MainsCompact NT®

Mains controller for the InteliCompact gen-set controllers

SW version 1.0, March 2009

ComAp
LEADER IN GEN-SET COMMUNICATION SOLUTION

REFERENCE GUIDE

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Document information

MAINSCOMPACT-NT® - REFERENCE GUIDE
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DOCUMENT HISTORY

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1	1.0	25.3.2009

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

CE

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

The MainsCompact^{NT} controller is a mains controller for a group of gen-sets controlled by InteliCompact^{NT} controllers operating in stand-by or parallel modes. A modular construction allow 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 reliability

Configurability

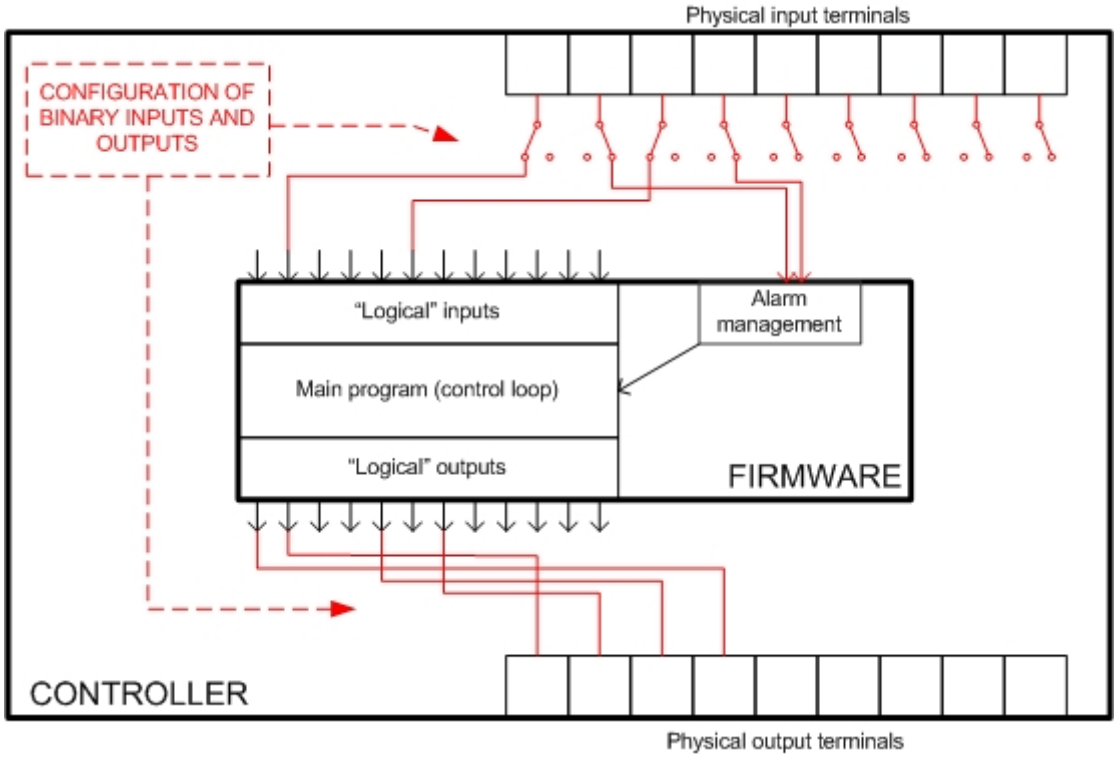
One of the key features of the controller is high level of adaptability of the system to the needs of every paricular application. The way, how to achive this, is the configuration.

NOTE:
Use **LiteEdit** PC software to read from controller or disk, view, modify 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. Changing language of 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 how to change the configuration.

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 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 in 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

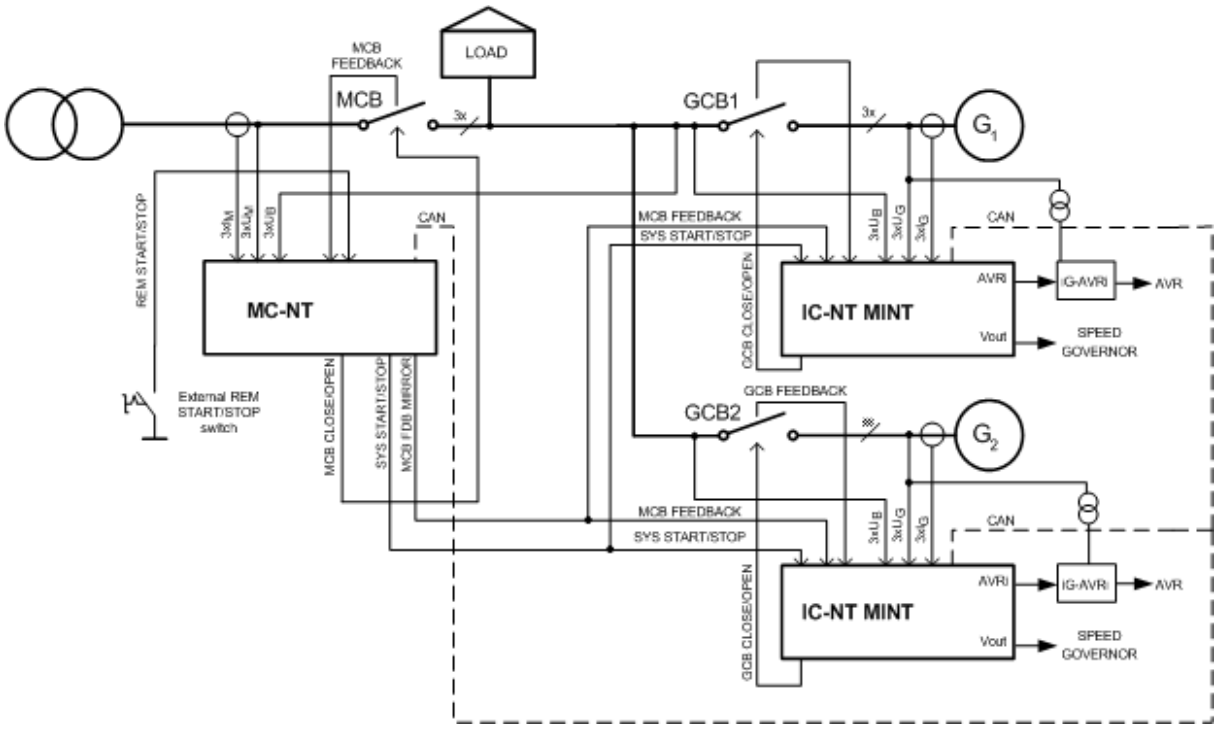
Applications overview

A typical application for using the MainsCompact-NT (MC-NT) controller is a group of gen-sets controlled by InteliCompact-NT controllers, which shall cooperate with a mains. The MC-NT plays a role of the mains decoupling relay, synchronizer, load control device and others.

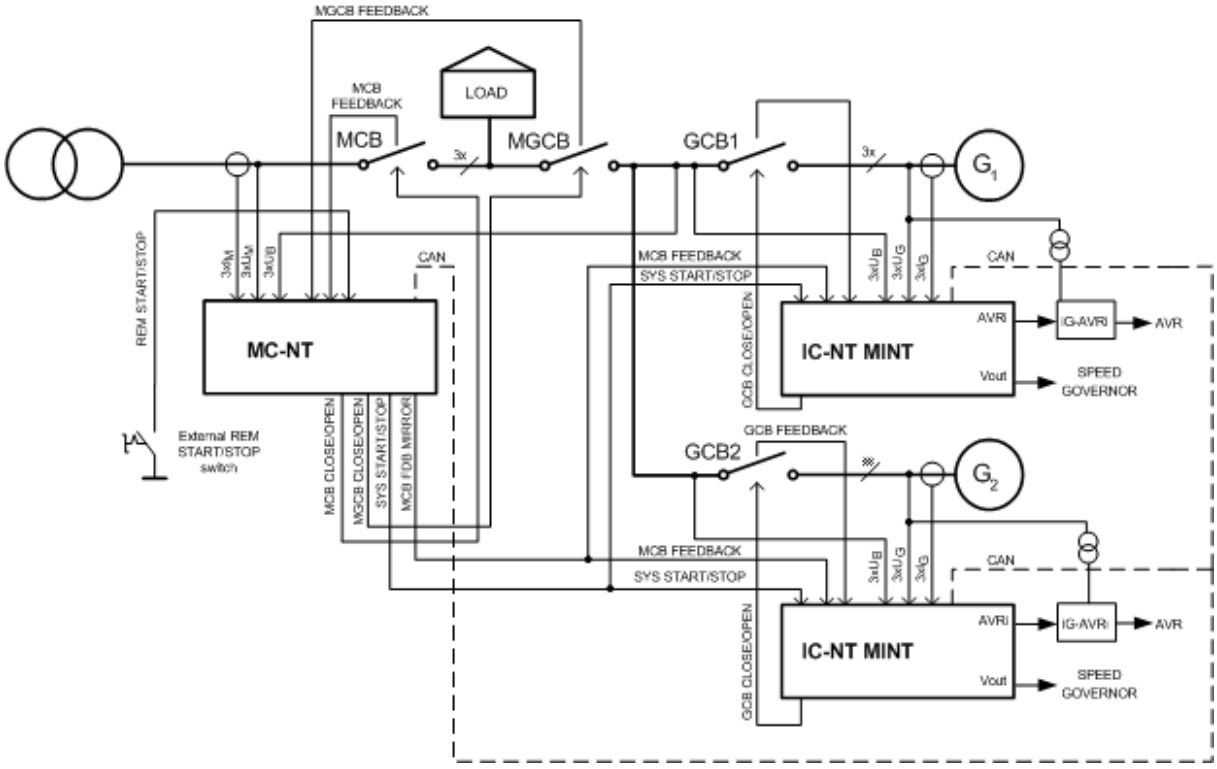
Key functions of the MC-NT are:

- Mains voltage and frequency measurement and mains failure detection.
- Mains circuit breaker control (MCB).
- AMF function - automatic start of the gensets in case of mains failure.

- Synchronizing of MGCB (master generator breaker) and reverse synchronizing of MCB.
- Soft load transfers between gensets and mains.
- Load control of the gensets in parallel to mains operation.



TYPICAL MCB WIRING

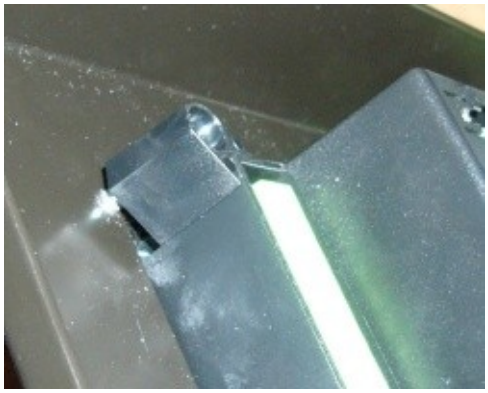


TYPICAL MGCB WIRING

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.



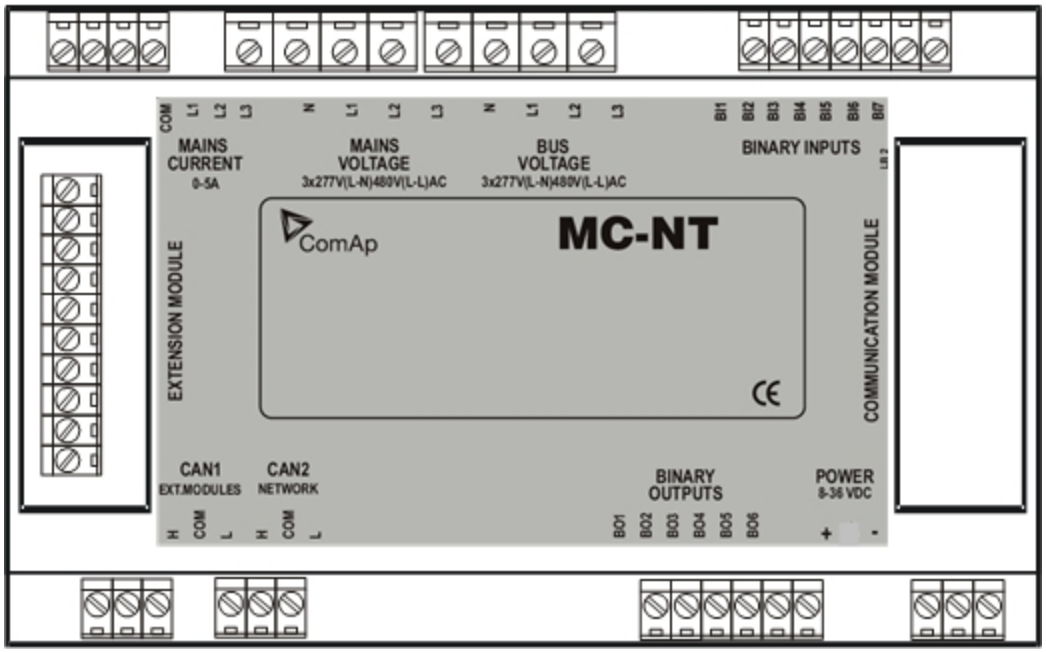
Package contents

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



MAINSCOMPACT-NT

Voltage and current inputs

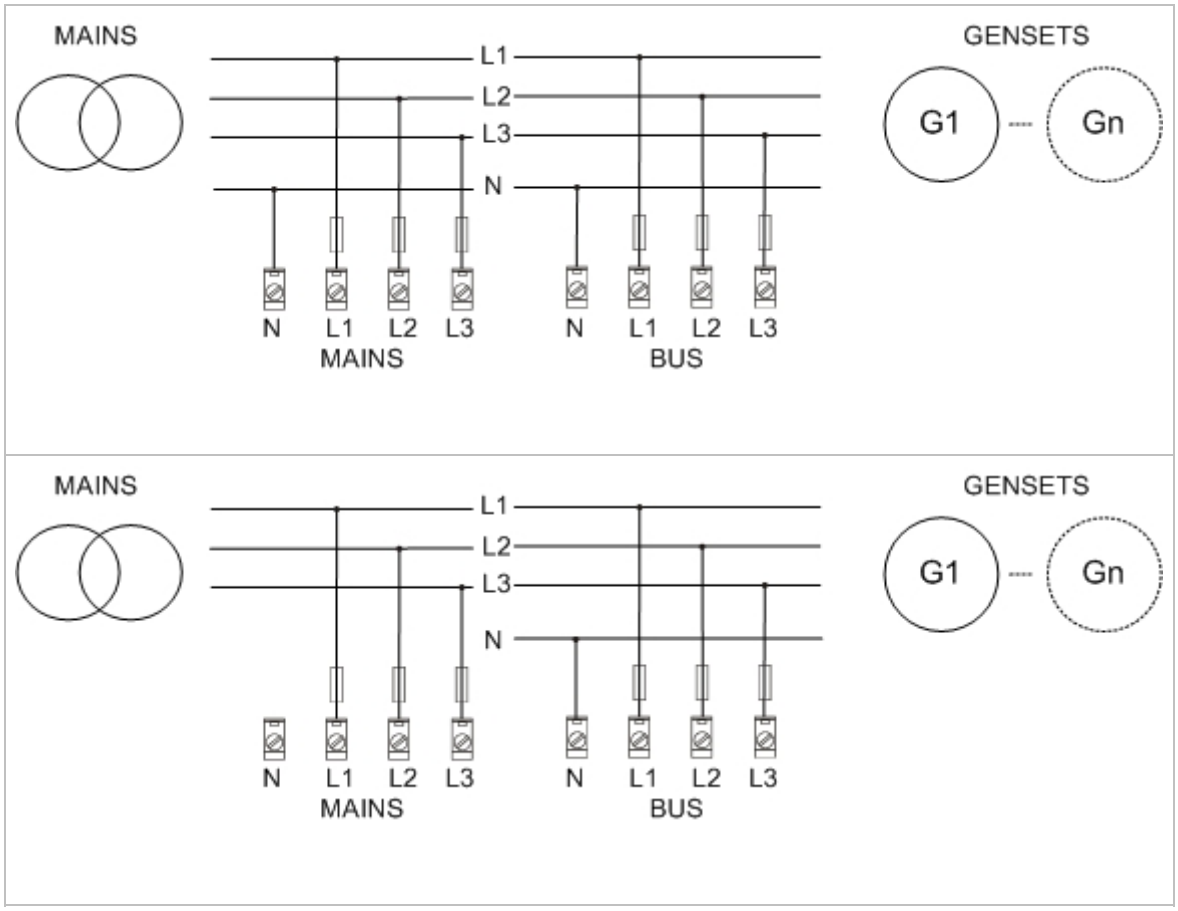
WARNING!
Risk of personal injury due to electric shock when manipulating with voltage terminals under voltage! Be sure the terminals are not under voltage before touching it.

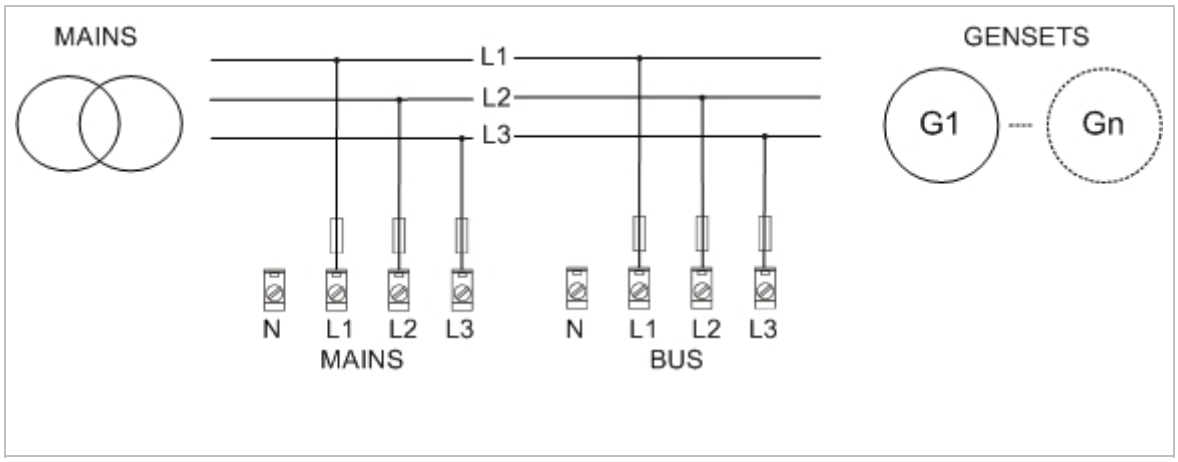
WARNING!
Do not open secondary circuit of current transformers when primary circuit is closed!!! Open the primary circuit first!

Use **1.5 mm^2** cables for voltage connection and **2.5 mm^2** for current transformers connection.

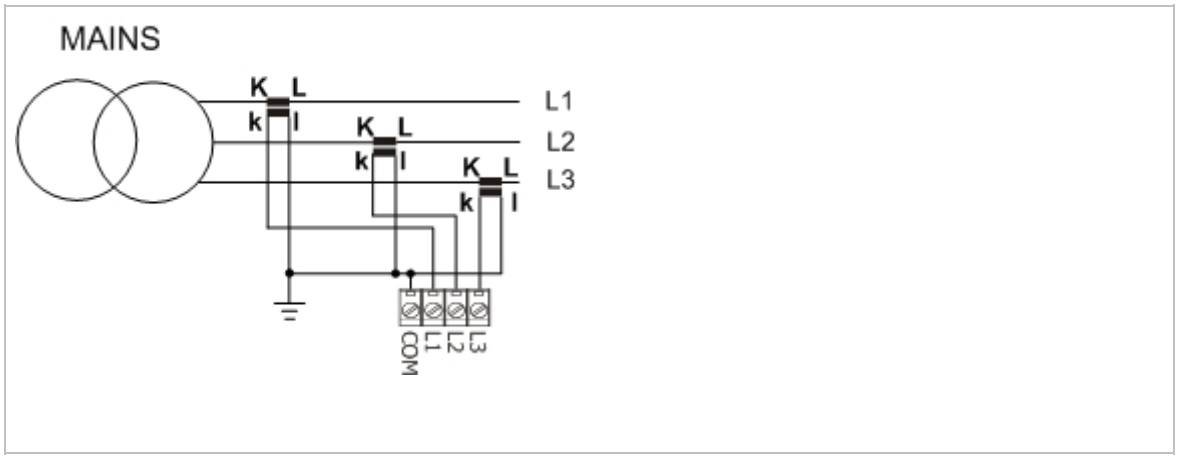
Adjust nominal voltage, nominal current, CT ratio and PT ratio by appropriate setpoints in the Basic Settings group. Learn about how to view and change setpoints in the User interface chapter.

VOLTAGE MEASUREMENT WIRING





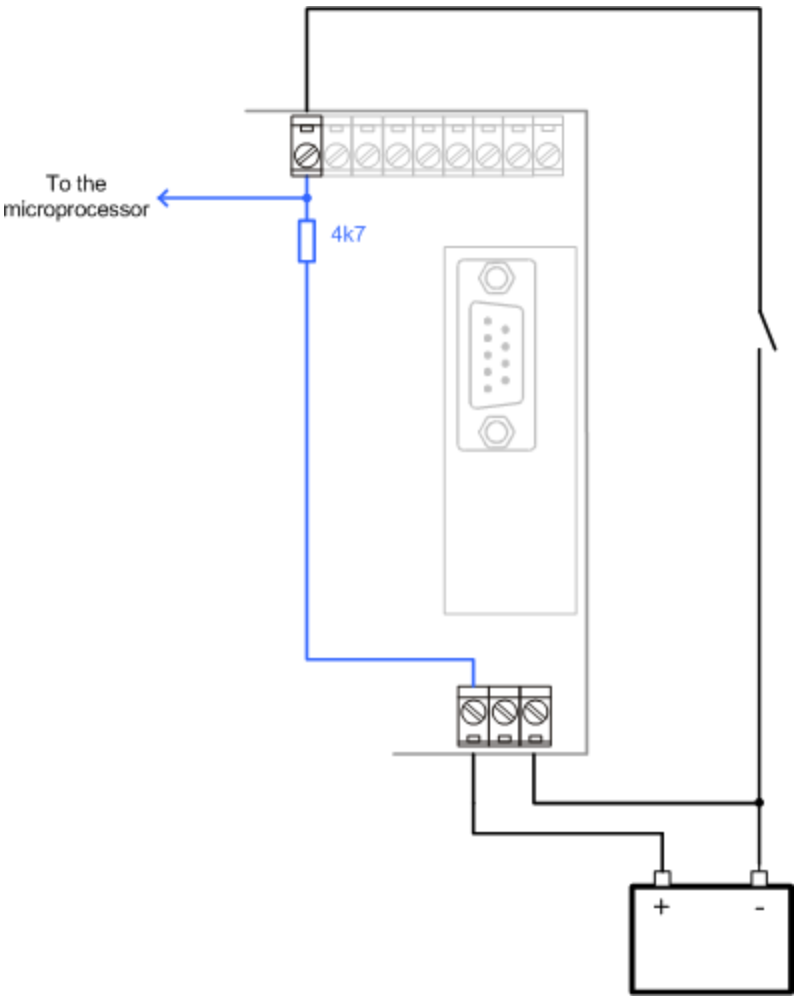
CURRENT MEASUREMENT WIRING



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.



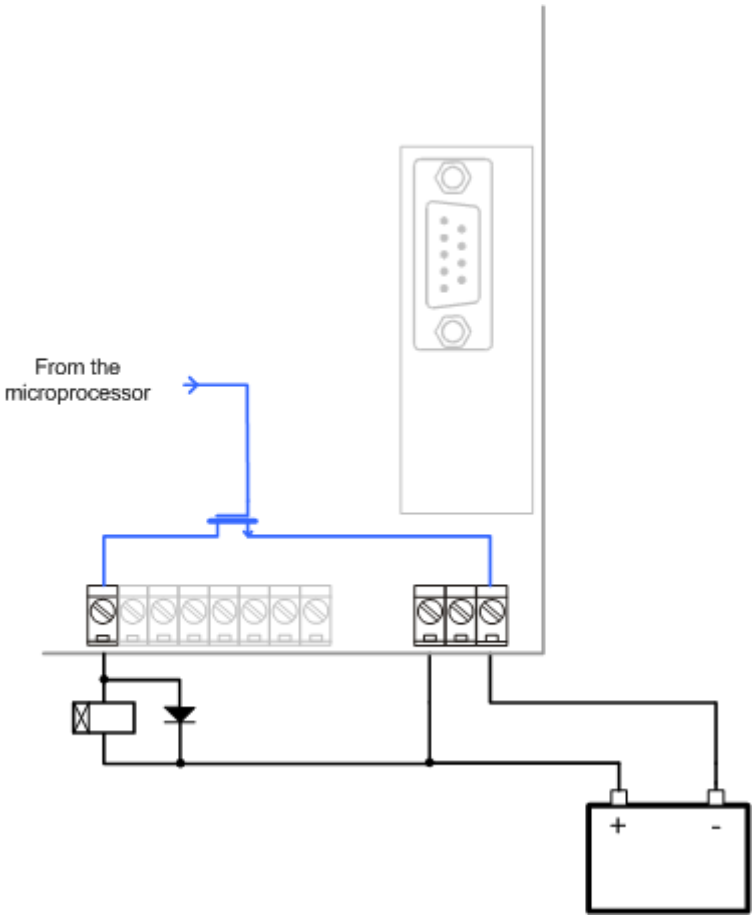
WIRING OF BINARY INPUTS

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

Circuit breakers

There are two power switches controlled by the controller:

- The master generator circuit breaker or contactor - MGCB (optional)
- The Mains circuit breaker or contactor - MCB

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:

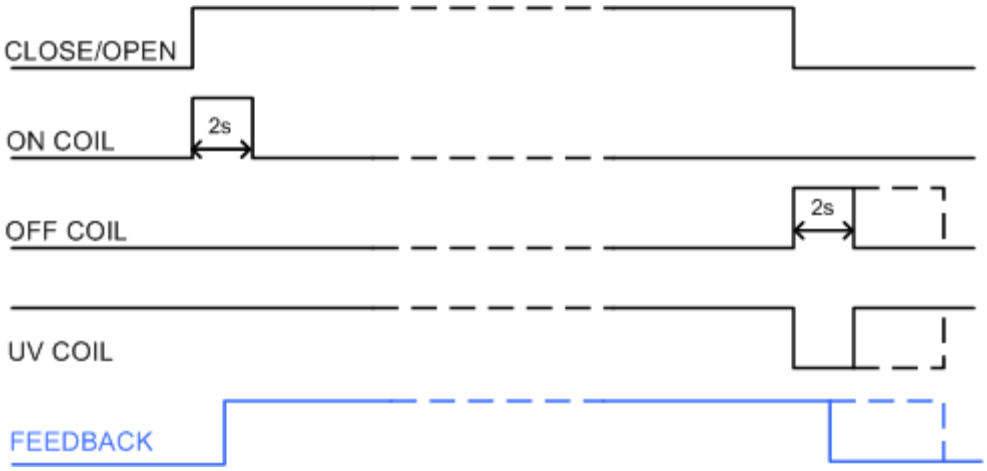
- The control outputs must be configured and wiring of the power switches must be provided such a way, that the controller has full control over the breakers - i.e. the controller can open and close the breaker at any time.
- The breaker must respond within max. 2s to a close and open command. A special attention should be paid to opening of motorized circuit breakers, as it could take more than 2s 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.

NOTE:
The controller resolves, whether the MGCB is used or not, according to the configuration of the *MGCB Feedback* input. If the feedback is not configured, the MGCB is supposed not to be present in the system.

NOTE:
Details about how the breakers are controlled can be found in the chapter Breaker control.

Breaker control outputs

Close/open	An output for control of a contactor. It's state represents the breaker position requested by the controller. The breaker must react within 2s to a close or open command, otherwise *alarm* is issued.
ON coil	An output giving 2s 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 2s. The output is intended for control of open coils of circuit breakers.
UV coil	The output is active all the time the controller is switched on. 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

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.

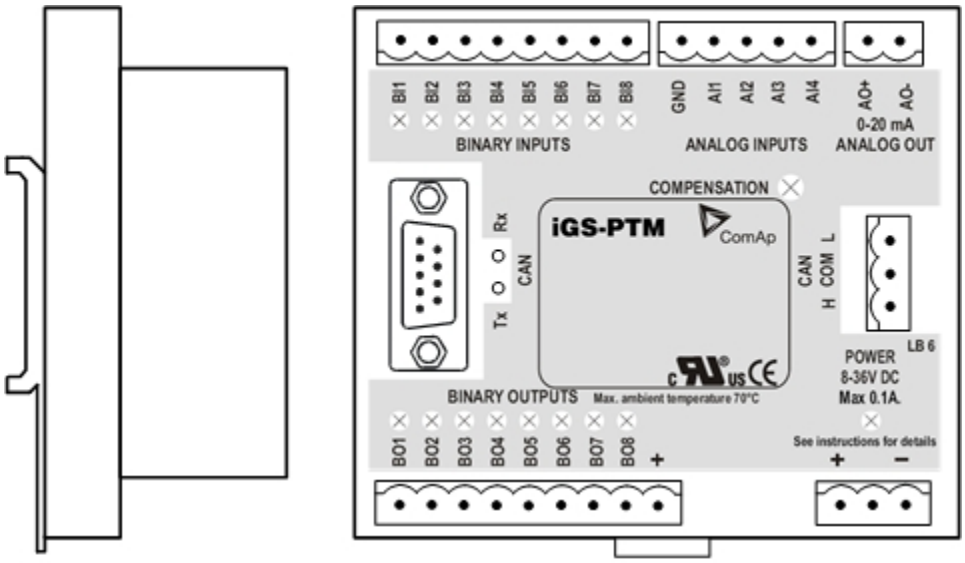
Extension modules

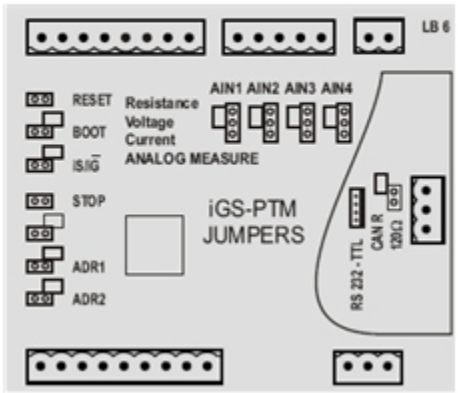
Extension modules are to be enabled and configured using LiteEdit. Extension modules are not contained in the factory default configuration.

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.

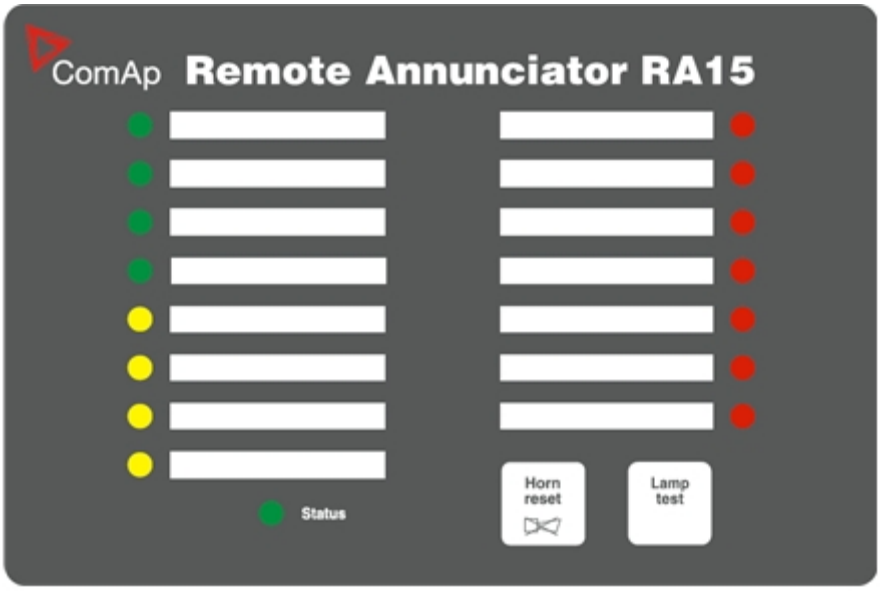
A separate manual for the IGS-PTM module is available for download on the ComAp web site

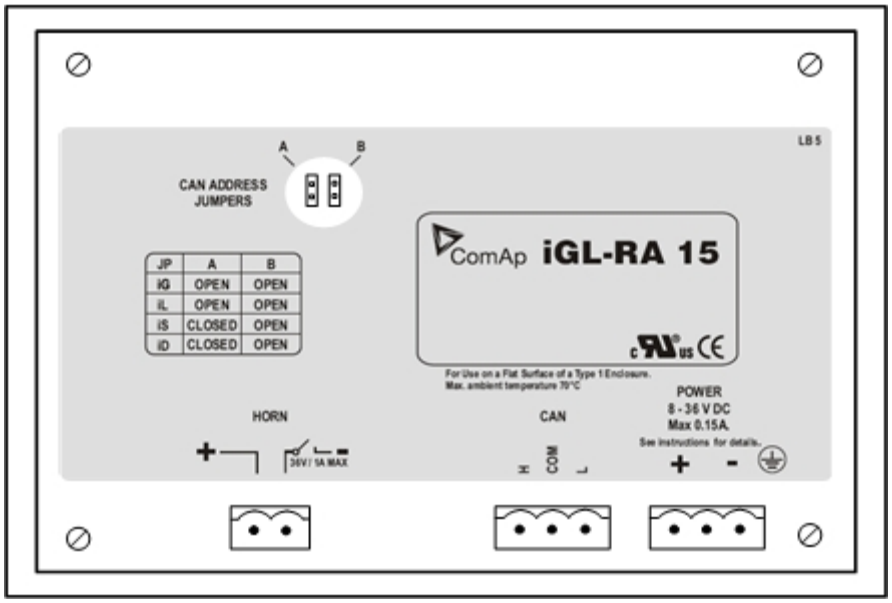
IGL-RA15 remote annunciator

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.





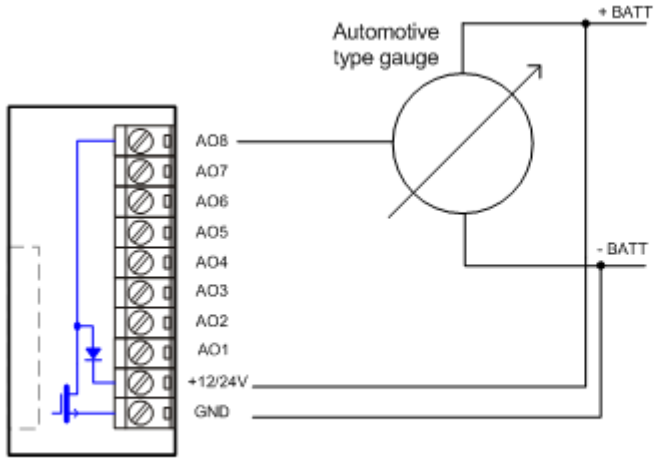
NOTE:
The address selection jumpers must be in the iG position for using the module with the InteliCompact-NT.

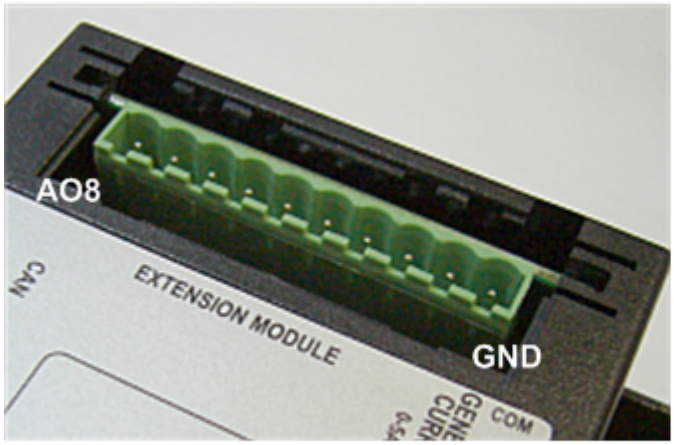
A separate manual for the IGL-RA15 module is available for download on the ComAp web site

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.





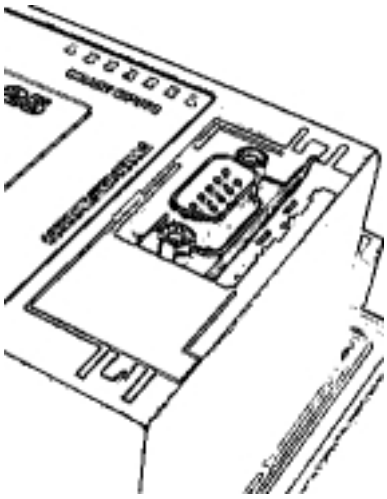
Examples of automotive gauges that can be used with the module:

- 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

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 accesible after slot cover is removed.

More information about how to use communication modules can be found in the chapter Communications.

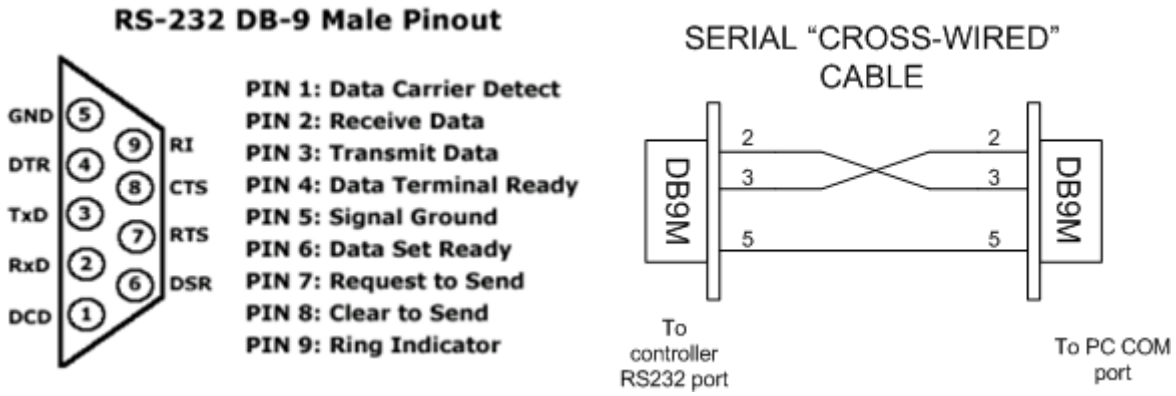


SLOT FOR COMMUNICATION MODULES

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

IL-NT-232

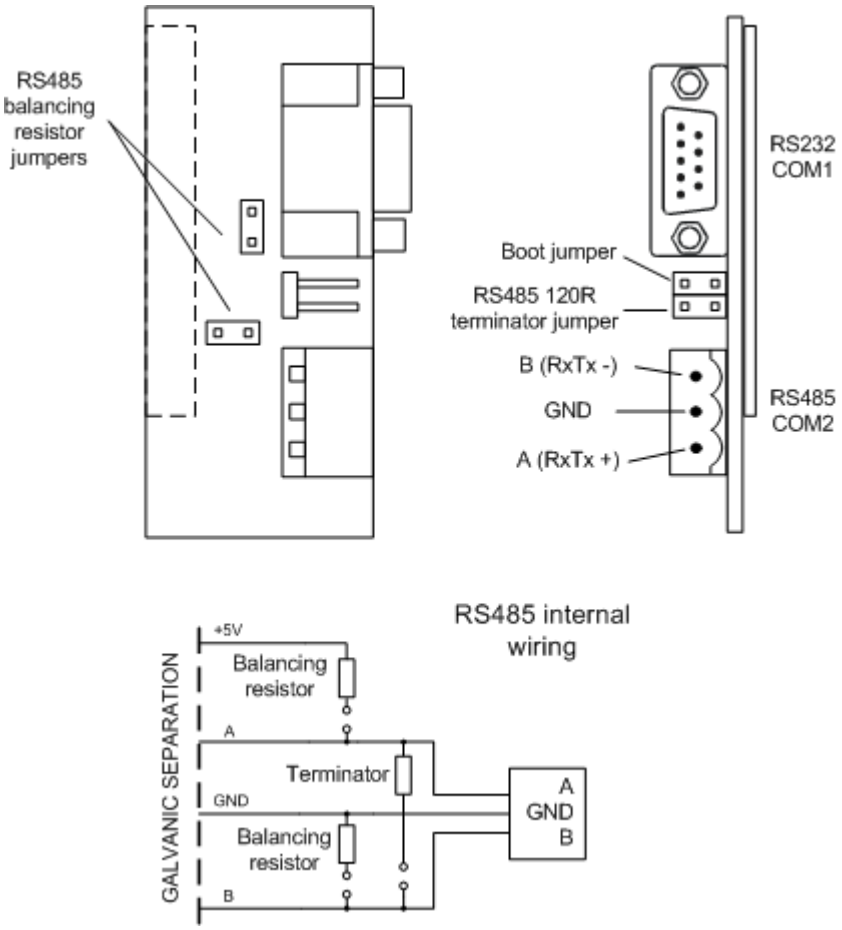
This module contains a RS232 port with all modem signals connected internally to the COM1 of the controller. DB9M connector is used on the RS232 side.



RS232 PINOUT AND CABLE WIRING

IL-NT-232-485

The IL-NT-232-485 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-232-485 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.

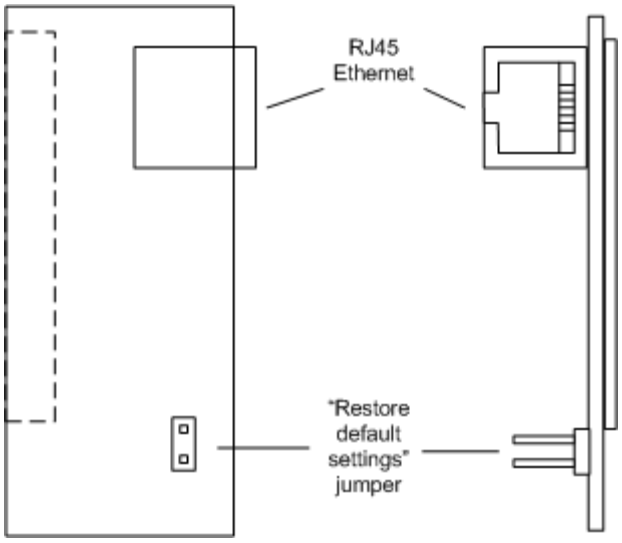
NOTE:
The FTDI driver is installed together with LiteEdit.

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!

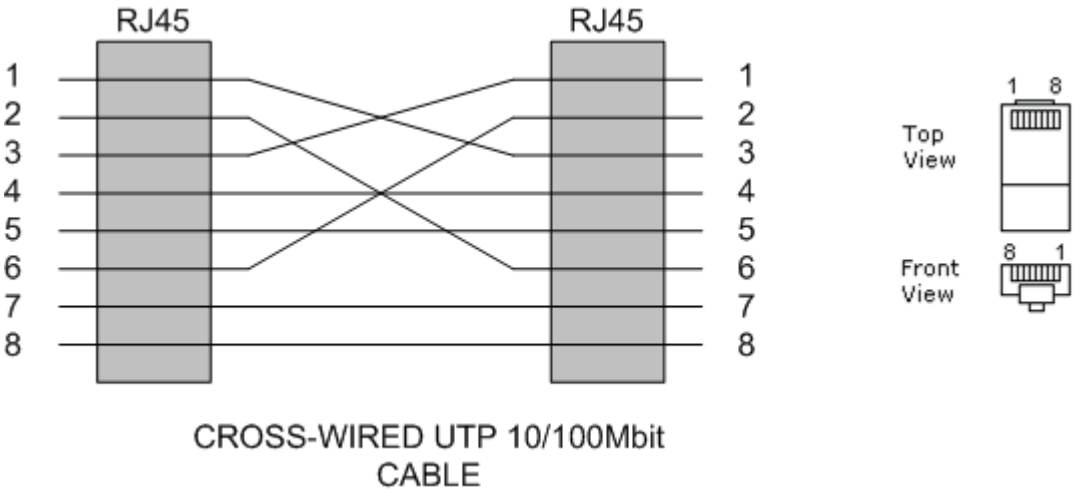
IB-Lite

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

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

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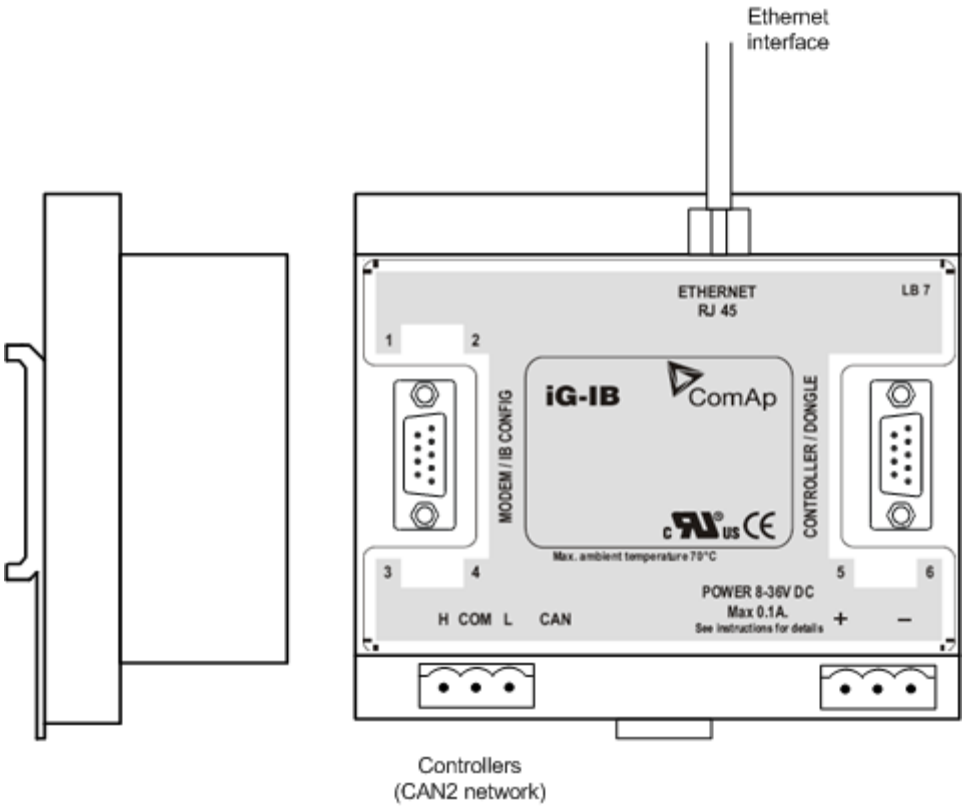
IG-IB Internet bridge

This external DIN-rail mounted module provides connection to the interner either via Ethernet or via modem and dial-up connection. A RS232 port is available for the modem connection and RJ45 connector for the Ethernet.

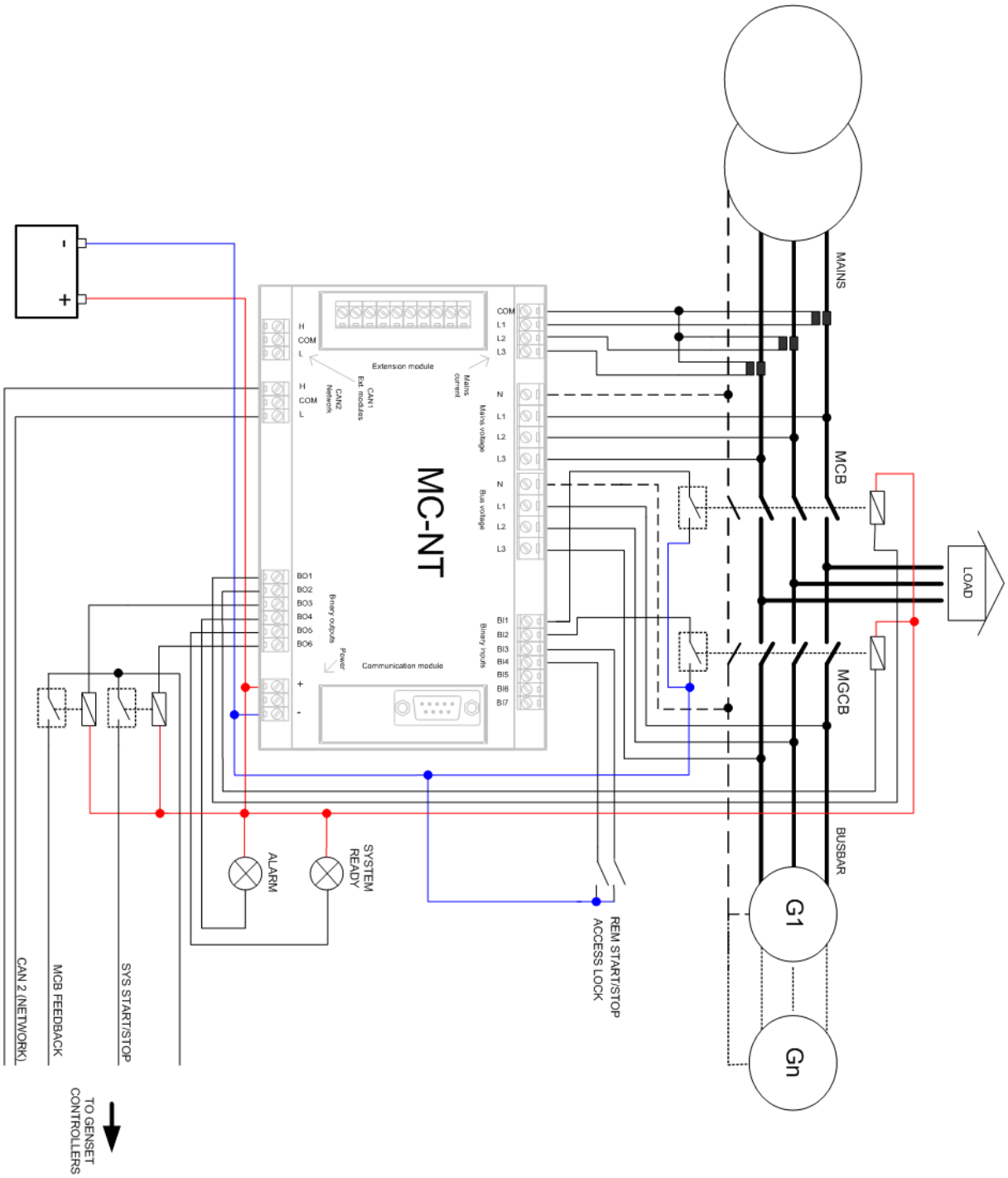


The controller can be connected either by CAN2 bus or by RS232. One IG-IB module can provide internet connectivity for up to 32 controllers (a IG-IB dongle is required for this case)

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

Typical wiring

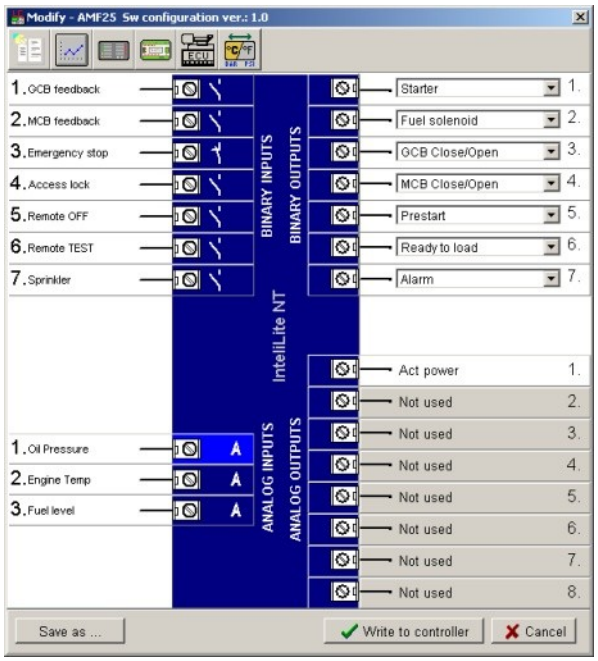
The wiring below contains the master generator circuit braker (MGCB). Using of the MGCB is optional, the system can work also without it. For this case the *MGCB Feedback* input must not be configured. The sequences are slightly different with and without MGCB. More information can be found in the Breaker control chapter.



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

BINARY INPUTS

NO.	DESCRIPTION	CONFIGURED FUNCTION
BI1	Mains circuit breaker feedback	*MCB Feedback*
BI2	Master generator circuit breaker feedback	*MGCB Feedback*
BI3	Remote start/stop	*Rem Start/Stop*
BI4	Access lock keyswitch	*Access Lock*
BI5	Not Used	
BI6	Not Used	
BI7	Not Used	

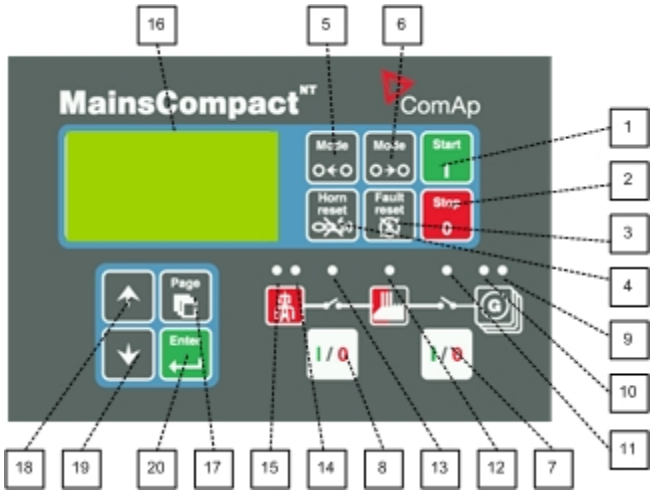
BINARY OUTPUTS

NO.	CONFIGURED FUNCTION
BO1	*MCB Close/Open*
BO2	*MGCB Close/Open*
BO3	*MCB Fdb Mirror*
BO4	*Alarm*
BO5	*System Ready*
BO6	*Sys Start/Stop*

Operator guide

NOTE:
The pictures of controller screens used in this chapter are for illustration only. They show typical contents of each particular screen category, however the real content of the screens may differ according to the configuration, version and others.

Front panel elements



GEN-SET CONTROL BUTTONS

POSITION		DESCRIPTION
1		**START** button. Works in MAN mode only. Press the button to start the group manually via *Sys Start/Stop* output connected to Sys Start/Stop inputs of the controllers. The gen-sets must be in AUT mode!
2		**STOP** button. Works in MAN mode only. Press the button to stop the group manually via *Sys Start/Stop* output connected to Sys Start/Stop inputs of the controllers. The gen-sets must be in AUT mode!
3		**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** button. Use this button to deactivate the horn output without acknowledging the alarms.

5		**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		**MGCB** button. Works in MAN mode only.
8		**MCB** button. Works in MAN mode 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!

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 came up and is still not acknowledged.
10	**Bus voltage OK**. This green indicator lits if the bus voltage and frequency is in limits.
11	**MGCB position**. This green indicator blinks if the MGCB is beeing sychronized, otherwise it shows current status of the MGCB cicuit breaker according to the feedback input.
12	**Load under voltage**. This green indicator shows if the load is under voltage or not.
13	**MCB position**. This green indicator blinks if the forward sychronizing is currently in progress, otherwise it shows current status of the mains cicuit breaker according to the feedback input.
14	**Mains voltage OK**. This green indicator lits if the mains is evaluated as healthy.
15	**Mains failure**. This red indicator starts blinking when the mains failure is detected and after the gen-set has started and connected to the load it changes to steady lit until the mains failure is finished.

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:

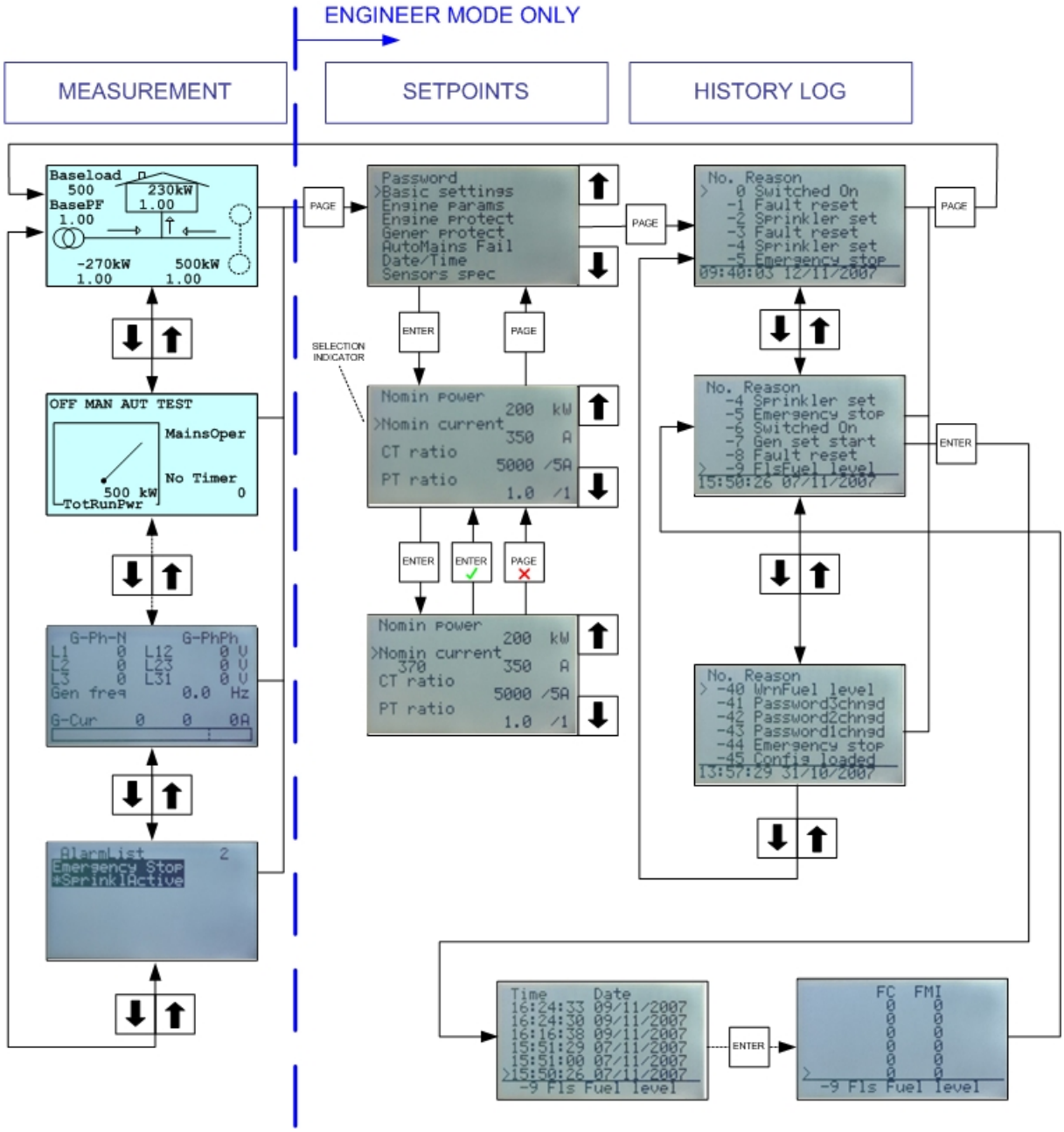
- **User mode** allows the user to go through all screens with measurements and alarms. The  button does not work, i.e. setpoints and history pages are not accesible.
- **Engineer mode** gives the qualified person full access to all pages and screens.

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, computed values like i.e. power or reserves, 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 last record is displayed first.

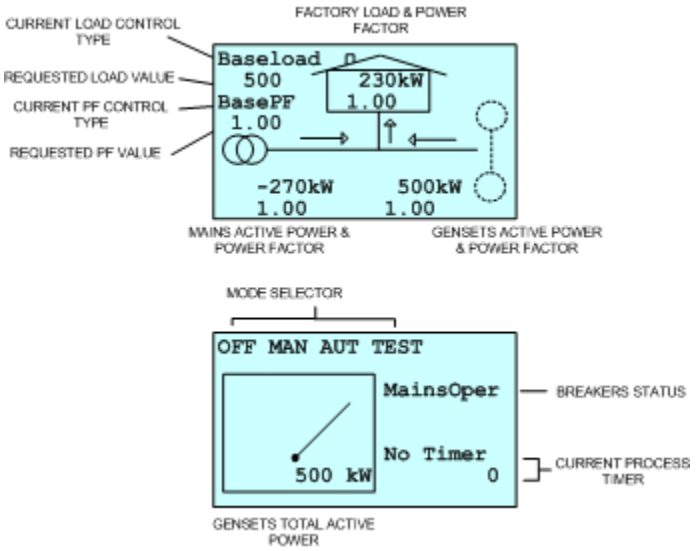


STRUCTURE OF THE DISPLAYED DATA

View measured values

Press 

button repeatedly until you see the main screen with the symbolic site diagram. Then press  or  to select requested screen within the measurement page. The mode selector and gen-set total kW meter are located on the 2nd screen.

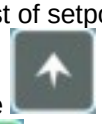


THE MAIN SCREEN

Setpoints - view and change

1. Press 

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 

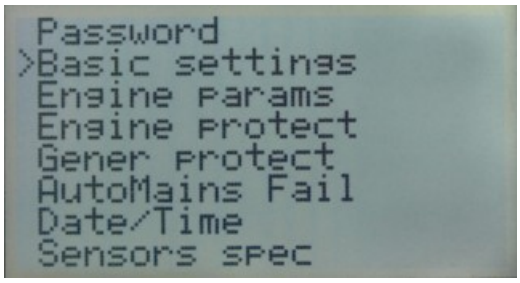
button to continue into the selected group.
2. Now you will see the list of setpoints, which belong to the selected group, together with their current setting. Use the  or  buttons again to select the setpoint you want to modify and press 

.
3. The cureent 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 

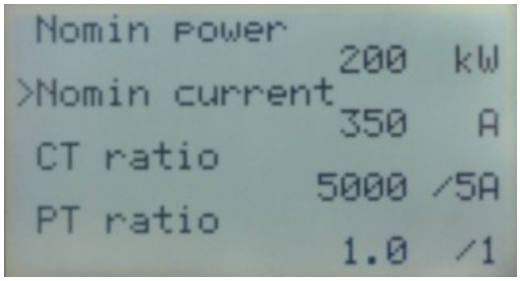
button to confirm the change or 

to discard it and return to the list of setpoints of the selected group.
5. Continue with change of another setpoint or press 

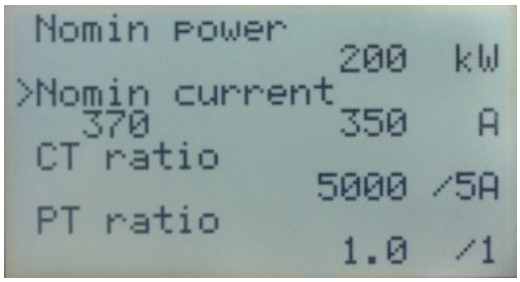
to return to the list of groups.



LIST OF GROUPS OF SETPOINTS



LIST OF SETPOINTS WITIN SELECTED GROUP



EDITING A SETPOINT

Browsing the history log

1. Press 

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

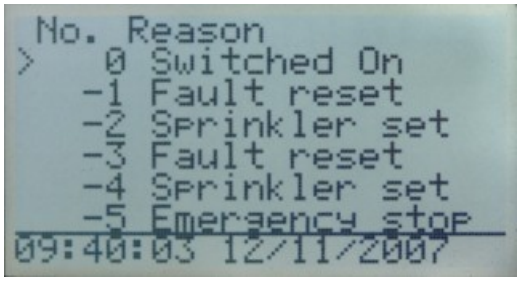
NOTE:

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 

button to move over columns within the selected record. Pressing it repeatedly will move cyclically over the columns, i.e. after last column the first one will be displayed.
3. Use buttons  and  to move over the records.
4. Press 

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.

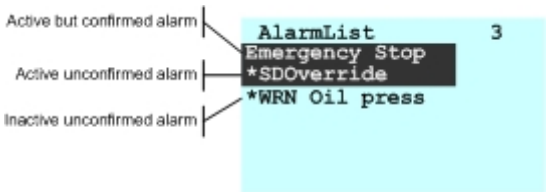
Browsing alarms

The Alarmlist is displayed on the last screen in the measurement page. The Alarmlist screen will appear automatically always when a new alarm occurs or can be displayed manually as described in the chapter View measured values.

- 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

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 containing the serial number a password decode number as 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.

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 

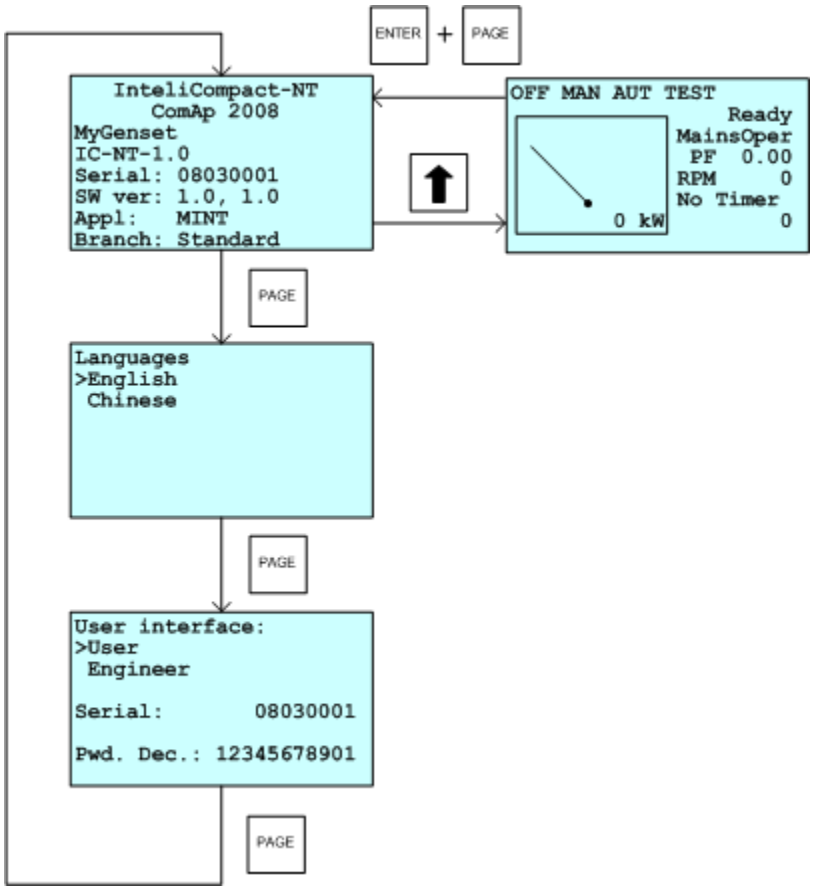
button and simultaneously press the button 

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 in 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 control. Non-standard situations and combinations with low probability of occurence are not described.

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 matches the order in the list above. If all inputs are deactivated, the mode will return to the original position given by the setpoint.

NOTE:
Starting and stopping of the gen-sets is done by the output *Sys Start/Stop*, which has to be connected to *Sys Start/Stop* inputs of all gen-set controllers. See the drawings in the chapter Typical applications.

OFF

- The MGCB is opened.
- The binary output *Sys Start/Stop* is deactivated.
- 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 MGCB, GCB, START, STOP are not active.

MAN

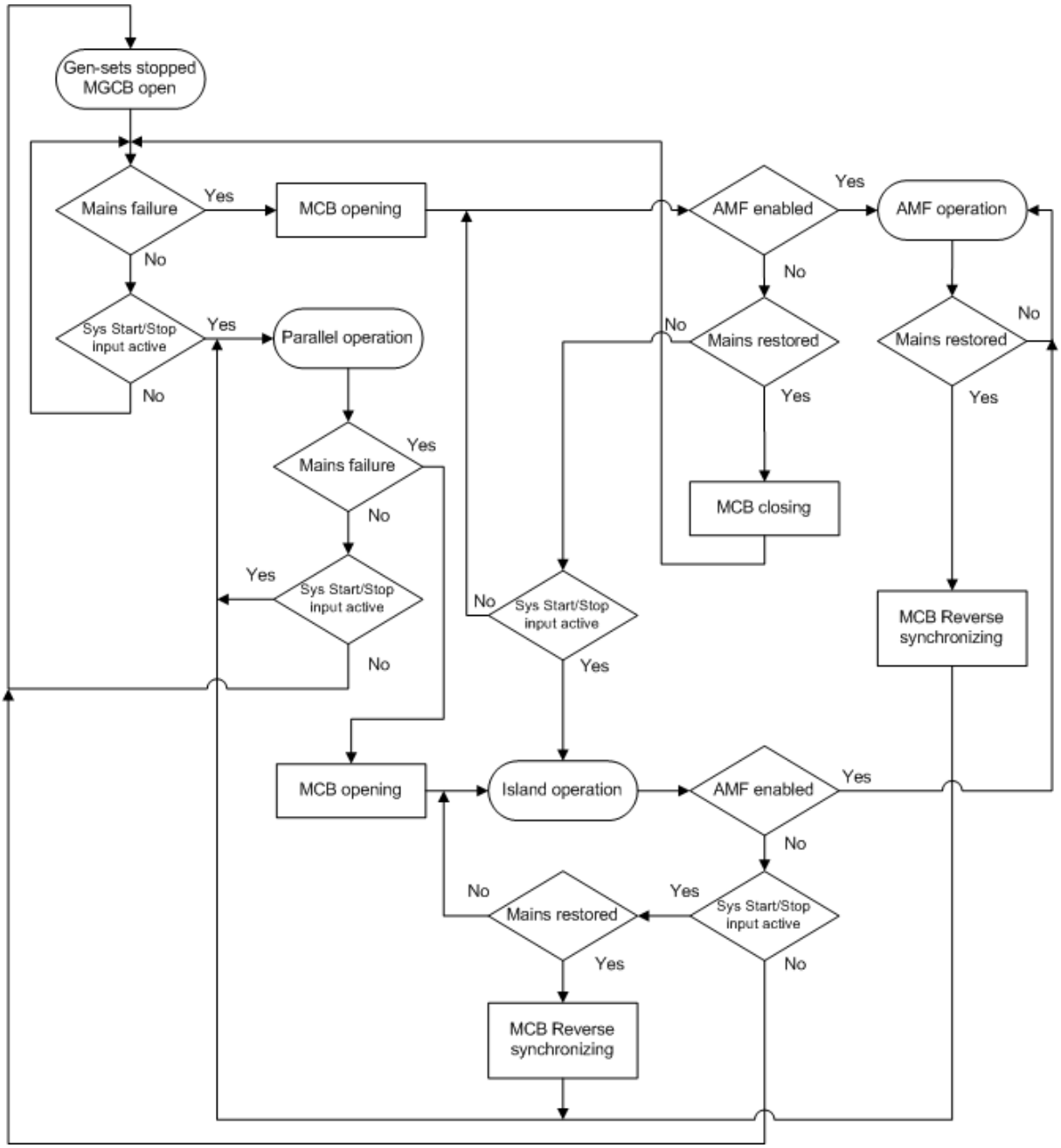
- The gen-set group can be started and stopped manually using START and STOP buttons (*Sys Start/Stop* output is activated/deactivated).
- No reaction to the input *Rem Start/Stop*.
- The MGCB and MCB are to be controlled manually by the MGCB resp. MCB button.
- The AMF function is not performed.

NOTE:
The breakers are internally blocked against closing of 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 gen-set group is started and stopped either by the binary input *Sys Start/Stop* or by AMF function if the mains is failed.
- Buttons MCB, MGCB, START, STOP are not active.
- The MGCB is opened when the gen-sets are not running. It is closed prior to starting and opened after stopping of the gen-sets.
- The MCB is opened when the mains has failed and closed back or reverse synchronized when the mains has returned. See also the setpoint *MCB Opens On*.



FLOWCHART OF AUTOMATIC OPERATION

TEST

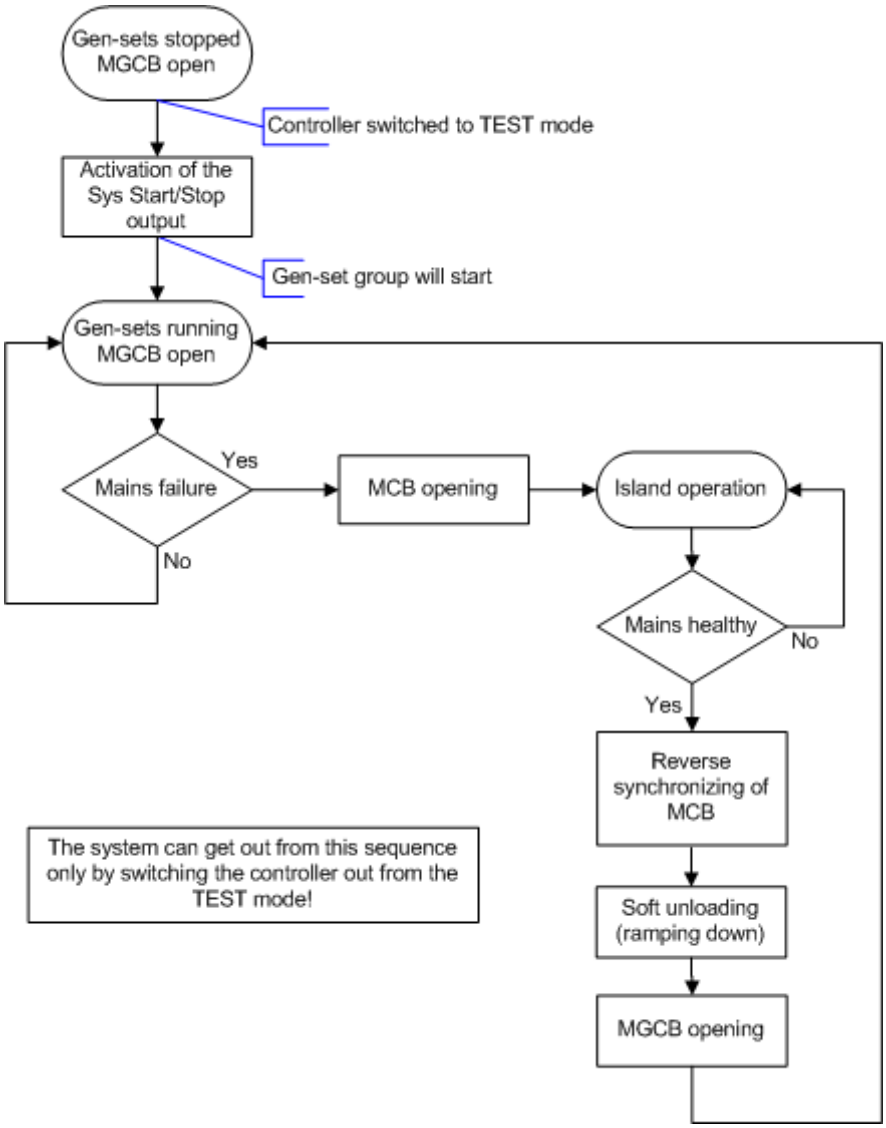
The behavior of the controller in TEST mode depends on setting of the *ReturnFromTEST* setpoint and whether there is MGCB or not. If the MGCB is present then it is opened all the time while the gen-sets are not running.

Automatic return, MGCB used

Setpoint *ReturnFromTEST* = ENABLED.

The gen-sets will be started when the controller is put to TEST mode. If a mains failure occurs the MCB will be opened and after *Fwd Return Del* the MGCB will be closed and the gen-sets 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), open the MGCB and **the gensets will remain running unloaded again until the mode is changed**.

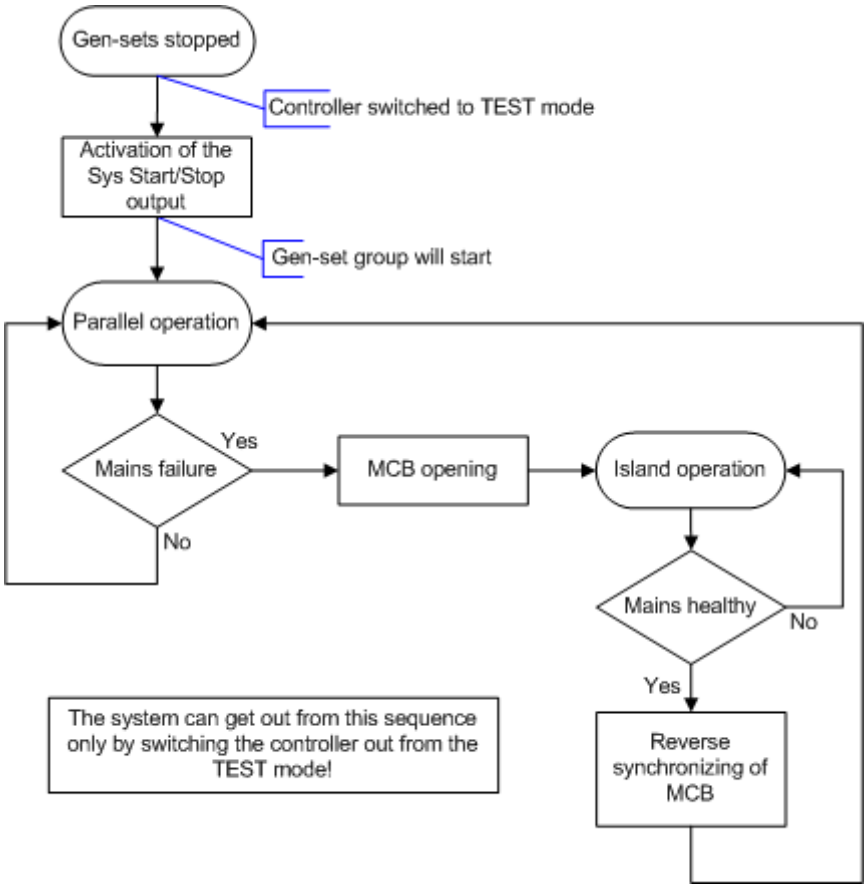


FLOWCHART OF TEST WITH AUTOMATIC RETURN AND WITH MGCB

Automatic return, no MGCB

Setpoint *ReturnFromTEST* = ENABLED.

The gen-sets will be started when the controller is put to TEST mode and will run parallel to the mains. If a mains failure occurs, the MCB will be opened and the gen-sets 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 and **the gensets will continue in parallel to mains operation until the mode is changed**.



FLOWCHART OF TEST WITH AUTOMATIC RETURN AND WITHOUT MGCB

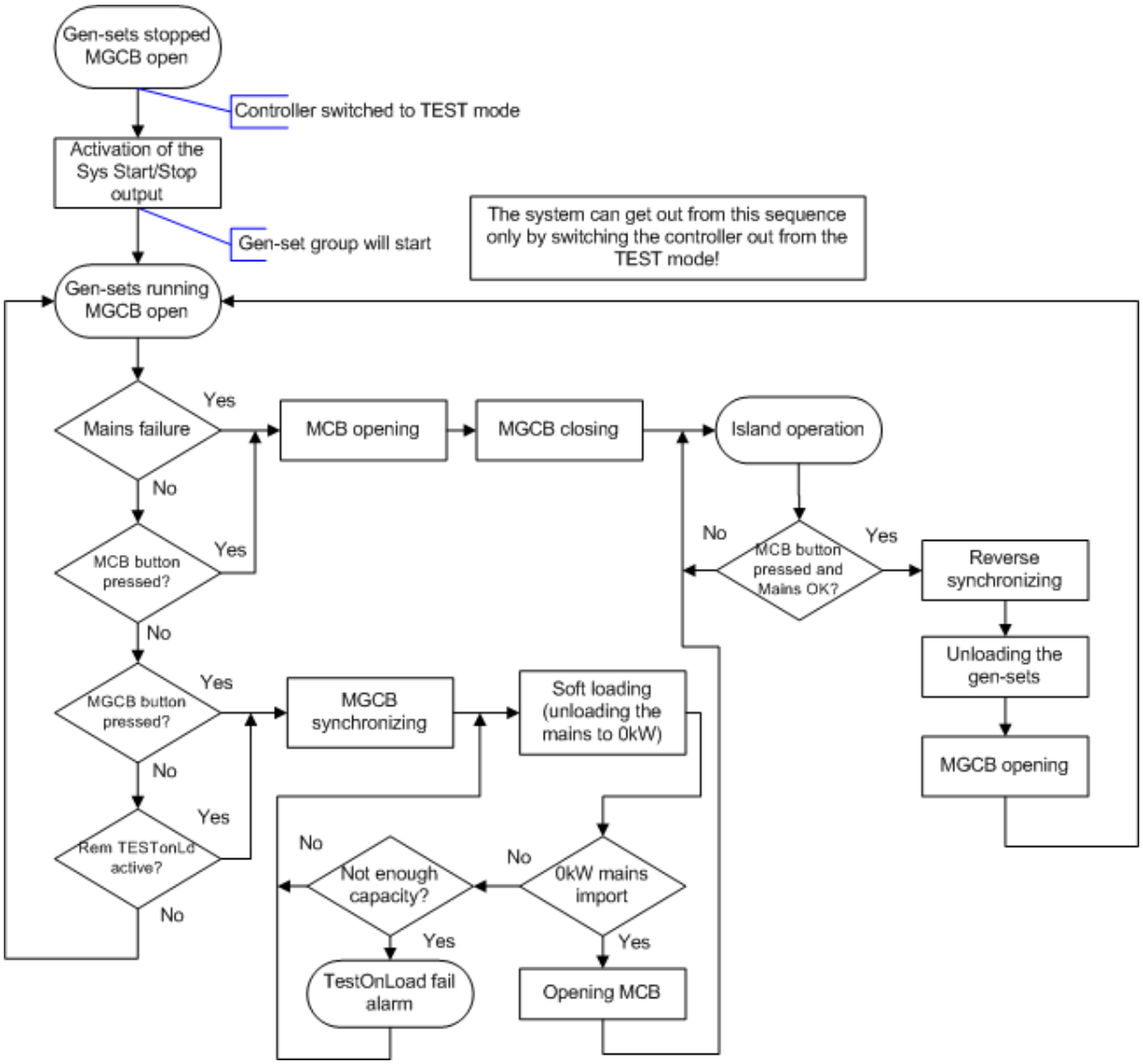
Manual return, MGCB is used

Setpoint *ReturnFromTEST* = DISABLED.

The gen-sets will be started when the controller is put to TEST mode and the MGCB will remain opened. If a mains failure occurs or MCB button is pressed the MCB will be opened and after *Fwd Return Del* the MGCB will be closed and the gen-sets will supply the load. If the mains remains healthy and MGCB button is pressed, the controller will synchronize to the mains, transfer the load to the gen-sets and then open the MCB. **Once the load is supplied by the gen-set, it is not transferred back to the mains after the mains has became healthy**. The gen-set will stay supplying it until the controller is switched to other mode.

NOTE:
This procedure can be used for no-break tranfer of the load onto the gen-sets when a scheduled mains cut-off is awaited.

NOTE:
If the forward synchronizing is disabled the no-break transfer of the load onto the gen-sets is not possible.

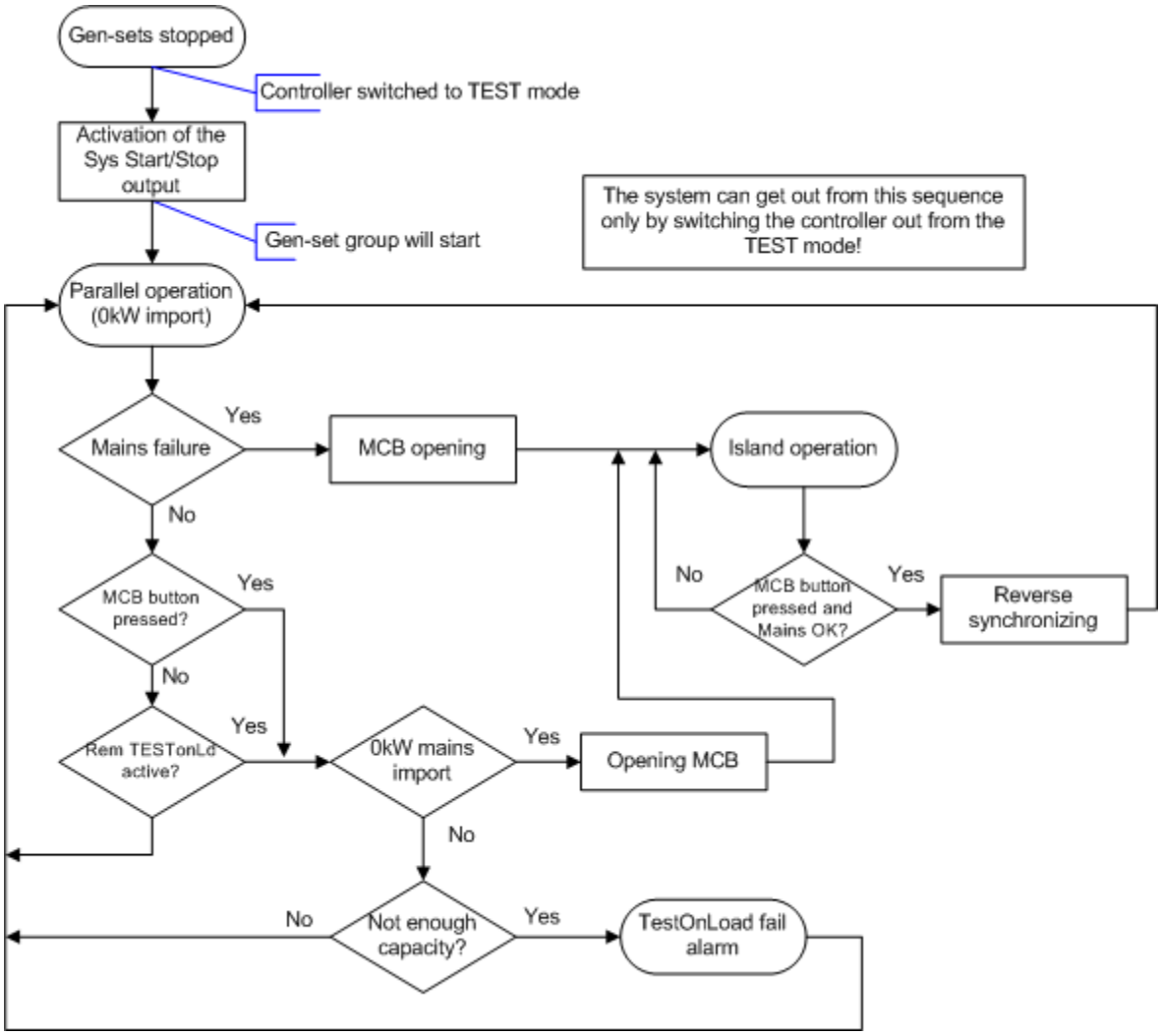


FLOWCHART OF TEST WITH MANUAL RETURN AND WITH MGCB

Manual return, no MGCB

Setpoint *ReturnFromTEST* = DISABLED.

The gen-sets will be started when the controller is put to TEST mode and will run parallel to the mains. If a mains failure occurs or MCB button is pressed the MCB will be opened and the gen-sets will supply the load. **Once the load is supplied by the gen-set, it is not transferred back to the mains after the mains has became healthy**. The gen-set will stay supplying it until the controller is switched to other mode.



FLOWCHART OF TEST WITH MANUAL RETURN AND WITHOUT MGCB

Test with load

Setpoint *ReturnFromTEST* = DISABLED.

If the binary input *Rem TEST OnLd* is activated, the controller is switched to TEST mode and consequently the load is transferred to the gen-sets by one of following ways:

- The gen-sets are started
- The MGCB is synchronized
- The load is transferred onto the gen-sets
- MCB is opened

or

- MGCB is closed
- The gen-sets are started and synchronized
- The load is transferred onto the gen-sets
- MCB is opened

Which scenario is used 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:
The alarm *Test with load fail* is issued when it is not possible to transfer the load from the mains to the gen-sets.

Periodic exercises

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

The controller must have AUT mode selected by mode buttons and no other "mode forcing" binary inputs may be active to ensure proper function of the exercise.

Gen-set group start/stop

The MC controller starts and stops the group of gen-sets by the output *Sys Start/Stop*, which has to be connected to *Sys Start/Stop* inputs of all IC-NT controllers in the group. See the drawings in the chapter Typical applications. If the group is "started" the power management system in each particular controller will resolve automatically, if the particullar gen-set shall run or not. If the group is "stopped", all gen-sets will stop. More information about power management system is available in the InteliCompact reference manual.

See the Operating modes chapter for more information about starting and stopping the group in each particular mode.

NOTE:
The gen-set controllers must be in AUT mode to allow to be controlled from MainsCompact-NT controller via their *Sys Start/Stop* inputs.

Breaker control

Master generator circuit breaker

The MGCB is located between the load and the gen-sets. The breaker enables starting of more gen-sets in the same moment, synchronize them together to provide larger capacity and then connect the load as late as the system is ready to take it.

- OFF mode: the MGCB is always open.
- MAN mode: the MGCB can be open and closed using the MGCB button. The controller will automatically recognize the conditions and either close the breaker to dead bus or perform synchronizing.
- AUT mode: the MGCB is opened when the gen-sets are not running. The controller closes it prior to starting the gen-sets and opens after stopping them.
- TEST mode: the MGCB is open except Test on load procedure.

Synchronizing of the MGCB can be disabled by the input *ForwSyncDisabl*. In this case a changeover is performed instead of synchronizing in test on load mode.

NOTE:
The controller resolves, whether the MGCB is used or not, according to the configuration of the *MGCB Feedback* input. If the feedback is not configured, the MGCB is supposed not to be present in the system.

Mains circuit breaker

- OFF mode: the MCB is either closed permanently (*MCB Opens On* = GENRUN) or is open or closed according to the mains is present or not (*MCB Opens On* = MAINSFAIL).
- MAN mode: the MCB can be open and closed using the MCB button. The controller will automatically recognize the conditions and either close the breaker to dead bus or perform synchronizing.
- AUT mode: the MCB is open and closed automatically according to the mains is present or not. The moment the MCB is open after the mains has failed depends on the setpoint *MCB Opens On*. See also the chapter AMF function.
- TEST mode: see the description in the chapter Test mode.

Reverse synchronizing of the MCB can be disabled by the input *RevSyncDisabl*. In this case a changeover is performed instead of sychronizing when returning the load back to the mains.

Synchronizing

- The forward synchronizing (synchronizing of MGCB) is required if the MGCB is open, the gen-sets are running (i.e. the gen-set bus is under voltage) and also the mains is ok and MCB is closed.
- The reverse synchronizing (synchronizing of MCB) is needed if the mains was failed and has been returned or if Test on load procedure is finished.

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 *Synchronizing Timeout* alarm will be issued.

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

Voltage matching

The gen-sets voltage is regulated via the digital VAr sharing line (CAN bus) to match the mains voltage witch tolerance given by setpoint *Voltage Window*. The regulation is adjusted by setpoints *Voltage Gain* and *Voltage Int*.

Frequency/angle matching

The gen-sets frequency is regulated via the digital load sharing line (CAN bus) to match the mains 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 MGCB or MCB is closed.

NOTE:
The breaker 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 breaker is closed externally.

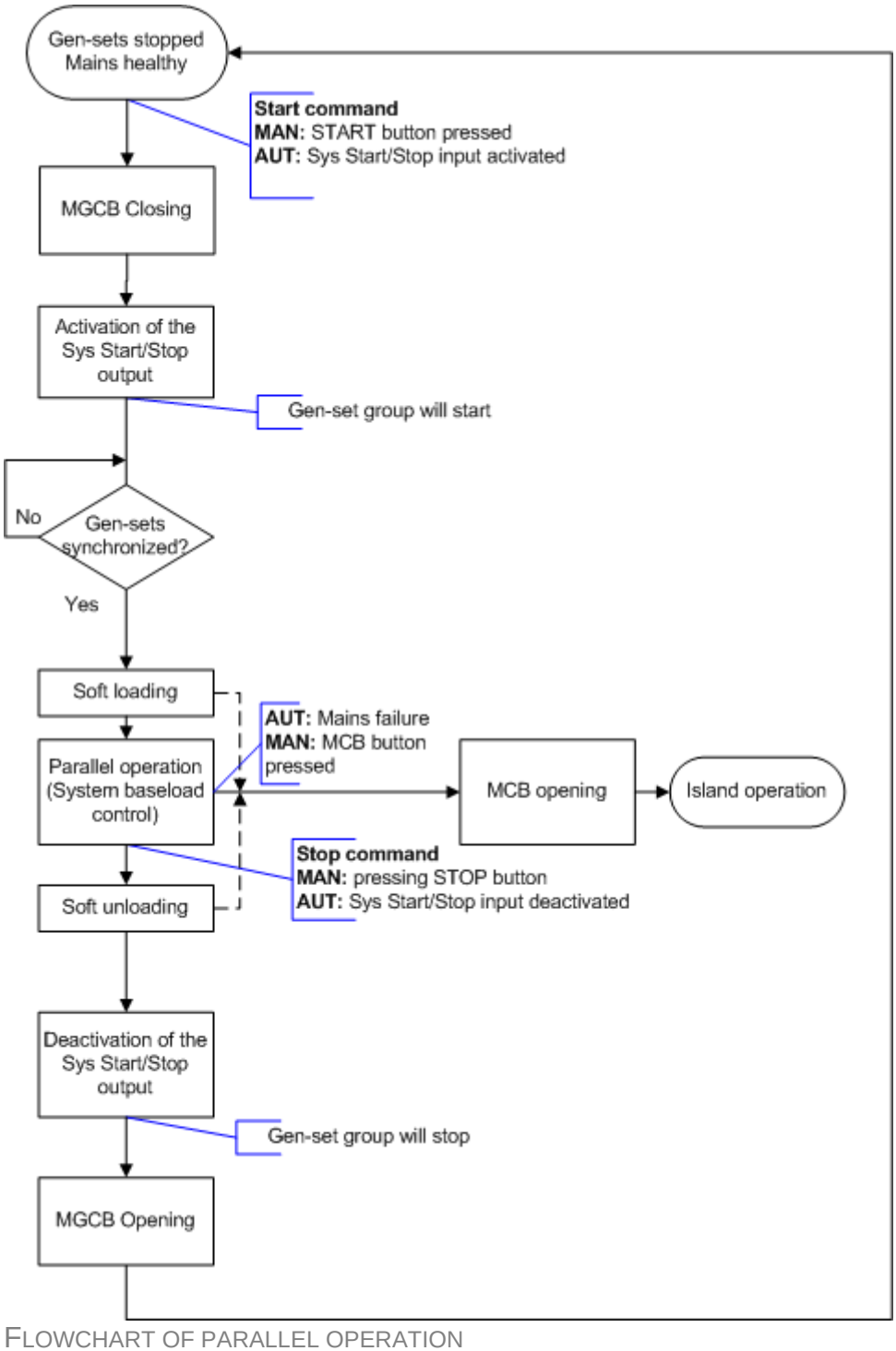
NOTE:
The matching loops continue runnig even the breaker close command has been already issued until the controller will receive the feedback or breaker fail alarm will occur. After the feedback has been received, the control loops are switched to load and power factor loops.

Changeover

The situation, when the load is transferred from the mains to the gen-sets or vice versa without synchronizing of the respective breaker (because it is disabled by respective binary input), is called

"changeover". During the changeover the closed breaker is opened first, then the controller will wait for time adjusted by *Fwd Return Del* setpoint and finally the controller will close the second breaker.

Parallel to mains operation



FLOWCHART OF PARALLEL OPERATION

Load control

The load of the gen-set group is controlled to constant level given by setpoint *#SysBaseLoad* during parallel to mains operation. There are two ways how the load control can work, which depends on the setpoint *#SysLdCtrl PtM*.

- BASELOAD: the load is controlled by the gen-set controllers itself like in SPtM mode. Each running gen-set takes proportional part of the system baseload setpoint and performs load regulation self. The MainsCompact controller has no influence to the load control in this mode, when the gen-set controllers have their MCB feedback input active (i.e. they "sense" parallel to mains operation).

  NOTE:

  The BASELOAD mode is designed to be used above all in systems without MainsCompact.

- LDSHARING: the gen-set controllers work the same way as in island mode, i.e. they perform load sharing. The MainsCompact controls the load of the group and maintains the system baseload via the digital load sharing line.

The regulation loop for load control in LDSHARING mode is adjusted by setpoints *Load Gain* and *Load Int*.

Power factor control

The power factor of each gen-set is controlled to constant level given by setpoint *#SysBaseLoad* during parallel to mains operation. The control is performed by the gen-set controllers itself like in SPtM mode, the MainsCompact controller has no influence to the PF control.

Ramping the power up

The load of the gen-sets is ramped up in all situations when the requested load increased, e.g.:

- The gen-sets have been just synchronized to the mains and will continue in parallel operation - they are ramped up to the system baseload.
- The MCB is to be open in test on load - the gen-sets are ramped up to unload the mains. The MCB opening level is computed as 5% of sum of nominal power of all gensets connected to the bus.
- The system baseload setpoint has been increased - they are ramped up to the new value of the system baseload.

The speed of the ramp is adjusted by setpoint *Load Ramp*.

Ramping the power down

The load of the gen-sets is ramped down in all situations when the requested load decreased, e.g.:

- Prior to opening the MGCB in parallel operation. The MGCB opening level is computed as 5% of sum of nominal power of all gensets connected to the bus and timeout for reaching this level is computed as the ramp time + 25%.
- When the system baseload setpoint has been decreased.

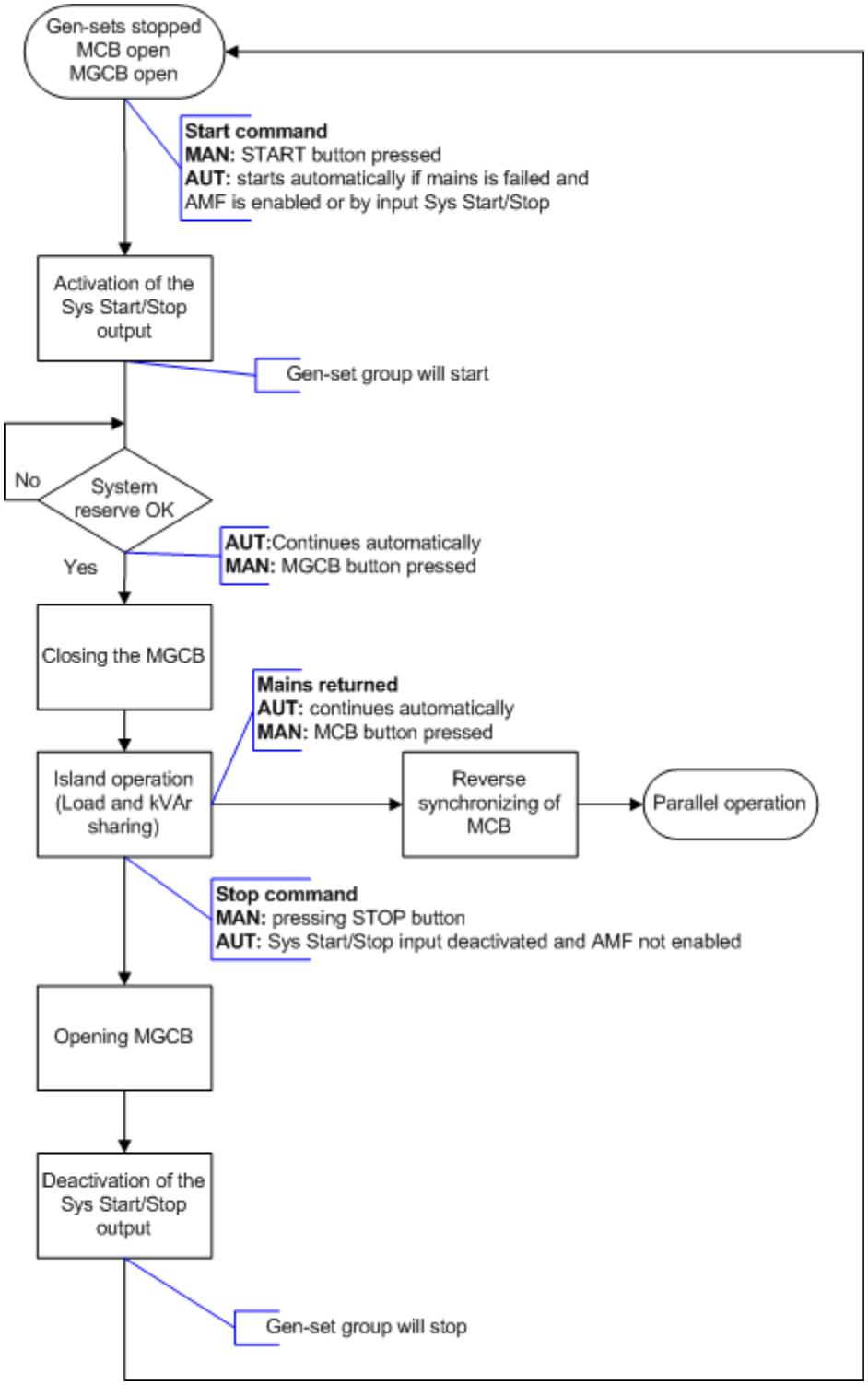
The speed of the ramp (ramp time) is adjusted by setpoint *Load Ramp*.

Mains to island transfer

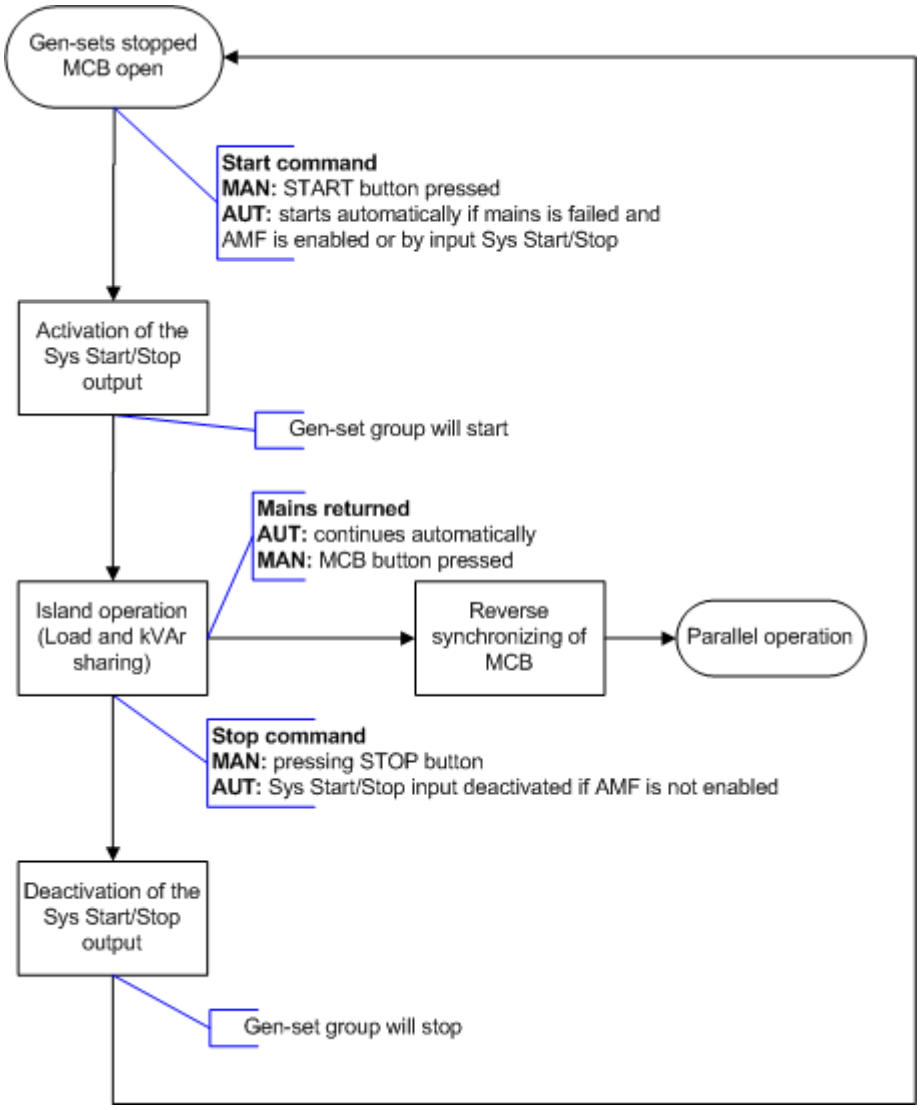
The only situation, when the load is transferred from the mains to the gen-sets, is test on load procedure. See the chapter Test on load.

Island operation

The situation, when the MCB is open and the load is supplied from the gen-sets, is called *Island operation*. The MainsCompact does not perform any regulation, the load sharing, VAr sharing, speed and voltage regulations are beeing performed by the gen-set controllers itself.



FLOWCHART OF ISLAND OPERATION WITH MGCB



FLOWCHART OF ISLAND OPERATION WITHOUT MGCB

Island to Mains transfer

Reverse synchronizing

The reverse synchronizing of the MCB will take place if the load, which is currently beeing supplied from the gen-sets, shall be connected to the mains without loosing power for a short moment.

Changeover

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

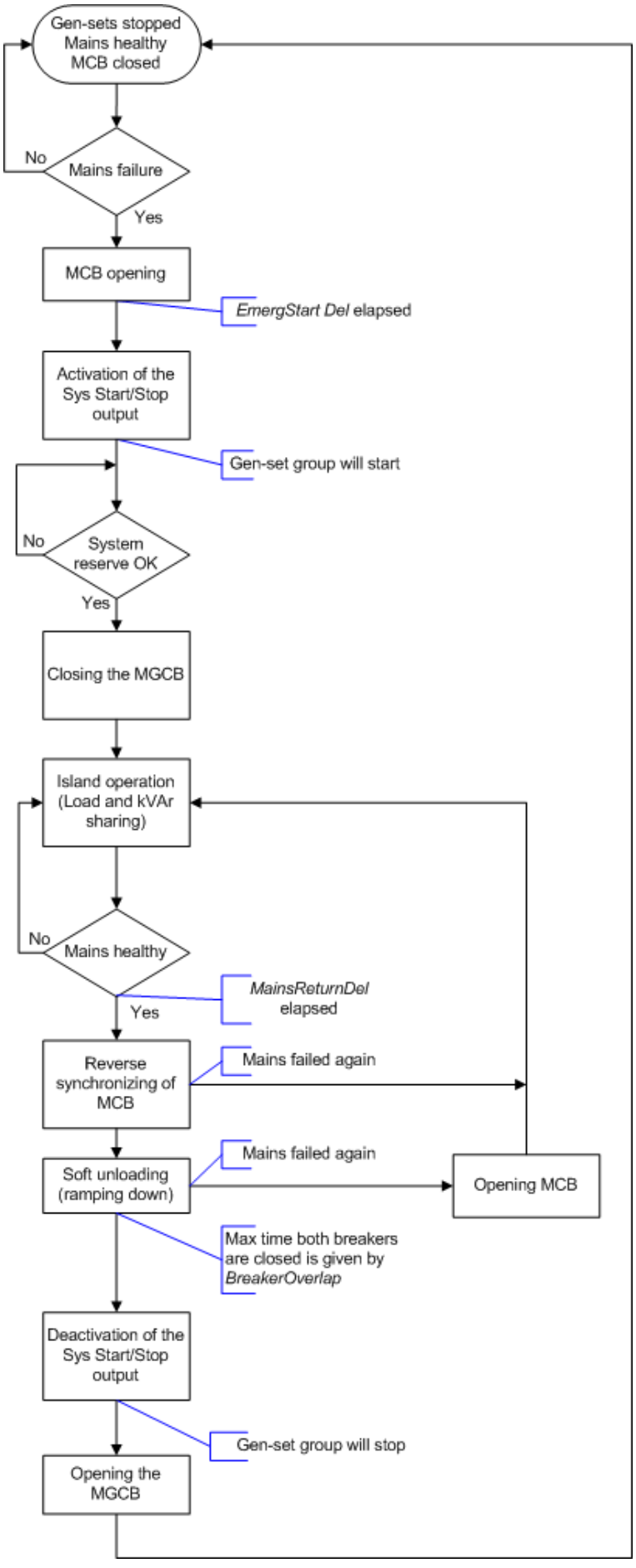
Power management

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 MainsCompact itself does not play any active role in the power management. The process of evaluation of starts and stops is beeing performed independently and simultaneously in all gen-set controllers. The synchronized setpoints in the power management group are present in the MainsCompact only for the purpose of allowing the user to control and adjust the system also from the MainsCompact HMI and are not actively used in MainsCompact.

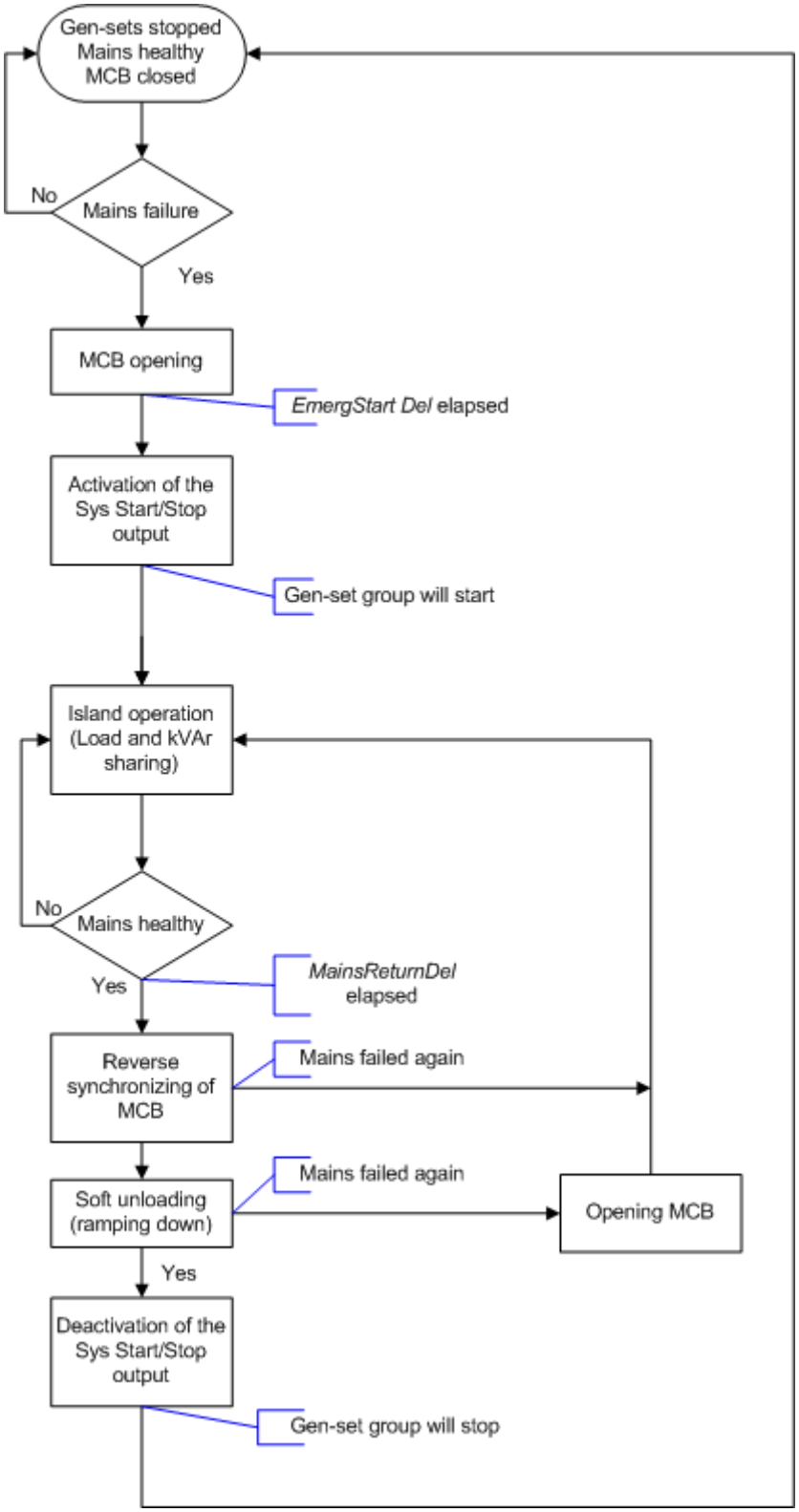
AMF function

The "AMF function" represents the automatic start of the gen-set group in case of the mains is failed and stop after the mains has been restored. The automatic start can be enabled or disabled by the setpoint *MFStart Enable*.

NOTE:
The AMF function works only in AUT mode!


Gen-sets stopped
Mains healthy
MCB closed
No
Mains failure
Yes
MCB opening
EmergStart Del elapsed
Activation of the Sys Start/Stop output
Gen-set group will start
No
System reserve OK
Yes
Closing the MGCB
Island operation (Load and kVAr sharing)
No
Mains healthy
MainsReturnDel elapsed
Yes
Reverse synchronizing of MCB
Mains failed again
Soft unloading (ramping down)
Mains failed again
Opening MCB
Max time both breakers are closed is given by BreakerOverlap
Deactivation of the Sys Start/Stop output
Gen-set group will stop
Opening the MGCB

FLOWCHART OF AMF FUNCTION WITH MGCB



FLOWCHART OF AMF FUNCTION WITHOUT MGCB

Mains failure detection

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

- The mains voltage is out from limits given by setpoints *Mains >V* and *Mains <V* for time period longer than *Mains V Del*.
- The mains frequency is out from 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-sets are 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-sets are started.
4. If the setpoint *MCB Opens On* is set to GENRUN, the MCB is opened once the first genset is started and his voltage is in limits.
5. If the mains becomes healthy back and the gen-sets are still not connected to the load, the controller interrupts the startup process and closes back the MCB.
6. After the gen-sets are started and the the system is ready to take the load, the MGCB is closed and the gen-sets begin to supply the load.
7. After the mains is healthy back, the timer *MainsReturnDel* begins to count down and when finished, either reverse synchronizing or changeover is performed. This depends on the binary input *RevSyncDisable*. If active, changeover is performed instead of reverse synchronizing.
8. In case of reverse synchronizing the maximum time both MGCB 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 MGCB is opened and the gen-sets are stopped.

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

Alarm management

- Each binary input can be configured as alarm input.
- Alarm can be assigned to each analog input of the IOM/PTM module
- There are also **built-in alarms**
- 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 e-mail.

Alarm handling

If the 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 condition 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 acive alarms changes 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.

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.

Remote alarm messaging

If a GSM modem and/or Internet bridge is 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.

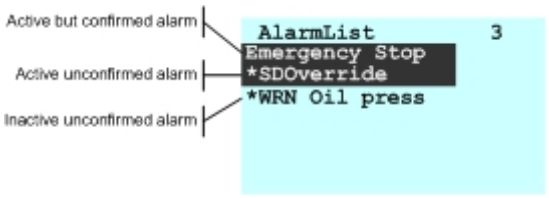
To enable this function, you should enable the alarm messaging with setpoint *Yel Alarm Msg* and also enter valid GSM phone number and/or e-mail address to the setpoints *TelNo/Addr Ch1* and *TelNo/Addr Ch2*. It is possible to put either a GSM number or e-mail to both setpoints.

NOTE:
An internet module must be available for sending of e-mails. Similarly, a GSM modem is necessary for sending of SMS.

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.

Built-in alarms

1. *MGCB fail*
2. *MCB fail*
3. *Synchronizing timeout*
4. *Reverse synchronizing timeout*
5. *Test with load fail*
6. *Battery voltage*
7. *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.

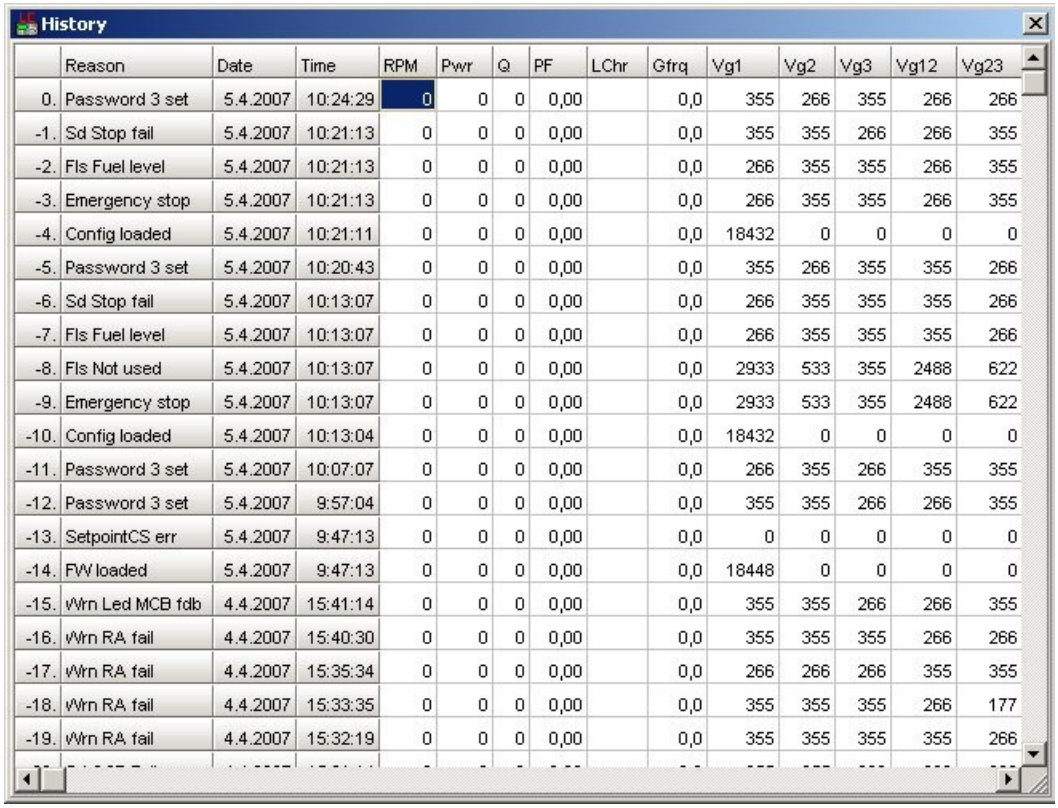
Each record has the same structure and contains:

- 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

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.



History

	Reason	Date	Time	RPM	Pwr	Q	PF	LChr	Gfrq	Vg1	Vg2	Vg3	Vg12	Vg23
0.	Password 3 set	5.4.2007	10:24:29	0	0	0	0,00		0,0	355	266	355	266	266
-1.	Sd Stop fail	5.4.2007	10:21:13	0	0	0	0,00		0,0	355	355	266	266	355
-2.	Fls Fuel level	5.4.2007	10:21:13	0	0	0	0,00		0,0	266	355	355	266	355
-3.	Emergency stop	5.4.2007	10:21:13	0	0	0	0,00		0,0	266	355	355	266	355
-4.	Config loaded	5.4.2007	10:21:11	0	0	0	0,00		0,0	18432	0	0	0	0
-5.	Password 3 set	5.4.2007	10:20:43	0	0	0	0,00		0,0	355	266	355	355	266
-6.	Sd Stop fail	5.4.2007	10:13:07	0	0	0	0,00		0,0	266	355	355	355	266
-7.	Fls Fuel level	5.4.2007	10:13:07	0	0	0	0,00		0,0	266	355	355	355	266
-8.	Fls Not used	5.4.2007	10:13:07	0	0	0	0,00		0,0	2933	533	355	2488	622
-9.	Emergency stop	5.4.2007	10:13:07	0	0	0	0,00		0,0	2933	533	355	2488	622
-10.	Config loaded	5.4.2007	10:13:04	0	0	0	0,00		0,0	18432	0	0	0	0
-11.	Password 3 set	5.4.2007	10:07:07	0	0	0	0,00		0,0	266	355	266	355	355
-12.	Password 3 set	5.4.2007	9:57:04	0	0	0	0,00		0,0	355	355	266	266	355
-13.	SetpointCS err	5.4.2007	9:47:13	0	0	0	0,00		0,0	0	0	0	0	0
-14.	FW loaded	5.4.2007	9:47:13	0	0	0	0,00		0,0	18448	0	0	0	0
-15.	Wrn Led MCB fdb	4.4.2007	15:41:14	0	0	0	0,00		0,0	355	355	266	266	355
-16.	Wrn RA fail	4.4.2007	15:40:30	0	0	0	0,00		0,0	355	355	355	266	266
-17.	Wrn RA fail	4.4.2007	15:35:34	0	0	0	0,00		0,0	266	266	266	355	355
-18.	Wrn RA fail	4.4.2007	15:33:35	0	0	0	0,00		0,0	355	355	355	266	177
-19.	Wrn RA fail	4.4.2007	15:32:19	0	0	0	0,00		0,0	355	355	355	355	266

Exercise timer

There is an exercise timer available in the controller, which is based on the RTC clock. The timer output is available as binary output *Exerc Timer* and is also internally connected to the *Remote TEST* input to enable periodic testing of the gen-sets.

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

- *Timer Repeat* - timer repetition period. It can be once a week, every working day, every day except sunday, every day or every weekend day.
- *Timer ON Time* - timer activation time on the selected day(s).
- *Timer Duration* - time period the timer remains active.

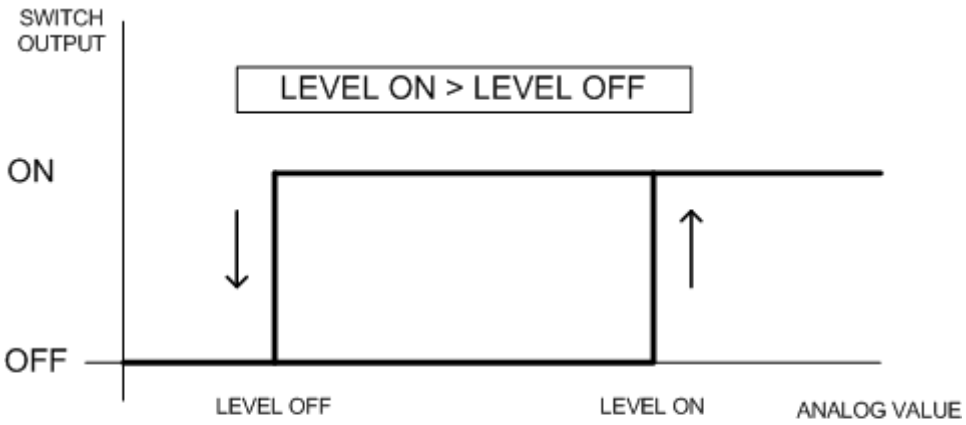
NOTE:
The timer is not active in OFF mode!

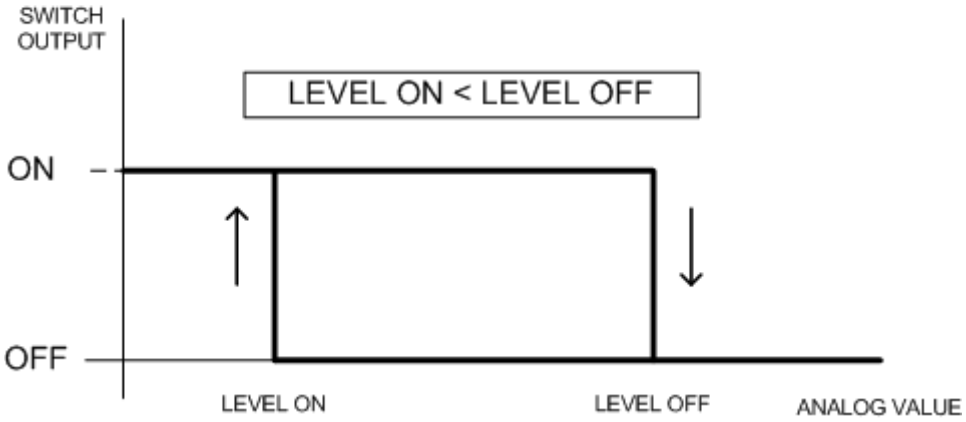
Power switch

The switch is controlled by one of following values: mains import (*Mains kW I*), load demand (*Load kW*) or sum of gen-sets power (*Running ActPwr*). It can be used e.g. for automatic starts of the gen-sets in the periods of high load demands. Associated setpoints are located in the setpoint group Power Switch.

- *PowerSwitch ON*
- *PowerSwitchOFF*
- *PwrSwitchMode*
- *PwrSwAutoStart*

The output of the switch can be either configured onto an output terminal or internally connected to the *Rem Start/Stop*.





Setpoints

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

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 and MC application, where the system of Power management is based on fact the respective setpoints are identical in all controllers.

Setpoint groups

1. Process Control
2. Basic Settings
3. Intern Protect
4. Pwr Management
5. AMF Settings
6. Bus Protect
7. Volt/PF Control
8. Sync/Load Ctrl
9. Power Switch
10. SMS/E-Mail
11. ExtI/O Protect
12. Sensors Spec
13. Date/Time

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. *#SysLdCtrl PtM*
2. *#SysBaseLoad*
3. *#SysPwrFactor*
4. *MFStart Enable*

Setpoints - Basic Settings

1. *ControllerName*
2. *CT Ratio*
3. *Nominal Volts*
4. *Vb PT Ratio*
5. *Vm PT Ratio*
6. *Nominal Freq*

7. ControllerAddr
8. COM1 Mode
9. COM2 Mode
10. ModemIniString
11. ModbusComSpeed
12. CAN Bus Mode
13. ControllerMode

Setpoints - Power management

1. #PowerMgmt Mode
2. #SysAMFstrtDel
3. #SysAMFstopDel
4. #LoadResStrt 1
5. #LoadResStop 1
6. #LoadResStrt 2
7. #LoadResStop 2
8. #Min Run Power
9. #NextStrt Del
10. #OverldNextDel
11. #NextStopDel
12. #SlowStopDel

Setpoints - AMF Settings

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. Fwd Return Del
11. MCB Close Del
12. MCB Opens On
13. RetFromIsland
14. BreakerOverlap
15. ReturnFromTEST
16. MCB Logic

Setpoints - Sync/Load Ctrl

1. Voltage Window
2. Phase Window
3. Dwell Time
4. Freq Gain
5. Freq Int
6. Angle Gain
7. Load Ramp
8. Load Gain
9. Load Int
10. Sync Timeout

Setpoints - Volt/PF Control

1. *Voltage Gain*
2. *Voltage Int*

Setpoints - SMS/E-Mail

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

Setpoints - ExtI/O Protect

1. *IOM AI1 Yel*
2. *IOM AI1 Del*
3. *IOM AI2 Yel*
4. *IOM AI2 Del*
5. *IOM AI3 Yel*
6. *IOM AI3 Del*
7. *IOM AI4 Yel*
8. *IOM AI4 Del*

Setpoints - Sensors Spec

1. *IOM AI1 Calibr*
2. *IOM AI2 Calibr*
3. *IOM AI3 Calibr*
4. *IOM AI4 Calibr*

Setpoints - Date/Time

1. *#Date*
2. *#Time*
3. *#SummerTimeMod*
4. *Time Stamp Per*
5. *Timer1 Repeat*
6. *Timer1 ON time*
7. *Timer1Duration*

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.

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. Mains
2. Bus
3. Pwr Management
4. Controller I/O
5. Extension I/O
6. Statistics
7. Info

Values - Mains

1. *Mains kW I*
2. *Mains kVAr I*
3. *Mains kVA I*
4. *Mains PF*
5. *Mains Load Chr*
6. *Mains V L1-N*
7. *Mains V L2-N*
8. *Mains V L3-N*
9. *Mains V L1-L2*
10. *Mains V L2-L3*
11. *Mains V L3-L1*
12. *Mains freq*
13. *Mains A L1*
14. *Mains A L2*
15. *Mains A L3*
16. *Mains kW L1*
17. *Mains kW L2*
18. *Mains kW L3*

19. *Mains kVAr L1*
20. *Mains kVAr L2*
21. *Mains kVAr L3*
22. *Mains kVA L1*
23. *Mains kVA L2*
24. *Mains kVA L3*
25. *Mains PF L1*
26. *Mains PF L2*
27. *Mains PF L3*
28. *Mains LChr L1*
29. *Mains LChr L2*
30. *Mains LChr L3*
31. *Slip*
32. *Angle*
33. *MaxVectorShift*

Values - Bus

1. *Bus V L1-N*
2. *Bus V L2-N*
3. *Bus V L3-N*
4. *Bus V L1-L2*
5. *Bus V L2-L3*
6. *Bus V L3-L1*
7. *Bus freq*
8. *Load kW*
9. *Load kVAr*
10. *Load PF*

Values - Pwr Management

1. *Actual Reserve*
2. *Running ActPwr*
3. *Running NomPwr*
4. *Avail NomPwr*

Values - Controller I/O

1. *Bin Outputs*
2. *Bin Inputs*
3. *Ldsharing Out*
4. *VArSharing Out*
5. *CPU Temp*
6. *Battery Volts*

Values - Extension I/O

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

Values - Statistics

1. *Mains kWh I*
2. *Mains kVAhr I*
3. *Mains kWh E*
4. *Mains kVAhr E*

Values - Info

1. *FW Version*
2. *FW Branch*
3. *PasswordDecode*
4. *Breaker State*
5. *Timer Text*
6. *Timer Value*
7. *CAN16*
8. *CAN32*

Binary input functions

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

1. *MCB Feedback*
2. *MGCB Feedback*
3. *Rem Start/Stop*
4. *Remote OFF*
5. *Remote MAN*
6. *Remote AUT*
7. *Remote TEST*
8. *Rem TEST OnLd*
9. *Load Reserve 2*
10. *Start Button*
11. *Stop Button*
12. *FaultResButton*
13. *HornResButton*
14. *MGCB Button*
15. *MCB Button*
16. *ForwSyncDisabl*
17. *RevSyncDisable*
18. *Ext MF Relay*
19. *Access Lock*
20. *RemControlLock*

Binary output functions

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

Common functions

1. *MCB Close/Open*
2. *MCB ON Coil*
3. *MCB OFF Coil*
4. *MCB UV Coil*
5. *MGCBClose/Open*
6. *MGCB ON Coil*
7. *MGCB OFF Coil*
8. *MGCB UV Coil*
9. *Alarm*
10. *Horn*
11. *Sys Start/Stop*
12. *MCB Fdb Mirror*
13. *Ctrl HeartBeat*
14. *Exercise Timer*
15. *Power Switch*
16. *Mode OFF*
17. *Mode MAN*
18. *Mode AUT*
19. *Mode TEST*
20. *Mains healthy*
21. *Bus healthy*
22. *Mains Fail*
23. *System Ready*
24. *SystReserve OK*

Alarm mirrors

1. *AL Sync Fail*
2. *AL Batt Volt*
3. *AL TstOnLdFail*
4. *BI1 Status*
5. *BI2 Status*
6. *BI3 Status*
7. *BI4 Status*
8. *BI5 Status*
9. *BI6 Status*
10. *BI7 Status*
11. *IOM BI1 Status*
12. *IOM BI2 Status*
13. *IOM BI3 Status*
14. *IOM BI4 Status*
15. *IOM BI5 Status*
16. *IOM BI6 Status*
17. *IOM BI7 Status*
18. *IOM BI8 Status*
19. *AL IOM AI1 Yel*
20. *AL IOM AI2 Yel*

21. *AL IOM AI3 Yel*
22. *AL IOM AI4 Yel*
23. *AL Common Wrn*
24. *AL Common Fls*

Communications

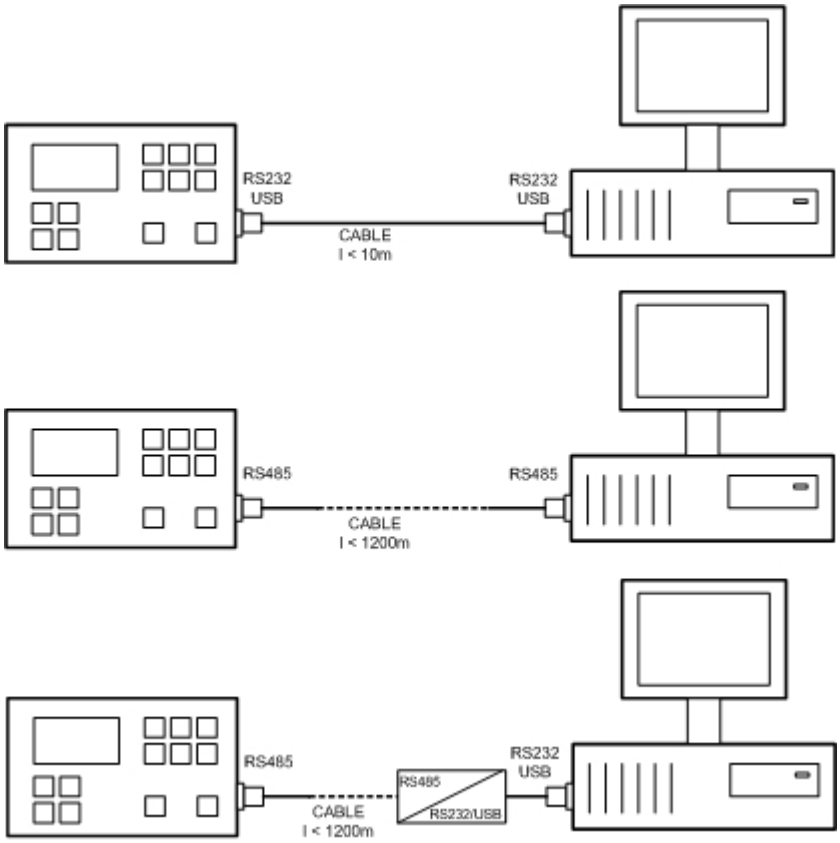
For details about communication with extension modules appropriate chapter.

Direct cable connection

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

Connection to a PC

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-232
2. IL-NT-232-485
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.

Connection to a PLC

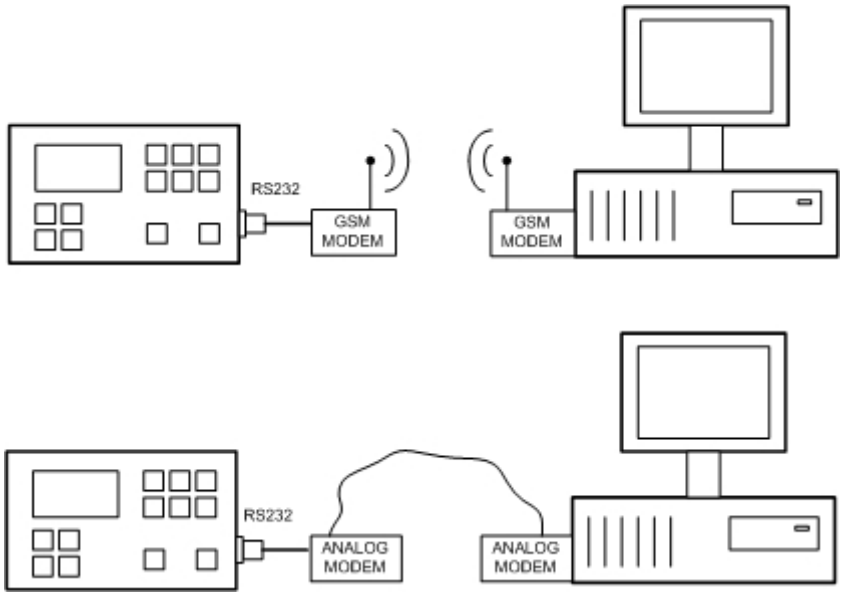
A PLC can be connected to the controller using RS232 or RS485 interface and MODBUS protocol. The setpoint *COM1 Mode* or *COM2 Mode* (according to the port used) must be set to MODBUS position. The speed of MODBUS communication can be adjusted by the setpoint *ModbusCommSpeed*. See more detailed description of the MODBUS protocol in separate chapter.

Following modules are available for connection to a PLC:

1. IL-NT-232
2. IL-NT-232-485

Modem connection

A PC can be connected to the controller also remotely via modems. Either an analog or 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 are available for modem connection to a PC:

1. IL-NT-232
2. IL-NT-232-485

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.

NOTE:
Use only modems certified for your country!

Recommended GSM modems

- Siemens 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 is bought in other country with different telephony system properties than it will be used.

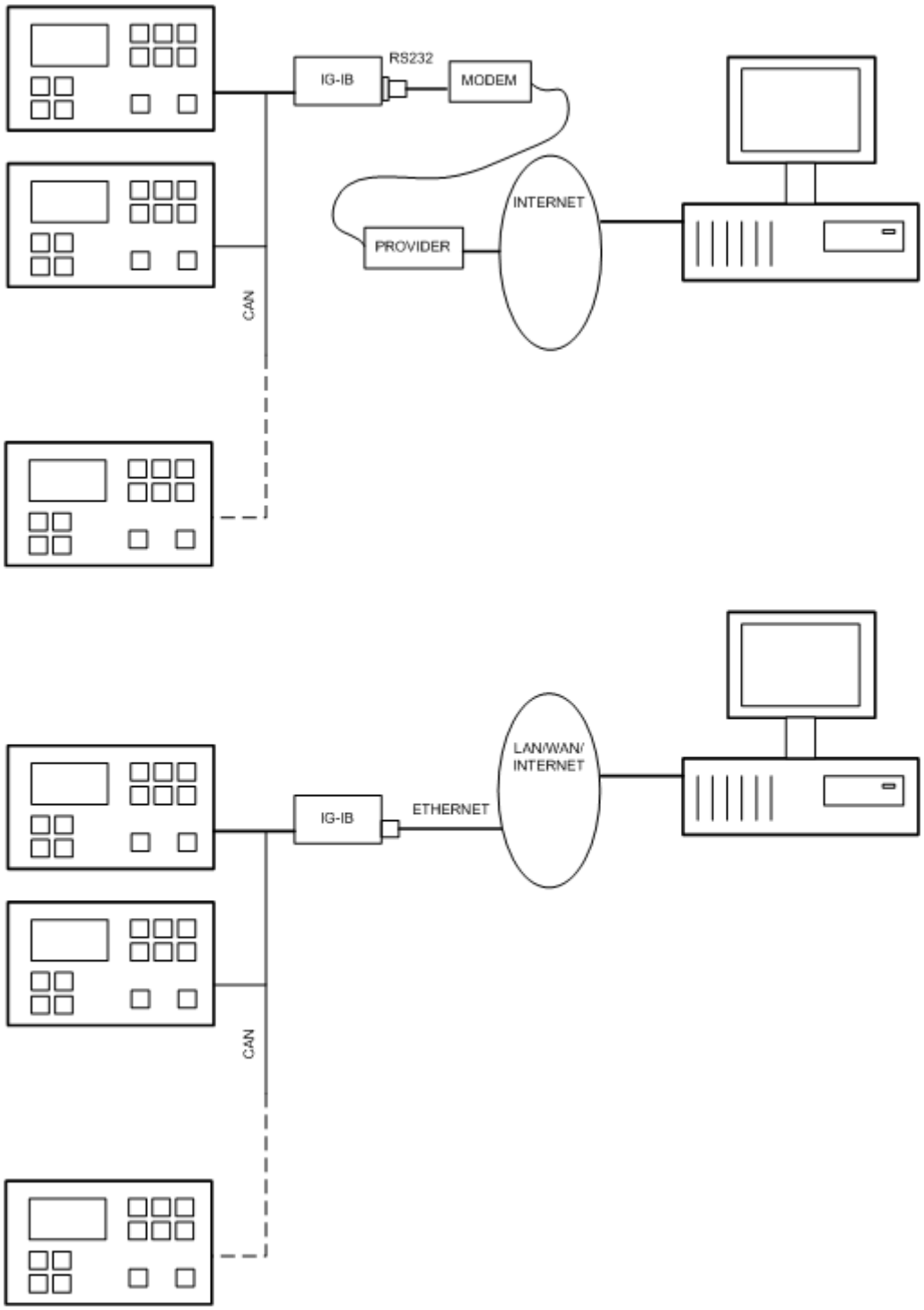
GSM modems need to be set-up prior to using with the controller. Use the *gm_setup* program (installed together with the LiteEdit) to make the initial setup of the modem. See the latest *InteliCommunicationGuide* (available on the ComAp web site) for details. The setup must be done while a SIM card is inserted.

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

Internet connection

Following ways are available for connecting the MC-NT controller to the internet:

- Using an external communication module IG-IB connected to the MC-NT via CAN2 bus together with other controllers in the group. The IG-IB module will provide connection to the network for all controllers connected to the CAN2 bus.
- Using a plug-in communication module IB-Lite (not available yet) on each controller. The setpoint *COM1 Mode* must be set to the DIRECT position in both cases.



INTERNET CONNECTION TYPES FOR MULTIPLE CONTROLLERS

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.

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.

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 backlit 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 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	
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 closing of 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	
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.

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

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

Physical dimensions

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

Binary inputs

Number of binary inputs	7
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	6
Galvanic insulation	Not insulated
Type	Transistor, switching to negative supply terminal
Operating voltage	8-36VDC
Switching current	500mA (suppresion diodes required for inductive loads)

Bus/Mains measurements

Measurement inputs	3ph mains voltage, 3ph mains current, 3ph bus voltage
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

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	120Ohm, 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

Appendix

Table of setpoints

Group: Process Control

Setpoint: #SysLdCtrl PtM

Group	Process Control
Range [units]	BASELOAD, LDSHARING [-]
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]
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]	0.7L .. 1.0 [-]
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: AMFStartEnable

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

Group: Basic Settings

Setpoint: ControllerName

Group	Basic Settings
Range [units]	[-]
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: CT Ratio

Group	Basic Settings
Range [units]	1 .. 5000 [A/5A]
Description	Mains current transformers ratio.

Setpoint: Nominal Volts

Group	Basic Settings
Range [units]	80 .. 300 [V]
Description	Nominal system voltage (phase to neutral)

Setpoint: Vb PT Ratio

Group	Basic Settings
Range [units]	0.1 .. 500 [V/V]
Description	Bus 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]
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]
Description	Nominal system frequency (usually 50 or 60 Hz).

Setpoint: ControllerAddr

Group	Basic Settings
Range [units]	1 .. 32(8) [-]
Description	**Unique** identification number of a controller within a group of controllers which are connected together via CAN2 bus or 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	Basic Settings
Range [units]	[DIRECT/MODEM/MODBUS]
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.

Setpoint: COM2 mode

Group	Basic Settings
Range [units]	[DIRECT/MODBUS]
Description	Communication protocol switch for the COM2 channel. • DIRECT: LiteEdit communication protocol via direct cable. • MODBUS: Modbus protocol. See detailed description in separate chapter.

Setpoint: ModemIniString

Group	Basic Settings
Range [units]	[-]
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	Basic Settings
Range [units]	9600, 19200, 38400, 57600 [-]
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	Basic Settings
Range [units]	32C,8C [-]
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: ControllerMode

Group	Basic Settings
Range [units]	OFF, MAN, AUT,(TEST) [-]
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.

Group: Int Protect

Setpoint: Horn Timeout

Group	Engine Protect
Range [units]	0 .. 600 [s]
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: Batt Undervolt

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

Setpoint: Batt Volt Del

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

Group: Pwr Management

Setpoint: #PowerMgmt Mode

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

Setpoint: #SysAMFstrtDel

Group	Power management
Range [units]	0 .. 600 [s]
Description	This setpoint adjusts the delay of the **gen-set** activation after the binary input *Sys start/stop***on the gen-set controller** has been activated. **NOTE:** This delay is typically used as "AMF start delay" on multiple AMF applications without MainsCompact, similarly as the setpoint *EmergStart del* in SPtM or MC. Adjust this setpoint to 0s in systems with the MainsCompact.

Setpoint: #SysAMFstopDel

Group	Power management
Range [units]	0 .. 600 [s]
Description	This setpoint adjusts the delay of the **gen-set** deactivation after the binary input *Sys start/stop***on the gen-set controller** has been deactivated. **NOTE:** This delay is typically used as "Mains return delay" on multiple AMF applications without MainsCompact, similarly as the setpoint *MainsReturnDel* in SPtM or MC. Adjust this setpoint to 0s in systems with the MainsCompact.

Setpoint: #LoadResStrt 1

Group	Power Management
Range [units]	-32000 .. *LoadResStop 1* [kW%]
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: #LoadResStrt 2

Group	Power Management
Range [units]	-32000 .. *LoadResStop 2* [kW%]
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 1

Group	Power Management
Range [units]	*LoadResStrt 1* .. 32000 [kW%]
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: #LoadResStop 2

Group	Power Management
Range [units]	*LoadResStrt 2* .. 32000 [kW%]
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: #Min Run Power

Group	Power Management
Range [units]	0 .. 65000 [kW]
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]
Description	This setpoint adjusts the delay for starting the next gen-set after the reserve has dropped below the reserve for start.

Setpoint: #OverldNext Del

Group	Power Management
Range [units]	0 .. 3600 [s]
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]
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]
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.

Group: AMF Settings

Setpoint: EmergStart del

Group	AMF Settings
Range [units]	0 .. 600 [s]
Description	Delay between the mains failure and the automatic start of the gen-set group to an AMF operation (activation of the MC binary output *Sys Start/Stop*). See more in the AMF operation chapter.

Setpoint: MainsReturnDel

Group	AMF Settings
Range [units]	1 .. 3600 [s]
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 [%]
Description	Threshold for detection of mains failure due to overvoltage. The setpoint is adjusted relative to the system nominal voltage (setpoint *Nominal Volts*).

Setpoint: Mains <V

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

Setpoint: Mains V Del

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

Setpoint: Mains >Freq

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

Setpoint: Mains <Freq

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

Setpoint: Mains Freq Del

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

Setpoint: VectorShiftLim

Group	AMF Settings
Range [units]	1 .. 45 [°]
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: FwRet break

Group	AMF Settings
Range [units]	0 .. 600 [s]
Description	When a switchover of the MCB and MGCB 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]
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, GEN RUN [-]
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). GEN RUN: 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 .. [-]
Description	MANUAL: Controller is automatically switched from AUT to MAN mode in each moment the gensets have been connected to island operation. The gen-set will not perform any automatic transfer of the load back to the mains and will run in island operation for infinite time until is manually stopped or the mode is changed back to AUT. AUTO: No automatic mode change is performed. **NOTE:** Select RetFromIsland = MANUAL in case you need to controll manually the moment when the load is transferred back to the mains.

Setpoint: BreakerOverlap

Group	AMF Settings
Range [units]	0,0 .. 300,0 [s]
Description	This setpoint adjust maximum time period the both MGCB and MCB are closed together during the interrupt-free transfer of the load from the gen-sets back to the mains. It takes place after reverse synchronizing if there is no demand to continue in parallel operation.

Setpoint: ReturnFromTEST

Group	AMF Settings
Range [units]	DISABLED, ENABLED [-]
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 [-]
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: Basic Settings

Setpoint: Bus >V

Group	Bus Protect
Range [units]	*Bus <V* .. 150 [%]
Description	Threshold for evaluation of the bus overvoltage. The setpoint is adjusted relative to the system nominal voltage (setpoint *Nominal Volts*).

Setpoint: Bus <V

Group	Bus Protect
Range [units]	50 .. *Bus >V* [%]
Description	Threshold for evaluation of the bus undervoltage. The setpoint is adjusted relative to the system nominal voltage (setpoint *Nominal Volts*).

Setpoint: Bus V Del

Group	Bus Protect
Range [units]	0 .. 600.0 [s]
Description	Delay for evaluation of the bus over/undervoltage.

Setpoint: Bus >Freq

Group	Bus Protect
Range [units]	*Bus <Freq* .. 150 [%]
Description	Threshold for evaluation of the bus overfrequency. The setpoint is adjusted relative to the system nominal frequency (setpoint *Nominal Freq*).

Setpoint: Bus <Freq

Group	Bus Protect
Range [units]	50 .. *Bus >Freq* [%]
Description	Threshold for evaluation of the bus overfrequency. The setpoint is adjusted relative to the system nominal frequency (setpoint *Nominal Freq*).

Setpoint: Bus Freq Del

Group	Bus Protect
Range [units]	0 .. 600.0 [s]
Description	Delay for evaluation of the bus over/underfrequency.

Group: Volt/PF Control

Setpoint: Voltage Gain

Group	Volt/PF Control
Range [units]	0 .. 200.0 [%]
Description	Gain of the voltage control PI loop.

Setpoint: Voltage Int

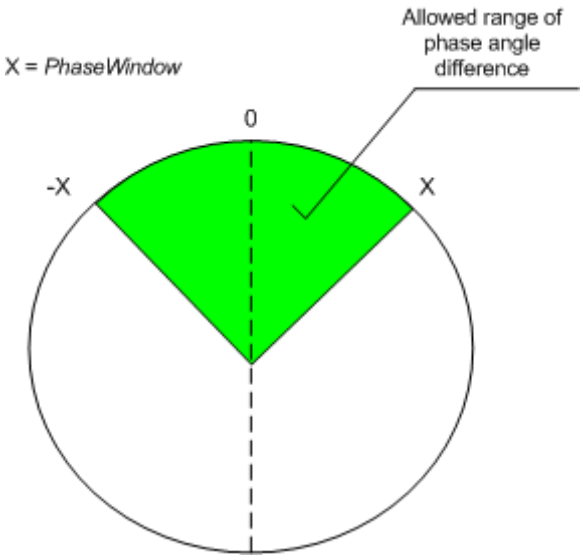
Group	Volt/PF Control
Range [units]	0 .. 100 [%]
Description	Relative integration factor of the voltage control loop.

Group: Sync/Load Ctrl

Setpoint: Voltage Window

Group	Sync/Load Ctrl
Range [units]	0 .. 100.0 [%]
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 [°]
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]
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 [%]
Description	Gain of the frequency control PI loop.

Setpoint: Freq Int

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

Setpoint: Angle Gain

Group	Sync/Load Ctrl
Range [units]	0 .. 200.0 [%]
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 Ctrl
Range [units]	0 .. 1800 [s]
Description	The setpoint adjusts the rate of the power ramp. The power is ramped in following situations: • During parallel to mains operation if the baseload is controlled from the MC (*#SysLdCtrl PtM* = LDSHARING) and the group has been just synchronized or the baseload has changed or the group is about to be stopped. • In the test on load mode when the load is beeing transferred to the gen-sets or back to the mains after reverse synchronizing. The rate is adjusted in seconds for 100% load change (from 0 to 100% of sum of nominal power of connected active gen-sets). So if the requested load change is 50% of nominal power, the ramp duration will be 50% of this setpoint.

Setpoint: Load gain

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

Setpoint: Load Int

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

Setpoint: Sync Timeout

Group	Sync/Load Ctrl
Range [units]	1 .. 1800 [s]
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.

Group: Power Switch

Setpoint: PowerSwitch ON

Group	Power Switch
Range [units]	0 .. 32000
Description	Threshhold level for switching the Power switch ON.

Setpoint: PowerSwitchOFF

Group	Power Switch
Range [units]	0 .. 32000
Description	Threshhold level for switching the Power switch OFF.

Setpoint: PwrSwitch Mode

Group	Power Switch
Range [units]	LOAD, IMPORT, GENSETS
Description	This setpoint selects which power value is taken as input for the Power switch. **NOTE:** If the power switch is used for starting the gen-sets in periods of high load demands, this setpoint should be adjusted in the LOAD position. Mains CTs are required for this function.

Setpoint: PwrSwAutoStart

Group	Power Switch
Range [units]	DISABLED, ENABLED
Description	Use this setpoint to make an "internal link" of the output from the Power switch and the *Rem Start/Stop* binary input. This internal link can be used for automatic starting of the gen-set group whenever the load demand exceeds adjusted level. **NOTE:** If this link is enabled and the *Rem Start/Stop* is also configured at some input terminal, then the resulting value is computed as logical "or" of both input signals.

Group: SMS/E-Mail

Setpoint: Yel Alarm Msg

Group	SMS/E-Mail
Range [units]	OFF, ON [-]
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: TelNo/Addr Ch1

Group	SMS/E-Mail
Range [units]	[-]
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]	[-]
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: ExtI/O Protect

Setpoint: IOM AI1 Yel

Group	ExtI/O Protect
Range [units]	Limits and units depend on analog input configuration
Description	Threshold for the yellow 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]
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
Description	Threshold for the yellow 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]
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
Description	Threshold for the yellow 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]
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
Description	Threshold for the yellow 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]
Description	Delay of the alarms configured to the analog input 4 of the extension module IG-IOM or IGS-PTM.

Group: Sensors Spec

Setpoint: IOM AI1 Calibr

Group	Sensors Spec
Range [units]	Limits and units depend on analog input configuration
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
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
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
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.

Group: Date/Time

Setpoint: #Date

Group	Date/Time
Range [units]	[dd.mm.yyyy]
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: #Time

Group	Date/Time
Range [units]	[hh.mm.ss]
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: SummertimeMod

Group	Date/Time
Range [units]	DISABLED, WINTER, SUMMER, WINTER-S, SUMMER-S [-]
Description	Select current time mode if you want to switch the daylight saving time automatically. • 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 Stamp Per

Group	Date/Time
Range [units]	0 .. 240 [min]
Description	If the gen-sets are 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: Timer1 Repeat

Group	Date/Time
Range [units]	NONE, MONDAY, TUESDAY, .. SUNDAY, MON-FRI, MON-SAT, MON-SUN, SAT-SUN [-]
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]
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]
Description	This setpoint adjusts duration the Timer 1 will be active within one cycle. Learn more about exercise timers in separate chapter.

Table of values

Value: Mains kW I

Group	Mains
Units	kW
Description	Active power imported from the mains (negative sign means export).

Value: Mains kVAr I

Group	Mains
Units	kVAr
Description	Reactive power imported from the mains.

Value: Mains kVA I

Group	Mains
Units	kVA
Description	Apparent power imported from te mains (negative sign means export).

Value: Mains PF

Group	Mains
Units	-
Description	Mains power factor.

Value: Mains Load Chr

Group	Mains
Units	-
Description	Character of the load. "L" means inductive load, "C" is capacitive and "R" is resistive load (power factor = 1).

Value: Mains V L1-N

Group	Mains
Units	V
Description	Mains phase L1 voltage.

Value: Mains V L2-N

Group	Mains
Units	V
Description	Mains phase L2 voltage.

Value: Mains V L3-N

Group	Mains
Units	V
Description	Mains phase L3 voltage.

Value: Mains V L1-L2

Group	Mains
Units	V
Description	Mains phase L1 to phase L2 voltage.

Value: Mains V L2-L3

Group	Mains
Units	V
Description	Mains phase L2 to phase L3 voltage.

Value: Mains V L3-L1

Group	Mains
Units	V
Description	Mains phase L3 to phase L1 voltage.

Value: Mains freq

Group	Mains
Units	Hz
Description	Mains frequency taken from phase L3.

Value: Mains A L1

Group	Mains
Units	A
Description	Mains current phase L1.

Value: Mains A L2

Group	Mains
Units	A
Description	Mains current phase L2.

Value: Mains A L3

Group	Mains
Units	A
Description	Mains current phase L3.

Value: Mains kW L1

Group	Mains
Units	kW
Description	Mains active import power in phase L1.

Value: Mains kW L2

Group	Mains
Units	kW
Description	Mains active import power in phase L2.

Value: Mains kW L3

Group	Mains
Units	kW
Description	Mains active import power in phase L3.

Value: Mains kVAr L1

Group	Mains
Units	kVAr
Description	Mains reactive power in phase L1.

Value: Mains kVAr L2

Group	Mains
Units	kVAr
Description	Mains reactive power in phase L2.

Value: Mains kVAr L3

Group	Mains
Units	kVAr
Description	Mains reactive power in phase L3.

Value: Mains kVA L1

Group	Mains
Units	kVA
Description	Mains apparent power in phase L1.

Value: Mains kVA L1

Group	Mains
Units	kVA
Description	Mains apparent power in phase L2.

Value: Mains kVA L1

Group	Mains
Units	kVA
Description	Mains apparent power in phase L3.

Value: Mains PF L1

Group	Mains
Units	-
Description	Mains power factor in phase L1.

Value: Mains PF L2

Group	Mains
Units	-
Description	Mains power factor in phase L2.

Value: Mains PF L3

Group	Mains
Units	-
Description	Mains power factor in phase L3.

Value: Mains LChr L1

Group	Mains
Units	-
Description	Character of the load in the L1 phase. "L" means inductive load, "C" is capacitive and "R" is resistive load (power factor = 1).

Value: Mains LChr L2

Group	Mains
Units	-
Description	Character of the load in the L2 phase. "L" means inductive load, "C" is capacitive and "R" is resistive load (power factor = 1).

Value: Mains LChr L3

Group	Mains
Units	-
Description	Character of the load in the L3 phase. "L" means inductive load, "C" is capacitive and "R" is resistive load (power factor = 1).

Value: Slip

Group	Mains
Units	Hz
Description	Differential frequency between the gen-sets and the mains.

Value: Angle

Group	Mains
Units	°
Description	The phase shift between the gen-set and the mains voltage.

Value: MaxVectorShift

Group	Mains
Units	°
Description	This is maximal measured value of vector surge of the generator voltage. The value is reset to 0 automatically in the moment of closing the MCB.

Value: Bus V L1-N

Group	Bus
Units	V
Description	Bus phase L1 voltage.

Value: Bus V L2-N

Group	Bus
Units	V
Description	Bus phase L2 voltage.

Value: Bus V L3-N

Group	Bus
Units	V
Description	Bus phase L3 voltage.

Value: Bus V L1-L2

Group	Bus
Units	V
Description	Bus phase L1 to phase L2 voltage.

Value: Bus V L2-L3

Group	Bus
Units	V
Description	Bus phase L2 to phase L3 voltage.

Value: Bus V L3-L1

Group	Bus
Units	V
Description	Bus phase L3 to phase L1 voltage.

Value: Bus freq

Group	Bus
Units	Hz
Description	Bus frequency taken from phase L3.

Value: Actual Reserve

Group	Power management
Units	%
Description	This value represents the difference between actual relative load of the group and 100%. Reserve = 100*(1 - (P_{act}/P_{nom})) [%] P_{nom} means *Running NomPwr* and P_{act} means *Running ActPwr*

Value: Running ActPwr

Group	Power management
Units	kW
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 NomPwr

Group	Power management
Units	kW
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
Description	Sum of **nominal** load of all active gen-sets within the group.

Value: Bin Outputs

Group	Controller I/O
Units	-
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: Bin Inputs

Group	Controller I/O
Units	-
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: Ldsharing Out

Group	Controller I/O
Units	%
Description	This is the actual value that is sent from the MainsCompact onto the digital loadsharing line. The controller uses the loadsharing line for load control of the gen-set group in parallel to mains operation and for frequency/angle control during synchronizing.

Value: VArSharing Out

Group	Controller I/O
Units	%
Description	This is the actual value that is sent from the MainsCompact onto the digital VArsharing line. The controller uses the VArsharing line for voltage control of the gen-set group during synchronizing.

Value: CPU Temp

Group	Controller I/O
Units	ºC
Description	Internal temperature of the CPU.

Value: Battery Volts

Group	Controller I/O
Units	V
Description	Controller supply voltage.

Value: IOM Bin Inp

Group	Extension I/O
Units	-
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: IOM Bin Out

Group	Extension I/O
Units	-
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.

Value: RA Bin Out

Group	Extension I/O
Units	-
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 AI1

Group	Extension I/O
Units	configurable
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
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
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
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: Mains kWh I

Group	Statistics
Units	kWh
Description	Counter of active energy imported from the mains.

Value: Mains kVAhr I

Group	Statistics
Units	kVAh
Description	Counter of reactive energy imported from the mains.

Value: Mains kWh E

Group	Statistics
Units	kWh
Description	Counter of active energy exported into the mains.

Value: Mains kVAhr E

Group	Statistics
Units	kVAh
Description	Counter of reactive energy exported into the mains.

Value: FW Version

Group	Info
Units	-
Description	Major and minor firmware version number. This value does not contain release version number.

Value: FW Branch

Group	Info
Units	-
Description	Firmware branch code. Contains 1 in case of standard branches.

Value: PasswordDecode

Group	Info
Units	-
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: Breaker State

Group	Info
Units	-
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	-
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 Val

Group	Info
Units	-
Description	The value contains "Current process timer" value, that is shown on the main screen of the controller.

Value: CAN16

Group	Info
Units	-
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	-
Description	Each bit of this value shows if a controller with corresponding address is found on the bus. Bit 0 represents address 16 etc.

Table of binary input functions

Binary input: MCB Feedback

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: MCGB Feedback

Description	This is an input from the Master generator circuit breaker or contactor (MGCB) auxiliary contact. If the input is active, the controller will consider the MGCB as closed and vice versa. **NOTE:** If this input is configured the controller expects the MGCB is present in the system and will behave according to this fact. See more details about the controller behavior in the function description, especially in subchapter Breaker control. If the input is configured and is not in expected position according to the *MGCB Close/Open* output, the *MGCB Fail* will be issued.

Binary input: Rem Start/Stop

Description	Use this input to start and stop the gen-sets in AUT mode. See details about starting and stopping in the chapter Gen-set group start/stop.

Binary input: Remote OFF

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

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

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: Remote TEST

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

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: Load Reserve 2

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: Start Button

Description	This input is to be used as an external start button for control of the gen-set group in manual mode. It works the same way as the start button on the panel with the only one difference, that this input is not disabled with *Access Lock*.

Binary input: Stop Button

Description	This input is to be used as an external stop button for control of the gen-set group in manual mode. It works the same way as the stop button on the panel with the only one difference, that this input is not disabled with *Access Lock*. **NOTE:** For the safety reasons it is recommended to configure this input as NC input and use a NC button.

Binary input: FaultResButton

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

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: MGCB Button

Description	This input is to be used as an external MGCB button for control of the breaker in manual mode. It works the same way as the MGCB button on the panel with the only one difference, that this input is not disabled with *Access lock*.

Binary input: MCB Button

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 with the only one difference, that this input is not disabled with *Access lock*.

Binary input: ForwSyncDisabl

Description	This input disables sychronizing of the MGCB breaker. If the input is active the load can't be transferred from the mains onto the gen-sets during TEST operation when the gen-sets are already running and then MGCB button is pressed or *Rem TEST OnLd* is activated.

Binary input: RevSyncDisable

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: Ext MF Relay

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: Access Lock

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: RemControlLock

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)

Table of binary output functions

Common functions

Binary output: MCB Close/Open

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

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

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

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: MGCBClose/Open

Description	This output is to be used for a contactor control in case a contactor is used in the MGCB position. See the chapter Circuit breakers for details about all outputs available for generator/mains power switches.

Binary output: MGCB ON Coil

Description	This output is to be used for control of the ON coil of the master generator circuit breaker. See the chapter Circuit breakers for details about all outputs available for generator/mains power switches.

Binary output: MGCB OFF Coil

Description	This output is to be used for control of the OFF coil of the master generator circuit breaker. See the chapter Circuit breakers for details about all outputs available for generator/mains power switches.

Binary output: MGCB UV Coil

Description	This output is to be used for control of the undervoltage coil of the master generator circuit breaker. See the chapter Circuit breakers for details about all outputs available for generator/mains power switches.

Binary output: Alarm

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

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: Sys Start/Stop

Description	This output is used for starting and stopping of the gen-sets and has to be connected to *Sys Start/Stop* inputs of all gen-set controllers in the group. See also the chapter Gen-set group start/stop.

Binary output: MCB Fdb Mirror

Description	This output is used for providing the information about MCB and MGCB position for the gen-set controllers and has to be connected to their *MCB Feedback* inputs. See also drawings in the Typical applications chapter. **NOTE:** In applications without the MGCB the information about MCB position can be also taken directly from an auxiliary contact from the MCB.

Binary output: Ctrl HeartBeat

Description	This output toggles on/off with period 500ms whenever the controller is switched on and functional.

Binary output: Exerc timer

Description	This is an output from the Exercise timer. This output is also internaly connected to the *Remote TEST* to make periodic tests of the gen-sets easier.

Binary output: Power Switch

Description	This is output from the Power switch function. This output can be also internaly connected to the *Rem Start/Stop* input to enable automatic starting and stopping of the gen-set group. See the setpoint *PwrSwAutoStart*.

Binary output: Mode OFF

Description	This output is active whenever the controller is in OFF mode.

Binary output: Mode MAN

Description	This output is active whenever the controller is in MAN mode.

Binary output: Mode AUT

Description	This output is active whenever the controller is in AUT mode.

Binary output: Mode TEST

Description	This output is active whenever the controller is in TEST mode.

Binary output: Mains Healthy

Description	This output is active while mains failure is not detected, i.e. the mains is healthy.

Binary output: Bus Healthy

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 can be found in the Bus protect setpoint group.

Binary output: Mains Fail

Description	This output is active while mains failure is detected.

Binary output: System Ready

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

Description	The output is closed while the *Actual Reserve* is greater than the currently selected reserve for start.

Alarm mirrors

Binary output: AL Sync Fail

Description	This output is active when the *Sync Timeout* or *RevSyncTimeout* is present in the alarmlist.

Binary output: AL Batt Volt

Description	This output is active when the *Battery voltage* or *Battery flat* is present in the alarmlist.

Binary output: AL TstOnLdFail

Description	This output is active when the *Test with load fail* is present in the alarmlist.

Binary output: BI1 Status

Description	This output gives an 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

Description	This output gives an 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

Description	This output gives an 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

Description	This output gives an 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

Description	This output gives an 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

Description	This output gives an 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

Description	This output gives an 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: IOM BI1 Status

Description	This output gives an 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

Description	This output gives an 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

Description	This output gives an 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

Description	This output gives an 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

Description	This output gives an 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

Description	This output gives an 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

Description	This output gives an 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

Description	This output gives an 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 IOM AI1 Yel

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

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

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

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 Common Wrn

Description	The output is closed when there is any warning type alarm present in the alarmlist.

Binary output: AL Common Fls

Description	The output is closed when there is any sensor fail alarm present in the alarmlist.

Table of internal alarms

Alarm: MCB Fail

Alarm type	Warning
Alarmlist message	`MCB Fail`
Alarm evaluated	All the time
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.

Alarm: MGCB Fail

Alarm type	Warning
Alarmlist message	`MGCB Fail`
Alarm evaluated	All the time
Description	This alarm will occur when the MGCB feedback input does not match the expected position given by the *MGCB 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. • The alarm will be also issued, if the breaker does not respond to the close command within 2 seconds. **NOTE:** If the input *MGCB Feedback* is not configured, the MGCB is not controlled and this alarm is not evaluated.

Alarm: Forward synchronization timeout

Alarm type	Warning
Alarmlist message	`Sync Timeout`
Alarm evaluated	During MGCB sychronization only
Description	If the synchronization of MGCB (forward synchronization) is not successful within a time period adjusted by setpoint *Sync Timeout*, this alarm will be issued. A new attempt of synchronization can be initiated as late as the alarm is reset.

Alarm: Reverse synchronization timeout

Alarm type	Warning
Alarmlist message	`RevSyncTimeout`
Alarm evaluated	During MCB sychronization only
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-sets will remain in island operation. A new attempt of reverse synchronization can be initiated as late as the alarm is reset.

Alarm: Test with load fail

Alarm type	Warning
Alarmlist message	`WrnTstOnLdFail`
Alarm evaluated	During test on load
Description	The alarm is issued when it is not possible to transfer the load from the mains to the gen-sets because the gen-set group has not enough capacity at the moment. The unloading process is continued.

Alarm: Battery voltage

Alarm type	Warning
Alarmlist message	`Wrn Batt Volt`
Alarm evaluated	All the time
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: Low BackupBatt

Alarm type	Shutdown
Alarmlist message	`LowBackupBatt`
Alarm evaluated	All the time
Description	This alarm indicates that the internal backup battery needs to be replaced.