InteliCompact NT®

Paralelling gen-set controller

SW version 1.3.1, November 2011

ComAp

Reference Guide

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Document information

INTELICOMPACT-NT® - REFERENCE GUIDE
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DOCUMENT HISTORY

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This documentation is available also in electronic form as a Windows help file *InteliCompact-NT.chm*. The help can be opened from the windows explorer or directly from the LiteEdit menu bar (if a connection is estabilished to an InteliCompact controller).

Pressing F1 in the LiteEdit setpoint, values or configuration window will open the help with the context of currently selected setpoint, value and binary input or output function.

Clarification of notation

NOTE:
This type of paragraph calls readers attention to a notice or related theme.

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

WARNING!
This type of paragraph indicates things, procedures, adjustments etc. which need high level of attention, otherwise can cause personal injury or death.

Conformity Declaration

The following described machine complies with the appropriate basic safety and health requirement of the EC Low Voltage Directive No: 73/23 / EEC and EC Electromagnetic Compatibility Directive 89/336 / EEC based on its design and type, as brought into circulation by us.

System overview

General description

InteliCompact^{NT} Family controllers are comprehensive gen-set controllers for single and multiple generating sets operating in stand-by or parallel modes. A modular construction allows upgrades to different levels of complexity in order to provide the best solution for various customer applications. The controllers are equipped with a powerful graphic display showing icons, symbols and bar-graphs for intuitive operation, which sets, together with high functionality, new standards in Gen-set controls.

The key features are:

- Easy-to-use operation and installation. Factory default configuration covers most of applications
- Different customer changes are possible thanks to the configurability
- Excellent remote communication capabilities
- High level of EFI engines support, most of world producers supported
- High reliability

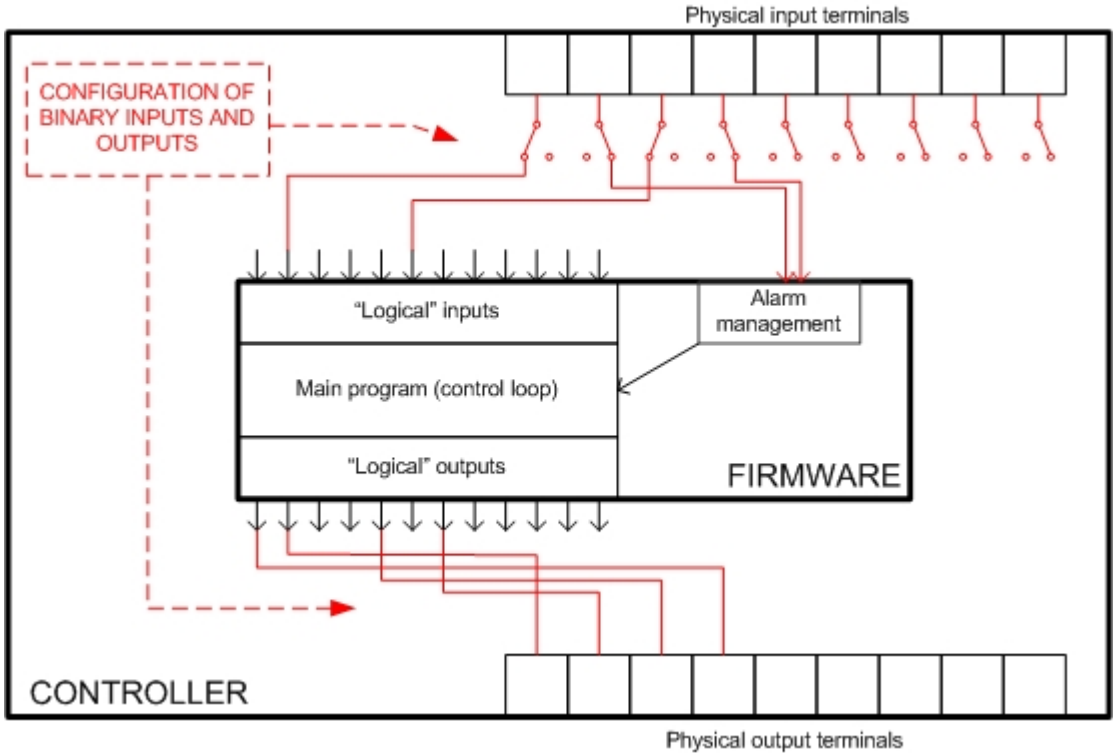
Configurability

One of the key features of the controller is high level of adaptability of the system to the needs of every particular application. The way, how to achieve this, is the configuration.

NOTE:
Use **LiteEdit** PC software to the read configuration from the controller or disk, view it, modify it and write the configuration to controller or disk.

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

1. Mapping of logical binary inputs (functions) or assigning alarms to physical binary input terminals
2. Mapping of logical binary outputs (functions) to physical binary output terminals
3. Assigning sensor characteristics and alarms to analog inputs
4. Assigning control values and output characteristics to analog outputs
5. Selecting of peripherial modules which are connected to the controller and doing the same as above for them
6. Selecting of ECU type if an ECU is connected
7. Changing language of the controller texts



PRINCIPLE OF BINARY INPUTS AND OUTPUTS CONFIGURATION

The controller is delivered with a **default configuration, which should fit to most standart applications**. This default configuration can be changed only using PC and LiteEdit software. See LiteEdit documentation for details.

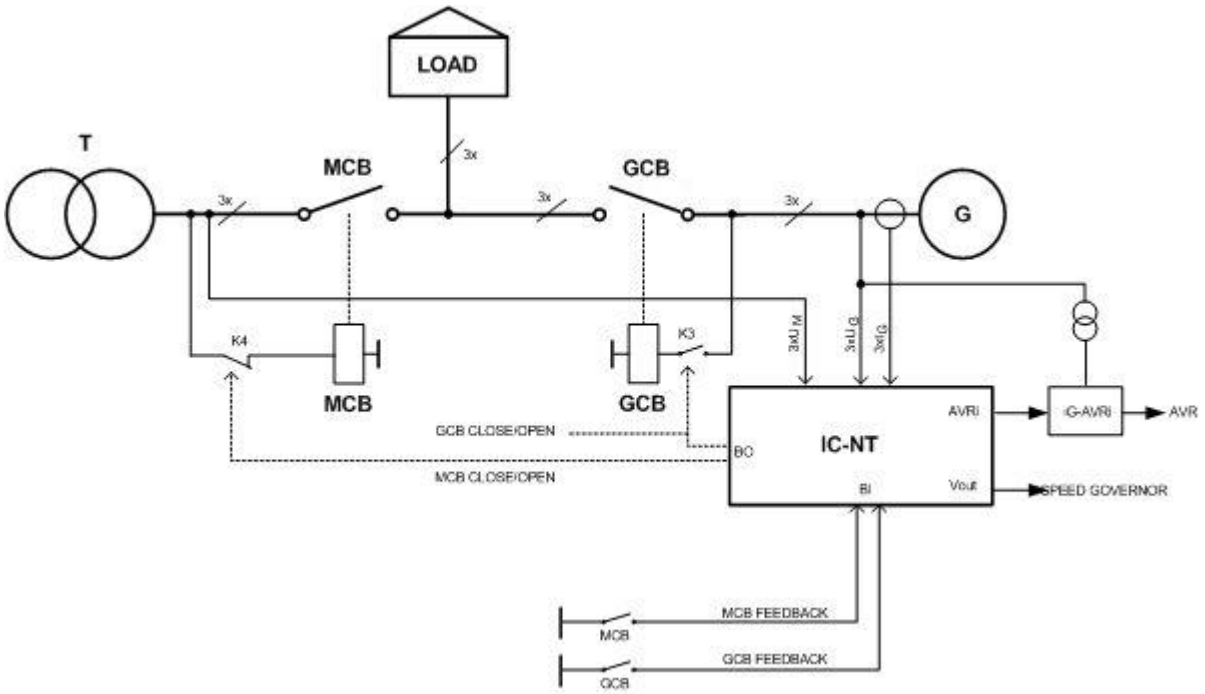
NOTE:
You need one of communication modules to connect the controller to a PC with LiteEdit. There is a special easy removable service module for cases, where there is no communication module permanently attached.

Once the configuration is modified, it can be stored in a file for later usage with another controller or for backup purposes. The file is called **archive** and has file extension "aic". An archive contains full image of the controller at the moment of saving (if the controller is online to the PC) except firmware, i.e. besides configuration there are also current adjustment of all setpoints, all measured values, a copy of history log and a copy of alarm list.
The archive can be simply used for **cloning** of controllers, which means preparing controllers with identical configuration and settings.

Applications overview

Single applications

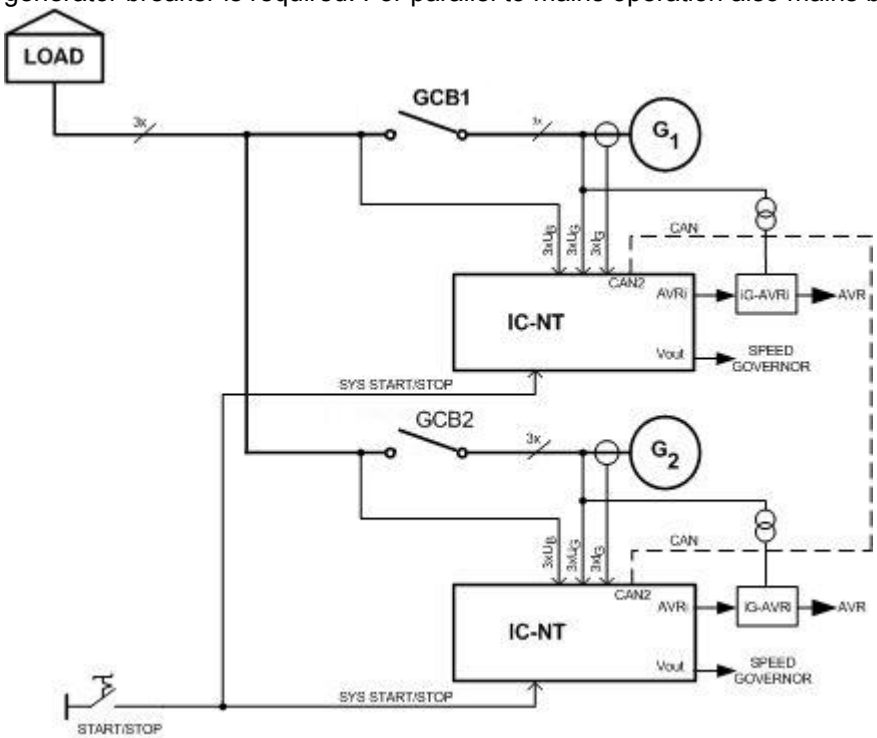
The typical scheme of a single parallel to mains application is shown below. The controller controls two breakers - mains breaker and generator breaker. Feedbacks from both breakers are required.



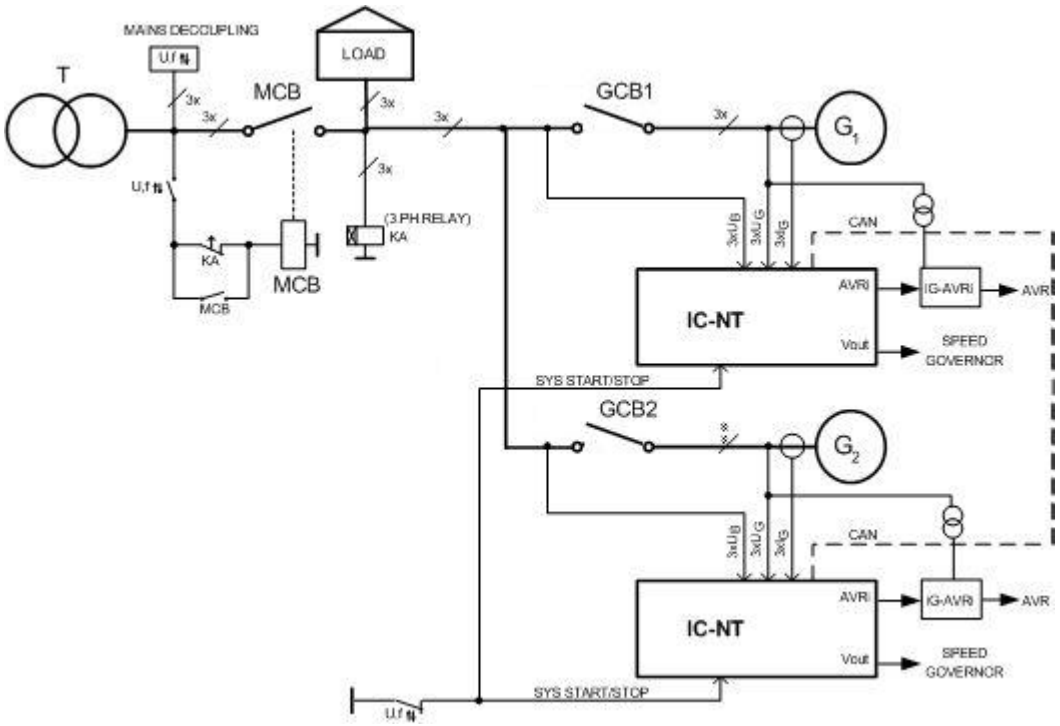
SINGLE PARALLEL TO MAINS APPLICATION

Multiple applications

The typical scheme of multiple island-parallel application without mains and with mains and AMF function is shown below. The controller controls one breaker only - generator breaker. Feedback from generator breaker is required. For parallel to mains operation also mains breaker feedback is required.



ISLAND-PARALLEL OPERATION WITHOUT MAINS



ISLAND-PARALLEL OPERATION WITH AMF AND WITHOUT PARALLELING

True RMS measurement

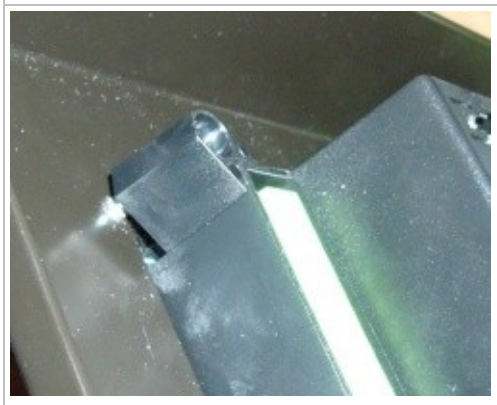
This controller measures AC values based on *True RMS* principle. This principle corresponds exactly to the physical definition of alternating voltage and current effective values. Under normal circumstances the mains voltage and current should have pure sinusoidal waveform. However some nonlinear elements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

NOTE:
The harmonic deformation causes that the *Power Factor* of a generator working parallel with the mains can not reach values in certain range around the PF 1.00. The higher is the deformation, the wider is the power factor dead range. If the requested power factor is adjusted inside the dead range, the controller **can not reach** the requested value because of above explained fact.

Installation

Mounting

The controller is to be mounted onto the switchboard door. Requested cutout size is 175x115mm. Use the screw holders delivered with the controller to fix the controller into the door as described on pictures below.



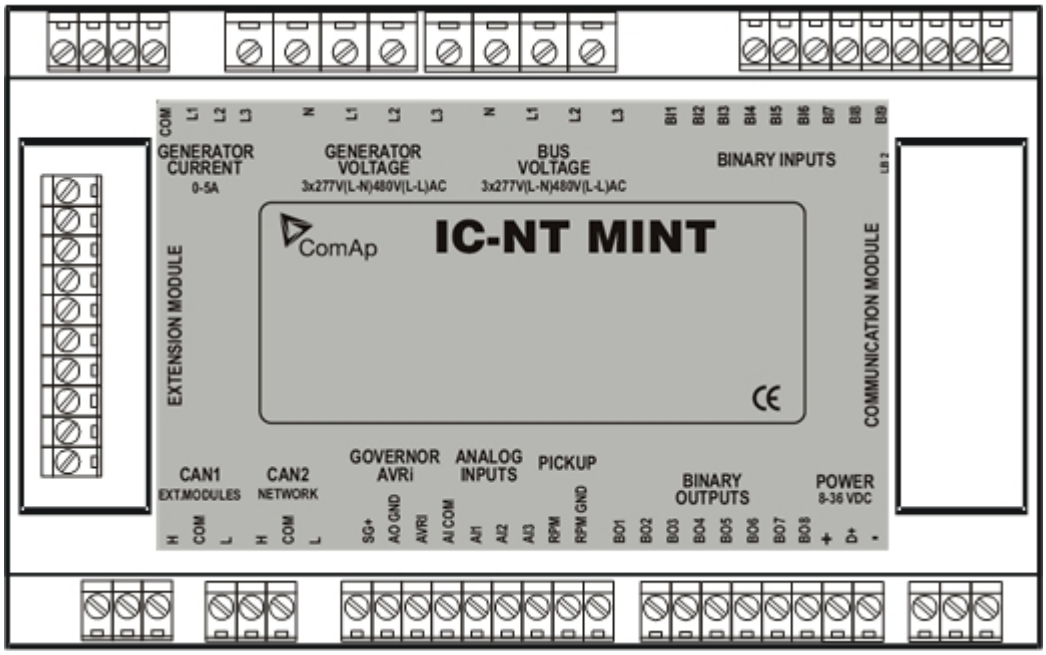
Package contents

The package contains:

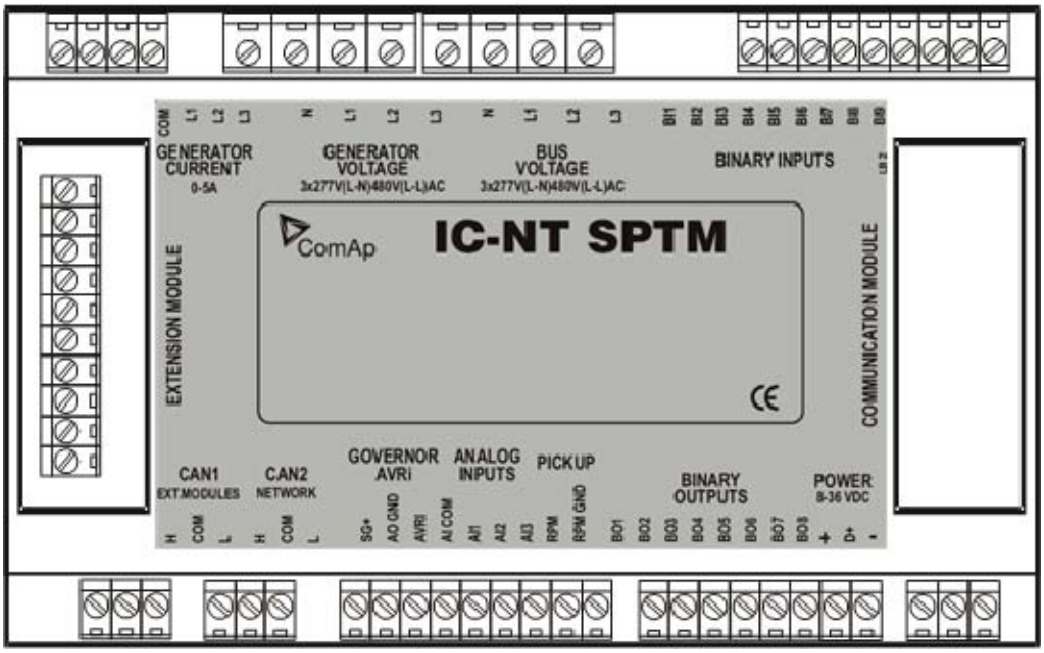
- Controller
- Mounting holders
- Terminal blocks

NOTE:
The package does not contain any communication module. The required module should be ordered separately.

Terminal diagram



MINT



SPTM

General

To ensure proper function:

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

Wiring

Tightening torque, allowable wire size and type, for the Field-Wiring Terminals:

- Based on terminal type:
  1. PA256:

SPECIFIED TIGHTENING TORQUE 0,5NM (4,4 IN-LB)

  2. 2EDGK:

SPECIFIED TIGHTENING TORQUE 0,4NM (3,5 IN-LB)

- For field type terminals:
  Use only diameter 2,0-0,5mm (12-26AWG) conductor, rated for 75°C minimum.

- For Mains(Bus) Voltage and Generator Voltage terminals
  Use only diameter 2,0-0,5mm (12-26AWG) conductor, rated for 90°C minimum.

- Use copper conductors only.

Grounding

The shortest possible piece of wire should be used for controller grounding. Use cable min. 2,5mm^2. Brass M4x10 screw with star washer securing ring type grounding terminal shall be used.

The negative "-" battery terminal has to be properly grounded.
Switchboard and engine has to be grounded in common spot. Use as short as possible cable to the grounding point.

Power supply

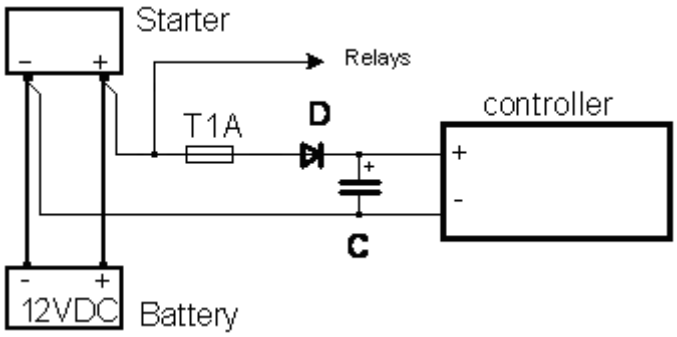
To ensure proper function:
Use min. power supply cable of 1.5mm^2
Maximum continuous DC power supply voltage is 36VDC. Maximum allowable power supply voltage is 39VDC. The InteliCompact's power supply terminals are protected against large pulse power disturbances. When there is a potential risk of the controller being subjected to conditions outside its capabilities, an outside protection devise should be used.

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

HINT:
The InteliCompact controller should be grounded properly in order to protect against lighting strikes!! The maximum allowable current through the controller's negative terminal is 4A (this is dependent on binary output load).

For the connections with 12VDC power supply, the InteliCompact^{NT} includes internal capacitors that allow the controller to continue operation during cranking if the battery voltage dip occurs. If the voltage before dip is 10V, after 100ms the voltage recovers to 7 V, the controller continues operating. During this voltage dip the controller screen backlight can turn off and on but the controller keeps operating.

It is possible to further support the controller by connecting the external capacitor and separating diode or I-LBA module:

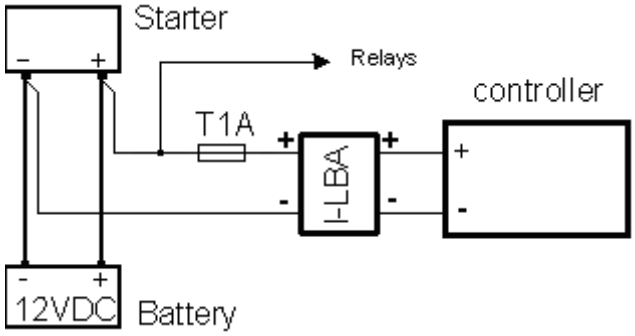


The capacitor size depends on required time. It shall be approximately thousands of microFarads. The capacitor size should be 5 000 microFarad to withstand 150ms voltage dip under following conditions:

Voltage before dip is 12V, after 150ms the voltage recovers to min. allowed voltage, i.e. 8V

HINT:
Before the battery is discharged the message "Low BackupBatt" appears.

Or by connecting of a special I-LBA Low Battery Adaptor module:



The I-LBA module ensures min. 350ms voltage dip under following conditions:

- RS232 and other plug-in module are connected.
- Voltage before dip is 12V and after 350ms the voltage recovers to min. allowed voltage 5V.
- The I-LBA enables controller operation from 5VDC (for 10 to 30 sec).
- The wiring resistance from battery should be up to 0.1 Ohm for I-LBA proper function.

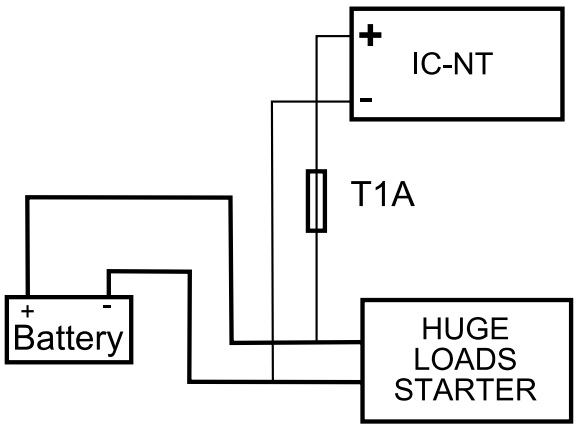
HINT:
I-LBA may not eliminate voltage drop when used with low temperature (-40°C) version of controller and display heating element is on (below 5°C). Current drain of heating element exhausts LBA capacitors very fast.

Power supply fusing

A one-amp fuse should be connected in-line with the battery positive terminal to the controller and modules. These items should never be connected directly to the starting battery.

Fuse value and type depends on number of connected devices and wire length.

Recommended fuse (not fast) type - T1A. Not fast due to internal capacitors charging during power up.



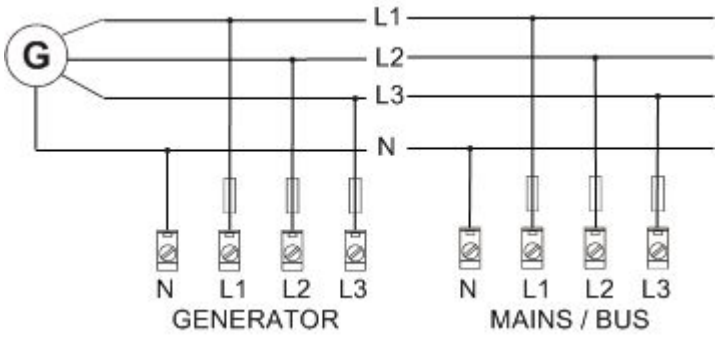
Voltage and current inputs

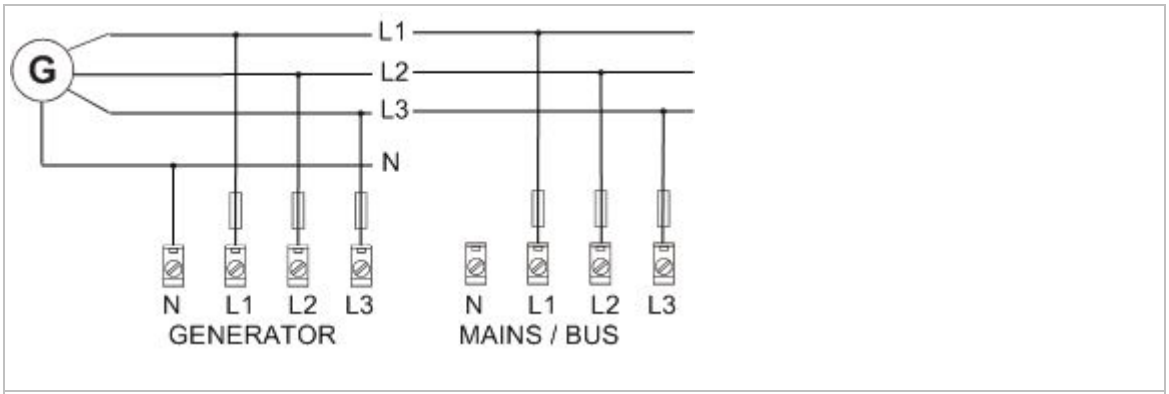
WARNING!
Risk of personal injury due to electric shock when manipulating with voltage terminals under voltage! Be sure the terminals are not under voltage before touching it.

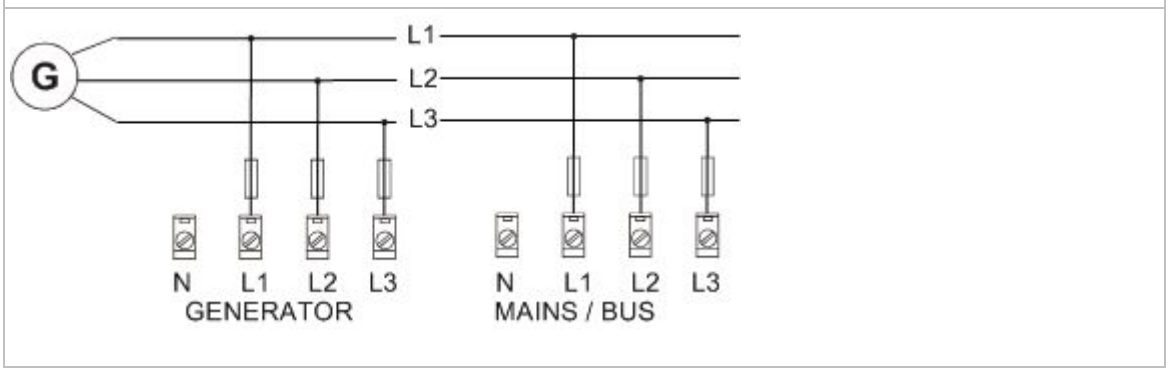
WARNING!
Do not open secondary circuit of current transformers when primary circuit is closed!!! Open the primary circuit first!

Use **1.5 mm^2** cables for voltage connection and **2.5 mm^2** for current transformers connection. Adjust nominal voltage, nominal current, CT ratio and PT ratio by appropriate setpoints in the Basic Settings group. Learn about how to view and change setpoints in the User interface chapter.

VOLTAGE MEASUREMENT WIRING







CURRENT MEASUREMENT WIRING

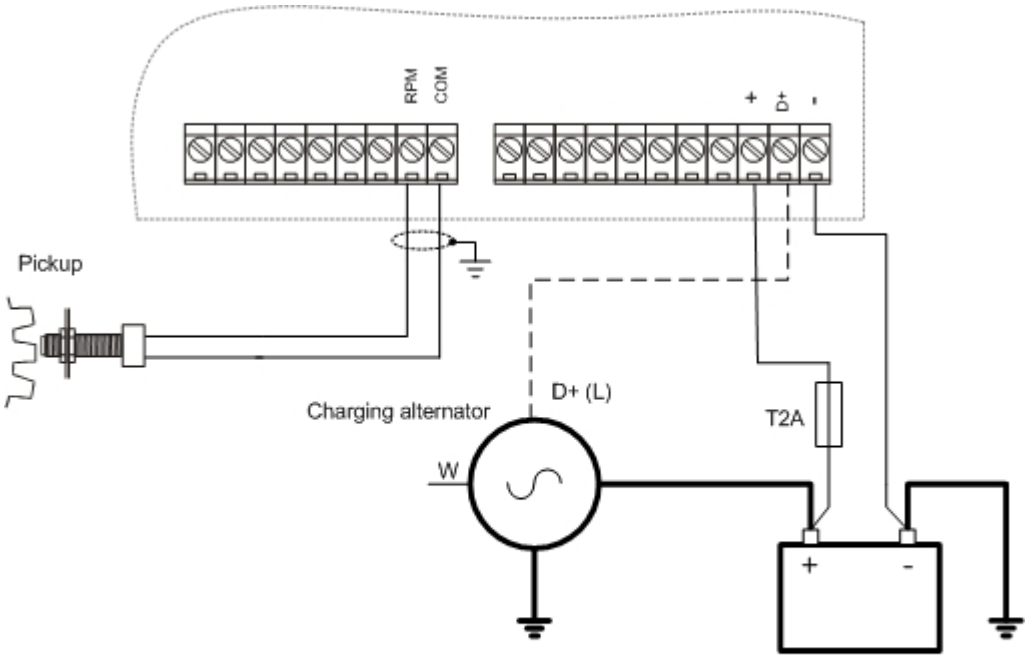
NOTE:
IT IS NECESSARY TO ENSURE THAT POTENCIAL DIFFERENCE BETWEEN GENERATOR CURRENT COM TERMINAL AND BATTERY "-" TERMINAL IS MAXIMALLY ± 2V. THEREFORE IS STRONGLY RECOMMENDED TO INTERCONNECT THESE TWO TERMINALS TOGETHER.

Speed measurement

The engine speed can be measured either from the generator frequency or from a magnetic pickup. If an EFI engine is configured, the engine speed is obtained from the ECU.

Pickup

A magnetic speed sensor (pickup) is the most common method of engine speed measurement. To use this method, mount the pickup opposite to the engine flywheel, connect the cable to the controller as shown on the picture below and adjust the setpoint *Gear Teeth* according to the number of teeth on the flywheel.
See chapter Technical data for details about the pickup input parameters.

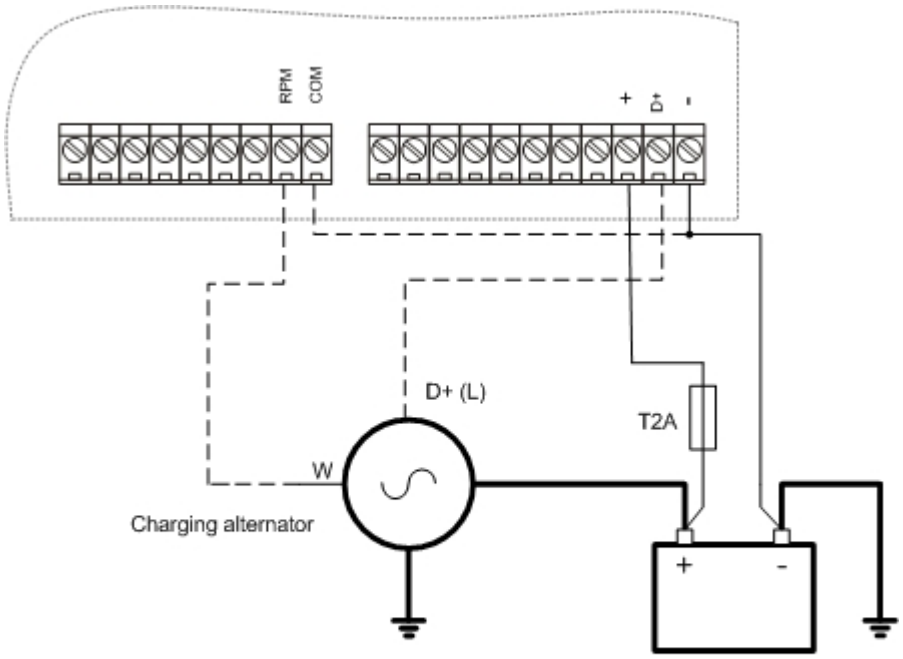


RPM measurement from the pickup.

D+ terminal from the charging alternator can be used as additional signal for detection of running engine.

Generator frequency

If the pickup is not used, set the setpoint *Gear Teeth* to zero. The engine speed will be measured from the generator frequency. Connect the W terminal from the charging alternator instead of pickup, if possible. See picture below.



RPM is measured from generator frequency.

D+ and W terminals from the charging alternator can be used as additional signals for detection of running engine.

Additional running engine indication

It is helpful to have another information besides from 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 can have delayed reaction to fast and big changes (i.e. in the moment the engine has just started…).
Following conditions are evaluated as additional running engine indication:

- Voltage on the D+ input is higher than 80% of battery voltage. Connect this input to the D+ (L) terminal of the charging alternator and enable the D+ function by setpoint *D+ Function*. If D+ terminal is not available, leave the input unconnected and disable the function.
- The pickup is not used and frequency is 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.

NOTE:
The starter cut-off frequency has to be adjusted by the setpoint *Start W Freq*. If you know the charging alternator nominal frequency, adjust the setpoint to frequency obtained from following equation:

$$f_{cutoff} = f_{nom} \cdot \left(\frac{"Starting\ RPM"}{"Nominal\ RPM"} \right)$$

If you do not know the charging alternator nominal frequency, follow this procedure:
1) Make sure that the starting accumulator is fully charged.
2) Close a fuel valve manually to disable the engine to be started.
3) Connect a PC with LiteEdit to the controller and display "Values" window, group "Engine", value *W-TerminalFreq*.
4) Select MAN mode and press Start button to crank the gen-set. Make a note about W terminal frequency while the gen-set is cranking.
5) Press Stop button to stop cranking.
6) Adjust the setpoint *Start W Freq* to a value twice higher than you measured during cranking.

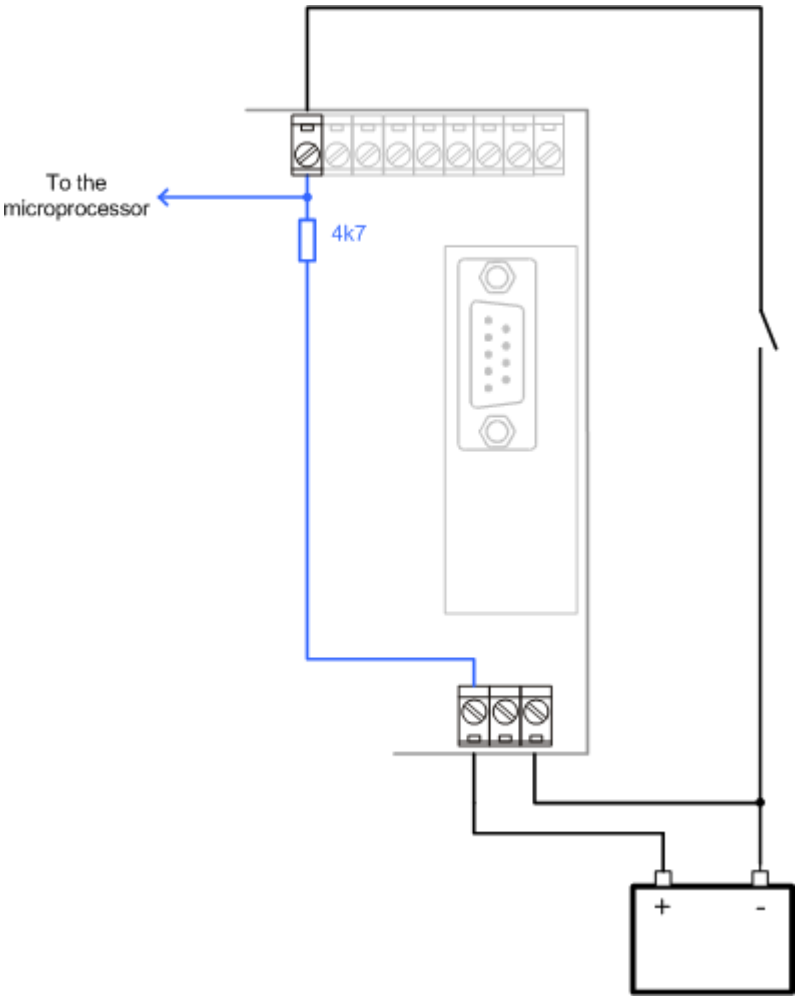
- Oil pressure > *Starting Oil P* setpoint. The oil pressure is evaluated from the analog input 1 or from the ECU if ECU is configured.
- Generator voltage in at least one phase > 20% of nominal voltage

These signals are used during start for deenergizing the starter motor even if still no RPM is measured and also during stop for evaluation if the engine is really stopped.

Binary inputs

Use min. **1 mm^2** cables for wiring of binary inputs.

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



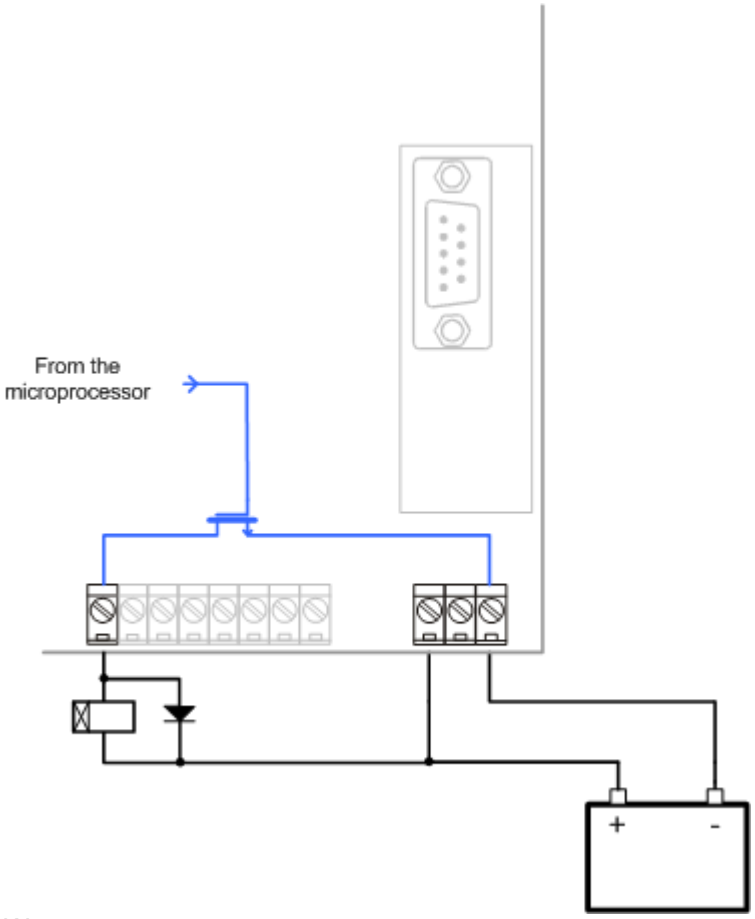
WIRING OF BINARY INPUTS

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...).

NOTE:
The function of each output has to be assigned during the configuration.

CAUTION!
Use suppression diodes on all relays and other inductive loads!



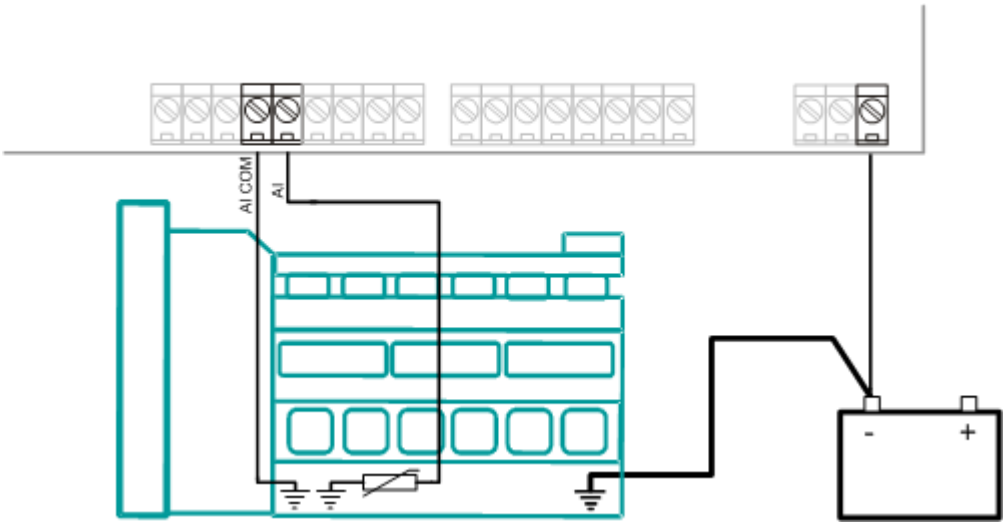
WIRING OF BINARY OUTPUTS

Analog inputs

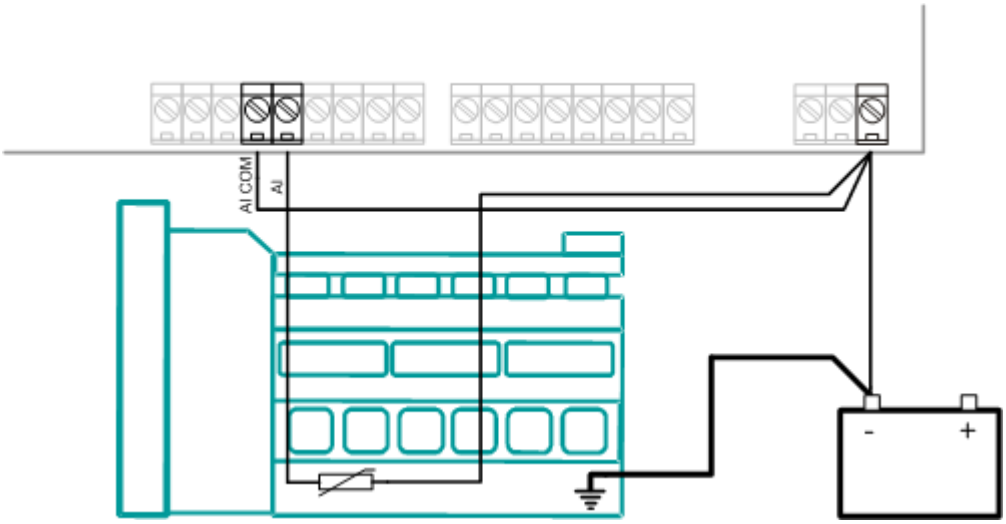
The analog inputs are designed for resistive automotive type sensors like VDO or DATCON. The sensors are connected either by one wire (the second pole is sensor body) or by two wires.

- In case of grounded sensors connect the AI COM terminal to the engine body as near from the sensors as possible.
- In case of isolated sensors connect the AI COM terminal to the negative power supply terminal of the controller as well as the opposite poles of the sensors.

NOTE:
The fail sensor alarm is issued if the measured resistance is smaller than one half of the first (lowest) point of the sensor curve characteristic or is greater than 112,5% of the last (greatest) point of the sensor curve characteristic.



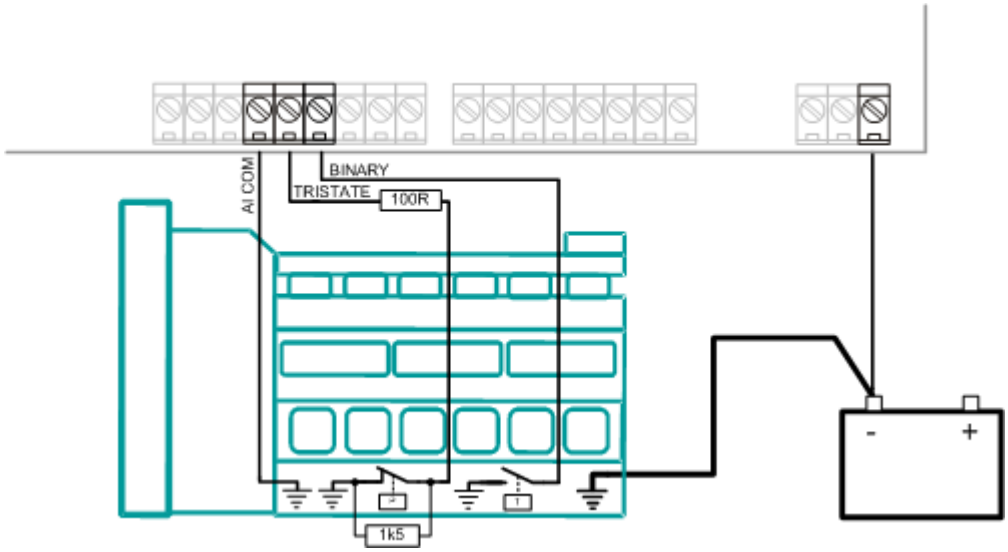
WIRING OF ANALOG INPUTS - GROUNDED SENSORS



WIRING OF ANALOG INPUTS - ISOLATED SENSORS

Tristate inputs

Analog inputs can be used also as binary or tristate, i.e. for contact sensors without or with circuit check. The threshold level is 750Ω. In case of tristate, values lower than 10Ω and values over 2400Ω are evaluated as sensor failure (short or open circuit).



WIRING OF ANALOG INPUTS - USED AS BINARY OR TRISTATE

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

Circuit breakers

There are two power switches controlled by the controller:

- The generator circuit breaker or contactor - GCB
- The Mains circuit breaker or contactor - MCB (SPtM application only)

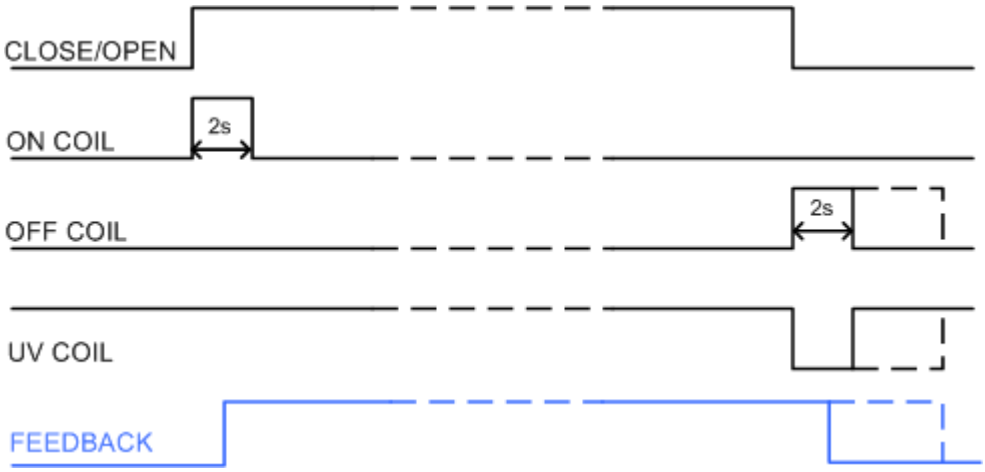
It is possible to use either a motorized circuit breaker or contactor. Below is the list of avalilable control outputs that should fit to all types of contactors or breakers. **Following rules** have to be kept when designing the wiring of power switches and their wiring:

- The control outputs must be configured and wiring of the power switches must be provided 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 sec. to a close and open command. A special attention should be paid to opening of motorized circuit breakers, as it could take more than 2 sec. on some types. In such cases it is necessary to use undervoltage coil for fast opening.
- The breaker feedback functions must be configured onto some binary inputs and the signals from the breakers must be connected to it and provide true information about the breaker position.

Breaker control ouputs

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 sec. to a close or open command, otherwise *alarm* is issued.
ON coil	An output giving 2 sec. 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 pulse in the moment the breaker has to be opened. The pulse lasts until the feedback deactivates, but at least 2 sec. The output is intended for control of open coils of circuit breakers.
UV coil	The output is active the whole time the gen-set is running (GCB, not in idle or cooling) or the controller is switched on (MCB). The output is deactivated for at least 2s in the moment the breaker has to be switched off. The output is intended for control of undervoltage coils of circuit breakers.



BREAKER OUTPUTS TIMING

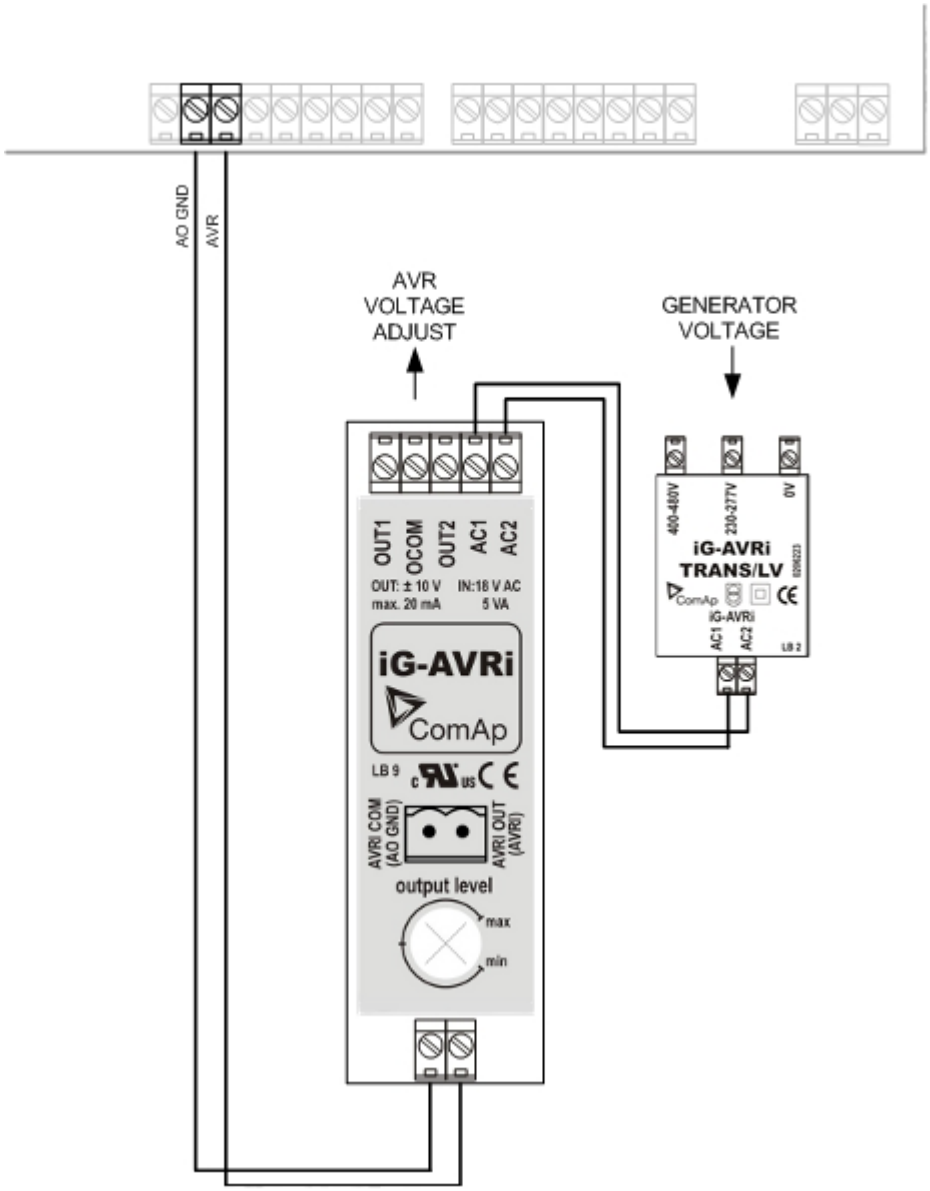
MCB special requirements

(SPtM only)

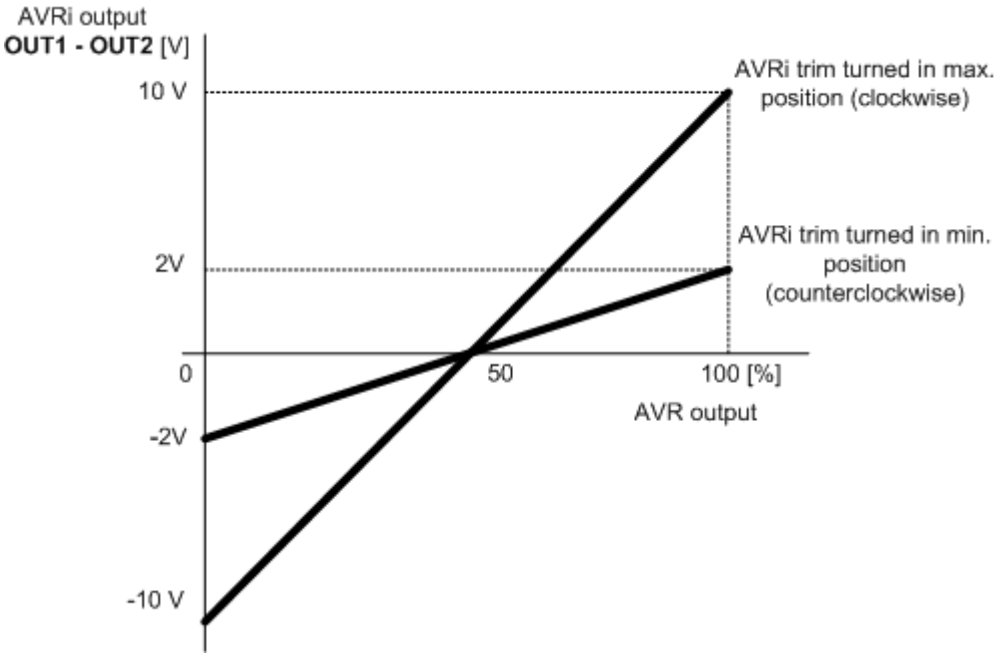
1. If a contactor is used on the MCB position, it is recommended to provide the wiring such a way, that the contactor will be normally closed and will open if the *MCB Close/Open* closes. This behavior is called "negative logic" and can be adjusted by the setpoint *MCB Logic*. The negative logic will prevent accidental opening of the MCB when the controller is switched off.
2. If a contactor is used on the MCB position, it will open self immediately after the mains has failed, because it will loose power for the coil. That is why following adjustment is necessary to prevent from getting *MCB fail* alarm: *MCB Opens On* = MAINSFAIL, *Mains V Del* <= 1sec.
3. If a 230V-motor driven circuit breaker is used on the MCB position and undervoltage coil is not fitted, it is not possible to open the breaker after the mains has 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* = GEN RUN will prevent from getting *MCB fail* alarm.

AVR interface

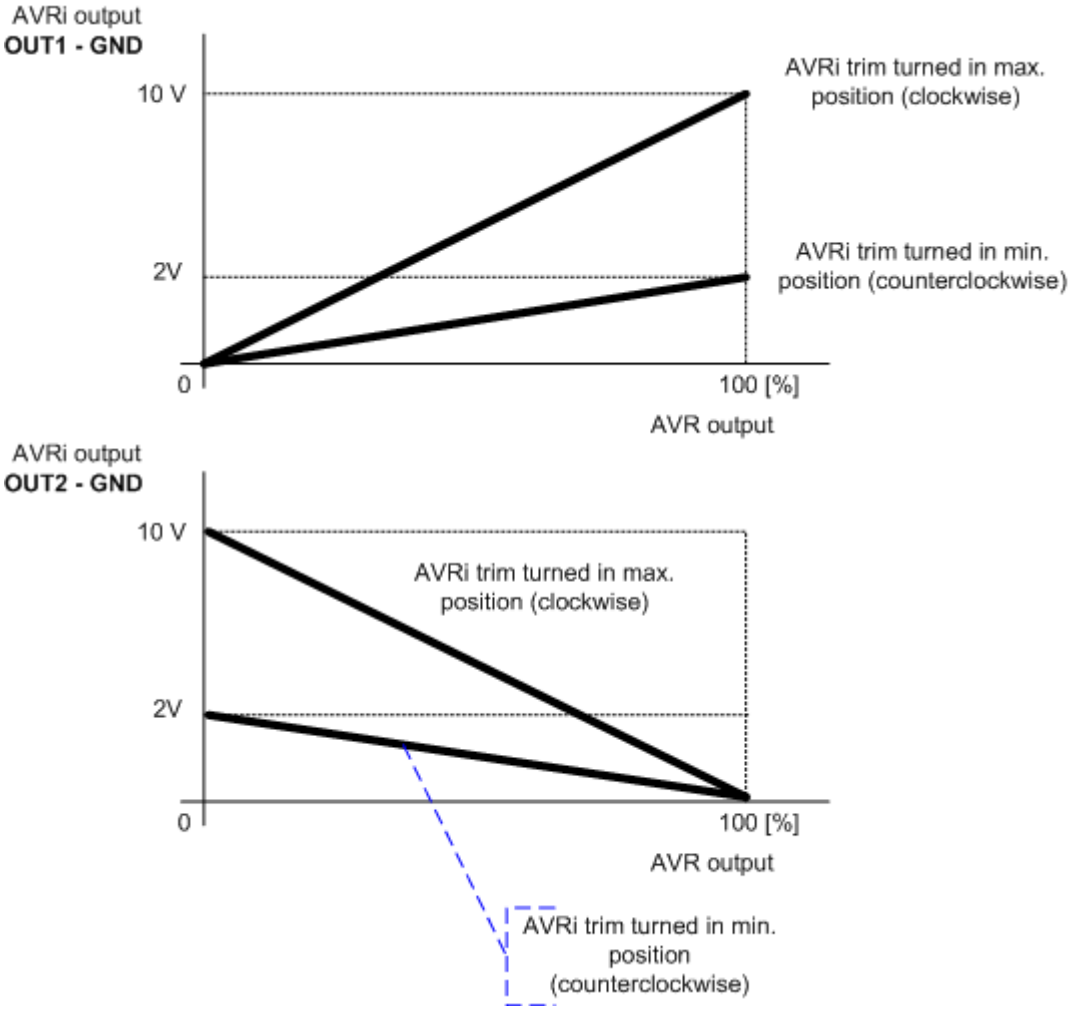
The AVR output is used to control the voltage or power factor of the generator via the remote voltage adjust input provided by the AVR.
The output from the controller is a 5V PWM that is designed to be used together with IG-AVRi module. The AVRi module provides galvanic separation of the controller from the generator and PWM to voltage conversion, which is needed for most AVRs. The output from the IG-AVRi module is available as positive, negative or symmetric. The output voltage range is adjustable by a trimmer located on the module.
The initial level of the AVR output is adjustable by the setpoint *AVRi Bias*.



IG-AVRI MODULE WIRING



SYMMETRIC AVRI OUTPUT CHARACTERISTIC



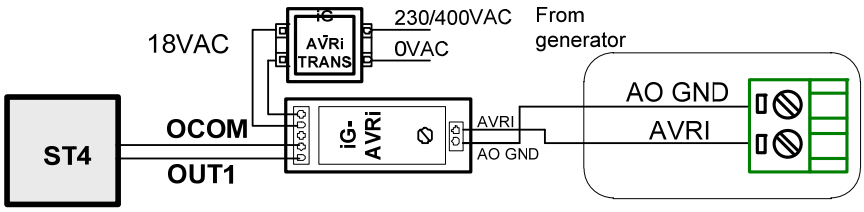
ASYMMETRIC AVRI OUTPUT CHARACTERISTIC

AVR list

LeRoy Sommer

Leroy Somer: R 438 LS, R448

Kutai EA448

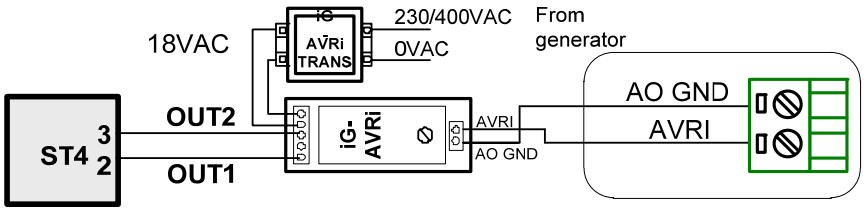


AVRi output is connected instead Remote voltage trimmer 470 ohm to terminals ST4. Module R726 is not required.

AVRi trim to minimum counter clockwise.

Volt/PF ctrl:
AVR DCout bias = 50%
VoltRegChar = POSITIVE

Leroy Somer: R 449

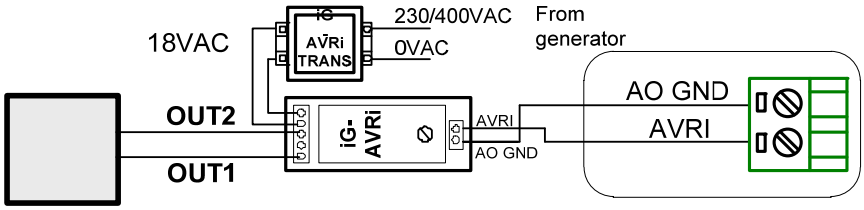


Module R726 is not required.

AVRi trim to minimum counter clockwise.

Volt/PF ctrl:
AVR DCout bias = 50%
VoltRegChar = POSITIVE

Leroy Somer: R 450

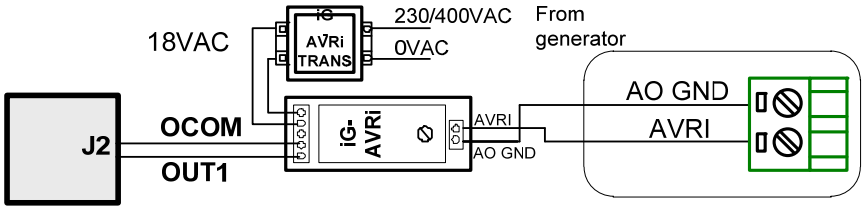


AVRi trim to minimum counter clockwise.

Volt/PF ctrl:
AVR DCout bias = 50%
VoltRegChar = POSITIVE

HINT:
Use AVRi instead of potentiometer 1000 Ohm
Read Leroy Somer R450 manual before use.

Leroy Somer: R 129

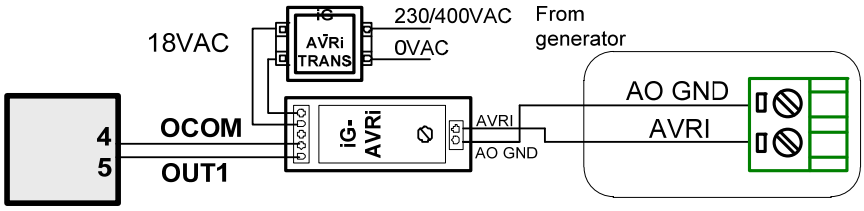


AVRi output is connected instead Remote voltage trimmer 470 ohm to terminal J2. Module R726 is not required.

AVRi trim to minimum counter clockwise.

Volt/PF ctrl:
AVR DCout bias = 50%
VoltRegChar = POSITIVE

Leroy Somer: R 128

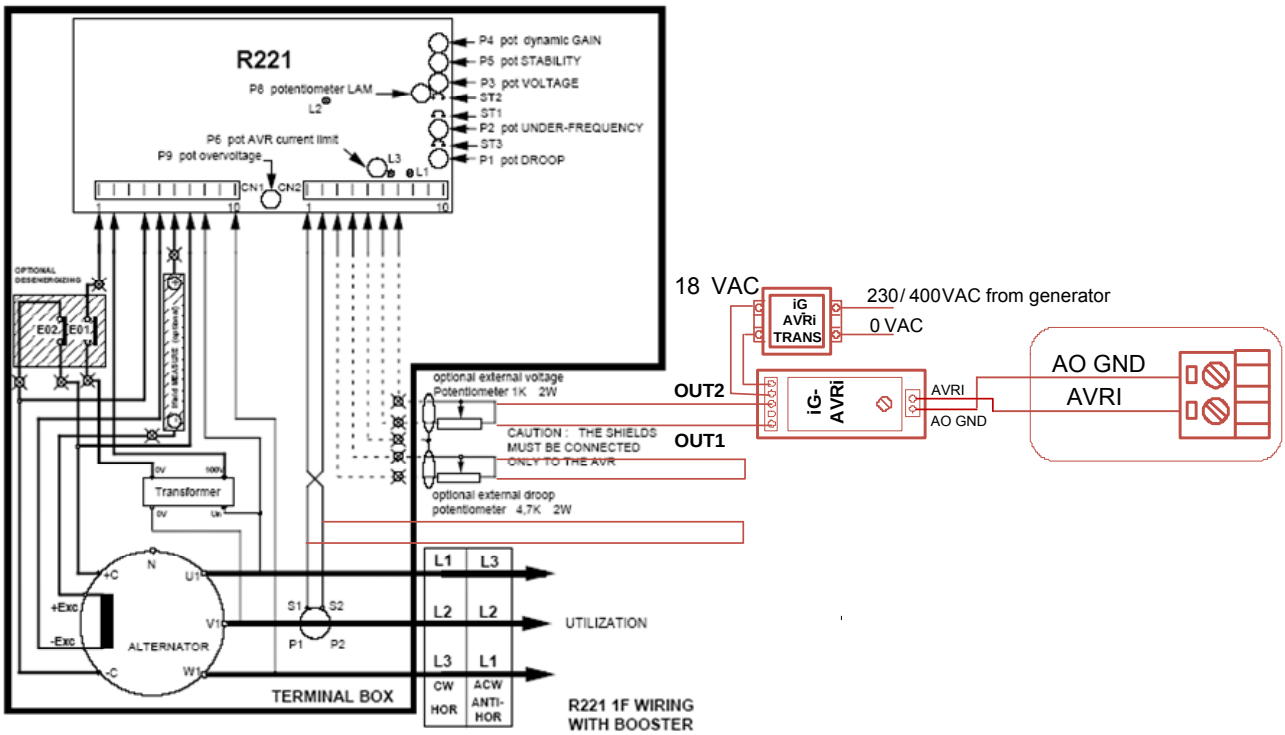


AVRi output is connected instead Remote voltage trimmer 470 ohm to terminals 4,5.

AVRi trim to minimum counter clockwise.

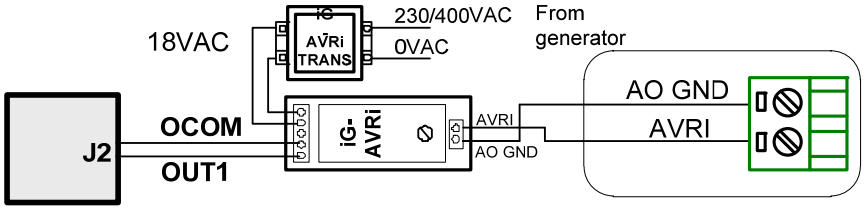
Volt/PF ctrl:
AVR DCout bias = 50%
VoltRegChar = POSITIVE

Leroy Somer: R 221, R 222



Module R726 is not required.
AVRi trim to minimum counter clockwise +5%.
Volt/PF ctrl:
AVR DCout bias = 24%
VoltRegChar = POSITIVE

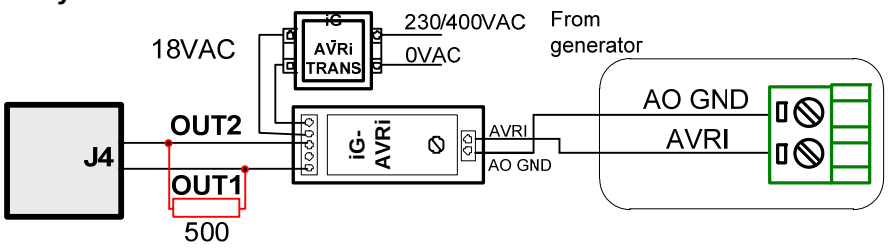
Leroy Somer: R 250



AVRi trim to minimum counter clockwise.

VoltRegChar = POSITIVE
AVRDCout bias = 50%

Leroy Somer: R 230



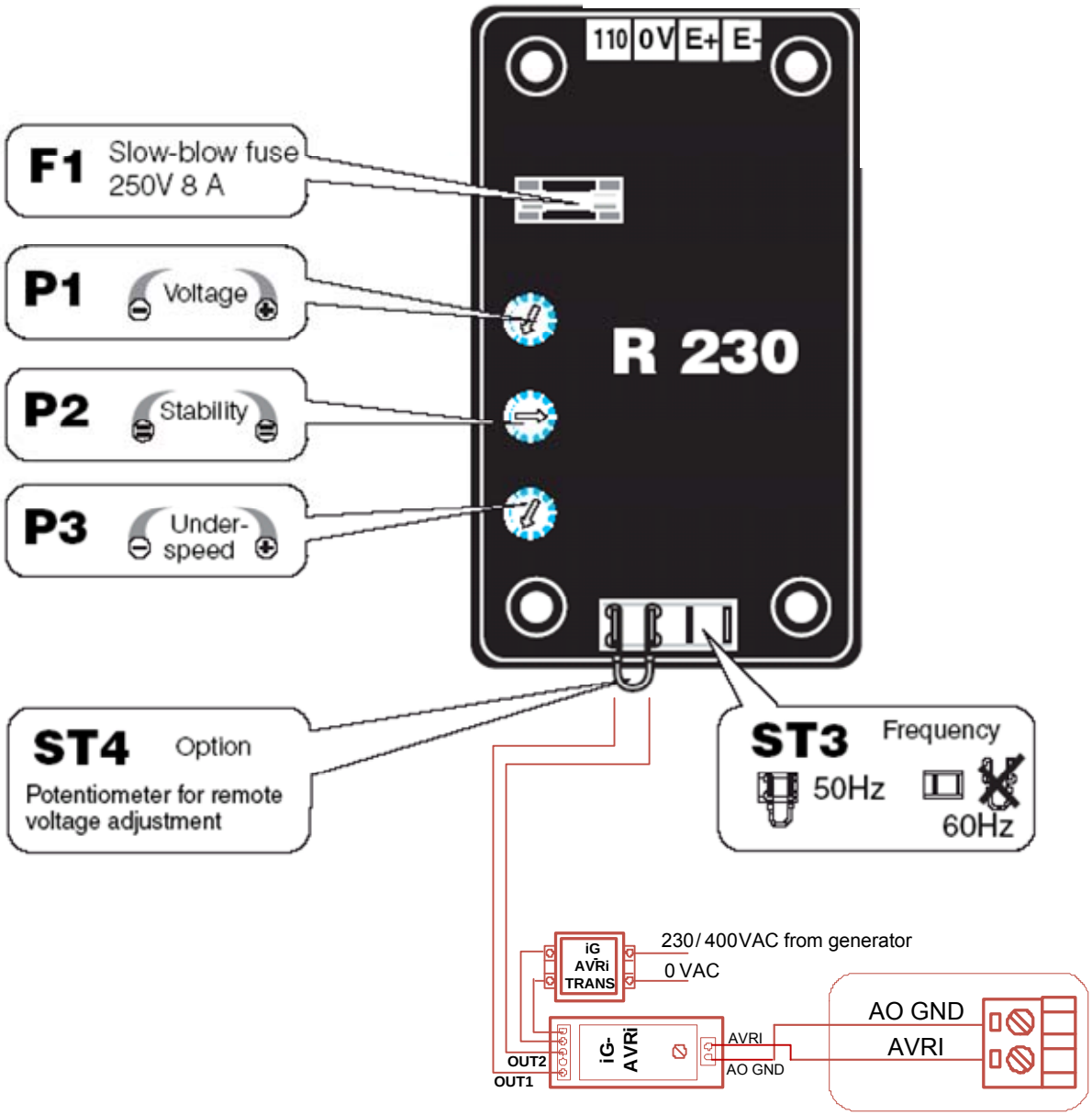
AVRi trim to minimum counter clockwise.

Volt/PF ctrl:
AVR DCout bias = 50%
VoltRegChar = POSITIVE

Remove Link J4 and replace through R500
Primary voltage setting with resistors connected: 230V

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 Bias Voltage//PF regulation (gain=0)
Stop gen-set and connect when equal Voltage and polarity is achieved.
Set again in regulation loop on demand

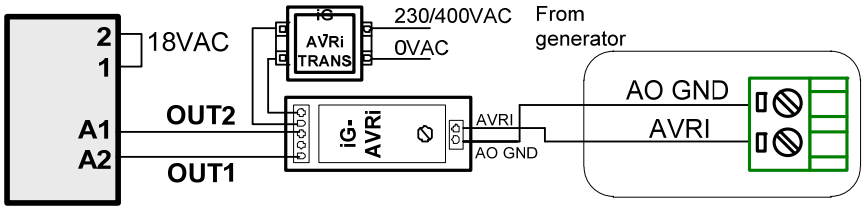
Leroy Somer: R 230



Module R726 is not required.
AVRi trim to minimum counter clockwise.

Volt/PF ctrl:
AVR DCout bias = 50%
VoltRegChar = POSITIVE

Newer Leroy Somer



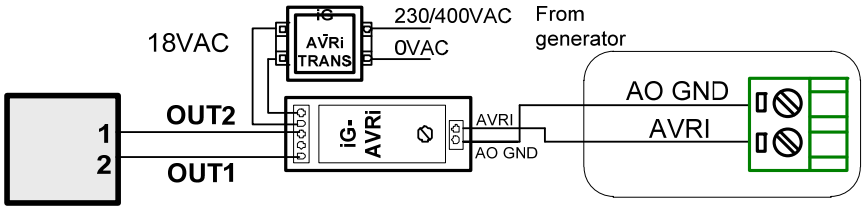
Regulation signal +/- 0..2,5V

AVRi trim to minimum counter clockwise

Volt/PF ctrl:
AVR DCout bias = 50%
VoltRegChar = POSITIVE

Stamford

STAMFORD SX 460



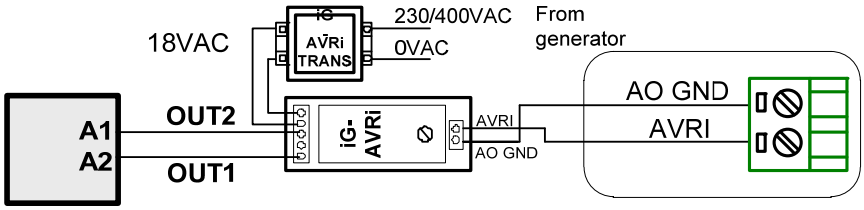
AVRi output is connected instead of external resistor for voltage adjusting.

HINT:
Before you connect IG-AVRi you should connect jumper on AVR between pin 1 and 2 to run voltage regulator without external control and set voltage by voltage trim on SX460 to roughly 227 volts (in case nominal voltage of the system is 230 V).

AVRi trim to cca 60 % clockwise.

Volt/PF ctrl:
AVR DCout bias = 60 - 70%
VoltRegChar = POSITIVE
Voltage range (-6V; 6V)

STAMFORD SX 440, AS440, MX 321, SX 421

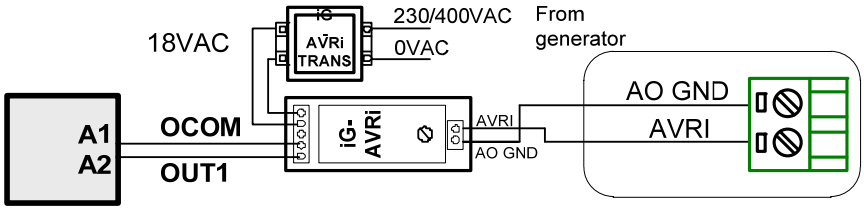


PFC3 module is not required.

AVRi trim to minimum counter clockwise.

Volt/PF ctrl:
AVR DCout bias = 50%
VoltRegChar = POSITIVE

STAMFORD MX 341



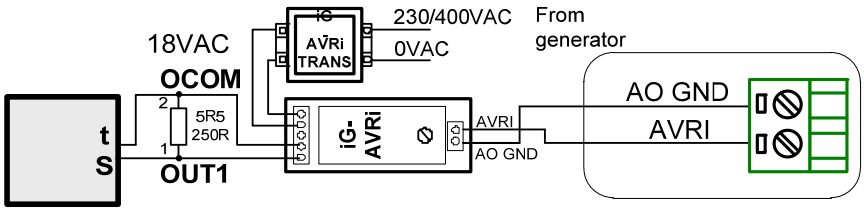
HINT:
Disconnect the droop CT (terminal S1 & S2) and short the droop CT leads short the terminal S1,S2 on the AVR

AVRi trim to minimum counter clockwise.

Volt/PF ctrl:
AVR DCout bias = 50%
VoltRegChar = POSITIVE

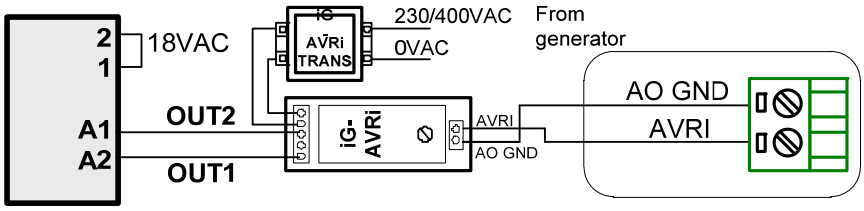
AVK Newage

AVK Newage Cosimat N+



Volt/PF ctrl:
AVR DCout bias = 25%
VoltRegChar = NEGATIVE

AVK Newage MA330, 327, 321, 341

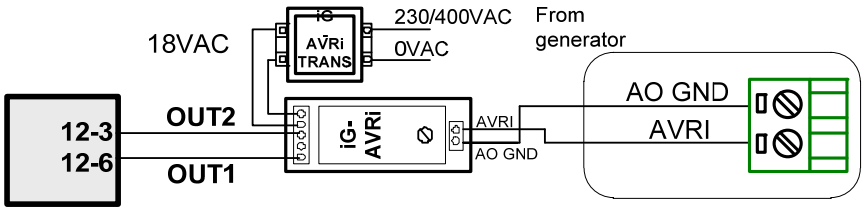


AVRi trim to minimum counter clockwise

Volt/PF ctrl:
AVR DCout bias = 50%
VoltRegChar = POSITIVE

Caterpillar

Caterpillar CDVR

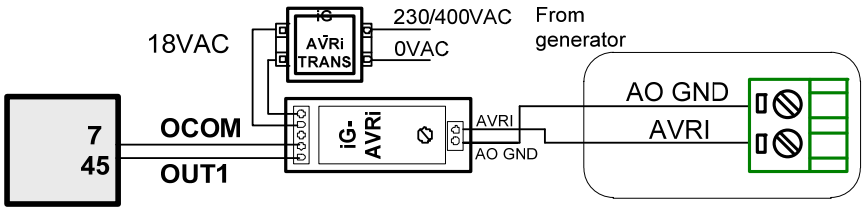


AVRi trim to 50%

Volt/PF ctrl:
AVR DCout bias = 50%
VoltRegChar = POSITIVE

Pin 44 on DVR – PF regulation directly from DVR is not connected.

Catterpillar DVR

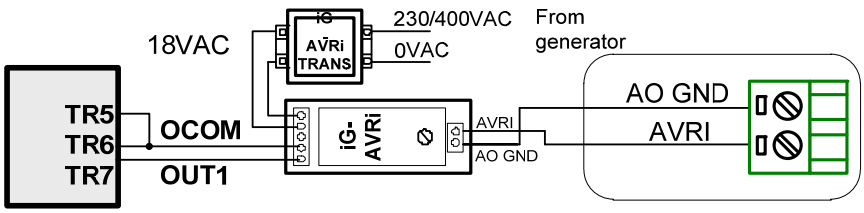


AVRi trim to 25%

Volt/PF ctrl:
AVR DCout bias = 50%
VoltRegChar = POSITIVE

Pin 44 on DVR – PF regulation directly from DVR is not connected.

Catterpillar VR6, VR3F

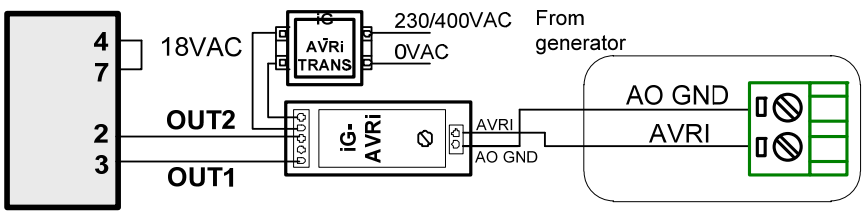


AVRi trim to minimum counter clockwise.

Volt/PF ctrl:
AVR DCout bias = 50%
VoltRegChar = POSITIVE

For VR3F link 4-7 has to be removed.

Caterpillar VR6-B

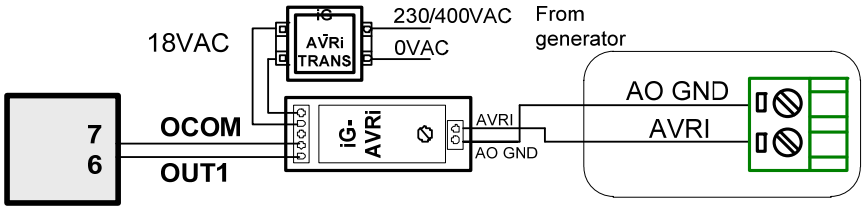


AVRi trim to minimum counter clockwise.

Volt/PF ctrl:
AVR DCout bias = 0%
VoltRegChar = POSITIVE
Voltage range (-2V; 2V)

Basler

Basler: APR 63-5, AEC 63-7, KR-FX, KR-FFX

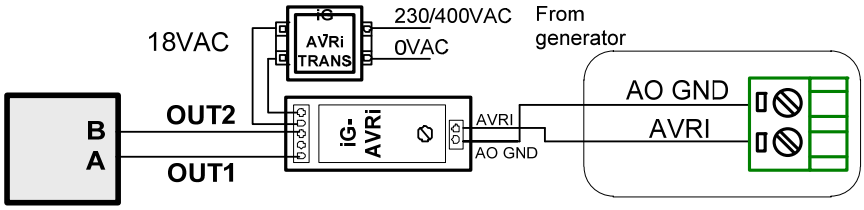


AVRi output is connected instead of external resistor for voltage adjusting.

AVRi trim to minimum counter clockwise.

Volt/PF ctrl:
AVR DCout bias = 50%
VoltRegChar = POSITIVE

Basler: DECS 100

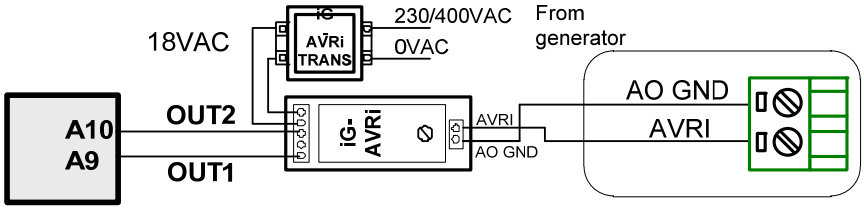


AVRi output is connected instead of external resistor for voltage adjusting.

AVRi trim to minimum counter clockwise.

Volt/PF ctrl:
AVR DCout bias = 50%
VoltRegChar = POSITIVE

Basler: DESC 200

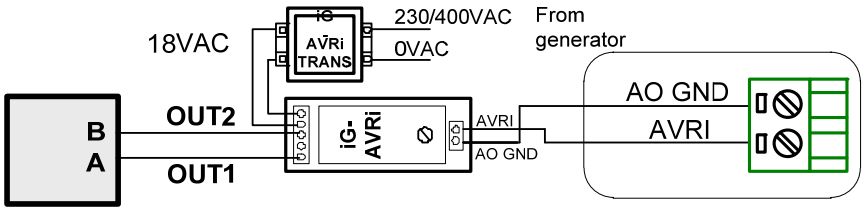


AVRi trim to minimum counter clockwise.

Volt/PF ctrl:
AVR DCout bias = 50%
VoltRegChar = POSITIVE

Marathon

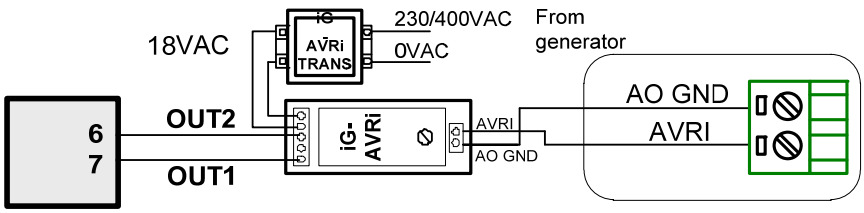
Marathon DVR2000E



AVRi trim to 1/3 clockwise

Volt/PF ctrl:
AVR DCout bias = 50%
VoltRegChar = POSITIVE

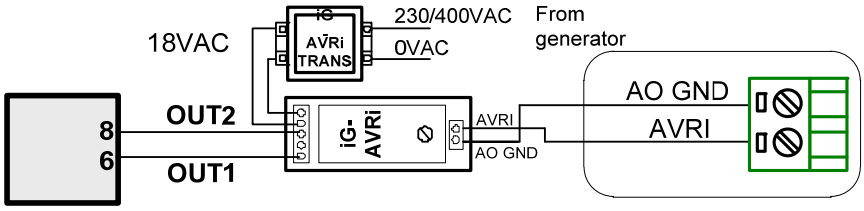
Marathon PM100, 200



Volt/PF ctrl:
AVR DCout bias = 50%
VoltRegChar = POSITIVE

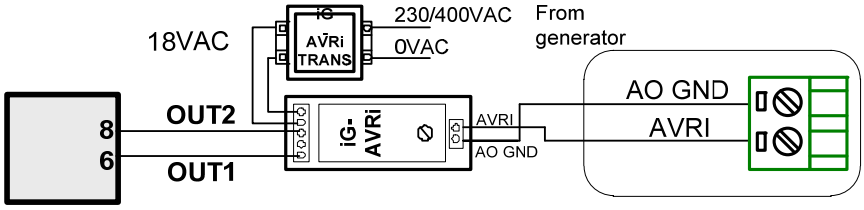
Marelli

MarelliMotori Mark I (M40FA640A/A)



Volt/PF ctrl:
AVR DCout bias = 50%
VoltRegChar = POSITIVE

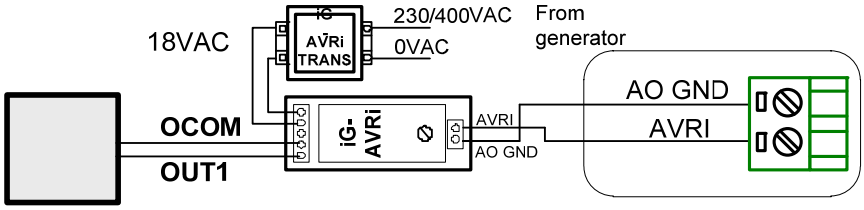
MarelliMotori (M40FA610A)



Volt/PF ctrl:
AVR DCout bias = 50%
VoltRegChar = POSITIVE

Mecc Alte Spa

Mecc Alte Spa: U.V.R.6



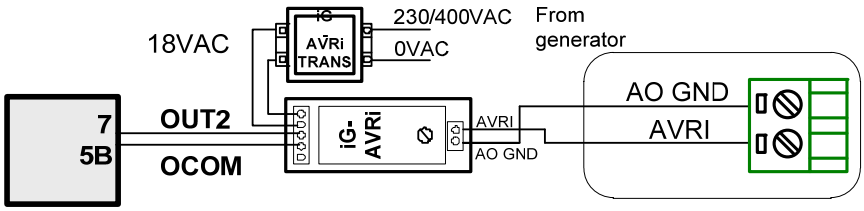
AVRi output is connected instead Remote voltage trimmer 100Kohm (OUT1=top position wire and GND =second top position).

AVRi trim to maximum clockwise.

Volt/PF ctrl:
AVR DCout bias = 75%
VoltRegChar = NEGATIVE

HINT:
VoltRegChar = POSITIVE is achieved by IG-AVRi OUT2 and GND connection.

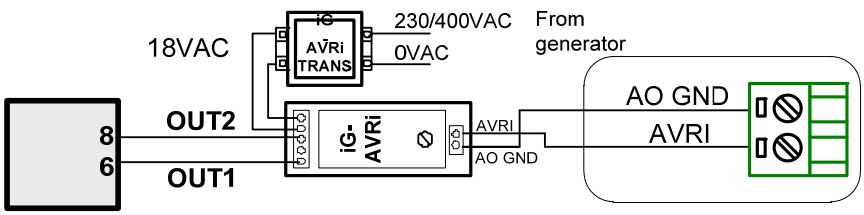
Mecc Alte Spa: S.R.7/2



AVRi trim to maximum clockwise.

Volt/PF ctrl:
AVR DCout bias = 75%
VoltRegChar = NEGATIVE

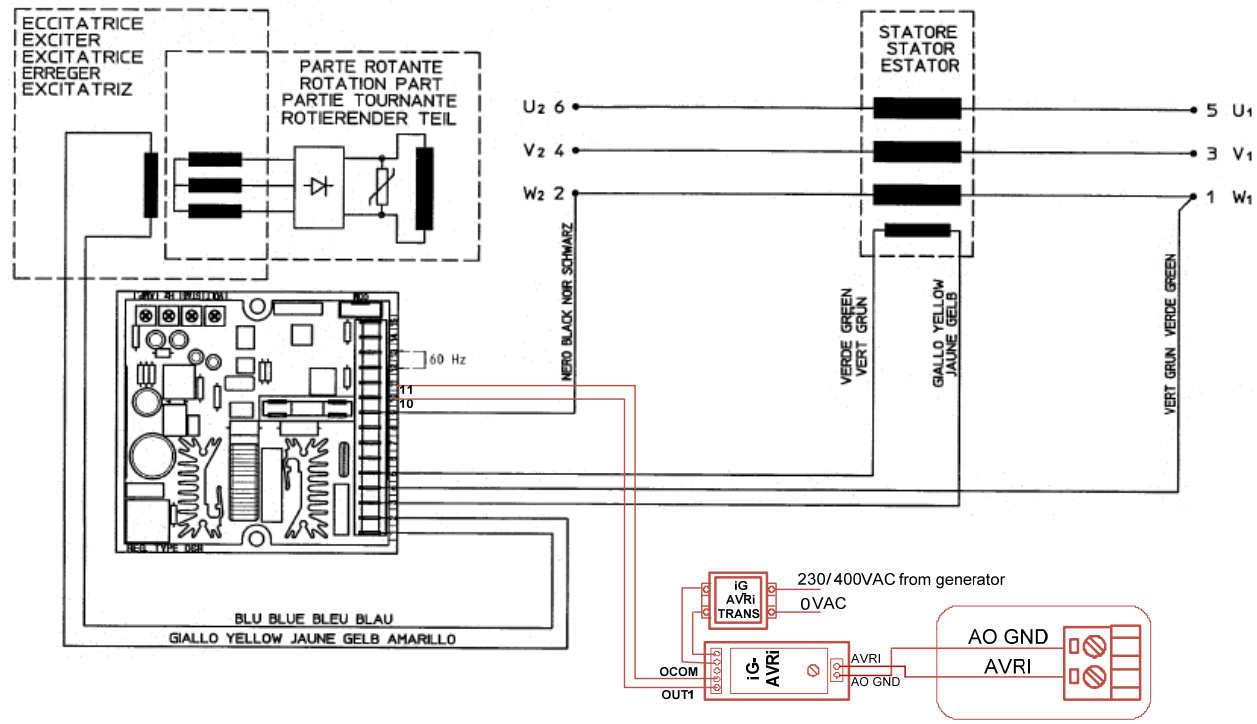
Mecc Alte UVR

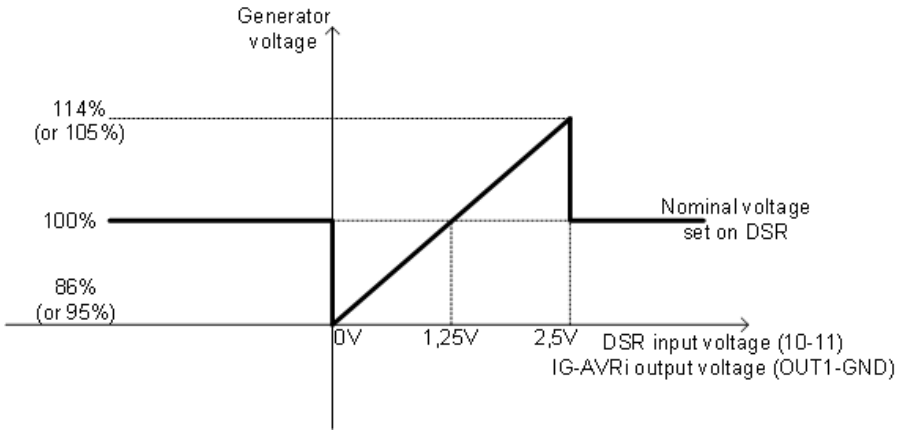


AVRi trim to maximum clockwise.

Volt/PF ctrl:
AVR DCout bias = 50%
VoltRegChar = POSITIVE

Mecc Alte DSR





AVRi trim = 1/16 from minimum (=6,25% => max. = 2,5V).

Volt/PF ctrl:
AVR DCout bias = 50%
VoltRegChar = POSITIVE

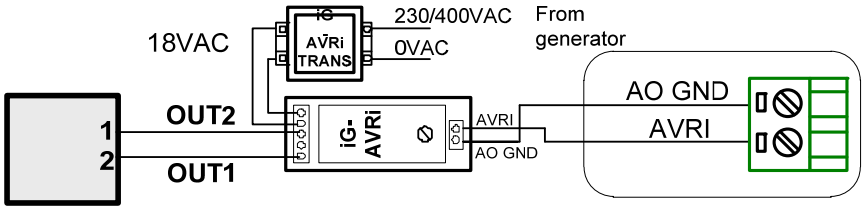
The Vext input (connector CN1 – terminals 10 and 11) permits analogical remote control of output voltage with a programmable variation range of up to ±10% (parameter 16, by default the setting is ±5%) with respect to the value set. If you want to use continuous voltage, it will be effective if it is in the range between 0V and +2,5V. The input tolerates voltages from –5V to +5V, but for values exceeding the limits of 0V / +2,5V (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).

Piller

Piller



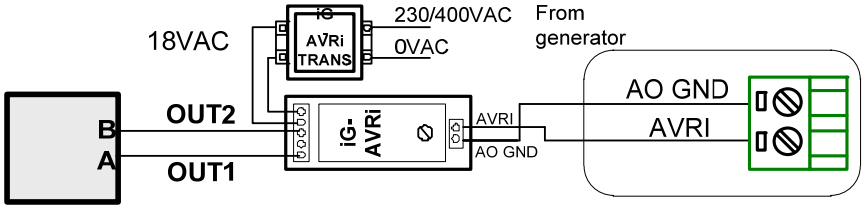
AVRi output is connected instead Remote voltage trimmer 100Kohm.

AVRi trim to minimum counter clockwise.

Volt/PF ctrl:
AVR DCout bias = 39%
VoltRegChar = POSITIVE

Marathon

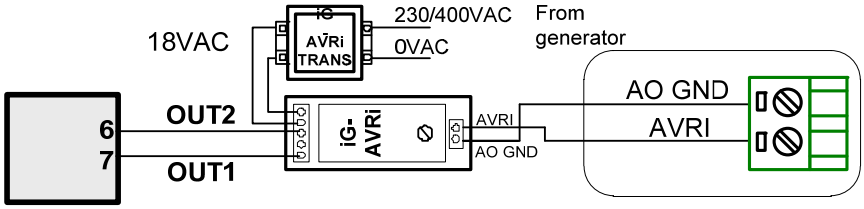
Marathon DVR2000E



AVRi trim to 1/3 clockwise

Volt/PF ctrl:
AVR DCout bias = 50%
VoltRegChar = POSITIVE

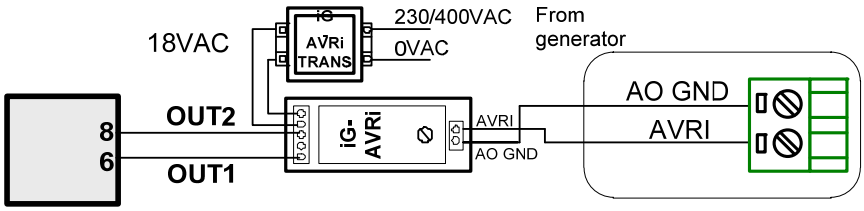
Marathon PM100, 200



Volt/PF ctrl:
AVR DCout bias = 50%
VoltRegChar = POSITIVE

KATO

KATO (KCR 360, 760)



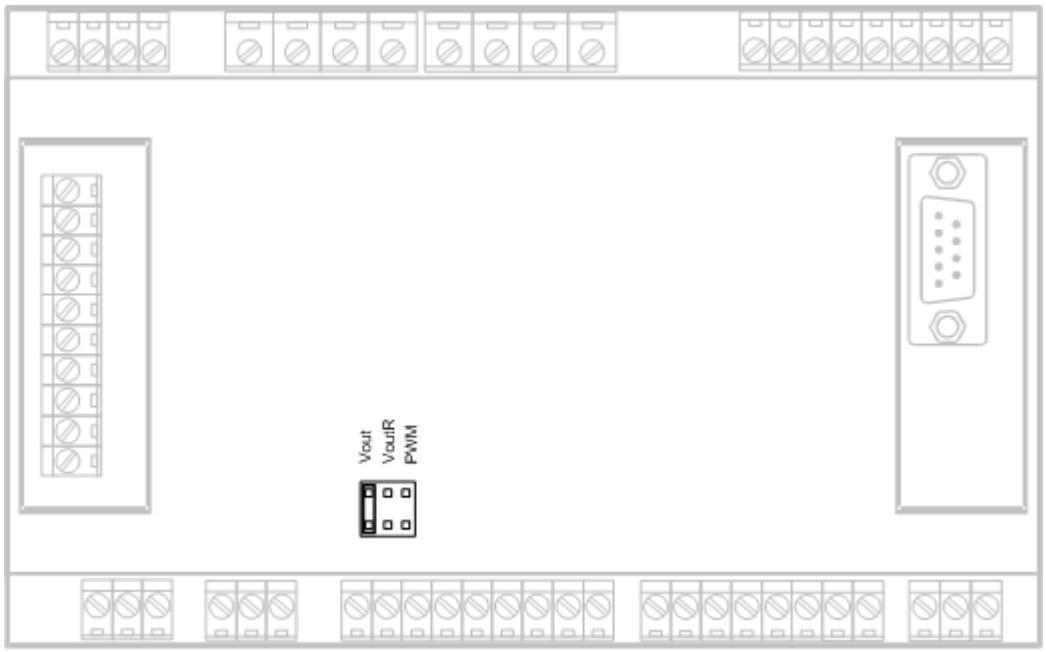
Volt/PF ctrl:
AVR DCout bias = 50%
VoltRegChar = POSITIVE

Speed governor interface

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

- voltage mode 0 to 10V
- voltage mode 0 to 10V with serial 10k resistor
- 5V PWM mode

The PWM mode is designed and optimized for Caterpillar governors. The jumpers for speed governor output mode are shown on the picture below.



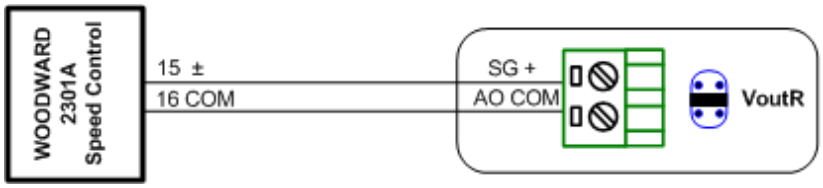
The initial level of the governor output is adjustable by the setpoint *Speed Gov Bias* and the characteristic (positive or negative) can be selected by setpoint *Speed Gov Char*.

The active range of the output can be adapted to the governor input range by setpoints *SpeedGovLowLim* and *SpeedGovHiLim*.

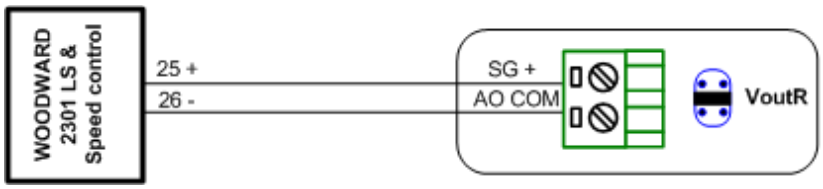
NOTE:
Some governors may evaluate input voltage out of allowed range as a faulty condition and their function may be blocked.

Speed governor list

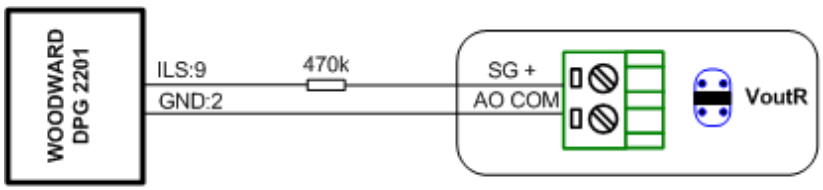
Woodward



Sync/Load Ctrl:
Speed Gov Bias = 5,00 V
SpeedGovChar = POSITIVE

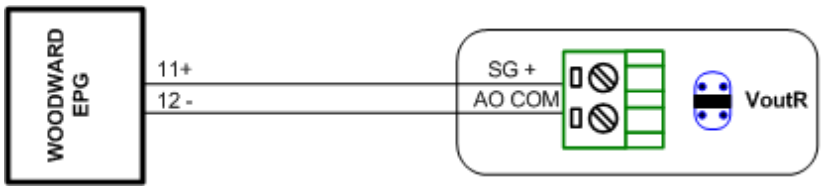


Sync/Load Ctrl:
Speed Gov Bias = 5,00 V
SpeedGovChar = POSITIVE



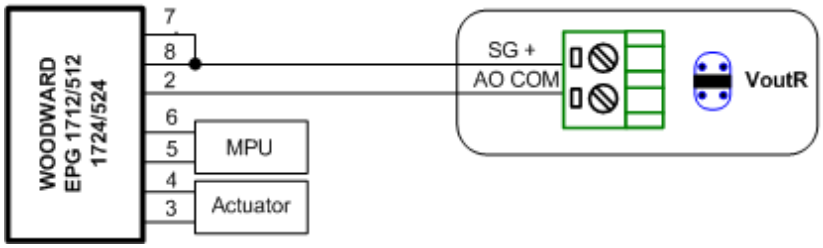
For Woodward DPG 2223 the ILS terminal is 10.

Sync/Load Ctrl:
Speed Gov Bias = 2,5 V
SpeedGovChar = POSITIVE
SpeedGovLowLim = 0 V
SpeedGovHiLim = 5 V



Sync/Load Ctrl:
Speed Gov Bias = 0 V
SpeedGovChar = POSITIVE
SpeedGovLowLim = -3 V
SpeedGovHiLim = 3 V

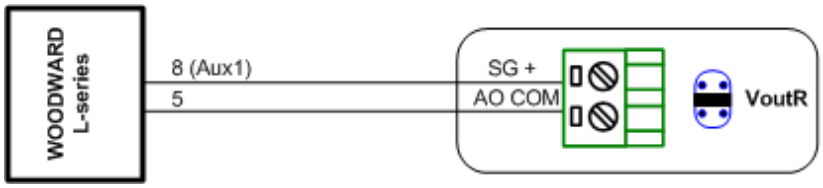
HINT:
For Woodward EPG speed governor (revision F) are limits:
Speed Gov Bias = -0,5 V
SpeedGovLowLim = -3 V
SpeedGovHiLim = +2 V



Sync/Load Ctrl:
Speed Gov Bias = 3,1 V
SpeedGovChar = POSITIVE
SpeedGovLowLim = 6,5 V
SpeedGovHiLim = 0 V

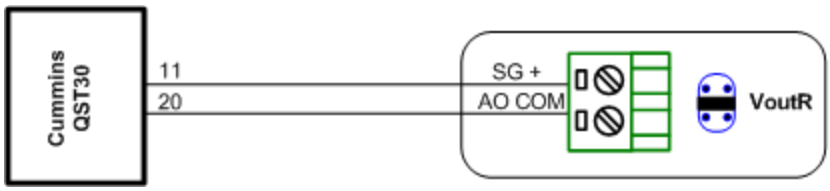
Terminals 19 and 20 are marked as analog inputs #1.
25, 26 = Speed Signal Inputs

Sync/Load Ctrl:
Speed Gov Bias = 5,00 V
SpeedGovChar = POSITIVE

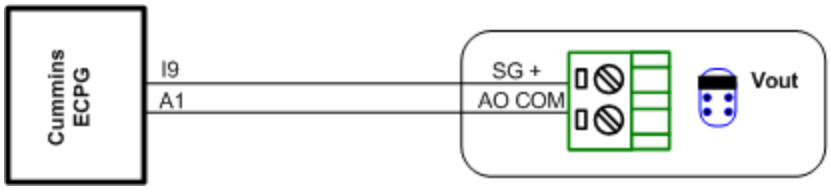


Sync/Load Ctrl:
Speed Gov Bias = 2,50 V
SpeedGovChar = POSITIVE
SpeedGovLowLim = 0 V
SpeedGovHiLim = 5 V

Cummins

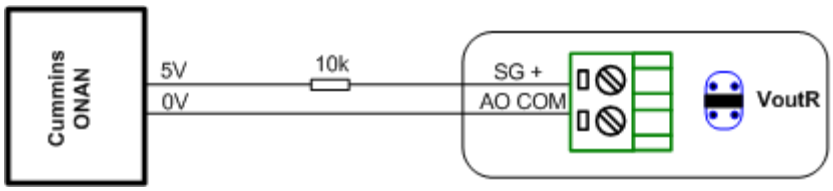


Sync/Load Ctrl:
Speed Gov Bias = 5,00 V
SpeedGovChar = POSITIVE

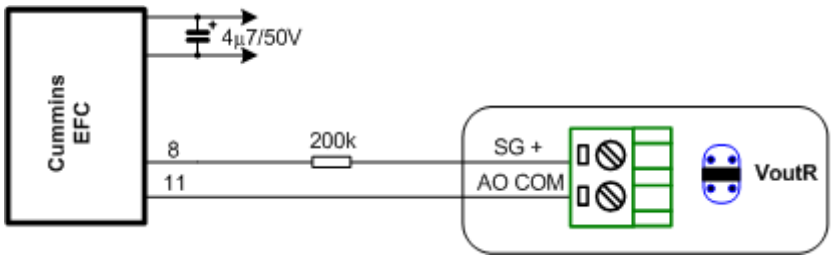


Sync/Load Ctrl:
Speed Gov Bias = 5,00 V
SpeedGovChar = POSITIVE

Pay attention to the connector and jumper orientation.

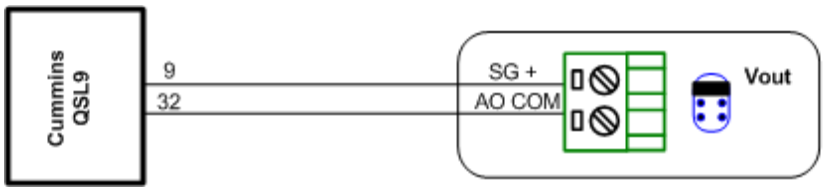


Sync/Load Ctrl:
Speed Gov Bias = 5,00 V
SpeedGovChar = POSITIVE



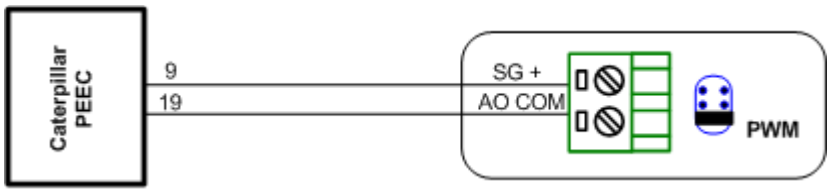
Sync/Load Ctrl:
Speed Gov Bias = 6,40 V
SpeedGovChar = POSITIVE
SpeedGovLowLim = 5 V
SpeedGovHiLim = 7,8 V

Setting at 15000 RPM: Primary setting governor with disconnected speed regulation lines.

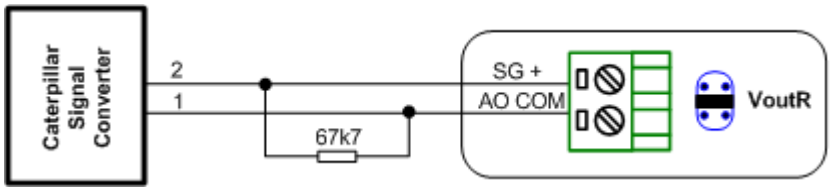


Sync/Load Ctrl:
Speed Gov Bias = 3,50 V
SpeedGovChar = POSITIVE
SpeedGovLowLim = 2,5 V
SpeedGovHiLim = 5 V

Caterpillar

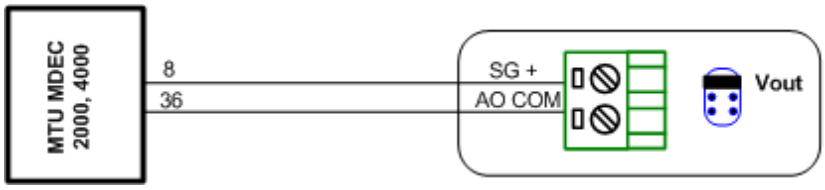


Pay attention to the connector and jumper orientation.



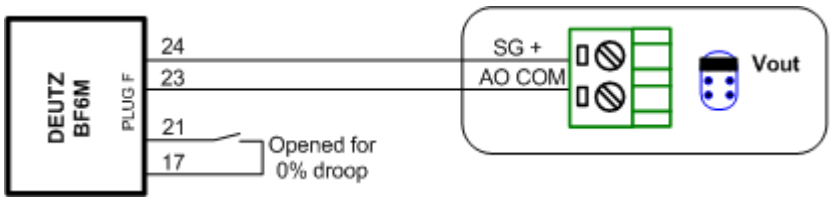
Sync/Load Ctrl:
Speed Gov Bias = 5,10 V
SpeedGovChar = POSITIVE
SpeedGovLowLim = 0 V
SpeedGovHiLim = 10 V

MTU



Sync/Load Ctrl:
Speed Gov Bias = 4,90 V
SpeedGovChar = POSITIVE
SpeedGovLowLim = 0 V
SpeedGovHiLim = 10 V

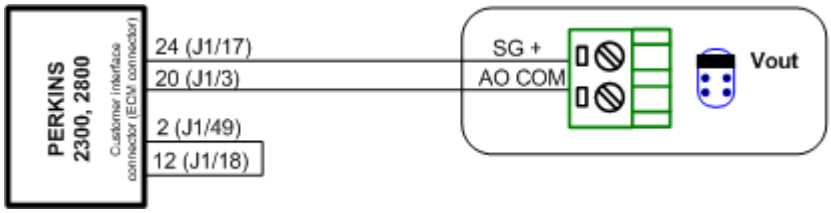
Deutz



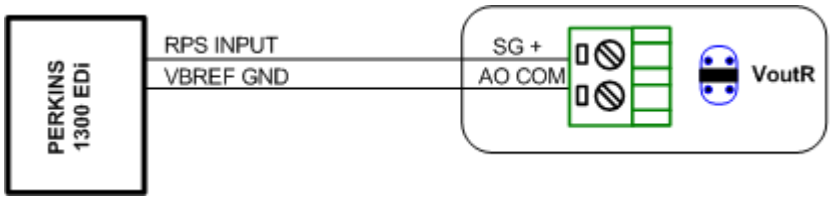
Pay attention to the connector and jumper orientation.

Sync/Load Ctrl:
Speed Gov Bias = 2,50 V
SpeedGovChar = POSITIVE
SpeedGovLowLim = 0,5 V
SpeedGovHiLim = 4,5 V

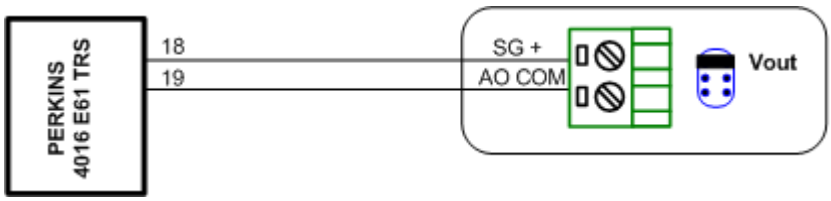
Perkins



Sync/Load Ctrl:
Speed Gov Bias = 2,50 V
SpeedGovChar = POSITIVE
SpeedGovLowLim = 0,5 V
SpeedGovHiLim = 4,5 V

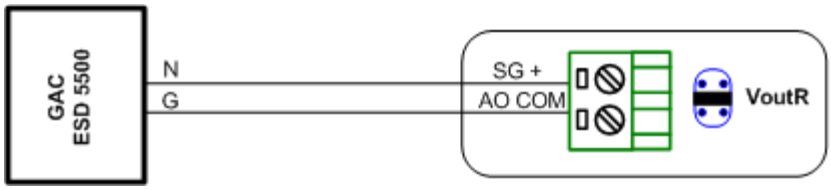


Sync/Load Ctrl:
Speed Gov Bias = 2,50 V
SpeedGovChar = POSITIVE
SpeedGovLowLim = 0,8 V
SpeedGovHiLim = 4,5 V

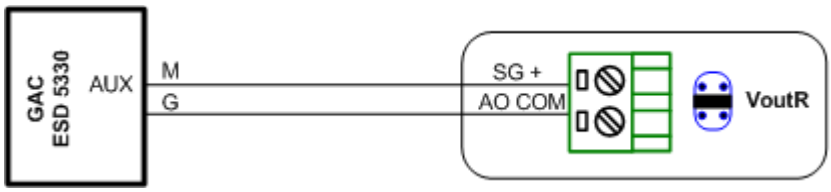


Sync/Load Ctrl:
Speed Gov Bias = 5,00 V
SpeedGovChar = POSITIVE
SpeedGovLowLim = 2,5 V
SpeedGovHiLim = 7,5 V

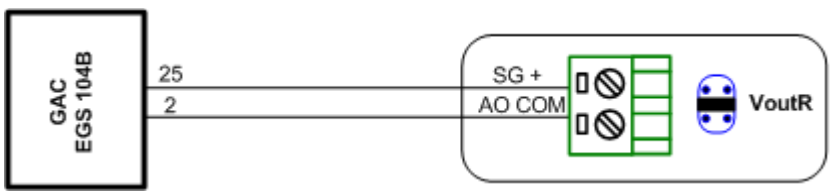
GAC



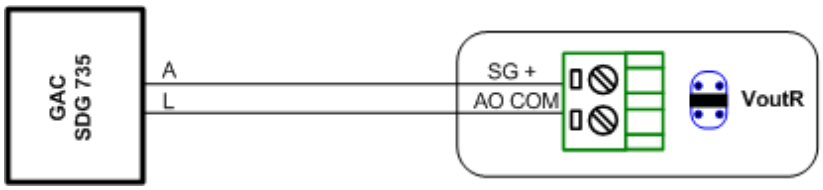
Sync/Load Ctrl:
Speed Gov Bias = 4,00 V
SpeedGovChar = NEGATIVE
SpeedGovLowLim = 2 V
SpeedGovHiLim = 6 V



Sync/Load Ctrl:
Speed Gov Bias = 4,00 V
SpeedGovChar = NEGATIVE

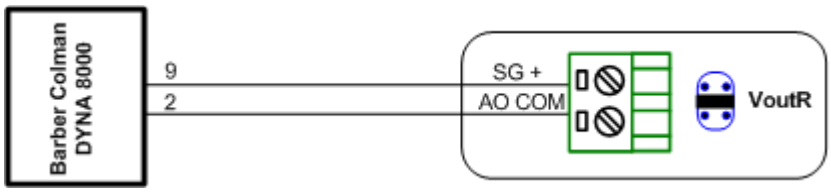


Sync/Load Ctrl:
Speed Gov Bias = 5,00 V
SpeedGovChar = NEGATIVE
SpeedGovLowLim = 2 V
SpeedGovHiLim = 6 V

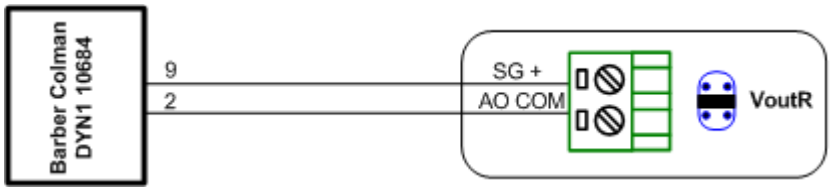


Sync/Load Ctrl:
Speed Gov Bias = 4,00 V
SpeedGovChar = NEGATIVE
SpeedGovLowLim = 2,5 V
SpeedGovHiLim = 7,5 V
TauSpeedActuat = 1 s

Barber Colman

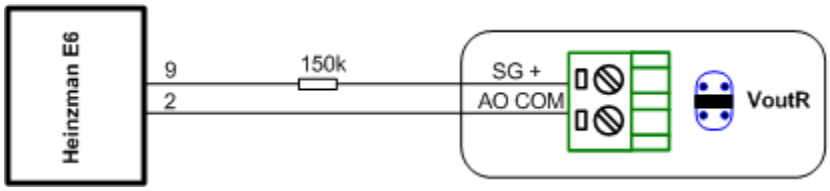


Sync/Load Ctrl:
Speed Gov Bias = 6,00 V
SpeedGovChar = POSITIVE
SpeedGovLowLim = 4 V
SpeedGovHiLim = 8 V

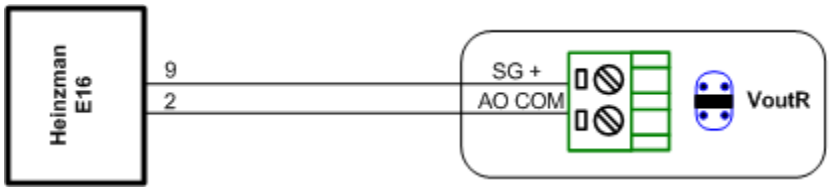


Sync/Load Ctrl:
Speed Gov Bias = 6,00 V
SpeedGovChar = POSITIVE
SpeedGovLowLim = 4 V
SpeedGovHiLim = 8 V

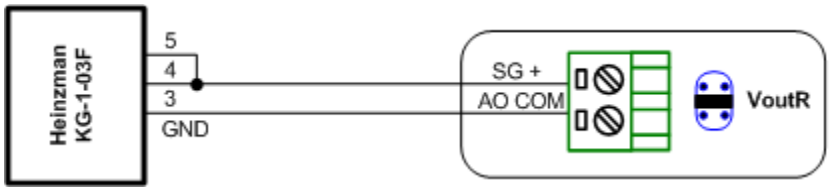
Heinzmann



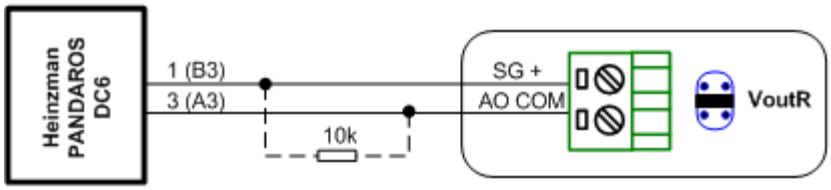
Sync/Load Ctrl:
Speed Gov Bias = 0,00 V
SpeedGovChar = POSITIVE



Sync/Load Ctrl:
Speed Gov Bias = 0,00 V
SpeedGovChar = POSITIVE



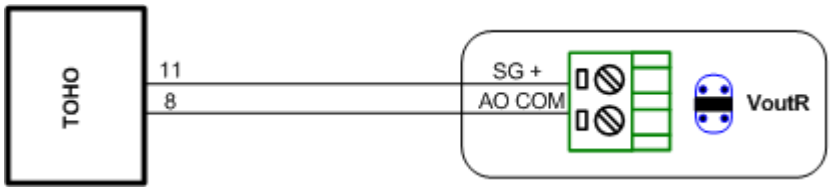
Sync/Load Ctrl:
Speed Gov Bias = 0,00 V
SpeedGovChar = POSITIVE



Terminals A3 and B3 are on OEM 14-pin connector.
Mounted o Perkins 40xx engines

Sync/Load Ctrl:
Speed Gov Bias = 5,00 V
SpeedGovChar = POSITIVE
SpeedGovLowLim = 0,8 V
Without resistor
Speed Gov Bias = 2,75 V
SpeedGovLowLim = 0 V
SpeedGovHiLim = 6 V

Toho



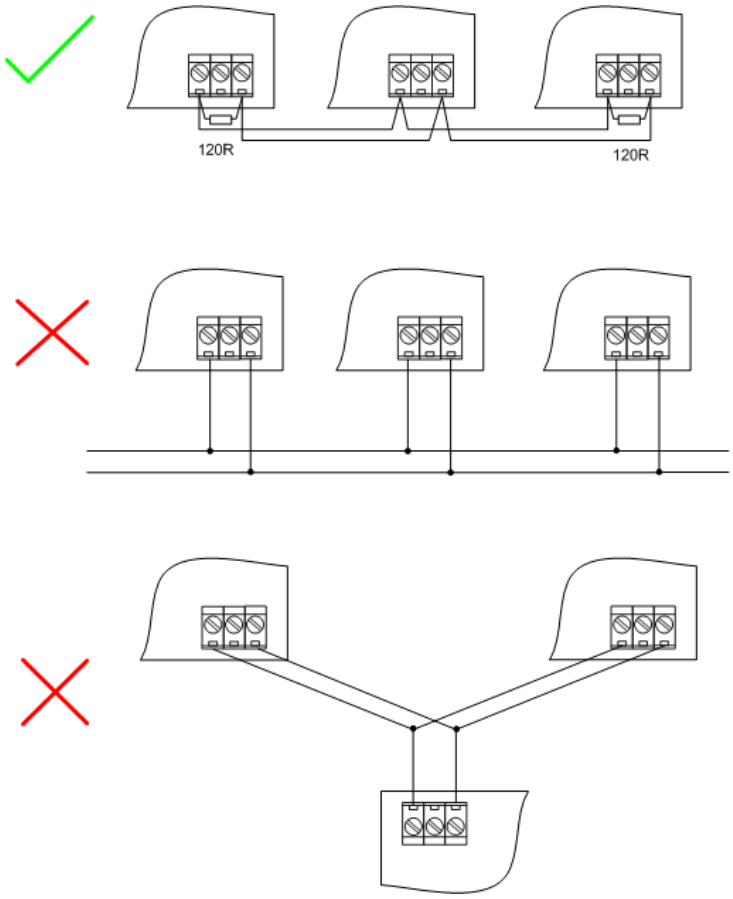
Sync/Load Ctrl:
Speed Gov Bias = 4,00 V
SpeedGovChar = POSITIVE

CAN bus wiring

The wiring of CAN bus communication should be provided so that following rules are kept:

- Maximal length of the CAN bus depends on the communication speed. For the speed of 250kbps, which is used on the CAN1 bus (extension modules, ECU) and CAN2 bus if it is switched to 32C mode the maximal length is 200m. If the CAN2 bus is switched to 8C mode the speed is 50kbps and the maximal length is 800m.
- The bus must be wired in linear form with termination resistors at both ends. No nodes except on the controller terminals are allowed.
- Use cable with following parameters:

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



CAN BUS TOPOLOGY

NOTE:
See the web page www.can-cia.org for information about CAN bus, specifications etc.

Recommended CAN/RS485 connection

CAN bus connection

The bus has to be terminated by 120 Ohm resistors at both ends. External units can be connected on the CAN bus line in any order, but keeping line arrangement (no tails, no star) is necessary. Standard maximum bus length is 200m for 32C CAN BUS MODE and 900m for 8C CAN BUS MODE. Shielded cable has to be used. Shielding has to be connected to PE on one side (controller side).

1. For shorter distances (all network components within one room) – picture 1
   Interconnect H and L; shielding connect to PE on controller side
2. For longer distances (connection between rooms within one building) – picture 2
   Interconnect H, L, COM; shielding connect to PE in one point
3. In case of surge hazard (connection out of building in case of storm etc.) – picture 3
   We recommend to use following protections:
   - Phoenix Contact (http://www.phoenixcontact.com): PT 5-HF-12DC-ST with PT2x2-BE (base element)
   - Saltek (http://www.saltek.cz): DM-012/2 R DJ

Recommended data cables: BELDEN (http://www.belden.com)

1. For shorter distances: 3105A Paired - EIA Industrial RS-485 PLTC/CM (1x2 conductors)
2. For longer distances: 3106A Paired - EIA Industrial RS-485 PLTC/CM (1x2+1 conductors)
3. In case of surge hazard: 3106A Paired - EIA Industrial RS-485 PLTC/CM (1x2+1 conductors)

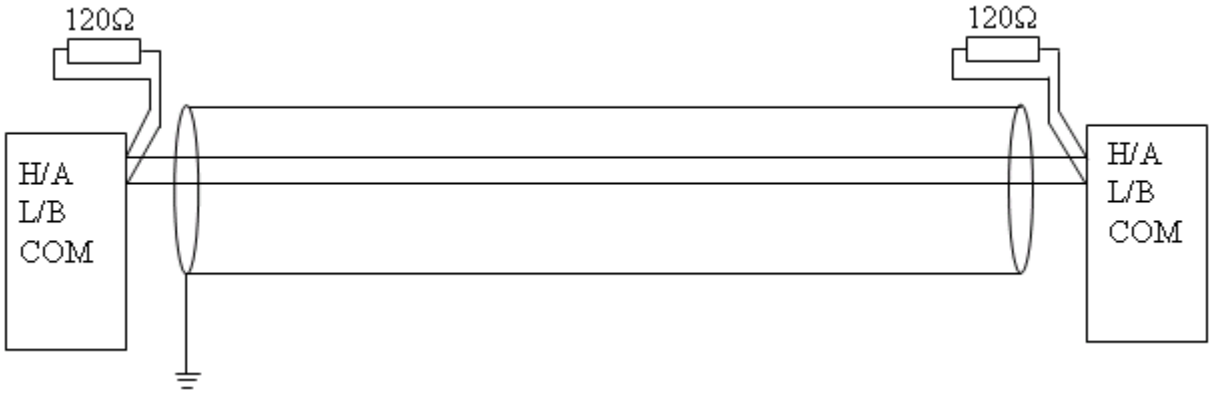
RS485 connection

The line has to be terminated by 120 Ohm resistors at both ends. External units can be connected on the RS485 line in any order, but keeping line arrangement (no tails, no star) is necessary. Standard maximum link length is 1000m. Shielded cable has to be used. Shielding has to be connected to PE on one side (controller side).

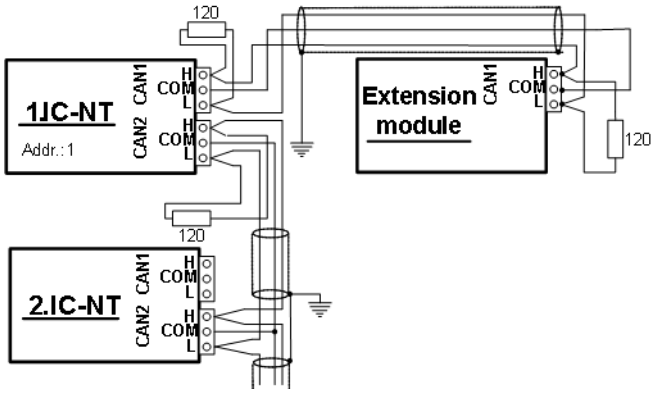
1. For shorter distances (all network components within one room) – picture 1 interconnect A and B; shielding connect to PE on controller side
2. For longer distances (connection between rooms within one building) – picture 2 interconnect A, B, COM; shielding connect to PE in one point
3. In case of surge hazard (connection out of building in case of storm etc.) – picture 3 We recommend to use following protections:
    - Phoenix Contact (http://www.phoenixcontact.com): PT 5-HF-5DC-ST with PT2x2-BE (base element)(or MT-RS485-TTL)
    - Saltek (http://www.saltek.cz): DM-006/2 R DJ

Recommended data cables: BELDEN (http://www.belden.com)

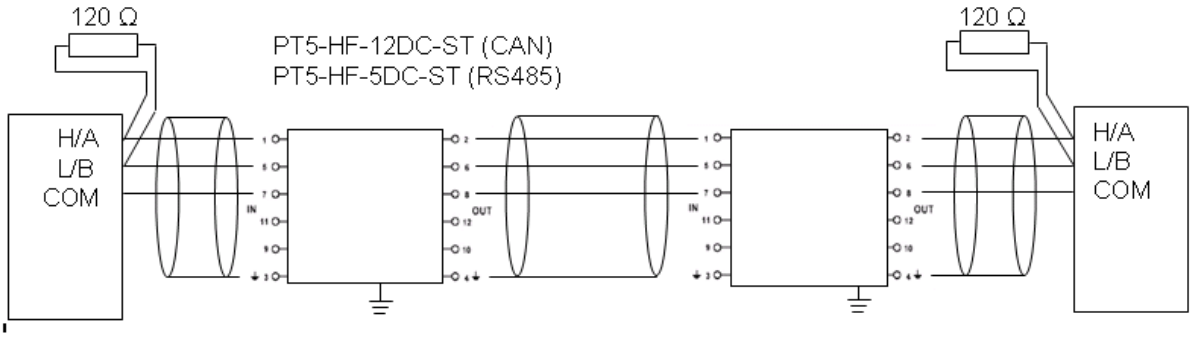
1. For shorter distances: 3105A Paired - EIA Industrial RS-485 PLTC/CM (1x2 conductors)
2. For shorter distances: 3105A Paired - EIA Industrial RS-485 PLTC/CM (1x2 conductors)
3. In case of surge hazard: 3106A Paired - EIA Industrial RS-485 PLTC/CM (1x2+1 conductors)



PICTURE 1 - SHORTER DISTANCES (ALL NETWORK COMPONENTS WITHIN ONE ROOM)



PICTURE 2 - LONGER DISTANCES (CONNECTION BETWEEN ROOMS WITHIN ONE BUILDING)



PICTURE 3 - SURGE HAZARD (CONNECTION OUT OF BUILDING IN CASE OF STORM ETC.)

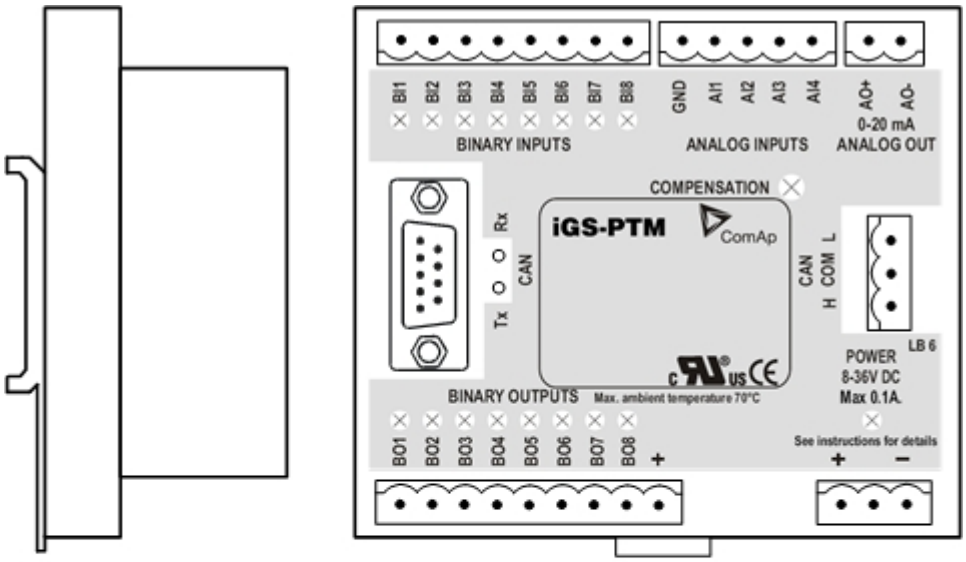
Extension modules

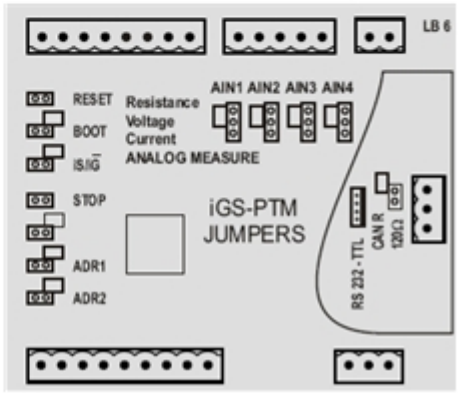
Extension modules are to be enabled and configured using LiteEdit. Extension modules are not contained in the factory default configuration.

IGS-PTM

The IGS-PTM is a DIN rail mounted extension module that is connected to the controller via CAN1 bus. The module contains:

- 8 binary inputs with the same properties and configuration as binary inputs of the controller.
- 8 binary outputs with the same properties and configuration as binary outputs of the controller.
- 4 analog inputs with selectable electrical range by a jumper: 0 - 250 Ohm, 0 - 100mV, 0 - 20mA, suitable for Pt100 and thermocouple sensors





NOTE:
The controller selection jumper (*iS/iG*) must be in the iG position for using the module with the InteliCompact-NT.

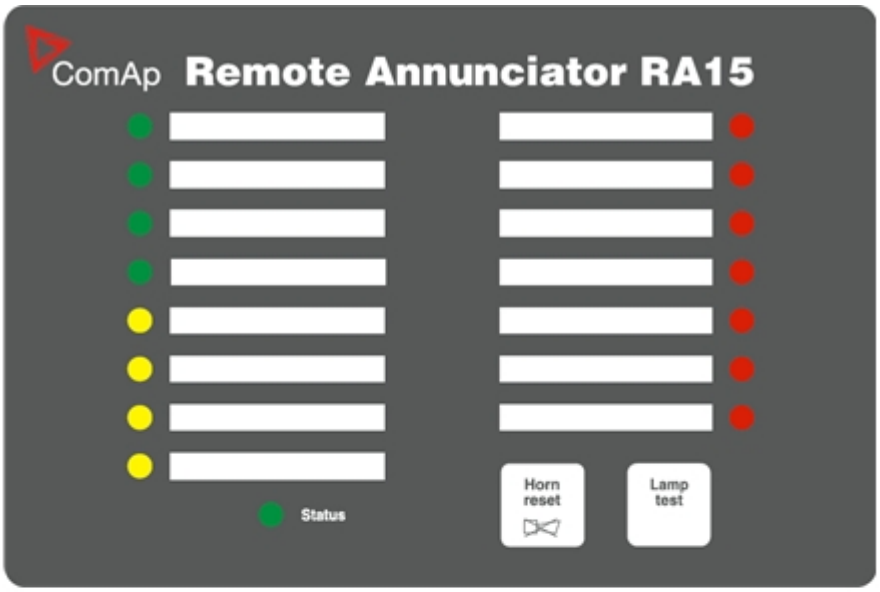
A separate manual for the IGS-PTM module is available for download on the ComAp web site

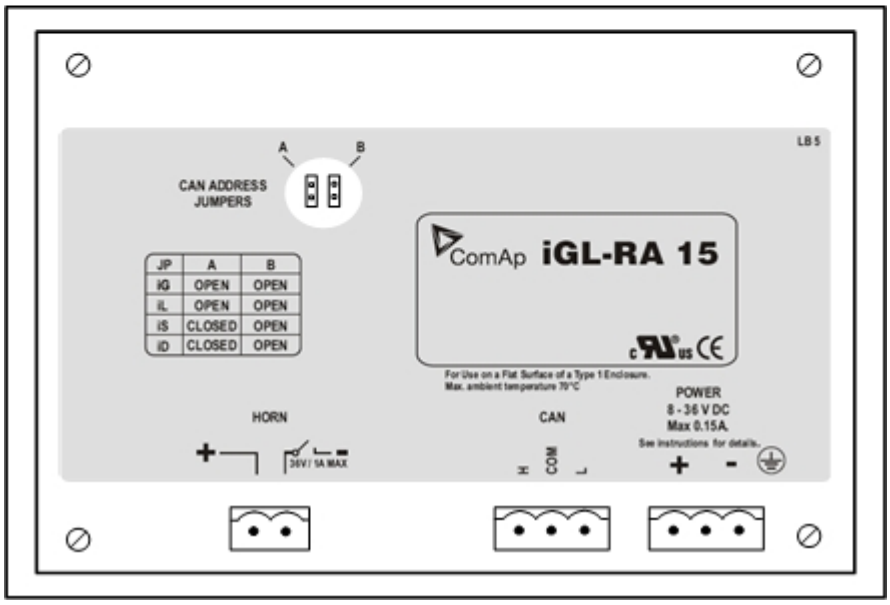
IGL-RA15 remote annunciator

The IGL-RA15 module is a remote annunciator that is connected to the controller via CAN1 bus. The module contains:

- 15 LEDs with configurable colour (red, green, yellow).
- Binary output for driving an external siren.
- Horn reset and Lamp test buttons.

The siren is activated automatically if a new yellow or red LED switches on, the duration is adjustable and it can be silenced by pressing horn reset button. In the controller the LEDs are configured like binary outputs, so all binary output functions can be used to drive the LEDs.





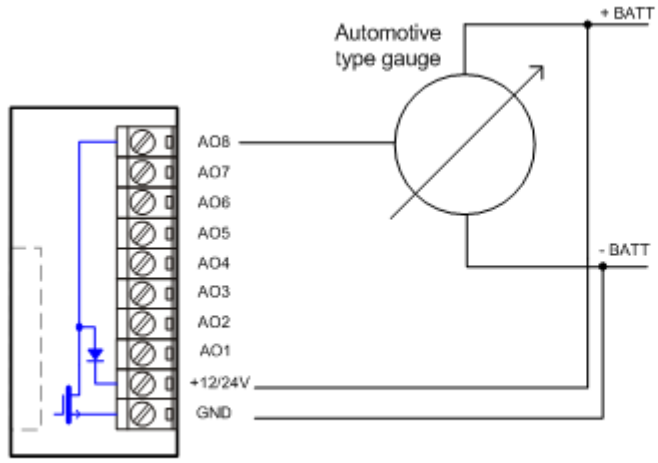
NOTE:
THE ADDRESS SELECTION JUMPERS MUST BE IN THE IG POSITION FOR USING THE MODULE WITH THE INTELICOMPACT-NT.

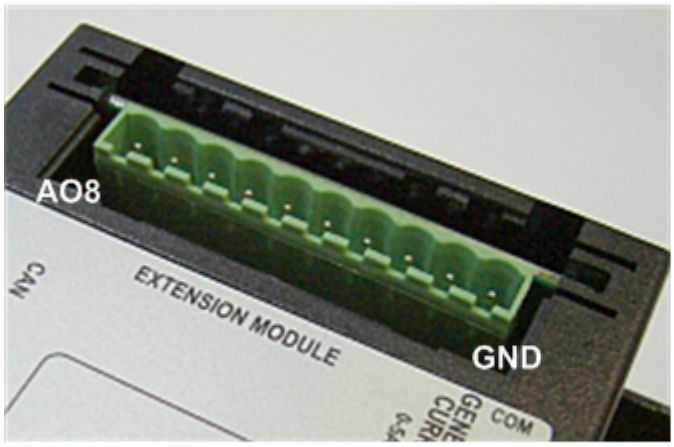
A separate manual for the IGL-RA15 module is available for download on the ComAp web site

IL-NT-AOUT8

The IL-NT-AOUT8 module is to be directly plugged-in into the slot on the rear side of the controller. The module contains 8 PWM open collector type outputs. The outputs are specially designed for driving of analog automotive type gauges. Any of analog values measured or computed in the controller can be configured to each output and it is possible to configure different conversion characteristic (curve) to each output.

NOTE:
The module is compatible with gauges, that are originally designed for resistive sensors, i.e. have board voltage compensation. These gauges have 3 terminals: +BATT, SENSOR, GND.





Examples of automotive gauges that can be used with the module:

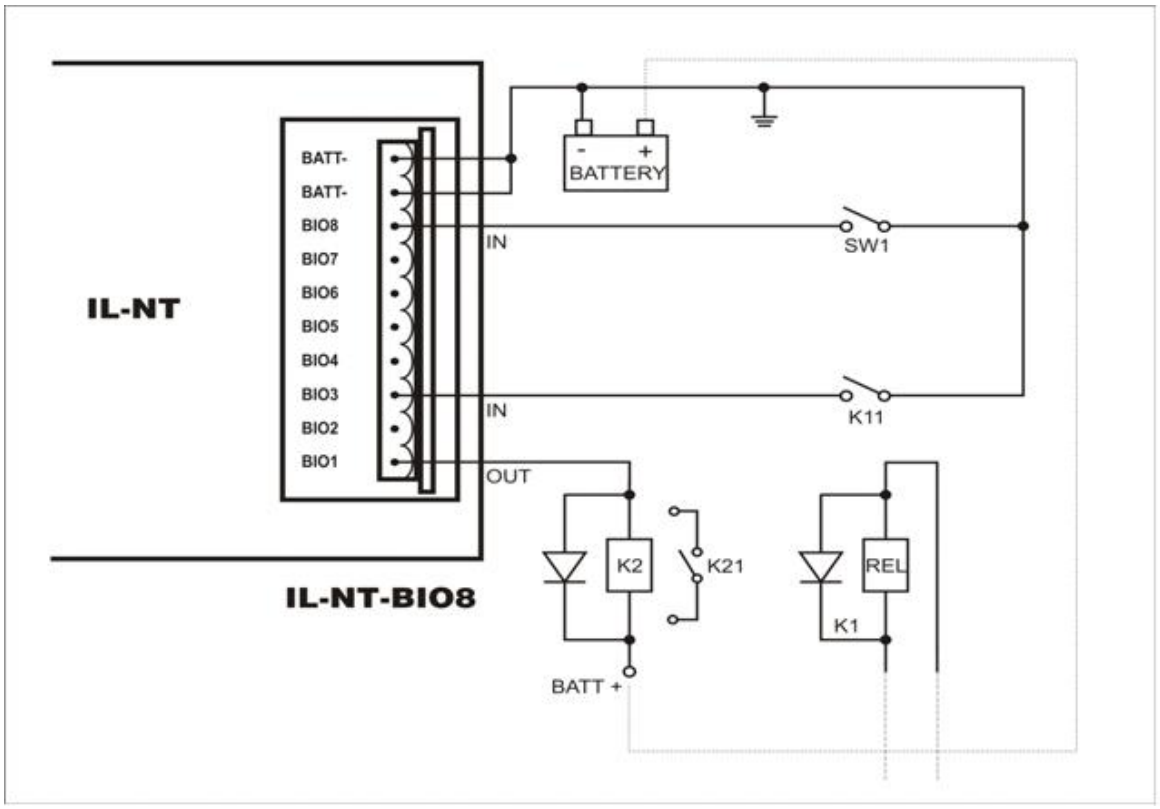
- VDO Oil pressure gauge 0-10Bar, p.n. 350-010-007
- VDO Coolant temperature gauge 40-120°C, p.n. 310-010-002
- VDO Fuel level 0-1/1, p.n. 301-010-001

IL-NT BIO8

Hybrid binary input/output module

IL-NT BIO8 is optional plug-in card. Through this card controller can accommodate up to 8 binary inputs or outputs. In LiteEdit PC configuration tool (version 4.4 and higher) it is possible to easily choose if particular I/O will be binary input or output.

To insert the module, you must open the cover first (use screwdriver to open) and then insert the module into slot. Once you have inserted it, the module will snap under plastic teeth. It is supposed to be installed permanently. Should you need to remove it, the safest way is to remove whole back cover and than remove module manually. Installing IL-NT BIO8 module is similar to installing RS 232 module. The difference is that module fits to “extension module” slot and after installing IL-NT BIO8 you do not put back the small cover.



Technical details:
IL-NT BIO8 plugs into IC-NT controller EXTENSION MODULE port.
8 dedicated pins of the plug-in card’s terminal can be configured as binary inputs or outputs.

BINARY INPUTS

Number of inputs	8
Input resistance	4.7 k?
Input range	0-36 VDC
Voltage level for close contact indication (Logical 1)	< 0.8 VDC
Voltage level for open contact indication (Logical 0)	> 2 VDC
Max voltage level for open contact indication	8-36 VDC

BINARY OPEN COLLECTOR OUTPUTS

Number of outputs	8
Maximum current per pin	0.5 A
Maximum switching common current	2A
Maximum switching voltage	36 VDC

NOTE:
Binary inputs are not galvanically isolated.

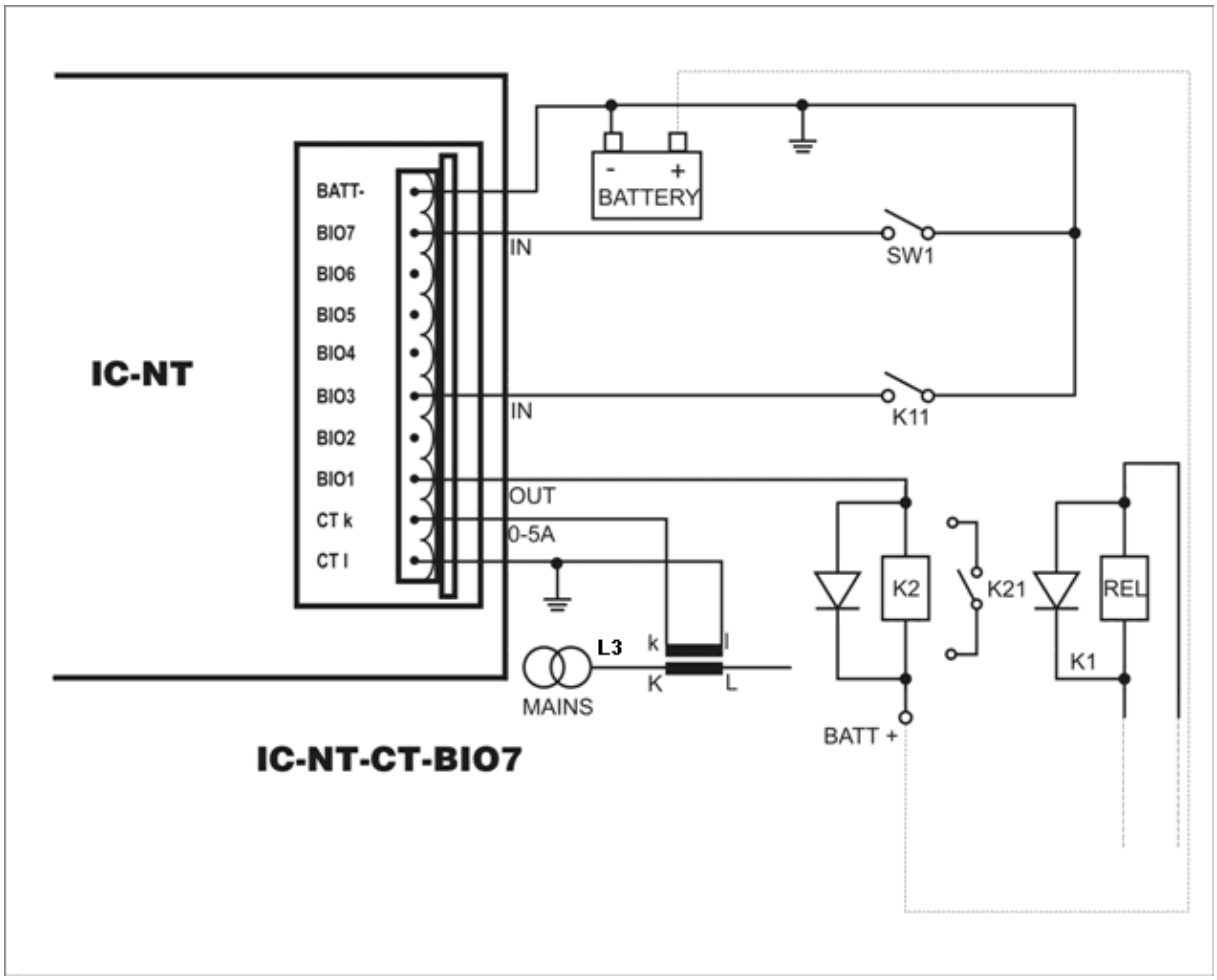
IC-NT CT-BIO7

Hybrid current input and binary input/output module (SPtM)

IC-NT CT-BIO7 is optional plug-in card. Through this card controller can accommodate one AC current (CT) measuring input and up to 7 binary inputs or outputs. In LiteEdit PC configuration tool (version 4.4 and higher) it is possible to easily choose if particular I/O will be binary input or output.

NOTE:
Current measuring input is intended to measure one phase (AC) current of mains and to limit Export/Import to/from mains to zero value during parallel to mains operation. This is case of SPtM application, so current input of IC-NT CT-BIO7 module is useful for SPtM controllers only.

To insert the module, you must open the cover first (use screwdriver to open) and then insert the module into slot. Once you have inserted it, the module will snap under plastic teeth. It is supposed to be installed permanently. Should you need to remove it, the safest way is to remove whole back cover and than remove module manually. Installing IC-NT CT-BIO7 module is similar to installing RS 232 module. The difference is that module fits to “extension module” slot and after installing IC-NT CT-BIO7 you do not put back the small cover.



Technical details:
IC-NT CT-BIO7 plugs into IC-NT controller EXTENSION MODULE port.
7 dedicated pins of the plug-in card's terminal can be configured as binary inputs or outputs.

CURRENT MEASURING INPUT

Number of inputs	1
Nominal input current (from CT)	5A
Load (CT output impedance)	< 0.1
Max measured current from CT	10A
Current measurement tolerance	2% from Nominal current
Max peak current from CT	150A / 1s
Max continuous current	10A

(All values in RMS)

BINARY INPUTS

Number of inputs	7
Input resistance	4.7 k?
Input range	0-36 VDC
Voltage level for close contact indication (Logical 1)	< 0.8 VDC
Voltage level for open contact indication (Logical 0)	> 2 VDC
Max voltage level for open contact indication	8-36 VDC

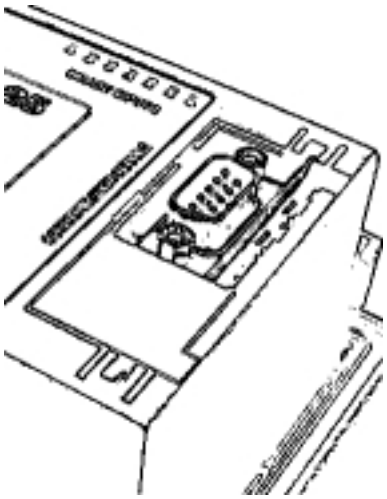
BINARY OPEN COLLECTOR OUTPUTS

Number of outputs	7
Maximum current per pin	0.5 A
Maximum switching common current	2A
Maximum switching voltage	36 VDC

NOTE:
Binary inputs are not galvanically isolated.

Communication modules

Communication module enables connection of a remote computer or other remote device such as PLC to the controller. The module is to be plugged-in into the slot in the rear side of the controller. The slot is accessible after slot cover is removed.
More information about how to use communication modules can be found in the chapter Communications.

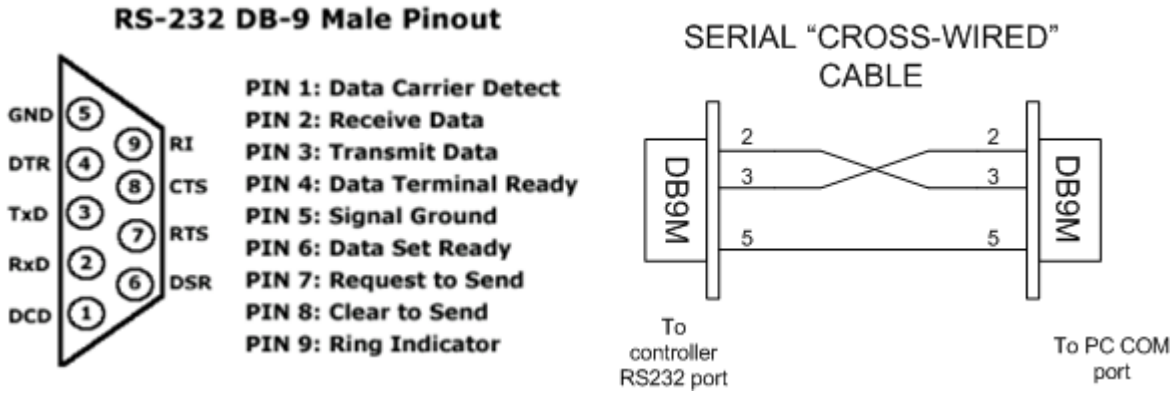


SLOT FOR COMMUNICATION MODULES

NOTE:
The modules are compatible with the IL-NT controllers.

IL-NT RS232

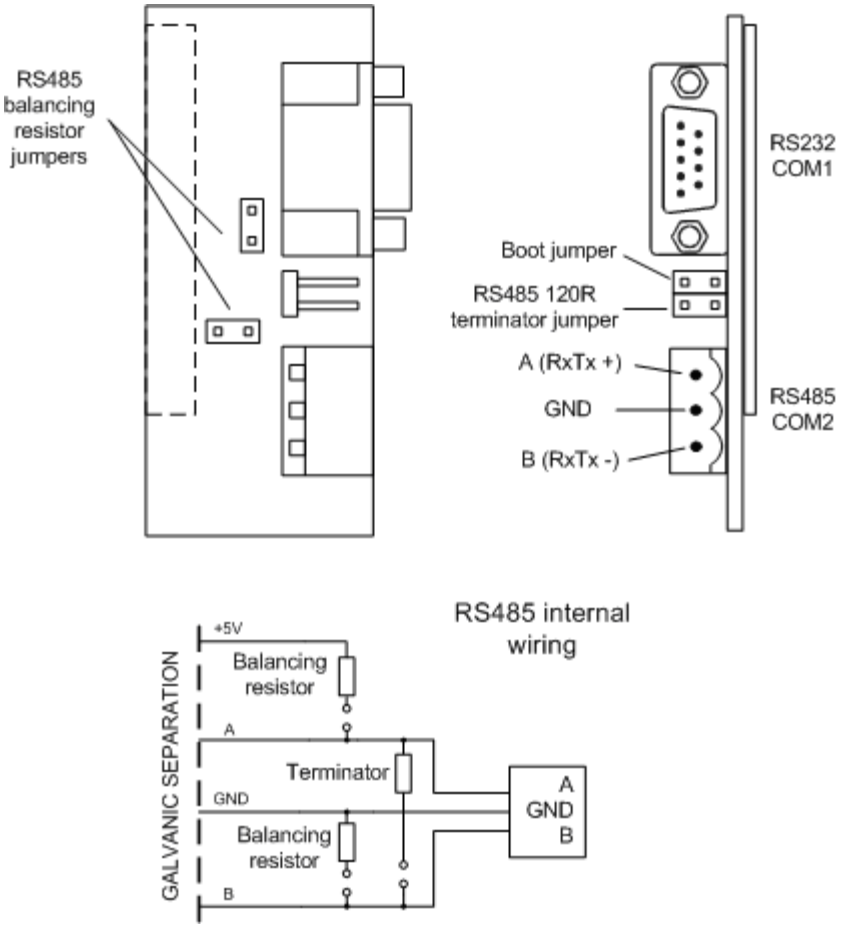
This module contains a RS232 port with all modem signals connected internally to the COM1 of the controller. DB9M connector is used on the RS232 side.



RS232 PINOUT AND CABLE WIRING

IL-NT RS232-485

The IL-NT 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.



IL-NT RS232-485 MODULE

IL-NT S-USB

This module contains USB slave port connected internally to the COM1 of the controller and is designed as an easy removable service module.

This module requires a FTDI USB Serial converter driver installed in the PC. The driver creates a virtual serial port (COM) in the PC, which must be used in LiteEdit as communication port when a connection is beeing opened.

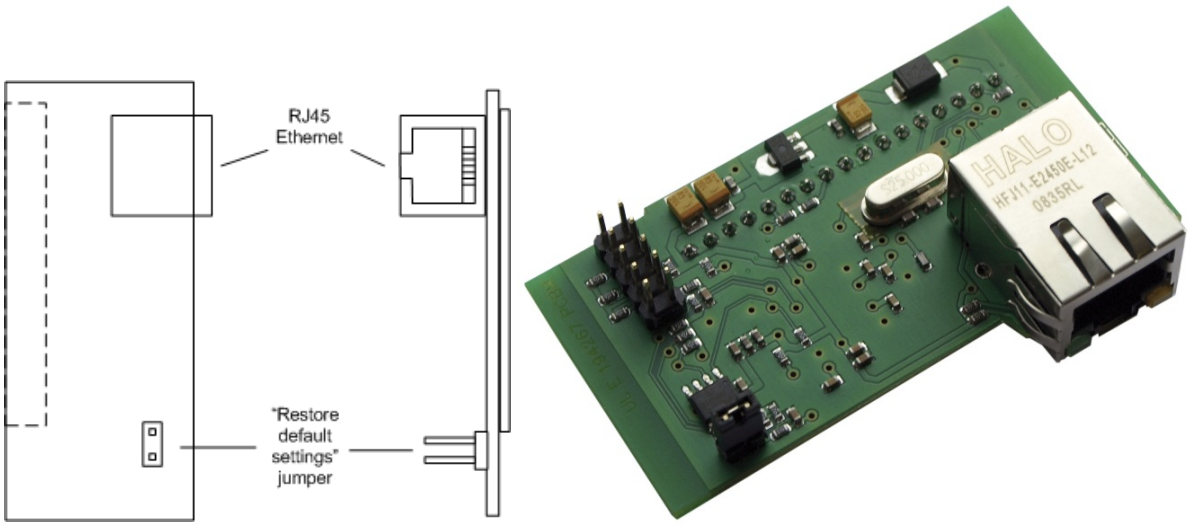
NOTE:
The FTDI driver is installed together with LiteEdit.

NOTE:
When the USB cable from the controller is plugged-in first time into different USB ports on the PC including USB hubs, it can be recognized as new hardware and the drivers are installed again with different number of the virtual serial port.

CAUTION!
Use shielded USB cable only!

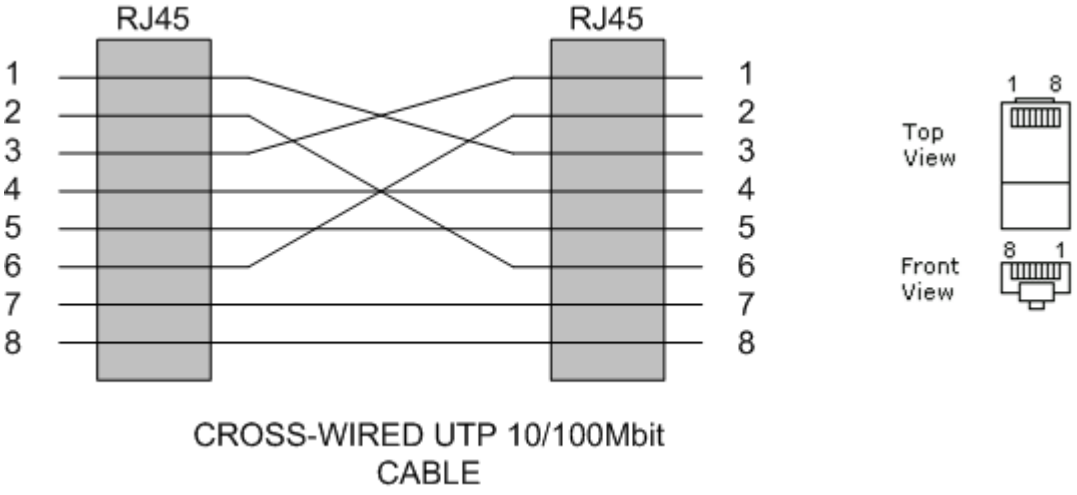
IB-Lite

IB-Lite is a plug-in module with Ethernet 10/100 Mbit interface in RJ45 connector. The module is internally connected to both COM1 and COM2 serial channels and provides an interface for connecting a PC with LiteEdit or InteliMonitor through ethernet/internet network, for sending active e-mails and for integration of the controller into a building management (Modbus/TCP protocol).



IB-LITE MODULE

Use Ethernet UTP cable with RJ45 connector for connection of the module into your ethernet network. The module can be also connected directly to a PC using cross-wired UTP cable.



CROSS-WIRED UTP CABLE

Communication module IB-Lite works with:

- WebSupervisor – internet based remote monitoring solution
- AirGate – powerful connection technology to make acces to internet as simple as posiible

NOTE:
The module requires some settings before initial usage. See chapter IB-Lite setup procedure.

IL-NT GPRS

This plug-in module is GSM/GPRS modem which can work in two modes of operation based on settings in setpoint COM1 Mode.

- Settings DIRECT = module works in GPRS network and enables connection via AirGate to LiteEdit and WebSupervisor as well as sending SMS alarms.
- Settings MODEM = module works as standard GSM modem enabling CSD (Circuit Switch Data) connection to controller with LiteEdit or other ComAp PC SW and sending alarm SMSes.

IL-NT GPRS MODULE AND GSM/GPRS SCREEN ON IC-NT DISPLAY

Communication module IL-NT GPRS works with:

- WebSupervisor – internet based remote monitoring solution
- AirGate – powerful connection technology to make acces to internet as simple as posiible
- Locate – localization technology

NOTE:
GPRS and CSD services have to be provided by your GSM/GPRS operator for successfuloperation.

NOTE:
GPRS AND CSD CONNECTION IS NOT SUITABLE FOR FIRMWARE UPDATE PROCESS, KINDLY USE WIRED CONNECTION INSTEAD LIKE RS232, USB, RS485 OR ETHERNET VIA IB-LITE!

NOTE:
It is necessary to power controller nad individually the IL-NT GPRS module as well.

WARNING
Any manipulation with IL-NT GPRS module can be done only without voltage.

EFI engines

To meet requests for low fuel consumption, low emmisions and high reliability, modern engines are electronically controlled by an "Engine Control Unit" (ECU). The ECU is fitted directly on the engine, it measures various engine parameters like speed, intake air flow, coolant temperature etc. and controls various actuators like injectors, ignition, valves etc. to achieve optimal operating conditions of the engine.

* For IC-NT available in 2012 Q2

Most of the ECUs have also a communication interface to the rest of the system (e.g. a vehicle, a gen-set, a pump ...) to provide engine operational data, alarm conditions and also to enable remote control. The most commonly used interface is the CAN bus with SAE J1939 protocol or sometimes also RS485 with MODBUS protocol.

The J1939 protocol was introduced by the SAE organization originally for automotive industry but now it is often used also for other engine applications. The specification of J1939 is partially open what means each engine producer can have little bit different kind of "implementation" of the J1939. This is why each new ECU type obviously needs slight modification of the controller firmware to support the particular ECU.

The IC-NT controller supports most of J1939-based ECU types as well as Cummins Modbus ECU and new ECU types are added to the firmware as they appear in the field.

Differencies between a classic and EFI-engine application

The main difference is less wiring, sensors and actuators in an EFI-engine application compared to a classic one. The typical wiring of an EFI-engine application shows that there are no analog sensors, no pickup and no governor. All this information is beeing communicated between the controller and the ECU via the communicaton bus.

Data received from the ECU (if available in the particular ECU)

Object	Type	Alarm	Comments
Engine speed	Analog	Shutdown (Overspeed)	
Oil pressure	Analog	Configurable	
Coolant temperature	Analog	Configurable	
Oil temperature	Analog	None	
Boost pressure	Analog	None	
Intake temperature	Analog	None	
Percent load at current speed	Analog	None	
Fuel rate	Analog	None	
Fuel level	Analog	Configurable	
Engine hours	Analog	None	
Yellow lamp	Binary	Warning	
Red lamp	Binary	Shutdown	
Engine hours	Analog	None	

NOTE:
The ECU values *Oil pressure*, *Coolant temperature* and *Fuel level* can be configured as source values for the controller analog inputs 1, 2, 3 instead of physical terminals. In such a case all analog inputs related things like protections, switches etc. work the same way as if physical terminals are used.

Data sent to the ECU (if supported by the particular ECU)

Object	Type	Coments
Speed request (governor output)	Analog	
Start request	Binary	
Stop request	Binary	

Idle/Nominal switch	Binary	
Shutdown override	Binary	
Frequency selection switch	Binary	50/60Hz selection

ECU alarms

Alarms (diagnostic messages) are read from the ECU and displayed in the ECU Alarmlist

Supported ECU types

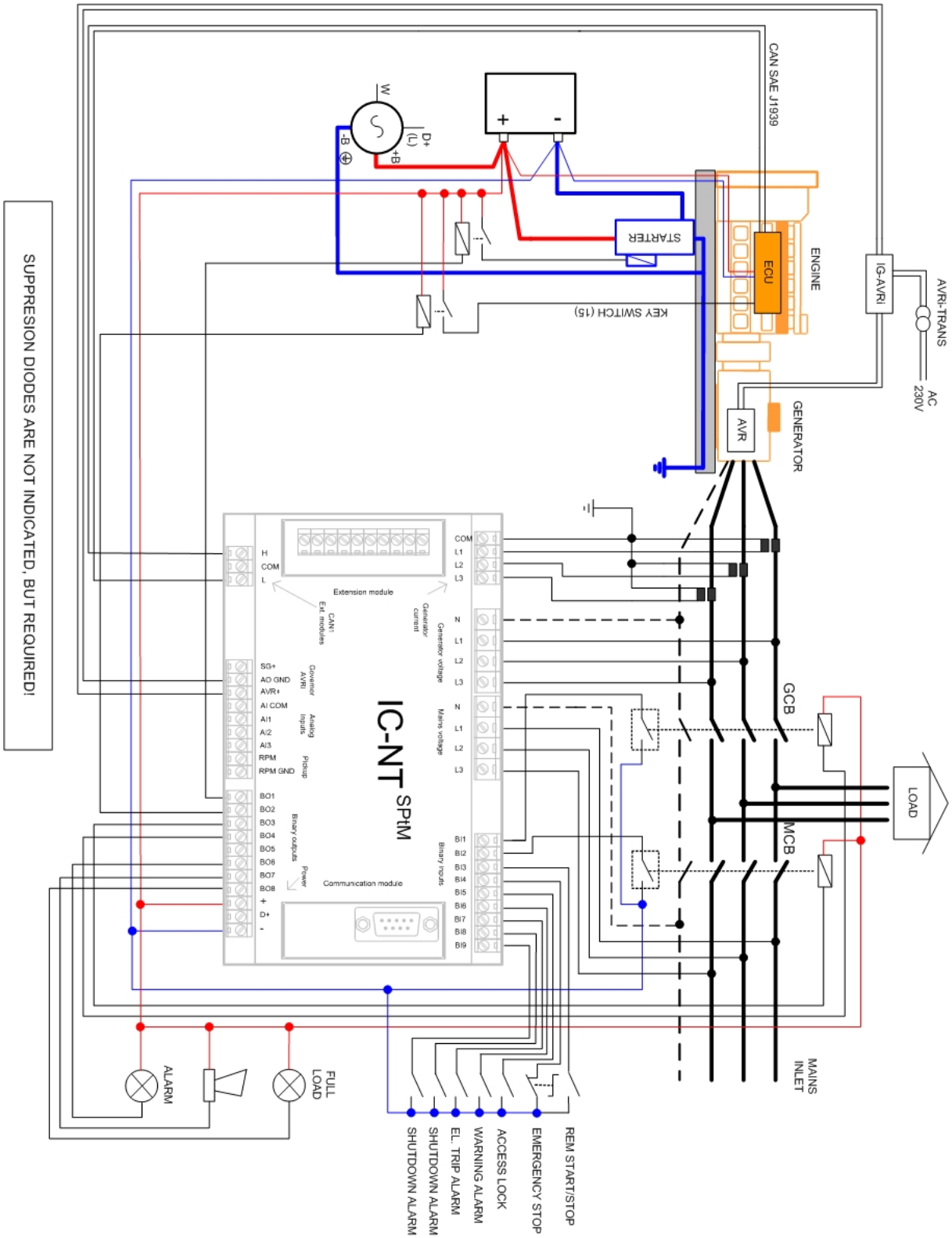
SUPPORTED ECU (ENGINE) TYPES AND THEIR REMOTE CONTROL CAPABILITIES

ECU TYPE	REMOTE START	REMOTE STOP	REMOTE SPEED CONTROL
Standart J1939 Engine	No	No	Yes*
Scania S6	Yes	Yes	Yes
Volvo EMS (AUX)	Yes	Yes	Yes
Deutz EMR2	No	Yes	Yes*
Deutz EMR3	Yes	Yes	Yes*
Cummins CM570	Yes	Yes	Yes*
Cummins CM850	No	No	No
MTU ADEC	Yes	Yes	Yes*
Waukesha ESM	No	No	No
Iveco ADEMIII (Vector)	Yes	Yes	Yes*
Iveco EDC (Cursor)	No	No	Yes*
John Deere	No	No	Yes*
Perkins ECM	No	No	Yes*
SISU EEM3 Genset	No	No	Yes*
Caterpillar ADEM	No	No	Yes*
DDC DDEC IV/V	No	No	Yes*
VM Industrial	No	No	Yes*
MAN MFR	Yes	Yes	Yes
SISU EEM3	Yes	Yes	No

- - standart TSC1 frame

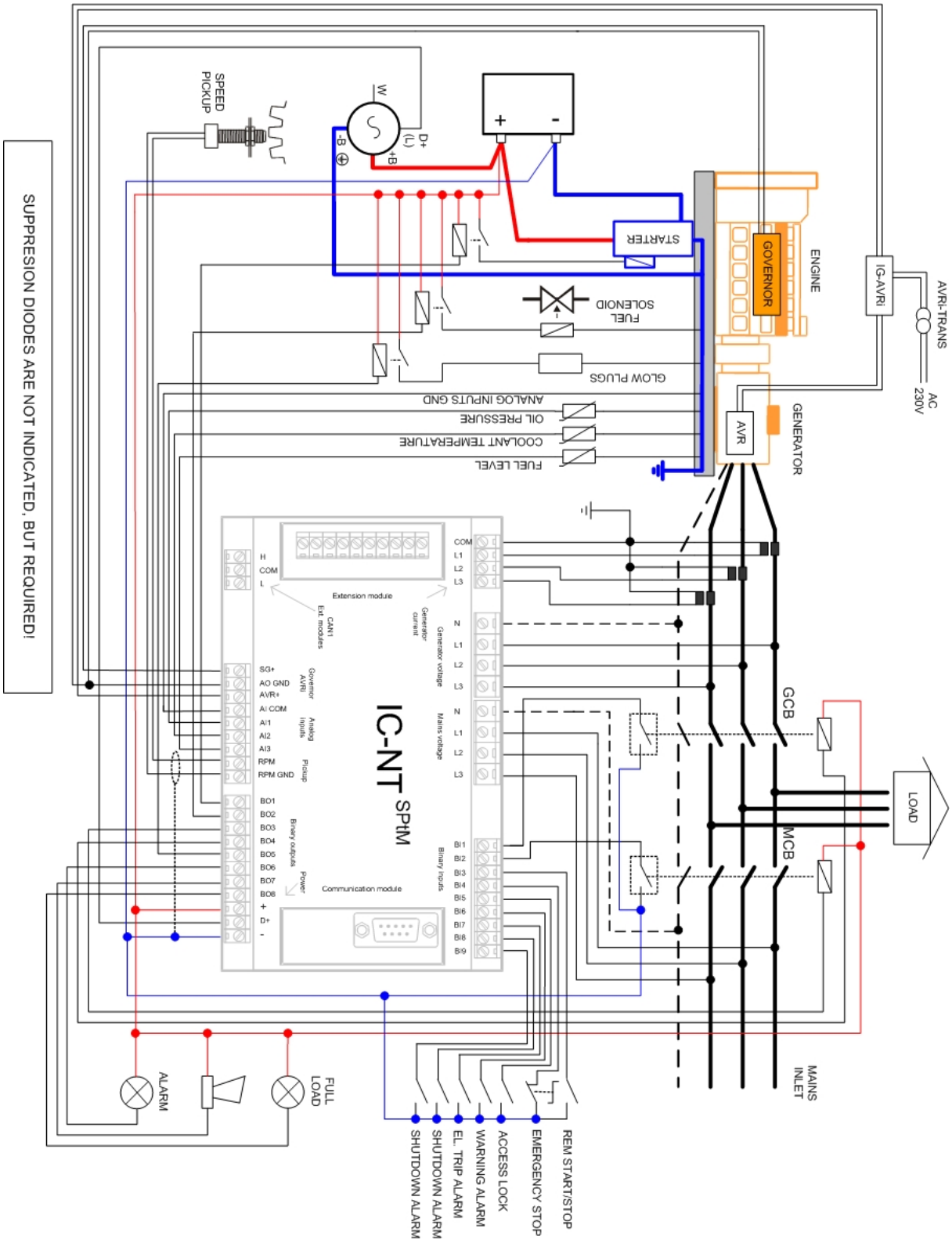
NOTE:
Support of new ECU types is continously added into the new firmware releases. If you haven't found your ECU type in the list, please download the latest release of the document *Comap Electronic Engines Support* from http://www.comap.cz or contact technical support for more information.

Typical wiring - EFI engine

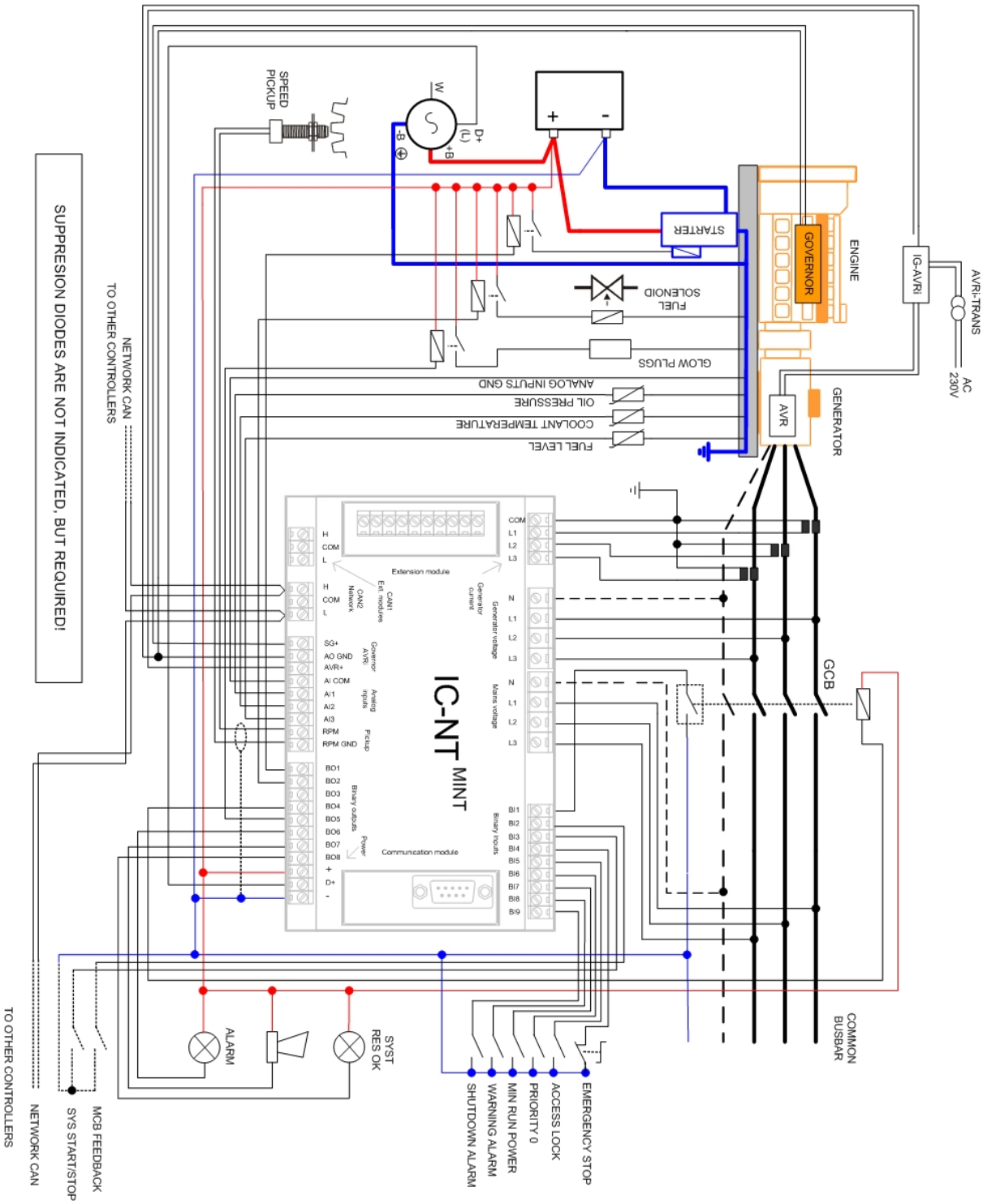


TYPICAL WIRING OF AN EFI ENGINE IN SPTM APPLICATION

Typical wiring - classic engine



THIS WIRING CORRESPONDS TO FACTORY DEFAULT SPTM CONFIGURATION

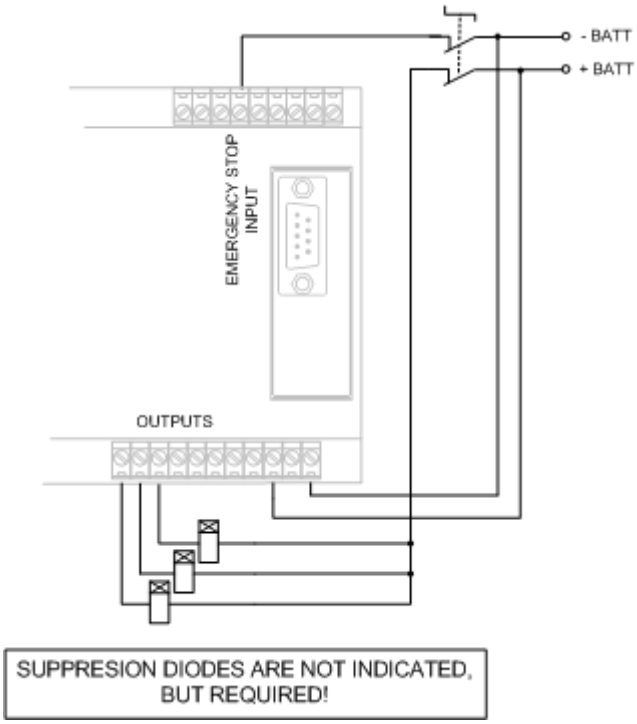


THIS WIRING CORRESPONDS TO FACTORY DEFAULT MINT CONFIGURATION

Emergency Stop

The Emergency Stop function can be made in two ways:

- Connecting a normally closed "mushroom-type" button to the binary input *Emergency Stop*. This is pure software solution.
- Hard-wired solution, where the button also disconnects power supply from the controller outputs.

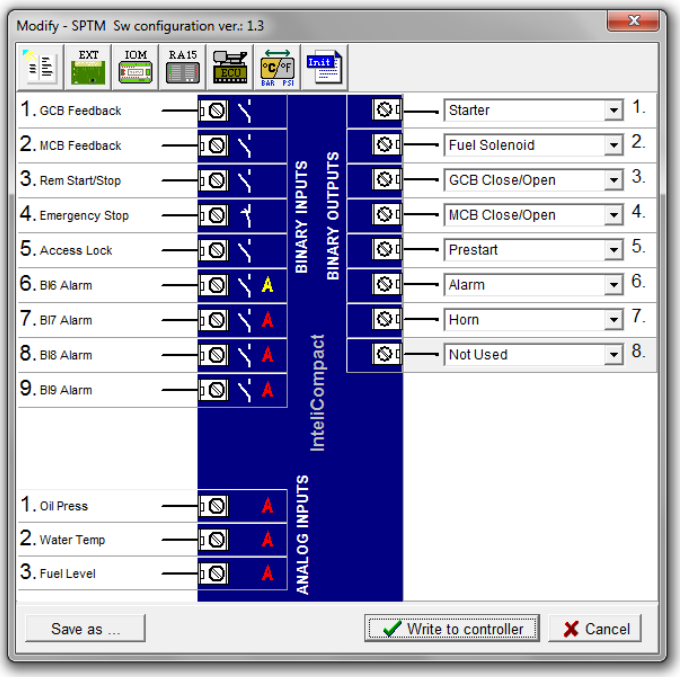


HARD-WIRED EMERGENCY STOP

Getting into operation

Programming the configuration

The controller is delivered with default configuration which should fit to most standart applications. Nevertheless you may need to modify it because your application is different. Please, refer to the LiteEdit manual or help to get information how to use LiteEdit for changing the particular items of the configuration and write the configuration to the controller.



CONFIGURATION WINDOW IN LITEEDIT

Programming the firmware

Although the controller is delivered containing the latest firmware available in the moment of production of the controller, it may be needed to upgrade the firmware in future. The process of programming firmware is following:

1. First you need the requested firmware. Firmwares of standard branch and major versions are distributed and installed together with LiteEdit installation package. Release versions and branches are distributed as import packages that need to be imported to the LiteEdit.
2. Latest installation and/or import packages are available for download at www.comap.cz. Please register to get access to the download page. The registration is free.
3. The import package is a file with IWE extension. To perform the import, start LiteEdit, do not open any connection, go to Options -> Import firmware and select appropriate file.
4. Create an **online connection** to the controller and save the archive for backup purposes.

NOTE:
It is not possible to programm firmware during offline connection!

5. Go to menu Controller -> Programming and clonning -> Programming, select appropriate firmware and press OK button.
6. The selected firmware will be programmed into your controller.

NOTE:
It is possible to programm only firmwares, that are compatible with the currently attached controller. Other firmwares are disabled and can not be selected for programming.

CAUTION!
The configuration returns back to default one after a firmware has been programmed. You have to re-programm also the configuration, if the default one does not fit!

CAUTION!
Also some setpoints may have incorrect values after a new firmware was programmed. Please check all setpoints after programming.

Programming a non-responding controller

If the controller does not contain valid firmware, a new firmware can not be programmed standard way. This situation can occur if the connection between PC and the controller was interrupted e.g. during previous firmware upgrade. In such a case the controller has blank display and does not communicate with the PC. The boot-jumper must be used to get a valid firmware into the controller.

1. Disconnect power supply from the controller, insert a communication module and close the boot-jumper.

BOOT-JUMPER ON IL-NT RS232

NOTE:
See communication modules chapter for information about boot-jumper position at other modules.

2. Connect proper communication cable between the controller and PC.
3. Start LiteEdit and open online connection according to the module used. Select controller address 1. Wait until the bottom line of LiteEdit will show red line with text "DDE server: Error".
4. Go to menu Controller -> Programming and clonning -> Programming, select appropriate firmware and press OK button.
5. Follow instructions given by a message appeared and finally press OK button.
6. Another message will appear when programming is finished. Follow instructions given there.

Factory default configuration

SPtM

(SPtM only)

BINARY INPUTS

No.	Description	Configured function
BI1	Generator circuit breaker feedback	*GCB Feedback*
BI2	Mains circuit breaker feedback	*MCB Feedback*
BI3	Remote start/stop	*Rem Start/Stop*
BI4	Emergency stop button	*Emergency Stop*
BI5	Access lock keyswitch	*Access Lock*
BI6	Warning alarm	None
BI7	Electrical trip alarm (BOC)	None
BI8	Shutdown alarm	None
BI9	Shutdown alarm	None

BINARY OUTPUTS

No.	Configured function
BO1	*Starter*
BO2	*Fuel Solenoid*
BO3	*GCB Close/Open*
BO4	*MCB Close/Open*
BO5	*Prestart*
BO6	*Alarm*
BO7	*Horn*
BO8	None

ANALOG INPUTS

No.	Input name	Configured sensor
AI1	Oil pressure	Sensor VDO 10Bar, warning + shutdown alarm
AI2	Water temperature	Sensor VDO 120deg, warning + shutdown alarm
AI3	Fuel level	Sensor VDO 180Ohm, warning alarm

NOTE:
A wiring diagram that corresponds to the factory default SPtM configuration is available in separate chapter in the section "Installation" of this manual.

MINT

(MINT only)

BINARY INPUTS

No.	Description	Configured function
BI1	Generator circuit breaker feedback	*GCB Feedback*
BI2	Mains circuit breaker feedback	*MCB Feedback*

BI3	System start/stop	*Sys Start/Stop*
BI4	Emergency stop button	*Emergency Stop*
BI5	Access lock keyswitch	*Access Lock*
BI6	Highest priority switch	*Top Priority*
BI7	Large load preparation switch	*Min Run Power*
BI8	Warning alarm	None
BI9	Shutdown alarm	None

BINARY OUTPUTS

No.	Configured function
BO1	*Starter*
BO2	*Fuel Solenoid*
BO3	*GCB Close/Open*
BO4	
BO5	*Prestart*
BO6	*Alarm*
BO7	*Horn*
BO8	*SystReserve OK*

ANALOG INPUTS

No.	Input name	Configured sensor
AI1	Oil pressure	Sensor VDO 10Bar, warning + shutdown alarm
AI2	Water temperature	Sensor VDO 120deg, warning + shutdown alarm
AI3	Fuel level	Sensor VDO 180Ohm, warning alarm

Step-by-step guide

Following you will find a couple of steps which you should carry out when you are getting a gen-set into the operation. It supposes the switchboard wiring has been already checked.

NOTE:
This guide is not a handbook for a beginner, but it is focused on things specific for ComAp controllers and expects sufficient knowledge and skills in the field of generating sets!

WARNING!
Some parts of the generator, engine and switchboard may have dangerous voltage which can cause injury or death when touched!

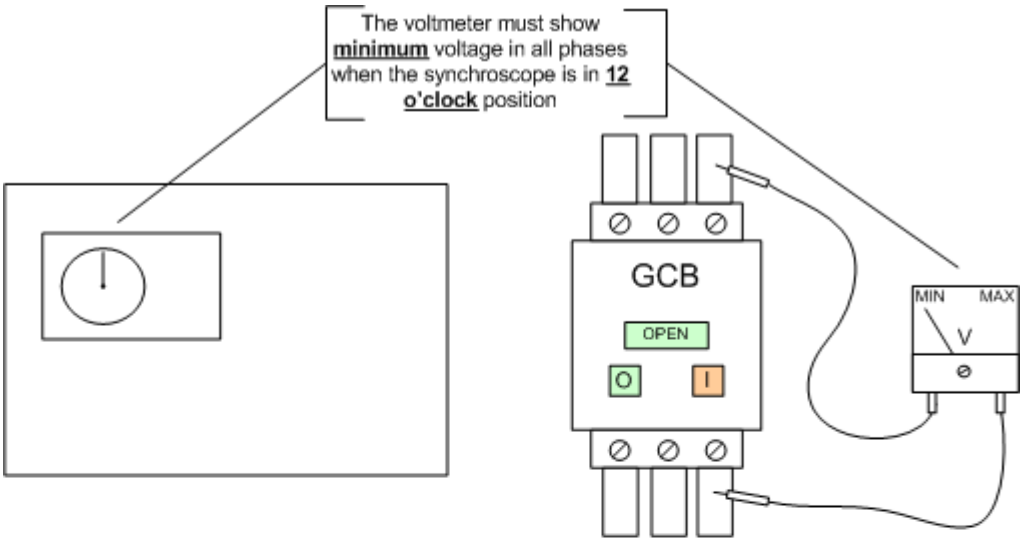
WARNING!
Rotating parts of the gen-set can catch your hair or parts of clothes and cause serious injury.

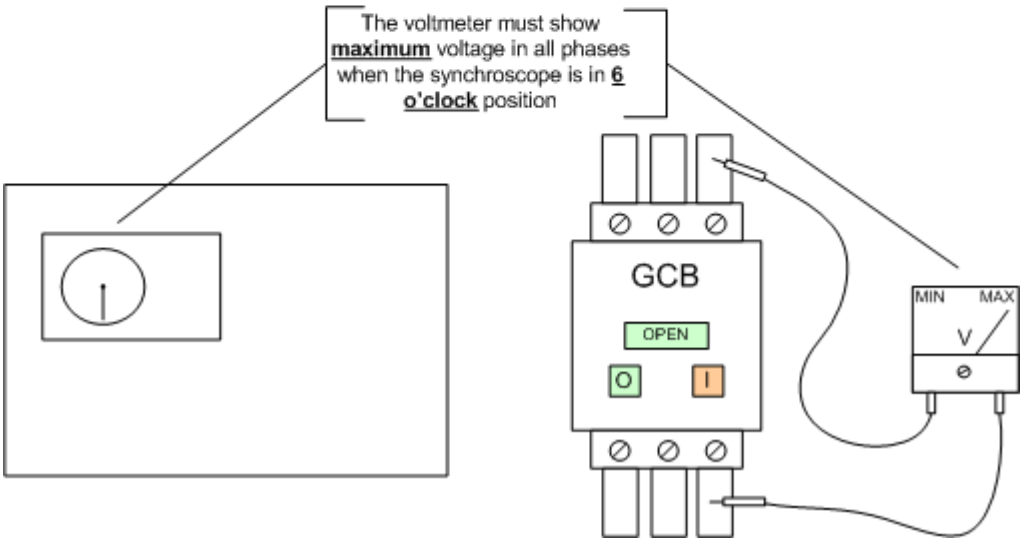
1. Disconnect binary outputs from the controller before connecting the power supply. If you have SPtM application, be sure that MCB and GCB are protected agains accidental switching when you are working in the switchboard.
2. Check the controller configuration according to the wiring diagram of the switchboard. If the configuration has been modified, write it to the controller

3. Write all setpoints from the default archive and then go through them and readjust all of them if it is necessary. Pay special attention to nominal values, overspeed, gear teeths, Fuel solenoid and CT ratio.
4. Check all settings regarding speed sensing and additional running information, especially if you do not use pickup for speed sensing.
5. Adjust bias setpoints for the governor and AVRi output to the recommended levels and adjust all delays for generator protections to high values to have enough time for making adjustments on running gen-set.
6. Connect the binary outputs back.
7. Adjust all setpoints related to engine start and stabilization phase, then start the gen-set in MAN mode and then make fine readjustments.
8. Leave the gen-set running and adjust the governor and/or AVRi so that the gen-set will have speed and voltage near to the nominal values. If this is not possible to achieve by turning the trim on AVRi and/or governor, you can also slightly change the bias setpoints.

NOTE:
The bias setpoints must not be near the limits for the particular output, because the regulation loops need sufficient reserve of the output range on both sides to work correctly.

9. Adjust all generator and engine protections according to your needs including the delays.
10. Adjust the setpoint *Phase Window* to 0. This adjustment will disable issuing of the GCB close command during sychronizing, but the sychnonizing itself will be performed normally for the whole adjusted time.
11. Press the GCB button to start the synchronizing and then check by a voltmeter connected directly over the contactor if the sychroscope indication on the controller screen matches the voltage. The voltage must be near to 0V when the synchroscope is in 12 o'clock position and near to $2*U_{nominal}$ when it is in 6 o'clock position. Check all three phases.

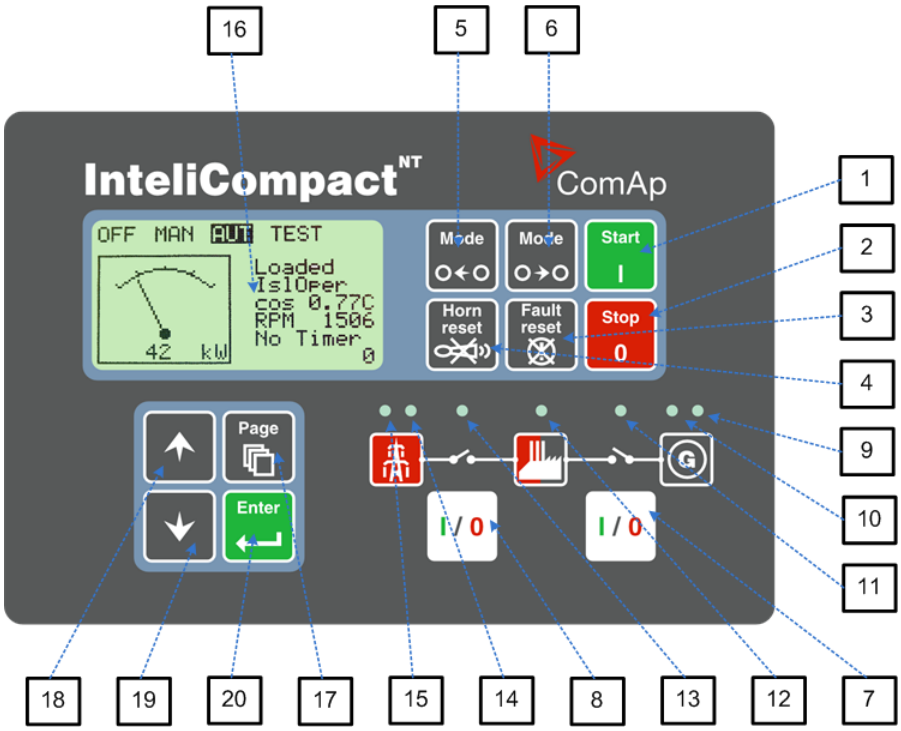




12. Adjust the setpoint *Phase Window* back to your desired value (typically 3-7°).
13. Synchronize the gen-set with the mains or other gen-sets. Adjust the setpoints for voltage, frequency and angle regulation loops to achieve fast and reliable synchronization.
14. Adjust setpoints for power, power factor, loadsharing and VARsharing loops.
15. Check the rest of setpoints and then save the archive to your disk for backup purposes.

Operator guide

Front panel elements



GEN-SET CONTROL BUTTONS

POSITION		DESCRIPTION
1	Start I	**START** button. Works in MAN mode only. Press this button to initiate the start sequence of the engine. See the Reference Guide - Engine start chapter to learn more about start sequence.
2	Stop 0	**STOP** button. Works in MAN mode only. Press this button to initiate the stop sequence of the gen-set. Repeated pressing or holding the button for more than 2s will cancel current phase of stop sequence (like ramping the power down or cooling) and next phase will continue. See the Reference Guide - Engine cooldown and stop chapter to learn more about stop sequence.
3	Fault reset	**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. Learn more about alarms in the Reference Guide - Alarm management chapter.
4	Horn reset	**HORN RESET** button. Use this button to deactivate the horn output without acknowledging the alarms.
5	Mode	**MODE LEFT** button. Use this button to change the mode. The button works only if the main screen with the indicator of currently selected mode is displayed. **NOTE:** This button will not work if the controller mode is forced by one of binary inputs listed in the Reference Guide - Operating modes chapter.

6		**MODE RIGHT** button. Use this button to change the mode. The button works only if the main screen with the indicator of currently selected mode is displayed. **NOTE:** This button will not work if the controller mode is forced by one of binary inputs listed in the Reference Guide - Operating modes chapter.
7		**GCB** button. Works in MAN and TEST modes only. Press this button to open or close the GCB or start synchronizing manually. Note that certain conditions must be valid otherwise GCB closing resp. starting of synchronization is blocked. See the Reference Guide - Connecting to the load chapter for details.
8		**MCB** button. Works in MAN and TEST modes only. Press this button to open or close the MCB or start reverse synchronizing manually. **CAUTION!** You can disconnect the load from the mains supply with this button! Be sure you know well what you are about to do!

GEN-SET OPERATION INDICATORS

POSITION	DESCRIPTION
9	**General alarm**. This red indicator lits if at least one alarm is present in the alarm list. It blinks if a new alarm has appeared and is still not acknowledged.
10	**Gen-set voltage OK**. This green indicator lits if the generator voltage and frequency is in limits. **NOTE:** The limits for the generator voltage and frequency are given by setpoints in the Gener Protect group.
11	**GCB position**. This green indicator blinks if the forward sychronizing is currently in progress, otherwise it shows current status of the generator circuit breaker according to the feedback input.
12	**Bus under voltage**. This green indicator shows if the bus is under voltage or not.
13	**MCB position**. This green indicator blinks if the reverse sychronizing is currently in progress; otherwise it shows current status of the mains circuit breaker according to the feedback input.
14	**Mains voltage OK**. This green indicator lits if the mains is evaluated as healthy. See the Reference guide - AMF function chapter for details about mains evaluation.
15	**Mains failure**. This red indicator starts blinking when the mains failure is detected and after the gen-set has started and is about to take the load it lights permanently until the mains failure disappears.

DISPLAY AND DISPLAY CONTROL BUTTONS

POSITION		DESCRIPTION
16		Graphic B/W display, 128x64 pixels
17		**PAGE** button. Use this button to switch over display pages. See next chapter for details about display pages and screens structure
18		**UP** button. Use this button to move up or increase value.

19		**DOWN** button. Use this button to move down or decrease value.
20		**ENTER** button. Use this button to finish editing a setpoint or moving right in the history page.

User interface modes

There are two modes of the user interface:

- **User mode** allows the user to go through all screens with measurements and alarms. The  button does not work, i.e. setpoints and history pages are not accessible.
- **Engineer mode** gives the qualified person full access to all pages and screens.

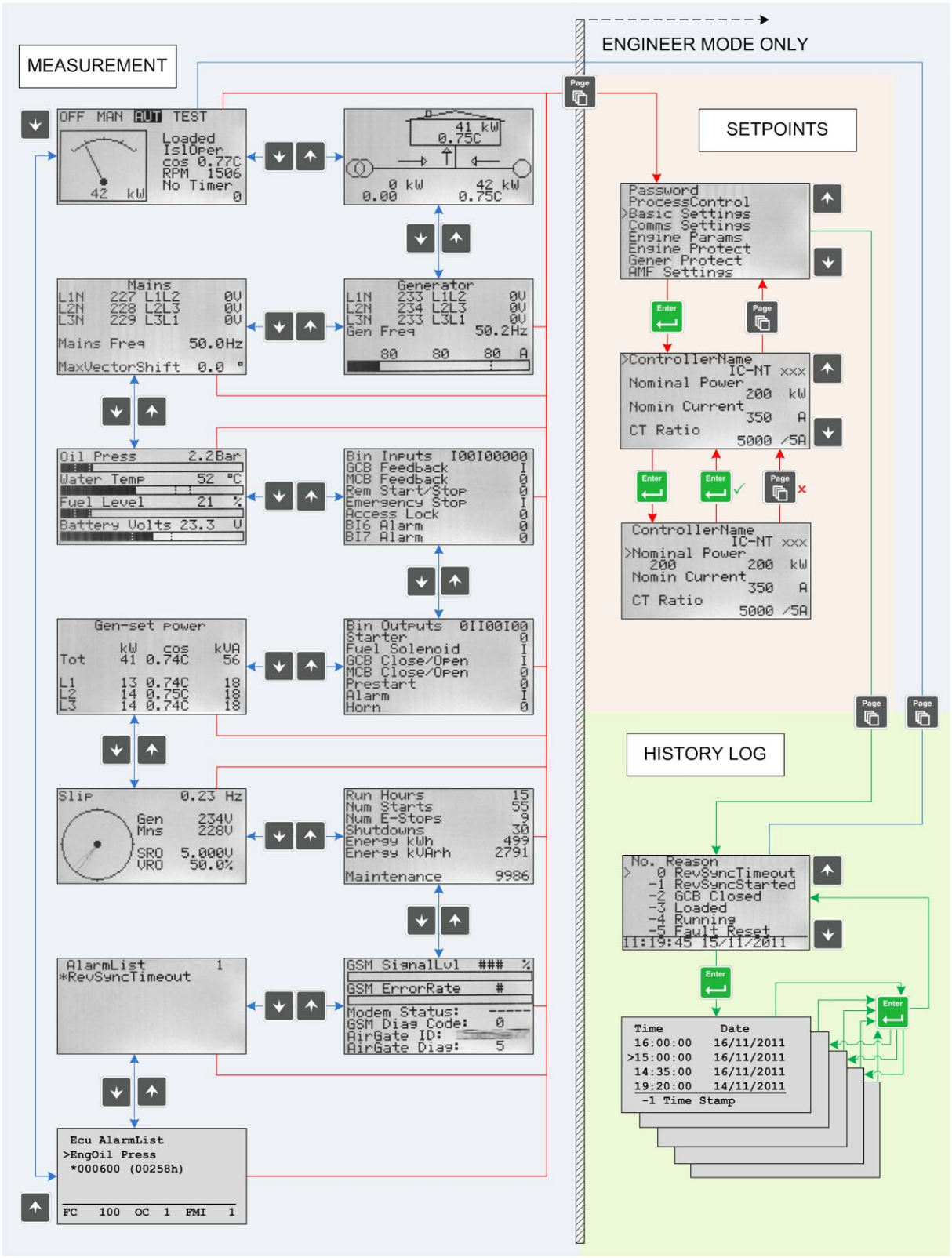
See the chapter User interface mode selection to learn how to switch the user interface mode.

Display screens and pages structure

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

1. The page *Measurement* consists of screens which display measured values like voltages, current, oil pressure etc., computed values like i.e. gen-set power, statistic data and the alarm list on the last screen.
2. The page *Setpoints* contains all setpoints organized to groups and also a special group for entering password.
3. The page *History log* shows the history log in the order that the last record is displayed first.

NOTE:
The picture below shows the structure of displayed data. The contents of each particular screen may be slightly different according to the firmware branch and version.

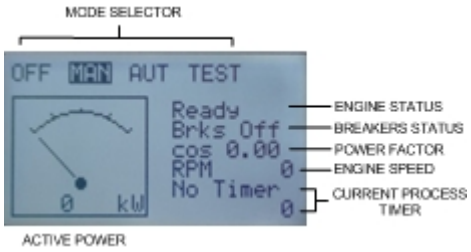


STRUCTURE OF THE DISPLAYED DATA

View measured values

Press Page button repeatedly until you see the main screen with the kW meter and mode selector.

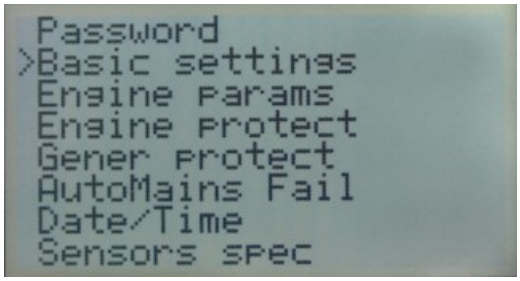
Then press ↑ or ↓ to select requested screen within the measurement page.



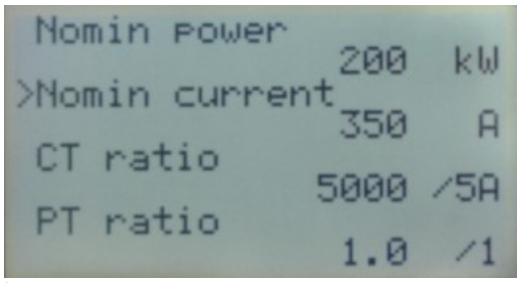
THE MAIN SCREEN

Setpoints - view and change

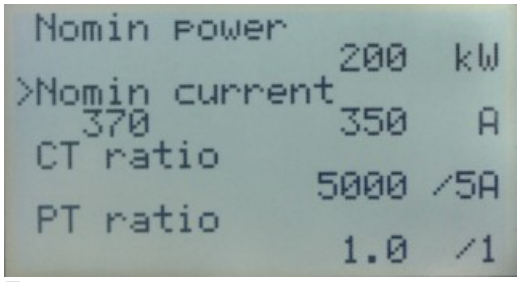
1. Press Page button repeatedly until you see a screen with a list of setpoint groups. Then select desired group by pressing the ↑ or ↓ buttons and finally press Enter button to continue into the selected group.
2. Now you will see the list of setpoints which belong to the selected group together with their current setting. Use the ↑ or ↓ buttons again to select the setpoint you want to modify and press Enter .
3. The current value of the setpoint will appear in the right part under the setpoint name and you can change it by pressing ↑ or ↓ buttons. The rate of changing the value will accelerate when the button is held down
4. Press Enter button to confirm the change or Page to discard it and return to the list of setpoints of the selected group.
5. Continue with change of another setpoint or press Page to return to the list of groups.



LIST OF GROUPS OF SETPOINTS



LIST OF SETPOINTS WITHIN SELECTED GROUP



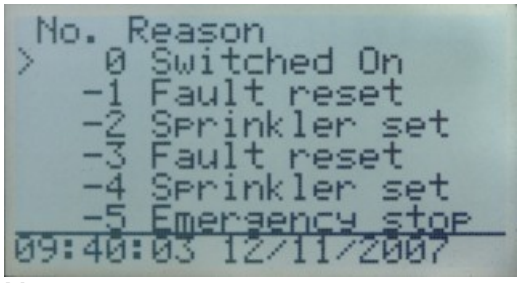
EDITING A SETPOINT

Browsing the history log

1. Press Page button repeatedly until you see the main history log screen with the reason column and the latest record.

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

2. Use the Enter button to move over columns within the selected record. Pressing it repeatedly will move cyclically through the columns, i.e. after last column the first one will be displayed.
3. Use buttons ↑ and ↓ to move over the records.
4. Press Page button to select another display page.



MAIN HISTORY LOG SCREEN

NOTE:
The first history record after the controller is switched on, programmed or watchdog reset occurs contains diagnostic values instead of operational. Some fields in these records seem to have nonsense values. Do not take these values into account.

Browsing alarms

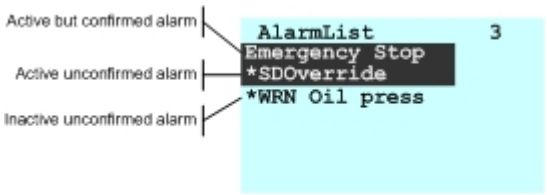
The Alarmlist and ECU Alarmlist are displayed on the last two screens in the measurement page. If the main screen is displayed then the Alarmlist screen will appear automatically always when a new alarm occurs. It can be also displayed manually as described in the chapter View measured values.

- Use the 

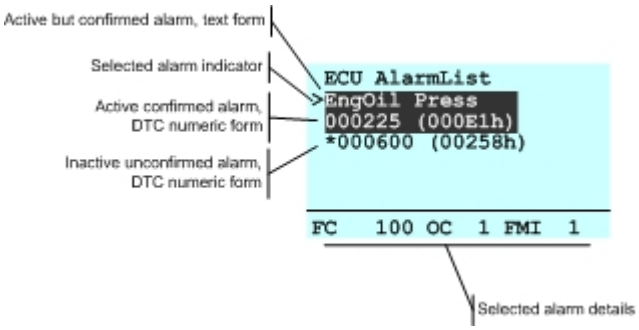
to move over the alarms in the ECU Alarmlist. Details of the selected alarm are displayed in the bottom line.
- Press 

button to reset alarms.

- **Active alarms** are displayed as white text on black background. It means the alarm is stil 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 no more active, i.e. the appropriate alarm conditions are gone.
- **Not confirmed alarms** are displayed with an asterisk. It means the alarm is still not acknowledged (confirmed).



ALARMLIST



ECU ALARMLIST

NOTE:
The ECU AlarmList is visible only if an ECU is configured.

Entering the password

The password must be entered prior adjusting setpoints that are password-protected. Password is located in the first group of setpoints and the way how to enter or change password is similar to change of setpoints as described in the setpoints chapter.

NOTE:
It is possible to change only passwords of the same or lower level than actually entered password!

NOTE:
Lost password? Display the information screen which contains the serial number and a password decode number as is described in the chapter below. Write down both numbers and send a request to

retrieve the passord to your local distributor containing these two numbers. You can also save and send an archive instead.

Controller information screen

1. Press the 

button repeatedly until you will see the main controller screen with the mode selector and kW analog meter.
2. Hold down the 

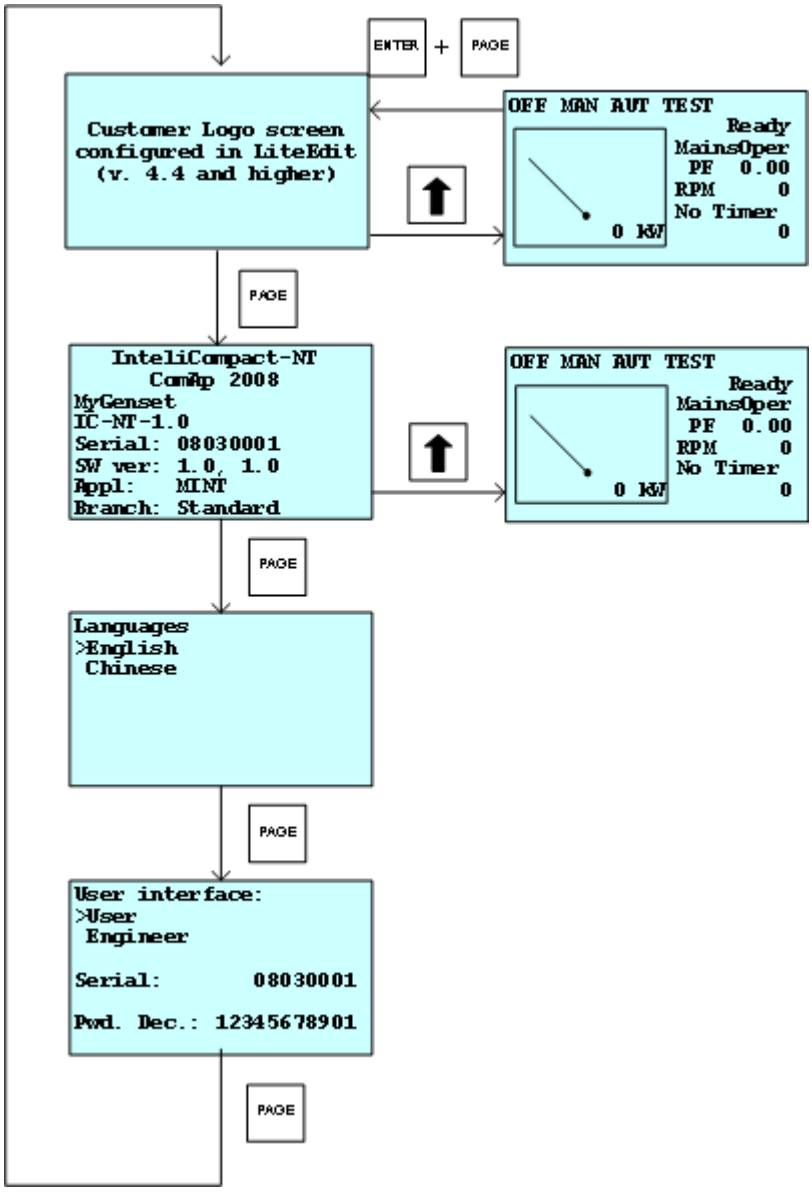
button and simultaneously press the button 

to see the controller information screen.
3. The information screen will disappear automatically after 5 secs
4. Press the button 

again within 5s to switch to language selection screen.
5. Press the button 

again to switch to the user interface mode selection screen. This screen also contains serial number and password decode number.
6. Next pressing of the button 

switches back to the information screen.
7. Press the button  to get back to the controller main screen.



The information screen contains following information:

- Controller Name
- Firmware identification string
- Serial number of the controller
- Firmware version, application version
- Application type
- Branch name

Controller language selection

There are two languages available in the controller. Default languages are English and Chinese. The languages can be changed or modified during the configuration in LiteEdit. Please see the LiteEdit documentation for details.
To switch the controller language:

1. Display the information screen as described above.
2. While the information screen is still displayed, press the 

button.
3. Language menu will appear, use  or  buttons to select the desired language.
4. Press 

to confirm the selection.

User interface mode selection

To switch the User interface mode, follow instructions below:

1. Display the information screen as described above.
2. While the information screen is still displayed, press the 

button twice.
3. User interface mode menu will appear, use  or  buttons to select the desired mode.
4. Press 

to confirm the selection.

Display contrast adjustment

1. Press the 

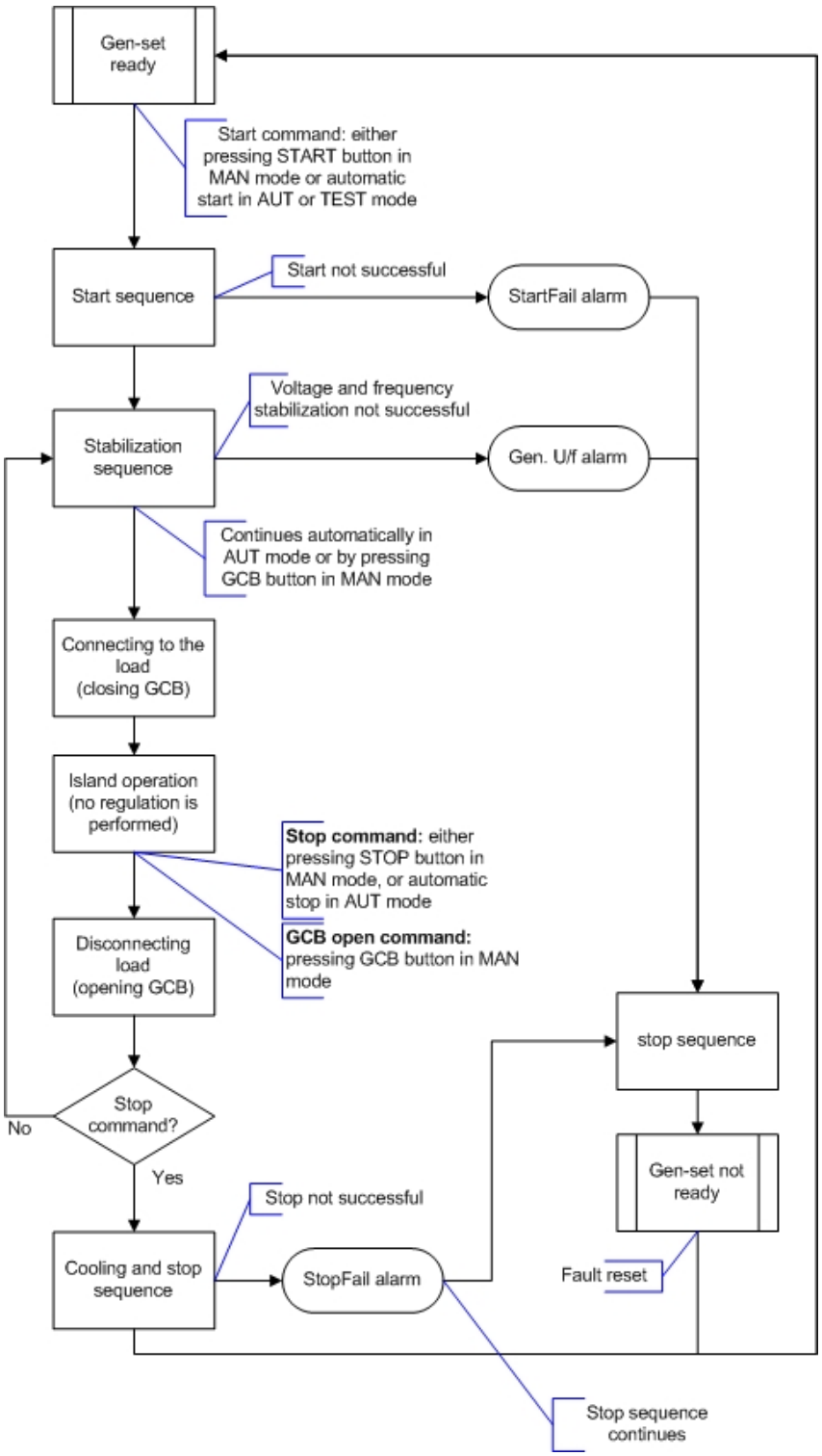
button repeatedly until you will see the main controller screen with the mode selector and kW analog meter.
2. Hold down the 

button and simultaneously press button  or  repeatedly to increase or decrease the contrast.

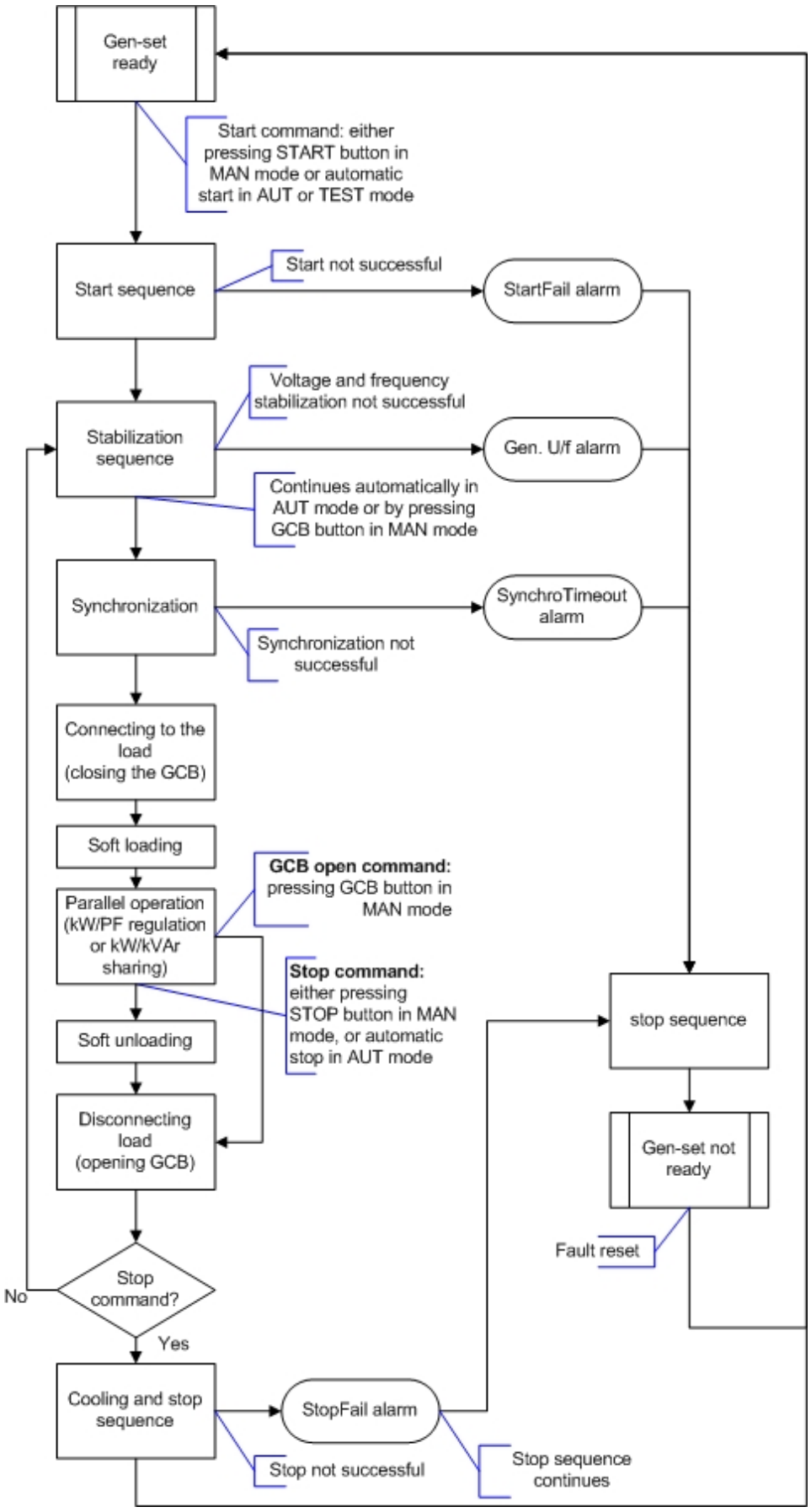
Function description

This chapter describes most frequent situations in the gen-set control. Non-standard situations and combinations with low probability of occurence are not described.

Island operation flowchart



Parallel operation flowchart



Operating modes

Selection of the operating mode is done through *Mode* buttons on the front panel or by changing of the *Controller mode* setpoint (from the front panel or remotely).

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

NOTE:
Mode can not be changed, if *Access Lock* input is active.

There are following binary inputs that can be used to force one respective operating mode independently on the mode setpoint selection:

- *Remote OFF*
- *Remote MAN*
- *Remote AUT*
- *Remote TEST*
- Rem TEST OnLd

If the respective input is active the controller will change mode to the respective position according to the active input. If more 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

The GCB will be opened and the engine will be immediately stopped in this mode without unloading and cooling. After that it will stay *Not ready* and can not be started any way. The MCB is closed permanently (*MCB Opens On* = GENRUN) or is open or closed according to the mains is present or not (*MCB Opens On* = MAINSFAIL). No AMF function will be performed. Buttons MCB, GCB, START, STOP including the appropriate binary inputs for external buttons are not active.

MAN

The engine can be started and stopped manually using START and STOP buttons (or external buttons wired to appropiate binary inputs) in MAN mode. When the engine is running, GCB can be closed to a dead bus or synchronizing can be started by the GCB button. Also MCB can be closed and opened manually using the MCB button, regardless the mains is present or not. No autostart is performed. No reaction to the inputs *Sys Start/Stop* or *Rem Start/Stop*.

A loaded engine in MAN mode will perform *Load sharing* and *VAR sharing*, but will not take place within the power management.

NOTE:
The breakers are internally locked to close two voltages against each other without synchonizing! The controller will automatically recognize if the breaker can be just closed or must be synchronized.

CAUTION!
The MCB can be opened manually in MAN mode. Accidental opening the MCB will cause the object (load) will remain without power!!!

AUT

The engine is started and stopped either by the binary input *Rem Start/Stop* (SPtM) or by the Load dependent autostart function (SPtM) or by the Power management (MINT). Buttons MCB, GCB, START, STOP including the appropriate binary inputs for external buttons are not active. The full start sequence up to the moment when the engine is loaded is automatic as well as unloading and the stop sequence.

WARNING!
If a red alarm is present and the gen-set is in AUT mode, it can start by self after all red alarms becomes inactive and are acknowledged!!! To avoid this situation, adjust the setpoint Reset to MAN to the ENABLED position.

TEST

(SPtM only)

The behavior of the controller in TEST mode depends mainly on setting of the *ReturnFromTEST* setpoint.

Automatic return

Setpoint *ReturnFromTEST* = ENABLED.

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 *Transfer Del* the GCB will be closed and the gen-set will supply the load. **After mains is recovered, the delay *MainsReturnDel* will count down and if elapses and the mains is still ok, the controller will synchronize back to the mains**, transfer the load back to the mains (maximum time the both breakers are closed is given by *BreakerOverlap* setpoint) and **the gen-set will remain running unloaded again until the mode is changed**.

Manual return

Setpoint *ReturnFromTEST* = DISABLED.

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 gen-set will take the load after it has started.

The load can be transferred to the gen-set also manually:

- If the GCB button is pressed, the controller will synchronize to the mains, transfer the load to the gen-set (maximum time the both breakers are closed is given by *BreakerOverlap* setpoint) and then open the MCB.
- If the MCB button is pressed, the controller will open the MCB, then wait for *Transfer Del* and finally close the GCB.

When the load is supplied by the gen-set and the mains is healthy, pressing of the MCB button will start reverse synchronizing and transfer the load back to the mains

. **The gen-set remains running until mode is changed.**

Test with load

If the binary input *Rem TEST OnLd* is activated, the controller is switched to TEST mode (i.e. the gen-set will be started as described above), but once started the controller will automatically either

- synchronize to the mains, transfer the load to the gen-set (maximum time the both breakers are closed is given by *BreakerOverlap* setpoint) and then open the MCB

or

- will make a switchover, i.e. open MCB, wait for *Transfer Del* and close GCB.

This depends on position of the binary input *ForwSyncDisable*. After the binary input *Rem TEST OnLd* has been deactivated, the controller goes back to previous operation mode and it's behavior depends on it. In most cases it will be AUT mode and the controller will either stay supplying the load if the mains is failed, or will transfer the load back to the mains.

NOTE:
During the *BreakerOverlap* time, when both breakers are closed, the load is controlled either to the constant *Baseload* level (if MCB has to be opened) or to zero level (if GCB has to be opened).

Periodic exercises

The output from the Exercise timer 1 is internally connected to the *Remote TEST* binary input to enable periodic testing of the gen-set.

The controller must have AUT mode selected by mode buttons and other "mode forcing" binary inputs must not be active to ensure proper function of the exercise.

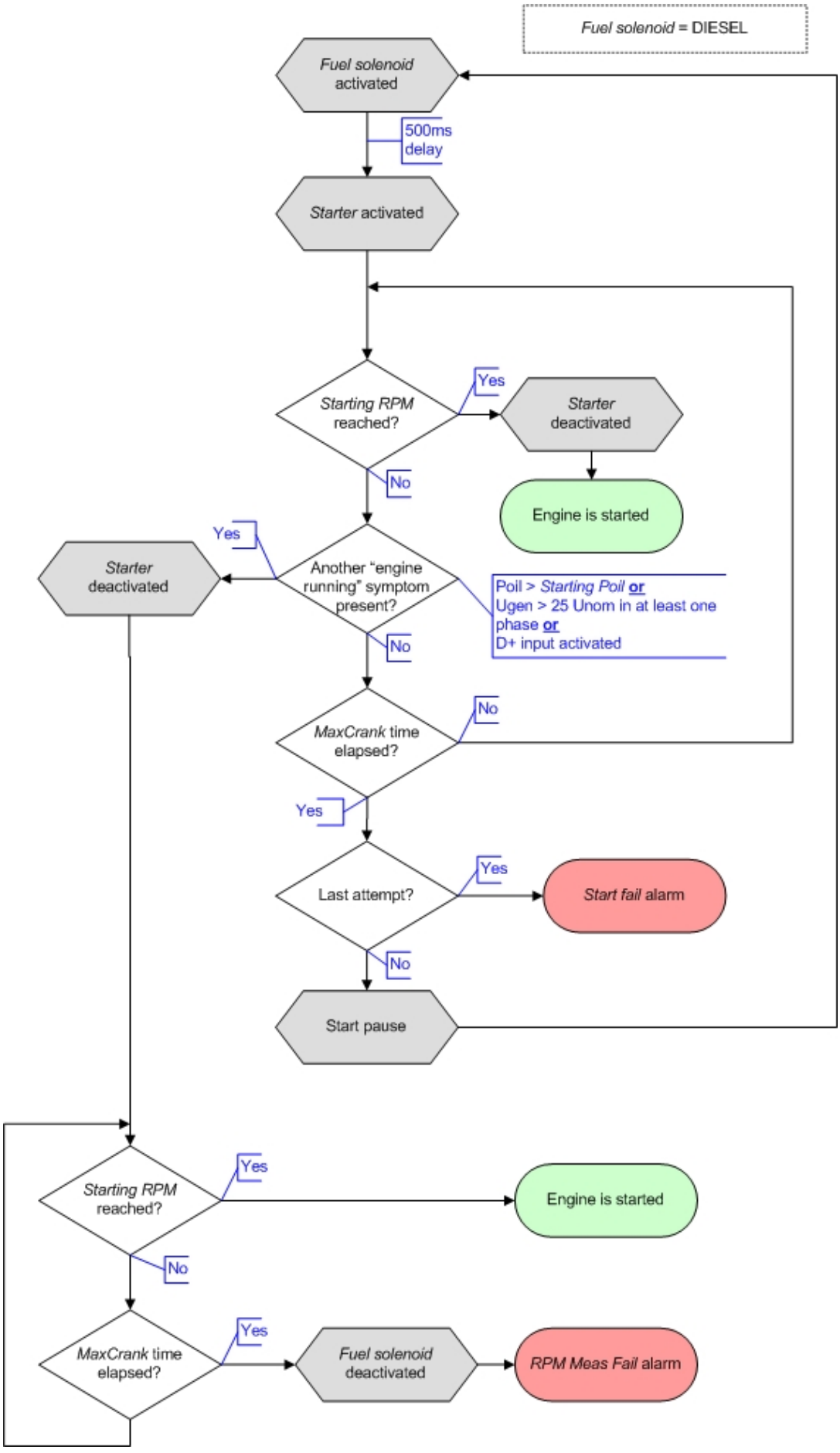
NOTE:
If a shutdown or other red alarm comes while the load is supplied from the gen-set and the mains is healthy, the load is switched back to the mains.

Engine start

Diesel engine

The setpoint *Fuel Solenoid* must be switched to DIESEL position.

1. After the command for start is issued (pressing START button in MAN mode, autostart condition is fullfiled in AUT mode or controller is switched to TEST mode), the output *Prestart* is energized for time period given by setpoint *Prestart Time*.
2. After the prestart has elapsed, the output *Fuel Solenoid* is energized and 0,5s after that the starter motor is activated by energizing the output *Starter*.
3. When one or more of following conditions are met, the both outputs prestart and starter are deenergized:
   - The engine speed exceeds value of *Starting RPM* or
   - One of additional running indication signals becomes active.
4. The controller remains in *Starting* phase until the engine speed exceeds value of *Starting RPM*, after that it is considered as started and *Idle* period will follow.
5. The maximal duration the starter motor is energized is given by setpoint *MaxCrank time*. If the engine does not start within this period, the starter motor is deenergized and a pause with length of *CrnkFail pause* will follow. Prestart output remains active during the pause. After the pause has elapsed, next start attempt is executed. The number of start attempts is given by setpoint *Crank Attempts*.
6. Once the engine is started, the *Idle* period follows. The binary output *Idle/Nominal* remains inactive (as it was during the start). The idle period duration is adjusted by setpoint *Idle Time*.
7. After the idle period has finished, the output *Idle/Nominal* is activated and the start-up sequence is finished. The stabilization phase follows.


Fuel solenoid = DIESEL
Fuel solenoid activated
500ms delay
Starter activated
Starting RPM reached?
Yes
Starter deactivated
No
Engine is started
Yes
Starter deactivated
Another "engine running" symptom present?
Poil > Starting Poil or
Ugen > 25 Unom in at least one phase or
D+ input activated
No
MaxCrank time elapsed?
No
Yes
Last attempt?
Yes
Start fail alarm
No
Start pause
Starting RPM reached?
Yes
Engine is started
No
MaxCrank time elapsed?
Yes
Fuel solenoid deactivated
RPM Meas Fail alarm

Gas engine

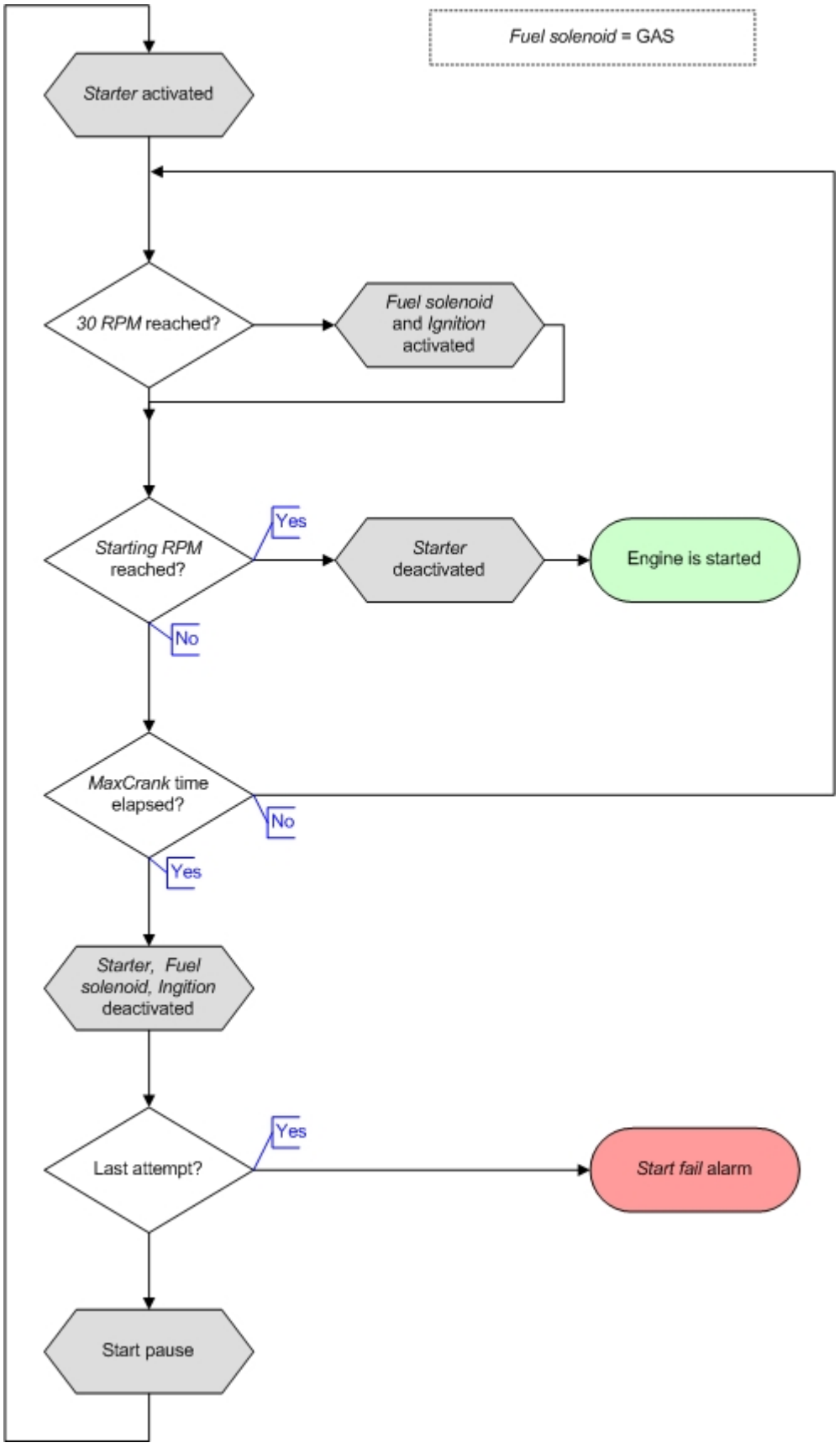
The setpoint *Fuel Solenoid* must be switched to GAS position.

1. After the command for start is issued (pressing START button in MAN mode, autostart condition is fullfiled in AUT mode or controller is switched to TEST mode), the output *Prestart* is energized for time period given by setpoint *Prestart Time*.
2. After the prestart has elapsed, the starter motor is activated by energizing the output *Starter*.
3. When the engine speed exceeds 30RPM, the outputs *Fuel Solenoid* and *Ignition* are energized.
4. When the engine speed exceeds value of *Starting RPM*, the starter motor is deenergized, the engine is considered as started and *Idle* period will follow.

CAUTION!

Additional running indication signals are not evaluated during start of a gas engine. The Pickup must be used in any case!

5. The maximal duration the starter motor is energized is given by setpoint *MaxCrank Time*. If the engine does not start within this period, the starter motor and fuel solenoid are deenergized and a pause with length of *CrnkFail Pause* will follow. Prestart output and ignition remain active during the pause. After the pause has elapsed, next start attempt is executed. The number of start attempts is given by setpoint *Crank Attempts*.
6. Once the engine is started, the *Idle* period follows. The binary output *Idle/Nominal* remains inactive (as it was during the start). The idle period duration is adjusted by setpoint *Idle Time*.
7. After the idle period has finished, the output *Idle/Nominal* is activated and the start-up sequence is finished. The stabilization phase follows.


Fuel solenoid = GAS
Starter activated
30 RPM reached?
Fuel solenoid and Ignition activated
Starting RPM reached?
Yes
Starter deactivated
Engine is started
No
MaxCrank time elapsed?
No
Yes
Starter, Fuel solenoid, Ingition deactivated
Last attempt?
Yes
Start fail alarm
Start pause

NOTE:
The starting sequence will be interrupted in any moment if a stop command comes.

NOTE:
The *Underspeed* protection starts to be evaluated 5s after the engine has been started (according to point 4.).

NOTE:
When the engine is started (according to point 4.) the delay given by setpoint *ProtectHoldOff* will count down and after elapsing the protections configured as *engine running only* are started to be evaluated.

Continue to the stabilization phase.

Stabilization

When the start-up sequence is finished, the gen-set goes to the stabilization phase. There are two timers (setpoints) in this phase:

1. *Min Stab Time* starts to count down just after idle period has finished. Generator voltage and frequency are not checked (respective protections are not evaluated) and GCB **can not be closed** even if generator voltage and frequency are in limits.
2. *Max Stab Time* starts to count down just after idle period has finished. Generator voltage and frequency are not checked (respective protections are not evaluated) but, opposite to previous timer, GCB **can be closed** (or synchronizing started) if generator voltage and frequency are in limits.

In the situations, when the GCB is closed automatically (AUT, TEST modes), the closing of GCB or starting of synchronization will occur in the first moment when the generator voltage and frequency will get into limits and the *Min Stab Time* has already elapsed.

In case the generator voltage or frequency do not get into limits within the *Max Stab Time* period, 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 Gener protect group.

NOTE:
Value of the *Min Stab Time* setpoint must be lower than the value of *Max Stab Time* setpoint.

Continue to the connecting to the load phase.

Connecting to the load

When the stabilization 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 (AUT, TEST modes) or manually by pressing the GCB button. Following conditions must be valid:

- The gen-set is running and the *Min Stab Time* timer has elapsed.
- The gen-set voltage and frequency are in limits.

NOTE:
The 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 *AVRi Bias* and *Speed Gov Bias* setpoints.

There are two ways how the gen-set can be connected to the load (busbar). It depends on the state of MCB feedback and on the measured mains/bus voltage.

Connecting to dead bus

SPtM: if the MCB is open, the busbar is considered as voltage-free and the GCB is closed without synchronizing.

MINT: the measured bus voltage is also taken in account and it must be below 2% of the nominal bus voltage together with the open MCB to close the GCB without synchronizing.

NOTE:
If the group of gen-sets is activated and more gen-sets have to start simultaneously and connect to the empty busbar, there is an internal logic to prevent closing of more GCBs to the busbar at the same moment without synchronizing. One of gen-sets will close the GCB, the others will wait and then they will synchronize to the first one.

Synchronizing

SPtM: If the MCB is closed, the busbar is considered to have identical voltage as measured on the mains. If the mains voltage/frequency is in limits, the gen-set is first synchronized with the mains and then the GCB is closed.

MINT: If the measured bus voltage is in limits, the gen-set is first synchronized with the bus and then the GCB is closed.

The synchronizing consists of voltage matching and frequency/angle matching. Maximum duration of synchronizing is given by setpoint *Sync Timeout*. If the synchronizing is not successful within this period of time, the *Sync Timeout* alarm will be issued.

NOTE:
The synchronization will be interrupted automatically if any of necessary conditions disappears during the synchronization process.

Voltage matching

The gen-set voltage is regulated to match the mains/bus voltage with tolerance given by setpoint *Voltage Window*. The regulation is adjusted by setpoints *Voltage Gain* and *Voltage Int*.

Frequency/angle matching

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

NOTE:
The GCB close command will be not issued, if the *Phase Window* setpoint is set to 0. Synchronizing will continue until *Sync Timeout* alarm occurs or the GCB is closed externally.

NOTE:
The matching loops will continue to run even the GCB close command has been already issued until the controller will receive GCB feedback or GCB fail alarm will occur. After the feedback has been received, the control loops are switched to load and power factor loops or load and power factor sharing respectively.

Parallel to mains operation - SPtM

(SPtM only)

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

Ramping the power up

The first phase of the PTM operation is ramping the gen-set up to the requested power level. The speed of the ramp is given by the setpoint *Load Ramp*. The setpoint adjusts ramp time for change from 0% to 100% of nominal power.

Load control

The load is maintained at the constant level given by setpoint *Baseload*. Regulation adjustment setpoints are available in the Sync/load control group.

NOTE:
In every moment when the requested load (e.g. baseload setpoint) changes, the ramp described in the chapter above will also take place.

Power factor control

The power factor is regulated to a constant value given by setpoint *Base PF*. PF regulation loop is active. Regulation adjustment setpoints are available in the Volt/PF control group.

Object load dependent autostart

The gen-set can start and stop automatically according to the object load. To enable this function, the setpoint *PeakAutS/S del* must not be set to 0(OFF). An automatic start will occur if the object exceeds the limit given by setpoint *PeakLevelStart* and remains exceeded for a period longer than *PeakAutS/S del*. If the object load drops below *PeakLevelStop*, the gen-set will be stopped with the same delay as by start. The gen-set load is controlled according to selected mode (see above).

NOTE:
The gen-set will stay running if the binary input *Rem Start/Stop* is active.

Ramping the power down

When stop command is received - e.g. from the binary input *Sys Start/Stop* is deactivated or STOP button is pressed, the genset load is ramped down before opening the GCB. The ramp speed is given by setpoint *Load Ramp*, the end level is given by *GCB Open Level* and the timeout for finishing the ramping without reaching the open level is given by *GCB open Del*.

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.

Continue to the cooldown and stop phase.

Parallel to mains operation - MINT

(MINT only)

If the MCB is closed (MCB feedback is present) and the gen-set has been synchronized to the busbar, the *parallel to mains* operation will follow. It consists of following phases:

Ramping the power up

The first phase of the PTM operation is the ramping of the gen-set up to desired power level derived from the system baseload or up to the load given by load sharing with other gen-sets connected to the busbar. The speed of the ramp is given by the setpoint *Load Ramp*. The setpoint adjusts ramp time for change from 0% to 100% of nominal power.

Load control modes

There are two load control modes - system baseload and load sharing which are selected by the setpoint *#SysLdCtrl PtM*. See the setpoint description for more information. If system baseload mode is selected, the *Load* regulation loop is active to maintain the load at the requested level which is derived from the system baseload. Each running gen-set takes relatively equal part of the system baseload.

In load sharing mode, the loop *LS* (load sharing) is active to maintain the load at the same relative level as other loaded gen-sets in the group have. The behavior in this case is identical as in multiple island mode.

NOTE:
The process of determining which gen-sets shall run is described in the power management chapter.

Power factor control

In system baseload mode the power factor is regulated to a constant value given by setpoint *#SysPwrFactor*. PF regulation loop is active. In load sharing mode also power factor sharing is active to keep the power factor of all loaded gensets at equal level. Regulation adjustment setpoints are available in the Volt/PF control group.

Ramping the power down

When stop command is received - e.g. from the power management or binary input *Sys Start/Stop* is deactivated or STOP button is pressed, the genset load is ramped down before opening the GCB. The ramp speed is given by setpoint *Load Ramp*, the end level is given by *GCB Open Level* and the timeout for finishing the ramping without reaching the open level is given by *GCB Open Del*.

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.

Continue to the cooldown and stop phase.

Island operation - SPtM

(SPtM only)

The situation, when the MCB is open and the load is supplied from the gen-set, is called *Island operation*. This situation will occur in following cases:

1. The GCB has been closed to a dead busbar, or
2. The gen-set was running parallel to mains and the MCB has been opened.

Neither voltage nor frequency regulation loop is active. Keeping voltage and frequency at rated values is a task of AVR and the governor.

When stop command is received - e.g. when the binary input *Sys Start/Stop* is deactivated or STOP button is pressed, the GCB will be opened and the gen-set will go to cooldown phase.

NOTE:
Using the GCB button in MAN mode the gen-set will not go to cooldown and stop.

Island to PtM transfers

(SPtM only)

If the mains is OK, the gen-set can be transferred back to the parallel to mains operation. The transfer can be done as no-break transfer (*Reverse synchronizing*) or break transfer (*Changeover*). Which of these kinds will be performed depends on the binary input *RevSyncDisable*.

In AUT mode or TEST mode with automatic return the reverse synchronizing or changeover is started automatically after the mains has been restored and remains healthy for a period given by setpoint *MainsReturnDel*. Reverse synchronizing can be started manually by pressing MCB button in MAN mode.

Reverse synchronizing

The reverse synchronizing process is identical as Forward synchronizing, but MCB is closed instead of GCB. In case the reverse synchronizing is not successful, *RevSyncTimeout* alarm is issued and the gen-set continues in island operation. After the alarm has been reset the gen-set can try to make reverse synchronizing again.

Changeover

The changeover is performed if the reverse synchronizing is disabled with the *RevSyncDisable* binary input.

The GCB is opened first and after a time period of *Transfer Del* the MCB is closed.

Island operation - MINT

(MINT only)

This chapter describes the situation, when more gen-sets are running parallel to each-other but not with mains. This situation will occur either when:

1. The common busbar is dead due to opened MCB or there is no mains at all and the group of gensets has been activated, or
2. The group was running parallel to mains and the MCB has been opened.

NOTE:
The controller in MINT application does not control the MCB! Only the MCB position is evaluated from the binary input *MCB Feedback* and **the position is the basic information for switching between island and parallel to mains operation**.

If the busbar is empty, the first gen-set will close it's GCB without synchronizing. Following gen-sets will synchronize to the already energized busbar. In case more gensets start simultaneously and the busbar is empty, the system will prevent closing of more GCB's to the busbar without synchronizing. Instead of this one of the gen-sets will close the GCB and energize the busbar and the others will wait and then synchronize to the busbar.

When stop command is received - e.g. from the power management or binary input *Sys Start/Stop* is deactivated or STOP button is pressed, the GCB will be opened and the gen-set will go to cooldown phase.

NOTE:
Using the GCB button in MAN mode the gen-set will not go to cooldown and stop.

Continue to the cooldown and stop phase.

Power management

(MINT only)
The power management is related to MINT application only. As "Power management" is called the process of automatic starts and stops of gen-sets within the group, depending on current load, state of the gen-sets and other conditions.

The concept

The power management is based on the load of the gensets, i.e. next gen-set will start when the load of the group raises above certain level. A next gen-set will stop, when the load drops down below a certain level. The proces of determining of starts and stops is done in each controller; there is no "master" in the system. Each of the controllers can be switched off without influencing the complete system (except the situation when the respective gen-set will be not available...)

The load of the group is evaluated as so called *reserve*. The reserve is calculated as difference between actual and nominal load of running gen-sets. The reserve can be calculated **as absoulute (in kW) or relative (in %)**. Use the setpoint *#PowerMgmt Mode* the calculation method.

NOTE:
Power management based on **relative reserves** perfectly fits for applications, where the load portions connected to the group at once are much lower than the gen-set capacity. This mode helps to achieve 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 busbar the bigger load portion can be connected at once.

Power management based on **absolute reserves** can be successfuly used also for cases where the load portions are similar to the gen-set capacity or even bigger. The goal of the absolute reserve mode is that **the system provides always the same reserve power capacity independently on how many gen-sets are currently running** and this why this mode perfectly fits for industrial plants with large loads.

Basics

- The setpoint *Pwr Management* enables and disables the gen-set to be active within the power management of the group and make automatic load dependent starts and stops. If the power management is disabled, the gen-set will run or not depending only on the binary input *Sys Start/Stop* and the start and stop will not depend on the load of the group.
- The binary input *Sys Start/Stop* activates and deactivates the gen-set. If the input is not active, the gen-set will stop with delay *#SysAMFstopDel* after the input has been deactivated and will not start again. It can be started in MAN mode only. When the input is activated again, the delay *#SysAMFstrtDel* will start to count down and after that the gen-set is activated and can start due to power management.

NOTE:
The gen-set will take part of the power management (= will be active) only if the controller is in AUT mode!

NOTE:
The gen-set performs load and VAR sharing whenever it is connected to the busbar i.e. it is independent on whether the controller is in AUT or MAN mode or whether the power management is active or not.

Reserves, minimal running power

- The value **100*(1 - (P_{act}/P_{nom})) [%]** is called **relative**reserve. It is the difference between actual relative load and 100%.
- The value **P_{nom} - P_{act} [kW]** is called **absolute** reserve. It is the difference between actual load of the group and nominal capacity of currently loaded gen-sets.

P_{act}	*Running ActPwr* = sum of actual load of all active gen-sets within the group, that are connected to the bus. In parallel to mains operation and baseload mode the baseload level is taken to the equation instead of actual gensets load.
P_{nom}	*Running NomPwr* = sum of nominal power of all active gen-sets within the group, that are connected to the bus.

- If the current **system reserve drops below the adjusted reserve for start**, the delay *#NextStrt Del* will start to count down on the gen-sets, which have decided to start. If the reserve remains under the limit for the whole countdown period, the gen-set(s) will start.
- If the **system reserve drops below zero** (i.e. the system is overloaded), the delay *#OverldNext Del* will start to count down on the gen-sets, which have decided to start. If the reserve remains under the limit for the whole countdown period, the gen-set(s) will start.
- If the **system reserve raises over the adjusted reserve for stop**, the delay *#NextStopDel* will start to count down on the gen-sets, which have decided to stop. If the reserve still remains over the limit, the gen-sets will stop.
- There are two pairs of setpoints for adjusting reserves for start and stop. Normally the pair *#LoadResStrt 1* and *#LoadResStop 1* is active. By the binary input *Load Reserve 2* the second pair *#LoadResStrt 2* and *#LoadResStop 2* is activated.

- With adjusting nonzero value to the setpoint *#Min Run Power* and activating the function by binary input *Min Run Power* it is possible to limit the number of running gensets so that the total nominal power of the loaded gen-sets will never drop below this level even the reserve for stop is fulfilled.

NOTE:
If the setpoint is adjusted to maximum, the function will force all gen-sets to run.

Priorities

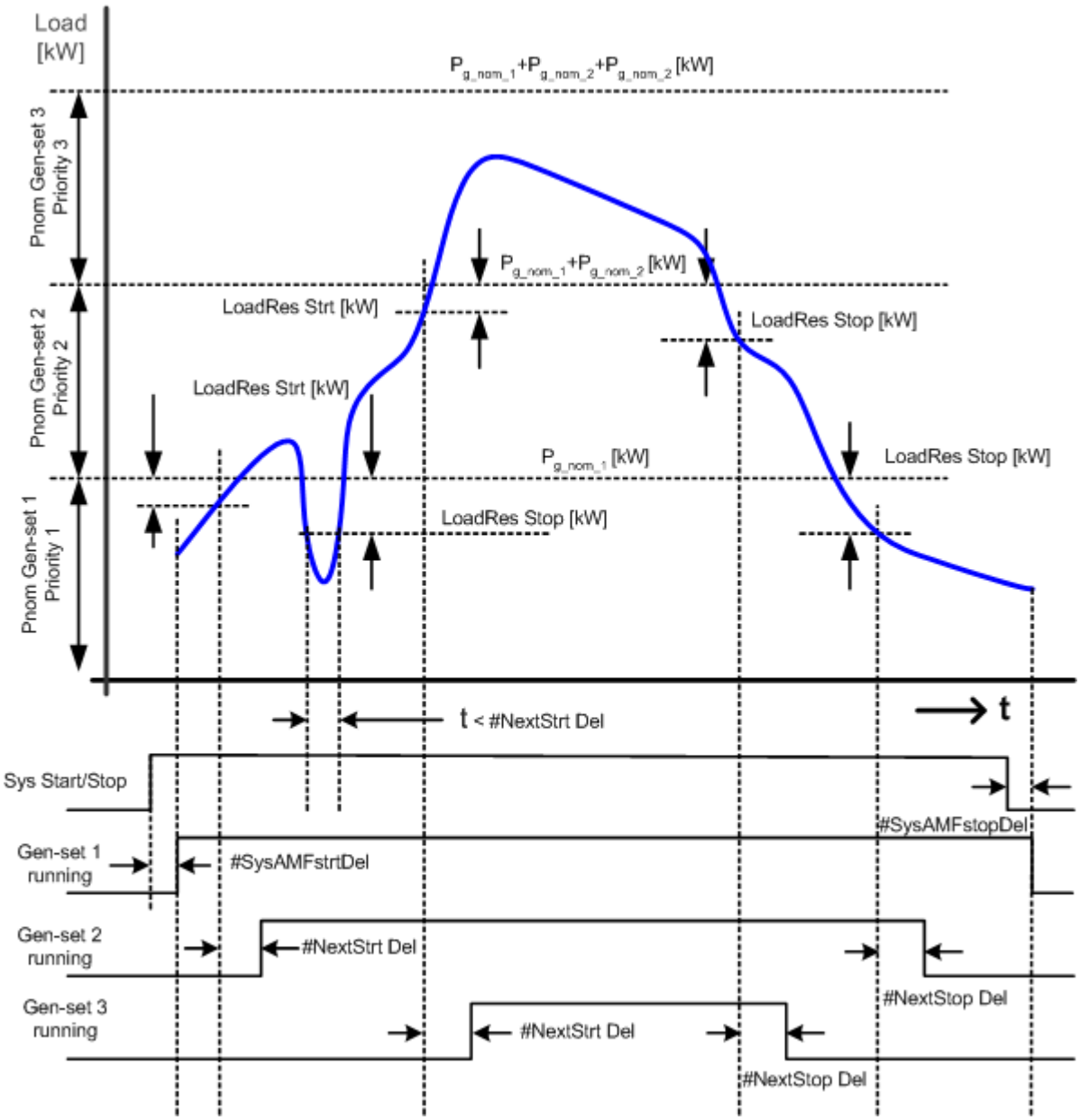
- The priority of the gen-set within the group is given by the setpoint *Priority*. Lower number represents "higher" priority, i.e. a gen-set with lower number will start before another one with higher number.
- If the binary input *Top Priority* is active, the gen-set gets highest priority (0) independently on the sepoint setting.
- If more than one gen-set have the same priority, they will act as "one big" gen-set.

NOTE:
It is possible to switch automatically priorities of the gen-sets by using of Run Hours Equalization function which can be setup in *#RunHrsMaxDiff* setpoint.

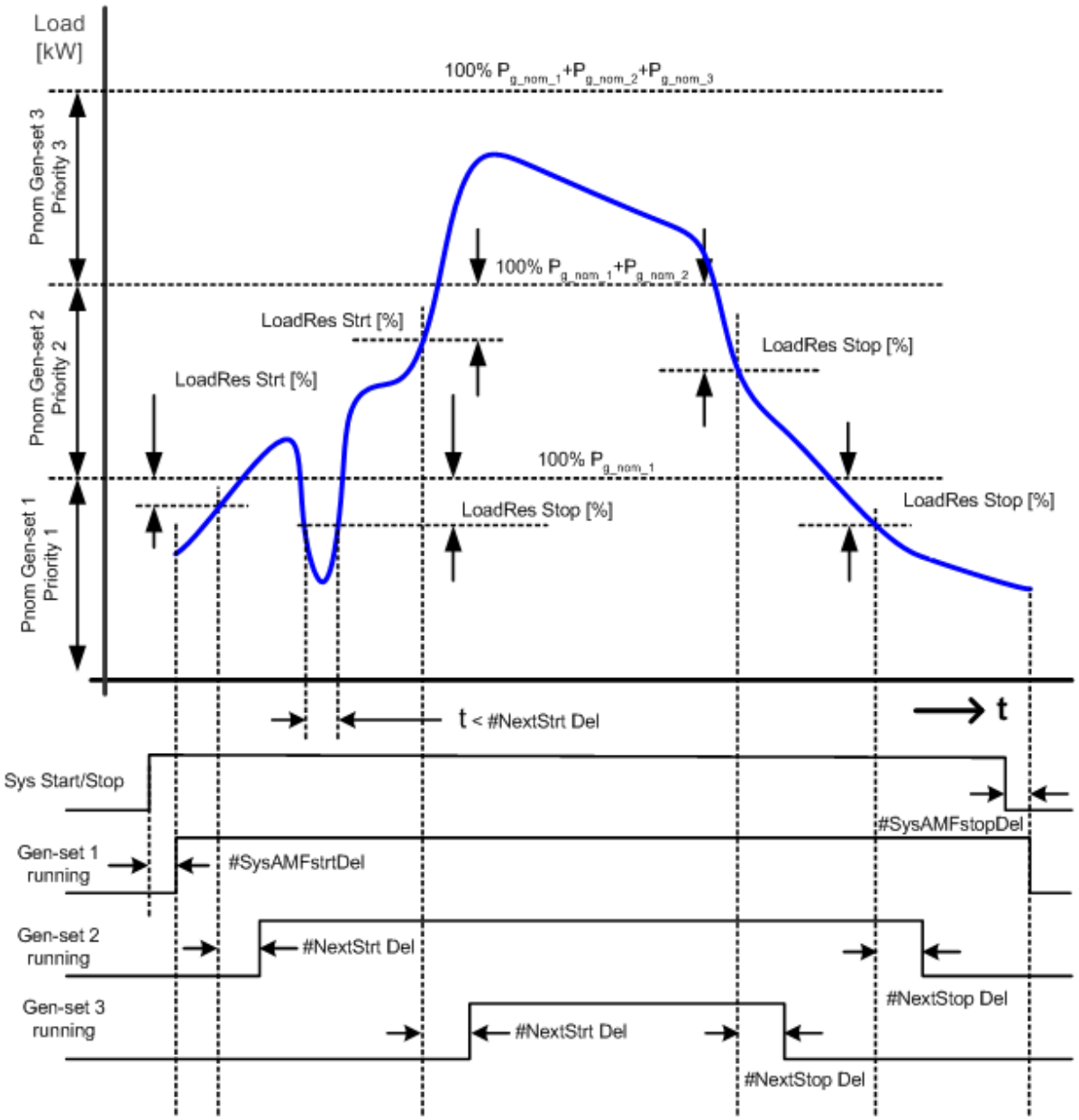
Start and stop

- The controller will decide to start the gen-set in the moment, when the reserve has dropped below the reserve for start and the gen-sets with higher priorities (lower priority numbers), that are available for power management, do not have enough capacity to get the reserve back over the start level or can not fulfil the adjusted minimal running power
- The controller will decide to stop the gen-set in the moment, when the reserve has increased over the reserve for stop and the gen-sets with higher priorities (lower priority numbers), that are available for power management, have enough capacity to keep the reserve over the start level and also can fulfil the adjusted minimal running power

NOTE:
When evaluating the stop condition, the controller computes actual reserve without taking in account the nominal power of self - i.e. it evaluates, how the reserve will be if the respective gen-set stops.



POWER MANAGEMENT WITH ABSOLUTE RESERVES



POWER MANAGEMENT WITH RELATIVE RESERVES

Reaction to alarms

- If a *Shutdown* or *BOC* alarm occurs, the gen-set will be taken out from the power management and next gen-set will start if necessary.
- If a *Slow stop* alarm occurs, the gen-set will be taken out from the power management, but the alarm will be suppressed for a definite time to give next gen-set chance to start and connect to the bus to get the reserve back over the start level. The alarm is suppressed until the reserve will get back over the start level (can occur either due to next gen-set has connected to the bus or the load has decreased..) or timeout given by setpoint *#SlowStopDel* has elapsed. The alarm will not be suppressed, if there is no other available gen-set that can start.

Related binary inputs

1. *Sys Start/Stop*
2. *Load Reserve 2*
3. *Top Priority*
4. *Min Run Power*

Related binary outputs

1. *System Ready*
2. *SystReserve OK*

Related setpoints and values

Related setpoints and values are collected to *Power management* setpoint resp. values group.

AMF function

(SPtM only)
The "AMF function" represents the automatic start in case the mains has failed and stop after the mains has been restored. The automatic start can be enabled or disabled by the setpoint *AMFStartEnable*.

NOTE:
The AMF function works only in AUT mode!

Mains failure detection

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

- The mains voltage is out of limits given by setpoints *Mains >V* and *Mains <V* for time period longer than *Mains V Del*.
- The mains frequency is out of limits given by setpoints *Mains >Freq* and *Mains <Freq* for time period longer than *Mains Freq Del*.
- In the moment when the Vector shift protection occurs.
- The MCB close command was not successful and the alarm *MCB fail* still was not reset.
- The binary input *Ext MF Relay* is active.

Vector shift

If a mains failure occurs during parallel to mains operation, in most cases it causes a fast change of the generator load. This change can be measured as a jump of the vector of the generator voltage and evaluated as a symptom of mais failure. The vector shift limit for evaluation of a mains failure is adjustable by setpoint *VectorShiftLim*.

NOTE:
Vector shift is beeing evaluated only while the gen-set is working parallel to the mains.

Healthy mains detection

The mains is considered as healthy, when **all** of following conditions are valid:

- The mains voltage is within limits given by setpoints *Mains >V* and *Mains <V*.
- The mains frequency is within limits given by setpoints *Mains >Freq* and *Mains <Freq*.
- The alarm *MCB fail* is not active.
- The binary input *Ext MF Relay* is not active.

The AMF procedure

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

1. If the setpoint *MCB Opens On* is set to MAINSFAIL, the MCB is opened
2. The timer for automatic start of the gen-set *EmergStart Del* begins to count down.
3. 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 input *MainsFailBlock*. If the gen-set is already running and the input is activated, the gen-set will cool down and stop. The control of breakers is not affected by this input.

4. If the setpoint *MCB Opens On* is set to GENRUN, the MCB is opened once the generator voltage is in limits.
5. If the mains becomes healthy back and the gen-set is still not connected to the load, the controller interrupts the startup process and closes back the MCB.
6. The GCB is closed and the gen-set begins to supply the load.
7. After the mains became healthly back, the timer *MainsReturnDel* begins to count down and when finished, either reverse synchronizing or switchover is performed. This depends on the binary input *RevSyncDisable*. If active, switchover is performed instead of reverse synchronizing.
8. In case of reverse synchronizing the maximum time both GCB and MCB are closed together (if there is no demand to continue in parallel operation) is given by setpoint *BreakerOverlap*.
9. If no demand for parallel operation is active (binary input *Rem Start/Stop*), the GCB is opened and the gen-set cooldown and stop follows.

NOTE:
For description how to make a test of AMF function, see chapter operating modes, TEST mode paragraph.

Engine cooldown and stop

The cooldown phase follows after the stop command has been issued and the GCB has been opened.

- Duration of the cooldown phase is adjusted by the setpoint *Cooling Time*.
- 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*.
- The cooldown can be finished manually in MAN mode by pressing STOP button.
- If a new start request comes, the cooldown will be interrupted and the gen-set will go back to the stabilization phase. If the cooling was at nominal speed, the stabilization timers are not count down again so the GCB is immediately ready to be closed.

When the cooldown is finished, the output *Fuel Solenoid* is deenergized and *Stop Solenoid* is energized. The engine shall stop within time period adjusted by setpoint *Stop Time*. If the engine does not stop within this time, the alarm *Stop fail* will be issued.

The output *Stop Solenoid* is energized until the engine is stopped, but at least for time period of *Stop Time*. If the Stop time has elapsed and the engine is still not stopped, the stop solenoid is deenergized for 5s and then energized again for max. Stop time and this repeats until the engine is stopped.

The output *Ignition* is continuously energized until the engine is stopped.

Stopped gen-set evaluation

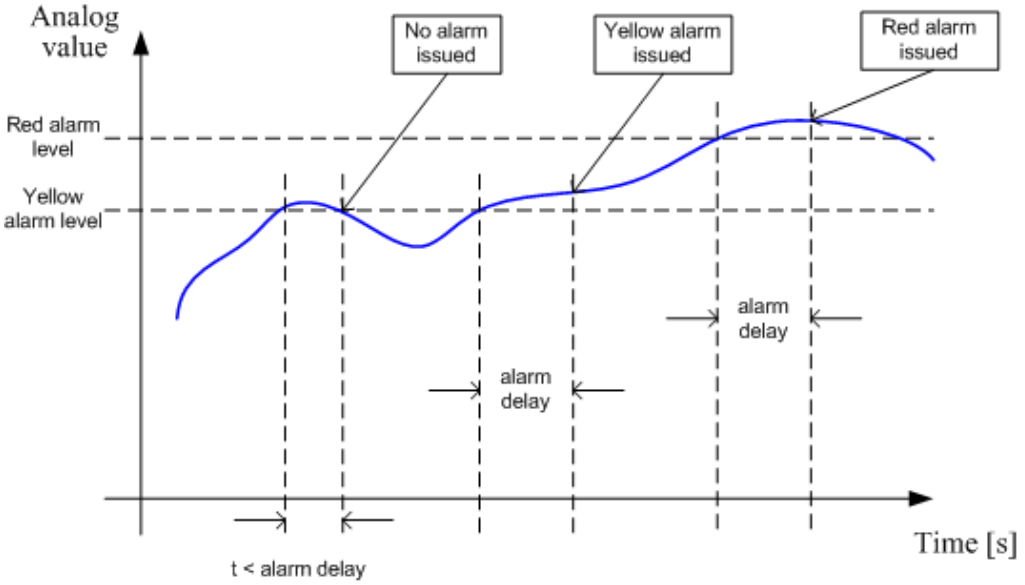
The gen-set is considered as stopped, when **all** of following conditions are valid:

- The engine speed is lower than 2RPM.
- The generator voltage in all phases is lower than 50V.
- None of additional running indication signals is active. See chapter Speed sensing for details.

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 critical situation, where an action has to be taken to prevent damage of the gen-set or technology.

- **One alarm** of any type can be assigned to each **binary input**
- **Two alarms** (one yellow and one red type) can be assigned to each **analog input**
- There are also **built-in alarms** with fixed alarm types.
- Each alarm is written to the Alarm list.
- Each alarm causes writing of a record into the history log.
- Each alarm activates the Alarm and Horn output.
- Each alarm can cause sending of a SMS mesage or an e-mail.



ANALOG INPUT ALARM EVALUATION PRINCIPLE

Alarm handling

- There are two 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 following:
  1) The alarm is evaluated **all the time** when the controller is switched on.
  2) The alarm is evaluated only when the **engine is running**. This type should be used for example for oil pressure. These alarms are started to be evaluated after the engine has been started with delay given by setpoint *ProtectHoldOff*.
  3) The alarm is evaluated only when the *generator is excited*. These alarms are started to be evaluated after the engine has been started and *Max Stab Time* has elapsed or GCB has been closed. They remain beeing 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.
- If an alarm is beeing evaluated and appropriate alarm condition is fulfilled, the delay of evaluation will start to run. The delay is adjustable by setpoint (built-in alarms, analog input alarms) or is fixed to 500ms (binary input alarms). If the conditions persist, the alarm will *activate*. The alarm will not activate, if the condition dismisses while the delay is still running.
- After pressing *Fault reset* button or activating binary input *FaultResButton* 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 dismisses before acknowledging the alarm, the alarm will remain in the Alarm list as *Inactive*. See also Browsing alarms chapter.

NOTE:
The input *Sd Override* can be used for temporary disabling of red alarms to take their actions. 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 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.

Alarm types - Yellow level

The yellow alarm indicates that a value or parameter is out of normal limits, but still did not reach critical level. Obviously it is indicated by yellow color. This alarm does not cause any actions regarding the gen-set control.

Warning (WRN)

The *Warning* alarm does not perform any actions regarding gen-set control.

Alarm types - Red level

The red level alarm indicates reaching of critical level of the respective value or parameter. Obviously it is indicated by red color. The controller will take one of following actions:

Breaker open and cool down (BOC)

The *BOC* (electric trip) alarm category is used above all for built-in alarms assigned to the generator electric values (voltage, current, power etc). GCB is opened immediately, but after that the engine will perform standard stop procedure including cooling.

Slow stop (STP)

The *Slow stop alarm* differs from the BOC in the fact, that the gen-set will perform soft unload before opening the GCB (if possible). After that standard stop procedure including cooling follows.

NOTE:
In the MINT application if the power management is active and a slow stop alarm occurs, the controller will wait until another gen-set is started (if there is at least one available) before unloading and stopping the gen-set. The maximum time the controller will wait is given by setpoint *#SlowStopDel*.

Shutdown (SD)

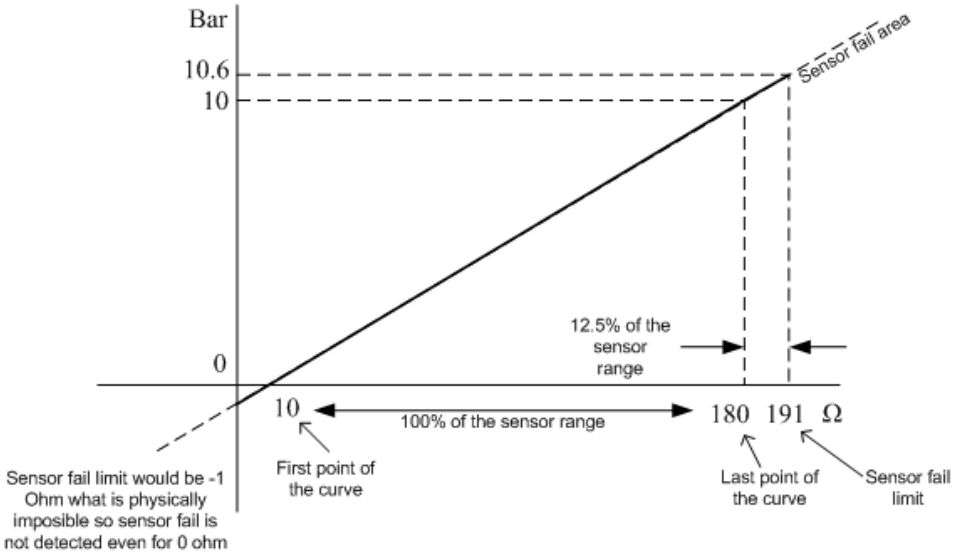
The *Shutdown* alarm opens GCB immediately and stops the engine immediately without cooling.

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

CAUTION!
The gen-set can start by self after acknowledging the alarms if there is no more active red alarm and the controller is in AUT or TEST mode!

Sensor fail detection (FLS)

If the measured resistance (or voltage or current in case of IGS-PTM module) on an analog input gets out of valid range, the sensor fail will be detected and a sensor fail message will appear in the alarmlist. The valid range is defined by the most-left (R_L) and most-right (R_H) points of the sensor characteristic ±12.5% from R_H-R_L.



SENSOR FAIL EVALUATION EXAMPLE

NOTE:
The sensor fail alarm does not influence the gen-set operation.

Remote alarm messaging

If a GSM modem and/or Internet Bridge are connected to the controller, the controller can send SMS messages and/or emails in the moment when a new alarm appears in the Alarm list. The message will contain a copy of the Alarm list.

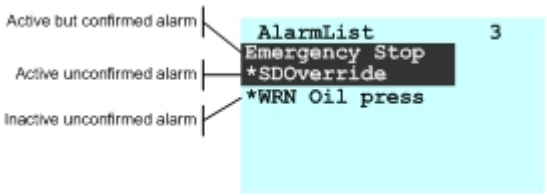
To enable this function, you should select with setpoints *Yel Alarm Msg* and *Red Alarm Msg*, which levels of alarms shall be announced (red/yellow/both) and also enter valid GSM phone number and/or e-mail address to the setpoints *TelNo/Addr Ch1* and *TelNo/Addr Ch2*. It is possible to put either a GSM number or e-mail to both setpoints.

NOTE:
An internet module must be available for sending of e-mails and a GSM modem is necessary for sending of SMS. See the Communications chapter for more information.

Alarmlist

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

- It can contain up to 16 alarms, but first 7 are visible on the screen. If it is full, recently comming alarms are not displayed.
- Active alarms are shown as inverted, not yet confirmed alarms are marked with asterisk on the beginning.
- An alarm message in the alarmlist begins with a prefix, which represents the alarm type (like *WRN*). Then the alarm name follows. In some cases the prefix can be ommited.



NOTE:
The Alarmlist can be read out from the controller via Modbus. See Modbus description chapter.

ECU Alarmlist

The ECU Alarmlist contains alarms that are received from the ECU. The alarms are represented by the Diagnostic Trouble Code, which contain information about the subsystem, where the alarm occured, alarm type and alarm occurence counter.
Most common fault codes are translated into text form. Other fault codes are displayed as numeric code and the engine fault codes list must be used to find out the reason.

NOTE:
The ECU AlarmList is visible only if an ECU is configured.

Built-in alarms

ANSI CODE	PROTECTION (ALARM)
	Emergency stop
12	*Engine overspeed*
14	*Engine underspeed*
	Start Fail
	RPM measurement failure
	Stop Fail
	GCB Fail
	MCB Fail
	Forward synchronization timeout
	Reverse synchronization timeout
32	*Generator overload*
32R	*Generator reverse power*
59, 27	*Generator under/overvoltage*
47	*Generator voltage unbalance*
81H, 81L	*Generator under/overfrequency*
51	*Generator overcurrent*
50	*Generator short current*
46	*Generator current unbalance*
47	*Phase sequence*
	Maintenance timer
	Charging alternator fail
	Battery voltage
	Governor output at limit
	AVR output at limit
	Battery flat
	Low backup battery

History log

The *history log* is an area in the controller nonvolatile memory, where "snapshots" of the system are recorded in moments, when important events occur. The history log is important for expecially for diagnostics of failures and problems. The capacity is over 100 records and it works as FIFO, i.e. the newest record overwrites the oldest one.

Each record has the same structure and contains:

- The event which caused the record (e.g. "Overspeed alarm" or "GCB closed")
- Date and time when it was recorded
- All important data values like RPM, kW, voltages etc. from the moment the event occured

BASIC VALUES

NAME	ABBREVIATION	DESCRIPTION
Number	Num	Row number (0 corresponds to the last record, -1 to the previous one etc.)
Reason	Reason	Reason of history record (any event or alarm related to the gen-set
Date	Date	Date
Time	Time	Time
RPM	RPM	Engine rotations per minute
Power	Pwr	Generator active power
Power Factor	PF	Generator power factor
Load Character	LChr	Generator load character
Generator Voltage	Vg1	Generator voltage Ph1
Generator Voltage	Vg2	Generator voltage Ph2
Generator Voltage	Vg3	Generator voltage Ph3
Generator Current	Ig1	Generator current Ph1
Generator Current	Ig2	Generator current Ph2
Generator Current	Ig3	Generator current Ph3
Oil Pressure	OilP	Oil pressure measured on the first analog input
Engine Temperature	EngT	Engine temperature measured on the second analog input
Fuel Level	FLvl	Fuel level measured on the third analog input
Analog Input Module	AIM1	Analog input 1 on IG-IOM extension module
Analog Input Module	AIM2	Analog input 2 on IG-IOM extension module
Analog Input Module	AIM3	Analog input 3 on IG-IOM extension module
Analog Input Module	AIM4	Analog input 4 on IG-IOM extension module
Binary Inputs	BIN	Controller binary inputs
Binary Input Module	BIM	Binary inputs on IG-IOM extension module
Binary Inputs/Outputs Extension	BIOE	Extension Module Binary Inputs/Outputs
Binary Outputs	BOUT	Controller binary outputs
Binary Outputs Module	BOM	Binary outputs on IG-IOM extension module
Speed Regulator Output	SRO	Speed regulator output (see chapter Speed Governor Interface)
Voltage Regulator Output	VRO	Voltage regulator output (see chapter AVR Interface)

- ECU values

ECU VALUES

NAME	ABBREVIATION
ECU Fuel rate	EFR
ECU Coolant Temperature	ECT
ECU Intake temperature	EIT
ECU Oil pressure	EOP
ECU Oil temperature	EOT
ECU Boost pressure	EBP
ECU Percent load at current speed	EPL
ECU Fuel Level	EFL
ECU Fault Code	FC
Failure Mode Identifier	FMI

- SPtM specific values

SPTM VALUES

NAME	ABBREVIATION	DESCRIPTION
Mains Frequency	Mfrq	Mains frequency
Mains Voltage	Vm1	Mains voltage Ph1
Mains Voltage	Vm2	Mains voltage Ph2
Mains Voltage	Vm3	Mains voltage Ph3
Mains Active Power	Pmns	Mains active power
Mains Reactive Power	Qmns	Mains reactive power
Mains Power Factor	MPF	Mains power factor
Mains Load Character	MLCh	Mains load character
Mains Vector Shift	MVS	Mains vector shift

- MINT specific values Information about gen-sets with GCB closed and their overall P and Q. Values can be also found in LiteEdit Values / Pwr Management and Info (LE ver. 4.4 and higher).

MINT VALUES

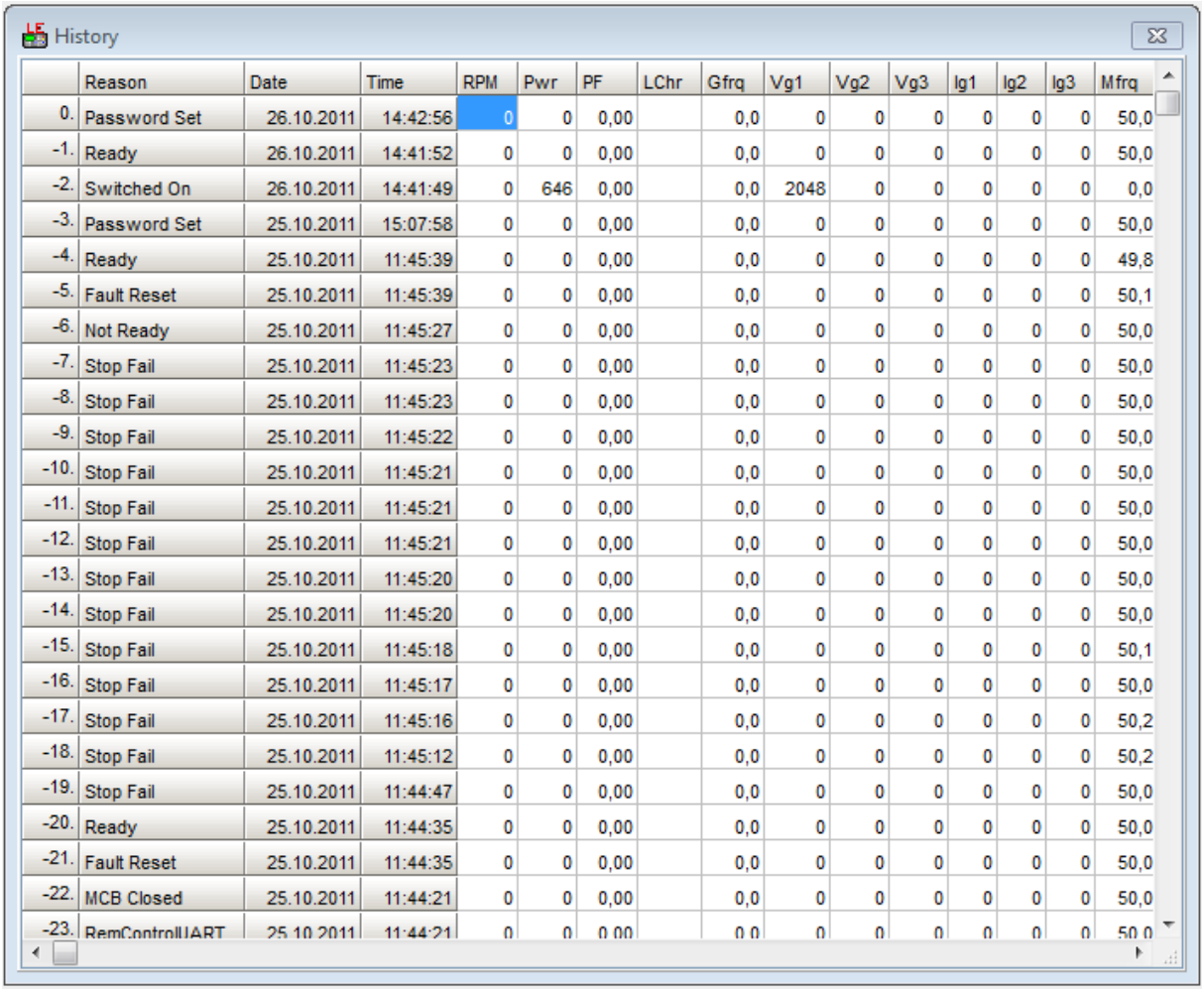
NAME	ABBREVIATION	DESCRIPTION
Bus Frequency	Bfrq	Bus frequency
Bus Voltage	Vb1	Bus voltage Ph1
Bus Voltage	Vb2	Bus voltage Ph2
Bus Voltage	Vb3	Bus voltage Ph3
ActualReserve	Ares	Actual reserve
GensLoaded16	GL16	Each bit if set represents gent-set with its GCB closed
GensLoaded32	GL32	Each bit if set represents gent-set with its GCB closed
Running ActPwr	TRPA	Overall power from gen-set with its GCB closed
Running Q-Pwr	TRQA	Overall reactive power from gen-set with its GCB closed

Running Nominal POwer	TRPN	Total running nominal power
Available Nominal Power	APN	Available nominal power

NOTE:
The contents of the history log will be deleted after programming firmware or configuration to the controller.

The history log can be displayed on the controller screen or in the LiteEdit. If an archive (*.ail file) is saved in LiteEdit, it will contain also the history log. The archive can be later opened in offline mode to view the history log offline.

NOTE:
The first history record after the controller is switched on, programmed or watchdog reset occurs contains diagnostic values instead of operational. Some fields in these records seem to have nonsense values. Do not take these values into account.



	Reason	Date	Time	RPM	Pwr	PF	LChr	Gfrq	Vg1	Vg2	Vg3	Ig1	Ig2	Ig3	Mfrq
0.	Password Set	26.10.2011	14:42:56	0	0	0,00		0,0	0	0	0	0	0	0	50,0
-1.	Ready	26.10.2011	14:41:52	0	0	0,00		0,0	0	0	0	0	0	0	50,0
-2.	Switched On	26.10.2011	14:41:49	0	646	0,00		0,0	2048	0	0	0	0	0	0,0
-3.	Password Set	25.10.2011	15:07:58	0	0	0,00		0,0	0	0	0	0	0	0	50,0
-4.	Ready	25.10.2011	11:45:39	0	0	0,00		0,0	0	0	0	0	0	0	49,8
-5.	Fault Reset	25.10.2011	11:45:39	0	0	0,00		0,0	0	0	0	0	0	0	50,1
-6.	Not Ready	25.10.2011	11:45:27	0	0	0,00		0,0	0	0	0	0	0	0	50,0
-7.	Stop Fail	25.10.2011	11:45:23	0	0	0,00		0,0	0	0	0	0	0	0	50,0
-8.	Stop Fail	25.10.2011	11:45:23	0	0	0,00		0,0	0	0	0	0	0	0	50,0
-9.	Stop Fail	25.10.2011	11:45:22	0	0	0,00		0,0	0	0	0	0	0	0	50,0
-10.	Stop Fail	25.10.2011	11:45:21	0	0	0,00		0,0	0	0	0	0	0	0	50,0
-11.	Stop Fail	25.10.2011	11:45:21	0	0	0,00		0,0	0	0	0	0	0	0	50,0
-12.	Stop Fail	25.10.2011	11:45:21	0	0	0,00		0,0	0	0	0	0	0	0	50,0
-13.	Stop Fail	25.10.2011	11:45:20	0	0	0,00		0,0	0	0	0	0	0	0	50,0
-14.	Stop Fail	25.10.2011	11:45:20	0	0	0,00		0,0	0	0	0	0	0	0	50,0
-15.	Stop Fail	25.10.2011	11:45:18	0	0	0,00		0,0	0	0	0	0	0	0	50,1
-16.	Stop Fail	25.10.2011	11:45:17	0	0	0,00		0,0	0	0	0	0	0	0	50,0
-17.	Stop Fail	25.10.2011	11:45:16	0	0	0,00		0,0	0	0	0	0	0	0	50,2
-18.	Stop Fail	25.10.2011	11:45:12	0	0	0,00		0,0	0	0	0	0	0	0	50,2
-19.	Stop Fail	25.10.2011	11:44:47	0	0	0,00		0,0	0	0	0	0	0	0	50,0
-20.	Ready	25.10.2011	11:44:35	0	0	0,00		0,0	0	0	0	0	0	0	50,0
-21.	Fault Reset	25.10.2011	11:44:35	0	0	0,00		0,0	0	0	0	0	0	0	50,0
-22.	MCB Closed	25.10.2011	11:44:21	0	0	0,00		0,0	0	0	0	0	0	0	50,0
-23.	RemControlUART	25.10.2011	11:44:21	0	0	0,00		0,0	0	0	0	0	0	0	50,0

Exercise timers

There are two exercise timers available in the controller, which are based on the RTC clock. Both of them are identical.

Each timer has following settings (in the Date/time setpoint group):

MINT

No Func	There is no any other function, but binary output *Exerc Timer 1* or *Exerc Timer 2* activation
Mode OFF	When this option is chosen then the Timer output is also internally connected to the *Remote OFF* binary input
AutoRun	When this option is chosen then the Timer directly starts gen-set (in AUT mode)

SPtM

No Func	There is no any other function, but binary output *Exerc Timer 1* or *Exerc Timer 2* activation
Mode OFF	When this option is chosen then the Timer output is also internally connected to the *Remote OFF* binary input
MFail Blk	When this option is chosen then the Timer output is also internally connected to the *MainsFailBlock* binary input.
TEST	When this option is chosen then the Timer output is also internally connected to the *Remote TEST* binary input.
TEST OnLd	When this option is chosen then the Timer output is also internally connected to the *Rem TEST OnLd* binary input.

The timer outputs are available as binary outputs *Exerc Timer 1* and *Exerc Timer 2*.

NOTE:
Timers are activated even in the middle of the cycle. It means that even when the controller is switched on after the moment when the timer should have been started and before it should have been finished timer is activated for the rest of the duration period.

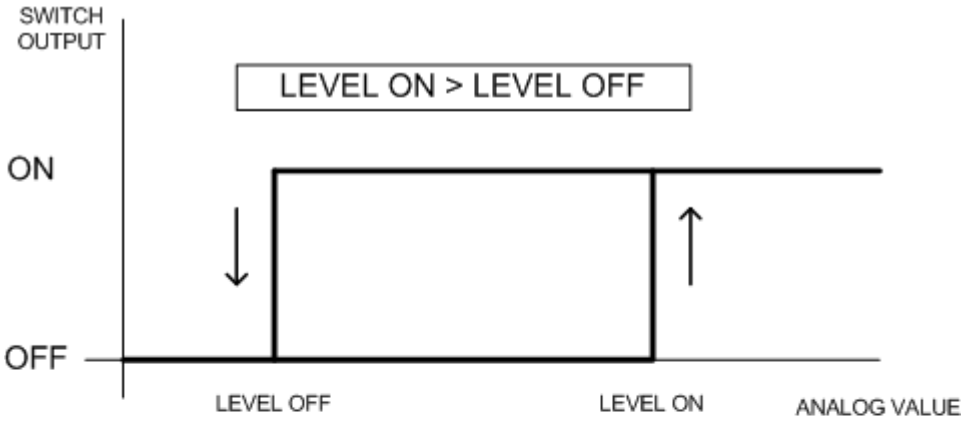
Timer functions can be activated only in AUT mode (not in OFF/MAN or TEST). There are 2 timers. In case both Timers are active at the same time Timer 1 has higher priority then Timer 2.

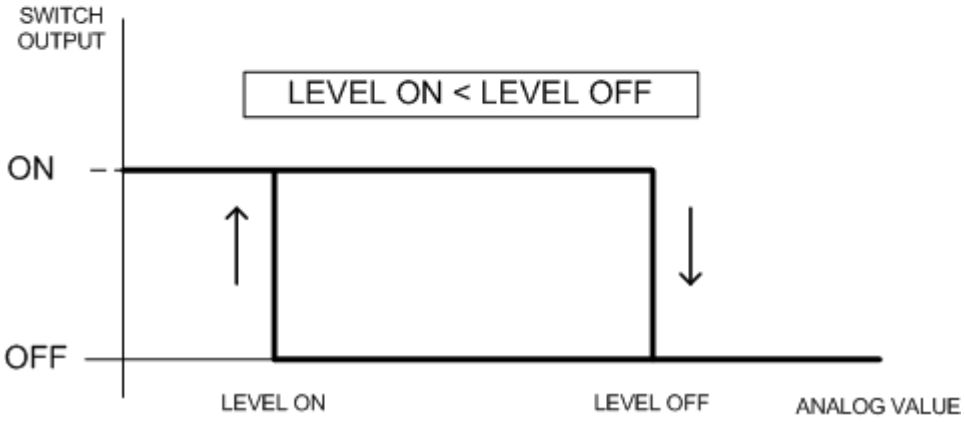
Analog switches

One analog switch (comparator) is assigned to each analog input to the controller. The switches are suitable for preheat control, day tank fuel pump control and others.

- Associated setpoints are located in the setpoint group Analog switches.
- One binary output is associated to each switch

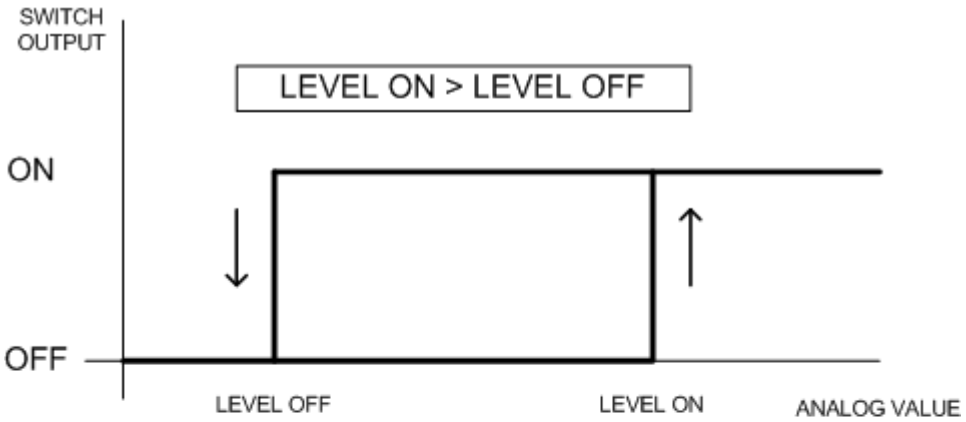
The behavior of the switch depends on setpoints adjustment.

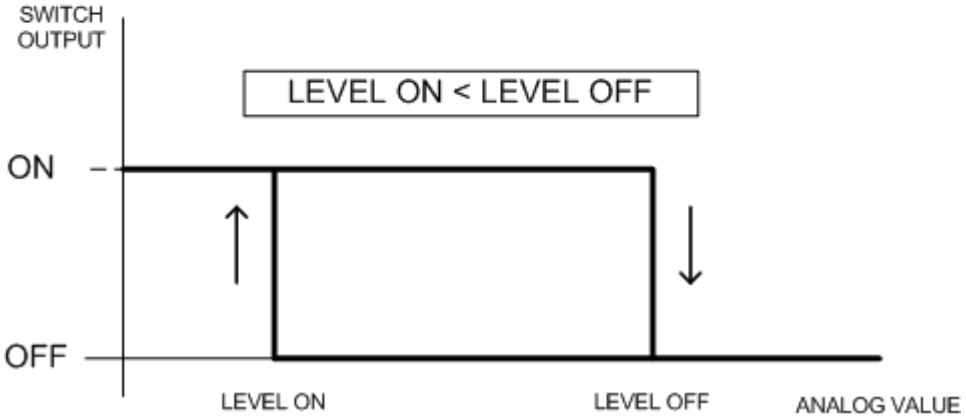




Power switch

There is also one switch assigned to the gen-set active power, which is called *Power switch*. The setpoints for on and off level adjustment are located in the setpoint group Analog switches. The output is provided as the binary output Power switch.
The behavior of the switch depends on setpoints adjustment.





Regulation loops overview

Following table shows which setpoints influence regulation in which situation.

SPtM

SPEED REGULATOR OUTPUT FOR SINGLE GEN-SET APPLICATION

ISLAND	LOADED ISLAND	PARALLEL TO MAINS	LOADED IN PARALLEL TO MAINS
Running GCB opened	GCB closed MCB opened	Synchronizing	GCB closed MCB closed
SRO output value = *Speed Gov Bias*	SRO output value = *Speed Gov Bias*	Speed/frequency control loop: *Freq Gain* *Freq Int* Angle control loop: *Angle Gain*	Power control loop: *Load Gain* *Load Int*

VOLTAGE REGULATOR OUTPUT FOR SINGLE GEN-SET APPLICATION

ISLAND	LOADED ISLAND	PARALLEL TO MAINS	LOADED IN PARALLEL TO MAINS
Running GCB opened	GCB closed MCB opened	Synchronizing	GCB closed MCB closed
Voltage control loop: *Voltage Gain* *Voltage Int*	Voltage control loop: *Voltage Gain* *Voltage Int*	Voltage control loop: *Voltage Gain* *Voltage Int*	Power factor control loop: *PF Gain* *PF Int*

MINT

SPEED REGULATOR OUTPUT FOR MULTIPLE GEN-SET APPLICATION

ISLAND	LOADED ISLAND	PARALLEL TO MAINS	LOADED IN PARALLEL TO MAINS
Running GCB opened	GCB closed MCB opened	Synchronizing	GCB closed MCB closed
SRO output value = *Speed Gov Bias*	Speed/frequency control loop: *LoadShare Gain* *LoadShare Int* background nominal frequency matching	Speed/frequency control loop: *Freq Gain* *Freq Int* Angle control loop: *Angle Gain*	Power control loop: *Load Gain* *Load Int*

VOLTAGE REGULATOR OUTPUT FOR MULTIPLE GEN-SET APPLICATION

MULTIPLE ISLAND	MULTIPLE LOADED ISLAND	MULTIPLE PARALLEL TO MAINS	MULTIPLE LOADED IN PARALLEL TO MAINS
Running GCB opened	GCB closed MCB opened	Synchronizing	GCB closed MCB closed
Voltage control loop: *Voltage Gain* *Voltage Int*	Voltage control loop: *VAr Share Gain* *VAr Share Int*	Voltage control loop: *Voltage Gain* *Voltage Int*	Power factor control loop: *PF Gain* *PF Int*

There are following regulation loops built-in in the controller. All of them are PI type except angle loop, which is P type.

Speed/frequency control loop

Speed/frequency control loop is active during the synchronization, when the gen-set frequency is controlled to the same value as the mains or bus have, i.e. to achieve zero slip frequency.

Differential angle control loop

Differential angle control loop is active during the synchronization, when the "near to zero" slip frequency has been successfuly achieved and then the differential angle between generator and mains/bus voltage shall be reduced to zero.

Power control loop

Power control loop is active during the parallel to mains operation. The recognition of parallel to mains operation is beeing done on the basis of the binary input *MCB feedback*. In MINT the setpoint *#SysLdCtrl PtM* must be also set to BASELOAD.

Load sharing control loop

Load sharing control loop is active in MINT, whenever the GCB is closed and the binary input *MCB feedback* is not active or the setpoint *#SysLdCtrl PtM* is in LDSHARING position.

Voltage control loop

Voltage control loop is active during synchronization (the generator voltage is controlled to the same value as the mains or bus has) and during the island operation in SPtM (the gen-set voltage is controlled to the nominal voltage). During the multiple island operation in MINT the voltage control loop is also running "in the background" of VAr sharing loop (using P,I parameters multiplied by 0.1) to maintain the voltage at the nominal level.

Power factor control loop

Power factor control loop is active during the parallel to mains operation. The recognition of parallel to mains operation is beeing done on the basis of the binary input *MCB feedback*.

VAr sharing control loop

VAr sharing control loop is active during multiple island operation in MINT application.

PI regulation adjustment

The exact adjustment of a PI loop always depend on the engine and generator characteristic. But there is a general rule, which can be used in the beginning of adjustment process:

- Prepare the system for adjustment. I.e. set limits for related alarms temporarily to values, which will disable the alarms, set the sychro timeout to maximum value etc.
- Adjust the gain to 5% and integration to 0%
- Switch the gen-set to MAN mode, start it and put it to the operation phase, where the appropriate regulation loop is active.
- Increase the gain slightly until the controlled quantity starts to oscillate. Then put it back to cca one half of the value, where the oscillations started.
- Increase the integrative factor slightly to achieve acceptable response to changes. Too small I-factor will cause too slow response, too high I-factor will cause overshooting or even oscillations.

NOTE:
It may be helpful to disable issuing the GCB close command when adjusting synchronization loops. Adjust the setpoint *Phase Window* to 0 to disable it. Adjust the setpoint back to it's original value after the adjustment is finished.

CAUTION!
Be ready to press emergency stop button in case the regulation loop would start to behave unacceptable.

Setpoints

Setpoints are analog, binary or special data objects which are used for adjusting the controller to the specific environment. Setpoints are collected to groups according to their meaning. Setpoints can be adjusted from the controller front panel, PC, MODBUS etc.

Pasword protection

Each setpoint can be protected by password against unauthorized change. The password protection can be assigned to the setpoints during the configuration procedure. See the chapter Operator guide for instructions how to enter and modify password. See also LiteEdit help to learn about working with password in LiteEdit.

Setpoint synchronization

Setpoints, that are marked with "#" sign at the begin of their names, are synchronized with other controllers present on the CAN bus line, i.e. the system will ensure that the respective setpoint will have identical value in each connected controller. If the setpoint is changed in one controller, the same change will occur in all other controllers. This function is necessary especially for MINT application, where the system of Power management is based on fact that the respective setpoints are identical in all controllers.

All parameters marked as shared (starts with #) are overwritten during archive download in case there is no another single controller visible on CAN bus (= there is just one number “1” in Values -> Info -> CAN16 and CAN32, what means only the controller (the archive is downloaded to). In case there is another controller (even just single one = there are at least two numbers “1” in Values -> Info -> CAN16 and CAN32) on CAN bus the shared parameters are not overwritten.

Setpoint groups

1. Process Control
2. Basic Settings
3. Comms Settings
4. Engine Params
5. Engine Protect
6. Gener Protect
7. Pwr Management
8. AMF Settings
9. Sync/Load Ctrl
10. Volt/PF Control
11. ExtI/O Protect
12. SMS/E-Mail
13. AnalogSwitches
14. Date/Time
15. Sensors Spec

CAUTION!
Do not perform repeated writing of setpoints (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 more than 10^5 times without risk of damage or data loss, but it may become damaged, when allowed number of writing cycles is exceeded!

Setpoints - Process Control

1. *Baseload*
2. *Base PF*
3. *AMFStartEnable*
4. *Export Limit*
5. *Export kW*
6. *#SysLdCtrl PtM*
7. *#SysBaseLoad*
8. *#SysPwrFactor*
9. *Synchro Enable*
10. *PeakLevelStart*
11. *PeakLevelStop*
12. *PeakAutS/S Del*

Setpoints - Basic Settings

1. *ControllerName*
2. *Nominal Power*
3. *Nomin Current*
4. *CT Ratio*
5. *EF CT Ratio*
6. *Im/EF CT Ratio*
7. *Im/EF input*
8. *Nominal Volts*
9. *PT Ratio*
10. *Vm PT Ratio*
11. *Nominal Freq*
12. *Nominal RPM*
13. *Gear Teeth*
14. *ControllerMode*
15. *Reset To MAN*

Setpoints - Comms Settings

1. *ControllerAddr*
2. *COM1 Mode*
3. *COM2 Mode*
4. *ModemIniString*
5. *ModbusComSpeed*
6. *CAN Bus Mode*
7. *IBLite IP Addr*
8. *IBLite NetMask*
9. *IBLite GateIP*
10. *IBLite DHCP*
11. *ComAp Port*
12. *APN Name*
13. *APN UserName*
14. *APN UserPass*
15. *AirGate*
16. *AirGate IP*
17. *SMTP UserName*
18. *SMTP UserPass*
19. *SMTP Server IP*
20. *Contr MailBox*
21. *Time Zone*
22. *DNS IP Address*

Setpoints - Engine Params

1. *Starting RPM*
2. *Start W Freq*
3. *Starting Oil P*
4. *Prestart Time*
5. *MaxCrank Time*
6. *CrnkFail Pause*
7. *Crank Attempts*
8. *Idle Time*
9. *Min Stab Time*
10. *Max Stab Time*
11. *Cooling Speed*
12. *Cooling Time*
13. *Stop Time*
14. *SDVentil Time*
15. *Fuel Solenoid*
16. *D+ Function*
17. *ECU FreqSelect*

Setpoints - Engine Protect

1. *Horn Timeout*
2. *ProtectHoldOff*
3. *Overspeed Sd*
4. *Batt Overvolt*
5. *Batt Undervolt*
6. *Batt Volt Del*
7. *AI1 Yel*
8. *AI1 Red*
9. *AI1 Del*
10. *AI2 Yel*
11. *AI2 Red*
12. *AI2 Del*
13. *AI3 Yel*
14. *AI3 Red*
15. *AI3 Del*
16. *WrnMaintenance*

Setpoints - Gener Protect

1. *Overload BOC*
2. *Overload Del*
3. *Amps IDMT Del*
4. *Short Crct BOC*
5. *Short Crct Del*
6. *Amps Unbal BOC*
7. *Amps Unbal Del*
8. *EarthFault Sd*
9. *EarthFault Del*
10. *Gen >V Sd*
11. *Gen <V BOC*
12. *Gen V Del*
13. *Volt Unbal BOC*
14. *Volt Unbal Del*
15. *Gen >Freq BOC*
16. *Gen <Freq BOC*
17. *Gen Freq Del*

18. Reverse Pwr BOC
19. Reverse Pwr Del
20. ExcitationLoss
21. ExctLoss Del

Setpoints - Pwr Management

(MINT only)

1. Pwr Management
2. Pwr Manag Del
3. #PowerMgmtMode
4. Priority
5. #SysAMFstrtDel
6. #SysAMFstopDel
7. #LoadResStrt 1
8. #LoadResStop 1
9. #LoadResStrt 2
10. #LoadResStop 2
11. #Min Run Power
12. #NextStrt Del
13. #OverldNextDel
14. #NextStopDel
15. #SlowStopDel
16. RunHoursBase
17. #RunHrsMaxDiff

Setpoints - AMF Settings

(SPtM only)

1. EmergStart Del
2. MainsReturnDel
3. Mains >V
4. Mains <V
5. Mains V Del
6. Mains >Freq
7. Mains <Freq
8. Mains Freq Del
9. VectorShiftLim
10. Transfer Del
11. MCB Close Del
12. MCB Opens On
13. RetFromIsland
14. BreakerOverlap
15. ReturnFromTEST
16. MCB Logic

Setpoints - Sync/Load Ctrl

1. Speed Gov Char
2. Speed Gov Bias
3. SpeedGovLowLim
4. SpeedGovHiLim
5. TauSpeedActuat
6. Voltage Window
7. Phase Window
8. Dwell Time
9. Freq Gain
10. Freq Int

11. Angle Gain
12. Load Ramp
13. Load Gain
14. Load Int
15. GCB Open Level
16. GCB Open Del
17. Sync Timeout
18. LoadShare Gain
19. LoadShare Int

Setpoints - Volt/PF Control

1. AVRi Bias
2. Voltage Gain
3. Voltage Int
4. PF Gain
5. PF Int
6. VAr Share Gain
7. VAr Share Int

Setpoints - ExtI/O Protect

1. IOM AI1 Yel
2. IOM AI1 Red
3. IOM AI1 Del
4. IOM AI2 Yel
5. IOM AI2 Red
6. IOM AI2 Del
7. IOM AI3 Yel
8. IOM AI3 Red
9. IOM AI3 Del
10. IOM AI4 Yel
11. IOM AI4 Red
12. IOM AI4 Del

Setpoints - SMS/E-Mail

1. Yel Alarm Msg
2. Red Alarm Msg
3. TelNo/Addr Ch1
4. TelNo/Addr Ch2

Setpoints - AnalogSwitches

1. AnaSwitch1 ON
2. AnaSwitch1 OFF
3. AnaSwitch2 ON
4. AnaSwitch2 OFF
5. AnaSwitch3 ON
6. AnaSwitch3 OFF
7. PowerSwitch ON
8. PowerSwitchOFF

Setpoints - Date/Time

1. Time Stamp Per
2. #SummerTimeMod

3. #Time
4. #Date
5. Timer1 Repeat
6. Timer1 ON Time
7. Timer1Duration
8. Timer1 Function
9. Timer2 Repeat
10. Timer2 ON Time
11. Timer2Duration
12. Timer2 Function

Setpoints - Sensors Spec

1. AI1Calibration
2. AI2Calibration
3. AI3Calibration
4. IOM AI1 Calibr
5. IOM AI2 Calibr
6. IOM AI3 Calibr
7. IOM AI4 Calibr

Values

Values (or quantites) 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 collected to groups according to their meaning.

NOTE:
Complete overview of all data objects available in the controller can be exported by LiteEdit into a text file. Open any connection (also off-line with a previously saved archive) and go to menu Controller -> Generate CFG image.

Invalid flag

If there are no valid data available for a particular value, the *invalid flag* is set to it. The reason for this situation can be following:

- The value is not beeing evaluated in the scope of current application and configuration.
- Sensor fail is 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 the LiteEdit and on the controller screen. If such a value is read out via Modbus, it will contain data 32768 in case of signed values and 65535 in case of unsigned values.

Value groups

1. Engine
2. Generator
3. Mains
4. Bus
5. Pwr Management
6. Controller I/O
7. Extension I/O
8. Statistics
9. Date/Time
10. Info

Values - Engine

1. *RPM*
2. *W-TerminalFreq*
3. *ECU State*
4. *Fuel Rate ECU*
5. *Cool Temp ECU*
6. *IntakeTemp ECU*
7. *Oil Press ECU*
8. *Oil Temp ECU*
9. *BoostPress ECU*
10. *Perc Load ECU*
11. *FuelLevel ECU*

Values - Generator

1. *Gen kW*
2. *Gen kW L1*
3. *Gen kW L2*
4. *Gen kW L3*
5. *Gen kVAr*
6. *Gen kVAr L1*
7. *Gen kVAr L2*
8. *Gen kVAr L3*
9. *Gen kVA*
10. *Gen kVA L1*
11. *Gen kVA L2*
12. *Gen kVA L3*
13. *Gen PF*
14. *Gen Load char*
15. *Gen PF L1*
16. *Gen Lchr L1*
17. *Gen PF L2*
18. *Gen Lchr L2*
19. *Gen PF L3*
20. *Gen Lchr L3*
21. *Gen Freq*
22. *Gen V L1-N*
23. *Gen V L2-N*
24. *Gen V L3-N*
25. *Gen V L1-L2*
26. *Gen V L2-L3*
27. *Gen V L3-L1*
28. *Gen A L1*
29. *Gen A L2*
30. *Gen A L3*
31. *EarthFaultCurr*

Values - Mains

(SPtM only)

1. *Mains Freq*
2. *Mains V L1-N*
3. *Mains V L2-N*
4. *Mains V L3-N*
5. *Mains V L1-L2*
6. *Mains V L2-L3*
7. *Mains V L3-L1*
8. *Mains A L3/EF*
9. *Mains kW I*
10. *Mains kVAr I*
11. *Mains PF*
12. *Mains LChr*
13. *Load kW*
14. *Load kVAr*
15. *Load PF*
16. *Load LChr*
17. *Slip*
18. *Angle*
19. *MaxVectorShift*

Values - Bus

(MINT only)

1. *Bus Freq*
2. *Bus V L1-N*
3. *Bus V L2-N*
4. *Bus V L3-N*
5. *Bus V L1-L2*
6. *Bus V L2-L3*
7. *Bus V L3-L1*
8. *Slip*
9. *Angle*

Values - Pwr Management

(MINT only)

1. *Actual Reserve*
2. *Running ActPwr*
3. *Running Q-Pwr*
4. *Running NomPwr*
5. *Avail Nom Pwr*
6. *Priority*

Values - Controller I/O

1. *Battery Volts*
2. *D+*
3. *Analog Input 1*
4. *Analog Input 2*
5. *Analog Input 3*
6. *Bin Inputs*
7. *Bin Outputs*
8. *Speed Gov Out*
9. *AVRi Output*
10. *GSM SignalLvl*
11. *GSM ErrorRate*
12. *GSM Diag Code*
13. *AirGate Diag*
14. *AirGate ID*
15. *Modem Status*

Values - Extension I/O

1. *IOM AI1*
2. *IOM AI2*
3. *IOM AI3*
4. *IOM AI4*
5. *IOM Bin Inp*
6. *ExtM Bin Inp*
7. *RA Bin Out*
8. *IOM Bin Out*

Values - Statistics

1. *Energy kWh*
2. *Energy kVAhr*

3. *Run Hours*
4. *Num Starts*
5. *WrnMaintenance*
6. Num E-Stops
7. Shutdowns

Values – Date/Time

1. *Time*
2. *Date*

Values - Info

1. *Engine State*
2. *Breaker State*
3. *Timer Text*
4. *Timer Value*
5. *FW Version*
6. *FW Branch*
7. *PasswordDecode*
8. *CAN16*
9. *CAN32*
10. *GensLoaded16*
11. *GensLoaded32*

Binary input functions

Following functions can be configured to physical binary inputs (terminals) of the controller and/or extension modules:

Common functions

1. *GCB Feedback*
2. *MCB Feedback*
3. *Emergency Stop*
4. *Sd Override*
5. Access Lock
6. *Remote OFF*
7. *Remote MAN*
8. *Remote AUT*
9. *RemControlLock*
10. Emergency MAN
11. *Start Button*
12. *Stop Button*
13. *FaultResButton*
14. *HornResButton*
15. *GCB Button*
16. *ForwSyncDisabl*

MINT specific

(MINT only)

1. *Sys Start/Stop*
2. *Load Reserve 2*
3. *Min Run Power*
4. *Top Priority*

SPtM specific

(SPtM only)

1. *Rem Start/Stop*
2. *Remote TEST*
3. *Rem TEST OnLd*
4. *RevSyncDisable*
5. *MCB Button*
6. *Ext MF Relay*
7. *MainsFailBlock*

Binary output functions

Common functions

NOTE:
Learn more about wiring of binary outputs in the chapter Wiring of binary outputs.

1. *Starter*
2. *Fuel Solenoid*
3. *Stop Solenoid*
4. *Stop Pulse*
5. *Ignition*
6. *Prestart*
7. *Cooling Pump*
8. *Idle/Nominal*
9. *Alarm*
10. *Horn*
11. *Fault Reset*
12. *GCB Close/Open*
13. *GCB ON Coil*
14. *GCB OFF Coil*
15. *GCB UV Coil*
16. *Speed Up*
17. *Speed Down*
18. *AVR Up*
19. *AVR Down*
20. *Ready To Load*
21. *Synchronizing*
22. *Running*
23. *Loaded*
24. *Unloading*
25. *AnalogSwitch 1*
26. *AnalogSwitch 2*
27. *AnalogSwitch 3*
28. *Ctrl HeartBeat*
29. *Gen Healthy*
30. *Mode OFF*
31. *Mode MAN*
32. *Mode AUT*
33. *Yellow Alarm*
34. *Red Alarm*
35. *Exerc Timer 1*
36. *Exerc Timer 2*
37. *Power Switch*

ECU info

1. *ECU Comm OK*
2. *ECU Comm Error*
3. *ECU YellowLamp*
4. *ECU RedLamp*
5. *ECU PowerRelay*

Alarm mirrors

1. AL Gen Volts
2. AL Gen Freq
3. AL Overcurrent
4. AL Gen V,Freq
5. AL Overspeed
6. AL Underspeed
7. AL Overload
8. AL Reverse Pwr
9. AL Start Fail
10. AL Stop Fail
11. AL Sync Fail
12. AL Batt Volt
13. BI1 Status
14. BI2 Status
15. BI3 Status
16. BI4 Status
17. BI5 Status
18. BI6 Status
19. BI7 Status
20. BI8 Status
21. BI9 Status
22. IOM BI1 Status
23. IOM BI2 Status
24. IOM BI3 Status
25. IOM BI4 Status
26. IOM BI5 Status
27. IOM BI6 Status
28. IOM BI7 Status
29. IOM BI8 Status
30. AL AI1 Yel
31. AL AI2 Yel
32. AL AI3 Yel
33. AL AI1 Red
34. AL AI2 Red
35. AL AI3 Red
36. AL IOM AI1 Yel
37. AL IOM AI2 Yel
38. AL IOM AI3 Yel
39. AL IOM AI4 Yel
40. AL IOM AI1 Red
41. AL IOM AI2 Red
42. AL IOM AI3 Red
43. AL IOM AI4 Red
44. AL Common Wrn
45. AL Common Sd
46. AL Common Stp
47. AL Common BOC
48. AL Common Fls

MINT specific

(MINT only)

1. System Ready
2. SystReserve OK
3. Bus Healthy

SPtM specific

(SPtM only)

1. MCB Close/Open
2. MCB ON Coil
3. MCB OFF Coil
4. MCB UV Coil
5. Ready To AMF
6. Mains Healthy
7. Mains Fail
8. Mode TEST

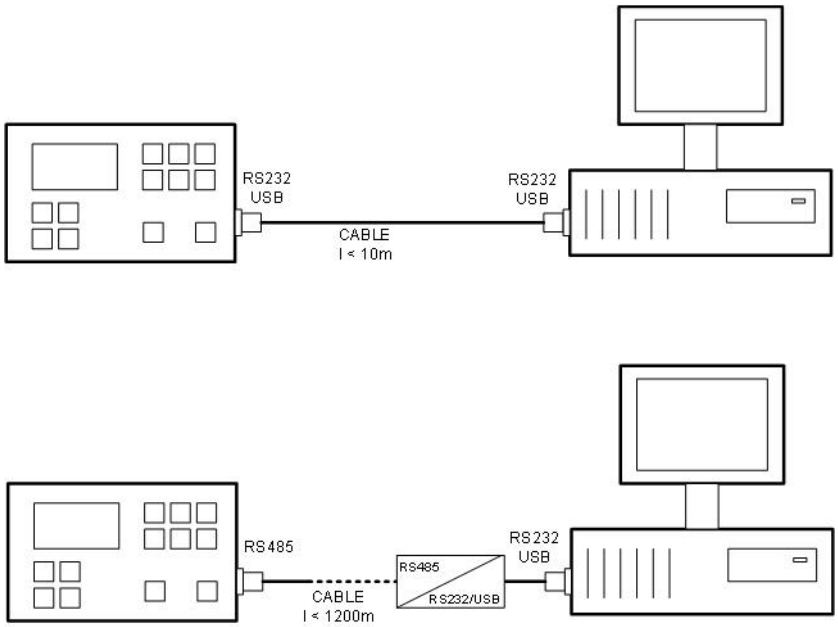
Communication

For details about communication with extension modules and EFI equipped engines see appropriate chapters in this manual.
More detailed information about all topics regarding communications is available in the InteliCommunicationGuide document, which is regularly updated and can be downloaded from the website www.comap.cz.

Direct cable connection

An external communication module is necessary to enable direct cable connection to a PC. The module is plugged-in into the slot located on the rear side of the controller. See more information about installation of the modules in separate chapter.

RS232, USB or RS485 interface can be used for direct cable connection to a PC. The setpoint *COM1 Mode* or *COM2 Mode* (according to the interface used) must be set to DIRECT position for this kind of connection.



DIRECT CABLE CONNECTION TYPES

Following modules are available for direct connection to a PC:

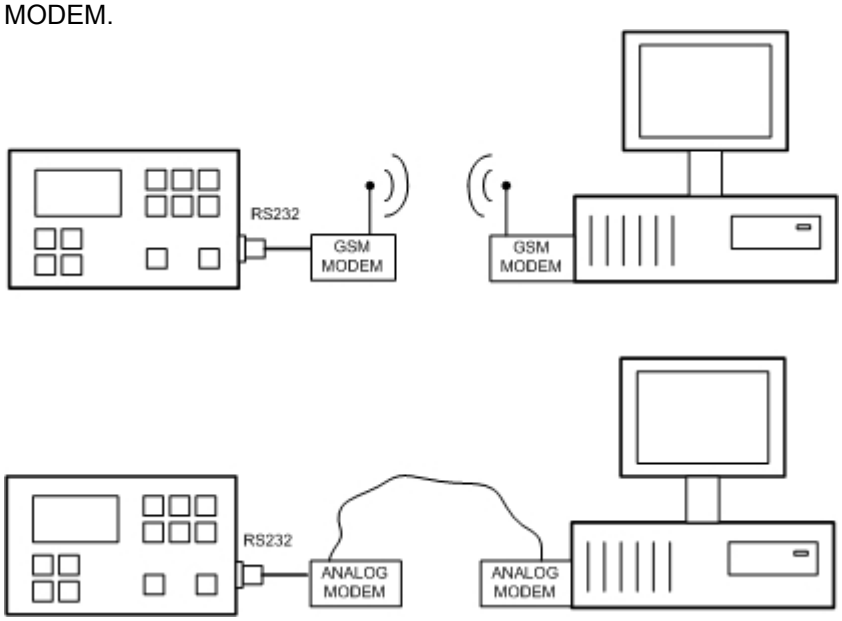
1. IL-NT RS232
2. IL-NT RS232-485
3. IL-NT S-USB (USB easy removable service module)

The RS232 or USB interface uses COM1 port of the controller. The RS485 uses COM2.

NOTE:
Use cross-wired serial communication cable with DB9 female connectors and signals Rx, Tx, GND for RS232 connection.

Modem connection

A PC can be connected to the controller also remotely via modems. Either an analog, GSM or ISDN modem must be connected to the RS232 interface and the setpoint *COM1 Mode* must be set to MODEM.



MODEM CONNECTION TYPES

Following modules can be used for modem connection to a PC:

1. IL-NT RS232
2. IL-NT RS232-485

The RS232 interface uses COM1 port of the controller.

In case of troubles with the modem communication an additional initialization string may be required. The reason can be for example some national telephone network specific feature. Use the setpoint *ModemIniString* to add some necessary AT commands which will be sent to the modem during the initialization. See the documentation of the modem for details.

NOTE:
Use the same kind of modem (e.g. analog, GSM or ISDN) as used on the controller also at PC side.

Recommended GSM modems

- Siemens/Cinterion M20, TC35, TC35i, ES75, MC39 (baud rate 9600 bps)
- Wavecom M1200/WMOD2 (baud rate 9600 bps)
- Wavecom Maestro 20
- Wavecom Fastrack M1306B (Fastrack M1206B is **not** recommended)
- Falcom A2D

Modem setup procedure

Analog modems obviously do not require any setup. The only case it could be needed is if the modem has been bought in other country with different telephony system than the target country where the modem will be used.

GSM modems need to be set-up prior to using with the controller. Use the *gm_setup* program (installed together with the LiteEdit) to make the initial setup of the modem. See the latest

InteliCommunicationGuide (available on the ComAp web site) for details. The setup must be done while a SIM card is inserted.

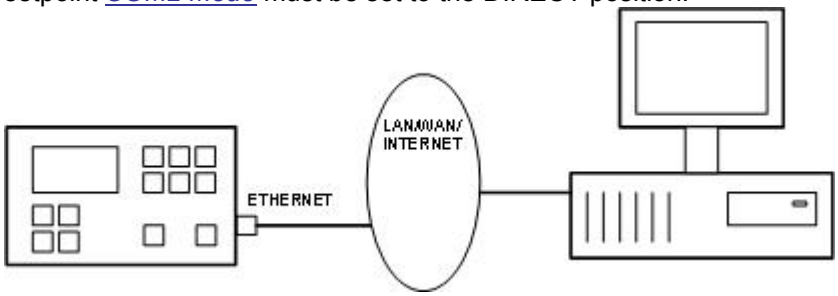
NOTE:
It is always recommended to use modems bought in the target country and approved for it.

Internet connection

A PC can be connected to the controller also remotely via Ethernet (Internet, Intranet). An appropriate ethernet communication module must be used.

SPtM

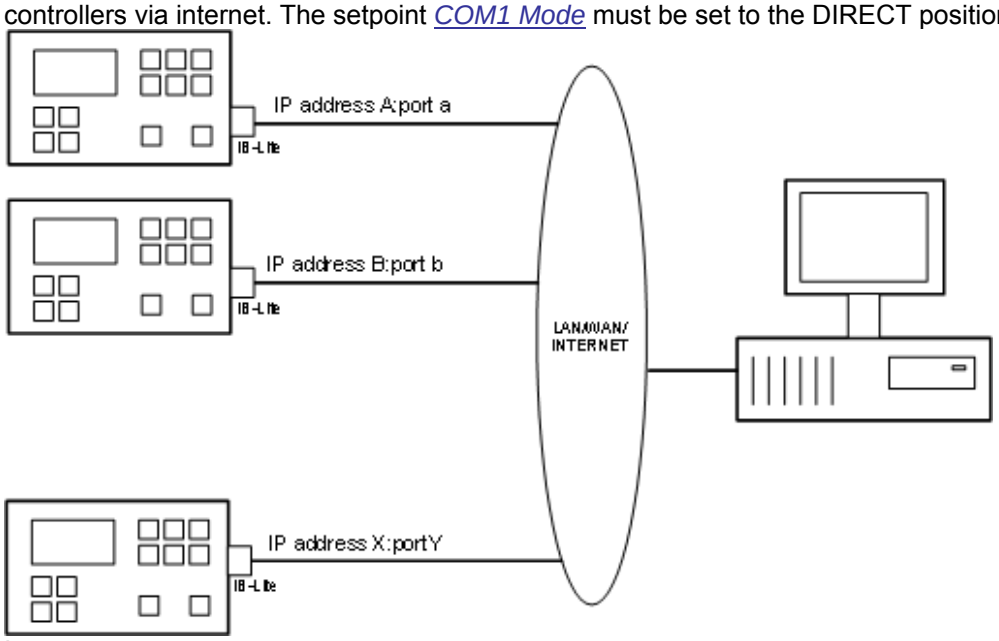
Use a plug-in communication module IB-Lite to connect to the IC-NT SPtM controller via internet. The setpoint *COM1 Mode* must be set to the DIRECT position.



INTERNET CONNECTION FOR SINGLE CONTROLLER

MINT

Use a plug-in communication module IB-Lite on each controller for connecting to the IC-NT MINT controllers via internet. The setpoint *COM1 Mode* must be set to the DIRECT position.



INTERNET CONNECTION FOR MULTIPLE CONTROLLERS

Using a web browser

The IB-Lite module with firmware version 1.1 and above makes possible using any web browser for basic monitoring and adjustment of the controller. Simply put the IP address of the module into the address line in your web browser like `http://192.168.1.254` and then enter access code.

IB-Lite setup procedure

NOTE:
Setup of the module requires certain level of knowledge of networks administration. Ask your IT specialist for assistance.

Default setting of the module is IP = 192.168.1.254, Netmask = 255.255.255.0, Gateway = 192.168.1.1. Default password for service web pages "comap" (or “0”).

To restore default setting close the "restore default setting" jumper located on the module before switching the controller on and remove it few seconds after the controller was switched on.

NOTE:
The Default setting can be changed directly from the controller panel by pressing of “Page” button and using of ▼, ▲ and “Enter” to get to “Comms Settings” menu. (IT APPLIES TO FIRMWARE VERIONS 1.3 AND HIGHER.)

Configuration

1. Plug the module into the controller and power the controller on.
2. Connect the module into your ethernet network. If the default address does not match local network parameters (i.e. the network segment does not use IP range 192.168.1.xxx or the IP 192.168.1.254 is occupied), connect the module directly to your PC using cross-wired cable. See details in the Installation chapter.
3. If you are connected direcly, you have to change temporarily IP address and subnet mask of your PC Ethernet connection. Use following setting: DHCP disabled, IP from the range 192.168.1.1 - 192.168.1.253 and subnet mask 255.255.255.0. After the IB-Lite setup is finished, restore your PC setting back to original values.
4. Start web browser and put `http://192.168.1.254/sp_config.htm` into the address line.
5. After successful login the configuration page will be displayed.
6. It is recommended to change the user name and password and keep the new values confidential.
7. Consult proper IP settings with your IT specialist.
8. Consult proper e-mail settings with your e-mail provider. Please note, that also most of public SMTP servers require authentification and e-mails must be sent from an existing addresses.
9. If you want to enable access only for clients with specified IP addresses, tick the checkbox "Trusted clients" and fill-in the allowed IP addresses.

NOTE:
See also the latest *LiteEdit Reference Guide* (available on the ComAp web site) for more information about IB-Lite setup.

Firmware upgrade

1. Follow steps 1-3 of the configuration procedure above.
2. Start web browser and put `http://192.168.1.254/sp_fw_upld.htm` into the address line.
3. After successful login the configuration page will be displayed.
4. Press the button "Browse" and select the appropriate firmware file.
5. Press "Upload new firmware" button. After the firmware upload is finished, the module will restart.

NOTE:
Interrupting the upload will NOT cause any damage. Just repeat the upload again.

IG-IB setup procedure

See the latest *InteliCommunicationGuide* (available on the ComAp web site) for the information how to set-up the IG-IB module.

System integration

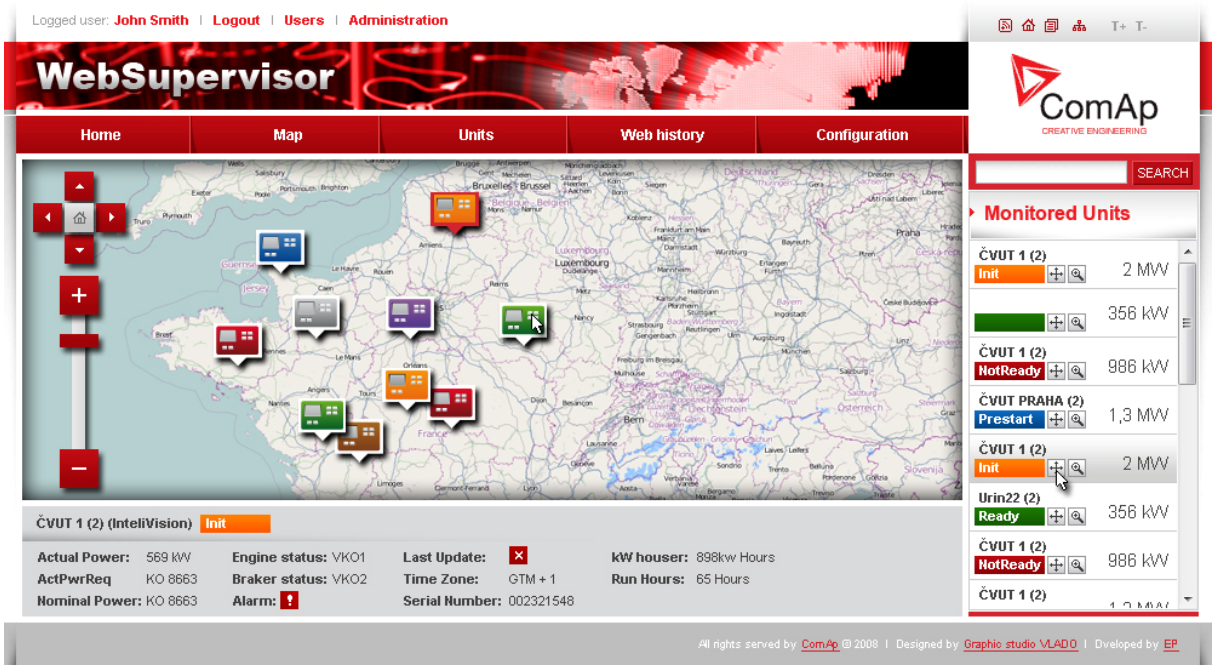
The controller can be integrated into a building management or similar system using RS232, RS485 or Ethernet interface and MODBUS protocol. Following modules can be used for this purpose:

1. IL-NT RS232
2. IL-NT RS232-485
3. IB-Lite (Modbus/TCP)

The setpoint *COM1 Mode* (RS232) resp. *COM2 Mode* (RS485, Ethernet) must be set to MODBUS position. The speed of MODBUS communication for RS232 and RS485 can be adjusted by the setpoint *ModbusCommSpeed*. In case of IB-Lite adjust this setpoint to 57600 bps. See also more detailed description of the MODBUS protocol in separate chapter.

Websupervisor

Controller supports WebSupervisor system. This system enables gen-set fleet and assets management as well as pure monitoring.



For more details about WebSupervisor kindly visit web page of the product http://www.comap.cz/products/detail/WebSupervisor.

AirGate

AirGate technology for easy plug'n'play wireless communication is incorporated. Common SIM card with GPRS service is suitable for this system. It overcomes problems with special SIM card (fixed and public IP) necessity, with firewalls and difficult communication settings.

http://www.comap.cz/news-room/news-and-events/detail/AirGate

http://www.comap.cz/news-room/news-and-events/detail/The-Rainbow-rises-for-remotemonitoring-applications/

Modbus protocol

The Modbus protocol can be activated on RS232 or RS485 port. The physical link parameters are:

- 8 data bits
- 1 stop bit
- no parity
- communication speed selectable by setpoint *ModbusComSpeed*

Modbus/TCP protocol uses the TCP/IP frames as the transport layer for Modbus frames. This protocol is available via the IB-Lite module on port 502.
Following features from the Modbus specification are supported:

- Transfer mode RTU
- Function 3 (Read Multiple Registers)
- Function 6 (Write Single Register)
- Function 16 (Write Multiple Registers)

The response to an incoming message depends on the communication speed. The delay is not shorter than the time needed to send/receive 3 and ½ characters. See the latest *InteliCommunicationGuide* (available on the ComAp web site) for details, examples etc.

The complete description of Modbus communication protocol can be found in Modbus Protocol Reference Guide PI-MBUS-300 and Open Modbus Specification Release 1.0. Both documents are available from web.

NOTE:
The complete list of available registers can be obtained from LiteEdit. Open an online connection to the controller or open offline an archive and go to menu Controller -> Generate Cfg image to get the register list.

Maintenance

Backup battery replacement

The internal backup battery lifetime is approx. 10 years. Replace the battery, if the alarm *Low BackupBatt* occurs. Follow these instructions:

1. Connect the controller to a PC and save an archive for backup purposes.
2. Disconnect all terminals from the controller and remove the controller from the switchboard.
3. Release the rear cover using a flat screwdriver or another suitable tool.

4. Remove all plug-in modules.
5. The battery is located in a holder on the circuit board. Remove the old battery with a small sharp screwdriver and push with a finger the new battery into the holder. Use only CR1225 lithium battery.

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

NOTE:
When internal RTC battery becomes empty, InteliCompact function (e.g. Ready for stand by) does not change until controller power supply is switched off. After the next power switch on controller:
- Alarm list is empty
- Time and Date values are set to zero
- Statistics values are random

Troubleshooting

SYMPTOM	
The unit is dark, no display, no leds lit.	
CAUSE	SOLUTION
There is no power on the power terminals.	Check the power supply voltage.
The boot-jumper is inserted.	Remove the boot-jumper.

SYMPTOM	
No display, only the backlight is on.	
CAUSE	SOLUTION
Extremely low display contrast.	Press PAGE button five times, then press and hold ENTER button and together press and hold UP button until display shows correctly.
Not valid firmware in the controller. This situation can occur if the previous programming of the firmware was interrupted.	Reprogramm the firmware using the boot-jumper.

SYMPTOM	
The unit shows "Configuration table error" and does not work.	
CAUSE	SOLUTION
Not valid configuration in the controller. This situation can occur if the previous programming of the configuration was interrupted.	Reprogramm the configuration.

SYMPTOM	
The unit shows "INIT" and it does not work, controller mode can not be changed. This situation occurs after controller reset if the checksum of setpoints is not correct.	
CAUSE	SOLUTION
A new firmware containing new setpoints has been programmed.	Use LiteEdit online connected to the controller to check all setpoints and correct the wrong ones. You have to change at least one setpoint. If all setpoints are correct, change one of them and put it back to the original value to recalculate the checksum. Then use LiteEdit command Controller -> Reset from init state.
The RTC backup battery is empty.	Replace the battery as described in the Maintenance chapter. Then proceed with the LiteEdit as described in the previous situation. Alternative way is checking all setpoints from the front panel. Change at least one of them and then switch the controller off and on.

SYMPTOM	
You do not know the password.	
CAUSE	SOLUTION

Probably forgotten... :-)	Display the information screen containing the serial number and the password decode number as described in the chapter Controller information screen. Write down both numbers and send a request to retrieve the passord to your local distributor containing these two numbers.

SYMPTOM	
The controller does not respond to mode buttons on the front panel.	
CAUSE	SOLUTION
The mode is forced by one of remote mode inputs.	Deactivate all remote mode inputs to be able to change the mode from the front panel.
The input *Access Lock* is active.	Deactivate the input.
The setpoint *ControllerMode* is protected by password.	Enter the password prior to changing the mode.

SYMPTOM	
The controller does not respond to the START, STOP or breaker buttons on the front panel.	
CAUSE	SOLUTION
The controller is not in MAN mode.	Switch the controller into MAN mode. Read more in the Operating modes chapter.
The conditions needed for start or for closing of the breakers are not fulfiled.	The gen-set can not be started if any red alarm is active. The GCB can not be closed until the gen-set is running and the generator voltage and frequency are in limits. More in the Stabilization chapter.

SYMPTOM	
It is not possible to change setpoints.	
CAUSE	SOLUTION
Some setpoints can be configured as protected by password.	Enter the password prior going to change protected setpoints
The binary input *Access Lock* is active.	Switch the Access lock off.

SYMPTOM	
Incorrect kW and power factor reading, but correct voltage and current readings.	
CAUSE	SOLUTION
Wrong wiring of voltage and/or current measurements. I.e. the voltage connected to L1 voltage terminal is not the same generator phase as the CT connected to L1 current terminal or the same situation for L2 or L3.	Correct the wiring to fit all phases of the voltage to their CT's.

SYMPTOM	
Governor output does not work, the output level is continuously at lower or upper limit.	
CAUSE	SOLUTION
Wrong (opposite) position of the setpoint *Speed Gov Char*.	Check the setpoint position if it fits the Governor requirements.
Opposite or wrong wiring of the Governor/AVRi output.	Check and correct the wiring.
The governor output is switched to PWM mode but the governor needs voltage mode or vice versa.	Put the PWM jumper at the governor output into the proper position according to the Governor requirements.

SYMPTOM	
The cranking is cut-off too early, the engine does not start.	
CAUSE	SOLUTION
The setpoint *Starting Oil P* is adjusted too low.	Adjust the setpoint to higher pressure level than can be achieved by cranking only. Note, that under cold condition the oil pressure achieved during cranking can be higher.
W terminal is connected to the pickup input of the controller, but autodetection of frequency-to-speed ratio was not performed (e.g. if the controller was previously used with another engine with another charging alternator).	Disconnect the W terminal from the pickup input, then start the gen-set in manual mode and wait until the gen-set is ready to take the load. Then stop the engine and connect the W terminal back. The autodetection process will be performed during next start.

SYMPTOM	
The MCB control does not work properly, the alarm *MCB fail* is present all the time.	
CAUSE	SOLUTION
The position of the setpoint *MCB Logic* does not match the current MCB wiring.	Switch the setpoint *MCB Logic* into proper position.

SYMPTOM	
The communication via CAN bus with other engines, extension units or ECU does not work, i.e. you do not see other engines in the *CAN16* or *CAN32* value or the controller shows an alarm in the Alarmlist that some of extension units or ECU does not communicate.	
CAUSE	SOLUTION
The wiring of the CAN bus network is not provided as linear bus without nodes.	Correct the wiring as described in the chapter CAN bus wiring.

Technical data

Power supply

Power supply range	8-36VDC
Power supply drop-out immunity	50ms (from min. 10V)
Power consumption	cca 200mA/8V; 50mA/36V
Peak power consumption (LT)	cca 0,56A/8V; 1,8A/36V
Backup battery type	CR 1225
Estimated backup battery lifetime	10 years

Operating conditions

Operating temperature	-20... 70°C
Operating temperature (LT version)	-40... 70°C
Operating humidity	95% non-condensing (IEC/EN 60068-2-30)
Protection degree (front panel)	IP65
Vibration	5-25Hz, +/- 1.6mm; 25-100Hz, a = 4g
Shocks	a_{max} 200m/s^2
Storage temperature	-30... 80°C

Physical dimensions

Dimensions	185x125x60mm (WxHxD)
Weight	
Mounting cutout size	175x115mm (WxH)

Standard conformity

Electromagnetic compatibility	EN 61000-6-1, EN 61000-6-2, EN 61000-6-3, EN 61000-6-4
Low voltage directive	EN 61010-1:95 +A1:97

Binary inputs

Number of binary inputs	9
Galvanic insulation	Not insulated
Common pole	Positive, V_s = 8-36VDC
Closed contact voltage	<2V
Open contact voltage	4V - V_s
Input resistance	4,2 kOhm

Binary outputs

Number of binary outputs	8
Galvanic insulation	Not insulated
Type	Transistor, switching to negative supply terminal
Operating voltage	8-36VDC
Switching current	500mA (suppresion diodes required for inductive loads)

Analog inputs

Number of analog inputs	3
Galvanic insulation	Not insulated
Electrical range	0-2500ohm
Resolution	10bits, 4digits
Supported sensor types	Predefined: VDO 10Bar, VDO Temperature, VDO Fuel level User defined: 10 points non-linear sensors can be defined by the user
Precision	1% from the range

Generator/Mains measurements

Measurement inputs	3ph generator voltage, 3ph generator current, 3ph mains voltage
Measurement type	True RMS
Voltage range	480V Ph-Ph (277V Ph-N)
Max. measured voltage	340V Ph-N
Voltage accuracy	1% from the range
Current range	5A
Max. measured current	9A
Max. allowed current	12A continous, 50A/1s
Current accuracy	2% from the range
CT input burden	<0.5VA
Frequency range	30-70Hz, measured from L3

Frequency accuracy	0.05Hz

Pickup input

Input voltage	2 - 70V_{pp}
Frequency range	4Hz-10kHz (min 2V_{pp}@4kHz, 6V_{pp}@10kHz)
Accuracy	0.2%

Charging alternator preexcitation circuit

Excitation current	200mA, during the engine start only
Charging fail threshold	80% of U_{supply}

AVR output

Output type	5V PWM, designed for IG-AVRi interface module
Galvanic insultation	Not insulated, insulation is provided by IG-AVRi module

Governor output

Output type	0-10V analog or 5V@500Hz PWM, selectable by jumper. Serial resistor 10kOhm shortable by jumper
Galvanic insulation	Not insulated

Remote communication interface

RS232	Optional using the plug-in module IL-NT RS232, D-SUB9M socket
RS485	Optional using the plug-in module IL-NT RS232-485, plug-in terminal block
Baud rate	Depending on selected mode (up to 57600 bps)
USB	Optional using the plug-in module IL-NT S-USB
Ethernet	Optional using the plug-in module IB-Lite

Extesion modules interface

Type	CAN bus
Galvanic insulation	Insulated, 500V
Baud rate	250kbps
Bus length	max. 200m
Termination resistor	120Ohm, built-in, jumper activated

Interface to other controllers

Type	CAN bus, available in MINT type only
Galvanic insulation	Insulated, 500V
Baud rate	250kbps
Bus length	max. 200m
Termination resistor	120 Ohm, built-in, jumper activated

Recommended CAN cables

- Belden 3082A DeviceBus for Allen-Bradley DeviceNet
- Belden 3083A DeviceBus for Allen-Bradley DeviceNet
- Belden 3084A DeviceBus for Allen-Bradley DeviceNet
- Belden 3085A DeviceBus for Allen-Bradley DeviceNet
- Belden 3086A DeviceBus for Honneywell SDS
- Belden 3087A DeviceBus for Honneywell SDS
- Lapp Cable Unitronic Bus DeviceNet Trunk Cable
- Lapp Cable Unitronic Bus DeviceNet Drop Cable
- Lapp Cable Unitronic Bus CAN
- Lapp Cable Unitronic-FD Bus P CAN UL/CSA

Language support

The controller contains memory slots for 2 languages. There are English and Chinese in default archives. The languages can be changed from LiteEdit software using dictionaries. There are two types of dictionaries:

- **Default dictionaries** are distributed together with the controller firmware.
- **Custom dictionaries** are created by the user during the translation process.

The custom dictionary is used for storing of translations that were made by the user because there was no default dictionary for the particular language, the default dictionary was incomplete or the user just wants to have different translations. For more information about languages and translations see the LiteEdit help.

It is possible to create any language, which uses a code page that is supported by the controller:

- Win 1250 - Middle Europe
- Win 1251 - Eastern Europe (Cyrilic)
- Win 1252 - Western Europe, America
- Win 1254 - Turkish
- GB2312 - Chinese

NOTE:
See the Operator guide for information how to select controller front panel language.

Appendix

Table of setpoints

Group: Process Control

Setpoint: Baseload

Group	Process Control
Range [units]	0 … *Nominal power* [kW]
Related applications	SPtM
Description	Required gen-set load in parallel to mains operation.

Setpoint: Base PF

Group	Process Control
Range [units]	0.7 ... 1.0 [-]
Related applications	SPtM
Description	Required gen-set power factor when the gen-set is running parallel to the mains.

Setpoint: AMFStartEnable

Group	Process Control
Range [units]	NO, YES [-]
Related applications	SPtM
Description	Use this setpoint to enable or disable the AMF operation.

Setpoint: Export Limit

Group	ProcessControl
Range [units]	DISABLED, ENABLED [-]
Related applications	SPtM
Description	Tells controller to activate protection against power export to the Mains. The function limits gen-set requested power to hold export power lower or equal to the setpoint *Export kW*.

Setpoint: Export kW

Group	ProcessControl
Range [units]	-32000 … 32000 [kW]
Related applications	SPtM
Description	It defines max limit for export / import in case *Export Limit* setpoint is set as ENABLED. Negative value means import limit, positive value export limit, zero means no export/import.

Setpoint: #SysLdCtrl PtM

Group	Process Control
Range [units]	BASELOAD, LDSHARING [-]
Related applications	MINT
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 setpoint *#SysBaseLoad*. 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, loadsharing is not active. The setpoint *#Sys base load* is also used for determining which gen-sets have to run or not. LDSHARING: Gen-sets load is controlled by MainsCompact controller to share the total load (given by the setpoint *#SysBaseLoad*) 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). *Loadsharing* regulation loop is active. **NOTE:** The LOADSHARING mode shall be used in case a MainsCompact controller is present in the system. In systems without MainsCompact the setpoint must be in BASELOAD position. **NOTE:** The power factor (PF) is regulated to constant level given by setpoint *#SysPwrFactor* in parallel to mains operation and does not depend on active load control mode.

Setpoint: #SysBaseLoad

Group	Process Control
Range [units]	0 ... 4000 [kW]
Related applications	MINT
Description	Required total load of the gen-set group in parallel to mains operation in baseload mode (setpoint *#SysLdCtrl PtM* = BASELOAD).

Setpoint: #SysPwrFactor

Group	Process Control
Range [units]	0.7 ... 1.0 [-]
Related applications	MINT
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.

Setpoint: Synchro Enable

Group	ProcessControl
Range [units]	NONE, FORWARD, REVERSE, BOTH [-]
Related applications	All
Description	It enables or disables forward/reverse synchronization (according to SPtM / MINT versions). NONE – No synchronizing is enabled. (SPtM and MINT) FORWARD – GCB synchronizing is enabled. (SPtM and MINT) REVERSE – MCB synchronizing is enabled. (SPtM) BOTH – GCB and MCB synchronizing are enabled. (SPtM)

Setpoint: PeakLevelStart

Group	Process Control
Range [units]	PeakLevelStop ... 32000 [kW]
Related applications	SPtM
Description	Load consumption level the gen-set has to start at. Function is inactive when *PeakAutS/S Del* = OFF. Genset start is “PeakAutS/S Del” delayed after the consumption of the Load exceeds the PeakLevelStart limit. **NOTE:** The actual setpoint units and range depend on setting of the Power format (see LiteEdit manual).

Setpoint: PeakLevelStop

Group	Process Control
Range [units]	0 ... PeakLevelStart [kW]
Related applications	SPtM
Description	Load consumption level the gen-set has to stop at. Genset stop is "*PeakAutS/S Del*" delayed after PeakLevelStop limit is reached. Load consumption is calculated (not directly measured) as a sum of gen-set and mains active power. **NOTE:** The actual setpoint units and range depend on setting of the Power format (see LiteEdit manual).

Setpoint: PeakAutS/S del

Group	Process Control
Range [units]	0(OFF) ... 600 [s]
Related applications	SPtM
Description	The condition for the "peak" automatic start or stop must be valid for time period longer than value of this setpoint to execute the automatic start or stop. Adjusting of "0" causes stop of the gen-set (if there is no other demand for running) and disables the automatic start.

Group: Basic Settings

Setpoint: ControllerName

Group	Basic Settings
Range [units]	[-]
Related applications	All
Description	User-defined name, used for controller identification at remote connections. The name is max 15 characters long and has to be entered using LiteEdit. **NOTE:** The setpoint can't be changed from the front panel of the controller.

Setpoint: Nominal Power

Group	Basic Settings
Range [units]	1 ... 32000 [kW]
Related applications	All
Description	Nominal power of the gen-set. *Generator overload* protection is based on this setpoint.

Setpoint: Nomin Current

Group	Basic Settings
Range [units]	1 ... 10000 [A]
Related applications	All
Description	This is the current limit for the generator. *Generator short current* and *generator overcurrent* alarms are based on this setpoint.

Setpoint: CT Ratio

Group	Basic Settings
Range [units]	1 ... 10000 [A/5A]
Related applications	All
Description	Gen-set current transformers ratio.

Setpoint: EF CT Ratio

Group	Basic Settings
Range [units]	1 ... 10000 [/5A]
Related applications	MINT
Description	Defines current transformer ratio for current measuring input of IC-NT CT-BIO7 extension module if used.

Setpoint: Im/EF CT Ratio

Group	Basic Settings
Range [units]	1 ... 10000 [/5A]
Related applications	SPtM
Description	Defines mains current transformer ratio for current measuring input of IC-NT CT-BIO7 extension module if used.

Setpoint: Im/EF input

Group	Basic Settings
Range [units]	Mains, EarthFltC [-]
Related applications	SPtM
Description	This setpoint is relevant only in case IC-NT CT-BIO7 module is used. Then it is used for switching between Mains current measurement and Earth Fault Current protection depending on purpose of IC-NT CT-BIO7 usage.

Setpoint: Nominal Volts

Group	Basic Settings
Range [units]	80 ... 20000 [V]
Related applications	All
Description	Nominal system voltage (phase to neutral)

Setpoint: PT Ratio

Group	Basic Settings
Range [units]	0.1 ... 500 [V/V]
Related applications	All
Description	Generator voltage potential transformers ratio. If no PTs are used, adjust the setpoint to 1.

Setpoint: Vm PT Ratio

Group	Basic Settings
Range [units]	0.1 ... 500 [V/V]
Related applications	All
Description	Mains voltage potential transformers ratio. If no PTs are used, adjust the setpoint to 1.

Setpoint: Nominal Freq

Group	Basic Settings
Range [units]	45 ... 65 [Hz]
Related applications	All
Description	Nominal system frequency (usually 50 or 60 Hz).

Setpoint: Nominal RPM

Group	Basic Settings
Range [units]	100 ... 4000 [RPM]
Related applications	All
Description	Nominal engine speed.

Setpoint: Gear Teeth

Group	Basic Settings
Range [units]	0 ... 500 [-]
Related applications	All
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.

Setpoint: ControllerMode

Group	Basic Settings
Range [units]	OFF, MAN, AUT, (TEST) [-]
Related applications	All
Description	This setpoint can be used for changing of the operating 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 LiteEdit.

Setpoint: Reset To MAN

Group	Basic Settings
Range [units]	DISABLED, ENABLED [-]
Related applications	All
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 is pressed. This is a safety function that avoids the gen-set to start automatically again if the gen-set is stopped due to a red alarm, the alarm is no more active and fault reset is pressed.

Group: Comms Settings

Setpoint: ControllerAddr

Group	Comms Settings
Range [units]	1 ... 32(8) [-]
Related applications	All
Description	**Unique** identification number of a controller within a group of controllers which are connected together via CAN2 bus (MINT, MC) or RS485 bus (SPtM). **NOTE:** Adjust the controller address to 1, if you have SPtM application and no other controllers are connected to the RS485 bus. **NOTE:** Do not use the same address for more controllers in the same group! **NOTE:** Use proper address when connecting to the controller from LiteEdit. **NOTE:** Changing the address remotely (e.g. from LiteEdit) will cause connection loss!

Setpoint: COM1 Mode

Group	Comms Settings
Range [units]	DIRECT, MODEM, MODBUS, ECU LINK [-]
Related applications	All
Description	Communication protocol switch for the COM1 channel. • DIRECT: LiteEdit communication protocol via direct cable. • MODEM: LiteEdit communication protocol via modem. • MODBUS: Modbus protocol. See detailed description in separate chapter. • ECU LINK: Protocol for communication with EFI engines via Modbus.

Setpoint: COM2 Mode

Group	Comms Settings
Range [units]	DIRECT, MODBUS, ECU LINK [-]
Related applications	All
Description	Communication protocol switch for the COM2 channel. • DIRECT: LiteEdit communication protocol via direct cable. • MODBUS: Modbus protocol. See detailed description in separate chapter. • ECU LINK: Protocol for communication with EFI engines via Modbus.

Setpoint: ModemIniString

Group	Comms Settings
Range [units]	[-]
Related applications	All
Description	If your modem needs some additional initialzation AT commands (i.e. because of national telephony network differencies), it can be entered here. Otherwise leave this setpoint blank.

Setpoint: ModbusComSpeed

Group	Comms Settings
Range [units]	9600, 19200, 38400, 57600 [bps]
Related applications	All
Description	If the Modbus mode is selected on COM1 or COM2 channels, the Modbus communication speed can be adjusted here.

Setpoint: CAN Bus Mode

Group	Comms Settings
Range [units]	32C, 8C [-]
Related applications	MINT
Description	CAN bus speed selection. • 32C: High speed CAN (250 kbps) applicable up to 32 controllers, CAN bus length limited up to 200 meters. • 8C: Low speed CAN (50 kbps) applicable up to 8 controllers, CAN bus length limited up to 900 meters. **NOTE:** Use low speed for long distance connection only. Set all connected controllers to the same speed.

Setpoint: IBLite IP Addr

Group	Comms Settings
Range [units]	[-]
Related applications	All
Description	If DHCP is DISABLED 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 DHCP is ENABLED this setpoint is used to display the IP address, which has been assigned by the DHCP server.

Setpoint: IBLite NetMask

Group	Comms Settings
Range [units]	[-]
Related applications	All
Description	If DHCP is DISABLED 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 DHCP is ENABLED this setpoint is used to display the IP address, which has been assigned by the DHCP server.

Setpoint: IBLite GateIP

Group	Comms Settings
Range [units]	[-]
Related applications	All
Description	If DHCP is DISABLED this setpoint is used to adjust the IP address of the gateway of the network segment where the controller is connected. If DHCP is ENABLED this setpoint is used to display the gateway IP address which has been assigned by the DHCP server. A gateway is a device which connects the respective segment with the other segments and/or Internet.

Setpoint: IBLite DHCP

Group	Comms Settings
Range [units]	ENABLED, DISABLED [-]
Related applications	All
Description	The setpoint is used to select the method how the ethernet connection is adjusted. DISABLED: The ethernet connection is adjusted fixedly according to the setpoints *IP Addr*, *NetMask*, *GateIP*, *DNS IP Address*. This method should be used for classic ethernet or Internet connection. When this type of connection is opening the controller is specified by it's IP address. That means it would be inconvenient if the IP address were not fixed (static). ENABLED: The ethernet connection settings is obtained **automatically from the DHCP server.** The obtained settings is then copied to the related setpoints. If the process of obtaining the settings from DHCP server is not successful the value *000.000.000.000* is copied to the setpoint *IP address* and the module continues trying to obtain the settings.

Setpoint: ComAp Port

Group	Comms Settings
Range [units]	0 ... 65535 [-]
Related applications	All
Description	This setpoint is used to adjust the port number, which is used for ethernet connection to a PC with any of ComAp PC program (i.e. LiteEdit, InteliMonitor). This setpoint should be adjusted to 23, which is the default port used by all ComAp PC programs. A different value should be used only in special situations as e.g. sharing one public IP address among many controllers or to overcome firewall restrictions.

Setpoint: APN Name

Group	Comms Settings
Range [units]	[-]
Related applications	All
Description	Name of APN access point for GPRS network provided by GSM/GPRS operator.

Setpoint: APN UserName

Group	Comms Settings
Range [units]	[-]
Related applications	All
Description	User name for APN access point provided by GSM/GPRS operator.

Setpoint: APN UserPass

Group	Comms Settings
Range [units]	[-]
Related applications	All
Description	User password for APN access point provided by GSM/GPRS operator.

Setpoint: AirGate

Group	Comms Settings
Range [units]	DISABLED / ENABLED [-]
Related applications	All
Description	This setpoint selects the ethernet 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 him. 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 uses the "AirGate" service, which hides all the issues with static/public address into a black box and you do not need to take care about it. You just need only a connection to the Internet. The AirGate server address is adjusted by the setpoint *AirGate IP*.

Setpoint: AirGate IP

Group	Comms Settings
Range [units]	[-]
Related applications	All
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 address airgate.comap.cz if your company does not operate it's own AirGate server.

Setpoint: SMTP UserName

Group	Comms Settings
Range [units]	[-]
Related applications	All
Description	Use this setpoint to enter the user name for the SMTP server.

Setpoint: SMTP UserPass

Group	Comms Settings
Range [units]	[-]
Related applications	All
Description	Use this setpoint to enter the password for the SMTP server.

Setpoint: SMTP Server IP

Group	Comms Settings
Range [units]	[-]
Related applications	All
Description	This setpoint is used for entering the domain name (e.g. smtp.yourprovider.com) or IP address (e.g. 74.125.39.109) of the SMTP server. Please ask your internet provider or IT manager for this information. ***HINT:*** You may also use one of free SMTP servers, e.g. smtp.gmail.com. However, please note that some free SMTP servers may cause delays (in hours...) when sending e-mails. If you do not want to send active e-mails, you may leave this setpoint blank, as well as other setpoints related to SMTP server and e-mail settings. Proper setting of SMTP-related setpoints as well as controller mailbox are essential for sending alerts via e-mails

Setpoint: Contr MailBox

Group	Comms Settings
Range [units]	[-]
Related applications	All
Description	Enter an existing e-mail address into this setpoint. This address will be used as sender address in active e-mails that will be sent from the controller.

Setpoint: Time Zone

Group	Comms Settings
Range [units]	GMT -12:00 … GMT +13:00 [-]
Related applications	All
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 the windows task bar) if you are not sure about your time zone. **HINT:** 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 occured.

Setpoint: DNS IP Address

Group	Comms Settings
Range [units]	[-]
Related applications	All
Description	If DHCP is DISABLED this setpoint is used to adjust the domain name server (DNS), which is needed to traslate domain names in e-mail addresses and server names into correct IP addresses. If DHCP is ENABLED this setpoint is used to display DNS server, which has been assigned by the DHCP server.

Group: Engine Params

Setpoint: Starting RPM

Group	Engine Params
Range [units]	5 ... 50 [%]
Related applications	All
Description	This setpoint defines "firing" speed level as percent value of the nominal speed. If this level is exceeded the engine is considered as started. More information is available in the Engine start chapter.

Setpoint: Start W Freq

Group	Engine Params
Range [units]	0 … 2000 [Hz]
Related applications	All
Description	This setpoint defines starter cutoff frequency, if the engine speed is measured from the generator frequency and the “W” terminal from the charging alternator is connected to the pickup input. More information is available in the Speed measurement chapter. **NOTE:** This setpoint takes place only if the setpoint *Gear Teeth* is adjusted to zero.

Setpoint: Starting Oil P

Group	Engine Params
Range [units]	Configuration dependent [Configuration dependent]
Related applications	All
Description	The controller will stop cranking (starter goes OFF) if the oil pressure rises above this limit. See description of the start procedure in separate chapter. **NOTE:** If an EFI engine is used, the oil pressure is read from it's ECU. In case of traditional engine the analog input 1 is fixedly configured for oil pressure measurement.

Setpoint: Prestart Time

Group	Engine Params
Range [units]	0 ... 600 [s]
Related applications	All
Description	Duration of closing of the *Prestart* output prior the starter motor is energized. Set to zero to disable this function.

Setpoint: MaxCrank Time

Group	Engine Params
Range [units]	1 ... 255 [s]
Related applications	All
Description	Maximum duration the starter motor is energized.

Setpoint: CrnkFail Pause

Group	Engine Params
Range [units]	5 ... 60 [s]
Related applications	All
Description	Pause between crank attempts.

Setpoint: Crank Attempts

Group	Engine Params
Range [units]	1 ... 10 [-]
Related applications	All
Description	Max. number of crank attempts. **NOTE:** If the last attempt is not successful, the alarm *Start fail* is issued.

Setpoint: Idle Time

Group	Engine Params
Range [units]	0 ... 600 [s]
Related applications	All
Description	This setpoint determines the duration of Idle period, which begins after the engine is started. The output *Idle/Nominal* remains inactive during the idle period. This output can be used for switching the governor between idle and nominal speed.

Setpoint: Min Stab Time

Group	Engine Params
Range [units]	1 ... *Max Stab Time* [s]
Related applications	All
Description	When the gen-set has been started and the idle timer has elapsed, the controller will wait a time period, which is adjusted by this setpoint, before closing GCB or starting of synchronizing even if generator voltage and frequency are already in limits.

Setpoint: Max Stab Time

Group	Engine Params
Range [units]	*Min Stab Time* … 300 [s]
Related applications	All
Description	When the gen-set has been started and the idle timer has elapsed, the generator voltage and frequency must get into limits within this period of time, otherwise an appropriate red alarm (generator voltage and/or frequency) is issued.

Setpoint: Cooling Speed

Group	Engine Params
Range [units]	IDLE, NOMINAL
Related applications	All
Description	This setpoint selects whether the cooling phase is performed at idle or nominal speed.

Setpoint: Cooling Time

Group	Engine Params
Range [units]	0 ... 3600 [s]
Related applications	All
Description	Duration of the gen-set is running unloaded to cool the engine down before stop.

Setpoint: Stop Time

Group	Engine Params
Range [units]	0 ... 240 [s]
Related applications	All
Description	Under normal conditions the engine must certainly stop within this period after the *fuel solenoid* has been deenergized and *stop solenoid* energized. The stop solenoid remains energized for the whole stop time period. **NOTE:** See the chapter Cooldown and stop for detailed info about stop procedure.

Setpoint: SDVentil Time

Group	Engine Params
Range [units]	0 ... 60 [s]
Related applications	All
Description	In case Fuel Solenoid is set to GAS, the *SDVentilTime* adjusts time of starter to be switched on for engine pre-ventilation in case of first start attempt after shutdown or controller switch-on.

Setpoint: Fuel Solenoid

Group	Engine Params
Range [units]	DIESEL, GAS [-]
Related applications	All
Description	This setpoint selects type of start-up sequence according to engine fuel type. See details in chapter Engine start.

Setpoint: D+ Function

Group	Engine Params
Range [units]	ENABLED, CHRGFAIL, DISABLED [-]
Related applications	All
Description	ENABLED: The D+ terminal is used for both functions – “running engine” detection and *charge fail* alarm detection. CHRGFAIL: The D+ terminal is used for charge fail alarm detection only DISABLED: The D+ terminal is not used. **NOTE:** The magnetization current is provided independently on this setpoint value.

Setpoint: ECU FreqSelect

Group	Engine Params
Range [units]	PRIMARY, SECONDARY, DEFAULT [-]
Related applications	All
Description	This setpoint is used for switching the ECU to nominal speed of 1500 or 1800RPM. **VOLVO EMSII (GE engines)** The nominal speed is selected via the VP Status proprietary frame, parameter "Frequency select". **SCANIA EMS/S6** The nominal speed is selected via parameters "Nominal speed switch 1" and "Nominal speed switch 2" in the DLN1 proprietary frame.

Group: Engine Protect

Setpoint: Horn Timeout

Group	Engine Protect
Range [units]	0 ... 600 [s]
Related applications	All
Description	Maximum time the *Horn* output is active. The horn activates always when a new alarm occurs and can be silenced earlier by pressing HORN RESET button. Acknowledging alarms by pressing FAULT RESET will silence the horn as well. If a new alarm appears, the timeout starts to count down again from the beginning even the previous countdown has still not elapsed.Adjust this setpoint to zero if you want to disable the horn completely.

Setpoint: ProtectHoldOff

Group	Engine Protect
Range [units]	0 ... 300 [s]
Related applications	All
Description	Use this setpoint to adjust the delay starting evaluation of *engine running only* alarms. The delay starts to count down in the moment of transition from starting phase to the idle phase.

Setpoint: Overspeed Sd

Group	Engine Protect
Range [units]	100 … 150 [%]
Related applications	All
Description	Threshold for *overspeed* protection. Relative to the nominal speed.

Setpoint: Batt Overvolt

Group	Engine Protect
Range [units]	*Batt Undervolt* ... 36 [V]
Related applications	All
Description	Warning threshold for *high battery voltage* alarm.

Setpoint: Batt Undervolt

Group	Engine Protect
Range [units]	8 ... *Batt Overvolt* [V]
Related applications	All
Description	Warning threshold for *low battery voltage* alarm.

Setpoint: Batt Volt Del

Group	Engine Protect
Range [units]	0 ... 600 [s]
Related applications	All
Description	Delay for *low battery voltage* alarm.

Setpoint: AI1 Yel

Group	Engine Protect
Range [units]	Limits and units depend on analog input configuration
Related applications	All
Description	Threshold for the yellow alarm configured to the analog input 1.

Setpoint: AI1 Red

Group	Engine Protect
Range [units]	Limits and units depend on analog input configuration
Related applications	All
Description	Threshold for the red alarm configured to the analog input 1.

Setpoint: AI1 Del

Group	Engine Protect
Range [units]	0 ... 180 [s]
Related applications	All
Description	Delay of the alarms configured to the analog input 1.

Setpoint: AI2 Yel

Group	Engine Protect
Range [units]	Limits and units depend on analog input configuration
Related applications	All
Description	Threshold for the yellow alarm configured to the analog input 2.

Setpoint: AI2 Red

Group	Engine Protect
Range [units]	Limits and units depend on analog input configuration
Related applications	All
Description	Threshold for the red alarm configured to the analog input 2.

Setpoint: AI2 Del

Group	Engine Protect
Range [units]	0 ... 180 [s]
Related applications	All
Description	Delay of the alarms configured to the analog input 2.

Setpoint: AI3 Yel

Group	Engine Protect
Range [units]	Limits and units depend on analog input configuration
Related applications	All
Description	Threshold for the yellow alarm configured to the analog input 3.

Setpoint: AI3 Red

Group	Engine Protect
Range [units]	Limits and units depend on analog input configuration
Related applications	All
Description	Threshold for the red alarm configured to the analog input 3.

Setpoint: AI3 Del

Group	Engine Protect
Range [units]	0 ... 180 [s]
Related applications	All
Description	Delay of the alarms configured to the analog input 3.

Setpoint: WrnMaintenance

Group	Engine Protect
Range [units]	0 ... 10000 [h]
Related applications	All
Description	Adjust this setpoint to the requested next maintenance interval. The value will count down when engine is running and if reaches zero, an alarm *Maintenance timer* will appear. This timer is also available in the value group Statistics, but it can not be modified there. In case WrnMaintenance set to 10000h the timer is disabled and not visible on controller display.

Group: Gener Protect

Setpoint: Overload BOC

Group	Gener Protect
Range [units]	100 ... 200 [%]
Related applications	All
Description	Limit for the *generator overload* alarm in % of the nominal power. The delay of this alarm is adjustable by setpoint *Overload Del*.

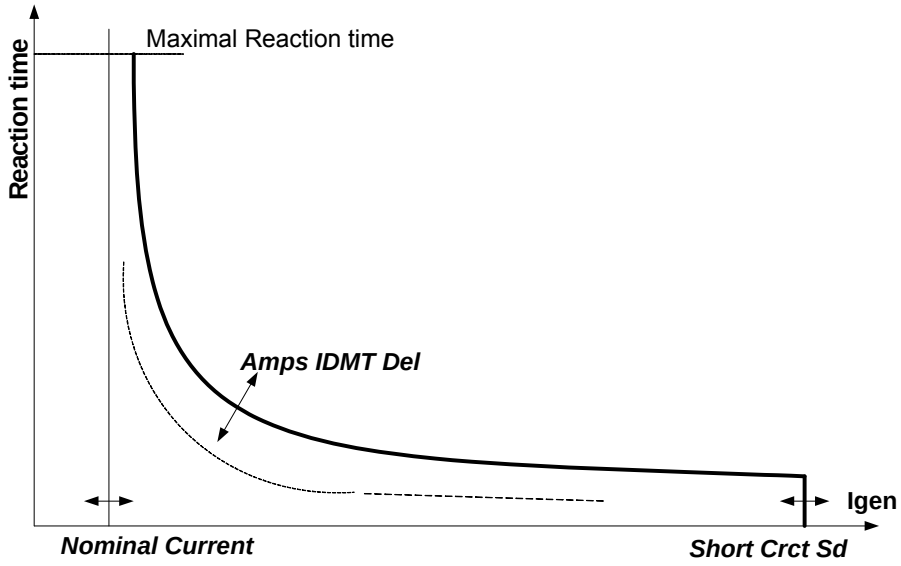
Setpoint: Overload Del

Group	Gener Protect
Range [units]	0 ... 600.0 [s]
Related applications	All
Description	Delay for the generator overload alarm. The limit for this alarm is adjustable by setpoint *Overload BOC*.

Setpoint: Amps IDMT Del

Group	Gener Protect
Range [units]	1 ... 600 [s]
Related applications	All
Description	IDMT curve shape selection. *Amps IDMT Del* is Reaction time of IDMT protection for 200% overcurrent $I_{gen} = 2 \cdot [Nomin\ Current]$. IDMT is “very inverse” generator over current protection. Reaction time is not constant but dpends on generator over current level accordint to following formula: $"\ Reaction\ \ time" = \frac{"\ Amps\ IDMT\ \ Del" \cdot "\ Nomin\ Current"}{I_{gen} - "\ Nomin\ Current"}$ ***HINT:*** Reaction time is limited up to 3600 sec = 60 minutes. IDMT protection is not active for Reaction time values longer than 60 minutes. Igen is maximal value of all measured phases of generator current.
Example	Example of Reaction time for different over current levels. Values in column 200% are *IDMT Curr Del.*

	Overcurrent			
	200 % = **IDMT Curr Del**	≤ 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	No action (time > 3600 s)	200 s



Setpoint: Short Crct BOC

Group	Gener Protect
Range [units]	100 ... 500 [%]
Related applications	All
Description	Limit for the *generator short circuit* alarm. The delay of this alarm is adjustable by setpoint *Short Crct Del*.

Setpoint: Short Crct Del

Group	Gener Protect
Range [units]	0 ... 10.00 [s]
Related applications	All
Description	Delay for the generator short circuit alarm. The limit for this alarm is adjustable by setpoint *Short Crct BOC*.

Setpoint: Amps Unbal BOC

Group	Gener Protect
Range [units]	1 ... 200 [%]
Related applications	All
Description	Threshold for generator *current unbalance alarm*, relative to the nominal current (setpoint *Nomin Current*).

Setpoint: Amps Unbal Del

Group	Gener Protect
Range [units]	0 ... 600.0 [s]
Related applications	All
Description	Delay for generator *current unbalance alarm*.

Setpoint: EarthFault Sd

Group	Gener Protect
Range [units]	1 ... 10000 [A]
Related applications	All
Description	Limit value for Earth Fault Current protection.

Setpoint: EarthFault Del

Group	Gener Protect
Range [units]	0.1 ... 600.0 [s]
Related applications	All
Description	Delay for Earth Fault Current protection.

Setpoint: Gen >V Sd

Group	Gener Protect
Range [units]	*Gen <V BOC* … 200 [%]
Related applications	All
Description	Threshold for generator *overvoltage alarm*, relative to the nominal voltage (setpoint *Nominal Volts*).

Setpoint: Gen <V BOC

Group	Gener Protect
Range [units]	0 ... *Gen >V Sd* [%]
Related applications	All
Description	Threshold for generator *undervoltage alarm*, relative to the nominal voltage (setpoint *Nominal Volts*).

Setpoint: Gen V Del

Group	Gener Protect
Range [units]	0 ... 600.0 [s]
Related applications	All
Description	Delay for generator *undervoltage and overvoltage alarm*.

Setpoint: Volt Unbal BOC

Group	Gener Protect
Range [units]	1 ... 200 [%]
Related applications	All
Description	Threshold for generator *voltage unbalance alarm*, relative to the nominal voltage (setpoint *Nominal Volts*).

Setpoint: Volt Unbal Del

Group	Gener Protect
Range [units]	0 ... 600.0 [s]
Related applications	All
Description	Delay for generator *voltage unbalance alarm*.

Setpoint: Gen >Freq BOC

Group	Gener Protect
Range [units]	*Gen <Freq BOC* ... 200 [%]
Related applications	All
Description	Threshold for generator *overfrequency alarm*, relative to the nominal frequency (setpoint *Nominal Freq*).

Setpoint: Gen <Freq BOC

Group	Gener Protect
Range [units]	50 ... *Gen >Freq BOC* [%]
Related applications	All
Description	Threshold for generator *underfrequency alarm*, relative to the nominal frequency (setpoint *Nominal Freq*).

Setpoint: Gen Freq Del

Group	Gener Protect
Range [units]	0 ... 600.0 [s]
Related applications	All
Description	Delay for generator *underfrequency and overfrequency alarm*.

Setpoint: Reverse Pwr BOC

Group	Gener Protect
Range [units]	1 ... 50 [%]
Related applications	All
Description	Threshold for generator *reverse power alarm*, relative to the nominal power (setpoint *Nominal Power*).

Setpoint: Reverse Pwr Del

Group	Gener Protect
Range [units]	0 ... 600.0 [s]
Related applications	All
Description	Delay for generator *reverse power alarm*.

Setpoint: ExcitationLoss

Group	Gener Protect
Range [units]	-32000 ... 0 [kVAr]
Related applications	All
Description	Loss of excitation is based on measurement of negative kVAr and it is BOC type protection.

Setpoint: ExctLoss Del

Group	Gener Protect
Range [units]	0 ... 600 [s]
Related applications	All
Description	Delay for Loss of excitation evaluation.

Group: Pwr Management

Setpoint: Pwr Management

Group	Pwr Management
Range [units]	DISABLED, ENABLED [-]
Related applications	MINT
Description	The setpoint enables and disables the gen-set to be active within the power management of the group and make automatic load dependent starts and stops. If the power management is disabled the gen-set will run or not depending only on the binary input *Sys Start/Stop* and the start and stop will not depend on the load of the group.

Setpoint: Pwr Manag Del

Group	Power Management
Range [units]	0 … 3600 [s]
Related applications	MINT
Description	Delay of the Power management. When Sys Start/Stop signal is activated and the gen-sets should start first all the engines (where Power Management is enabled) are started and stays running for time period specified by this parameter, after this period elapses only the gen-set(s) needed according the Power Management calculation (i.e. SystReserve OK = 1) stay running and the rest is stopped.

Setpoint: #PowerMgmtMode

Group	Power Management
Range [units]	ABS(kW), REL(%) ... [-]
Related applications	MINT
Description	Use this setpoint to select whether the power management has to be based on absolute reserve (in kW) or relative (in %).

Setpoint: Priority

Group	Pwr Management
Range [units]	1 ... 32 [-]
Related applications	MINT
Description	This setpoint adjusts priority of the gen-set within the group. Lower number represents "higher" priority, i.e. a gen-set with lower number will start before another one with higher number. If the binary input *Top Priority* is active the gen-set gets highest priority (0) independently on the sepoint setting. **NOTE:** If more than one gen-set have the same priority they will act as "one big" gen-set.

Setpoint: #SysAMFStrtDel

Group	Power Management
Range [units]	0 ... 600 [s]
Related applications	MINT
Description	This setpoint adjusts the delay of the system activation after the binary input *Sys Start/Stop* has been activated. This delay is typically used as "AMF start delay", similarly as the setpoint *EmergStart Del* in SPtM, on multiple AMF applications without MainsCompact. See MINT basic schemes.

Setpoint: #SysAMFStopDel

Group	Power Management
Range [units]	0 ... 600 [s]
Related applications	MINT
Description	This setpoint adjusts the delay of the system deactivation after the binary input *Sys Start/Stop* has been deactivated. This delay is typically used as "Mains return delay", similarly as the setpoint *MainsReturnDel* in SPtM, on multiple AMF applications without MainsCompact. See MINT basic schemes.

Setpoint: #LoadResStrt 1

Group	Power Management
Range [units]	-32000 ... *LoadResStop 1* [kW%]
Related applications	MINT
Description	This setpoint adjusts the reserve for start if the set 1 of reserves is selected, i.e. binary input *Load Reserve 2* is not active. See the power management description to learn more about reserves.

Setpoint: #LoadResStop 1

Group	Power Management
Range [units]	*LoadResStrt 1* ... 32000 [kW%]
Related applications	MINT
Description	This setpoint adjusts the reserve for stop if the set 1 of reserves is selected, i.e. binary input *Load Reserve 2* is not active. See the power management description to learn more about reserves.

Setpoint: #LoadResStrt 2

Group	Power Management
Range [units]	-32000 ... *LoadResStop 2* [kW%]
Related applications	MINT
Description	This setpoint adjusts the reserve for start if the set 2 of reserves is selected, i.e. binary input *Load Reserve 2* is active. See the power management description to learn more about reserves.

Setpoint: #LoadResStop 2

Group	Power Management
Range [units]	*LoadResStrt 2* ... 32000 [kW%]
Related applications	MINT
Description	This setpoint adjusts the reserve for stop if the set 2 of reserves is selected, i.e. binary input *Load Reserve 2* is active. See the power management description to learn more about reserves.

Setpoint: #MinRun Power

Group	Power Management
Range [units]	0 ... 65000 [kW]
Related applications	MINT
Description	Adjusting nonzero value to this setpoint and activating the binary input *Min Run Power* it is possible to keep the number of running gen-sets so that the total nominal power of the loaded gen-sets will never drop below this level even if the reserve for stop is fulfiled.

Setpoint: #NextStrt Del

Group	Power Management
Range [units]	0 ... 3600 [s]
Related applications	MINT
Description	This setpoint adjusts the delay for starting the next gen-set after the reserve has dropped below the reserve for start.

Setpoint: #OverldNextDel

Group	Power Management
Range [units]	0 ... 3600 [s]
Related applications	MINT
Description	This setpoint adjusts the delay for starting the next gen-set after the reserve has dropped below zero, i.e. the system is overloaded. **NOTE:** Adjust this setpoint as short as possible to avoid system shutdown due to overload caused by too fast load rising.

Setpoint: #NextStopDel

Group	Power Management
Range [units]	0 ... 3600 [s]
Related applications	MINT
Description	This setpoint adjusts the delay for stopping the gen-set after the reserve has raised above the reserve for stop.

Setpoint: #SlowStopDel

Group	Power Management
Range [units]	0 ... 600 [s]
Related applications	MINT
Description	If a *slow stop* red alarm occurs, the affected gen-set will send an information to other gen-sets, that it is no more available, but will remain loaded until next gen-set starts and connects to the bus. This setpoint adjusts maximum time the affected gen-set will wait for start of another one. After this period it will perform the slow stop regardless to other gen-sets.

Setpoint: RunHoursBase

Group	Power Management
Range [units]	0 ... 200000 [h]
Related applications	MINT
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 *RunHourBase* for Gen-set 1 = 1000 h and *RunHourBase* for Gen-set 2 = 2000 h to be on the same base for Running Hours Equalization.

Setpoint: #RunHrsMaxDiff

Group	Power Management
Range [units]	0 … 65000 [h]
Related applications	MINT
Description	Maximum allowed Running hours difference between gen-sets. Running Hours Equalization is only active when: *PwrManagement* = ENABLED BI Sys Start/Stop = CLOSED *#RunHrsMaxDiff* is not set to 65000 (this value DISABLES Running Hours Equalization function) When running gen-set reaches *#RunHrsMaxDiff* value its Priority is automatically swapped with lowest priority gen-set that takes part in Running Hours Equalization.

Group: AMF Settings

Setpoint: EmergStart Del

Group	AMF Settings
Range [units]	0 ... 600 [s]
Related applications	SPtM
Description	Delay between the mains failure and the automatic start of the gen-set to an AMF operation. See more in the AMF operation chapter.

Setpoint: MainsReturnDel

Group	AMF Settings
Range [units]	1 … 3600 [s]
Related applications	SPtM
Description	This is a "mains stabilization" time. If the mains is continuously healthy for this period after it has returned, the controller will finish the AMF operation (e.g. by reverse synchronization or a switchover). See more in the AMF operation chapter.

Setpoint: Mains >V

Group	AMF Settings
Range [units]	*Mains <V* ... 150 [%]
Related applications	SPtM
Description	Threshold for detection of mains failure due to overvoltage. The setpoint is adjusted relative to the generator nominal voltage (setpoint *Nominal Volts*).

Setpoint: Mains <V

Group	AMF Settings
Range [units]	50 ... *Mains >V* [%]
Related applications	SPtM
Description	Threshold for detection of mains failure due to undervoltage. The setpoint is adjusted relative to the generator nominal voltage (setpoint *Nominal Volts*).

Setpoint: Mains V Del

Group	AMF Settings
Range [units]	0 ... 600.0 [s]
Related applications	SPtM
Description	Delay for detection of mains failure due to over/undervoltage.

Setpoint: Mains >Freq

Group	AMF Settings
Range [units]	Mains <Freq ... 150 [%]
Related applications	SPtM
Description	Threshold for detection of mains failure due to overfrequency. The setpoint is adjusted relative to the generator nominal frequency (setpoint Nominal Freq).

Setpoint: Mains <Freq

Group	AMF Settings
Range [units]	50 ... Mains >Freq [%]
Related applications	SPtM
Description	Threshold for detection of mains failure due to underfrequency. The setpoint is adjusted relative to the generator nominal frequency (setpoint Nominal Freq).

Setpoint: Mains Freq Del

Group	AMF Settings
Range [units]	0 ... 600.0 [s]
Related applications	SPtM
Description	Delay for detection of mains failure due to over/underfrequency.

Setpoint: VectorShiftLim

Group	AMF Settings
Range [units]	1 ... 45 [°]
Related applications	SPtM
Description	Threshold for detection of mains failure due to Vector shift. A mains failure is detected immediately when the vector surge has occured without any delay.

Setpoint: Transfer Del

Group	AMF Settings
Range [units]	0 ... 600 [s]
Related applications	SPtM
Description	When a switchover of the MCB and GCB is performed (in both directions), this setpoint defines the period between one breaker has been opened and the other closes.

Setpoint: MCB Close Del

Group	AMF Settings
Range [units]	0 ... 60 [s]
Related applications	SPtM
Description	If the gen-set is still not in AMF operation e.g. not started and not closed GCB yet, and the mains becomes healthy again, the MCB is reclosed after the mains is continuously healthy for this time period. **NOTE:** If the gen-set is already supplying the load, the setpoint *MainsReturnDel* will take place instead of this setpoint.

Setpoint: MCB Opens On

Group	AMF Settings
Range [units]	MAINSFAIL, GENRUN [-]
Related applications	SPtM
Description	Adjusting of condition when MCB opens after Mains fail: MAINSFAIL: Controller opens the MCB when Mains fail is detected (24 VDC controlled circuit breaker or contactor expected). GENRUN: Controller opens the MCB only after the gen-set has been started, i.e. the generator voltage is present to open the MCB (230 VAC controlled breaker expected).

Setpoint: RetFromIsland

Group	AMF Settings
Range [units]	MANUAL, AUTO [-]
Related applications	SPtM
Description	MANUAL: When RetFromIsland = MANUAL and there is a Mains Fail gen-sets are started and after Mains Return operator can manually transfer the load back to Mains even if the controller stay in AUT mode. AUTO: No automatic mode change is performed. **NOTE:** Select RetFromIsland = MANUAL in case you need to control manually the moment when the load is transferred back to the mains.

Setpoint: BreakerOverlap

Group	AMF Settings
Range [units]	0,0 ... 300,0 [s]
Related applications	SPtM
Description	This setpoint adjusts maximal time period the both GCB and MCB are closed together during the interrupt-free transfer of the load from the mains to the gen-set and vice versa. It takes place after reverse synchronizing if there is no demand to continue in parallel operation and during the test on load just after the forward synchronizing before disconnecting the mains.

Setpoint: ReturnFromTEST

Group	AMF Settings
Range [units]	DISABLED, ENABLED [-]
Related applications	SPtM
Description	Adjusting of the behavior of the controller if the gen-set is supplying the load in TEST mode (after mains has failed) and the mains is recovered: DISABLED: The gen-set will remain running and supplying the load until operating mode is changed. See Manual return from test description. ENABLED: The controller will transfer the load back to the healthy mains and remain running unloaded. See Automatic return from test description.

Setpoint: MCB Logic

Group	AMF Settings
Range [units]	CLOSE-ON, CLOSE-OFF [-]
Related applications	SPtM
Description	The setpoint selects behavior of the *MCB Close/Open* output: CLOSE-ON: The output is closed when the MCB is requested to be closed (normal, positive logic). CLOSE-OFF: The output is closed when the MCB is requested to be open (inverted, negative logic). **CAUTION!** For safety reasons it is recommended to use negative logic (CLOSE-OFF). Using positive logic could cause the mains will be disconnected accidentally when the controller is switched off or a wire is broken.

Group: Sync/Load Ctrl

Setpoint: Speed Gov Char

Group	Sync/Load Ctrl
Range [units]	POSITIVE, NEGATIVE [-]
Related applications	All
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 lower.

Setpoint: Speed Gov Bias

Group	Sync/Load Ctrl
Range [units]	*SpeedGovLowLim* ... *SpeedGovHiLim* [V]
Related applications	All
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. See the chapter Governor interface for details about the recommended settings for various governor types. 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.

Setpoint: SpeedGovLowLim

Group	Sync/Load Ctrl
Range [units]	0 … SpeedGovHiLim [V]
Related applications	All
Description	Lower limit of the speed governor output. Use this setpoint to adjust the governor output range according to your governor type.

Setpoint: SpeedGovHiLim

Group	Sync/Load Ctrl
Range [units]	SpeedGovLowLim … 10.00 [V]
Related applications	All
Description	Upper limit of the speed governor output. Use this setpoint to adjust the governor output range according to your governor type.

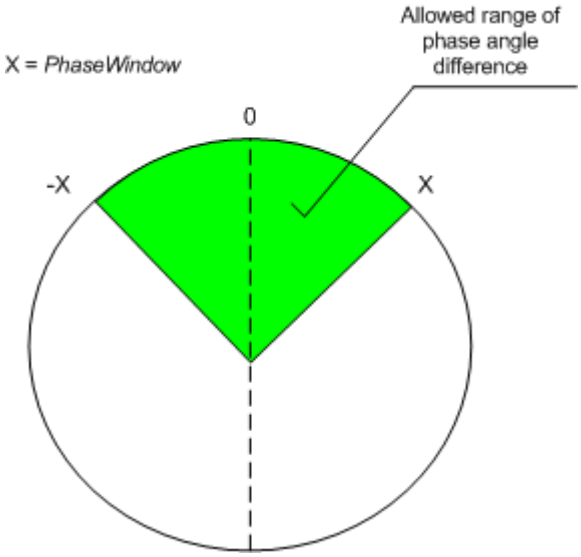
Setpoint: TauSpeedActuat

Group	Sync/Load Ctrl
Range [units]	*1 ... 300* [s]
Related applications	All
Description	Time constant of the speed actuator connected to the binary outputs Speed Up/Speed Down. Setting of this parameter affects length of the pulses on these binary outputs. This is to match the reaction of the controller's regulator with the actual reaction time of the actuator.

Setpoint: Voltage Window

Group	Sync/Load Ctrl
Range [units]	0 … 100.0 [%]
Related applications	All
Description	This setpoint adjusts maximum difference between generator and mains/bus voltage in respective phases for synchronizing.

Setpoint: Phase Window

Group	Sync/Load Ctrl
Range [units]	0 ... 90 [°]
Related applications	All
Description	This setpoint adjusts maximum absolute value of difference between actual phase angle between the generator and mains/bus voltages for synchronizing. **NOTE:** To disable issuing the breaker close command (i.e. for test purpose) adjust this setpoint to 0. Synchronizing will continue until timeout occurs or the breaker is closed externally. 

Setpoint: Dwell Time

Group	Sync/Load Ctrl
Range [units]	0 … 25.0 [s]
Related applications	All
Description	The period of time that the phase angle difference must be within +/- *Phase Window* and voltage difference within *Voltage Window* before the breaker is closed.

Setpoint: Freq Gain

Group	Sync/Load Ctrl
Range [units]	0 ... 200.0 [%]
Related applications	All
Description	Gain of the frequency control PI loop.

Setpoint: Freq Int

Group	Sync/Load Ctrl
Range [units]	0 ... 100 [%]
Related applications	All
Description	Relative integration factor of the frequency control loop.

Setpoint: Angle Gain

Group	Sync/Load Ctrl
Range [units]	0 ... 200.0 [%]
Related applications	All
Description	Gain of the phase angle control loop. During the synchronizing 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.

Setpoint: Load Ramp

Group	Sync/Load Cont
Range [units]	0 ... GCB Open Del [s]
Related applications	All
Description	All changes of requested gen-set load (except in loadsharing mode) are not made as one step, but are ramped - i.e. the requested load is changing slowly with the rate adjusted by this setpoint. The rate is adjusted in seconds for 100% load change (from 0 to 100% of nominal power). So if the requested load change is 50% of nominal power, the ramp duration will be 50% of this setpoint. The ramp takes place in following situations: • The gen-set has been just synchronized and is ramping up to the target load level (e.g. baseload in parallel to mains operation or average gen-set load in multiple loadsharing operation) • The gen-set is running parallel to the mains and baseload is changed. • The gen-set is beeing unloaded before opening the GCB and stop. In this case the end load level is adjusted by setpoint *GCB Open Level* and the timeout for unloading is adjusted by setpoint *GCB Open Del*.

Setpoint: Load Gain

Group	Sync/Load Ctrl
Range [units]	0 ... 200.0 [%]
Related applications	All
Description	Gain of the load control PI loop.

Setpoint: Load Int

Group	Sync/Load Ctrl
Range [units]	0 ... 100 [%]
Related applications	All
Description	Relative integration factor of the load control loop.

Setpoint: GCB Open Level

Group	Sync/Load Ctrl
Range [units]	0 ... 100 [%]
Related applications	all
Description	After a stop command has been issued in parallel to mains or other gen-sets operation, the gen-set load is ramped down before the GCB will open. Use this setpoint to adjust the end-point of the ramp, e.g. the load level (in % of *Nominal Power*) where the GCB will be opened.

Setpoint: GCB Open Del

Group	Sync/Load Ctrl
Range [units]	Load Ramp ... 1800 [s]
Related applications	All
Description	Use this setpoint to adjust the timeout for reaching the load level *GCB Open Level* during the gen-set is beeing unloaded. When the timeout has elapsed, the GCB will open regardless of the load.

Setpoint: Sync Timeout

Group	Sync/Load Ctrl
Range [units]	1 ... 1800 [s]
Related applications	All
Description	This setpoint adjusts maximum duration of synchronizing. If the synchronizing is not successful within this period of time, the *Sync Timeout* or *RevSyncTimeout* alarm will be issued.

Setpoint: LoadShare Gain

Group	Sync/Load Ctrl
Range [units]	0 ... 200.0 [%]
Related applications	MINT
Description	Gain of the load sharing control PI loop.

Setpoint: LoadShare Int

Group	Sync/Load Ctrl
Range [units]	0 ... 100 [%]
Related applications	MINT
Description	Relative integration factor of load sharing control loop.

Group: Volt/PF Ctrl

Setpoint: AVRi Bias

Group	Volt/PF Ctrl
Range [units]	0 ... 100.0 [%]
Related applications	All
Description	This setpoint adjusts the initial PWM level for the AVR output, which is present on the output, if no voltage or power factor regulation loop is active. See the chapter AVR interface for details about the recommended settings for various AVR types. **NOTE:** The voltage level on the AVR remote voltage input depends also on AVRi output wiring and potentiometer position.

Setpoint: Voltage Gain

Group	Volt/PF Ctrl
Range [units]	0 … 200.0 [%]
Related applications	All
Description	Gain of the voltage control PI loop.

Setpoint: Voltage Int

Group	Volt/PF Ctrl
Range [units]	0 ... 100 [%]
Related applications	All
Description	Relative integration factor of the voltage control loop.

Setpoint: PF Gain

Group	Volt/PF Ctrl
Range [units]	0 ... 200.0 [%]
Related applications	All
Description	Gain of power factor control PI loop.

Setpoint: PF Int

Group	Volt/PF Ctrl
Range [units]	0 ... 100 [%]
Related applications	All
Description	Relative integration factor of the power factor control loop.

Setpoint: VAr Share Gain

Group	Volt/PF Ctrl
Range [units]	0 ... 200.0 [%]
Related applications	MINT
Description	Gain of VAr sharing control PI loop.

Setpoint: VAr Share Int

Group	Volt/PF Ctrl
Range [units]	0 ... 100 [%]
Related applications	MINT
Description	Relative integration factor of VAr sharing control loop.

Group: ExtI/O Protect

Setpoint: IOM AI1 Yel

Group	ExtI/O Protect
Range [units]	Limits and units depend on analog input configuration
Related applications	All
Description	Threshold for the yellow alarm configured to the analog input 1 of the extension module IG-IOM or IGS-PTM.

Setpoint: IOM AI1 Red

Group	ExtI/O Protect
Range [units]	Limits and units depend on analog input configuration
Related applications	All
Description	Threshold for the red alarm configured to the analog input 1 of the extension module IG-IOM or IGS-PTM.

Setpoint: IOM AI1 Del

Group	ExtI/O Protect
Range [units]	0 ... 180 [s]
Related applications	All
Description	Delay of the alarms configured to the analog input 1 of the extension module IG-IOM or IGS-PTM.

Setpoint: IOM AI2 Yel

Group	ExtI/O Protect
Range [units]	Limits and units depend on analog input configuration
Related applications	All
Description	Threshold for the yellow alarm configured to the analog input 2 of the extension module IG-IOM or IGS-PTM.

Setpoint: IOM AI2 Red

Group	ExtI/O Protect
Range [units]	Limits and units depend on analog input configuration
Related applications	All
Description	Threshold for the red alarm configured to the analog input 2 of the extension module IG-IOM or IGS-PTM.

Setpoint: IOM AI2 Del

Group	ExtI/O Protect
Range [units]	0 ... 180 [s]
Related applications	All
Description	Delay of the alarms configured to the analog input 2 of the extension module IG-IOM or IGS-PTM.

Setpoint: IOM AI3 Yel

Group	ExtI/O Protect
Range [units]	Limits and units depend on analog input configuration
Related applications	All
Description	Threshold for the yellow alarm configured to the analog input 3 of the extension module IG-IOM or IGS-PTM.

Setpoint: IOM AI3 Red

Group	ExtI/O Protect
Range [units]	Limits and units depend on analog input configuration
Related applications	All
Description	Threshold for the red alarm configured to the analog input 3 of the extension module IG-IOM or IGS-PTM.

Setpoint: IOM AI3 Del

Group	ExtI/O Protect
Range [units]	0 … 180 [s]
Related applications	All
Description	Delay of the alarms configured to the analog input 3 of the extension module IG-IOM or IGS-PTM.

Setpoint: IOM AI4 Yel

Group	ExtI/O Protect
Range [units]	Limits and units depend on analog input configuration
Related applications	All
Description	Threshold for the yellow alarm configured to the analog input 4 of the extension module IG-IOM or IGS-PTM.

Setpoint: IOM AI4 Red

Group	ExtI/O Protect
Range [units]	Limits and units depend on analog input configuration
Related applications	All
Description	Threshold for the red alarm configured to the analog input 4 of the extension module IG-IOM or IGS-PTM.

Setpoint: IOM AI4 Del

Group	ExtI/O Protect
Range [units]	0 ... 180 [s]
Related applications	All
Description	Delay of the alarms configured to the analog input 4 of the extension module IG-IOM or IGS-PTM.

Group: SMS/E-Mail

Setpoint: Yel Alarm Msg

Group	SMS/E-Mail
Range [units]	OFF, ON [-]
Related applications	All
Description	Set this setpoint to YES if you want to get messages when a **yellow** alarm occurs. **NOTE:** The target address (GSM phone number or e-mail address) must be set correctly to the setpoint(s) *Phone/Addr 1* resp. *Phone/Addr 2*.

Setpoint: Red Alarm Msg

Group	SMS/E-Mail
Range [units]	OFF, ON [-]
Related applications	All
Description	Set this setpoint to YES if you want to get messages when a **red** alarm occurs. **NOTE:** The target address (GSM phone number or e-mail address) must be set correctly to the setpoint(s) *Phone/Addr 1* resp. *Phone/Addr 2*.

Setpoint: TelNo/Addr Ch1

Group	SMS/E-Mail
Range [units]	[-]
Related applications	All
Description	Enter either a valid GSM phone number or e-mail address to this setpoint, where the alarm messages shall be sent. **NOTE:** For GSM numbers use either national format (i.e. like number you will dial if you want to make a local call) or full international format with "+" character followed by international prefix in the beginning. **NOTE:** This setpoint can be modified from PC only!

Setpoint: TelNo/Addr Ch2

Group	SMS/E-Mail
Range [units]	[-]
Related applications	All
Description	Enter either a valid GSM phone number or e-mail address to this setpoint, where the alarm messages shall be sent. **NOTE:** For GSM numbers use either national format (i.e. like number you will dial if you want to make a local call) or full international format with "+" character followed by international prefix in the beginning. **NOTE:** This setpoint can be modified from PC only!

Group: AnalogSwitches

Setpoint: AnaSwitch1 ON

Group	AnalogSwitches
Range [units]	Limits and units depend on analog input configuration
Related applications	All
Description	Threshhold level for switching ON the analog switch assigned to the analog input 1 of the controller.

Setpoint: AnaSwitch1 OFF

Group	AnalogSwitches
Range [units]	Limits and units depend on analog input configuration
Related applications	All
Description	Threshhold level for switching OFF the analog switch assigned to the analog input 1 of the controller.

Setpoint: AnaSwitch2 ON

Group	AnalogSwitches
Range [units]	Limits and units depend on analog input configuration
Related applications	All
Description	Threshhold level for switching ON the analog switch assigned to the analog input 2 of the controller.

Setpoint: AnaSwitch2 OFF

Group	AnalogSwitches
Range [units]	Limits and units depend on analog input configuration
Related applications	All
Description	Threshhold level for switching OFF the analog switch assigned to the analog input 2 of the controller.

Setpoint: AnaSwitch3 ON

Group	AnalogSwitches
Range [units]	Limits and units depend on analog input configuration
Related applications	All
Description	Threshhold level for switching ON the analog switch assigned to the analog input 3 of the controller.

Setpoint: AnaSwitch3 OFF

Group	AnalogSwitches
Range [units]	Limits and units depend on analog input configuration
Related applications	All
Description	Threshhold level for switching OFF the analog switch assigned to the analog input 3 of the controller.

Setpoint: PowerSwitch ON

Group	AnalogSwitches
Range [units]	0 … 32000 [kW]
Related applications	All
Description	On level for power switch activation, see Power switch chapter.

Setpoint: PowerSwitchOFF

Group	AnalogSwitches
Range [units]	0 ... 32000 [kW]
Related applications	All
Description	Off level for power switch activation, see Power switch chapter.

Group: Date/Time

Setpoint: Time Stamp Per

Group	Date/Time
Range [units]	0 … 240 [min]
Related applications	All
Description	If the gen-set is running, the *Time stamp* records are written periodically into the history. Use this setpoint to adjust the period of writing of these records. Adjust the setpoint to 0 to disable this function. **NOTE:** The shorter is the timestamp period the earlier can be the history log overwritten by *Time stamp* records. E.g. if the period is adjusted to 1 min the history will be overwritten after approx. 2 hours of continous operation.

Setpoint: #SummerTimeMod

Group	Date/Time
Range [units]	DISABLED, WINTER, SUMMER, WINTER-S, SUMMER-S [-]
Related applications	All
Description	• DISABLED: the time mode switching is disabled. • WINTER: northern hemisphere winter time is valid for current time period. • SUMMER: northern hemisphere summer (daylight saving) time is valid for current time period. • WINTER: southern hemisphere winter time is valid for current time period. • SUMMER: southern hemisphere summer (daylight saving) time is valid for current time period.

Setpoint: #Time

Group	Date/Time
Range [units]	[hh.mm.ss]
Related applications	All
Description	System time can be modified here. The system time is stored in a battery-backup RTC circuit and normally need not to be adjusted except initial setting and occasional corrections. The system date and time is used for the exercise timers as well as for the history log. Each record in the history log contains a date/time stamp. **NOTE:** If the system date and time get incorrect after the controller has been switched off for longer time, it may indicate the backup battery needs to be replaced.

Setpoint: #Date

Group	Date/Time
Range [units]	[dd.mm.yyyy]
Related applications	All
Description	System date can be modified here. The system date is stored in a battery-backup RTC circuit and normally does not need to be adjusted except initial setting. The system date and time is used for the exercise timers as well as for the history log. Each record in the history log contains a date/time stamp. **NOTE:** If the system date and time get incorrect after the controller has been switched off for longer time, it may indicate the backup battery needs to be replaced.

Setpoint: Timer1 Repeat

Group	Date/Time
Range [units]	NONE, MONDAY, TUESDAY, ... SUNDAY, MON-FRI, MON-SAT, MON-SUN, SAT-SUN [-]
Related applications	All
Description	This setpoint adjusts the repetition period of the Timer 1. Learn more about exercise timers in separate chapter.

Setpoint: Timer1 ON Time

Group	Date/Time
Range [units]	[hh:mm:ss]
Related applications	All
Description	The Timer 1 will be activated at this time on selected day(s). Learn more about exercise timers in separate chapter.

Setpoint: Timer1Duration

Group	Date/Time
Range [units]	1 ... 1440 [min]
Related applications	All
Description	This setpoint adjusts duration the Timer 1 will be active within one cycle. Learn more about exercise timers in separate chapter.

Setpoint: Timer1Function

Group	Date/Time
Range [units]	No Func, Mode OFF, MFail Blk, TEST, TEST OnLd [-]
Related applications	All
Description	It is possible to choose out of 5 (for SPtM) or 3 (for MINT) following Timer functions. Binary output *Exerc Timer 1* is always activated when Timer is active regardless of chosen Timer function.

MINT

No Func	There is no any other function, but binary output *Exerc Timer1* activation
Mode OFF	When this option is chosen then the Timer output is also internally connected to the *Remote OFF* binary input
AutoRun	When this option is chosen then the Timer directly starts gen-set (in AUT mode)

SPtM

No Func	There is no any other function, but binary output *Exerc Timer1* activation
Mode OFF	When this option is chosen then the Timer output is also internally connected to the *Remote OFF* binary input
MFail Blk	When this option is chosen then the Timer output is also internally connected to the *MainsFailBlock* binary input.
TEST	When this option is chosen then the Timer output is also internally connected to the *Remote TEST* binary input.
TEST OnLd	When this option is chosen then the Timer output is also internally connected to the *Rem TEST OnLd* binary input.

Setpoint: Timer2 Repeat

Group	Date/Time
Range [units]	NONE, MONDAY, TUESDAY, ... SUNDAY, MON-FRI, MON-SAT, MON-SUN, SAT-SUN [-]
Related applications	All
Description	This setpoint adjusts the repetition period of the Timer 2. Learn more about exercise timers in separate chapter.

Setpoint: Timer2 ON Time

Group	Date/Time
Range [units]	[hh:mm:ss]
Related applications	All
Description	The Timer 2 will be activated at this time on selected day(s). Learn more about exercise timers in separate chapter.

Setpoint: Timer2Duration

Group	Date/Time
Range [units]	1 … 1440 [min]
Related applications	All
Description	This setpoint adjusts duration the Timer 2 will be active within one cycle. Learn more about exercise timers in separate chapter.

Setpoint: Timer2 Function

Group	Date/Time
Range [units]	No Func, Mode OFF, MFail Blk, TEST, TEST OnLd [-]
Related applications	All
Description	It is possible to choose out of 5 (for SPtM) or 3 (for MINT) following Timer functions. Binary output *Exerc Timer 2* is always activated when Timer is active regardless of chosen Timer function. **MINT** No Func: There is no any other function, but binary output *Exerc Timer 2* activation Mode OFF: When this option is chosen then the Timer output is also internally connected to the *Remote OFF* binary input AutoRun: When this option is chosen then the Timer directly starts gen-set (in AUT mode) **SPtM** No Func: There is no any other function, but binary output *Exerc Timer 2* activation Mode OFF: When this option is chosen then the Timer output is also internally connected to the *Remote OFF* binary input MFail Blk: When this option is chosen then the Timer output is also internally connected to the *MainsFailBlock* binary input. TEST: When this option is chosen then the Timer output is also internally connected to the *Remote TEST* binary input. TEST OnLd: When this option is chosen then the Timer output is also internally connected to the *Rem TEST OnLd* binary input.

Group: Sensors Spec

Setpoint: AI1Calibration

Group	Sensors Spec
Range [units]	Limits and units depend on analog input configuration
Related applications	All
Description	This setpoint can be used to "calibrate" the controller analog input 1, i.e. shift the measured value on the analog input with a constant. The setpoint (constant) is always added to the measured analog value. **NOTE:** It is recommended to do the calibration under operating conditions. I.e. perform a coolant temperature sensor calibration when the engine is warm, not cold.

Setpoint: AI2Calibration

Group	Sensors Spec
Range [units]	Limits and units depend on analog input configuration
Related applications	All
Description	This setpoint can be used to "calibrate" the controller analog input 2, i.e. shift the measured value on the analog input with a constant. The setpoint (constant) is always added to the measured analog value. **NOTE:** It is recommended to do the calibration under operating conditions. I.e. perform a coolant temperature sensor calibration when the engine is warm, not cold.

Setpoint: AI3Calibration

Group	Sensors Spec
Range [units]	Limits and units depend on analog input configuration
Related applications	All
Description	This setpoint can be used to "calibrate" the controller analog input 3, i.e. shift the measured value on the analog input with a constant. The setpoint (constant) is always added to the measured analog value. **NOTE:** It is recommended to do the calibration under operating conditions. I.e. perform a coolant temperature sensor calibration when the engine is warm, not cold.

Setpoint: IOM AI1 Calibr

Group	Sensors Spec
Range [units]	Limits and units depend on analog input configuration
Related applications	All
Description	This setpoint can be used to "calibrate" the analog input 1 of the extension module IG-IOM or IGS-PTM, i.e. shift the measured value on the analog input with a constant. The setpoint (constant) is always added to the measured analog value. **NOTE:** It is recommended to do the calibration under operating conditions. I.e. perform a coolant temperature sensor calibration when the engine is warm, not cold.

Setpoint: IOM AI2 Calibr

Group	Sensors Spec
Range [units]	Limits and units depend on analog input configuration
Related applications	All
Description	This setpoint can be used to "calibrate" the analog input 2 of the extension module IG-IOM or IGS-PTM, i.e. shift the measured value on the analog input with a constant. The setpoint (constant) is always added to the measured analog value. **NOTE:** It is recommended to do the calibration under operating conditions. I.e. perform a coolant temperature sensor calibration when the engine is warm, not cold.

Setpoint: IOM AI3 Calibr

Group	Sensors Spec
Range [units]	Limits and units depend on analog input configuration
Related applications	All
Description	This setpoint can be used to "calibrate" the analog input 3 of the extension module IG-IOM or IGS-PTM, i.e. shift the measured value on the analog input with a constant. The setpoint (constant) is always added to the measured analog value. **NOTE:** It is recommended to do the calibration under operating conditions. I.e. perform a coolant temperature sensor calibration when the engine is warm, not cold.

Setpoint: IOM AI4 Calibr

Group	Sensors Spec
Range [units]	Limits and units depend on analog input configuration
Related applications	All
Description	This setpoint can be used to "calibrate" the analog input 4 of the extension module IG-IOM or IGS-PTM, i.e. shift the measured value on the analog input with a constant. The setpoint (constant) is always added to the measured analog value. **NOTE:** It is recommended to do the calibration under operating conditions. I.e. perform a coolant temperature sensor calibration when the engine is warm, not cold.

Table of values

Group: Engine

Value: RPM

Group	Engine
Units	RPM
Related applications	All
Description	This value contains current engine speed. The value is obtained from one of following sources: • ECU, if an ECU is configured • Pickup input • Generator frequency Learn more in Speed measurement chapter.

Value: W-TerminalFreq

Group	Engine
Units	Hz
Related applications	All
Description	Frequency measured on the pickup input if the setpoint *Gear Teeth* is adjusted to zero and it is expected that "W" terminal from the charging alternator is connected to the pickup input.

Value: ECU State

Group	Engine
Units	
Related applications	All
Description	Shows binary status (0 or 1) of ECU: • ECU Yellow Lamp • ECU Red Lamp • WaitToStrt

Value: Fuel Rate ECU

Group	Engine
Units	L/h or G/h - selectable in configuration (LiteEdit)
Related applications	All
Description	Current fuel consumption obtained from the ECU. Contains invalid flag if ECU is not configured or if the prarticular ECU does not provide this value.

Value: Cool Temp ECU

Group	Engine
Units	ºC/ºF - selectable in configuration (LiteEdit)
Related applications	All
Description	Coolant temperature obtained from the ECU. Contains invalid flag if ECU is not configured or if the prarticular ECU does not provide this value.

Value: IntakeTemp ECU

Group	Engine
Units	ºC/ºF - selectable in configuration (LiteEdit)
Related applications	All
Description	Intake air temperature obtained from the ECU. Contains invalid flag if ECU is not configured or if the prarticular ECU does not provide this value.

Value: Oil Press ECU

Group	Engine
Units	Bar/Psi - selectable in configuration (LiteEdit)
Related applications	All
Description	Oil pressure obtained from the ECU. Contains invalid flag if ECU is not configured or if the prarticular ECU does not provide this value.

Value: Oil Temp ECU

Group	Engine
Units	ºC/ºF - selectable in configuration (LiteEdit)
Related applications	All
Description	Oil temperature obtained from the ECU. Contains invalid flag if ECU is not configured or if the prarticular ECU does not provide this value.

Value: BoostPress ECU

Group	Engine
Units	Bar/Psi - selectable in configuration (LiteEdit)
Related applications	All
Description	Engine boost pressure obtained from the ECU. Contains invalid flag if ECU is not configured or if the prarticular ECU does not provide this value.

Value: Perc Load ECU

Group	Engine
Units	%
Related applications	All
Description	"Percent load at current speed" value obtained from the ECU. Contains invalid flag if ECU is not configured or if the prarticular ECU does not provide this value.

Value: FuelLevel ECU

Group	Engine
Units	%
Related applications	All
Description	Fuel level obtained from the J1939 bus. Contains invalid flag if ECU is not configured or if the prarticular ECU does not provide this value.

Group: Generator

Value: Gen kW

Group	Generator
Units	kW
Related applications	All
Description	Generator active power.

Value: Gen kW L1

Group	Generator
Units	kW
Related applications	All
Description	Generator active power in phase L1.

Value: Gen kW L2

Group	Generator
Units	kW
Related applications	All
Description	Generator active power in phase L2.

Value: Gen kW L3

Group	Generator
Units	kW
Related applications	All
Description	Generator active power in phase L3.

Value: Gen kVAr

Group	Generator
Units	kVAr
Related applications	All
Description	Generator reactive power.

Value: Gen kVAr L1

Group	Generator
Units	kVAr
Related applications	All
Description	Generator reactive power in phase L1.

Value: Gen kVAr L2

Group	Generator
Units	kVAr
Related applications	All
Description	Generator reactive power in phase L2.

Value: Gen kVAr L3

Group	Generator
Units	kVAr
Related applications	All
Description	Generator reactive power in phase L3.

Value: Gen kVA

Group	Generator
Units	kVA
Related applications	All
Description	Generator apparent power.

Value: Gen kVA L1

Group	Generator
Units	kVA
Related applications	All
Description	Generator apparent power in phase L1.

Value: Gen kVA L2

Group	Generator
Units	kVA
Related applications	All
Description	Generator apparent power in phase L2.

Value: Gen kVA L3

Group	Generator
Units	kVA
Related applications	All
Description	Generator apparent power in phase L3.

Value: Gen PF

Group	Generator
Units	-
Related applications	All
Description	Generator power factor.

Value: Gen Load Char

Group	Generator
Units	-
Related applications	All
Description	Character of the generator load. "L" means inductive load, "C" is capacitive and "R" is resistive load (power factor = 1).

Value: Gen PF L1

Group	Generator
Units	-
Related applications	All
Description	Generator power factor in phase L1.

Value: Gen Lchr L1

Group	Generator
Units	-
Related applications	All
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).

Value: Gen PF L2

Group	Generator
Units	-
Related applications	All
Description	Generator power factor in phase L2.

Value: Gen Lchr L2

Group	Generator
Units	-
Related applications	All
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).

Value: Gen PF L3

Group	Generator
Units	-
Related applications	All
Description	Generator power factor in phase L3.

Value: Gen Lchr L3

Group	Generator
Units	-
Related applications	All
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).

Value: Gen Freq

Group	Generator
Units	Hz
Related applications	All
Description	Generator frequency taken from phase L3.

Value: Gen V L1-N

Group	Generator
Units	V
Related applications	All
Description	Generator phase L1 voltage.

Value: Gen V L2-N

Group	Generator
Units	V
Related applications	All
Description	Generator phase L2 voltage.

Value: Gen V L3-N

Group	Generator
Units	V
Related applications	All
Description	Generator phase L3 voltage.

Value: Gen V L1-L2

Group	Generator
Units	V
Related applications	All
Description	Generator phase L1 to phase L2 voltage.

Value: Gen V L2-L3

Group	Generator
Units	V
Related applications	All
Description	Generator phase L2 to phase L3 voltage.

Value: Gen V L3-L1

Group	Generator
Units	V
Related applications	All
Description	Generator phase L3 to phase L1 voltage.

Value: Gen A L1

Group	Generator
Units	A
Related applications	All
Description	Generator current phase L1.

Value: Gen A L2

Group	Generator
Units	A
Related applications	All
Description	Generator current phase L2.

Value: Gen A L3

Group	Generator
Units	A
Related applications	All
Description	Generator current phase L3.

Value: EarthFaultCurr

Group	Generator
Units	A
Related applications	MINT
Description	Measured value of earth fault for evaluation of earth fault protection.

Group: Mains

Value: Mains Freq

Group	Mains
Units	Hz
Related applications	SPtM
Description	Mains frequency taken from phase L3.

Value: Mains V L1-N

Group	Mains
Units	V
Related applications	SPtM
Description	Mains phase L1 voltage.

Value: Mains V L2-N

Group	Mains
Units	V
Related applications	SPtM
Description	Mains phase L2 voltage.

Value: Mains V L3-N

Group	Mains
Units	V
Related applications	SPtM
Description	Mains phase L3 voltage.

Value: Mains V L1-L2

Group	Mains
Units	V
Related applications	SPtM
Description	Mains phase L1 to phase L2 voltage.

Value: Mains V L2-L3

Group	Mains
Units	V
Related applications	SPtM
Description	Mains phase L2 to phase L3 voltage.

Value: Mains V L3-L1

Group	Mains
Units	V
Related applications	SPtM
Description	Mains phase L3 to phase L1 voltage.

Value: Mains A L3/EF

Group	Mains
Units	A
Related applications	SPtM
Description	Mains effective current in phase L3.

Value: Mains kW I

Group	Mains
Units	kW
Related applications	SPtM
Description	Mains active power.

Value: Mains kVAr I

Group	Mains
Units	kVAr
Related applications	SPtM
Description	Mains reactive power.

Value: Mains PF

Group	Mains
Units	-
Related applications	SPtM
Description	Mains power factor.

Value: Mains LChr

Group	Mains
Units	-
Related applications	SPtM
Description	Character of the mains. "L" means inductive load, "C" is capacitive and "R" is resistive load (power factor = 1).

Value: Load kW

Group	Mains
Units	kW
Related applications	SPtM
Description	Load active power.

Value: Load kVAr

Group	Mains
Units	kVAr
Related applications	SPtM
Description	Load reactive power.

Value: Load PF

Group	Mains
Units	-
Related applications	SPtM
Description	Load power factor.

Value: Load LChr

Group	Mains
Units	-
Related applications	SPtM
Description	Character of the load. "L" means inductive load, "C" is capacitive and "R" is resistive load (power factor = 1).

Value: Slip

Group	Mains
Units	Hz
Related applications	All
Description	Differential frequency between the gen-set and the mains.

Value: Angle

Group	Mains
Units	°
Related applications	All
Description	The phase shift between the gen-set and the mains voltage.

Value: MaxVectorShift

Group	Mains
Units	°
Related applications	SPtM
Description	This is maximal measured value of vector shift of the generator voltage. The value is reset to 0 automatically in the moment of closing the GCB.

Group: Bus

Value: Bus Freq

Group	Bus
Units	Hz
Related applications	MINT
Description	Bus frequency taken from phase L3.

Value: Bus V L1-N

Group	Bus
Units	V
Related applications	MINT
Description	Bus phase L1 voltage.

Value: Bus V L2-N

Group	Bus
Units	V
Related applications	MINT
Description	Bus phase L2 voltage.

Value: Bus V L3-N

Group	Bus
Units	V
Related applications	MINT
Description	Bus phase L3 voltage.

Value: Bus V L1-L2

Group	Bus
Units	V
Related applications	MINT
Description	Bus phase L1 to phase L2 voltage.

Value: Bus V L2-L3

Group	Bus
Units	V
Related applications	MINT
Description	Bus phase L2 to phase L3 voltage.

Value: Bus V L3-L1

Group	Bus
Units	V
Related applications	MINT
Description	Bus phase L3 to phase L1 voltage.

Value: Slip

Group	Mains
Units	Hz
Related applications	MINT
Description	Differential frequency between the gen-set and the mains.

Value: Angle

Group	Mains
Units	°
Related applications	MINT
Description	The phase shift between the gen-set and the mains voltage.

Group: Pwr Management

Value: Actual Reserve

Group	Power management
Units	kW%
Related applications	MINT
Description	This value represents the difference between actual relative load of the group and 100%. $" Reserve" = 100^{\left(1-\frac{P_{act}}{P_{nom}}\right)}$ [%] P_{nom} means *Running NomPwr* and P_{act} means *Running ActPwr*.

Value: Running ActPwr

Group	Power management
Units	kW
Related applications	MINT
Description	Sum of **actual** power of all gen-sets within the group that are connected to the bus and are performing the power management, i.e. that are in AUT mode and have power management enabled.

Value: Running Q-Pwr

Group	Power management
Units	kVAr
Related applications	MINT
Description	Sum of **reactive** power of all gen-sets within the group that are connected to the bus and are performing the power management, i.e. that are in AUT mode and have power management enabled.

Value: Running NomPwr

Group	Power management
Units	kW
Related applications	MINT
Description	Sum of **nominal** power of all gen-sets within the group that are connected to the bus and are performing the power management, i.e. that are in AUT mode and have power management enabled.

Value: Avail Nom Pwr

Group	Power management
Units	kW
Related applications	MINT
Description	Sum of **nominal** load of all active gen-sets within the group.

Value: Priority

Group	Power management
Units	-
Related applications	MINT
Description	This value shows current priority number. If the binary input *Top Priority* is active, the priority number will be 0, otherwise the value will correspond to the setpoint *Priority*. See the chapter Power management for details.

Group: Controller I/O

Value: Battery Volts

Group	Controller I/O
Units	V
Related applications	All
Description	Controller supply voltage.

Value: D+

Group	Controller I/O
Units	V
Related applications	All
Description	D+ terminal voltage.

Value: Analog Input 1

Group	Controller I/O
Units	configurable
Related applications	All
Description	This is value of the analog input 1 of the controller. It will contain an invalid flag if the input is not used or sensor fail is detected on it.

Value: Analog Input 2

Group	Controller I/O
Units	configurable
Related applications	All
Description	This is value of the analog input 2 of the controller. It will contain an invalid flag if the input is not used or sensor fail is detected on it.

Value: Analog Input 3

Group	Controller I/O
Units	configurable
Related applications	All
Description	This is value of the analog input 3 of the controller. It will contain an invalid flag if the input is not used or sensor fail is detected on it.

Value: Bin Inputs

Group	Controller I/O
Units	-
Related applications	All
Description	This is a bit array containing status of physical binary inputs of the controller. Bit0 represents BI1, bit1 represents BI2 etc.. **NOTE:** In the LiteEdit and on the controller screen this value is displayed in "normal order", i.e. BI1 in the leftmost position

Value: Bin Outputs

Group	Controller I/O
Units	-
Related applications	All
Description	This is a bit array containing status of physical binary outputs of the controller. Bit0 represents BO1, bit1 represents BO2 etc.. **NOTE:** In the LiteEdit and on the controller screen this value is displayed in "normal order", i.e. BO1 in the leftmost position.

Value: Speed Gov Out

Group	Controller I/O
Units	V
Related applications	All
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 10V ~ 100% PWM.

Value: AVRi Output

Group	Controller I/O
Units	%
Related applications	All
Description	This is the actual PWM percentage on the AVRi output of the controller.

Value: GSM SignalLvl

Group	Controller I/O
Units	%
Related applications	All
Description	IL-NT-GPRS module shows the strength of GSM signal. It is relative value helping to find the best signal and for troubleshooting cases.

Value: GSM ErrorRate

Group	Controller I/O
Units	-
Related applications	All
Description	IL-NT-GPRS module shows this information for relative evaluation of signal quality. Lesser value means higher quality of signal.

Value: GSM Diag Code

Group	Controller I/O
Units	-
Related applications	All
Description	Diagnostic code for IL-NT-GPRS modem. Standard GSM modems usually support this value as well. Helps in troubleshooting.

NOTE: TABLE OF DIAGNOSTIC CODES

Code	Description
0	OK. No error.
1	Not possible to hang up.
2	IL-NT-GPRS is switched off
3	IL-NT-GPRS is switched on
4	IL-NT-GPRS – error in initialization
5	IL-NT-GPRS – not possible to set the APN
6	IL-NT-GPRS – not possible to connect to GPRS network
7	IL-NT-GPRS – not possible to retrieve IP address
8	IL-NT-GPRS – not accepted DNS IP address
9	Error in modem detection
10	Error in initialization of analog modem
11	SIM card is locked (Possibly PIN code required, PIN needs to be deactivated) or unknown status of SIM locking
12	No GSM signal
13	Not possible to read the SIM card parameters
14	GSM modem did not accepted particular initialization command, possibly caused by locked SIM card
15	Unknown modem
16	Bad answer to complement initialization string
17	Not possible to read GSM signal strength

18	CDMA modem not detected
19	No CDMA network
20	Unsuccessful registration to CDMA network
255	Only running communication is needed to indicate

Value: AirGate Diag

Group	Controller I/O
Units	-
Related applications	All
Description	Diagnostic code for Airgate connection. Helps in troubleshooting. **NOTE:** TABLE OF DIAGNOSTIC CODES:

Code	Description
1	Controller registered, waiting for authorization
2	Not possible to register, controller blacklisted
3	Not possible to register, server has no more capacity
4	Not possible to register, other reason
5	Controller registered and authorized

Value: AirGate ID

Group	Controller I/O
Units	-
Related applications	All
Description	Identification name generated by AirGate server for purpose of establishing communication via WebSupervisor, LiteEdit or InteliMonitor.

Value: Modem Status

Group	Controller I/O
Units	-
Related applications	All
Description	Status of the modem. • "--------" After controller initialization • "Trying" Modem active. Trying to establish connection. • "Ready" Modem ready. Communication with modem is OK.

Group: Extension I/O

Value: IOM AI1

Group	Extension I/O
Units	configurable
Related applications	All
Description	This is value of the analog input 1 of the IOM/PTM extension module. It will contain an invalid flag if the input or module is not used or sensor fail is detected on it.

Value: IOM AI2

Group	Extension I/O
Units	configurable
Related applications	All
Description	This is value of the analog input 2 of the IOM/PTM extension module. It will contain an invalid flag if the input or module is not used or sensor fail is detected on it.

Value: IOM AI3

Group	Extension I/O
Units	configurable
Related applications	All
Description	This is value of the analog input 3 of the IOM/PTM extension module. It will contain an invalid flag if the input or module is not used or sensor fail is detected on it.

Value: IOM AI4

Group	Extension I/O
Units	configurable
Related applications	All
Description	This is value of the analog input 4 of the IOM/PTM extension module. It will contain an invalid flag if the input or module is not used or sensor fail is detected on it.

Value: IOM Bin Inp

Group	Extension I/O
Units	-
Related applications	All
Description	This is a bit array containing status of physical binary inputs of the IOM/PTM extension module. Bit0 represents BI1, bit1 represents BI2 etc.. **NOTE:** In the LiteEdit and on the controller screen this value is displayed in "normal order", i.e. BI1 in the leftmost position

Value: ExtM Bin Inp

Group	Extension I/O
Units	-
Related applications	All
Description	This is a bit array containing status of physical binary inputs of the extension plugin module. Bit0 represents ExM BI1, bit1 represents ExM BI2 etc. **NOTE:** In the LiteEdit and on the controller screen this value is displayed in "normal order", i.e. ExM BI1 in the leftmost position

Value: RA Bin Out

Group	Extension I/O
Units	-
Related applications	All
Description	This is a bit array containing status of led indicators of the RA15 module. Bit0 represents the top left LED, bit14 represents the bottom right LED. **NOTE:** In the LiteEdit and on the controller screen this value is displayed in "normal order", i.e. bit0 in the leftmost position.

Value: IOM Bin Out

Group	Extension I/O
Units	-
Related applications	All
Description	This is a bit array containing status of physical binary outputs of the IOM/PTM module. Bit0 represents BO1, bit1 represents BO2 etc.. **NOTE:** In the LiteEdit and on the controller screen this value is displayed in "normal order", i.e. BO1 in the leftmost position.

Group: Statistics

Value: Energy kWh

Group	Statistics
Units	kWh
Related applications	All
Description	Active energy counter.

Value: Energy kVArh

Group	Statistics
Units	kVAh
Related applications	All
Description	Reactive energy counter.

Value: Run Hours

Group	Statistics
Units	h
Related applications	All
Description	Engine operation hours counter. If an ECU is configured and it provides engine hours value, the value is taken from ECU. If the value is not available from the ECU or ECU is not configured, the engine hours are incremented in the controller while the engine is running.

Value: Num Starts

Group	Statistics
Units	-
Related applications	All
Description	Engine start commands counter. The counter is increased by 1 even if the particular start command will take more than one attempt.

Value: Maintenance

Group	Statistics
Units	h
Related applications	All
Description	Countdown for next maintenance. Initial value can be setup in Engine Protect – WrnMaintenace.

Value: Num E-Stops

Group	Statistics
Units	-
Related applications	All
Description	Emergency stop alarms counter.

Value: Shutdowns

Group	Statistics
Units	-
Related applications	All
Description	Shutdown alarms counter. This counter counts all occurences 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.

Group: Date/Time

Value: Time

Group	Info
Units	hh:mm:ss
Related applications	All
Description	Shows setup time.

Value: Date

Group	Info
Units	dd.mm.yyyy
Related applications	All
Description	Shows setup date.

Group: Info

Value: Engine State

Group	Info
Units	-
Related applications	All
Description	The value contains numeric code of the "engine state" message which is shown on the main screen of the controller. Assignment of texts to the codes can be obtained using LiteEdit. Open any connection (also off-line with a previously saved archive) and go to menu Controller -> Generate CFG image. The resulting file will contain assignment of texts to the codes.

Value: Breaker State

Group	Info
Units	-
Related applications	All
Description	The value contains numeric code of the "breaker state" message, that is shown on the main screen of the controller. Assignment of texts to the codes can be obtained using LiteEdit. Open any connection (also off-line with a previously saved archive) and go to menu Controller -> Generate CFG image. The resulting file will contain assignment of texts to the codes.

Value: Timer Text

Group	Info
Units	-
Related applications	All
Description	The value contains numeric code of the "Current process timer" text, that is shown on the main screen of the controller. Assignment of texts to the codes can be obtained using LiteEdit. Open any connection (also off-line with a previously saved archive) and go to menu Controller -> Generate CFG image. The resulting file will contain assignment of texts to the codes.

Value: Timer Value

Group	Info
Units	-
Related applications	All
Description	The value contains "Current process timer" value, that is shown on the main screen of the controller.

Value: FW Version

Group	Info
Units	-
Related applications	All
Description	Major and minor firmware version number. This value does not contain release version number.

Value: FW Branch

Group	Info
Units	-
Related applications	All
Description	Firmware branch code. Contains 1 in case of standard branches.

Value: PasswordDecode

Group	Info
Units	-
Related applications	All
Description	This value contains a number, which can be used for retrieving of a lost password. Send this number together with controller serial number to your distributor if you lost your password.

Value: CAN16

Group	Info
Units	-
Related applications	MINT
Description	Each bit of this value shows if a controller with corresponding address is found on the bus. Bit 0 represents address 1 etc.

Value: CAN32

Group	Info
Units	-
Related applications	MINT
Description	Each bit of this value shows if a controller with corresponding address is found on the bus. Bit 0 represents address 16 etc.

Value: GensLoaded16

Group	Info
Units	-
Related applications	MINT
Description	Each bit if set represents gen-set with its GCB closed.

Value: GensLoaded32

Group	Info
Units	-
Related applications	MINT
Description	Each bit if set represents gen-set with its GCB closed.

Table of binary input functions

Common functions

Binary input: GCB Feedback

Related applications	All
Description	This is an input from the generator circuit breaker or contactor auxiliary contact. If the input is active, the controller will consider the GCB as closed and vice versa. If the GCB is not in expected position, the alarm *GCB Fail* will occur.

Binary input: MCB Feedback

Related applications	All
Description	This is an input from the Mains circuit breaker or contactor auxiliary contact. If the input is active, the controller will consider the MCB as closed and vice versa. According to the MCB position the controller diferentiates between *Parallel to Mains operation* and *Island operation*. SPtM, MainsCompact: If the MCB is not in expected position, the alarm *MCB Fail* will occur.

Binary input: Emergency Stop

Related applications	All
Description	This input will activate the built-in *Emergency Stop* alarm. It is recommended to use "NC" button for this input because of safety reasons. **CAUTION!** This is a software function only. See the chapter Emergency stop in the Installation section of this manual if a "hard-wired" emergency stop function is needed.

Binary input: Sd Override

Related applications	All
Description	If this input is active, all red alarms except emergency stop and overspeed are suppressed. The suppressed alarms will be displayed in the alarmlist, but not take effect regarding the gen-set control. **NOTE:** This input is designed to be used only in the moment the gen-set is supplying pumps for automatic fire-extinguishing devices (sprinklers) or in other situations, where providing power is more important than protecting the gen-set. **CAUTION!** Misuse of this input can cause damage of the gen-set!

Binary input: Access Lock

Related applications	All
Description	If this input is active, then change of all sepoints and controller mode is disabled, even if the password is entered. **NOTE:** Active access lock is indicated by an "L" letter in the upper right corner of the controller main screen. **NOTE:** This input does not disable remote changes of setpoints i.e. from LiteEdit.

Binary input: Remote OFF

Related applications	All
Description	This input switches the controller into OFF mode independently on which mode is selected by the mode selector on the controller main screen. Learn more about controller modes in the Operating modes chapter. If more "remote mode" inputs are active at the same time, the highest priority has Remote OFF, then Remote TEST, Remote MAN and Remote AUT.

Binary input: Remote MAN

Related applications	All
Description	This input switches the controller into MAN mode independently on which mode is selected by the mode selector on the controller main screen. Learn more about controller modes in the Operating modes chapter. If more "remote mode" inputs are active at the same time, the highest priority has Remote OFF, then Remote TEST, Remote MAN and Remote AUT.

Binary input: Remote AUT

Related applications	All
Description	This input switches the controller into AUT mode independently on which mode is selected by the mode selector on the controller main screen. Learn more about controller modes in the Operating modes chapter. If more "remote mode" inputs are active at the same time, the highest priority has Remote OFF, then Remote TEST, Remote MAN and Remote AUT.

Binary input: RemControlLock

Related applications	All
Description	If the input is active, the controller will not accept any actions regarding the gen-set control - e.g. writing of commands and setpoint changes - from remote communication interfaces (RS232, Modem, Modbus, iG-IB, i-LB).

Binary input: Emergency MAN

Related applications	All
Description	This input is designed to allow the gen-set to be controlled externally, not by the controller. This feature can be useful in case of testing the gen-set or in case of some failure, which disables the gen-set to be controlled by the controller, but the gen-set itself is operational. The controller behaves following way: • Shows the text *EmergMan* in the engine status on the main screen. • Stops all functions regarding the gen-set control, deactivates all outputs related to it. • *Stop Fail* alarm is not beeing evaluated and stop solenoid is not activated if nonzero speed is detected. • When the input is deactivated, the controller takes control over the gen-set according to the situation the gen-set was 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.

Binary input: Start Button

Related applications	All
Description	This input is to be used as an external start button for control of the gen-set in manual mode. It works the same way as the start button on the panel.

Binary input: Stop Button

Related applications	All
Description	This input is to be used as an external stop button for control of the gen-set in manual mode. It works the same way as the stop button on the panel. **NOTE:** For the safety reasons it is recommended to configure this input as NC input and use a NC button.

Binary input: FaultResButton

Related applications	All
Description	This input is to be used as an external fault reset button. It works the same way as the fault reset button on the panel.

Binary input: HornResButton

Related applications	All
Description	This input is to be used as an external horn reset button. It works the same way as the horn reset button on the panel.

Binary input: GCB Button

Related applications	All
Description	This input is to be used as an external GCB button for control of the gen-set in manual mode. It works the same way as the GCB button on the panel.

Binary input: ForwSyncDisabl

Related applications	All
Description	If the input is active, the controller will not continue to synchronizing after *MinStabTime* elapsed even in AUT mode. If an island condition occurs (mains fails), the genset will take the island load.

MINT specific

Binary input: Sys Start/Stop

Related applications	MINT
Description	This input activates the power management in the controller. If this input is not active, the gen-set is stopped in AUT mode and does not take part within the power management of the group. **NOTE:** In most cases this input is wired parallel into all controllers within the group to activate and deactivate the whole group. If you want to deactivate one particular genset, switch it out from AUT mode. **NOTE:** If the power management is disabled by the *Pwr Management* setpoint, the gen-set is started and stopped only according to this input.

Binary input: Load Reserve 2

Related applications	MINT
Description	This input selects the currently used pair of reserves for the power management. If the input is active, the pair *LoadResStrt 2* and *LoadResStop 2* instead of *LoadResStrt 1* and *LoadResStop 1*.

Binary input: Min Run Power

Related applications	MINT
Description	Use this input if you need to ensure, that the nominal power of loaded gen-sets does not drop below the value of *Min Run Power* even if the reserve for stop is fulfilled.

Binary input: Top Priority

Related applications	MINT
Description	If this input is active, the controller will have highest priority in the group independently on setpoint *Priority*.

SPtM specific

Binary input: Rem Start/Stop

Related applications	SPtM
Description	Use this input to start and stop the gen-set in AUT mode.

Binary input: Remote TEST

Related applications	SPtM
Description	This input switches the controller into TEST mode independently on which mode is selected by the mode selector on the controller main screen. Learn more about controller modes in the Operating modes chapter. If more "remote mode" inputs are active at the same time, the highest priority has Remote OFF, then Remote TEST, Remote MAN and Remote AUT.

Binary input: Rem TEST OnLd

Related applications	SPtM
Description	This input switches the controller into TEST mode like *Remote TEST*, but forces the controller to take the load - i.e. perform the test on load procedure.

Binary input: RevSyncDisable

Related applications	SPtM
Description	If the input is active, the controller will not perform reverse synchronizing when the mains has returned, but performs a changeover instead.

Binary input: MCB Button

Related applications	SPtM
Description	This input is to be used as an external MCB button for control of the breaker in manual mode. It works the same way as the MCB button on the panel.

Binary input: Ext MF Relay

Related applications	SPtM
Description	This input can be used for connecting of an external mains protection relay. If the input is activated, the controller will consider the mains as failed and will perform all appropriate actions.

Binary input: MainsFailBlock

Related applications	SPtM
Description	If the input is active, the gen-set will not start after the mains fails although the controller is in AUT mode. If the gen-set is already running and the input has been activated, the timer ReturtnDel starts to count then the GCB is opened, gen-set goes to cooling procedure nad stops The input simulates healthy Mains. **NOTE:** THE MCB WILL CLOSE WHILE OPENING OF GCB!

Table of binary output functions

Common functions

Binary output: Starter

Related applications	All
Description	This output is dedicated for starter motor control. **NOTE:** Learn more about starting procedure in the chapter Engine start.

Binary output: Fuel Solenoid

Related applications	All
Description	This output is dedicated to control the fuel solenoid (valve). The output is closed 0.5s before *Starter* and remains closed all the time the gen-set shall run. **NOTE:** Learn more about starting procedure in the chapter Engine start.

Binary output: Stop Solenoid

Related applications	All
Description	This output is dedicated to control the stop solenoid (valve). The output is closed in the moment when the gen-set shall stop and remains active until the gen-set is stopped, but at least for time period of *Stop Time*. If the Stop time has elapsed and the engine is still not stopped, the stop solenoid is deenergized for 5s and then energized again for max. Stop time and this repeats until the engine is stopped. **NOTE:** Learn more about evaluation of sttoped engine in the chapter Stopped gen-set evaluation.

Binary output: Stop Pulse

Related applications	All
Description	This output will give a 1s pulse whenever a stop command is issued to the gen-set, i.e. when the binary output *Stop Solenoid* is activated.

Binary output: Ignition

Related applications	All
Description	This output is dedicated to control the ignition at a gas engine. The output is closed together with *Fuel Solenoid* in the moment the gen-set reaches 30RPM during cranking. The output is opened when the gen-set has stopped.

Binary output: Prestart

Related applications	All
Description	This output can be used for control of any device, which has to be activated just before start, i.e. glow plugs. The output is closed for time period of *Prestart Time* prior to activating of the starter motor and remains closed during cranking and also during pause between cranking attempts.

Binary output: Cooling Pump

Related applications	All
Description	This output is dedicated for coolant pump control. It is closed in the moment the gen-set is started and remains closed until the gen-set is stopped.

Binary output: Idle/Nominal

Related applications	All
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 case of some EFI engines the idle/nominal switching is performed over the communication bus.

Binary output: Alarm

Related applications	All
Description	The output is designed to be used as external alarm indication like a red bulb in the control room etc. The output is active when at least one unconfirmed alarm is present in the alarmlist.

Binary output: Horn

Related applications	All
Description	The output designed to be used for acoustic indication of newly appeared alarm. The output is activated each time a new alarm has appeared and remains active until one of following events occurs: • Fault reset is pressed • Horn reset is pressed • *Horn Timeout* has elapsed

Binary output: Fault Reset

Related applications	All
Description	The output is a copy of Fault Reset button on controller and binary input *FaultResButton*.

Binary output: GCB Close/Open

Related applications	All
Description	This output is to be used for a contactor control in case a contactor is used in the GCB position. See the chapter Circuit breakers for details about all outputs available for generator/mains power switches.

Binary output: GCB ON Coil

Related applications	All
Description	This output is to be used for control of the ON coil of the generator circuit breaker. See the chapter Circuit breakers for details about all outputs available for generator/mains power switches.

Binary output: GCB OFF Coil

Related applications	All
Description	This output is to be used for control of the OFF coil of the generator circuit breaker. See the chapter Circuit breakers for details about all outputs available for generator/mains power switches.

Binary output: GCB UV Coil

Related applications	All
Description	This output is to be used for opening the generator circuit breaker via the undervoltage coil. See the chapter Circuit breakers for details about all outputs available for generator/mains power switches.

Binary output: Speed Up

Related applications	All
Description	This output together with the complementary output *Speed Down* is designed for speed and power control at gen-sets, where the governor does not support analogue control. The outputs are also used for direct control of a gas throttle at asynchronous gen-sets. **NOTE:** Droop function is required when these outputs are used for power control through a governor.

Binary output: Speed Down

Related applications	All
Description	This output together with the complementary output *Speed Up* is designed for speed and power control at gen-sets, where the governor does not support analogue control. The outputs are also used for direct control of a gas throttle at asynchronous gen-sets. **NOTE:** Droop function is required when these outputs are used for power control through a governor.

Binary output: AVR Up

Related applications	All
Description	This output together with the complementary output *AVR Down* is designed for voltage and power factor control at gen-sets, where the AVR does not support analogue control. **NOTE:** Droop function is required when these outputs are used for power factor control.

Binary output: AVR Down

Related applications	All
Description	This output together with the complementary output *AVR Up* is designed for voltage and power factor control at gen-sets, where the AVR does not support analogue control. **NOTE:** Droop function is required when these outputs are used for power factor control.

Binary output: Ready To Load

Related applications	All
Description	The output is closed whenever the GCB is closed or can be closed. Details about conditions, when the GCB can be closed, are available in the chapter Connecting to the load.

Binary output: Synchronizing

Related applications	All
Description	The output is closed during forward or reverse synchronizing.

Binary output: Running

Related applications	All
Description	The output is designed to be used as an indication, that the gen-set is running. It is activated in the moment the gen-set has been started and the idle period has elapsed. Remains active until stop command is issued.

Binary output: Loaded

Related applications	All
Description	The output is closed whenever the GCB is closed except unloading phase prior to opening the GCB.

Binary output: Unloading

Related applications	All
Description	The output is closed during the unloading phase (ramping the power down) prior to opening the GCB. More detailed description is available in the chapter Parallel to mains operation.

Binary output: AnalogSwitch 1

Related applications	All
Description	This is an output from the Analog switch 1.

Binary output: AnalogSwitch 2

Related applications	All
Description	This is an output from the Analog switch 2.

Binary output: AnalogSwitch 3

Related applications	All
Description	This is an output from the Analog switch 3.

Binary output: Ctrl HeartBeat

Related applications	All
Description	This output toggles on/off with period 500ms whenever the controller is switched on and functional.

Binary output: Gen Healthy

Related applications	All
Description	This output is active when the generator voltage and frequency is in limits. It is deactivated: • Immediately when the voltage/frequency gets out of limits (when GCB is not closed) or • With appropriate delay after the voltage/frequency has got out of limits (when GCB is closed) The limits for under/overvoltage, under/overfrequency and voltage unbalance as well as appropriate delays can be found in the Gener protect setpoint group.

Binary output: Mode OFF

Related applications	All
Description	This output is active whenever the controller is in OFF mode.

Binary output: Mode MAN

Related applications	All
Description	This output is active whenever the controller is in MAN mode.

Binary output: Mode AUT

Related applications	All
Description	This output is active whenever the controller is in AUT mode.

Binary output: Yellow Alarm

Related applications	All
Description	Yellow Alarm is active when either AL Common Sd or AL Common Stp or AL Common BOC are active.

Binary output: Red Alarm

Related applications	All
Description	Red Alarm is active when AL Common Wrn is active.

Binary output: Exerc Timer 1

Related applications	All
Description	This is an output from the Exercise timer 1. This output enables to make periodic tests of the gen-set easier and it's activation depends on the setpoints in Date/time group.

Binary output: Exerc Timer 2

Related applications	All
Description	This is an output from the Exercise timer 2. It's behavior depends on setpoints in Date/timegroup.

Binary output: Power Switch

Related applications	All
Description	This is output from the Power switch function.

ECU info

Binary output: ECU Comm OK

Related applications	All
Description	This output is active when an ECU is configured, connected and the communication with the ECU is established.

Binary output: ECU Comm Error

Related applications	All
Description	This output is active when an ECU is configured, but the communication with the ECU is not established or has dropped out.

Binary output: ECU YellowLamp

Related applications	All
Description	This output is active when the ECU sends active "yellow lamp" flag, i.e. it has detected a non-critical malfunction. This flag is taken from DM1 frame at standard J1939 ECUs. Some ECU provides this flag in their own proprietary frames and some do not provide the flag at all.

Binary output: ECU RedLamp

Related applications	All
Description	This output is active when the ECU sends active "red lamp" flag, i.e. it has detected a critical malfunction and the engine should not br operated until service check is preformed. This flag is taken from DM1 frame at standard J1939 ECUs. Some ECU provides this flag in their own proprietary frames and some do not provide the flag at all.

Binary output: ECU PowerRelay

Related applications	All
Description	This output is to be used for control of "keyswitch" input of an ECU. If the particular ECU does not have keyswitch or similar input, it can be used for control of DC power for the ECU. The output closes together with *Prestart* and remains closed all the time the engine shall be running. It is opened in the moment the engine shall stop (i.e. together with the *Fuel Solenoid*. **NOTE:** The controller does not evaluate the communication failure alarm during the period when this output is not active.

Alarm mirrors

Binary output: AL Gen Volts

Related applications	All
Description	This output is active when the generator *under- or overvoltage alarm* is present in the alarmlist.

Binary output: AL Gen Freq

Related applications	All
Description	This output is active when the generator *under- or overfrequency alarm* is present in the alarmlist.

Binary output: AL Overcurrent

Related applications	All
Description	This output is active when the generator overcurrent or short current alarm is present in the alarmlist.

Binary output: AL Gen V,Freq

Related applications	All
Description	This output is active when the generator under/overvoltage, under/overfrequency or voltage unbalance alarm is present in the alarmlist.

Binary output: AL Overspeed

Related applications	All
Description	This output is active when the overspeed alarm is present in the alarmlist.

Binary output: AL Underspeed

Related applications	All
Description	This output is active when the underspeed alarm is present in the alarmlist.

Binary output: AL Overload

Related applications	All
Description	This output is active when the overload alarm is present in the alarmlist.

Binary output: AL Reverse Pwr

Related applications	All
Description	This output is active when the reverse power alarm is present in the alarmlist.

Binary output: AL Start Fail

Related applications	All
Description	This output is active when the start fail alarm is present in the alarmlist.

Binary output: AL Stop Fail

Related applications	All
Description	This output is active when the *stop fail alarm* is present in the alarmlist.

Binary output: AL Sync Fail

Related applications	All
Description	This output is active when the *Sync Timeout* or *RevSyncTimeout* is present in the alarmlist.

Binary output: AL Batt Volt

Related applications	All
Description	This output is active when the *Battery voltage* or *Battery flat* is present in the alarmlist.

Binary output: BI1 Status

Related applications	All
Description	This output gives information about status of binary input 1 of the controller. • If the related binary input is configured as alarm input, the output is closed when the assigned alarm is present in the alarmlist. • If the related binary input is configured as functional, the output copies directly the status of the input.

Binary output: BI2 Status

Related applications	All
Description	This output gives information about status of binary input 2 of the controller. • If the related binary input is configured as alarm input, the output is closed when the assigned alarm is present in the alarmlist. • If the related binary input is configured as functional, the output copies directly the status of the input.

Binary output: BI3 Status

Related applications	All
Description	This output gives information about status of binary input 3 of the controller. • If the related binary input is configured as alarm input, the output is closed when the assigned alarm is present in the alarmlist. • If the related binary input is configured as functional, the output copies directly the status of the input.

Binary output: BI4 Status

Related applications	All
Description	This output gives information about status of binary input 4 of the controller. • If the related binary input is configured as alarm input, the output is closed when the assigned alarm is present in the alarmlist. • If the related binary input is configured as functional, the output copies directly the status of the input.

Binary output: BI5 Status

Related applications	All
Description	This output gives information about status of binary input 5 of the controller. • If the related binary input is configured as alarm input, the output is closed when the assigned alarm is present in the alarmlist. • If the related binary input is configured as functional, the output copies directly the status of the input.

Binary output: BI6 Status

Related applications	All
Description	This output gives information about status of binary input 6 of the controller. • If the related binary input is configured as alarm input, the output is closed when the assigned alarm is present in the alarmlist. • If the related binary input is configured as functional, the output copies directly the status of the input.

Binary output: BI7 Status

Related applications	All
Description	This output gives information about status of binary input 7 of the controller. • If the related binary input is configured as alarm input, the output is closed when the assigned alarm is present in the alarmlist. • If the related binary input is configured as functional, the output copies directly the status of the input.

Binary output: BI8 Status

Related applications	All
Description	This output gives information about status of binary input 8 of the controller. • If the related binary input is configured as alarm input, the output is closed when the assigned alarm is present in the alarmlist. • If the related binary input is configured as functional, the output copies directly the status of the input.

Binary output: BI9 Status

Related applications	All
Description	This output gives information about status of binary input 9 of the controller. • If the related binary input is configured as alarm input, the output is closed when the assigned alarm is present in the alarmlist. • If the related binary input is configured as functional, the output copies directly the status of the input.

Binary output: IOM BI1 Status

Related applications	All
Description	This output gives information about status of binary input 1 of the extension IOM/PTM module. • If the related binary input is configured as alarm input, the output is closed when the assigned alarm is present in the alarmlist. • If the related binary input is configured as functional, the output copies directly the status of the input.

Binary output: IOM BI2 Status

Related applications	All
Description	This output gives information about status of binary input 2 of the extension IOM/PTM module. • If the related binary input is configured as alarm input, the output is closed when the assigned alarm is present in the alarmlist. • If the related binary input is configured as functional, the output copies directly the status of the input.

Binary output: IOM BI3 Status

Related applications	All
Description	This output gives information about status of binary input 3 of the extension IOM/PTM module. • If the related binary input is configured as alarm input, the output is closed when the assigned alarm is present in the alarmlist. • If the related binary input is configured as functional, the output copies directly the status of the input.

Binary output: IOM BI4 Status

Related applications	All
Description	This output gives information about status of binary input 4 of the extension IOM/PTM module. • If the related binary input is configured as alarm input, the output is closed when the assigned alarm is present in the alarmlist. • If the related binary input is configured as functional, the output copies directly the status of the input.

Binary output: IOM BI5 Status

Related applications	All
Description	This output gives information about status of binary input 5 of the extension IOM/PTM module. • If the related binary input is configured as alarm input, the output is closed when the assigned alarm is present in the alarmlist. • If the related binary input is configured as functional, the output copies directly the status of the input.

Binary output: IOM BI6 Status

Related applications	All
Description	This output gives information about status of binary input 6 of the extension IOM/PTM module. • If the related binary input is configured as alarm input, the output is closed when the assigned alarm is present in the alarmlist. • If the related binary input is configured as functional, the output copies directly the status of the input.

Binary output: IOM BI7 Status

Related applications	All
Description	This output gives information about status of binary input 7 of the extension IOM/PTM module. • If the related binary input is configured as alarm input, the output is closed when the assigned alarm is present in the alarmlist. • If the related binary input is configured as functional, the output copies directly the status of the input.

Binary output: IOM BI8 Status

Related applications	All
Description	This output gives information about status of binary input 8 of the extension IOM/PTM module. • If the related binary input is configured as alarm input, the output is closed when the assigned alarm is present in the alarmlist. • If the related binary input is configured as functional, the output copies directly the status of the input.

Binary output: AL AI1 Yel

Related applications	All
Description	The output is closed when there is the yellow alarm from the analog input 1 of the controller present in the alarmlist.

Binary output: AL AI2 Yel

Related applications	All
Description	The output is closed when there is the yellow alarm from the analog input 2 of the controller present in the alarmlist.

Binary output: AL AI3 Yel

Related applications	All
Description	The output is closed when there is the yellow alarm from the analog input 3 of the controller present in the alarmlist.

Binary output: AL AI1 Red

Related applications	All
Description	The output is closed when there is the red alarm from the analog input 1 of the controller present in the alarmlist.

Binary output: AL AI2 Red

Related applications	All
Description	The output is closed when there is the red alarm from the analog input 2 of the controller present in the alarmlist.

Binary output: AL AI3 Red

Related applications	All
Description	The output is closed when there is the red alarm from the analog input 3 of the controller present in the alarmlist.

Binary output: AL IOM AI1 Yel

Related applications	All
Description	The output is closed when there is the yellow alarm from the analog input 1 of the extension IOM/PTM module present in the alarmlist.

Binary output: AL IOM AI2 Yel

Related applications	All
Description	The output is closed when there is the yellow alarm from the analog input 2 of the extension IOM/PTM module present in the alarmlist.

Binary output: AL IOM AI3 Yel

Related applications	All
Description	The output is closed when there is the yellow alarm from the analog input 3 of the extension IOM/PTM module present in the alarmlist.

Binary output: AL IOM AI4 Yel

Related applications	All
Description	The output is closed when there is the yellow alarm from the analog input 4 of the extension IOM/PTM module present in the alarmlist.

Binary output: AL IOM AI1 Red

Related applications	All
Description	The output is closed when there is the red alarm from the analog input 1 of the extension IOM/PTM module present in the alarmlist.

Binary output: AL IOM AI2 Red

Related applications	All
Description	The output is closed when there is the red alarm from the analog input 2 of the extension IOM/PTM module present in the alarmlist.

Binary output: AL IOM AI3 Red

Related applications	All
Description	The output is closed when there is the red alarm from the analog input 3 of the extension IOM/PTM module present in the alarmlist.

Binary output: AL IOM AI4I Red

Related applications	All
Description	The output is closed when there is the red alarm from the analog input 4 of the extension IOM/PTM module present in the alarmlist.

Binary output: AL Common Wrn

Related applications	All
Description	The output is closed when there is any warning type alarm present in the alarmlist.

Binary output: AL Common Sd

Related applications	All
Description	The output is closed when there is any shutdown type alarm present in the alarmlist.

Binary output: AL Common Stp

Related applications	All
Description	The output is closed when there is any slow stop type alarm present in the alarmlist.

Binary output: AL Common BOC

Related applications	All
Description	The output is closed when there is any BOC type alarm present in the alarmlist.

Binary output: AL Common Fls

Related applications	All
Description	The output is closed when there is any sensor fail alarm present in the alarmlist.

MINT specific

Binary output: System Ready

Related applications	MINT
Description	This output is closed if the gen-set group is able to take the current load and keep the reserve greater than the currently selected reserve for start. This output should be normally closed while the group works in automatic power management mode. If the output is open, it means the whole gen-set group is overloaded. It will open i.e. if a red alarm occurs on one gen-set and there is no other gen-set available to start instead of the stopped one. **NOTE:** This output does not provide information, that the reserve is already reached, it only gives information, that there is enough capacity within gen-set group to reach the reserve.

Binary output: SystReserve OK

Related applications	MINT
Description	The output is closed while the *Actual Reserve* is greater than the currently selected reserve for start.

Binary output: Bus Healthy

Related applications	MINT
Description	This output is active when the bus voltage and frequency are in limits. It is deactivated with appropriate delay after the voltage/frequency has got out of limits. The limits for under/overvoltage and under/overfrequency as well as appropriate delays are the same as for generator voltage/frequency and can be found in the Gener protect setpoint group.

SPtM specific

Binary output: MCB Close/Open

Related applications	SPtM
Description	This output is to be used for a contactor control in case a contactor is used in the MCB position. See the chapter Circuit breakers for details about all outputs available for generator/mains power switches.

Binary output: MCB ON Coil

Related applications	SPtM
Description	This output is to be used for control of the ON coil of the mains circuit breaker. See the chapter Circuit breakers for details about all outputs available for generator/mains power switches.

Binary output: MCB OFF Coil

Related applications	SPtM
Description	This output is to be used for control of the OFF coil of the mains circuit breaker. See the chapter Circuit breakers for details about all outputs available for generator/mains power switches.

Binary output: MCB UV Coil

Related applications	SPtM
Description	This output is to be used for control of the undervoltage coil of the mains circuit breaker. See the chapter Circuit breakers for details about all outputs available for generator/mains power switches.

Binary output: Ready To AMF

Related applications	SPtM
Description	The output is closed if the gen-set is ready to start automatically and take the load if the mains fails, i.e.: • the gen-set is not running and • the controller is in AUT mode and • no red alarm is present in the alarmlist

Binary output: Mains Healthy

Related applications	SPtM
Description	This output is active while mains failure is not detected, i.e. the mains is healthy.

Binary output: Mains Fail

Related applications	SPtM
Description	This output is active while mains failure is detected.

Binary output: Mode TEST

Related applications	All
Description	This output is active whenever the controller is in TEST mode.

Table of internal alarms

Alarm: Emergency Stop

Alarm type	Shutdown
Alarmlist message	`Emergency Stop`
Alarm evaluated	All the time
Related applications	All
Description	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. 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. **NOTE:** The MCB control is not affected by this alarm.

Alarm: Engine overspeed

Alarm type	Shutdown
Alarmlist message	`Sd Overspeed`
Alarm evaluated	All the time
Related applications	All
Description	This alarm occurs immediately when the engine speed has raised above the limit adjusted by setpoint *Overspeed Sd*. There is no delay for this alarm. See chapter Speed sensing to learn more about methods of speed measurement.

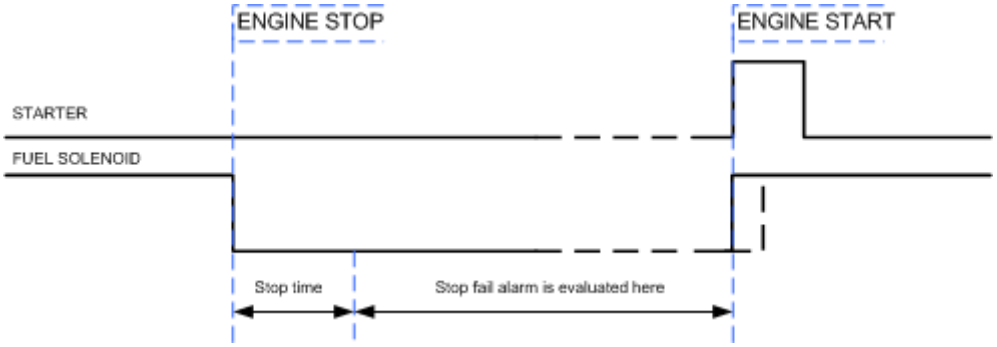
Alarm: Engine underspeed

Alarm type	Shutdown
Alarmlist message	`Sd Underspeed`
Alarm evaluated	Engine running only
Related applications	All
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 *Starting RPM*. The underspeed alarm starts to be evaluated 5 sec after successful gen-set start and is beeing evaluated all the time the fuel solenoid is on.

Alarm: Start Fail

Alarm type	Shutdown
Alarmlist message	`Sd Start Fail`
Alarm evaluated	When the gen-set is beeing started
Related applications	All
Description	This alarm will be issued after all attempts to start the gen-set (setpoint *Crank Attempts*) are run out but the gen-set did not start. See also Engine start chapter. **NOTE:** The gen-set can not be started again until this alarm is reset.

Alarm: Stop fail

Alarm type	Shutdown
Alarmlist message	`Stop fail`
Alarm evaluated	While the engine shall be stopped
Related applications	All
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 has been switched off and time delay *Stop time* has elapsed and lasts for the all time the fuel resp. starter motor are off.  See chapter Cooldown and stop to learn more about symptoms that are taken in account for the evaluation of stopped engine. **NOTE:** The gen-set can not be started until this alarm is inactive and reset.

Alarm: RPM measurement failure

Alarm type	Warning
Alarmlist message	`Sd RPMMeasFail`
Alarm evaluated	During cranking
Related applications	All
Description	The alarm is issued if the engine speed has not exceeded the *Starting RPM* within the *MaxCrank Time*, although some of additional running engine indication sources indicate that the engine has started.

Alarm: GCB Fail

Alarm type	BOC
Alarmlist message	`GCB Fail`
Alarm evaluated	All the time
Related applications	All
Description	This alarm will occur when the GCB feedback input does not match the expected position given by the *GCB Close/Open* 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 self, the alarm will be issued immediately. • The alarm will be also issued, if the breaker does not respond to an open or close command within 2 seconds. If synchronizing is disabled (binary input *ForwSyncDisable* is active) the maximal allowed reaction time is increased to 5s.

Alarm: MCB Fail

Alarm type	Warning
Alarmlist message	`MCB Fail`
Alarm evaluated	All the time
Related applications	SPtM
Description	This alarm will occur when the MCB feedback input does not match the expected position given by the *MCB Close/Open* output. It stays active until the mismatch between the output and feedback disappears. • If there was no command issued by the controller and the breaker (feedback) changes suddenly the position self, the alarm will be issued immediately. • Self-opening of the breaker is not considered as a fault and if all mains values are in limits, the command to reclosing the breaker is issued after delay given by setpoint *MainsReturnDel* has elapsed. • The alarm will be also issued, if the breaker does not respond to the close command within 2 seconds. After this period has elapsed the output *MCB Close/Open* is deactivated again and next attempt to close the breaker will occur first after the alarm is reset. • The alarm will be also issued, if the breaker does not respond to the open command within 2 seconds. The output *MCB Close/Open* will stay deactivated. Closing of GCB is blocked until this alarm becomes inactive. • If reverse synchronizing is disabled (binary input *RevSyncDisable* is active) the maximal allowed reaction time is increased to 5s.

Alarm: Forward synchronization timeout

Alarm type	Breaker open & cool down
Alarmlist message	`Sync Timeout`
Alarm evaluated	During GCB sychronization only
Related applications	All
Description	If the synchronization of GCB (forward synchronization) is not successful within a time period adjusted by setpoint *Sync Timeout*, this alarm will be issued, the gen-set will be cooled down and stopped.

Alarm: Reverse synchronization timeout

Alarm type	Warning
Alarmlist message	`RevSyncTimeout`
Alarm evaluated	During MCB sychronization only
Related applications	SPtM
Description	If the synchronization of MCB (reverse synchronization) is not successful within a time period adjusted by setpoint *Sync Timeout*, this alarm will be issued a the gen-set will remain in island operation. A new attempt of reverse synchronization can be initiated as late as the alarm is reset.

Alarm: Generator overload

Alarm type	Breaker open & cool down
Alarmlist message	`BOC Overload`
Alarm evaluated	All the time
Related applications	All
Description	The behavior of the overload alarm is adjusted by following setpoints: • *Overload BOC* adjusts the overload limit. • *Overload Del* adjusts the delay. The alarm is issued when the gen-set power is over the limit for time period longer than the delay.

Alarm: Generator reverse power

Alarm type	Breaker open & cool down
Alarmlist message	`BOC ReversePwr`
Alarm evaluated	All the time
Related applications	All
Description	This alarm protects the gen-set running parallel to mains or other gen-sets against the situation, when the engine looses power and becomes to be driven by the generator acting as an electric motor supplied from the mains or other gen-sets. Following setpoints are related to this alarm: • *ReversePwr BOC* adjusts the negative kW limit for this alarm. • *ReversePwr Del* adjusts the delay.

Alarm: Generator under/overvoltage

Alarm type	Breaker open & cool down
Alarmlist message	`BOC Gen Lx >V, BOC Gen Lx <V`
Alarm evaluated	Generator excited only
Related applications	All
Description	This alarm evaluates the generator phase voltage in all three phases. Following setpoints are related to it: • *Gen >V Sd* adjusts the overvoltage limit. • *Gen <V BOC* adjusts the undervoltage limit. • *Gen V Del* adjusts the alarm delay. **NOTE:** The generator voltage must be in limits to enable closing of GCB or starting of synchronization.

Alarm: Generator voltage unbalance

Alarm type	Breaker open & cool down
Alarmlist message	`BOC Volt Unbal`
Alarm evaluated	Generator excited only
Related applications	All
Description	This alarm evaluates the unbalance of the phase voltages, i.e. difference between highest and lowest phase voltage in one moment. Following setpoints are related to it: • *Volt Unbal BOC* adjusts the maximum allowed difference between highest and lowest phase voltage in one moment. • *Volt Unbal Del* adjusts the alarm delay.

Alarm: Generator under/overfrequency

Alarm type	Breaker open & cool down
Alarmlist message	`BOC Gen >Freq, BOC Gen <Freq`
Alarm evaluated	Generator excited only
Related applications	All
Description	This alarm evaluates the generator frequency in the phase L3. Following setpoints are related to it: • *Gen >Freq BOC* adjusts the overfrequency limit. • *Gen <Freq BOC* adjusts the underfrequency limit. • *Gen Freq Del* adjusts the alarm delay. **NOTE:** The generator voltage must be in limits to enable closing of GCB or starting of synchronization.

Alarm: Generator IDMT overcurrent

Alarm type	Breaker open & cool down
Alarmlist message	`BOC Overcurrnt`
Alarm evaluated	All the time
Related applications	All
Description	The overcurrent alarm is based on IDMT principle. The reaction time of an IDMT alarm is not fixed, but depends on how much is the protected value (generator current in this case) above the limit (nominal current). The higher is the overcurrent, the shorter the reaction time will be. All generator phases are evaluated. The behavior of the overcurrent alarm is adjusted by following setpoint:

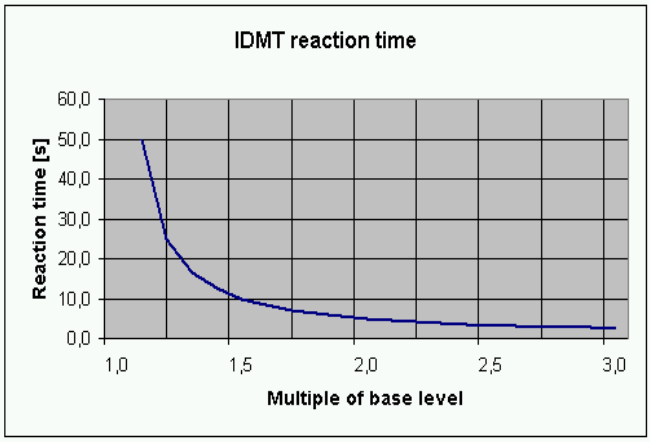
- *Amps IDMT Del* which defines the reaction time at the double of nominal current.

The nominal current level, where the alarm starts to be evaluated, is given by *Nomin Current*. The reaction time is infinite at this point.

Multiple of base level	Reaction time
1,0	∞
1,1	50,0
1,2	25,0
1,3	16,7
1,4	12,5
1,5	10,0
1,6	8,3
1,7	7,1
1,8	6,3
1,9	5,6
2,0	**5,0**
2,1	4,5
2,2	4,2
2,3	3,8
2,4	3,6
2,5	3,3
2,6	3,1
2,7	2,9
2,8	2,8
2,9	2,6
3,0	2,5

REACTION TIME = 2NOM_DEL * BASE / ACTUAL - BASE

2Nom delay setpoint **5** s



IDMT reaction time example (2Nom delay adjusted to 5s)

Alarm: Generator short current

Alarm type	Breaker open & cool down
Alarmlist message	`BOC ShortCrct`
Alarm evaluated	All the time
Related applications	All
Description	This is a fast overcurrent protection. Following setpoints are related to this alarm: • *Short Crct BOC* adjusts the short current limit. • *Short Crct Del* adjusts the delay in fine steps.

Alarm: Generator current unbalance

Alarm type	Breaker open & cool down
Alarmlist message	`BOC Amps Unbal`
Alarm evaluated	All the time
Related applications	All
Description	This alarm evaluates the unbalance of the phase currents, i.e. difference between highest and lowest phase current in one moment. Following setpoints are related to it: • *Amps Unbal BOC* adjusts the maximum allowed difference between highest and lowest phase current in one moment. • *Amps Unbal Del* adjusts the alarm delay.

Alarm: Phase sequence

Alarm type	Warning
Alarmlist message	`Gen CCW Rot, Mains CCW Rot`
Alarm evaluated	All the time
Related applications	All
Description	The controller detects phase sequence on both generator and mains/bus voltage terminals. These protections are important after controller installation to avoid wrong voltage phase connection. There is fix defined phase sequence in InteliCompact controller: L1, L2 and L3. When the phases are connected in different order (e.g. L1, L3, L2 or L2, L1, L3) alarms are detected. These alarms prevent circuit breaker closing.

Alarm: Maintenance timer

Alarm type	Warning
Alarmlist message	`WrnMaintenance`
Alarm evaluated	All the time
Related applications	All
Description	Adjust the setpoint *WrnMaintenance* to the interval of next maintenance check. The value of the setpoint will count down while the engine running and if reaches zero, this alarm will be issued. It will continue to count down to negative values and the alarm message will remain in the alarm list (even if the controller is switched off and on again) until the setpoint is re-adjusted to a positive value.

Alarm: Charging alternator fail

Alarm type	Warning
Alarmlist message	`Wrn ChrgAltFail`
Alarm evaluated	Engine running only
Related applications	All
Description	This alarm is issued if the engine is running and the voltage on the D+ terminal is lower than 80% of the controller supply voltage. This alarm works similar to the red "battery" alarm indicator on a vehicle dashboard. The setpoint *D+ Function* has to be in CHRGFAIL or ENABLED position to enable this alarm.

Alarm: Battery voltage

Alarm type	Warning
Alarmlist message	`Wrn Batt Volt`
Alarm evaluated	All the time
Related applications	All
Description	This alarm informs the operator, that the controller supply voltage is too low or too high. Following setpoints are related to it: • *Batt Undervolt* adjusts the low voltage limit. • *Batt Overvolt* adjusts the high voltage limit. • *Batt Volt Del* adjusts the alarm delay.

Alarm: Governor output at limit

Alarm type	Warning
Alarmlist message	`Wrn SpdRegLim`
Alarm evaluated	All the time
Related applications	All
Description	This alarm will be issued if the governor output has 0V or 10V for more than 2sec. This situation can occur for example if the *Speed Gov Char* setpoint is in wrong position or if the connection of the governor output to the governor is not correct.

Alarm: AVR output at limit

Alarm type	Warning
Alarmlist message	`Wrn AVRregLim`
Alarm evaluated	All the time
Related applications	All
Description	This alarm will be issued if the governor output has 0% or 100% for more than 2sec. This situation can occur for example if the connection of the AVRi output to the AVR is not correct.

Alarm: Battery flat

Alarm type	Shutdown
Alarmlist message	`Sd BatteryFlat`
Alarm evaluated	During cranking
Related applications	All
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 it's voltage drops so low when starter motor is energized that it causes controller reset.

Alarm: Low BackupBatt

Alarm type	Shutdown
Alarmlist message	`LowBackupBatt`
Alarm evaluated	All the time
Related applications	All
Description	This alarm indicates that the internal backup battery needs to be replaced.

Alarm: Low Fuel Level 1

Alarm type	Warning
Alarmlist message	`Wrn Fuel Level`
Alarm evaluated	All the time
Related applications	All
Description	This alarm indicates that the fuel level is lower than the set yellow alarm of relevant AI (Fuel Level).

Alarm: Low Fuel Level 2

Alarm type	Braker open & cool down
Alarmlist message	`Stp Fuel Level`
Alarm evaluated	All the time
Related applications	All
Description	This alarm indicates that the fuel level is lower than the set red alarm of relevant AI (Fuel Level).

Alarm: High Water Temperature 1

Alarm type	Warning
Alarmlist message	`Wrn Water Temp`
Alarm evaluated	All the time
Related applications	All
Description	This alarm indicates that the water temperature is higher than the set yellow alarm of relevant AI (Water Temp).

Alarm: High Water Temperature 2

Alarm type	Shutdown
Alarmlist message	`Sd Water Temp`
Alarm evaluated	All the time
Related applications	All
Description	This alarm indicates that the water temperature is higher than the set red alarm of relevant AI (Water Temp).

Alarm: Low Oil Pressure 1

Alarm type	Warning
Alarmlist message	`Wrn Oil Press`
Alarm evaluated	All the time
Related applications	All
Description	This alarm indicates that the oil pressure is lower than the set yellow alarm of relevant AI (Oil Press).

Alarm: Low Oil Pressure 2

Alarm type	Shutdown
Alarmlist message	`Sd Oil Press`
Alarm evaluated	All the time
Related applications	All
Description	This alarm indicates that the oil pressure is lower than the set red alarm of relevant AI (Oil Press).

Alarm: Engine Stop Fail

Alarm type	Warning/Shutdown
Alarmlist message	`Sd Stop Fail`
Alarm evaluated	All the time
Related applications	All
Description	Engine stop fail indication. Stop fail means that the engine does not reach “still engine” state within Engine params: Stop time. **NOTE:** “Still engine” conditions: - Engine speed (RPM) = 0 and - AI: Oil press < Starting POil and - D+ terminal is not active and - BI: RunIndication 1 and 2 and 3 are not active and - Generator voltage < 15V (in all phases) and - Generator frequency = 0 Hz If all these conditions are fulfilled, additional 2s delay is used to confirm “still engine” state.

Alarm: GCB Fail

Alarm type	Warning
Alarmlist message	`GCB Fail`
Alarm evaluated	All the time
Related applications	SPtM
Description	GCB Failure was detected. a) Wrong connection between breaker feedback signals and controller binary input. b) Wrong breaker signal logic or breaker signal feedback signal logic

Alarm: MCB Fail

Alarm type	Warning
Alarmlist message	`MCB Fail`
Alarm evaluated	All the time
Related applications	SPtM
Description	MCB Failure was detected. a) Wrong connection between breaker feedback signals and controller binary input. b) Wrong breaker signal logic or breaker signal feedback signal logic (CLOSE-OFF/CLOSE-ON)