** | MINT, SPtM |
| **Description** | This alarm evaluates the generator phase to phase voltage between phases 3 and 1. The following setpoints are related to it:<br>› **Generator Undervoltage Wrn (page 329)**<br>› **Generator <> Voltage Delay (page 330)** |

back to List of alarms level 1

## Wrn Generator Overfrequency

| | |
|---|---|
| **Alarm Type** | WRN |
| **Alarmlist message** | Generator > Frequency |
| **Alarm evaluated** | Generator excited only |
| **Related applications** | MINT, SPtM |
| **Description** | This alarm evaluates the generator overfrequency in the phase L1. The following setpoints are related to it:<br>› **Generator Overfrequency Wrn (page 331)**<br>› **Generator <> Frequency Delay (page 332)** |

back to List of alarms level 1

## Wrn Generator Uderfrequency

| | |
|---|---|
| **Alarm Type** | WRN |
| **Alarmlist message** | Generator < Frequency |
| **Alarm evaluated** | Generator excited only |
| **Related applications** | MINT, SPtM |
| **Description** | This alarm evaluates the generator underfrequency in the phase L1. The following setpoints are related to it:<br>› **Generator Underfrequency Wrn (page 331)**<br>› **Generator <> Frequency Delay (page 332)** |

back to List of alarms level 1

## Wrn Oil Pressure

| | |
|---|---|
| **Alarm Type** | Warning |
| **Alarmlist message** | Wrn Oil Pressure |
| **Alarm evaluated** | Gen-set is running |
| **Related applications** | MINT, SPtM |
| **Description** | This alarm indicates that the oil pressure is lower than the pressure set in the setpoint. |

back to List of alarms level 1

## Wrn Overload

| | |
|---|---|
| **Alarm Type** | WRN |
| **Alarmlist message** | Overload |
| **Alarm evaluated** | All the time |
| **Related applications** | MINT, SPtM |
| **Description** | The alarm is issued when the Gen-set power is over the limit for time period longer than the delay. The following setpoints are related to it:<br>› **Overload Wrn (page 324)** adjusts the overload limit.<br>› **Overload BOC (page 323)** Overload Del adjusts the delay. |

back to List of alarms level 1

## Wrn Battery Overvoltage

| | |
|---|---|
| **Alarm Type** | WRN |
| **Alarmlist message** | All the time |
| **Alarm evaluated** | Wrn Battery > Voltage |
| **Related applications** | MINT, SPtM |
| **Description** | This alarm informs the operator that the controller supply voltage is too high. The following setpoints are related to it:<br>› **Battery Overvoltage (page 316)**<br>› **Battery <> Voltage Delay (page 316)** |

back to List of alarms level 1

## Wrn Battery Undervoltage

| | |
|---|---|
| **Alarm Type** | WRN |
| **Alarmlist message** | Wrn Battery < Voltage |
| **Alarm evaluated** | All the time |
| **Related applications** | MINT, SPtM |
| **Description** | This alarm informs the operator that the controller supply voltage is too low. The following setpoints are related to it:<br>› **Battery Undervoltage (page 315)**<br>› **Battery <> Voltage Delay (page 316)** |

back to List of alarms level 1

## Wrn Password reset e-mail addr is not set

| | |
|---|---|
| **Alarm Type** | WRN |
| **Alarmlist message** | Wrn Password reset e-mail addr is not set |
| **Alarm evaluated** | All the time |
| **Related applications** | MINT, SPtM |
| **Description** | This alarm is active when there is no email address set in the controller and simultaneously controller administrator password is not the default password. |

| | |
|---|---|
| | ***Note:*** *When default password is changed the Wrn Password reset e-mail addr is not set will be active after the restart of the controller.* |

back to List of alarms level 1

## Wrn Battery Charger Fail

| | |
|---|---|
| **Alarm Type** | WRN |
| **Alarmlist message** | Battery Charge Fail |
| **Alarm evaluated** | All the time |
| **Related applications** | MINT, SPtM |
| **Description** | This alarm is activated when logical binary input **BATTERY CHARGER (PAGE 609)** is active. |

back to List of alarms level 1

## ALI Manual Restore

| | |
|---|---|
| **Alarm Type** | ALI |
| **Alarmlist message** | Manual Restore |
| **Alarm evaluated** | All the time |
| **Related applications** | MINT, SPtM |
| **Description** | Alarm is activated when controller is in AUTO mode, **Return From Island (page 352)** setpoint is set to manual, load is on Gen-set and mains has returned. |

back to List of alarms level 1

## Wrn Override All Sd

| | |
|---|---|
| **Alarm Type** | WRN |
| **Alarmlist message** | Override All Sd |
| **Alarm evaluated** | All the time |
| **Related applications** | MINT, SPtM |
| **Description** | This alarm occurs when binary input **SD OVERRIDE (PAGE 629)** is activated. |

back to List of alarms level 1

## Wrn Production Mode

| | |
|---|---|
| **Alarm Type** | WRN |
| **Alarmlist message** | Wrn Production Mode |
| **Alarm evaluated** | All the time |
| **Related applications** | MINT, SPtM |
| **Description** | Alarm is active when the controller has turned on Productiom mode. In turned on Production mode the user has the highest level 3 access without performing log in. |

back to List of alarms level 1

## Wrn Brute Force Protection Active

| | |
|---|---|
| **Alarm Type** | WRN |
| **Alarmlist message** | Wrn Brute Force Protection Active |

| | |
|---|---|
| **Alarm evaluated** | All the time |
| **Related applications** | MINT, SPtM |
| **Description** | This alarm is activated when account break protection detects possible attack and at least one account is blocked according to **Account break protection (page 218)** rules. |

back to List of alarms level 1

## Wrn Rental Timer 1

| | |
|---|---|
| **Alarm Type** | WRN |
| **Alarmlist message** | Wrn Rental Timer 1 |
| **Alarm evaluated** | All the time |
| **Related applications** | MINT, SPtM |
| **Description** | This alarm occurs xx hours before **Rental Timer 1 (page 465)** elapsed. Hours are adjusted by setpoint **Rental Timer 1 Wrn (page 467)**. |

back to List of alarms level 1

## Wrn Rental Timer 2

| | |
|---|---|
| **Alarm Type** | WRN |
| **Alarmlist message** | Wrn Rental Timer 2 |
| **Alarm evaluated** | All the time |
| **Related applications** | MINT, SPtM |
| **Description** | This alarm occurs xx hours before **Rental Timer 2 (page 467)** elapsed. Hours are adjusted by setpoint **Rental Timer 2 Wrn (page 469)**. |

back to List of alarms level 1

## Wrn AI/Hist.msg. 1

| | |
|---|---|
| **Alarm Type** | WRN |
| **Alarmlist message** | AI/Hist.msg. 1 |
| **Alarm evaluated** | All the time |
| **Related applications** | MINT, SPtM |
| **Description** | This alarm is issued when history event 1 will trigger. |

back to List of alarms level 1

## Wrn AI/Hist.msg. 2

| | |
|---|---|
| **Alarm Type** | WRN |
| **Alarmlist message** | AI/Hist.msg. 2 |
| **Alarm evaluated** | All the time |
| **Related applications** | MINT, SPtM |
| **Description** | This alarm is issued when history event 2 will trigger. |

back to List of alarms level 1

## Wrn AI/Hist.msg. 3

| | |
|---|---|
| **Alarm Type** | WRN |

| | |
|---|---|
| **Alarmlist message** | AI/Hist.msg. 3 |
| **Alarm evaluated** | All the time |
| **Related applications** | MINT, SPtM |
| **Description** | This alarm is issued when history event 3 will trigger. |

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## Wrn AI/Hist.msg. 4

| | |
|---|---|
| **Alarm Type** | WRN |
| **Alarmlist message** | AI/Hist.msg. 4 |
| **Alarm evaluated** | All the time |
| **Related applications** | MINT, SPtM |
| **Description** | This alarm is issued when history event 4 will trigger. |

back to List of alarms level 1

## Wrn AI/Hist.msg. 5

| | |
|---|---|
| **Alarm Type** | WRN |
| **Alarmlist message** | AI/Hist.msg. 5 |
| **Alarm evaluated** | All the time |
| **Related applications** | MINT, SPtM |
| **Description** | This alarm is issued when history event 5 will trigger. |

back to List of alarms level 1

## Wrn AI/Hist.msg. 6

| | |
|---|---|
| **Alarm Type** | WRN |
| **Alarmlist message** | AI/Hist.msg. 6 |
| **Alarm evaluated** | All the time |
| **Related applications** | MINT, SPtM |
| **Description** | This alarm is issued when history event 6 will trigger. |

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## Wrn AI/Hist.msg. 7

| | |
|---|---|
| **Alarm Type** | WRN |
| **Alarmlist message** | AI/Hist.msg. 7 |
| **Alarm evaluated** | All the time |
| **Related applications** | MINT, SPtM |
| **Description** | This alarm is issued when history event 7 will trigger. |

back to List of alarms level 1

## Wrn AI/Hist.msg. 8

| | |
|---|---|
| **Alarm Type** | WRN |
| **Alarmlist message** | AI/Hist.msg. 8 |
| **Alarm evaluated** | All the time |
| **Related applications** | MINT, SPtM |

| | |
|---|---|
| **Description** | This alarm is issued when history event 8 will trigger. |

back to List of alarms level 1

## Wrn AI/Hist.msg. 9

| | |
|---|---|
| **Alarm Type** | WRN |
| **Alarmlist message** | AI/Hist.msg. 9 |
| **Alarm evaluated** | All the time |
| **Related applications** | MINT, SPtM |
| **Description** | This alarm is issued when history event 9 will trigger. |

back to List of alarms level 1

## Wrn AI/Hist.msg. 10

| | |
|---|---|
| **Alarm Type** | WRN |
| **Alarmlist message** | AI/Hist.msg. 10 |
| **Alarm evaluated** | All the time |
| **Related applications** | MINT, SPtM |
| **Description** | This alarm is issued when history event 10 will trigger. |

back to List of alarms level 1

## Wrn AI/Hist.msg. 11

| | |
|---|---|
| **Alarm Type** | WRN |
| **Alarmlist message** | AI/Hist.msg. 11 |
| **Alarm evaluated** | All the time |
| **Related applications** | MINT, SPtM |
| **Description** | This alarm is issued when history event 11 will trigger. |

back to List of alarms level 1

## Wrn AI/Hist.msg. 12

| | |
|---|---|
| **Alarm Type** | WRN |
| **Alarmlist message** | AI/Hist.msg. 12 |
| **Alarm evaluated** | All the time |
| **Related applications** | MINT, SPtM |
| **Description** | This alarm is issued when history event 12 will trigger. |

back to List of alarms level 1

## Wrn AI/Hist.msg. 13

| | |
|---|---|
| **Alarm Type** | WRN |
| **Alarmlist message** | AI/Hist.msg. 13 |
| **Alarm evaluated** | All the time |
| **Related applications** | MINT, SPtM |
| **Description** | This alarm is issued when history event 13 will trigger. |

back to List of alarms level 1

## Wrn AI/Hist.msg. 14

| | |
|---|---|
| **Alarm Type** | WRN |
| **Alarmlist message** | AI/Hist.msg. 14 |
| **Alarm evaluated** | All the time |
| **Related applications** | MINT, SPtM |
| **Description** | This alarm is issued when history event 14 will trigger. |

back to List of alarms level 1

## Wrn AI/Hist.msg. 15

| | |
|---|---|
| **Alarm Type** | WRN |
| **Alarmlist message** | AI/Hist.msg. 1 |
| **Alarm evaluated** | All the time |
| **Related applications** | MINT, SPtM |
| **Description** | This alarm is issued when history event 15 will trigger. |

back to List of alarms level 1

## Wrn AI/Hist.msg. 16

| | |
|---|---|
| **Alarm Type** | WRN |
| **Alarmlist message** | AI/Hist.msg. 16 |
| **Alarm evaluated** | All the time |
| **Related applications** | MINT, SPtM |
| **Description** | This alarm is issued when history event 16 will trigger. |

back to List of alarms level 1

## AHI Rental Timer 1 Elapsed

| | |
|---|---|
| **Alarm Type** | AHI |
| **Alarmlist message** | Rental Timer 1 Elapsed |
| **Alarm evaluated** | All the time |
| **Related applications** | MINT, SPtM |
| **Description** | This alarm is activated when **Rental Timer 1 (page 465)** elapses. |

back to List of alarms level 1

## AHI Rental Timer 2 Elapsed

| | |
|---|---|
| **Alarm Type** | AHI |
| **Alarmlist message** | Rental Timer 2 Elapsed |
| **Alarm evaluated** | All the time |
| **Related applications** | MINT, SPtM |
| **Description** | This alarm is activated when **Rental Timer 2 (page 467)** elapses. |

back to List of alarms level 1

## ALI Gen Ph L1 Inverted

| | |
|---|---|
| **Alarm Type** | ALI |

| | |
|---|---|
| **Alarmlist message** | ALI Gen Ph L1 Inverted |
| **Alarm evaluated** | All the time |
| **Related applications** | MINT, SPtM |
| **Description** | This alarm is issued if generator phase L1 is inverted. |

back to List of alarms level 1

## ALI Gen Ph L2 Inverted

| | |
|---|---|
| **Alarm Type** | ALI |
| **Alarmlist message** | ALI Gen Ph L2 Inverted |
| **Alarm evaluated** | All the time |
| **Related applications** | MINT, SPtM |
| **Description** | This alarm is issued if generator phase L2 is inverted. |

back to List of alarms level 1

## ALI Gen Ph L3 Inverted

| | |
|---|---|
| **Alarm Type** | ALI |
| **Alarmlist message** | ALI Gen Ph L3 Inverted |
| **Alarm evaluated** | All the time |
| **Related applications** | MINT, SPtM |
| **Description** | This alarm is issued if generator phase L3 is inverted. |

back to List of alarms level 1

## ALI Gen Ph Rotation Opposite

| | |
|---|---|
| **Alarm Type** | ALI |
| **Alarmlist message** | ALI Gen Ph Rotation Opposite |
| **Alarm evaluated** | All the time |
| **Related applications** | MINT, SPtM |
| **Description** | This alarm is issued if generator phases are wired in wrong order. |

back to List of alarms level 1

## ALI Bus Ph L1 Inverted

| | |
|---|---|
| **Alarm Type** | ALI |
| **Alarmlist message** | ALI Bus Ph L1 Inverted |
| **Alarm evaluated** | All the time |
| **Related applications** | MINT, SPtM |
| **Description** | This alarm is issued if bus phase L1 is inverted. |

back to List of alarms level 1

## ALI Bus Ph L2 Inverted

| | |
|---|---|
| **Alarm Type** | ALI |
| **Alarmlist message** | ALI Bus Ph L2 Inverted |
| **Alarm evaluated** | All the time |
| **Related applications** | MINT, SPtM |

| | |
|---|---|
| **Description** | This alarm is issued if bus phase L2 is inverted. |

back to List of alarms level 1

## ALI Bus Ph L3 Inverted

| | |
|---|---|
| **Alarm Type** | ALI |
| **Alarmlist message** | ALI Bus Ph L3 Inverted |
| **Alarm evaluated** | All the time |
| **Related applications** | MINT, SPtM |
| **Description** | This alarm is issued if bus phase L3 is inverted. |

back to List of alarms level 1

## ALI Bus Ph Rotation Opposite

| | |
|---|---|
| **Alarm Type** | ALI |
| **Alarmlist message** | ALI Bus Ph Rotation Opposite |
| **Alarm evaluated** | All the time |
| **Related applications** | MINT, SPtM |
| **Description** | This alarm is issued if bus phases are wired in wrong order. |

back to List of alarms level 1

## ALI Mains Ph L1 Inverted

| | |
|---|---|
| **Alarm Type** | ALI |
| **Alarmlist message** | ALI Mains Ph L1 Inverted |
| **Alarm evaluated** | All the time |
| **Related applications** | MINT, SPtM |
| **Description** | This alarm is issued if mains phase L1 is inverted. |

back to List of alarms level 1

## ALI Mains Ph L2 Inverted

| | |
|---|---|
| **Alarm Type** | ALI |
| **Alarmlist message** | ALI Mains Ph L2 Inverted |
| **Alarm evaluated** | All the time |
| **Related applications** | MINT, SPtM |
| **Description** | This alarm is issued if mains phase L2 is inverted. |

back to List of alarms level 1

## ALI Mains Ph L3 Inverted

| | |
|---|---|
| **Alarm Type** | ALI |
| **Alarmlist message** | ALI Mains Ph L3 Inverted |
| **Alarm evaluated** | All the time |
| **Related applications** | MINT, SPtM |
| **Description** | This alarm is issued if mains phase L3 is inverted. |

back to List of alarms level 1

## ALI Mains Ph Rotation Opposite

| | |
|---|---|
| **Alarm Type** | ALI |
| **Alarmlist message** | ALI Mains Ph Rotation Opposite |
| **Alarm evaluated** | All the time |
| **Related applications** | MINT, SPtM |
| **Description** | This alarm is issued if mains phases are wired in wrong order. |

back to List of alarms level 1

## Mains Voltage Unbalance ph-n

| | |
|---|---|
| **Alarm Type** | MP |
| **Alarmlist message** | Mains Voltage Unbalance ph-n |
| **Alarm evaluated** | All the time |
| **Related applications** | MINT, SPtM |
| **Description** | This alarm is issued depending on evaluation of the unbalance of the phase voltages, i.e. the difference between highest and lowest phase voltage at any given time. The following setpoints are related to it:<br>› **Mains Voltage Unbalance (page 348)** adjusts the maximum allowed difference between the highest and lowest phase voltage at any given time.<br>› **Mains Voltage Unbalance Delay (page 348)** adjusts the alarm delay. |

back to List of alarms level 1

## Mains Voltage Unbalance ph-ph

| | |
|---|---|
| **Alarm Type** | MP |
| **Alarmlist message** | Mains Voltage Unbalance ph-ph |
| **Alarm evaluated** | All the time |
| **Related applications** | MINT, SPtM |
| **Description** | This alarm is issued depending on evaluation of the unbalance of the phase to phase voltages, i.e. the difference between highest and lowest phase to phase voltage at any given time. The following setpoints are related to it:<br>› **Mains Voltage Unbalance (page 348)** adjusts the maximum allowed difference between the highest and lowest phase voltage at any given time.<br>› **Mains Voltage Unbalance Delay (page 348)** adjusts the alarm delay. |

back to List of alarms level 1

## Mains Overfrequency

| | |
|---|---|
| **Alarm Type** | MP |
| **Alarmlist message** | Mains Overfrequency |
| **Alarm evaluated** | All the time |
| **Related applications** | MINT, SPtM |
| **Description** | This alarm is active when Mains frequency is above the setpoint **Mains Overfrequency (page 348)** for the period longer than **Mains < > Frequency** |

| | |
|---|---|
| | **Delay (page 352)**. |

back to List of alarms level 1

## Mains Underfrequency

| | |
|---|---|
| **Alarm Type** | MP |
| **Alarmlist message** | Mains Underfrequency |
| **Alarm evaluated** | All the time |
| **Related applications** | MINT, SPtM |
| **Description** | This alarm is active when Mains frequency is bellow the setpoint **Mains Underfrequency (page 350)** for the period longer than **Mains < > Frequency Delay (page 352)**. |

back to List of alarms level 1

## Wrn Rental Timer Block Start

| | |
|---|---|
| **Alarm Type** | WRN |
| **Alarmlist message** | Rental Timer Block Start |
| **Alarm evaluated** | All the time |
| **Related applications** | MINT, SPtM |
| **Description** | Alarm is active when there is start command and **Rental Timer 1 (page 465)** or **Rental Timer 2 (page 467)** elapsed. |

back to List of alarms level 1

## Wrn Mains Voltage Detected

| | |
|---|---|
| **Alarm Type** | WRN |
| **Alarmlist message** | Wrn Mains Voltage Detected |
| **Alarm evaluated** | Gen-set is running |
| **Related applications** | MINT, SPtM |
| **Description** | This alarm occurs when setpoint **Default Application Select (page 257)** is adjusted to MRS and voltage is detected on mains. |

back to List of alarms level 1

## Wrn Wrong GCB Control Mode

| | |
|---|---|
| **Alarm Type** | WRN |
| **Alarmlist message** | Wrn Wrong GCB Control Mode |
| **Alarm evaluated** | all the time |
| **Related applications** | MINT, SPtM |
| **Description** | This alarm is issued when GCB Control Mode is selected to option No Button and simultaneously the controller is in SPtM mode. |

back to List of alarms level 1

## Wrn Wrong MCB Control Mode

| | |
|---|---|
| **Alarm Type** | WRN |
| **Alarmlist message** | Wrn Wrong GCB Control Mode |

| | |
|---|---|
| **Alarm evaluated** | all the time |
| **Related applications** | MINT, SPtM |
| **Description** | This alarm is issued when MCB Control Mode is selected to option No Button and simultaneously the controller is in SPtM mode. |

back to List of alarms level 1

## Wrn Fence 1 Alarm

| | |
|---|---|
| **Alarm Type** | WRN |
| **Alarmlist message** | Wrn Fence 1 Alarm |
| **Alarm evaluated** | All the time |
| **Related applications** | MINT, SPtM |
| **Description** | This alarm evaluates the GPS position of Gen-set. The following setpoint are related to it:<br>› **Geo-Fencing (page 470)**<br>› **Fence 1 Protection (page 472)**<br>› **Fence 1 Radius (page 473)** |

back to List of alarms level 1

## Wrn Fence 2 Alarm

| | |
|---|---|
| **Alarm Type** | WRN |
| **Alarmlist message** | Wrn Fence 2 Alarm |
| **Alarm evaluated** | All the time |
| **Related applications** | MINT, SPtM |
| **Description** | This alarm evaluates the GPS position of Gen-set. The following setpoint are related to it:<br>› **Geo-Fencing (page 470)**<br>› **Fence 2 Protection (page 474)**<br>› **Fence 2 Radius (page 475)** |

back to List of alarms level 1

## Wrn Fuel Theft

| | |
|---|---|
| **Alarm Type** | WRN |
| **Alarmlist message** | Wrn Fuel Theft |
| **Alarm evaluated** | All the time |
| **Related applications** | MINT, SPtM |
| **Description** | This alarm occurs when the fuel level value measured at relevant AI (Fuel Level) drops faster than is the limit adjusted by setpoint **Maximal Fuel Drop (page 312)**. |

back to List of alarms level 1

## Wrn Reverse Synchro FailWrn Synchronisation Fail

| | |
|---|---|
| **Alarm Type** | WRN |

| | |
|---|---|
| **Alarmlist message** | Wrn Reverse Synchro Fail |
| **Alarm evaluated** | During synchronization |
| **Related applications** | MINT, SPtM |
| **Description** | This alarm is issued when Gen-set is synchronizing to the mains/bus via MCB and **Synchronization Timeout (page 395)** gets elapsed. |

**back to List of alarms level 1**

### Wrn Unsupported PMS Mode

| | |
|---|---|
| **Alarm Type** | WRN |
| **Alarmlist message** | Wrn Unsupported PMS Mode |
| **Alarm evaluated** | All the time |
| **Related applications** | MINT, SPtM |
| **Description** | This alarm is active if setpoint **#Power Management Mode (page 365)** is adjusted to not available option. |

**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.

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## Sd CAN 2 Units Missing

| | |
|---|---|
| **Alarm Type** | Sd |
| **Alarmlist message** | Sd CAN 2 Units Missing |
| **Alarm evaluated** | All the time |
| **Related application** | MINT, SPtM |
| **Description** | This alarm is activated when actual number of unit on CAN2 is lower than value adjusted in setpoint **#Number Of Controllers On CAN (page 401)**, **#Number Of Units On CAN2 Check (page 292)** is Enabled and **#CAN2 Units Missing Protection (page 291)** is adjusted to Shutdown. |

back to List of alarms level 2

## Sd Module: Slot 1

| | |
|---|---|
| **Alarm Type** | SD |
| **Alarmlist message** | Module: Slot 1 |
| **Alarm evaluated** | All the time |
| **Related applications** | MINT, SPtM |
| **Description** | This alarm is issued if controller will not be able to communicate with preconfigured module 1. |

back to List of alarms level 2

## Sd Module: Slot 2

| | |
|---|---|
| **Alarm Type** | SD |
| **Alarmlist message** | Module: Slot 2 |
| **Alarm evaluated** | All the time |
| **Related applications** | MINT, SPtM |
| **Description** | This alarm is issued if controller will not be able to communicate with preconfigured module 2. |

back to List of alarms level 2

## Sd Module: Slot 3

| | |
|---|---|
| **Alarm Type** | SD |
| **Alarmlist message** | Module: Slot 3 |
| **Alarm evaluated** | All the time |
| **Related applications** | MINT, SPtM |
| **Description** | This alarm is issued if controller will not be able to communicate with preconfigured module 3. |

back to List of alarms level 2

## Sd Module: Slot 4

| | |
|---|---|
| **Alarm Type** | SD |
| **Alarmlist message** | Module: Slot 4 |
| **Alarm evaluated** | All the time |
| **Related applications** | MINT, SPtM |
| **Description** | This alarm is issued if controller will not be able to communicate with preconfigured module 4. |

back to List of alarms level 2

## Sd Module: Slot 5

| | |
|---|---|
| **Alarm Type** | SD |
| **Alarmlist message** | Module: Slot 5 |
| **Alarm evaluated** | All the time |
| **Related applications** | MINT, SPtM |
| **Description** | This alarm is issued if controller will not be able to communicate with preconfigured module 5. |

back to List of alarms level 2

## Sd Module(slotA) - false module

| | |
|---|---|
| **Alarm Type** | SD |
| **Alarmlist message** | Module(slotA) - fake module |
| **Alarm evaluated** | All the time |
| **Related applications** | MINT, SPtM |
| **Description** | This alarm indicates that false module is inserted in slot. |

back to List of alarms level 2

## Sd Module(slotB) - false module

| | |
|---|---|
| **Alarm Type** | SD |
| **Alarmlist message** | Module(slotB) - fake module |
| **Alarm evaluated** | All the time |
| **Related applications** | MINT, SPtM |
| **Description** | This alarm indicates that false module is inserted in slot. |

back to List of alarms level 2

## Sd Module(slotA) - unknown module

| | |
|---|---|
| **Alarm Type** | SD |
| **Alarmlist message** | Module(slotA) - unknown module |
| **Alarm evaluated** | All the time |
| **Related applications** | MINT, SPtM |
| **Description** | This alarm indicates that unknown module is inserted in slot. |

back to List of alarms level 2

## Sd Module(slotB) - unknown module

| | |
|---|---|
| **Alarm Type** | SD |
| **Alarmlist message** | Module(slotB) - unknown module |
| **Alarm evaluated** | All the time |
| **Related applications** | MINT, SPtM |
| **Description** | This alarm indicates that unknown module is inserted in slot. |

back to List of alarms level 2

## Sd Module(slotA) - unattended

| | |
|---|---|
| **Alarm Type** | SD |
| **Alarmlist message** | Module(slotA) - unattended |
| **Alarm evaluated** | All the time |
| **Related applications** | MINT, SPtM |
| **Description** | This alarm indicates that two same communication modules are inserted in slots and one of them will be inactive. |

back to List of alarms level 2

## Sd Module(slotB) - unattended

| | |
|---|---|
| **Alarm Type** | SD |
| **Alarmlist message** | Module(slotB) - unattended |
| **Alarm evaluated** | All the time |
| **Related applications** | MINT, SPtM |
| **Description** | This alarm indicates that two same communication modules are inserted in slots and one of them will be inactive. |

back to List of alarms level 2

## Sd Module(slotA) - comm. outage

| | |
|---|---|
| **Alarm Type** | SD |
| **Alarmlist message** | Module(slotA) - comm. outage |
| **Alarm evaluated** | All the time |
| **Related applications** | MINT, SPtM |
| **Description** | This alarm indicates that there is a problem with communication between controller and module in slot. |

back to List of alarms level 2

## Sd Module(slotB) - comm. outage

| | |
|---|---|
| **Alarm Type** | SD |
| **Alarmlist message** | Module(slotB) - comm. outage |
| **Alarm evaluated** | All the time |
| **Related applications** | MINT, SPtM |
| **Description** | This alarm indicates that there is a problem with communication between controller and module in slot. |

back to List of alarms level 2

## Sd Module(slotA) - unexpected

| | |
|---|---|
| **Alarm Type** | SD |
| **Alarmlist message** | Module(slotA) - unexpected |
| **Alarm evaluated** | All the time |
| **Related applications** | MINT, SPtM |
| **Description** | This alarm indicates that in slot is inserted different module than which is configured or the module is unconfigured and has to be configured for proper function. |

back to List of alarms level 2

## Sd Module(slotB) - unexpected

| | |
|---|---|
| **Alarm Type** | SD |
| **Alarmlist message** | Module(slotB) - unexpected |
| **Alarm evaluated** | All the time |
| **Related applications** | MINT, SPtM |
| **Description** | This alarm indicates that in slot is inserted different module than which is configured or the module is unconfigured and has to be configured for proper function. |

back to List of alarms level 2

## Sd EM(B) - a message lost

| | |
|---|---|
| **Alarm Type** | SD |
| **Alarmlist message** | EM(B) - a message lost |
| **Alarm evaluated** | All the time |
| **Related applications** | MINT, SPtM |
| **Description** | This alarm indicates that there is a problem with communication between controller and module in slot. |

back to List of alarms level 2

## Sd EM(A) - configuration mistake

| | |
|---|---|
| **Alarm Type** | SD |
| **Alarmlist message** | EM(A) - configuration mistake |
| **Alarm evaluated** | All the time |
| **Related applications** | MINT, SPtM |
| **Description** | This alarm indicates that there is a problem with configuration of binary input or output of module in slot. |

back to List of alarms level 2

## Sd EM(B) - configuration mistake

| | |
|---|---|
| **Alarm Type** | SD |
| **Alarmlist message** | EM(B) - configuration mistake |
| **Alarm evaluated** | All the time |
| **Related applications** | MINT, SPtM |
| **Description** | This alarm indicates that there is a problem with configuration of binary input or output of module in slot. |

back to List of alarms level 2

## Sd EM(A) - insufficient

| | |
|---|---|
| **Alarm Type** | SD |
| **Alarmlist message** | EM(A) - insufficient |
| **Alarm evaluated** | All the time |
| **Related applications** | MINT, SPtM |
| **Description** | This alarm indicates that module does not support all required features. |

back to List of alarms level 2

## Sd EM(B) - insufficient

| | |
|---|---|
| **Alarm Type** | SD |
| **Alarmlist message** | EM(B) - insufficient |
| **Alarm evaluated** | All the time |
| **Related applications** | MINT, SPtM |
| **Description** | This alarm indicates that module does not support all required features. |

back to List of alarms level 2

## Sd EM(A) - missing or damaged

| | |
|---|---|
| **Alarm Type** | SD |
| **Alarmlist message** | EM(A) - missing or damaged |
| **Alarm evaluated** | All the time |
| **Related applications** | MINT, SPtM |
| **Description** | This alarm indicates that there is a problem with communication with module in slot (in first 5 second there was no communication and module is configured in slot). |

back to List of alarms level 2

## Sd EM(B) - missing or damaged

| | |
|---|---|
| **Alarm Type** | SD |
| **Alarmlist message** | EM(B) - missing or damaged |
| **Alarm evaluated** | All the time |
| **Related applications** | MINT, SPtM |
| **Description** | This alarm indicates that there is a problem with communication with module in slot (if first 5 second there was no communication and module is configured in slot). |

back to List of alarms level 2

## Sd ECU Communication Fail

| | |
|---|---|
| **Alarm Type** | Shutdown |
| **Alarmlist message** | Sd ECU Communication Fail |
| **Alarm evaluated** | With configured LBO **ECU POWER RELAY (PAGE 650)** – only when this LBO is active<br>Without configured LBO **ECU POWER RELAY (PAGE 650)** – all the time |
| **Related applications** | MINT, SPtM |
| **Description** | This alarm occurs when an ECU is configured, but the communication with the ECU is not established or has dropped out. |

back to List of alarms level 2

## Sd Emergency Stop

| | |
|---|---|
| **Alarm Type** | SD |
| **Alarmlist message** | Sd Emergency Stop |
| **Alarm evaluated** | All the time |
| **Related applications** | MINT, SPtM |
| **Description** | Alarm is activated when binary input **EMERGENCY STOP (PAGE 613)** is activated. The Gen-set shuts down in the moment the input is activated and starting is blocked until the input is deactivated and fault reset is pressed.<br>***Note:*** *Use red emergency button placed on the switchboard door and connect it to a binary input of the controller. Then configure the function Emergency Stop to this binary input. It is recommended to use NC contact of the button.*<br>***Note:*** *The MCB control is not affected by this alarm.* |

back to List of alarms level 2

## Sd E-Stop

| | |
|---|---|
| **Alarm Type** | SD |
| **Alarmlist message** | Sd E-Stop |
| **Alarm evaluated** | All the time |
| **Related applications** | MINT, SPtM |
| **Description** | Alarm is activated when dedicated E-Stop input is activated. The Gen-set shuts |

| | |
|---|---|
| | down in the moment the input is activated and starting is blocked until the input is deactivated and fault reset is pressed. |

back to List of alarms level 2

## Sd Charging Alternator Fail

| | |
|---|---|
| **Alarm Type** | SD |
| **Alarmlist message** | Wrn Charging Alternator Fail |
| **Alarm evaluated** | Engine running only |
| **Related applications** | MINT, SPtM |
| **Description** | This alarm is issued if the engine is running and the voltage on the D+ terminal is lower than 80%**D+ Threshold (page 308)** of the controller supply voltage. This alarm works similar to the red “battery” alarm indicator on a vehicle dashboard.<br>The setpoint has to be in Charge Fail or Enabled position to enable this alarm. |

back to List of alarms level 2

## Sd Overspeed

| | |
|---|---|
| **Alarm Type** | SD |
| **Alarmlist message** | Sd Overspeed |
| **Alarm evaluated** | All the time |
| **Related applications** | MINT, SPtM |
| **Description** | This alarm occurs immediately when the engine speed has exceeded the limit. The behavior of the overspeed alarm is adjusted by the following setpoints:<br>› **Overspeed Sd (page 309)** adjust the overspeed limit |

back to List of alarms level 2

## Sd Underspeed

| | |
|---|---|
| **Alarm Type** | SD |
| **Alarmlist message** | Sd Underspeed |
| **Alarm evaluated** | Engine running only |
| **Related applications** | MINT, SPtM |
| **Description** | This alarm will be issued when the Gen-set is running and then stops by itself, i.e. the RPM drops under the value of setpoint **Underspeed Sd (page 309)**.<br>The underspeed alarm starts to be evaluated after successful Gen-set start and is being evaluated for the entire time that the fuel solenoid is on. |

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## Sd RPM Measurement Fail

| | |
|---|---|
| **Alarm Type** | SD |
| **Alarmlist message** | Sd RPM Measurement Fail |
| **Alarm evaluated** | During cranking |
| **Related applications** | MINT, SPtM |
| **Description** | The alarm is issued if the engine speed has not exceeded the **Starting RPM (page 296)** within the **Maximum Cranking Time (page 295)**, although some of |

| | |
|---|---|
| | additional running engine indication sources indicate that the engine has started. |

back to List of alarms level 2

## Sd Battery Flat

| | |
|---|---|
| **Alarm Type** | SD |
| **Alarmlist message** | Sd Battery Flat |
| **Alarm evaluated** | During cranking |
| **Related applications** | MINT, SPtM |
| **Description** | This alarm will be issued if the controller was reset during cranking of the gen-set. If this situation occurs, the controller supposes the starting battery is so exhausted that its voltage drops so low when starter motor is energized that it causes controller reset. |

back to List of alarms level 2

## Sd CAN2 Units Missing

| | |
|---|---|
| **Alarm Type** | BOC |
| **Alarmlist message** | Sd CAN2 Units Missing |
| **Alarm evaluated** | All the time |
| **Related applications** | MINT |
| **Description** | This alarm is activated when actual number of unit on CAN2 is lower than value adjusted in setpoint **#Number Of Controller On CAN (page 291)**, **#Number Of Units On CAN2 Check (page 292)** is Enabled and **#CAN2 Units Missing Protection (page 291)** is adjusted to Shutdown. |

back to List of alarms level 2

## Sd Start Fail

| | |
|---|---|
| **Alarm Type** | SD |
| **Alarmlist message** | Sd Start Fail |
| **Alarm evaluated** | When the gen-set is being started |
| **Related applications** | MINT, SPtM |
| **Description** | This alarm will be issued after all attempts to start the gen-set have run out but the Gen-set did not start. The following setpoints are related to this alarm:<br>› **Cranking Attempts (page 294)** adjust the number of attempts |

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## Stp GCB Fail

| | |
|---|---|
| **Alarm Type** | Stp |
| **Alarmlist message** | Stp GCB Fail |
| **Alarm evaluated** | All the time |
| **Related applications** | MINT, SPtM |
| **Description** | This alarm will occur when the **GCB Feedback (page 618)** input does not match the expected position given by the **GCB Close/Open (page 655)** output. It stays active until the mismatch between the output and feedback persists. |

| | |
|---|---|
| | ▪ If there was no command issued by the controller and the breaker (feedback) changes suddenly the position itself, the alarm will be issued immediately.<br>▪ The alarm will be also issued if the breaker does not respond to an open or close command within 5 seconds. |

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## Sd Generator L1 Overvoltage

| | |
|---|---|
| **Alarm Type** | SD |
| **Alarmlist message** | Sd Generator L1 > Voltage |
| **Alarm evaluated** | Generator excited only |
| **Related applications** | MINT, SPtM |
| **Description** | This alarm evaluates the generator phase voltage in phase 1. The following setpoints are related to it:<br>▪ **Generator Overvoltage Sd (page 328)**<br>▪ **Generator <> Voltage Delay (page 330)** |

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## Sd Generator L2 Overvoltage

| | |
|---|---|
| **Alarm Type** | SD |
| **Alarmlist message** | Sd Generator L2 > Voltage |
| **Alarm evaluated** | Generator excited only |
| **Related applications** | MINT, SPtM |
| **Description** | This alarm evaluates the generator phase voltage in phase 2. The following setpoints are related to it:<br>▪ **Generator Overvoltage Sd (page 328)**<br>▪ **Generator <> Voltage Delay (page 330)** |

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## Sd Generator L3 Overvoltage

| | |
|---|---|
| **Alarm Type** | SD |
| **Alarmlist message** | Sd Generator L3 > Voltage |
| **Alarm evaluated** | Generator excited only |
| **Related applications** | MINT, SPtM |
| **Description** | This alarm evaluates the generator phase voltage in phase 3. The following setpoints are related to it:<br>▪ **Generator Overvoltage Sd (page 328)**<br>▪ **Generator <> Voltage Delay (page 330)** |

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## Sd Generator L1L2 Overvoltage

| | |
|---|---|
| **Alarm Type** | SD |
| **Alarmlist message** | Sd Generator L1L2 > Voltage |

| | |
|---|---|
| **Alarm evaluated** | Generator excited only |
| **Related applications** | MINT, SPtM |
| **Description** | This alarm evaluates the generator phase to phase voltage between phases 1 and 2. The following setpoints are related to it:<br>› **Generator Overvoltage Sd (page 328)**<br>› **Generator <> Voltage Delay (page 330)** |

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## Sd Generator L2L3 Overvoltage

| | |
|---|---|
| **Alarm Type** | SD |
| **Alarmlist message** | Sd Generator L2L3 > Voltage |
| **Alarm evaluated** | Generator excited only |
| **Related applications** | MINT, SPtM |
| **Description** | This alarm evaluates the generator phase to phase voltage between phases 2 and 3. The following setpoints are related to it:<br>› **Generator Overvoltage Sd (page 328)**<br>› **Generator <> Voltage Delay (page 330)** |

back to List of alarms level 2

## Sd Generator L3L1 Overvoltage

| | |
|---|---|
| **Alarm Type** | SD |
| **Alarmlist message** | Sd Generator L3L1 > Voltage |
| **Alarm evaluated** | Generator excited only |
| **Related applications** | MINT, SPtM |
| **Description** | This alarm evaluates the generator phase to phase voltage between phases 3 and 1. The following setpoints are related to it:<br>› **Generator Overvoltage Sd (page 328)**<br>› **Generator <> Voltage Delay (page 330)** |

back to List of alarms level 2

## BOC Generator L1 Undervoltage

| | |
|---|---|
| **Alarm Type** | BOC |
| **Alarmlist message** | Sd Generator L1 < Voltage |
| **Alarm evaluated** | Generator excited only |
| **Related applications** | MINT, SPtM |
| **Description** | This alarm evaluates the generator phase voltage in phases 1. The following setpoints are related to it:<br>› **Generator Undervoltage BOC (page 329)**<br>› **Generator <> Voltage Delay (page 330)** |

back to List of alarms level 2

## BOC Generator L2 Undervoltage

| | |
|---|---|
| **Alarm Type** | BOC |
| **Alarmlist message** | Sd Generator L2 < Voltage |
| **Alarm evaluated** | Generator excited only |
| **Related applications** | MINT, SPtM |
| **Description** | This alarm evaluates the generator phase voltage in phases 2. The following setpoints are related to it:<br>› **Generator Undervoltage BOC (page 329)**<br>› **Generator <> Voltage Delay (page 330)** |

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## BOC Generator L3 Undervoltage

| | |
|---|---|
| **Alarm Type** | BOC |
| **Alarmlist message** | Sd Generator L3 < Voltage |
| **Alarm evaluated** | Generator excited only |
| **Related applications** | MINT, SPtM |
| **Description** | This alarm evaluates the generator phase voltage in phases 3. The following setpoints are related to it:<br>› **Generator Undervoltage BOC (page 329)**<br>› **Generator <> Voltage Delay (page 330)** |

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## BOC Generator L1L2 Undervoltage

| | |
|---|---|
| **Alarm Type** | BOC |
| **Alarmlist message** | Sd Generator L1L2 < Voltage |
| **Alarm evaluated** | Generator excited only |
| **Related applications** | MINT, SPtM |
| **Description** | This alarm evaluates the generator phase to phase voltage between phases 1 and 2. The following setpoints are related to it:<br>› **Generator Undervoltage BOC (page 329)**<br>› **Generator <> Voltage Delay (page 330)** |

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## BOC Generator L2L3 Undervoltage

| | |
|---|---|
| **Alarm Type** | BOC |
| **Alarmlist message** | Sd Generator L2L3 < Voltage |
| **Alarm evaluated** | Generator excited only |
| **Related applications** | MINT, SPtM |
| **Description** | This alarm evaluates the generator phase to phase voltage between phases 2 and 3. The following setpoints are related to it:<br>› **Generator Undervoltage BOC (page 329)**<br>› **Generator <> Voltage Delay (page 330)** |

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## BOC Generator L3L1 Undervoltage

| | |
|---|---|
| **Alarm Type** | BOC |
| **Alarmlist message** | Sd Generator L3L1 < Voltage |
| **Alarm evaluated** | Generator excited only |
| **Related applications** | MINT, SPtM |
| **Description** | This alarm evaluates the generator phase to phase voltage between phases 3 and 1. The following setpoints are related to it:<br>› **Generator Undervoltage BOC (page 329)**<br>› **Generator <> Voltage Delay (page 330)** |

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## BOC Coolant Temp

| | |
|---|---|
| **Alarm Type** | BOC |
| **Alarmlist message** | BOC Coolant Temp |
| **Alarm evaluated** | All the time |
| **Related applications** | MINT, SPtM |
| **Description** | Breaker Open and Stop alarm for Coolant Temp user protection. |

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## BOC Fuel Level

| | |
|---|---|
| **Alarm Type** | BOC |
| **Alarmlist message** | BOC Fuel Level |
| **Alarm evaluated** | All the time |
| **Related applications** | MINT, SPtM |
| **Description** | Breaker Open and Stop alarm for Fuel Level user protection. |

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## BOC Generator L1 Undervoltage

| | |
|---|---|
| **Alarm Type** | BOC |
| **Alarmlist message** | BOC Generator L1 < Voltage |
| **Alarm evaluated** | Generator excited only |
| **Related applications** | MINT, SPtM |
| **Description** | This alarm evaluates the generator phase voltage in phases 1. The following setpoints are related to it:<br>› **Generator Undervoltage BOC (page 329)**<br>› **Generator <> Voltage Delay (page 330)** |

back to List of alarms level 2

## BOC Generator L2 Undervoltage

| | |
|---|---|
| **Alarm Type** | BOC |
| **Alarmlist message** | BOC Generator L2 < Voltage |

| | |
|---|---|
| **Alarm evaluated** | Generator excited only |
| **Related applications** | MINT, SPtM |
| **Description** | This alarm evaluates the generator phase voltage in phases 2. The following setpoints are related to it:<br>› **Generator Undervoltage BOC (page 329)**<br>› **Generator <> Voltage Delay (page 330)** |

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## BOC Generator L3 Undervoltage

| | |
|---|---|
| **Alarm Type** | BOC |
| **Alarmlist message** | BOC Generator L3 < Voltage |
| **Alarm evaluated** | Generator excited only |
| **Related applications** | MINT, SPtM |
| **Description** | This alarm evaluates the generator phase voltage in phases 3. The following setpoints are related to it:<br>› **Generator Undervoltage BOC (page 329)**<br>› **Generator <> Voltage Delay (page 330)** |

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## BOC Generator L1L2 Undervoltage

| | |
|---|---|
| **Alarm Type** | BOC |
| **Alarmlist message** | BOC Generator L1L2 < Voltage |
| **Alarm evaluated** | Generator excited only |
| **Related applications** | MINT, SPtM |
| **Description** | This alarm evaluates the generator phase to phase voltage between phases 1 and 2. The following setpoints are related to it:<br>› **Generator Undervoltage BOC (page 329)**<br>› **Generator <> Voltage Delay (page 330)** |

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## BOC Generator L2L3 Undervoltage

| | |
|---|---|
| **Alarm Type** | BOC |
| **Alarmlist message** | BOC Generator L2L3 < Voltage |
| **Alarm evaluated** | Generator excited only |
| **Related applications** | MINT, SPtM |
| **Description** | This alarm evaluates the generator phase to phase voltage between phases 2 and 3. The following setpoints are related to it:<br>› **Generator Undervoltage BOC (page 329)**<br>› **Generator <> Voltage Delay (page 330)** |

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## BOC Generator L3L1 Undervoltage

| | |
|---|---|
| **Alarm Type** | BOC |
| **Alarmlist message** | BOC Generator L3L1 < Voltage |
| **Alarm evaluated** | Generator excited only |
| **Related applications** | MINT, SPtM |
| **Description** | This alarm evaluates the generator phase to phase voltage between phases 3 and 1. The following setpoints are related to it:<br>› **Generator Undervoltage BOC (page 329)**<br>› **Generator <> Voltage Delay (page 330)** |

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## BOC Gen Voltage Unbalance Ph-Ph

| | |
|---|---|
| **Alarm Type** | BOC |
| **Alarmlist message** | BOC Gen Voltage Unbalance ph-ph |
| **Alarm evaluated** | Generator excited only |
| **Related applications** | MINT, SPtM |
| **Description** | This alarm evaluates the unbalance of the phase to phase voltages, i.e. the difference between highest and lowest phase to phase voltage at any given time. The following setpoints are related to it:<br>› **Generator V Unbalance (page 330)** adjusts the maximum allowed difference between the highest and lowest phase voltage at any given time.<br>› **Generator V Unbalance Delay (page 330)** adjusts the alarm delay. |

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## BOC Gen Voltage Unbalance Ph-N

| | |
|---|---|
| **Alarm Type** | BOC |
| **Alarmlist message** | BOC Gen Voltage Unbalance ph-n |
| **Alarm evaluated** | Generator excited only |
| **Related applications** | MINT, SPtM |
| **Description** | This alarm evaluates the unbalance of the phase voltages, i.e. the difference between highest and lowest phase voltage at any given time. The following setpoints are related to it:<br>› **Generator V Unbalance (page 330)** adjusts the maximum allowed difference between the highest and lowest phase voltage at any given time.<br>› **Generator V Unbalance Delay (page 330)** adjusts the alarm delay. |

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## BOC Generator Overfrequency

| | |
|---|---|
| **Alarm Type** | BOC |
| **Alarmlist message** | BOC Generator > Frequency |

| | |
|---|---|
| **Alarm evaluated** | Generator excited only |
| **Related applications** | MINT, SPtM |
| **Description** | This alarm evaluates the generator frequency in the phase L1. The following setpoints are related to it:<br>› **Generator Overfrequency BOC (page 331)**<br>› **Generator <> Frequency Delay (page 332)** |

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## BOC Generator Underfrequency

| | |
|---|---|
| **Alarm Type** | BOC |
| **Alarmlist message** | BOC Generator < Frequency |
| **Alarm evaluated** | Generator excited only |
| **Related applications** | MINT, SPtM |
| **Description** | This alarm evaluates the generator frequency in the phase L1. The following setpoints are related to it:<br>› **Generator Underfrequency BOC (page 332)**<br>› **Generator <> Voltage Delay (page 330)** |

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## MP Mains L1 Overvoltage

| | |
|---|---|
| **Alarm Type** | MP |
| **Alarmlist message** | No |
| **Alarm evaluated** | All the time |
| **Related applications** | MINT, SPtM |
| **Description** | This alarm evaluates the Mains phase voltage in phases. The following setpoints are related to it:<br>› **Mains Overvoltage (page 343)**<br>› **Mains Overvoltage Delay (page 344)** |

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## MP Mains L1 Undervoltage

| | |
|---|---|
| **Alarm Type** | MP |
| **Alarmlist message** | No |
| **Alarm evaluated** | All the time |
| **Related applications** | MINT, SPtM |
| **Description** | This alarm evaluates the Mains phase voltage in phases. The following setpoints are related to it:<br>› **Mains Undervoltage (page 346)**<br>› **Mains Undervoltage Delay (page 346)** |

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## MP Mains L2 Overvoltage

| | |
|---|---|
| **Alarm Type** | MP |
| **Alarmlist message** | No |
| **Alarm evaluated** | All the time |
| **Related applications** | MINT, SPtM |
| **Description** | This alarm evaluates the Mains phase voltage in phases. The following setpoints are related to it:<br>› **Mains Overvoltage (page 343)**<br>› **Mains Overvoltage Delay (page 344)** |

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## MP Mains L2 Undervoltage

| | |
|---|---|
| **Alarm Type** | MP |
| **Alarmlist message** | No |
| **Alarm evaluated** | All the time |
| **Related applications** | MINT, SPtM |
| **Description** | This alarm evaluates the Mains phase voltage in phases. The following setpoints are related to it:<br>› **Mains Undervoltage (page 346)**<br>› **Mains Undervoltage Delay (page 346)** |

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## MP Mains L3 Overvoltage

| | |
|---|---|
| **Alarm Type** | MP |
| **Alarmlist message** | No |
| **Alarm evaluated** | All the time |
| **Related applications** | MINT, SPtM |
| **Description** | This alarm evaluates the Mains phase voltage in phases. The following setpoints are related to it:<br>› **Mains Overvoltage (page 343)**<br>› **Mains Overvoltage Delay (page 344)** |

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## MP Mains L3 Overvoltage

| | |
|---|---|
| **Alarm Type** | MP |
| **Alarmlist message** | No |
| **Alarm evaluated** | All the time |
| **Related applications** | MINT, SPtM |
| **Description** | This alarm evaluates the Mains phase voltage in phases. The following setpoints are related to it:<br>› **Mains Undervoltage (page 346)**<br>› **Mains Undervoltage Delay (page 346)** |

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## MP Mains L1L2 Overvoltage

| | |
|---|---|
| **Alarm Type** | MP |
| **Alarmlist message** | No |
| **Alarm evaluated** | All the time |
| **Related applications** | MINT, SPtM |
| **Description** | This alarm evaluates the Mains phase voltage in phases L1 and L2. The following setpoints are related to it:<br>› **Mains Overvoltage (page 343)**<br>› **Mains Overvoltage Delay (page 344)** |

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## MP Mains L1L2 Undervoltage

| | |
|---|---|
| **Alarm Type** | MP |
| **Alarmlist message** | No |
| **Alarm evaluated** | All the time |
| **Related applications** | MINT, SPtM |
| **Description** | This alarm evaluates the Mains phase voltage in phases L1 and L2. The following setpoints are related to it:<br>› **Mains Undervoltage (page 346)**<br>› **Mains Undervoltage Delay (page 346)** |

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## MP Mains L2L3 Overvoltage

| | |
|---|---|
| **Alarm Type** | MP |
| **Alarmlist message** | No |
| **Alarm evaluated** | All the time |
| **Related applications** | MINT, SPtM |
| **Description** | This alarm evaluates the Mains phase voltage in phases L2 and L3. The following setpoints are related to it:<br>› **Mains Overvoltage (page 343)**<br>› **Mains Overvoltage Delay (page 344)** |

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## MP Mains L2L3 Undervoltage

| | |
|---|---|
| **Alarm Type** | MP |
| **Alarmlist message** | No |
| **Alarm evaluated** | All the time |
| **Related applications** | MINT, SPtM |
| **Description** | This alarm evaluates the Mains phase voltage in phases L2 and L3. The following setpoints are related to it:<br>› **Mains Undervoltage (page 346)** |

| | |
|---|---|
| | › **Mains Undervoltage Delay (page 346)** |

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## MP Mains L3L1 Overvoltage

| | |
|---|---|
| **Alarm Type** | MP |
| **Alarmlist message** | No |
| **Alarm evaluated** | All the time |
| **Related applications** | MINT, SPtM |
| **Description** | This alarm evaluates the Mains phase voltage in phases L3 and L1. The following setpoints are related to it:<br>› **Mains Overvoltage (page 343)**<br>› **Mains Overvoltage Delay (page 344)** |

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## MP Mains L3L1 Undervoltage

| | |
|---|---|
| **Alarm Type** | MP |
| **Alarmlist message** | No |
| **Alarm evaluated** | All the time |
| **Related applications** | MINT, SPtM |
| **Description** | This alarm evaluates the Mains phase voltage in phases L3 and L1. The following setpoints are related to it:<br>› **Mains Undervoltage (page 346)**<br>› **Mains Undervoltage Delay (page 346)** |

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## MP Mains Overfrequency

| | |
|---|---|
| **Alarm Type** | MP |
| **Alarmlist message** | No |
| **Alarm evaluated** | All the time |
| **Related applications** | MINT, SPtM |
| **Description** | This alarm evaluates the Mains phase voltage in phases 1. The following setpoints are related to it:<br>› **Mains Overfrequency (page 348)**<br>› **Mains < > Frequency Delay (page 352)** |

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## MP Mains Underfrequency

| | |
|---|---|
| **Alarm Type** | MP |
| **Alarmlist message** | No |
| **Alarm evaluated** | All the time |
| **Related applications** | MINT, SPtM |
| **Description** | This alarm evaluates the Mains phase voltage in phases 1. The following setpoints are related to it: |

| | |
|---|---|
| | › **Mains Underfrequency (page 350)**<br>› **Mains < > Frequency Delay (page 352)** |

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## BOC Reverse Power

| | |
|---|---|
| **Alarm Type** | BOC |
| **Alarmlist message** | BOC Reverse Power |
| **Alarm evaluated** | Gen-set is running |
| **Related applications** | MINT, SPtM |
| **Description** | The alarm is issued when the level of active power (-kW) gets under limit given by setpoint **Reverse Power Level (page 333)** for time longer than the value of setpoint **Reverse Power Delay (page 333)**. |

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## BOC Current Unbalance

| | |
|---|---|
| **Alarm Type** | BOC |
| **Alarmlist message** | BOC Current Unbalance |
| **Alarm evaluated** | All the time |
| **Related applications** | MINT, SPtM |
| **Description** | This alarm evaluates the unbalance of the phase currents, i.e. the difference between highest and lowest phase current at any given time. The following setpoints are related to it:<br>› **Generator Current Unbalance (page 326)** adjusts the maximum allowed difference between the highest and lowest phase current at any given time.<br>› **Generator Current Unbalance Delay (page 327)** adjusts the alarm delay. |

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## BOC Overload

| | |
|---|---|
| **Alarm Type** | BOC |
| **Alarmlist message** | BOC Overload |
| **Alarm evaluated** | All the time |
| **Related applications** | MINT, SPtM |
| **Description** | The alarm is issued when the gen-set power is over the limit for time period longer than the delay. The behavior of the overload alarm is adjusted by the following setpoints:<br>› **Overload BOC (page 323)** adjusts the overload limit.<br>› **Overload Delay (page 324)** adjusts the delay |

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## BOC Short Circuit

| | |
|---|---|
| **Alarm Type** | BOC |

| | |
|---|---|
| **Alarmlist message** | BOC Short Circuit |
| **Alarm evaluated** | All the time |
| **Related applications** | MINT, SPtM |
| **Description** | This is a fast overcurrent protection. The following setpoints are related to this alarm:<br>› **Short Circuit (page 325)** adjusts the short current limit<br>› **Short Circuit Delay (page 325)** adjusts the delay in fine steps |

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## Sd Earth Fault Current

| | |
|---|---|
| **Alarm Type** | SD |
| **Alarmlist message** | Sd Earth Fault Current |
| **Alarm evaluated** | All the time |
| **Related applications** | MINT, SPtM |
| **Description** | This alarm indicates that the value of earth fault current is higher than adjusted limit. The following setpoints are related to it:<br>› **IDMT Earth Fault Current Sd (page 521)** adjusts the maximum allowed earth fault current.<br>› **IDMT Earth Fault Current Delay (page 520)** adjusts the alarm delay. |

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## Sd Oil Pressure

| | |
|---|---|
| **Alarm Type** | BOCSD |
| **Alarmlist message** | Sd Oil Pressure |
| **Alarm evaluated** | All the time |
| **Related applications** | MINT, SPtM |
| **Description** | Shutdown alarm for Oil Pressure user protection. |

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## BOC Overcurrent IDMT

| | |
|---|---|
| **Alarm Type** | BOC |
| **Alarmlist message** | Sd + Name of binary input |
| **Alarm evaluated** | Generator excited only |
| **Related applications** | MINT, SPtM |
| **Description** | This alarm is issued if IDMT protection is activated due to over-crossing the IDMT curve set by setpoints **IDMT Generator >A Delay (page 325)**.<br>The behaviour of the overcurrent alarm is adjusted by the following setpoints:<br>› **IDMT Generator >A Delay (page 325)** defines the reaction time of the protection when the current is twice the amount of nominal value.<br>› **Nominal Current (page 275)** set the nominal current level, where the alarm starts to be evaluated. The reaction time is infinite at this point. |

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## BOC Coolant Temp

| | |
|---|---|
| **Alarm Type** | BOC |
| **Alarmlist message** | BOC Coolant Temp |
| **Alarm evaluated** | All the time |
| **Related applications** | MINT, SPtM |
| **Description** | Breaker Open and Stop alarm for Coolant Temp user protection. |

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## BOC Rental Timer 1 Exceeded

| | |
|---|---|
| **Alarm Type** | BOC |
| **Alarmlist message** | BOC Rental Timer 1 Exceeded |
| **Alarm evaluated** | All the time |
| **Related applications** | MINT, SPtM |
| **Description** | This alarm is issued if Rental Timer 1 BOC will timer elapse. |

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## BOC Rental Timer 2 Exceeded

| | |
|---|---|
| **Alarm Type** | BOC |
| **Alarmlist message** | BOC Rental Timer 2 Exceeded |
| **Alarm evaluated** | All the time |
| **Related applications** | MINT, SPtM |
| **Description** | This alarm is issued if Rental Timer 2 BOC will timer elapse. |

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## BOC Maintenance Timer 1 RunHours

| | |
|---|---|
| **Alarm Type** | BOC |
| **Alarmlist message** | BOC Maintenance Timer 1 RunHours |
| **Alarm evaluated** | All the time |
| **Related applications** | MINT, SPtM |
| **Description** | The alarm is active when the value **Maintenance Timer 1 RunHours (page 574)** reaches 0.<br>The value is adjustable by setpoint **Maintenance Timer 1 RunHours (page 319)** (unit is hours-h) and it counts down while engine is running. Setpoint **Maintenance Timer 1 Protection (page 320)** has to be set to: BOC |

back to List of alarms level 2

## BOC Maintenance Timer 1 Interval

| | |
|---|---|
| **Alarm Type** | BOC |
| **Alarmlist message** | BOC Maintenance Timer 1 Interval |
| **Alarm evaluated** | All the time |
| **Related applications** | MINT, SPtM |
| **Description** | The alarm is active when the value **Maintenance Timer 1 RunHours (page 574)** reaches 0. |

| | |
|---|---|
| | The value is adjustable by setpoint **Maintenance Timer 1 Interval (page 319)** (unit is in months-m) and it counts down in days based on actual date (No matter if engine is running or not). Setpoint **Maintenance Timer 1 Protection (page 320)** has to be set to: Warning |

back to List of alarms level 2

## BOC Maintenance Timer 2 RunHours

| | |
|---|---|
| **Alarm Type** | BOC |
| **Alarmlist message** | BOC Maintenance Timer 2 RunHours |
| **Alarm evaluated** | All the time |
| **Related applications** | MINT, SPtM |
| **Description** | The alarm is active when the value **Maintenance Timer 2 RunHours (page 574)** reaches 0.<br>The value is adjustable by setpoint **Maintenance Timer 2 RunHours (page 320)** (unit is hours-h) and it counts down while engine is running. Setpoint **Maintenance Timer 2 Protection (page 321)** has to be set to: BOC |

back to List of alarms level 2

## BOC Maintenance Timer 2 Interval

| | |
|---|---|
| **Alarm Type** | BOC |
| **Alarmlist message** | BOC Maintenance Timer 2 Interval |
| **Alarm evaluated** | All the time |
| **Related applications** | MINT, SPtM |
| **Description** | The alarm is active when the value **Maintenance Timer 2 RunHours (page 574)** reaches 0.<br>The value is adjustable by setpoint **Maintenance Timer 2 Interval (page 321)** (unit is in months-m) and it counts down in days based on actual date (No matter if engine is running or not). Setpoint **Maintenance Timer 2 Protection (page 321)** has to be set to: Warning |

back to List of alarms level 2

## BOC Maintenance Timer 3 RunHours

| | |
|---|---|
| **Alarm Type** | BOC |
| **Alarmlist message** | BOC Maintenance Timer 3 RunHours |
| **Alarm evaluated** | All the time |
| **Related applications** | MINT, SPtM |
| **Description** | The alarm is active when the value **Maintenance Timer 3 RunHours (page 575)** reaches 0.<br>The value is adjustable by setpoint **Maintenance Timer 3 RunHours (page 322)** (unit is hours-h) and it counts down while engine is running. Setpoint **Maintenance Timer 3 Protection (page 323)** has to be set to: BOC |

back to List of alarms level 2

## BOC Maintenance Timer 3 Interval

| | |
|---|---|
| **Alarm Type** | BOC |
| **Alarmlist message** | BOC Maintenance Timer 3 Interval |
| **Alarm evaluated** | All the time |
| **Related applications** | MINT, SPtM |
| **Description** | The alarm is active when the value **Maintenance Timer 3 RunHours (page 575)** reaches 0.<br>The value is adjustable by setpoint **Maintenance Timer 3 Interval (page 322)** (unit is in months-m) and it counts down in days based on actual date (No matter if engine is running or not). Setpoint **Maintenance Timer 3 Protection (page 323)** has to be set to: Warning |

back to List of alarms level 2

## Sd Fence 1 Alarm

| | |
|---|---|
| **Alarm Type** | Shutdown |
| **Alarmlist message** | Sd Fence 1 Alarm |
| **Alarm evaluated** | All the time |
| **Related applications** | MINT, SPtM |
| **Description** | This alarm evaluates the GPS position of Gen-set. The following setpoint are related to it:<br>› **Geo-Fencing (page 470)**<br>› **Fence 1 Protection (page 472)**<br>› **Fence 1 Radius (page 473)** |

back to List of alarms level 2

## BOC Fence 1 Alarm

| | |
|---|---|
| **Alarm Type** | BOC |
| **Alarmlist message** | BOC Fence 1 Alarm |
| **Alarm evaluated** | All the time |
| **Related applications** | MINT, SPtM |
| **Description** | This alarm evaluates the GPS position of Gen-set. The following setpoint are related to it:<br>› **Geo-Fencing (page 470)**<br>› **Fence 1 Protection (page 472)**<br>› **Fence 1 Radius (page 473)** |

back to List of alarms level 2

## Sd Fence 2 Alarm

| | |
|---|---|
| **Alarm Type** | Shutdown |
| **Alarmlist message** | Sd Fence 2 Alarm |
| **Alarm evaluated** | All the time |
| **Related applications** | MINT, SPtM |

| | |
|---|---|
| **Description** | This alarm evaluates the GPS position of Gen-set. The following setpoint are related to it:<br>› **Geo-Fencing (page 470)**<br>› **Fence 1 Protection (page 472)**<br>› **Fence 1 Radius (page 473)** |

back to List of alarms level 2

## BOC Fence 2 Alarm

| | |
|---|---|
| **Alarm Type** | BOC |
| **Alarmlist message** | BOC Fence 2 Alarm |
| **Alarm evaluated** | All the time |
| **Related applications** | MINT, SPtM |
| **Description** | This alarm evaluates the GPS position of Gen-set. The following setpoint are related to it:<br>› **Geo-Fencing (page 470)**<br>› **Fence 1 Protection (page 472)**<br>› **Fence 1 Radius (page 473)** |

back to List of alarms level 2

## Stp Synchronisation Fail

| | |
|---|---|
| **Alarm Type** | ProtSTP |
| **Alarmlist message** | Stp Synchronisation Fail |
| **Alarm evaluated** | All the time |
| **Related applications** | MINT, SPtM |
| **Description** | This alarm is issued if the synchronization timeout gets elapsed (forward synchronization). |

back to List of alarms level 2

## Stp GCB Fail

| | |
|---|---|
| **Alarm Type** | ProtSTP |
| **Alarmlist message** | Stp GCB Fail |
| **Alarm evaluated** | All the time |
| **Related applications** | MINT, SPtM |
| **Description** | This alarm is immediately activated when there is an unexpected change of GCB state. That means LBI **GCB Feedback (page 618)** changes without request from LBO **GCB Close/Open (page 655)** while Setpoint **GCB Control Mode (page 271)** is set to Internal or Follow.<br>Or it is activated after 500 ms when there is a mismatch between LBI **GCB Feedback (page 618)** and LBI **GCB Feedback Negative (page 619)**. |

back to List of alarms level 2

## Stp GCB Fail To Close

| | |
|---|---|
| **Alarm Type** | ProtSTP |

| | |
|---|---|
| **Alarmlist message** | Stp GCB Fail To Close |
| **Alarm evaluated** | All the time |
| **Related applications** | MINT, SPtM |
| **Description** | Alarm is issued after 2 (5 if synchro is not used) seconds when LBO **GCB CLOSE/OPEN (PAGE 655)** closed and LBI **GCB FEEDBACK (PAGE 618)** did not close for the second try. |

back to List of alarms level 2

### Stp GCB Fail To Open

| | |
|---|---|
| **Alarm Type** | ProtSTP |
| **Alarmlist message** | Stp GCB Fail To Open |
| **Alarm evaluated** | All the time |
| **Related applications** | MINT, SPtM |
| **Description** | Alarm is issued after 2 (5 if synchro is not used) seconds when LBO **GCB CLOSE/OPEN (PAGE 655)** opened and LBI **GCB FEEDBACK (PAGE 618)** did not open. |

back to List of alarms level 2

### Sd Parallel Work

| | |
|---|---|
| **Alarm Type** | Shutdown |
| **Alarmlist message** | Sd Parallel Work |
| **Alarm evaluated** | All the time |
| **Related applications** | MINT, SPtM |
| **Description** | This alarm is active when GCB is closed externally while MCB is closed. |

back to List of alarms level 2

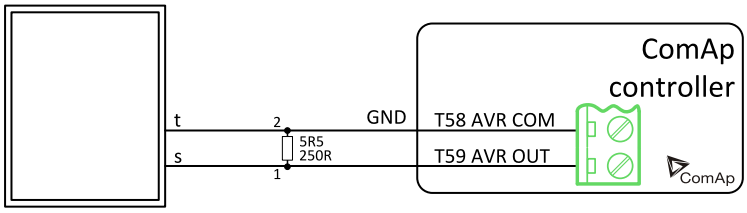
# 8.3 AVR interfaces

It is possible to connect various AVRis to the controllers.

> **IMPORTANT: Read carefully AVR instructions before connecting to a controller! It is not sufficient to use suggested wiring settings, it is necessary as well to adjust AVR settings!**

## 8.3.1 AVR interfaces alphabetically

### AVK Newage Cosimat N+




**Voltage/PF Control:**

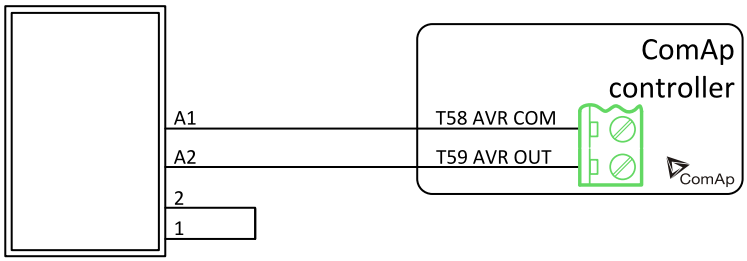
*Voltage Regulator Character* = NEGATIVE

*Voltage Regulator Bias* = 0,50 V

*Voltage Regulator Low Limit* = 0,00 V

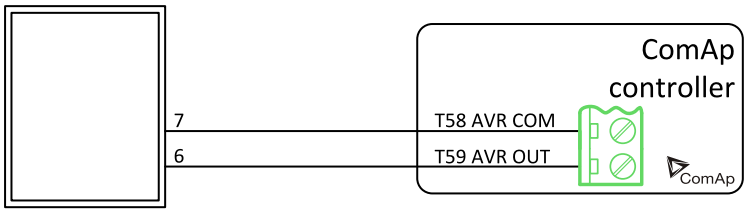
*Voltage Regulator High Limit* = 2,00 V

## AVK Newage MA330, 327, 321, 341




**Voltage/PF Control:**
*Voltage Regulator Character* = POSITIVE
*Voltage Regulator Bias* = 0,00 V
*Voltage Regulator Low Limit* = -2,00 V
*Voltage Regulator High Limit* = 2,00 V

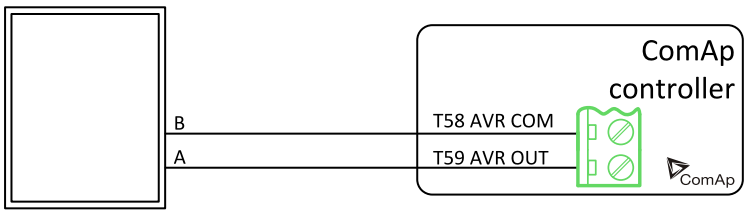
## Basler: APR 63-5, AEC 63-7, KR-FX, KR-FFX




AVRi output is connected instead of external resistor for voltage adjusting.

**Voltage/PF Control:**
*Voltage Regulator Character* = POSITIVE
*Voltage Regulator Bias* = 1,00 V
*Voltage Regulator Low Limit* = 0,00 V
*Voltage Regulator High Limit* = 2,00 V

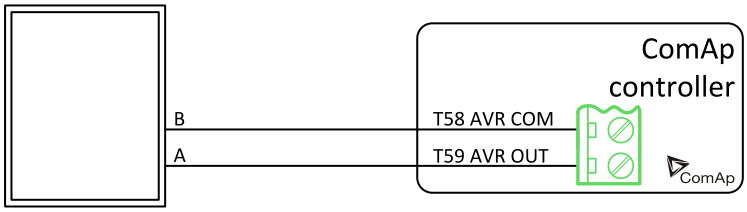
## Basler: DECS 100




AVRi output is connected instead of external resistor for voltage adjusting.

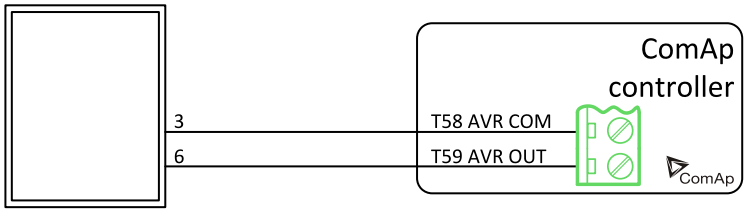
**Voltage/PF Control:**
*Voltage Regulator Character* = POSITIVE
*Voltage Regulator Bias* = 0,00 V
*Voltage Regulator Low Limit* = -2,00 V
*Voltage Regulator High Limit* = 2,00 V

## Basler: DECS 200




**Voltage/PF Control:**
*Voltage Regulator Character* = POSITIVE
*Voltage Regulator Bias* = 0,00 V
*Voltage Regulator Low Limit* = -2,00 V
*Voltage Regulator High Limit* = 2,00 V

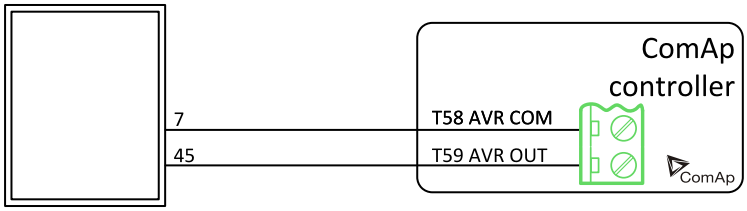
## Catterpillar CDVR




Pin 44 on DVR – PF regulation directly from DVR is not connected.

**Voltage/PF Control:**
*Voltage Regulator Character* = POSITIVE
*Voltage Regulator Bias* = 0,00 V
*Voltage Regulator Low Limit* = -6,00 V
*Voltage Regulator High Limit* = 6,00 V

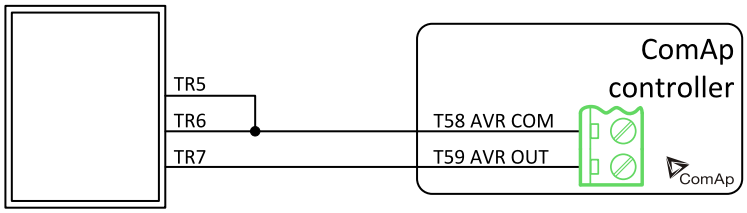
## Catterpillar DVR




Pin 44 on DVR – PF regulation directly from DVR is not connected.

**Voltage/PF Control:**
*Voltage Regulator Character* = POSITIVE
*Voltage Regulator Bias* = 2,00 V
*Voltage Regulator Low Limit* = 0,00 V
*Voltage Regulator High Limit* = 4,00 V

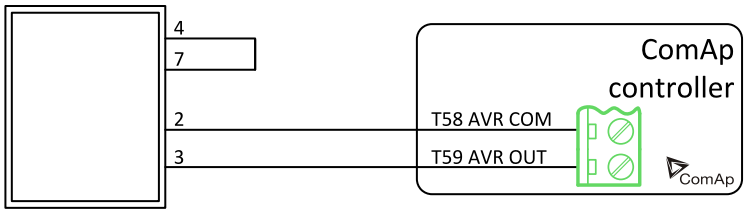
## Catterpillar VR6, VR3F




For VR3F link 4-7 has to be removed.

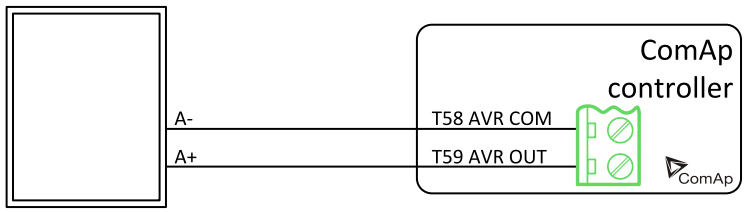
**Voltage/PF Control:**
*Voltage Regulator Character* = POSITIVE
*Voltage Regulator Bias* = 1,00 V
*Voltage Regulator Low Limit* = 0,00 V
*Voltage Regulator High Limit* = 2,00 V

## Catterpillar VR6-B



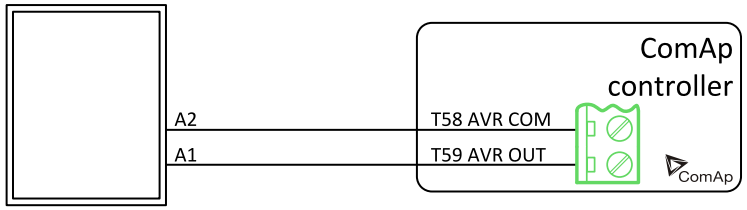

**Voltage/PF Control:**
*Voltage Regulator Character* = POSITIVE
*Voltage Regulator Bias* = 0,00 V
*Voltage Regulator Low Limit* = -2,00 V
*Voltage Regulator High Limit* = 2,00 V

## ENGGA WT- 2



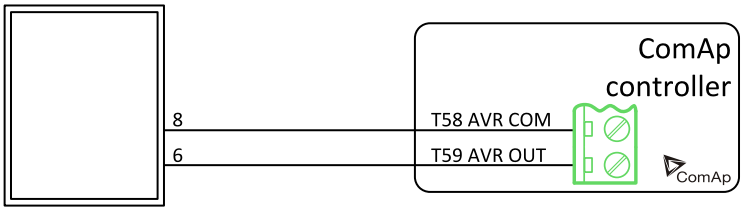

**Voltage/PF Control:**
*Voltage Regulator Character* = POSITIVE
*Voltage Regulator Bias* = 0,00 V
*Voltage Regulator Low Limit* = -2,00 V
*Voltage Regulator High Limit* = 2,00 V

## ENGGA WT- 3



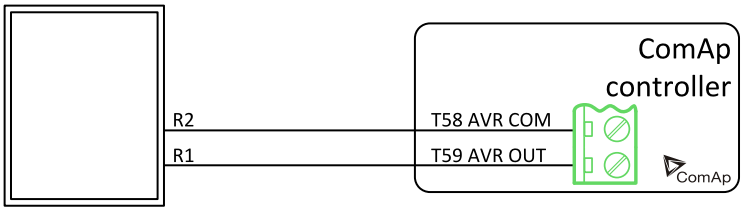

**Voltage/PF Control:**
*Voltage Regulator Character* = POSITIVE
*Voltage Regulator Bias* = 0,00 V
*Voltage Regulator Low Limit* = -2,00 V
*Voltage Regulator High Limit* = 2,00 V

## KATO KCR 360



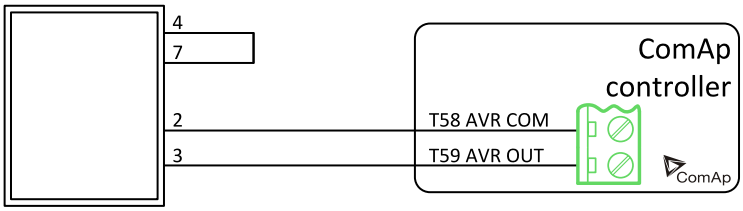

**Voltage/PF Control:**
*Voltage Regulator Character* = POSITIVE
*Voltage Regulator Bias* = 0,00 V
*Voltage Regulator Low Limit* = -2,00 V
*Voltage Regulator High Limit* = 2,00 V

## KATO KCR 760



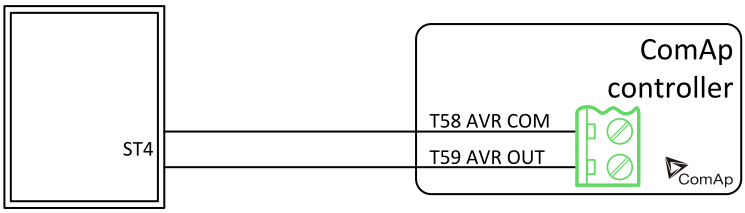

**Voltage Control:**
*Voltage Regulator Character* = POSITIVE
*Voltage Regulator Bias* = -0,20 V
*Voltage Regulator Low Limit* = -2,00 V
*Voltage Regulator High Limit* = 2,00 V

## KATO KCR K-65-12B




**Voltage/PF Control:**
*Voltage Regulator Character* = POSITIVE
*Voltage Regulator Bias* = 0,00 V
*Voltage Regulator Low Limit* = -2,00 V
*Voltage Regulator High Limit* = 2,00 V

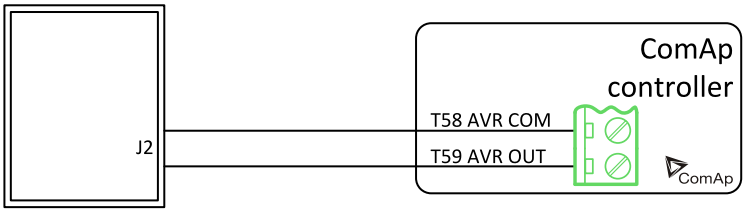
## Kutai EA448




AVRi output is connected instead of Remote voltage trimmer 470 Ω to terminal ST4. Module R726 is not required.

**Voltage/PF Control:**
*Voltage Regulator Character* = POSITIVE
*Voltage Regulator Bias* = 1,00 V
*Voltage Regulator Low Limit* = 0,00 V
*Voltage Regulator High Limit* = 2,00 V

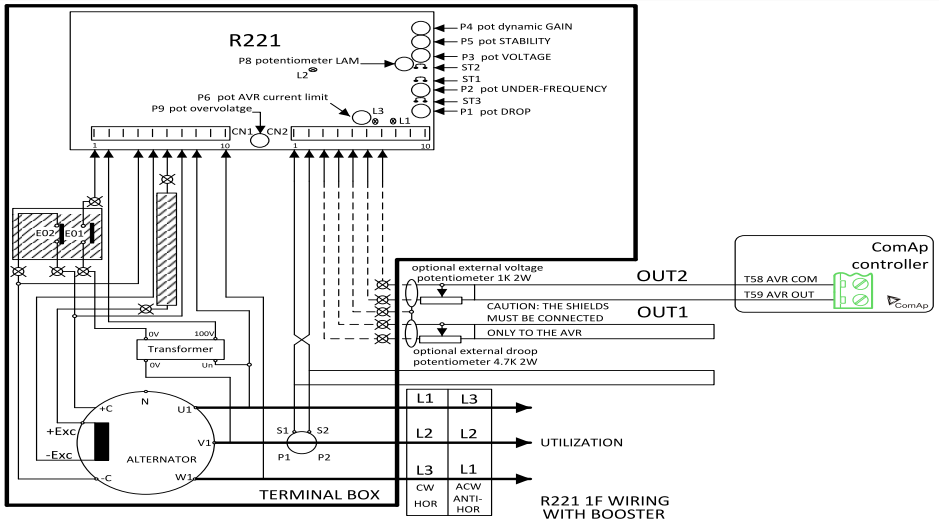
## Leroy Somer: R 129




AVRi output is connected instead of Remote voltage trimmer 470 Ω to terminal J2. module R726 is not required.

**Voltage/PF Control:**
*Voltage Regulator Character* = POSITIVE
*Voltage Regulator Bias* = 1,00 V
*Voltage Regulator Low Limit* = 0,00 V
*Voltage Regulator High Limit* = 2,00 V

## Leroy Somer: R 221, R 222




Module R726 is not required. AVRi trim to minimum counter clockwise +5%.

**Voltage/PF Control:**

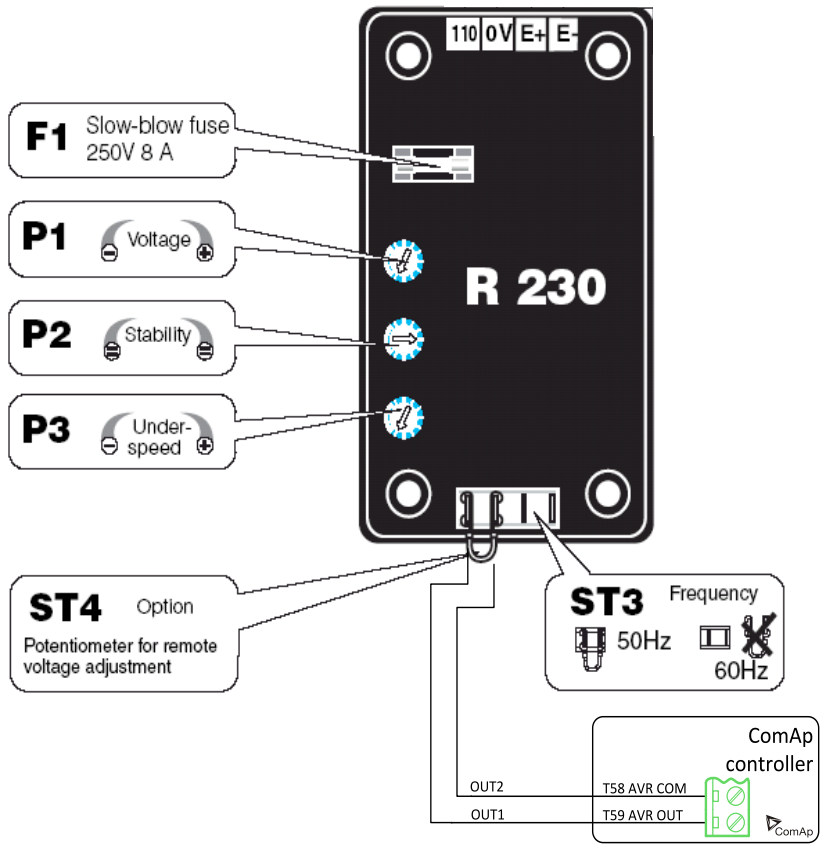
*Voltage Regulator Character* = POSITIVE

*Voltage Regulator Bias* = -1,00 V

*Voltage Regulator Low Limit* = -2,10 V

*Voltage Regulator High Limit* = 2,10 V

## Leroy Somer: R 230




Module R726 is not required. AVRi trim minimum counter clockwise.

**Voltage/PF Control:**

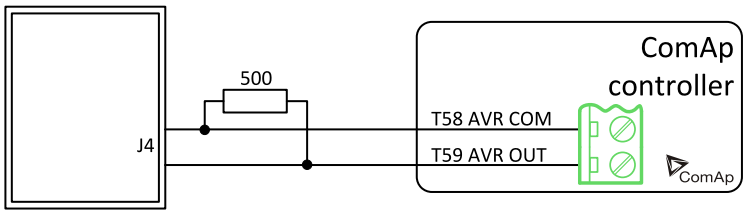
*Voltage Regulator Character* = POSITIVE

*Voltage Regulator Bias* = 0,00 V

*Voltage Regulator Low Limit* = -2,00 V

*Voltage Regulator High Limit* = 2,00 V

## Leroy Somer: R 230




Remove Link J4 and replace through R500

Primary voltage setting with resistors connected: 230V

progress hint:

- Disconnect one wire (OUT 1), set voltage on running Generator to U = nom.
- Measure Voltage over Resistor
- Depending on Value increase AVRi potentiometer to get Range
- Set exact Value with Voltage Regulator Bias regulation (gain = 0)
- Stop gen-set and connect when equal Voltage and polarity is achieved
- Set again regulation loop on demand

**Voltage Control:**

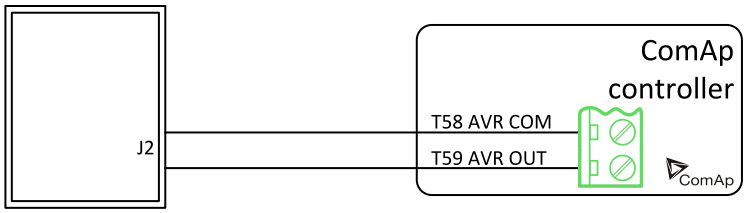
*Voltage Regulator Character* = POSITIVE

*Voltage Regulator Bias* = 0,00 V

*Voltage Regulator Low Limit* = -2,00 V

*Voltage Regulator High Limit* = 2,00 V

## Leroy Somer: R 250




**Voltage/PF Control:**

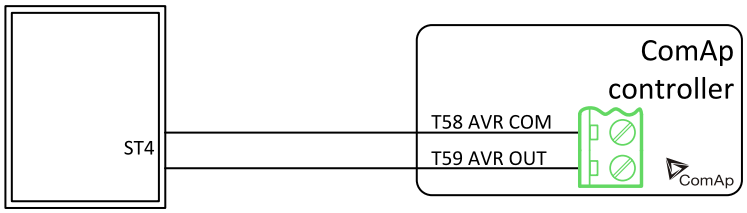
*Voltage Regulator Character* = POSITIVE

*Voltage Regulator Bias* = 1,00 V

*Voltage Regulator Low Limit* = 0,00 V

*Voltage Regulator High Limit* = 2,00 V

## Leroy Somer: R 438 LS, R448




AVRi output is connected (Specific.Remote Voltage trimmer 470 Ω to terminals) ST4.
(Specific Module R726 is not required.).

**Voltage/PF Control:**

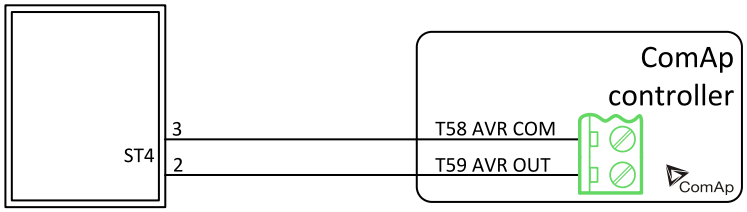
*Voltage Regulator Character* = POSITIVE

*Voltage Regulator Bias* = 1,00 V

*Voltage Regulator Low Limit* = 0,00 V

*Voltage Regulator High Limit* = 2,00 V

## Leroy Somer: R 449




Module R726 is not required..

**Voltage/PF Control:**

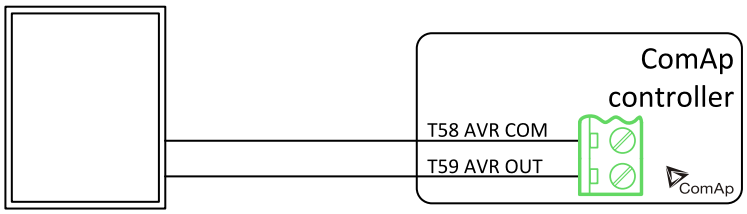
*Voltage Regulator Character* = POSITIVE

*Voltage Regulator Bias* = 0,00 V

*Voltage Regulator Low Limit* = -2,00 V

*Voltage Regulator High Limit* = 2,00 V

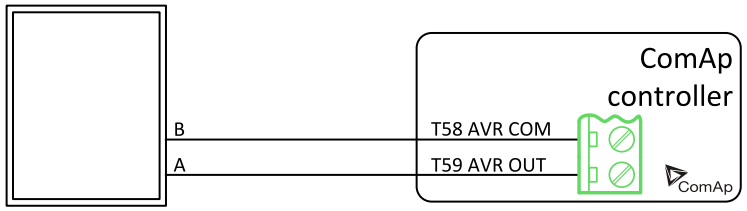
## Leroy Somer: R 450




Use Avri instead pf potentiometer 1000 Ω. Read Leroy Somer R 450 manual before use.

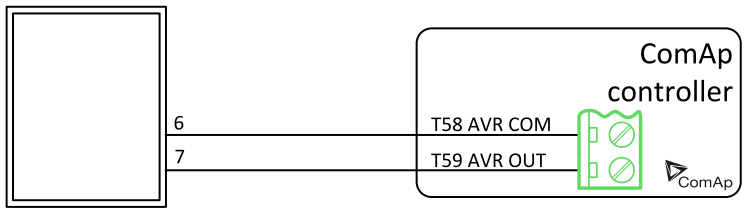
**Voltage/PF Control:**
*Voltage Regulator Character* = POSITIVE
*Voltage Regulator Bias* = 1,00 V
*Voltage Regulator Low Limit* = 0,00 V
*Voltage Regulator High Limit* = 2,00 V

## Marathon DVR2000E



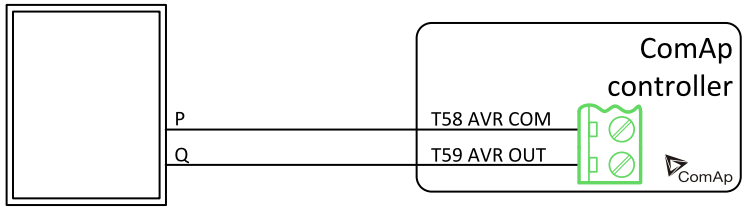

**Voltage/PF Control:**
*Voltage Regulator Character* = POSITIVE
*Voltage Regulator Bias* = 0,00 V
*Voltage Regulator Low Limit* = -5,00 V
*Voltage Regulator High Limit* = 5,00 V

## Marathon PM100, 200



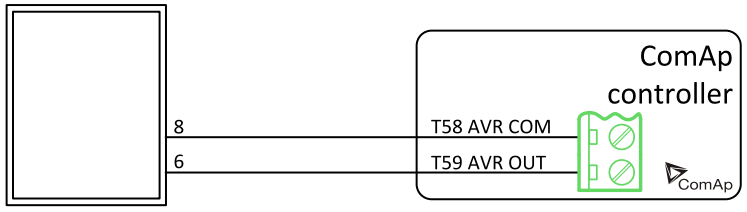

**Voltage/PF Control:**
*Voltage Regulator Character* = POSITIVE
*Voltage Regulator Bias* = 0,00 V
*Voltage Regulator Low Limit* = -2,00 V
*Voltage Regulator High Limit* = 2,00 V

## MarelliGenerators MARK 5 (M16FA655A)



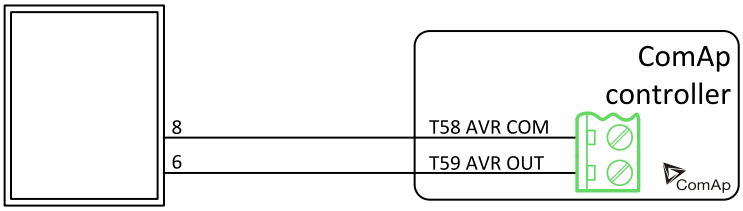

**Voltage/PF Control:**
*Voltage Regulator Character* = POSITIVE
*Voltage Regulator Bias* = 0,60 V
*Voltage Regulator Low Limit* = 0,00 V
*Voltage Regulator High Limit* = 4,00 V

## MarelliMotori (M40FA610A)




**Voltage/PF Control:**
*Voltage Regulator Character* = POSITIVE
*Voltage Regulator Bias* = 0,00 V
*Voltage Regulator Low Limit* = -3,50 V
*Voltage Regulator High Limit* = 3,50 V

## MarelliMotori Mark I (M40FA640A/A)




**Voltage/PF Control:**

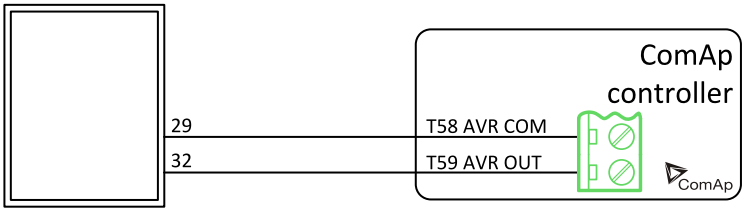
*Voltage Regulator Character* = POSITIVE

*Voltage Regulator Bias* = 0,00 V

*Voltage Regulator Low Limit* = -3,50 V

*Voltage Regulator High Limit* = 3,50 V

## Mecc Alte DER1




Remove jumpers connecting input 27 to 28 and input 31 to 32.

***Note:*** *For values exceeding the limits of ±10 V the external input is automatically disabled.*

**Voltage Control:**

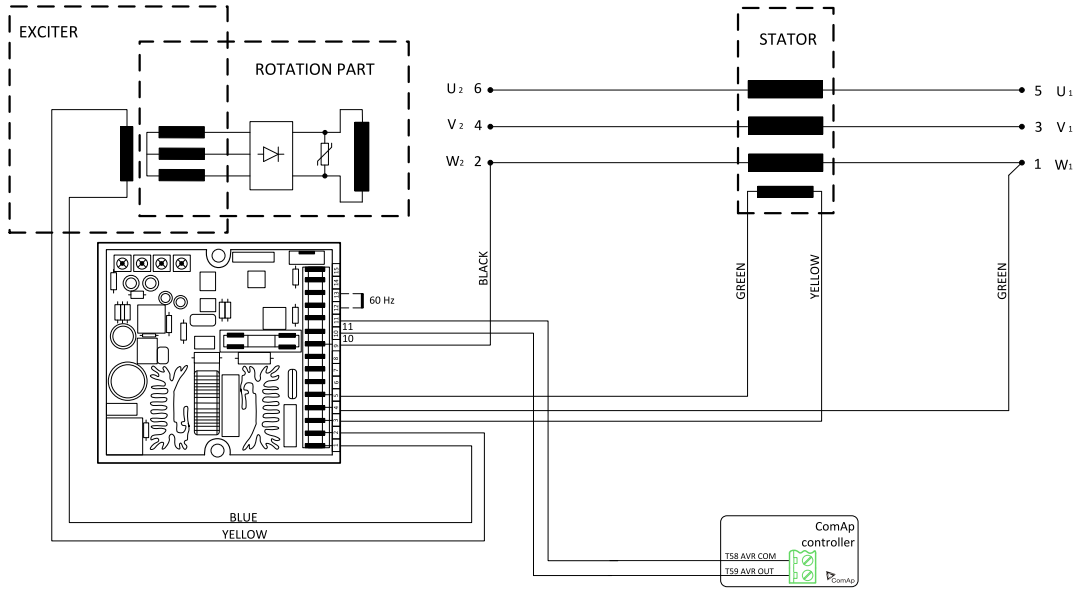
*Voltage Regulator Character* = POSITIVE

*Voltage Regulator Bias* = 0.00 V

*Voltage Regulator Low Limit* = -10.00 V

*Voltage Regulator High Limit* = 10.00 V

## Mecc Alte DSR




The Vext input (connector CN1 – terminals 10 and 11) permits analogical remote control of output voltage with a programmable variation range of up to ±10% (parameter 16, by default the setting is ±5%) with respect to the value set. If you want to use continuous voltage, it will be effective if it is in the range between 0 V and +2,5 V. The input tolerates voltages from –5 V to +5 V, but for values exceeding the limits of 0 V / +2,5 V (or in the event of disconnection) it is automatically disabled and the voltage adjustment goes back to the value set through the trimmer (if enabled) or through parameter 19 (as shown on the picture). Changing of DSR parameters requires PC with dedicated software and DI1-DSR unit! DSR automatically detects presence of transformer for parallel operation (if used it works with droop, if not used it works isochronous).

**Voltage/PF Control:**

*Voltage Regulator Character* = POSITIVE

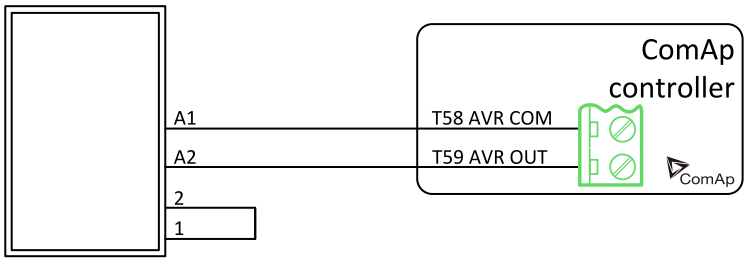
*Voltage Regulator Bias* = 1,25 V

*Voltage Regulator Low Limit* = 0,00 V

*Voltage Regulator High Limit* = 2,50 V

***Note:*** *For values exceeding the limits of 0 V / +2,5 V, the external input is automatically disabled.*

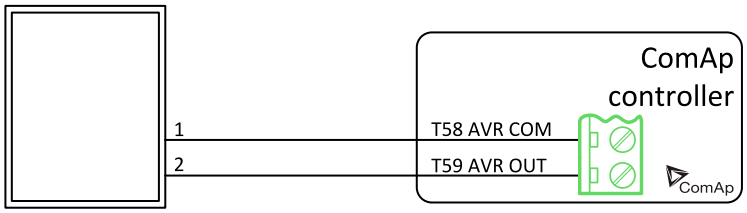
## Newer Leroy Somer




Regulation signal +/- 0...2,5 V

**Voltage/PF Control:**
*Voltage Regulator Character* = POSITIVE
*Voltage Regulator Bias* = 0,00 V
*Voltage Regulator Low Limit* = -2,50 V
*Voltage Regulator High Limit* = 2,50 V

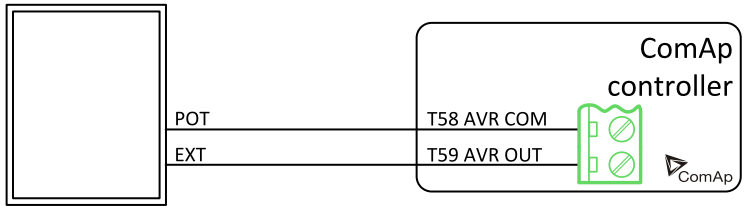
## Piller




AVRi output is connected instead Remote voltage trimmer 100 kΩ.

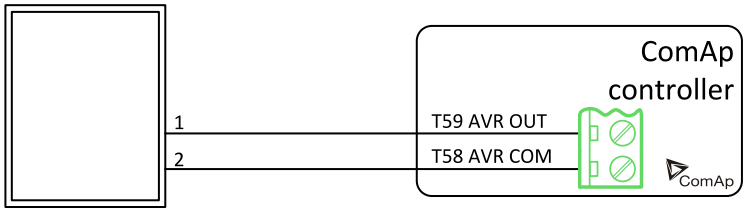
**Voltage Control:**
*Voltage Regulator Character* = POSITIVE
*Voltage Regulator Bias* = -0,44 V
*Voltage Regulator Low Limit* = -2,00 V
*Voltage Regulator High Limit* = 2,00 V

## SINCRO AVR BL4 or AVR BL3




**Voltage/PF Control:**
*Voltage Regulator Character* = NEGATIVE
*Voltage Regulator Bias* = 1,20 V
*Voltage Regulator Low Limit* = 0,00 V
*Voltage Regulator High Limit* = 6,00 V

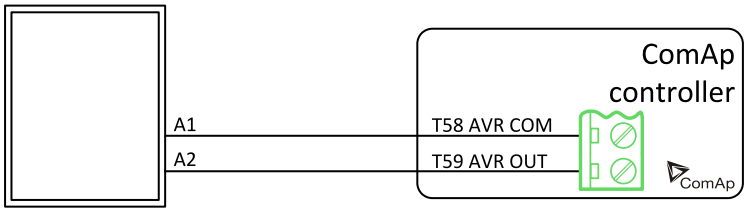
## Stamford AS480




AVRi output is connected instead of external resistor for voltage adjusting.

**Voltage/PF Control:**
*Voltage Regulator Character* = NEGATIVE
*Voltage Regulator Bias* = 1,00 V
*Voltage Regulator Low Limit* = 0,00 V
*Voltage Regulator High Limit* = 2,00 V

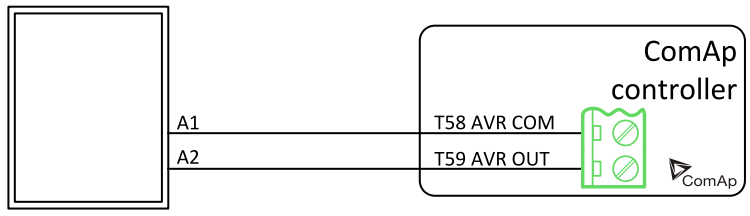
## Stamfrod MX 341




Disconnect the droop CT ( terminal S1&S2) and short the droop CT leads.

**Voltage Control:**
*Voltage Regulator Character* = POSITIVE
*Voltage Regulator Bias* = 1,00 V
*Voltage Regulator Low Limit* = 0,00 V
*Voltage Regulator High Limit* = 2,00 V

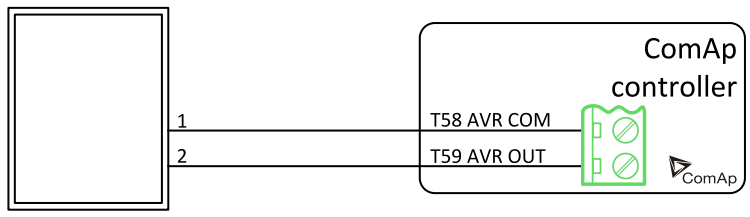
### Stamford SX 440, AS 440, MX 321, SX 421




PFC3 module is not required.

**Voltage/PF Control:**
*Voltage Regulator Character* = POSITIVE
*Voltage Regulator Bias* = 0,00 V
*Voltage Regulator Low Limit* = -2,00 V
*Voltage Regulator High Limit* = 2,00 V

### Stamford SX 460




AVRi output is connected instead of external resistor for voltage adjusting.

**Voltage Control:**
*Voltage Regulator Character* = POSITIVE
*Voltage Regulator Bias* = 0,00 V
*Voltage Regulator Low Limit* = -2,00 V
*Voltage Regulator High Limit* = 2,00 V

back to Appendix

# 8.4 Speed governors interfaces

It is possible to connect various Speed governors to the controller.

> **IMPORTANT: Read carefully Speed governor instructions before connecting controller Speed governor interface! It is not sufficient to use suggested wiring settings, it is necessary as well to adjust speed governor settings!**

## 8.4.1 Electronic engines interface

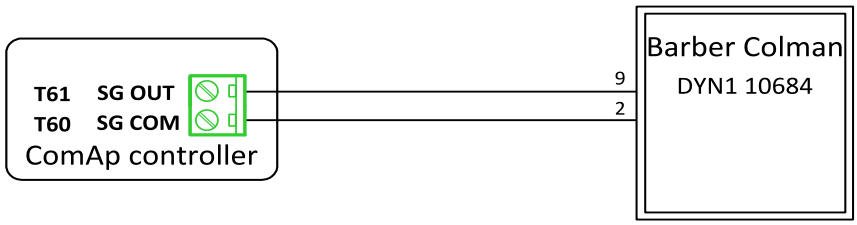
All below mentioned interface examples describe analog interface even if they are (in some cases) used for Electronic Control Units (electronic engines) with CAN data bus. There are several possibilities to connect CAN bus interface between Electronic engine and ComAp controller. Refer to ComAp Electronic Engines Support manual.

## 8.4.2 Controller Speed Regulator Output voltage limits

Setpoints **Sync/Load Control:** Speed Governor Low Limit [0.01 V] and Speed Governor High Limit [0.01 V] limit low and high levels of output voltage. E.g. instead of full -10 V to +10 V Speed governor output range can be set Speed Governor Low Limit = 0.00 V and Speed Governor High Limit = 5.00 V to reduce the output range from 0 to 5 V.

## 8.4.3 Speed governors interfaces alphabetically

### Barber Colman DYN1 10684




**Speed/Load control:**

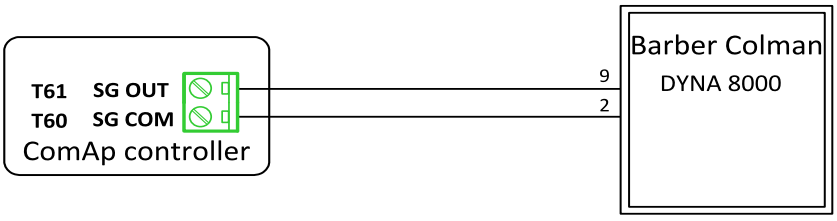
*Speed Governor Bias* = 6,00 V

*Speed Regulator Character* = POSITIVE

*Speed Governor Low Limit* = 4,00 V

*Speed Governor High Limit* = 8,00 V

### Barber Colman DYNA 8000




**Speed/Load control:**

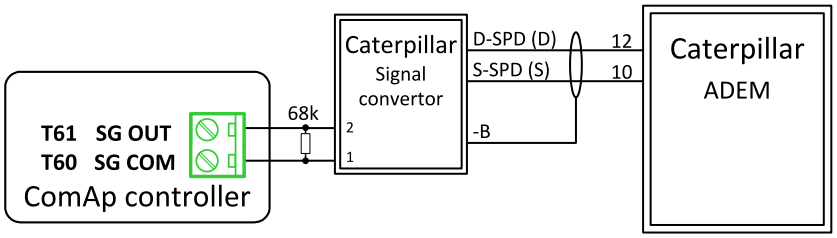
*Speed Governor Bias* = 6,00 V

*Speed Regulator Character* = POSITIVE

*Speed Governor Low Limit* = 4,00 V

*Speed Governor Hi Limit* = 8,00 V

### Caterpillar ADEM + Signal convertor




**Speed/Load control:**

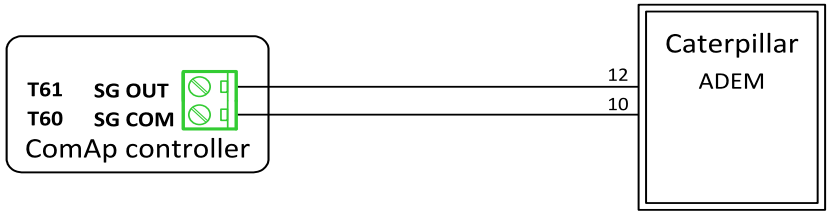
*Speed Governor Bias* = 5,10 V

*Speed Regulator Character* = POSITIVE

*Speed Governor Low Limit* = 0,00 V

*Speed Governor High Limit* = 10,00 V

### Caterpillar ADEM




**Speed/Load control:**

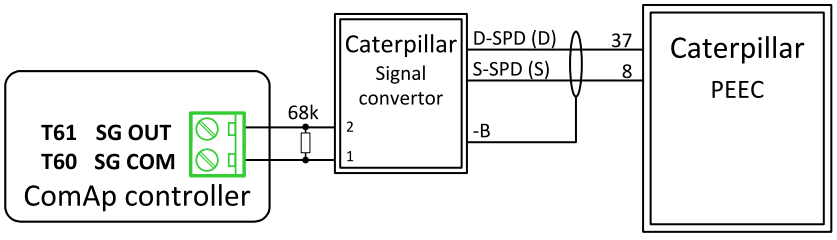
*Speed Governor Bias* = 5,10 V

*Speed Regulator Character* = POSITIVE

*Speed Governor Low Limit* = 0,00 V

*Speed Governor High Limit* = 10,00 V

### Caterpillar PEEC + Signal convertor




**Speed/Load control:**

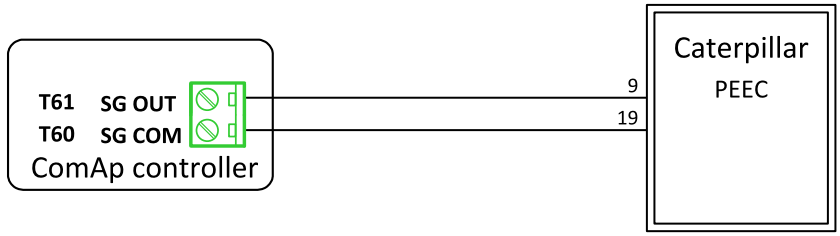
*Speed Governor Bias* = 5,10 V

*Speed Regulator Character* = POSITIVE

*Speed Governor Low Limit* = 0,00 V

*Speed Governor High Limit* = 10,00 V

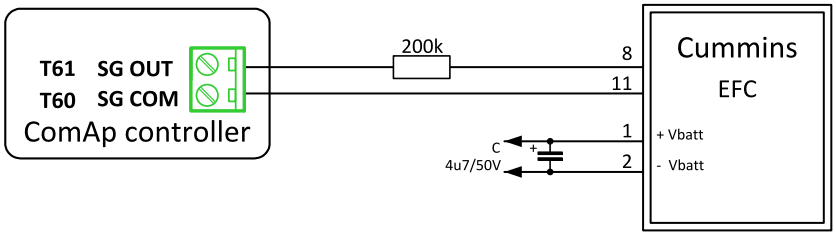
## Caterpillar PEEC




**Speed/Load control:**

*Speed Governor PWM rate* = 500 Hz

## Cummins EFC




**Speed/Load control:**

*Speed Governor Bias* = 6,40 V

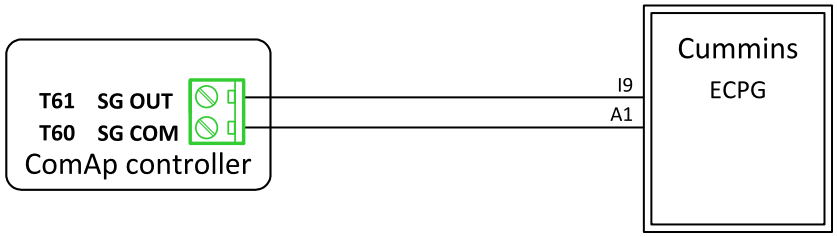
*Speed Regulator Character* = POSITIVE

*Speed Governor Low Limit* = 5,00 V

*Speed Governor High Limit* = *7,80 V*

Spurious operation of the controller push buttons is caused by excessive interference from the speed controller when capacitor is not connected between power supply terminals 1 and 2.

## Cummins ECPG

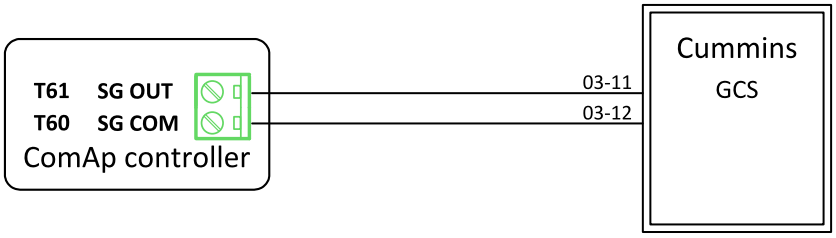



**Speed/Load control:**

*Speed Governor Bias* = 2,50 V

*Speed Regulator Character* = POSITIVE

## Cummins GCS




**Speed/Load ctrl:**

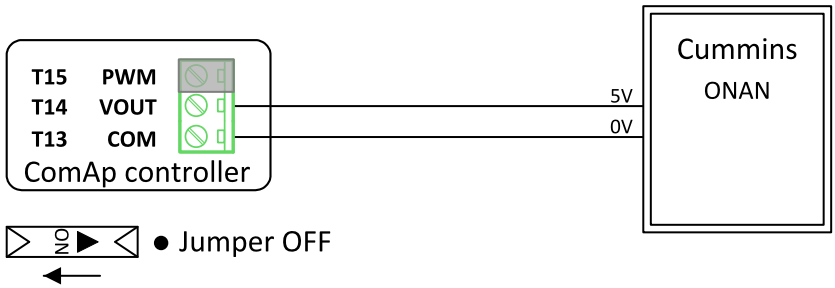
*Speed Governor Bias* = 5,00 V

*Speed Regulator Character* = POSITIVE

*Speed Governor Low Limit* = 2,50 V

*Speed Governor High Limit* = 7,50 V

## Cummins ONAN




**Speed/Load ctrl:**

*Speed Govovernor Bias* = 2,50 V

*Speed Regulator Character* = POSITIVE

*Speed Governor Low Limit* = 0V

*Speed Governor High Limit* = 5 V

## Cummins QSL9




**Speed/Load ctrl:**

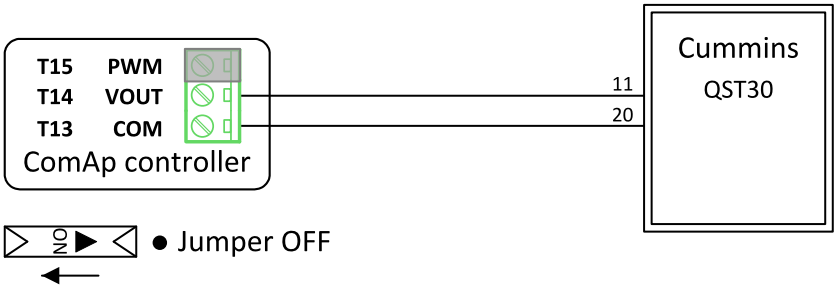
*Speed Governor Bias* = 3,50 V

*Speed Regulator Character* = POSITIVE

*Speed Governor Low Limit* = 2,50 V

*Speed Governor High Limit* = 5,00 V

## Cummins QST30

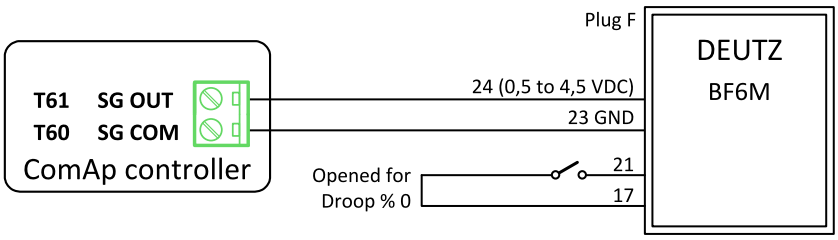



**Speed/Load ctrl:**

*Speed Governor Bias* = 5,00 V

*Speed Regulator Character* = POSITIVE

## DEUTZ BF6M




**Speed/Load ctrl:**

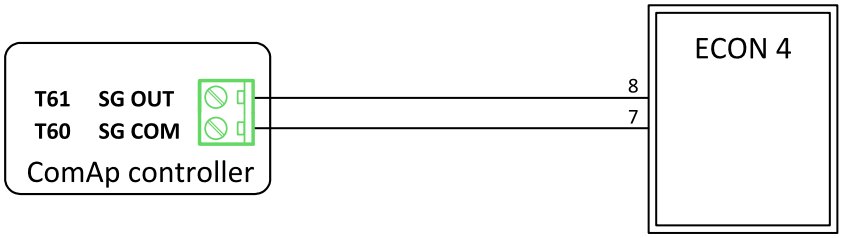
*Speed Governor Bias* = 2,50 V

*Speed Regulator Character* = POSITIVE

*Speed Governor Low Limit* = 0,50 V

*Speed Governor High Limit* = 4,50 V

## ECON 4




**Speed/Load ctrl:**

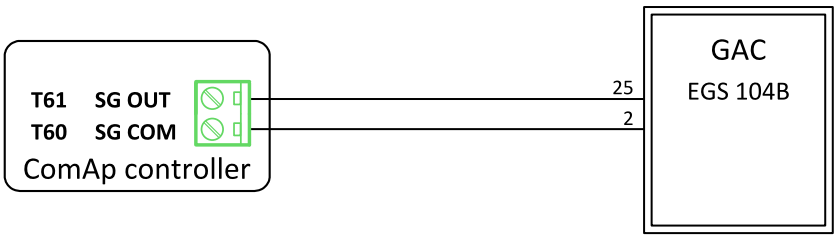
*Speed Governor Bias* = 5,10 V

*Speed Regulator Character* = POSITIVE

*Speed Governor Low Limit* = 0,0 V

*Speed Governor High Limit* = 10,00 V

## GAC EGS 104B




**Speed/Load ctrl:**

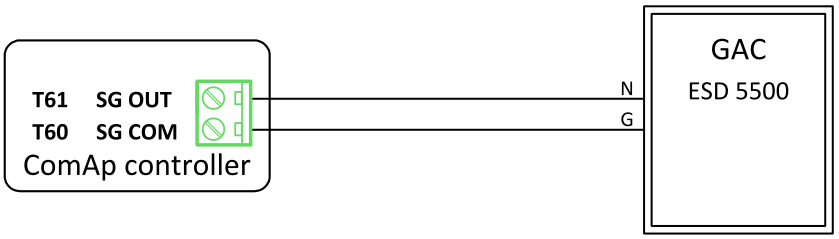
*Speed Governor Bias* = 5,00 V

*Speed Regulator Character* = NEGATIVE

*Speed Governor Low Limit* = 4,00 V

*Speed Governor High Limit* = 6,00 V

## GAC ESD 5500




**Speed/Load ctrl:**

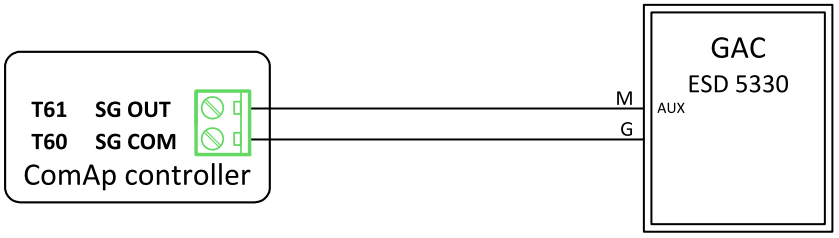
*Speed Governor Bias* = 5,00 V

*Speed Regulator Character* = NEGATIVE

*Speed Governor Low Limit* = 4,00 V

*Speed Governor High Limit* = 6,00 V

## GAC ESD 5330

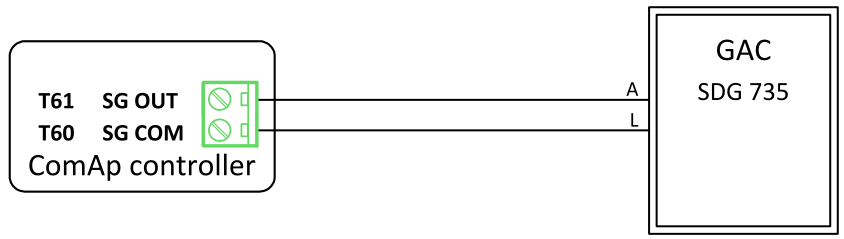



**Speed/Load ctrl:**

*Speed Gov Bias* = 5,00 V

*Speed Regulator Character* = NEGATIVE

## GAC SDG 735




**Speed/Load ctrl:**

*Speed Governor Bias* = 5,00 V

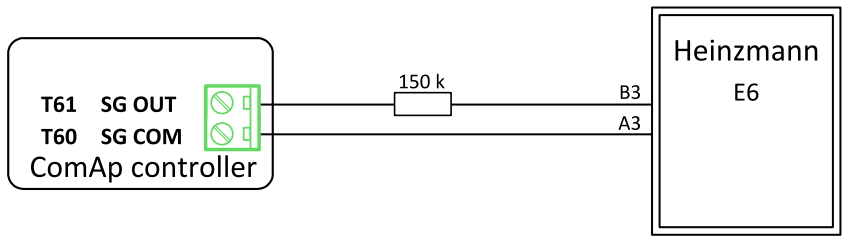
*Speed Regulator Character* = NEGATIVE

*Speed Governor Low Limit* = 2,50 V

*Speed Governor High Limit* = 7,50 V

*Tau Speed Governor Actuator* = 1,0 s

## Heinzmann E6

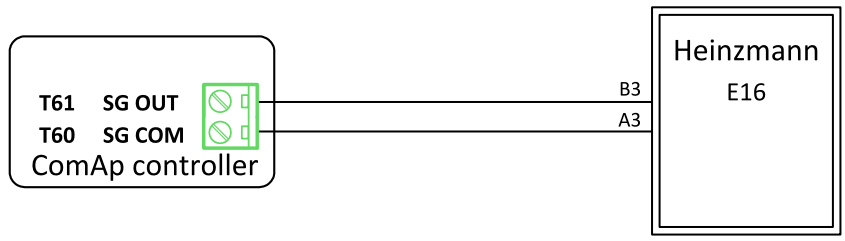



**Speed/Load ctrl:**

*Speed Governor Bias* = 5,00 V

*Speed Regulator Character* = POSITIVE

## Heinzmann E16

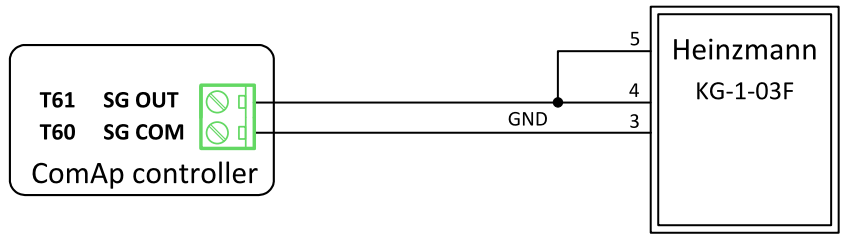



**Speed/Load ctrl:**

*Speed Governor Bias* = 0,00 V

*Speed Regulator Character* = POSITIVE

## Heinzmann KG-1-03F

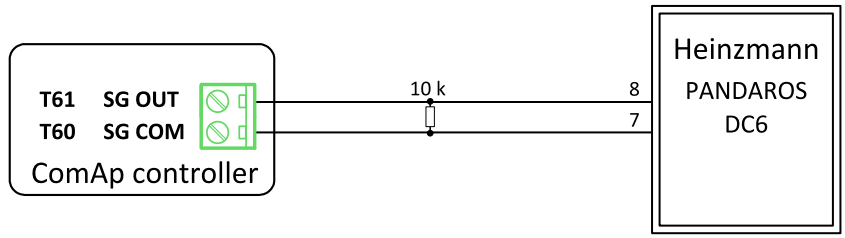



**Speed/Load ctrl:**

*Speed Governor Bias* = 0,00 V

*Speed Regulator Character* = POSITIVE

## Heinzmann PANDAROS DC6




Terminals A3 and B3 are on OEM 14-pin connector.

Mounted on Perkins 40xx engines.

**Speed/Load ctrl:**

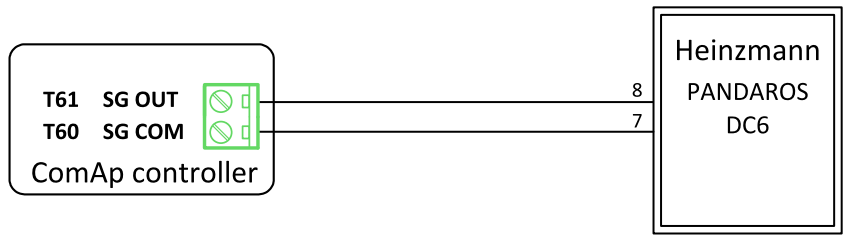
*Speed Governor Bias* = 5,00 V

*Speed Regulator Character* = POSITIVE

*Speed Governor Low Limit* = 0,80 V

For connection w/o resistor refer to the next setting

## Heinzmann PANDAROS DC6




**Speed/Load ctrl:**

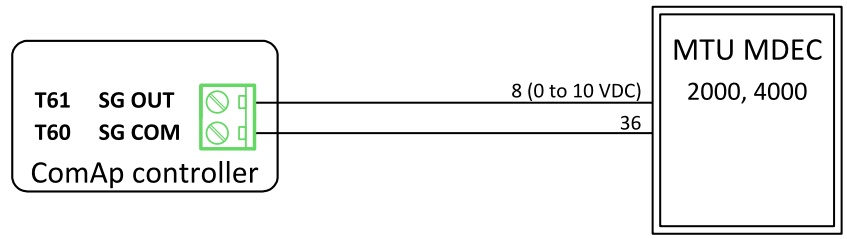
*Speed Governor Bias* = 2,70 V

*Speed Regulator Character* = POSITIVE

*Speed Governor Low Limit* = 0,00 V

*Speed Governor High Limit* = 6,00 V

## MTU MDEC 2000, 4000




**Speed/Load ctrl:**

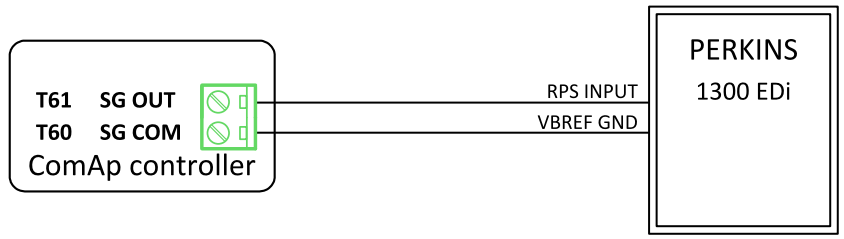
*Speed Governor Bias* = 4,90 V

*Speed Regulator Character* = POSITIVE

*Speed Governor Low Limit* = 0,00 V

*Speed Governor High Limit* = 10,00 V

## PERKINS 1300 EDi




**Speed/Load ctrl:**

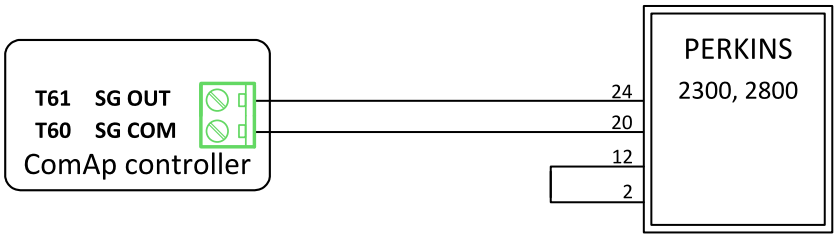
*Speed Governor Bias* = 2,50 V

*Speed Regulator Character* = POSITIVE

*Speed Governor Low Limit* = 0,80V

*Speed Governor High Limit* = 4,50 V

## PERKINS 2300, 2800




Above mentioned pin numbers refer to the Customer Interface Connector. The J1 connector on ECM has the following numbering:

20 = J1/3; 24 = J1/17

**Speed/Load ctrl:**

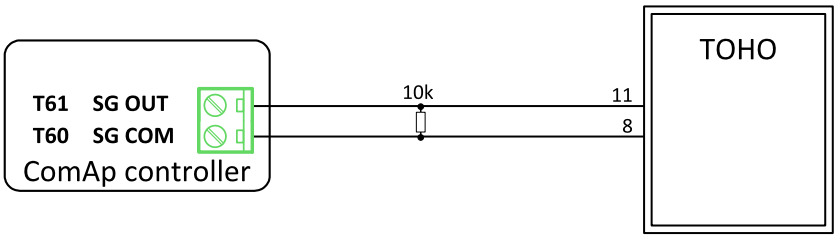
*Speed Governor Bias* = 2,50 V

*Speed Regulator Character* = POSITIVE

*Speed Governor Low Limit* = 0,50 V

*Speed Governor High Limit* = 4,50 V

## TOHO




**Speed/Load ctrl:**

*Speed Governor Bias* = 4,00 V

*Speed Regulator Character* = POSITIVE

## WOODWARD 2301A LS and Speed

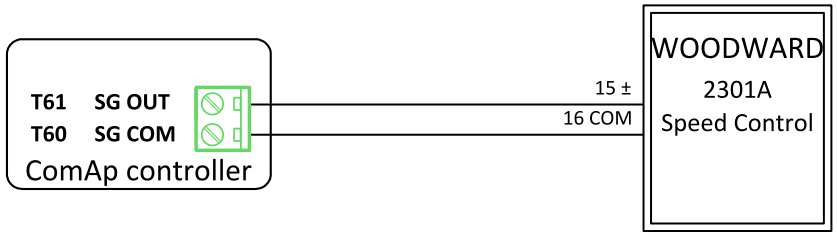



**Speed/Load ctrl:**

*Speed Governor Bias* = 5,00 V

*Speed Regulator Character* = POSITIVE

## WOODWARD 2301A Speed Control

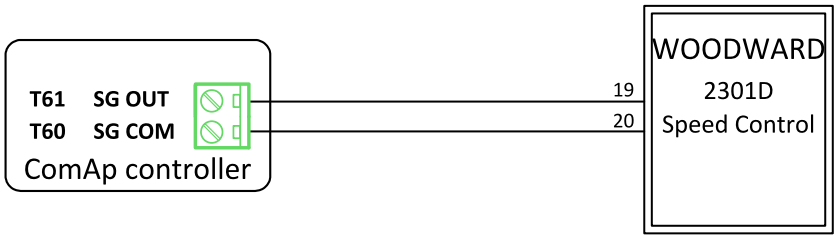



**Speed/Load ctrl:**

*Speed Governor Bias* = 5,00 V

*Speed Regulator Character* = POSITIVE

## WOODWARD 2301D Speed Control




Terminals 19 and 20 are marked as Analog inputs #1.

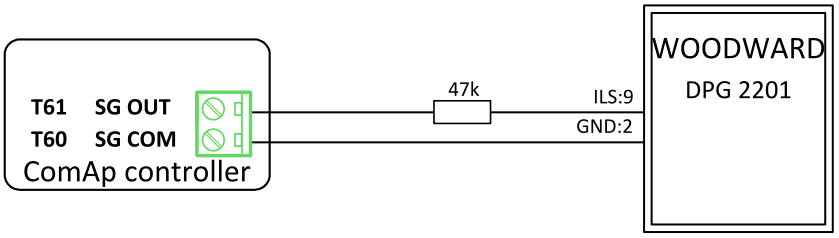
25,26 = Speed Signal Inputs

**Speed/Load ctrl:**

*Speed Governor Bias* = 5,00 V

*Speed Regulator Character* = POSITIVE

## WOODWARD DPG 2201




For Woodward DPG 2223 the ILS terminal is 10.

**Speed/Load ctrl:**

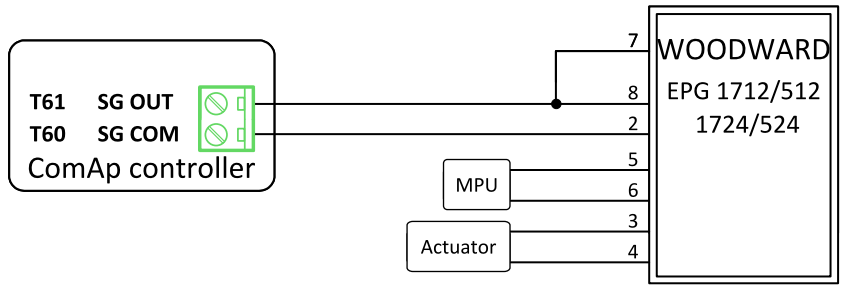
*Speed Governor Bias* = 2,50 V

*Speed Regulator Character* = POSITIVE

*Speed Governor Low Limit* = 0,00 V

*Speed Governor High Limit* = 5,00 V

## WOODWARD EPG 1712/512 (1724/524)




**Speed/Load ctrl:**

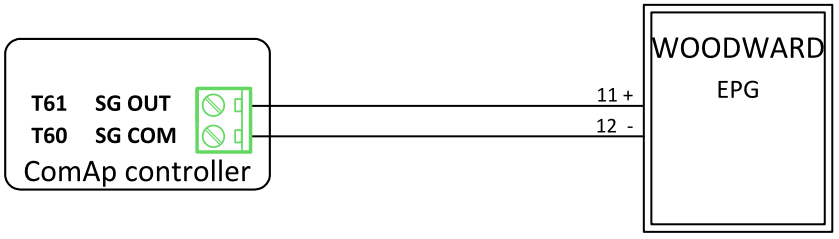
*Speed Governor Bias* = 3,10 V

*Speed Regulator Character* = POSITIVE

*Speed Governor Low Limit* = 6,50 V

*Speed Governor High Limit* = 0,00 V

## WOODWARD EPG




For Woodward EPG speed governor (revision F) are limits:

Speed Governor Low Limit = -3,00 V

Speed Governor High Limit = +2,00 V

Speed Governor Bias = -0,50 V

**Speed/Load ctrl:**

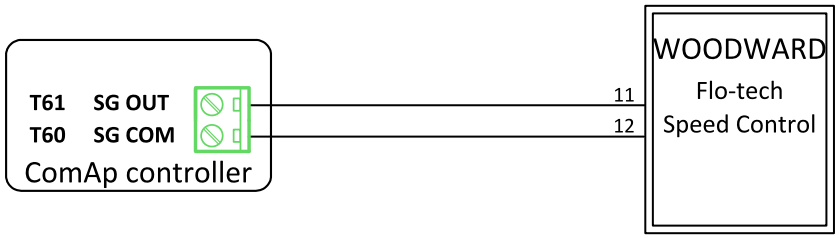
*Speed Governor Bias* = 0,00 V

*Speed Regulator Character* = POSITIVE

*Speed Governor Low Limit* = -3,00 V

*Speed Governor High Limit* = 3,00 V

### WOODWARD Flo - tech Speed Control




**Speed/Load ctrl:**

*Speed Governor Bias* = 0,00 V

### WOODWARD L - series




**Speed/Load ctrl:**

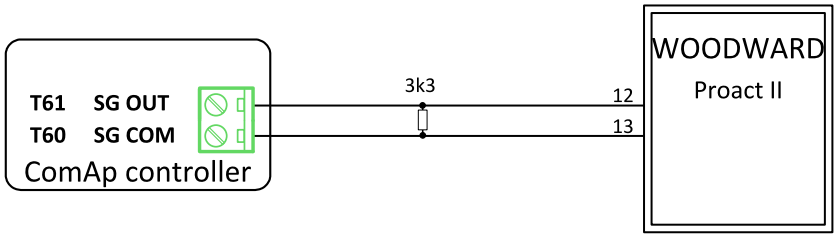
*Speed Governor Bias* = 2,50 V

*Speed Regulator Character* = POSITIVE

*Speed Governor Low Limit* = 0,00 V

*Speed Governor High Limit* = 5,00 V

### WOODWARD Proact II




**Speed/Load ctrl:**

*Speed Governor Bias* = 0,00 V

*Speed Regulator Character* = POSITIVE

*Speed Governor Low Limit* = -2,50 V

*Speed GovernorHigh Limit* = 2,50 V

**back to Appendix**

# 8.5 Modules

## 8.5.1 Plug-in modules

The available communication plug-in modules are:

- CM-RS232-485 – communication module for connection via RS232 or RS485 line
- CM2-4G-GPS – communication module for connection via 4G
- CM3-Ethernet – communication module for internet connection via Ethernet

The available extension plug-in modules are:

- EM-BIO8-EFCP – extension module with 8 binary inputs/outputs and with earth fault current protection

***Note:*** *Controller has 12 plug-in module slots.*

## Supported combinations of plug-in modules

| Module | CM3-Ethernet | CM2-4G-GPS | CM-RS232-485 | EM-BIO8-EFCP |
|---|---|---|---|---|
| CM3-Ethernet | ✗ | ✓ | ✓ | ✓ |
| CM2-4G-GPS | ✓ | ✗ | ✓ | ✓ |
| CM-RS232-485 | ✓ | ✓ | ✗ | ✓ |
| EM-BIO8-EFCP | ✓ | ✓ | ✓ | ✓ |

# Communication modules


CM-RS232-485 ..... 792
CM3-Ethernet ..... 794
CM2-4G-GPS ..... 796


### CM-RS232-485

CM-RS232-485 is optional plug-in card to enable InteliGen4 200 the RS232 and RS485 communication. This is required for computer or Modbus connection. The CM-RS232-485 is a dual port module with RS232 and RS485 interfaces at independent COM channels. The RS232 is connected to COM1 and RS485 to COM2.

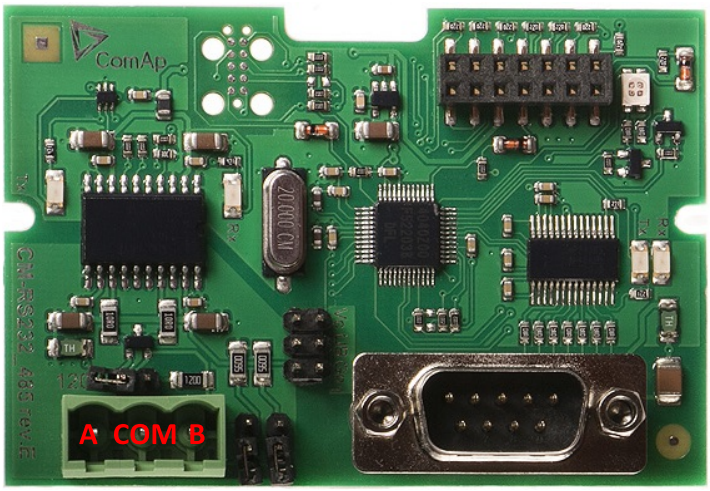



Image 8.102 CM-RS232-485 interface

**IMPORTANT: Any manipulation with plug-in module shall be done with disconnected power supply to controller.**

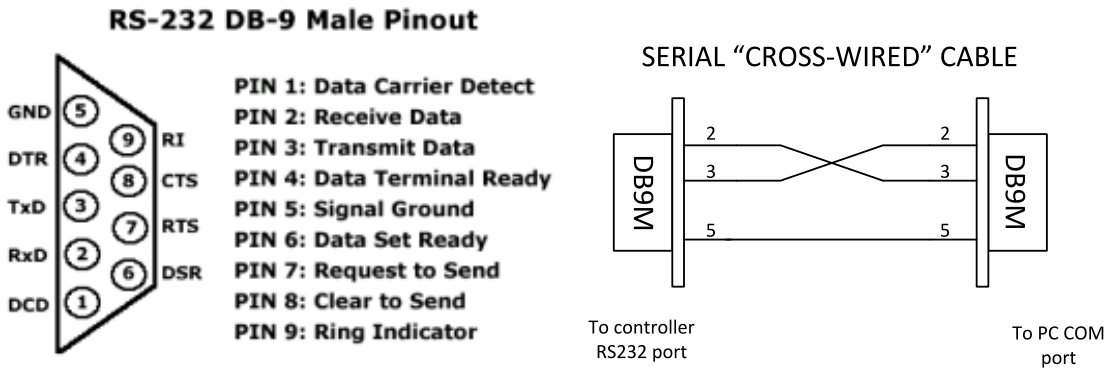



Image 8.103 Pinout of RS232 line

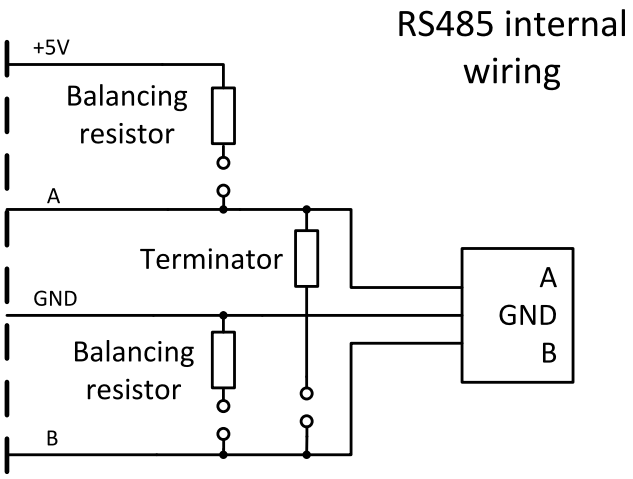



Image 8.104 Pinout of RS485 line

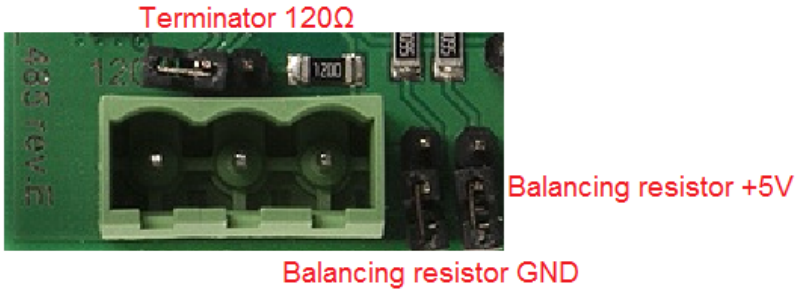



Image 8.105 Jumpers description

***Note:*** *Balancing resistors should both be closed at only one device in the whole RS485 network.*

Maximal distance of line is 10 m for RS232 line and 1200 m for RS485 line.

Terminator 120 Ω

Balancing resistor +5 V

## Technical data

| | |
|---|---|
| **Power consumption** | 40 mA / 8 VDC<br>26 mA / 12 VDC<br>14 mA / 24 VDC<br>10 mA / 36 VDC |
| **Isolation** | Galvanic separation |

## Firmware upgrade

- Download the newest FW of module from ComAp website (in form of PSI file or installation package)
- Install package to computer or open PSI to install it into InteliConfig
- Plug the module into the controller and power the controller on.
- Open a connection with controller via InteliConfig
- Go the menu Tools -> Firmware upgrade, select the Plug-in modules tab and select the appropriate firmware you want to program into the module (in InteliConfig).
- Press the OK button to start upgrade of firmware.

The firmware update process may be performed via any kind of connection including connection via the same module in which the firmware is to be updated. The connection is re-established again automatically when the update process is finished.

### CM3-Ethernet

CM3-Ethernet is a plug-in card with Ethernet 10/100 Mbit interface in RJ45 connector. It provides an interface for connecting a PC through ethernet/internet network, for sending active e-mails and for integration of the controller into a building management (MODBUS TCP and SNMP protocols).

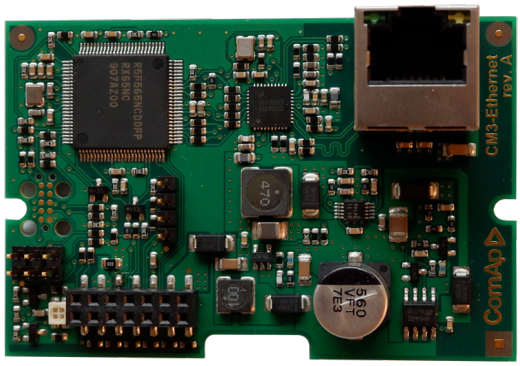



Image 8.106 CM3-Ethernet interface

> **IMPORTANT: Any manipulation with plug-in module shall be done with disconnected power supply to controller.**

Use an Ethernet UTP cable with a RJ45 connector for linking the module with your Ethernet network. The module can also be connected directly to a PC using cross-wired UTP cable.

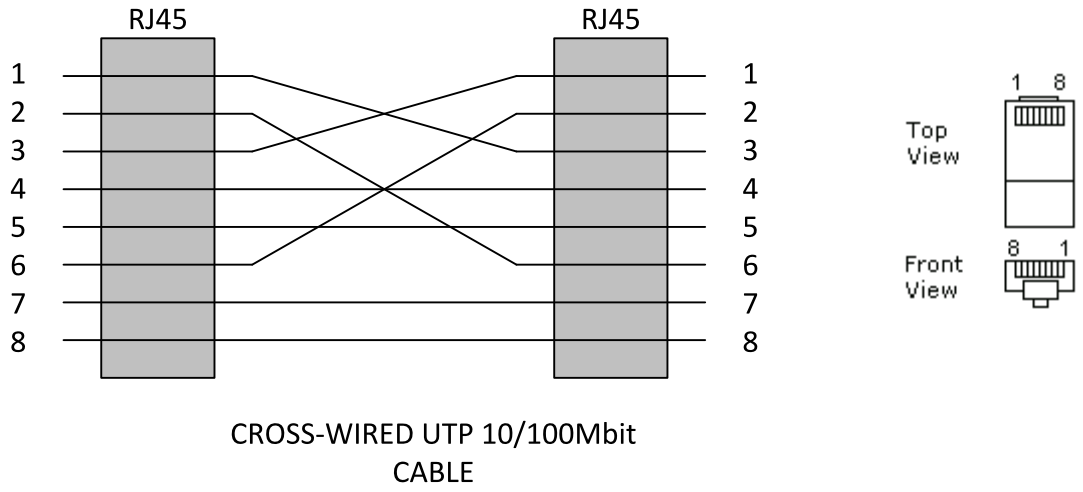



Image 8.107 Cross-wired cable

## Technical data

### General

| | |
|---|---|
| **Width × Height × Depth** | 73.8 × 50.3 × 21 |
| **Weight** | ~30 g |
| **Power supply** | 8-36 V DC |
| **Power consumption** | 1 W |
| **Peak power consumption** | 2 W |
| **Operating temperature** | -40 ˚C to +70 ˚C |
| **Storage temperature** | -40 ˚C to +80 ˚C |

### Ethernet port

| |
|---|
| 100 Mbit/s, full duplex |
| RJ45 socket |

### Module setup

All settings related to the module are to be adjusted via the controller setpoints. The respective setpoints are located in the setpoint **Group: CM-Ethernet (page 501)**.

All actual operational values like actual IP address etc. are available in controller values in a specific group as well.

### Status LED

| Blinking frequency | Color |
|---|---|
| 1 Hz | Green – everything is OK<br>Red – some of following errors occurred:<br>› unplugged Ethernet cable<br>› module cannot connect to AirGate<br>› module can not obtain IP address from DHCP |
| 10 Hz | Green – firmware is currently being programmed<br>Red – no firmware present in the module |

### Firmware upgrade

- Download the newest FW of module from ComAp website (in form of PSI file or installation package)
- Install package to computer or open PSI to install it into InteliConfig
- Plug the module into the controller and power the controller on.
- Open a connection with controller via InteliConfig
- Go the menu Tools -> Firmware upgrade, select the Plug-in modules tab and select the appropriate firmware you want to program into the module (in InteliConfig).
- Press the OK button to start upgrade of firmware.

The firmware update process may be performed via any kind of connection including connection via the same module in which the firmware is to be updated. The connection is re-established again automatically when the update process is finished.

## CM2-4G-GPS

CM2-4G-GPS plug-in module containing a GPS receiver and GSM/WCDMA/LTE modem which can work in two modes of operation based on the settings in the setpoint **Internet Connection (page 479)**.

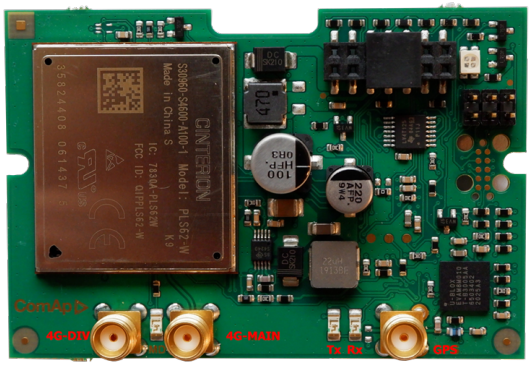



Image 8.108 CM2-4G-GPS module

**IMPORTANT: Any manipulation with plug-in module shall be done with disconnected power supply to controller.**

**IMPORTANT: Operating temperature of module is from -30 °C to +75 °C.**

***Note:*** *Cellular data service must be enabled in your SIM card by your mobile operator for successful operation.*

CM2-4G-GPS module works with:

- WebSupervisor – internet-based remote monitoring solution
- AirGate – powerful connection technology to make internet access as simple as possible

CM2-4G-GPS module also works like GPS locator. Geo-fencing function can be used with this module.

## 4G module types

- If the anthenna is CELLULAR only and has 1 cable (OT1A4GXXMCX), it is connected to the 4G-MAIN connector.
- If the anthenna is CELLULAR only and has 2 cables, cables are connected to the 4G-MAIN or 4G-DIV connectors (does not matter which cable to which connector).
- If the anthenna is a combination of CELLULAR/GPS and has 2 cables (OT1A4GGPSCX), then cable "4G/LTE" needs to be connected to the 4G-MAIN connector and "GPS" cable to the GPS connector.
- If the anthenna is a combination of CELLULAR/GPS and has 3 cables (OT2A4GGPSCX), then cables "4G/LTE" need to be connected to the 4G-MAIN and 4G-DIV connectors (does not matter which cable to which connector) and "GPS" cable to the GPS connector.

***Note:*** *Type of the cable is labeled on its side.*




## Technical data

### General

| | |
|---|---|
| **Width × Height × Depth** | 73.8 × 50.3 × 15 |
| **Weight** | ~35 g |
| **Power supply** | 8-36 V DC |
| **Power consumption** | 1.7 W |
| **Peak power consumption** | 10 W |
| **Operating temperature** | -30 ˚C to +70 ˚C |
| **Storage temperature** | -40 ˚C to +80 ˚C |

### GNSS

| | |
|---|---|
| **Antenna interface** | SMA female, 2.8 V / 20 mA |
| **Antenna type** | Active |

### Cellular

| | |
|---|---|
| **Supported networks and frequency bands** | 2G (GSM/GPRS/EDGE) Quad band, 850/900/1800/1900 MHz<br>3G (UMTS/HSPA+) Seven band, 800 (BdXIX) / 850 (BdV) / 900 (BdVIII) / AWS (BdIV) / 1800 (BdIX) / 1900 (BdII) / 2100MHz (BdI)<br>4G (LTE) Twelve band, 700 (Bd12 <MFBI |

| | |
|---|---|
| | Bd17>, Bd28) 800 (Bd18, Bd19, Bd20) 850 (Bd5) / 900 (Bd8) / AWS (Bd4) / 1800 (Bd3) / 1900 (Bd2) / 2100 (Bd1) / 2600MHz (Bd7) |
| **Antenna interface** | 2x SMA female (Main and Diversity) |

## SIM card settings

SIM card must be adjusted as follows:

- SMS service enabled
- Packet data (Internet access) enabled (when required for the selected mode of operation)
- PIN code security disabled

## How to start using CM2-4G-GPS module

- You will need a controller, CM2-4G-GPS module, antenna and SIM card with SMS and packet data service.

***Note:*** *Make sure that your SIM supports the packet data network type you want to use. – i.e. if you want to use the module in LTE (4G) network you have to confirm with the operator that the particular SIM card supports 4G network.*

- Make sure SIM card does not require PIN code. Use any mobile phone to switch the SIM PIN security off.
- Place the SIM card into slot on CM2-4G-GPS card
- Connect the antenna to Cellular module antenna connector.
- If you want to use the built-in GPS receiver, also connect an **active** GPS antenna to the GPS antenna connector.
- Switch off the controller.
- Insert CM2-4G-GPS module into controller
- Power up the controller.
- Activate CM2-4G-GPS module by switching the setpoint **Internet Connection (page 479)** to enabled
- Enter correct **Access Point Name** (this information is provided by Mobile Operator). Setpoint can be set on controller's front panel or by InteliConfig.
- Wait for approx 2 – 4 minutes for first connection of the system to AirGate. AirGate will automatically generate the AirGate ID value. Then navigate to measurement screens where you will find signal strength bar and AirGate ID identifier.

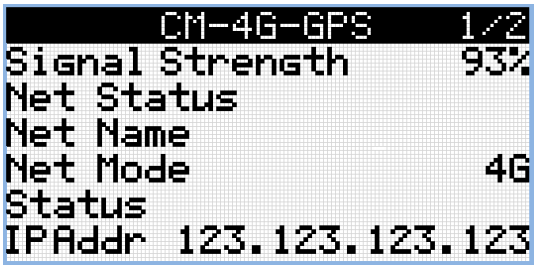



Image 8.109 Main screen of CM2-4G-GPS module

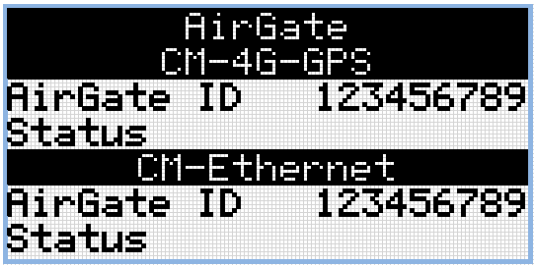



Image 8.110 Screen of AirGate

## Modem Status

| Code | Description |
|---|---|
| OK | Module successfully initialized and connected to the cellular network |
| E01 | Unsuccessful restore to the factory settings |
| E02 | Modem configuration error |
| E SIM | SIM not inserted or locked by PIN.<br>› Use another device (e.g. mobile phone) to disable the option for SIM to be locked by PIN |
| E04 | It is not possible to set manually chosen network mode 2G/3G/4G/Automatic |
| E registration | It is not possible to register into cellular network. Possible reasons:<br>› No signal (no coverage, broken or unconnected antenna)<br>› Manually chosen network mode 2G/3G/4G is not available |
| E context | It is not possible to set PDP (Packet Data Protocol) context for defined APN (Access Point Name). Possible reasons:<br>› Setpoint Access Point Name is not correctly set (format)<br>› Wrong PDP context number |
| E connect | It is not possible to connect to cellular network (ATD*99***context) Possible reasons:<br>› Setpoint Access Point Name is not correctly set (wrong text) |
| E08 | Modem configuration error |
| E09 | It is not possible to get signal strength |
| E10 | It is not possible to get operator name |
| E11 | Loss of registration into cellular network was detected |
| E12 | Data error |
| E13 | Data error |
| E14 | Modem was restarted |
| E SMS send | It is not possible to send SMS. Possible reasons:<br>› Wrong number<br>› SIM doesn't support SMS |
| E18 | Modem hardware configuration error |
| E conn lost | Loss of connection with cellular network |

| | |
|---|---|
| E19 | Modem configuration error |
| Restart-config | Modem was restarted due to the change of controller setpoint |
| Restart-app | Modem was restarted due to the performed cellular connection check |

### AirGate Status

| Code | Description |
|---|---|
| Not defined | Setpoint AirGate Connection is Disabled |
| Wait to connect | Waiting to connect |
| Resolving | Resolving |
| Connecting | Connecting |
| Creat sec chan | Creating secure channel |
| Registering | Registering |
| Conn inoperable | Connected, inoperable |
| Conn operable | Connected, operable |
| Susp AGkeyEmpty | AirGate is not set in the controller |

### Firmware upgrade

- Download the newest FW of module from ComAp website (in form of PSI file or installation package)
- Install package to computer or open PSI to install it into InteliConfig
- Plug the module into the controller and power the controller on.
- Open a connection with controller via InteliConfig
- Go the menu Tools -> Firmware upgrade, select the Plug-in modules tab and select the appropriate firmware you want to program into the module (in InteliConfig).
- Press the OK button to start upgrade of firmware.

The firmware update process may be performed via any kind of connection including connection via the same module in which the firmware is to be updated. The connection is re-established again automatically when the update process is finished.

## Extension modules

EM-BIO8-EFCP ..... 800

### EM-BIO8-EFCP

EM-BIO8-EFCP is optional plug-in card. Through this card, the controller can accommodate one AC current (CT) measuring input (1A or 5A input) and up to 8 binary inputs or outputs. In InteliConfig PC configuration tool it is possible to easily choose whether particular I/O will be binary input or output.

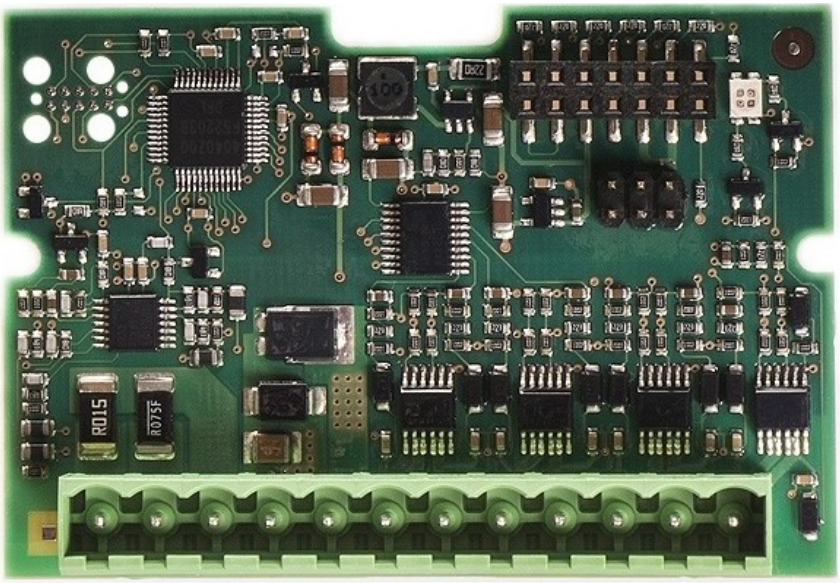



Image 8.111 EM-BIO8-EFCP interface

***Note:*** *This protection is active ONLY when Engine is running.*

**IMPORTANT: Any manipulation with plug-in module shall be done with disconnected power supply to controller.**

**IMPORTANT: Earth fault current measurement is supported by controller only in slot A.**

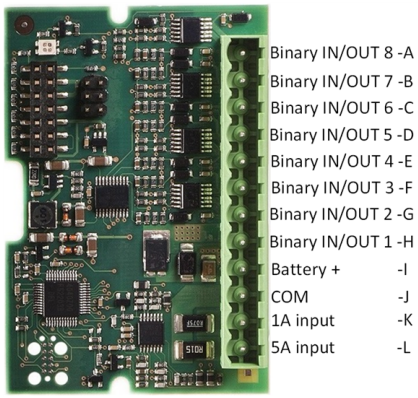



Image 8.112 Overview of EM-BIO8-EFCP

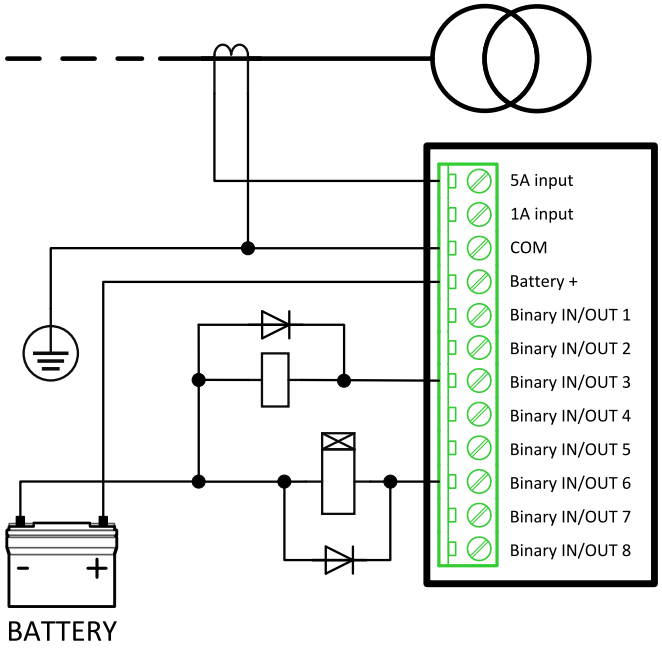



Image 8.113 EM-BIO8-EFCP wiring

## EM-BIO8-EFCP technical data

### Power supply

| | |
|---|---|
| **Power supply range** | 8-36 VDC |
| **Power consumption** | 40 mA / 8 VDC<br>27 mA / 12 VDC<br>22 mA / 24 VDC<br>19 mA / 36 VDC |

### Binary inputs

| | |
|---|---|
| **Number** | Up to 8, non-isolated |
| **Close/Open indication** | 0-2 VDC close contact<br>>6 VDC open contact |

### Binary outputs

| | |
|---|---|
| **Number** | Up to 8 , non-isolated |
| **Max. current** | 0,5A |
| **Switching to** | positive supply terminal |

### Current measuring input

| | |
|---|---|
| **Number of inputs** | 2 |
| **Nominal input current** | 1A/5A |
| **Load (CT output impedance)** | < 0,1 |
| **Max measured current from CT** | 10 A |

| | |
|---|---|
| **Current measurement tolerance** | 2% from Nominal current |
| **Max peak current from CT** | 150 A / 1 s |
| **Max continuous current** | 10 A |

## Earth fault current measurement

The Earth Fault protection is done by the extension module EM-BIO8-EFCP.

When the measured current exceeds the set value, which indicates that part of the current is dispersed to earth, and when the set **IDMT Earth Fault Current Delay (page 520)** time elapses, the **Earth Fault Current Protection (page 519)**, **Sd Earth Fault Current (page 768)** alarms activate. Earth Fault protection is not active when Gen-set does not run and when the **Earth Fault Current Protection (page 519)** is disabled.

> **IMPORTANT: Earth fault current measurement is not intended to protect human health, but the device!**

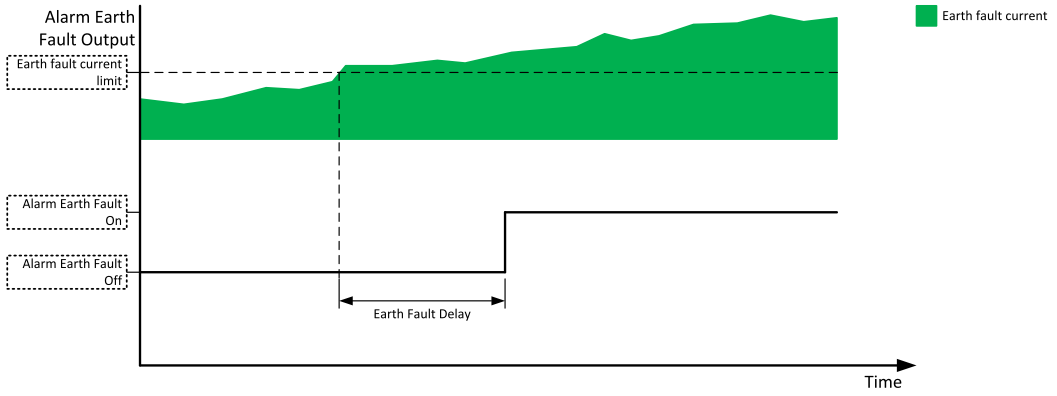



Image 8.114 Earth fault current protection

## Firmware upgrade

- Download the newest FW of module from ComAp website (in form of PSI file or installation package)
- Install package to computer or open PSI to install it into InteliConfig
- Plug the module into the controller and power the controller on.
- Open a connection with controller via InteliConfig
- Go the menu Tools -> Firmware upgrade, select the Plug-in modules tab and select the appropriate firmware you want to program into the module (in InteliConfig).
- Press the OK button to start upgrade of firmware.

The firmware update process may be performed via any kind of connection including connection via the same module in which the firmware is to be updated. The connection is re-established again automatically when the update process is finished.

## 8.5.2 CAN modules

The available extension CAN modules are:

- Inteli AIN8 – extension CAN module with 8 analog inputs
- Inteli IO8/8 – extension CAN module with 8 binary inputs, 8 binary outputs and 2 analog outputs
  - this CAN module can be switched to Inteli IO16/0 – extension CAN module with 16 binary inputs and 2 analog outputs

### Supported combinations of modules

| Slot | Inteli AIN8 | Inteli AIN8TC | Inteli IO8/8 | Inteli IO16/0 | IGL-RA15 | IGS-PTM | Inteli AIO9/1 |
|---|---|---|---|---|---|---|---|
| 1 | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |
| 2 | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |
| 3 | ✓ | ✓ | ✓ | ✓ | ✓ | ✗ | ✗ |
| 4 | ✓ | ✓ | ✓ | ✓ | ✓ | ✗ | ✗ |
| 5 | ✗ | ✗ | ✓ | ✓ | ✗ | ✗ | ✗ |

**IMPORTANT: In slot 3, 4 and 5 CAN modules Inteli IO8/8 and Inteli IO16/0 are supported without analog outputs. Analog outputs of these CAN modules are supported only in slot 1 and 2.**

It is possible to add up to 80 binary inputs or up to 68 binary outputs or up to 32 analog inputs on CAN modules.

## Extension modules


Inteli AIN8 ..... 804
Inteli IO8/8 ..... 810
IGS-PTM ..... 817
Inteli AIN8TC ..... 823
Inteli AIO9/1 ..... 827
IGL-RA15 ..... 832


### Inteli AIN8

Inteli AIN8 module is an extension module equipped with analog inputs. Inteli AIN8 module is connected to controller by CAN1 bus.




Image 8.115 Inteli AIN8

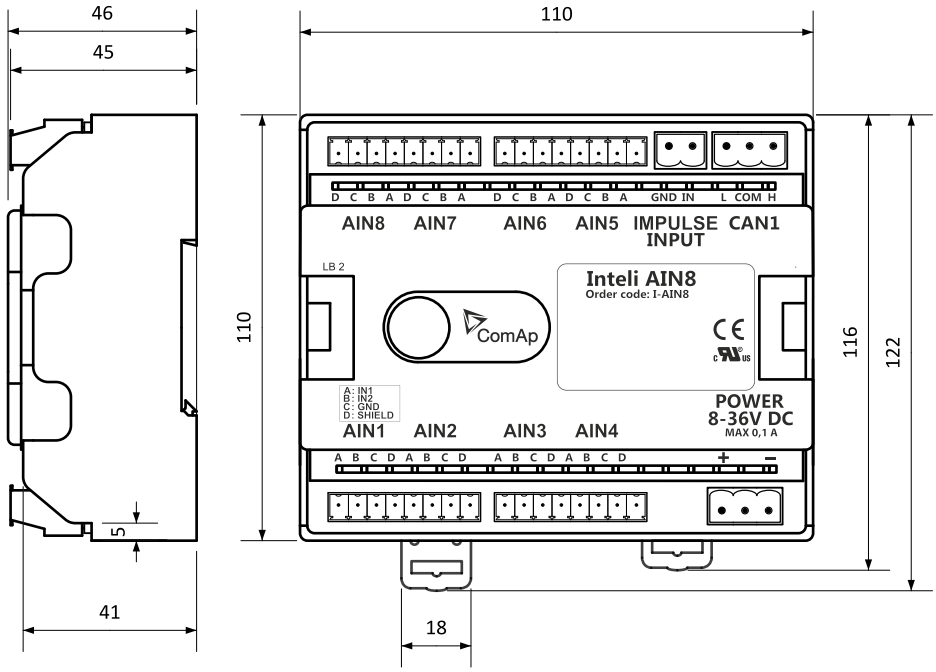
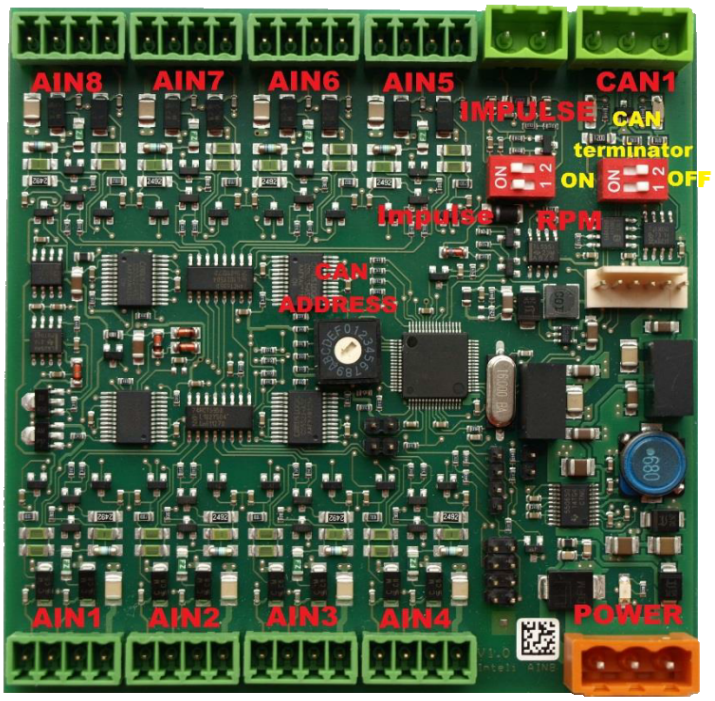



Image 8.116 Inteli AIN8 dimensions

***Note:*** *All dimensions are in mm.*

## Terminals




| | |
|---|---|
| Analog input | 8 analog Inputs |
| 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" – switch both switches) |

***Note:*** *Impulse input is not supported.*

## 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.

**IMPORTANT: Impulse input is not supported in controller.**

## Supported sensors

| Sensors | | |
|---|---|---|
| User curves | NI100 [°F] (fix) | 0-5 V |
| PT100 [°C] (fix) | NI1000 [°F] (fix) | 0-10 V |
| PT1000 [°C] (fix) | | 4-20 mA passive |
| NI100 [°C] (fix) | 0-2400 Ω | 4-20 mA active |

| Sensors | | |
|---|---|---|
| NI1000 [°C] (fix) | 0-10 kΩ | 0-20 mA passive |
| PT100 [°F] (fix) | ±1 V | ±20 mA active |
| PT1000 [°F] (fix) | 0-2.4 V | |

## CAN address

DIP switch determinates CAN address for analog inputs.

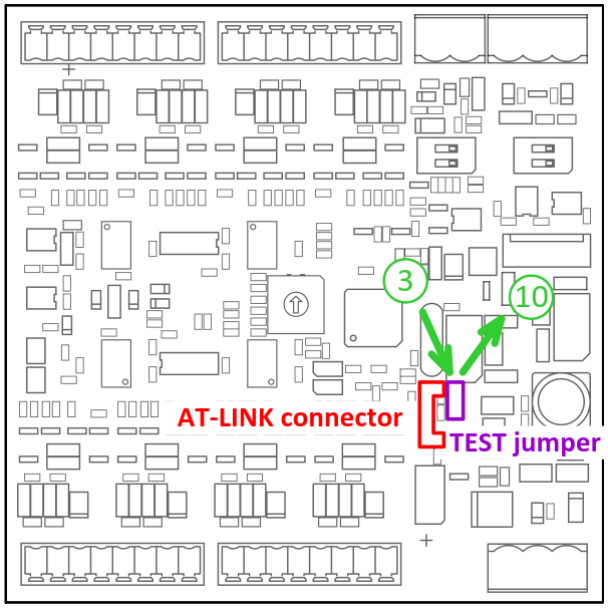



***Note:*** *When setting the CAN address to zero, the appropriate group of signals is deactivated.*

## Programming firmware

Firmware upgrade process:

1. Disconnect all terminals from the unit.
2. Remove the top cover of module
3. Put the TEST jumper on pins
4. Connect the unit with PC via RS232-null modem cable and AT-Link conv




5. Connect power supply of the module (status LED lights continuously)
6. Launch FlashPgr.exe PC software (version 4.2 or higher)
7. In FlashPrg program choose card Inteli AIN8 and load FW for the module
8. Set the proper COM port (connected with the unit) and press the Start button
9. Wait till process is done (If the process does not start – after 60 seconds 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 blink)
12. Module FW is upgraded

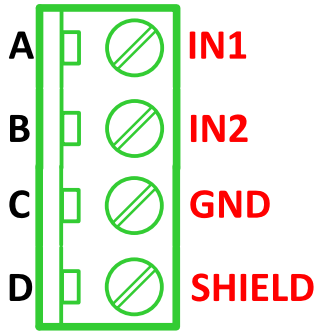
## LED indication

| 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.<br>Or power supply is in range and zero CAN address is set. (in case zero CAN address module doesn't communicate with the controller). |

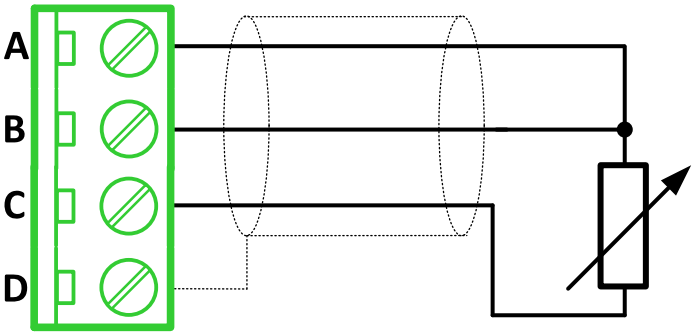
## Wiring

The following diagrams show the correct connection of sensors.

**Terminator**

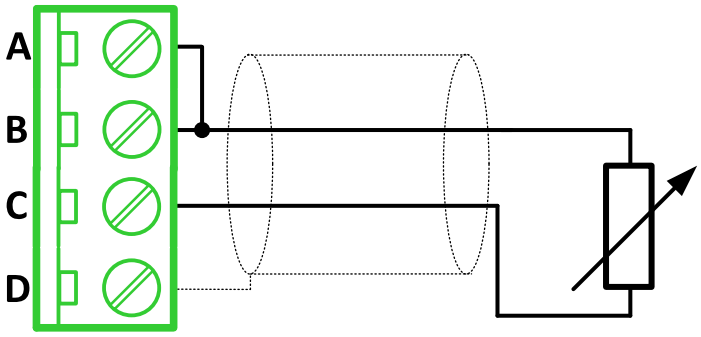



**Resistance sensor - 3 wires**



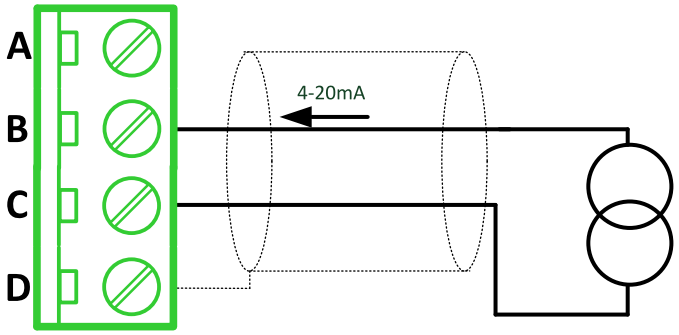

***Note:*** *Ranges: Pt100, Pt1000, Ni100, Ni1000, 0-2400 Ω, 0-10 kΩ*

**Resistance sensor – 2 wires**



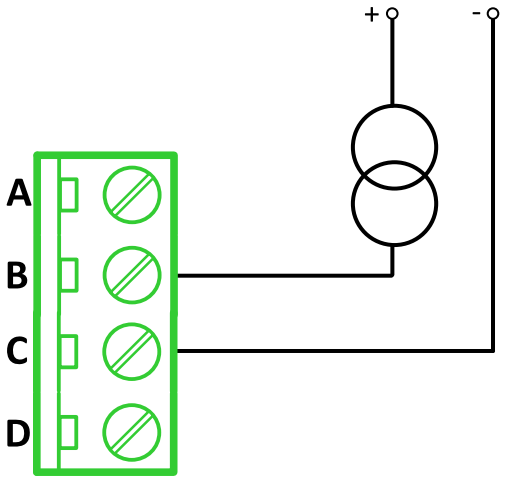

***Note:*** *Ranges: Pt100, Pt1000, Ni100, Ni1000, 0-2400 Ω, 0-10 kΩ*

**Current sensor - active**



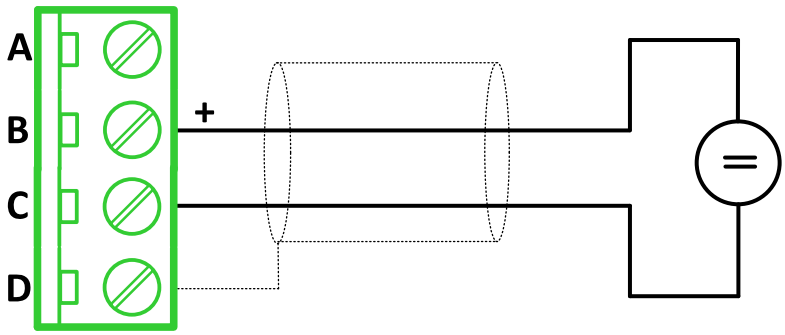

***Note:*** *Ranges: ±20 mA, 4 – 20 mA*

**Current sensor - passive**




***Note:*** *Ranges: 0 – 20 mA, 4 – 20 mA*

**Voltage sensor**




***Note:*** *Ranges: ±1 V, 0 – 2,5 V, 0 – 5 V, 0 – 10 V*

## Technical data

## General data

| | |
|---|---|
| Power supply | 8 to 36 V DC |
| Current consumption | 35 mA at 24 V ÷ 100 mA at 8 V |
| Interface to controller | CAN1 |
| 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 | 221.5 grams |

## Analog inputs

| | |
|---|---|
| Number of channels | 8 |
| Voltage | Range 0-10 V<br>Accuracy: ±0.25 % of actual value + ±25 mV |
| Current | Range: ±20 mA<br>Accuracy: ±0.25 % of actual value + ±50 µA |
| Resistive | Range: 0- 10 kΩ<br>Accuracy: ±0.5 % of actual value + ±2 Ω |

### Inteli IO8/8

Inteli IO8/8 module is an extension module equipped with binary inputs, binary outputs and analog outputs.

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

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 8.117 Inteli IO8/8

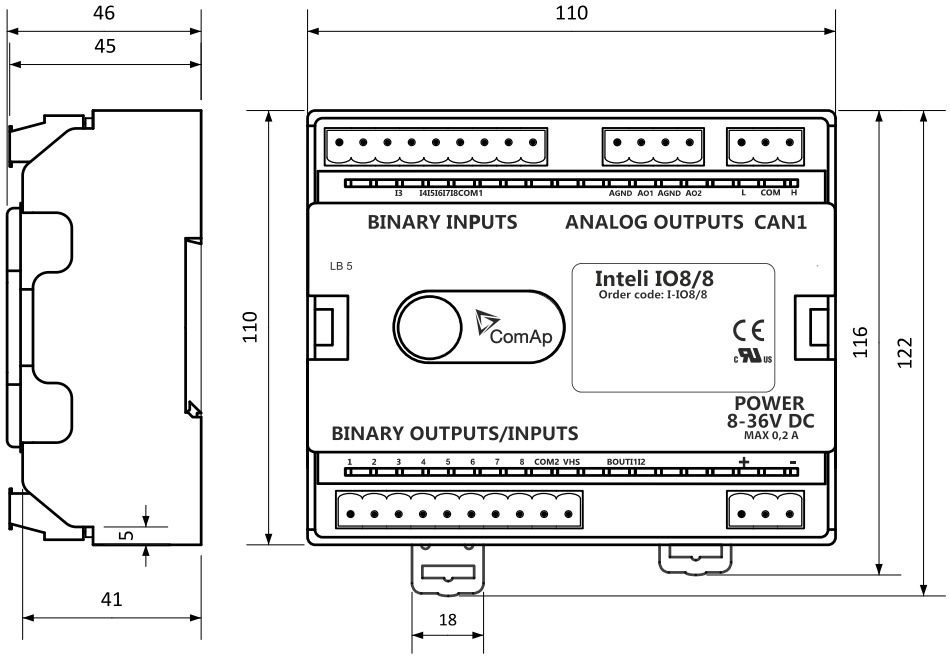
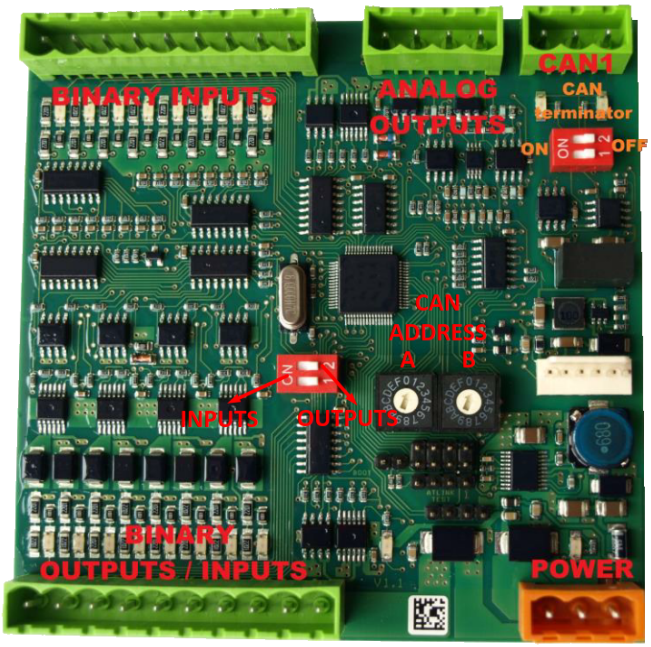



Image 8.118 Inteli IO8/8 dimensions

***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 |
| CAN | CAN1 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

All 8 inputs are always configured to one type (HSS/LSS) together. All 8 outputs can be modified to inputs by switch on the PCB ( Inteli IO8/8 to Inteli IO16/0).

**Analog outputs**

- 2 channels
- can be configured as:
  - voltage 0-10V
  - current 0-20mA
  - PWM (level 5 V, with adjustable frequency from 200 Hz to 2400 Hz, with step 1 Hz)

All inputs/outputs can be configured to any logical function or protection.

## Output state check

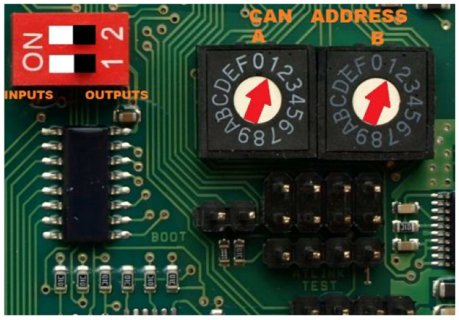
Output state check function evaluates in real time the state of binary outputs and adjusted (required) state. In case of failure (a difference between the required state and real state) history record and alarm are issued (type of the alarm is set by "Protection upon module failure" – (No protection / Warning / Shutdown)).

This function is designed for short-circuit or other failure, which causes change of set state of binary output.

## CAN address

In Inteli IO8/8 mode CAN address for binary inputs is determined by DIP switch A, CAN address for binary output and analog outputs is determined by DIP switch B.

In Inteli IO16/0 mode CAN address for binary inputs is determined by DIP switch A, first group of 8 input has address A, second group of 8 inputs has address A+1. CAN address of analog outputs is set by DIP switch B.



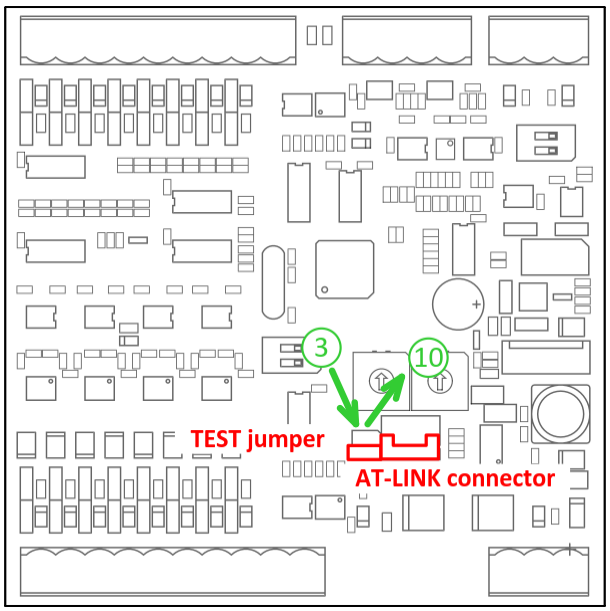

***Note:*** *When setting the CAN address to zero, the appropriate group of signals is deactivated.*

## Programming firmware

Firmware upgrade process:

1. Disconnect all terminals from the unit.
2. Remove the top cover of module
3. Put the TEST jumper on 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 the Start button
9. Wait till process is done (if the process does not start – after 60 seconds 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 blink)
12. Module FW is upgraded

## LED indication

**Binary input**

Each binary input has an 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 an LED which indicates output signal. Binary output LED is shining when binary output is set. When this LED is shining, then the module is configured as 8 binary inputs and 8 binary outputs. When this LED is dark, the module is configured as 16 binary inputs.

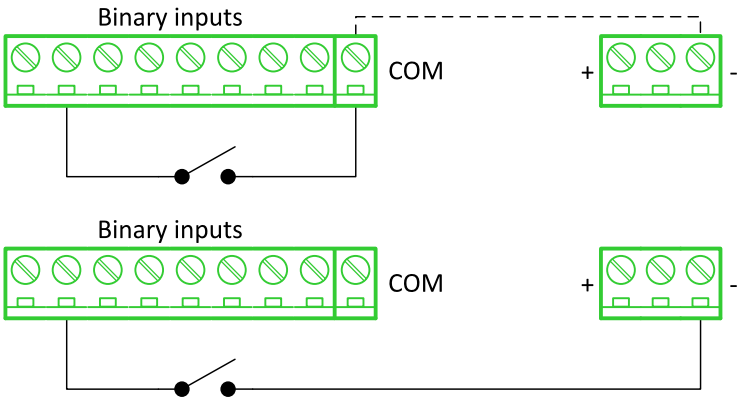
**LED at power connector – status LED**

| 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.<br>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.

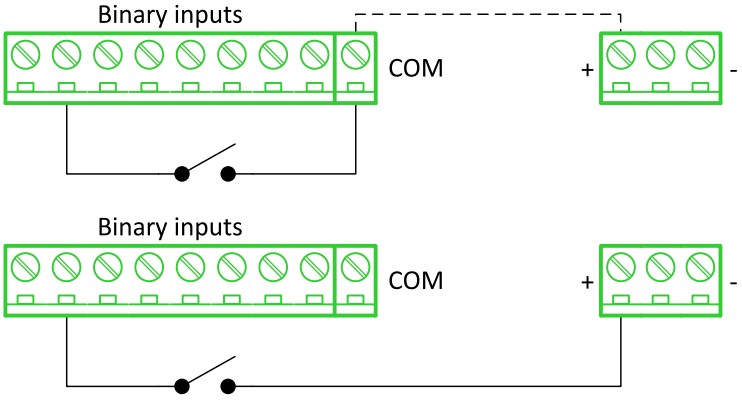
**Binary inputs – pull up**




There are two options of wiring. On upper picture you can see example of binary input is connected between BIN2 and COM (COM is connected internally to the GND (-) – dashed line).

In lower picture is an example of wiring between BIN2 and GND (-). Both ways are correct.

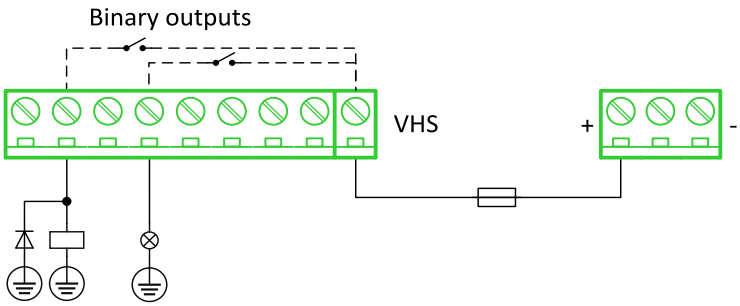
**Binary inputs – pull down**




There are two options of wiring. In the upper picture you can see an example of binary input connected between BIN2 and COM (COM is connected internally to the Ucc (+) – dashed line).

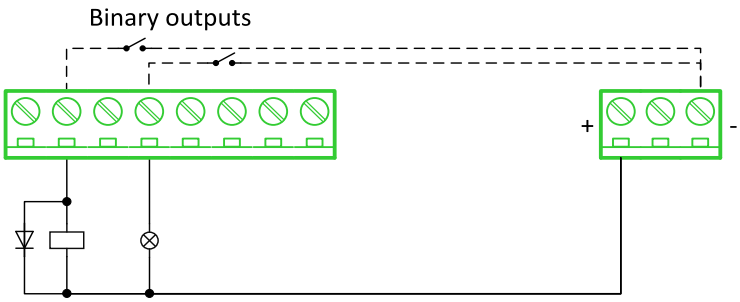
In the lower picture is an example of wiring between BIN2 and Ucc (+). Both ways are correct.

**Binary outputs – high side**



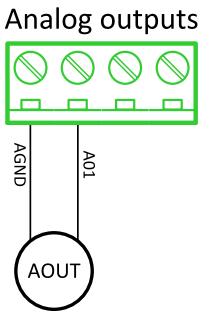

When high side setting of outputs is chosen – binary output must be connected to the negative potential directly Terminal VHS (voltage High side) must be connected to positive potential directly. Maximal current of each binary output is 500 mA. Size of fuse depends on load.

**Binary outputs – low side**




When low side setting of outputs is chosen – binary output must be connected to the positive potential of power supply directly. Negative potential is connected internally – dashed line.

**Analog outputs**




***Note:*** *Limit of analog ground (AGND) is 100 mA.*

> **IMPORTANT: Terminator for analog output has special analog ground (AGND), which must not be connected to the GND.**

## Technical data

## General data

| | |
|---|---|
| Power supply | 8 to 36 V DC |
| Current consumption | 35 mA at 24 V ÷ 100 mA at 8 V |
| Interface to controller | CAN1 |
| Protection | IP20 |
| Storage temperature | -40 °C to +80 °C |

| | |
|---|---|
| Operating temperature | -30 °C to +70 °C |
| Dimensions (W × H × D) | 110 × 110 × 46 mm (4.3” × 4.3” × 1.8”) |
| Weight | 240 grams |

## Analog outputs

| | |
|---|---|
| Number of channels | 2 |
| Voltage | Range 0-10 V<br>Accuracy: ±20 mV + ±0.5 % of actual value<br>Imax 5 mA |
| Current | Range: 0-20 mA<br>Accuracy: ±100 µA + ±0.5 % of actual value<br>Rmax 500 Ω |
| PWM | Level 5 V<br>Frequency – adjustable 200÷2400 Hz<br>Imax 20 mA |

## Binary inputs

| | |
|---|---|
| Number of channels | 8 for Inteli IO8/8, 16 for Inteli IO16/0 |
| Input resistance | 4400 Ω |
| Input range | 0 to 36 V DC |
| Switching voltage level for close contact indication | 0 to 2 V DC |
| Max voltage level for open contact indication | 6 to 36 V DC |

***Note:*** *Signals and communications can't be connected as long distance lines (not to be connected outside of the building or longer than 30 m).*

## Binary outputs

| | |
|---|---|
| Number of channels | 8 for Inteli IO8/8, 0 for Inteli IO16/0 |
| Max current | 500 mA |
| Max switching voltage | 36 V DC |

### IGS-PTM

IGS-PTM module is extension module equipped with binary inputs, binary outputs, analog inputs and analog output. IGS-PTM module is connected to controller by CAN1 bus.




Image 8.119 IGS-PTM

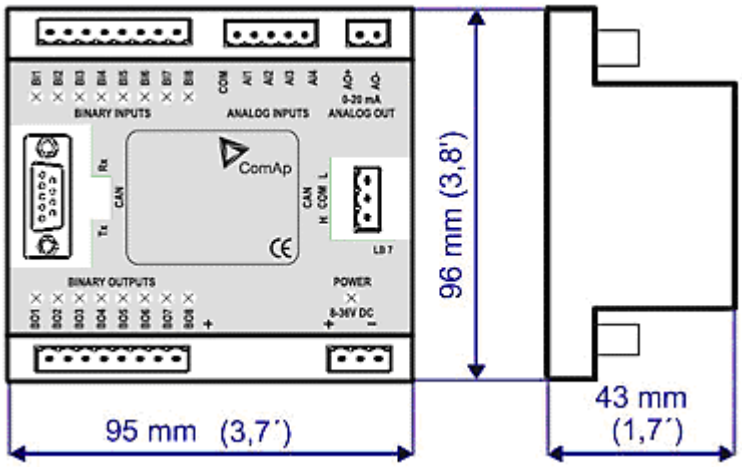
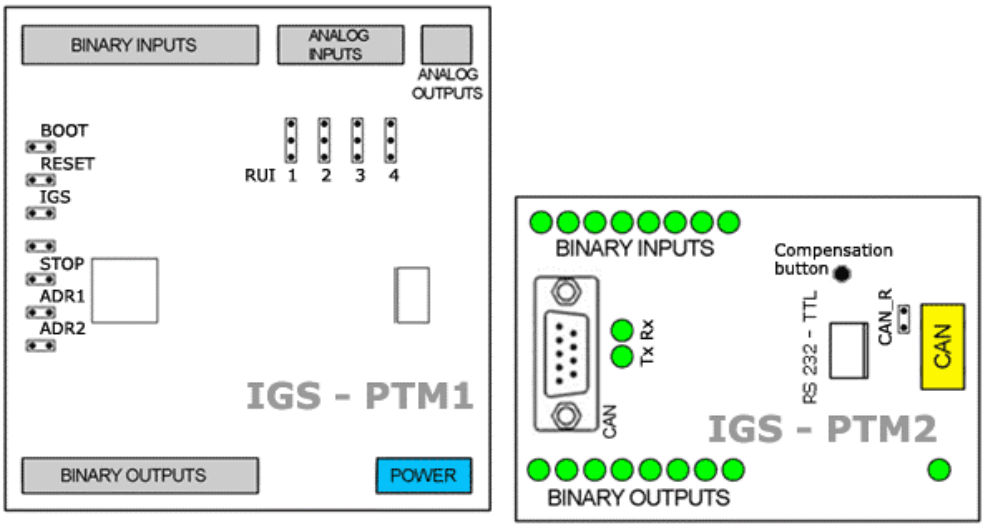



Image 8.120 IGS-PTM dimensions

## Terminals




| | |
|---|---|
| Binary inputs | 8 binary inputs |
| Analog inputs | 4 analog inputs |
| Analog outputs | 1 analog output |
| Binary outputs | 8 binary outputs |
| CAN | CAN1 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 input 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 Ω |
| 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, InteliGen4 200 |

### Address configuration

If InteliGen4 200 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 |

## Programming firmware

Firmware upgrade is available 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 FlashProg PC tool should be used.

## LED indication

### Binary input

Each binary input has an 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

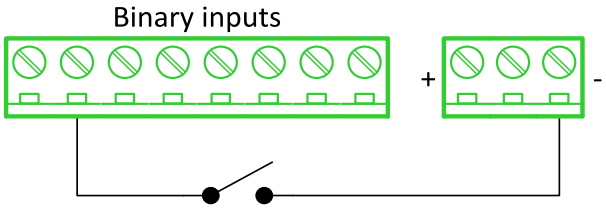
Each binary output has an LED which indicates output signal. Binary output LED is shining when binary output is set.

### LED at power connector – status LED

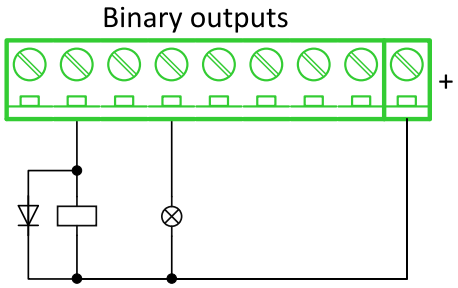
| LED status | Description |
|---|---|
| Dark | No required power connected. |
| Quick flashing | Program check failure. |
| One flash and pause | Compensation fail. |
| Three flashes and pause | Compensation successful. |
| Flashes | There is no communication between IGS-PTM and the controller. |
| Lights | Power supply is in the range and communication between IGS-PTM and controller properly works. |

## Wiring

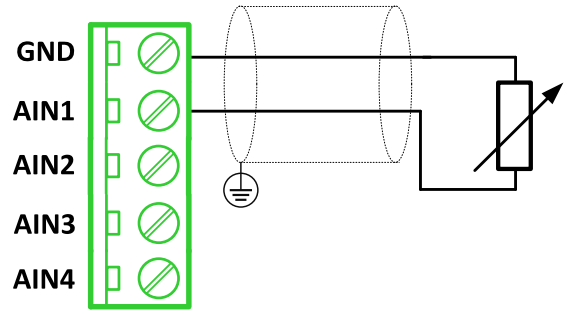
### Binary inputs




### Binary outputs



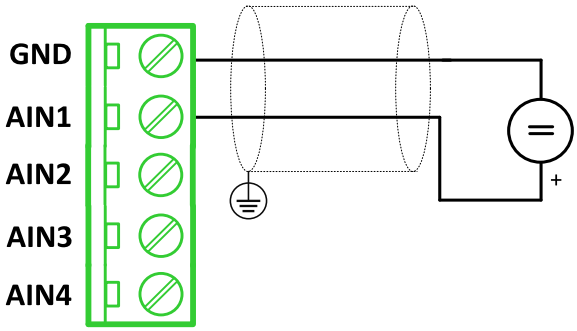

### Resistance sensor




***Note:*** *Range: 0-2400 Ω*

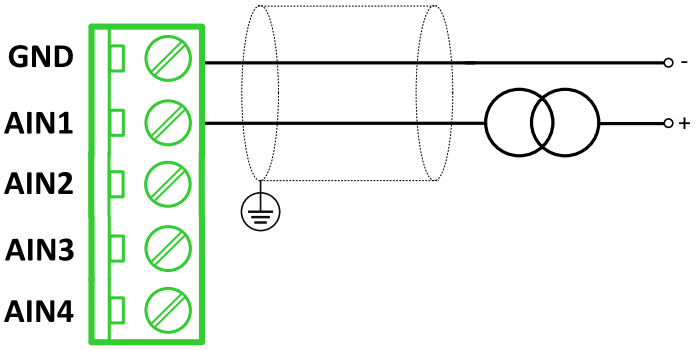
**IMPORTANT: Physical analog input range is 0-250 Ω. In sensor configuration in PC tool it is necessary to chose 0-2400 Ω sensor HW type to ensure proper function of analog input.**

### Voltage sensor




***Note:*** *Range 0-100 mV*

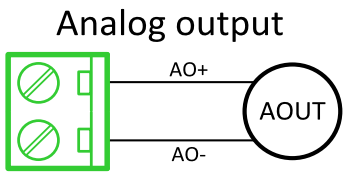
**Current sensor – passive**




***Note:*** *Range: ±0-20 mA*

**IMPORTANT: Physical analog input range is 0-20 mA. In sensor configuration in PC tool it is necessary to chose ±20 mA active sensor HW type to ensure proper function of analog input.**

**Analog outputs**




***Note:*** *Range: 0 to 20 mA ±0.33 mA*

## Technical data

## General data

| | |
|---|---|
| Power supply | 8 to 36 V DC |
| Current consumption | 100 mA at 24V ÷ 500 mA |
| Interface to controller | CAN1 |
| 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<br>Accuracy: 1.5 % ±1 mV out of measured value |
| Current | Range: 0-20 mA<br>Accuracy: 2.5 % ±0.5 Ω out of measured value |
| Resistive | Range: 0-250 Ω<br>Accuracy: 1 % ±2 Ω out of measured value |

## Analog outputs

| | |
|---|---|
| Number of channels | 1 |
| Current | Range: 0 to 20 mA ± 0.33 mA<br>Resolution 10 bit |

## Binary inputs

| | |
|---|---|
| Number of channels | 8 |
| Input resistance | 4700 Ω |
| Input range | 0 to 36 V DC |
| Switching voltage level for close contact indication | 0 to 2 V DC |
| Max voltage level for open contact indication | 8 to 36 V DC |

***Note:*** *Signals and communications can't be connected as long distance lines (not to be connected outside of the building or longer than 30 m).*

## 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<br>Accuracy: 1.5 % ±.1 mV out of measured value |
| Current | Range: 0-20 mA<br>Accuracy: 2.5 % ± 0.5 Ω out of measured value |
| Resistive | Range: 0-250 Ω<br>Accuracy: 1 % ±2 Ω out of measured value |

### Inteli AIN8TC

Inteli AIN8TC module is an extension module equipped with 8 analog inputs dedicated for thermocouple sensors only.

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 8.121 Inteli AIN8TC

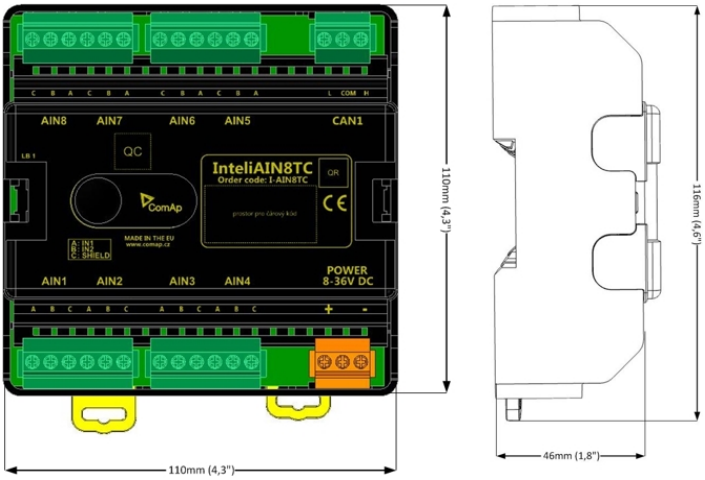
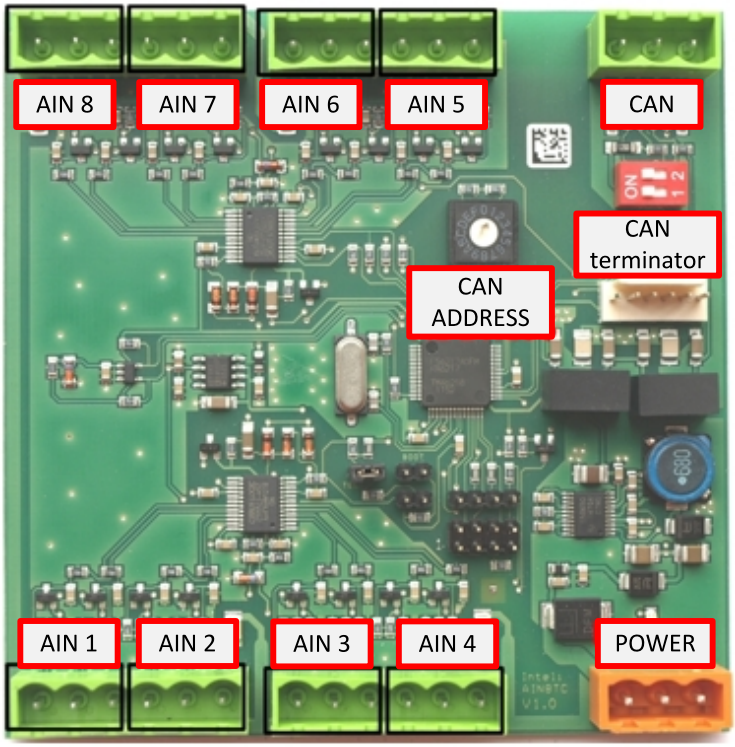



Image 8.122 Inteli AIN8TC dimensions

## Terminals




| | |
|---|---|
| ANALOG INPUT | 8 analog Inputs |
| 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 |

## Analog inputs

- 8 channels
- can be configured as thermocouple sensors only

## Supported sensors

| Sensors |
|---|
| Thermocpl J [°C] (fix) |
| Thermocpl K [°C] (fix) |
| Thermocpl L [°C] (fix) |
| Thermocpl J [°F] (fix) |
| Thermocpl K [°F] (fix) |
| Thermocpl L [°F] (fix) |
| Thermocpl (nc) J [°C] (fix) |

| |
|---|
| Thermocpl (nc) K [°C] (fix) |
| Thermocpl (nc) L [°C] (fix) |
| Thermocpl (nc) J [°F] (fix) |
| Thermocpl (nc) K [°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*

## Address and DIP switch setting

### Address configuration

DIP switch determines CAN address for analog inputs.

### Programming firmware

Firmware is upgraded via AT-link (TTL). For programming it is necessary to close jumper TEST.

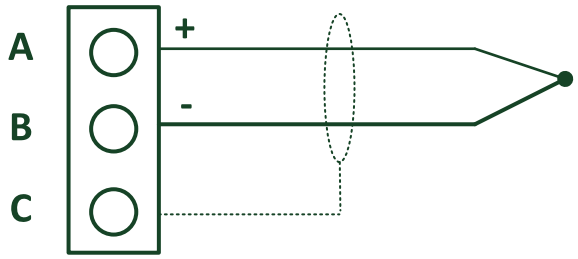
For programming FlashProg PC tool version 4.2 or higher must be used.

## LED indication

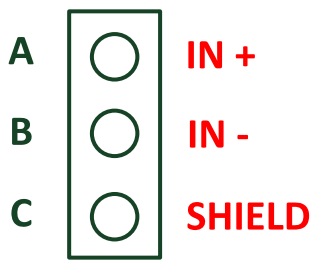
| LED status | Description |
|---|---|
| Dark | FW in module does not work correctly. |
| Flashing | Module does not communicate with controller (in case non-zero CAN address) |
| Fast flashing | Detection of CAN communication speed |
| Lights | Power supply is in the range and the communication between Inteli AIN8TC and controller works properly.<br>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

### Analog inputs




### Terminator



## 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.<br>All analog inputs are galvanic separated from power supply.<br>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 |

Thermocouples which are galvanically separated and galvanically non-separated are supported.

### Inteli AIO9/1

Inteli AIO9/1 module is an extension module equipped with analog inputs and outputs – designed for DC measurement.

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 8.123 Inteli AIO9/1

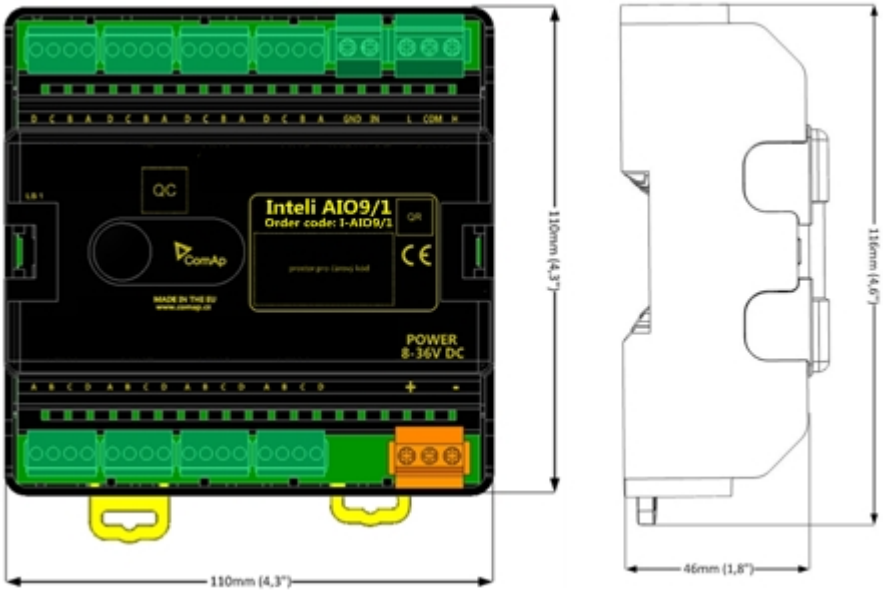
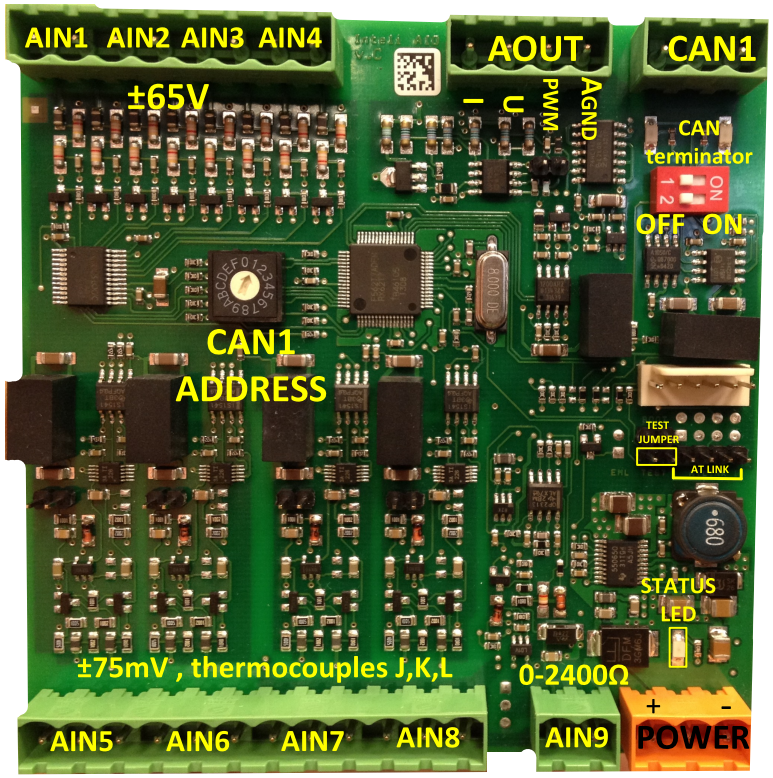



Image 8.124 Inteli AIO9/1 dimensions

## Terminals




| | |
|---|---|
| ANALOG INPUT | 9 channels |
| ANALOG OUTPUTS | 1 channel |
| CAN | CAN1 line |
| POWER | Power supply |
| CAN LED Tx, Rx | Indication transmitted or received data |
| Status LED | LED indication of correct function |
| CAN terminator | Terminating CAN resistor (active in position "ON") |
| TEST jumper | Upgrade of SW |
| AT-LINK | Connector for AT-LINK (Upgrade of SW) |

## Analog inputs

- 4 channels AIN1 – AIN4 can be configured as:
  - Sensor ±65V (determined for measurement of battery voltage)
- 4 channels AIN5 – AIN8 can be configured as:
  - Thermocouples – type J,K or L (in °C or °F)
  - Sensor ±75mV DC – (for connecting current shunts)
- 1 channel AIN9 can be configured as:
  - RTD (Pt1000, Ni1000)
  - Common resistance 0-2400Ω

## Analog outputs

- 1 channel AOUT1. Type of output:
  - 0-10V DC
  - 0-20mA
  - PWM (5 V, freq 2.4 Hz ÷2.4 kHz)
- Analog output has 4-pins connector – GND and one pin for each type of output.

All analog inputs can be configured to any logical function or protection.

## Supported sensors

| Sensors |
|---|
| User curves |
| PT1000 [°C] (fix) |
| NI1000 [°C] (fix) |
| PT1000 [°F] (fix) |
| NI1000 [°F] (fix) |
| 0-2400 Ω (fix linear) |
| ±65 V DC (fix linear) |
| ±75 mV (fix linear) |
| Thermocpl J [°C] (fix) |
| Thermocpl K [°C] (fix) |
| Thermocpl L [°C] (fix) |
| Thermocpl (nc) J [°C] (fix) |
| Thermocpl (nc) K [°C] (fix) |
| Thermocpl (nc) L [°C] (fix) |
| Thermocpl (nc) J [°F] (fix) |
| Thermocpl (nc) K [°F] (fix) |
| Thermocpl (nc) L [°F] (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.

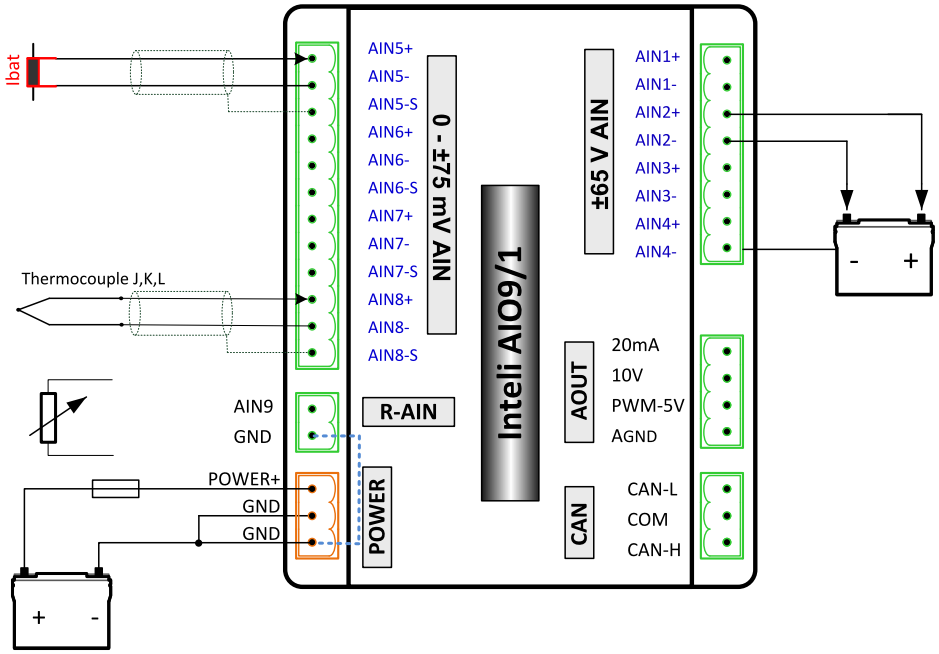
## LED indication

| 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.<br>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

| | |
|---|---|
| **Dimension (W × H × D)** | 110 × 110 × 46 mm (4.3" × 4.3" × 1.8") |
| **Weight** | 248 grams |
| **Interface to controller** | CAN1 – galvanic separated from power supply and measurement, |

| | | |
|---|---|---|
| **Analog inputs (not electric separated)** | | 9 channels |
| **AIN1-AIN4 – Voltage inputs** | **Range** | 0-65 V ± 0.25 % of actual value + ± 120 mV<br>Measurement is not galvanic separated from power supply, but IN- is not interconnected with GND – there is floating measurement. |
| | **Accuracy of measurement** | ± 0,1 % of actual value + ± 100 µV (± 3 °C) |
| **AIN5-AIN8 – Voltage inputs** | **Range** | ± 75 mV (nominal) (measurement up to ±80 mV) |
| | **Accuracy of measurement** | ± 0.1 % of actual value + ± 75 µV<br>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<br>It is not galvanic separated from power supply. |

| **Analog output** |
|---|
| I 0-20mA /500Rmax. ± 1 % of actual value + ± 200 uA<br>U 0-10V ± 0.5 % of actual value + ± 50 mV<br>PWM – 5 V, 200 Hz-2.4kHz 15 mA max.<br>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.*

## IGL-RA15

Remote annunciator (IGL-RA15) is designed as an extension signalling unit.

The unit is equipped with a fully configurable tricolor (red, orange, green) LED for intuitive operation together with high functionality.




Image 8.125 IGL-RA15

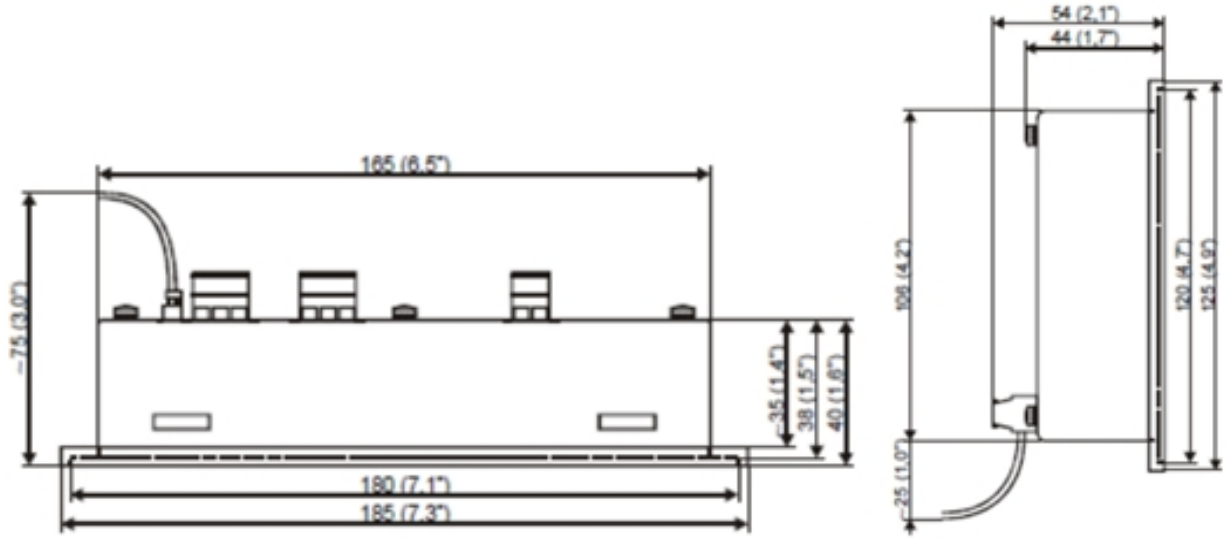



Image 8.126 IGL-RA15 dimensions

## Terminals

| | |
|---|---|
| Horn | Horn |
| CAN | CAN1 line |
| Power | Power supply |

## CAN address

| Address | Jumper A | Jumper B |
|---|---|---|
| 1 | OPEN | OPEN |
| 5+6 | CLOSED | OPEN |
| Customer defined | CLOSED | CLOSED |

SW changing of CAN1 address is enabled only when both jumpers are closed. Any one of these addresses (1+2 or 3+4 or 5+6 or 7+8) can be set via the following steps:

- Switch to programming mode (Hold the Horn reset and Lamp test when unit is powering on). Status led is yellow

- Press Lamp test sixteen times
- Set the address up by pressing Horn reset.
  - The number of red luminous LEDs means the CAN1 addresses (two for addresses 1+2, four for addresses 3+4, six for addresses 5+6 and eight for addresses 7+8)
- Press Lamp test

## LED indication

Each LED color is adjusted independently of controller output settings. If controller output 1 is set as "Common Shutdown" it does not 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 Lamp test three 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.*

### Status LED

The signals LEDs are handled like binary outputs. This means everything that 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 via the 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 (any 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 any red or yellow LED lights up or

› At the end of the extended lamp test. See chapter **Lamp and horn test (page 835)**

**The horn can be silenced:**

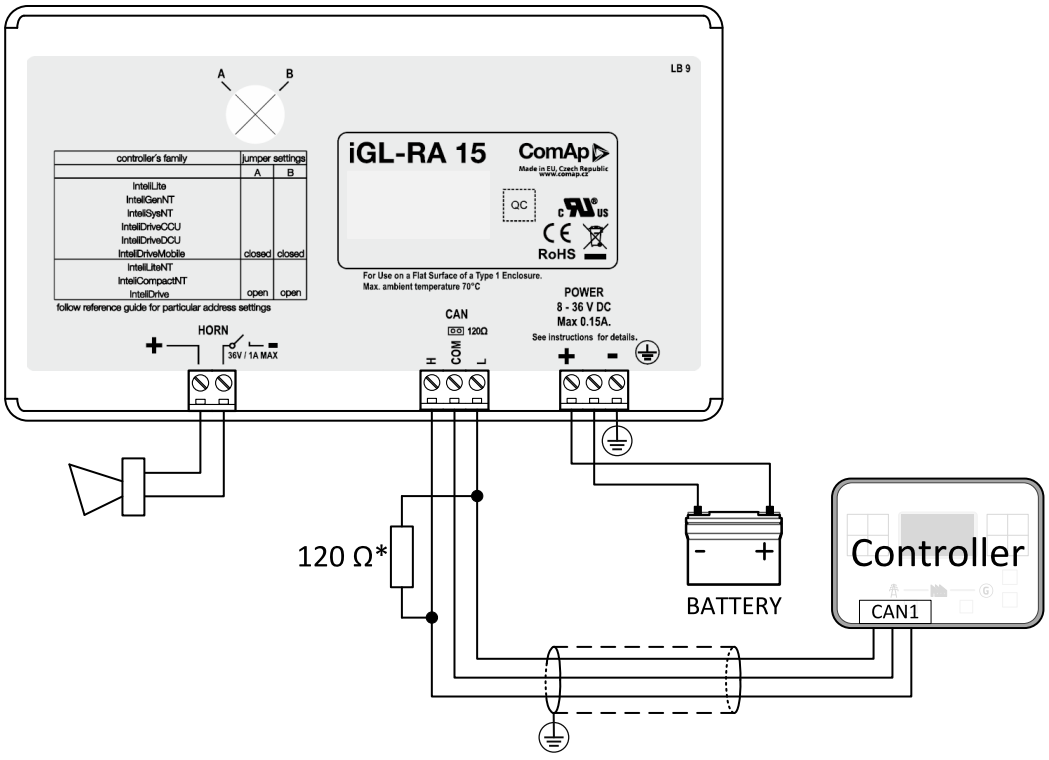
› By pressing horn reset button or

› It silences automatically after adjusted time

## Lamp and horn test

Pressing and holding lamp test button for less than 2 s executes the basic lamp test. All LEDs light up with the configured color. If the button is held longer than 2 s, an extended test is started. Every LED is tested step-by-step in green color and then in red color. The horn is activated at the end of the test. Afterwards, that the unit returns to normal operation. The horn can be silenced with horn reset.

## Wiring




* terminator resistor only when iGL-RA 15 is the last unit on the CAN1 bus.

***Note:*** *The shielding of the CAN bus cable must be grounded at one point only!*

***Note:*** *See the section **Technical data (page 246)** for recommended CAN bus cable type.*

## Technical data

## General data

| | |
|---|---|
| Power supply | 8 to 36 V DC |
| Current consumption | 0.35-0.1A (+1Amax horn output) depends on supply voltage |
| Protection | IP65 |
| Humidity | 85% |
| Storage temperature | -30 °C to +80 °C |
| Operating temperature | -20 °C to +70 °C |
| Dimensions (WxHxD) | 180 × 120 × 55 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 kBd |
| 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 / 100 m |
| Recommended Industrial Automation & Process Control Cables | |
| BELDEN (www.belden.com) | › 3082A DeviceBus for Allen-Bradley DeviceNet<br>› 3083A DeviceBus for Allen-Bradley DeviceNet<br>› 3086A DeviceBus for Honeywell SDS<br>› 3087A DeviceBus for Honeywell SDS<br>› 3084A DeviceBus for Allen-Bradley DeviceNet<br>› 3085A DeviceBus for Allen-Bradley DeviceNet<br>› 3105A Paired EIA Industrial RS485 cable |
| LAPP CABLE (www.lappcable.com) | › Unitronic BUS DeviceNet Trunk Cable<br>› Unitronic BUS DeviceNet Drop Cable<br>› Unitronic BUS CAN<br>› Unitronic-FD BUS P CAN UL/CSA |

back to Appendix