InteliMains^{NT}®

Mains Circuit Breaker and Master Generator Circuit Breaker Applications

IM-NT-BB, IM-NTC-BB, IM-NT

SW version 3.2.0, September 2015

Reference Guide

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1 Document information

InteliMains-NT® – MGCB/MCB Reference guide
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DOCUMENT HISTORY

REVISION NUMBER	RELATED SW. VERSION	DATE
1	3.0	27.5.2013
2	3.1.0	1.9.2014
3	3.2.0	30.3.2015

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

1.1 Available Related Documentation

PDF files	Description
IM-NT-MCB-MGCB-3.2.0 Reference Guide.pdf	General description of MCB and MGCB applications for InteliMains. Contains general information about installation and related PC software.
IM-NT-BTB-3.2.0 Reference Guide.pdf	General description of BTB applications for InteliMains. Contains general information about installation and related PC software.
IM-NT-FDR-3.2.0 Reference Guide.pdf	General description of FDR applications for InteliMains. Contains general information about installation and related PC software.
IG/IS-NT Installation Guide 08-2014.pdf	Thorough description of installation and technical information about InteliGen NT, InteliSys NT, InteliMains NT and related accessories.
IG/IS-NT Communication Guide 09-2014.pdf	Thorough description of connectivity and communication for InteliGen NT, InteliSys NT, InteliMains NT and related accessories.
IG/IS-NT Operator Guide 01-2014.pdf	Operator Guide for BaseBox controllers using InteliVision 5 and/or 8.
IG/IS-NT-Application Guide 05-2013.pdf	Application Guide for InteliGen NT, InteliSys NT and InteliMains NT systems
IG/IS-NT Troubleshooting Guide 08-2014.pdf	Troubleshooting guide for InteliGen NT, InteliSys NT, InteliMains NT and related accessories

1.2 Clarification of notation

HINT
This type of paragraph points out details to help user installation/configuration.

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 may cause damage or improper functioning of the equipment if not carried out correctly and may not be clear at first sight.

WARNING!
This type of paragraph indicates things, procedures, adjustments, etc. which demand a high level of attention, otherwise personal injury or death may occur.

EXAMPLE:

This type of paragraph indicates examples of usage for illustrational purposes.

TYPE	TEXT NOTATION
Setpoints in the text	**SetpointGroup:***SetpointName*
Values in the text	**ValueGroup:***ValueName*
Logical Binary/Analog Input/Output functions in the text	LOGICALFUNCTION
Setpoint setting option	OPTION

1.3 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.

2 System overview

2.1 General description

InteliMains-NT controller is comprehensive mains supervision controller for multiple generating sets operating in parallel to the Mains. A modular construction allows upgrades to different levels of complexity in order to provide the best solution for various customer applications.

NT Family 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.

BaseBox versions of InteliMains controllers are now available. This version features controller without built-in monochromatic display and can be combined with new and powerful display units InteliVision-8 and InteliVision-5. For more information on these products, please go to comap.cz web pages.

The controller automatically connects the group of gen-sets to the Mains. It features mains failure detection using integrated Mains protections, MCB and MGCB synchronization, configuration level switches based on Mains import or object consumption.

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

NOTE:
In versions below 2.6 the IM-NT controller does not accept an external bus supply (bus supply which is not controlled by a ComAp controller).

Gensets have to be in AUT mode to ensure proper MGCB function.

The key features are:

- Automatic gen-set start when the mains fails (BI SYS START/STOP is closed)
- MCB controlled by InteliMains-NT
- Break transfer on mains failure
- MCB synchronizing after mains return
- Power management (load dependent start and stop)
- Gen-set priority can be defined manually or automatically based on running hours equalization or load demand (most efficient combination)
- Load sharing and VAR sharing
- Gen-sets soft loading and unloading
- Voltage matching
- Reverse power protection
- Full PLC logic included
- Support of redundancy controller
- MGCB support
- Group Link function
- Active calls and SMS

2.2 *Configurability and monitoring*

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

Supported configuration and monitoring tools:

- GenConfig – complete configuration and firmware upgrade
- InteliMonitor – multiple site monitoring and setpoint setting
- WinScope – special graphical monitoring software
- WebSupervisor – web-based system for monitoring and controlling
    - WebSupervisor mobile – supporting application for smartphones

NOTE:
Use the GenConfig PC software to read, view and modify configuration from the controller or disk and write the new configuration to the controller or disk.

2.2.1 GenConfig

Configuration and monitoring tool for InteliMains^{NT}, InteliGen^{NT} and other controllers. See more in GenConfig Reference Guide.

This tool provides the following functions:

- Direct, modem or internet communication with the controller
- Offline or online controller configuration
- Controller firmware upgrade
- Reading/writing/adjustment of setpoints
- Binary/Analog Inputs and Outputs logical functions adjustments
- Exporting data into a XLS file
- Controller language translation
- Screen Editor for editing InteliVision 5 a 8 screens
- PLC Editor for editing built-in PLC functions
- Updating and configuration of InteliVision 8 firmware
- User Protections, User sensor curves, password protection and history management

2.2.2 InteliMonitor

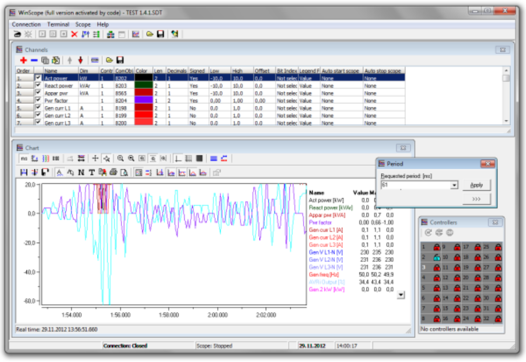
PC Monitoring tool for Inteli controllers. See more in the InteliMonitor Reference Guide.

This tool provides the following functions:

- Online monitoring of a controller or whole site
- Fully customizable SCADA diagram
- Reading/writing/adjustment of setpoints
- Reading of measured values
- Browsing of controller history records

2.2.3 WinScope

Special graphical controller monitoring software. See more in the WinScope Reference guide.



This tool provides the following functions:

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

2.2.4 WebSupervisor

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

This tool provides the following functions:

- Site and fleet monitoring
- Reading of measured values
- Browsing of controller history records
- On-line notification of alarms
- E-mail notification
- Also available as a smartphone application

2.3 Applications overview

For detailed description of several possible applications using InteliMains^{NT} please refer to the IGS-NT-Application Guide.

NOTE:
It is necessary to use power formats in MX when the sum of nominal power of gen-sets or any power in the system (e.g. power imported from Mains) is expected to be above 32000 kW.

3 Installation

There are currently three HW versions of InteliMains^{NT} controller. Please refer to the corresponding portion of this chapter for installation instruction for your particular controller type. Chapters relevant for both HW configurations are marked as "(general)".

CONTROLLER TYPE	HARDWARE FEATURES
IM-NT 	• 6 Binary Outputs • 6 Binary Inputs • Mains and Bus Voltage measurement (3-phase) • Mains Current measurement (3-phase) • Auxiliary Current measurement (1-phase) • RS485 Communication port for universal use • RS232 Communication port • CAN1 Communication port (for extension modules) • CAN2 Communication port (for intercontroller communication and monitoring)
IM-NT-BB 	• 12 Binary Outputs • 12 Binary Inputs • 3 Analog Inputs • 1 Analog Output • Mains and Bus Voltage measurement (3-phase) • Mains Current measurement (3-phase) • Auxiliary Current measurement (1-phase) • RS485 Communication port dedicated for display • RS232 Communication port • CAN1 Communication port (for extension modules) • CAN2 Communication port (for intercontroller communication and monitoring)
IM-NTC-BB 	• 12 Binary Outputs • 12 Binary Inputs • 3 Analog Inputs • 1 Analog Output • Mains and Bus Voltage measurement (3-phase) • Mains Current measurement (3-phase) • Auxiliary Current measurement (1-phase) • RS485 Communication port dedicated for display • RS485 Communication port for universal use with galvanic separation • RS232 Communication port • CAN1 Communication port (for extension modules) • CAN2 Communication port (for intercontroller communication and monitoring) • USB Communication port • RJ45 (Ethernet) Communication port

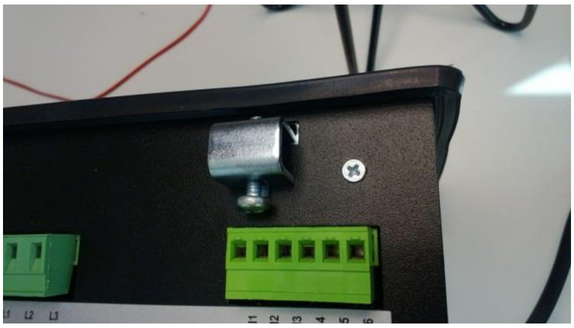
3.1 IM-NT Installation instructions

	This portion of Instalation instructions is dedicated to the **InteliMains-NT-GC** controller with built-in display. If you have BaseBox type of the controller (without the built-in display), please refer to the section 3.2.

3.1.1 Mounting

Prepare the screw holders

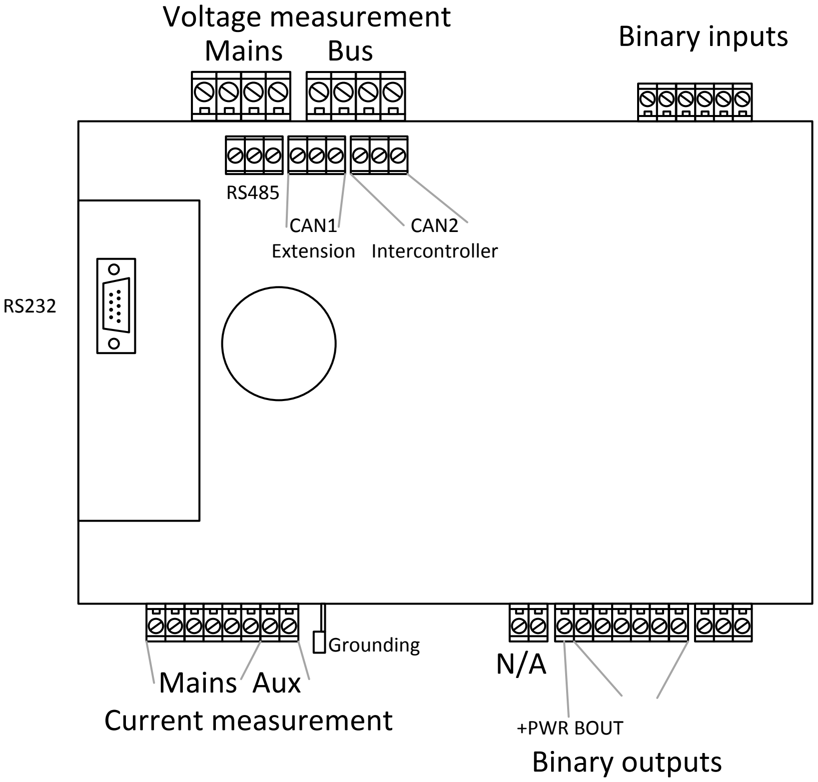
Locate four sockets for screw holders

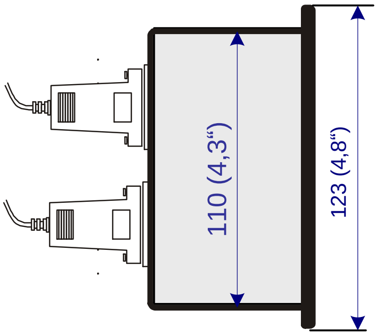


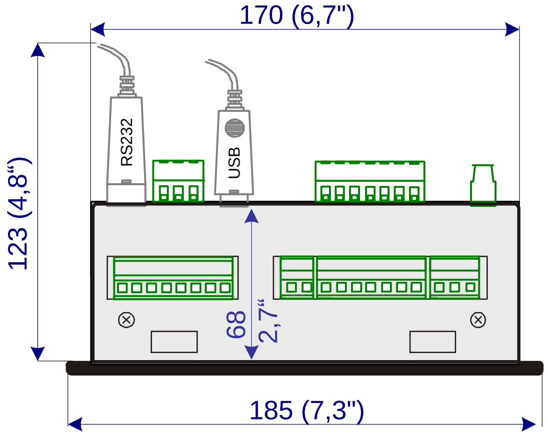
Insert the unit into cut-out in a switchboard and insert all four screw holders accordingly to their positions

Tighten as required to fix the controller in the position

3.1.2 Terminal diagram, Dimensions







Cutout for IG-XX/IM-NT
113 x 175 mm
4,4 x 6,9”

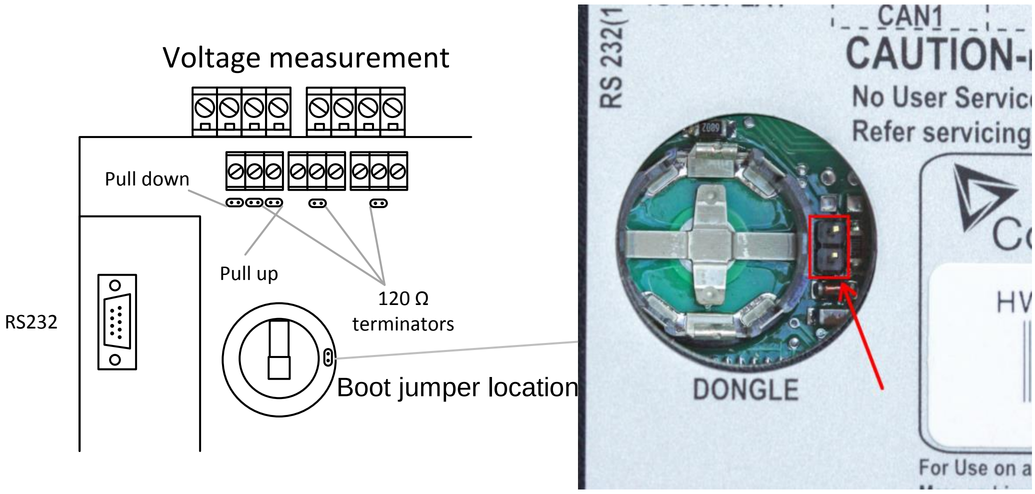
3.1.3 Package contents

The package contains:

- Controller
- Mounting holders
- Terminal blocks

3.1.4 Jumper settings

There are several jumpers available on the unit. Their location and purpose is described below.



Use boot jumper if controller is not responding to communication (e.g. due to faulty programming sequence). Take off the rubber cover using screwdriver to acces boot jumper next to dongle slot.

Use 120 Ω terminators at the end of CAN1, CAN2 or RS485 buses. Do not use these terminators on units that are not terminating the bus.

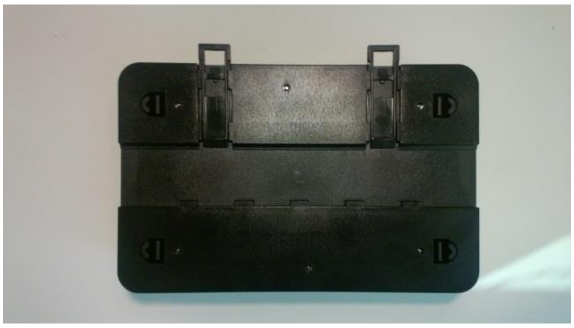
Use pull up and pull down resitors on RS485 to bias the line when no device is active on the bus to prevent noise from undriven line to be interpreted as data.

3.2 IM-NT-BB and IM-NTC-BB Installation instructions

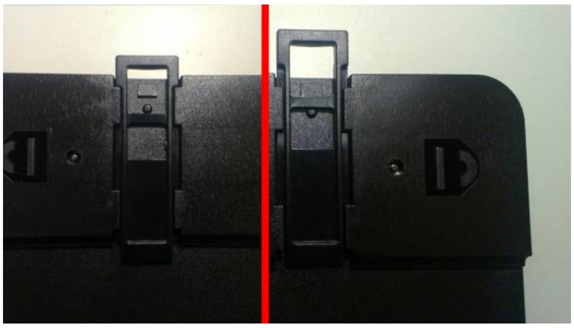
	This portion of Instalation instructions is dedicated to the **InteliMains-NT-BaseBox** and **InteliMains-NTC-BaseBox** controllers without built-in display. If you have version with built-in display of the controller, please refer to the section 3.1.

3.2.1 Mounting

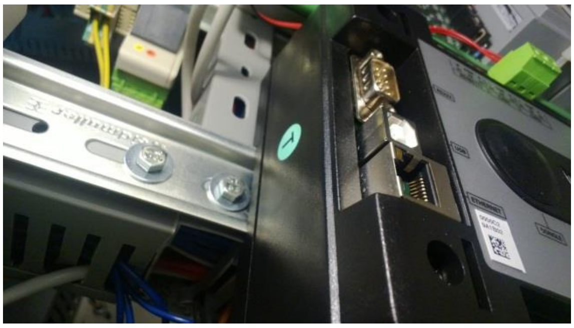
BaseBox units are prepared for mounting on DIN rain mount (35mm).



Locate two plastic holders on the back side of the controller



Make sure both holders are in open position (right image). If not (left image) open them by pulling them slightly out



Mount the unit on the DIN rail and secure by pressing two plastic holder until they click and fix the unit into position

BaseBox units may also be mounted on InteliVision 5 and together with it mounted into cut-out in a switchboard.

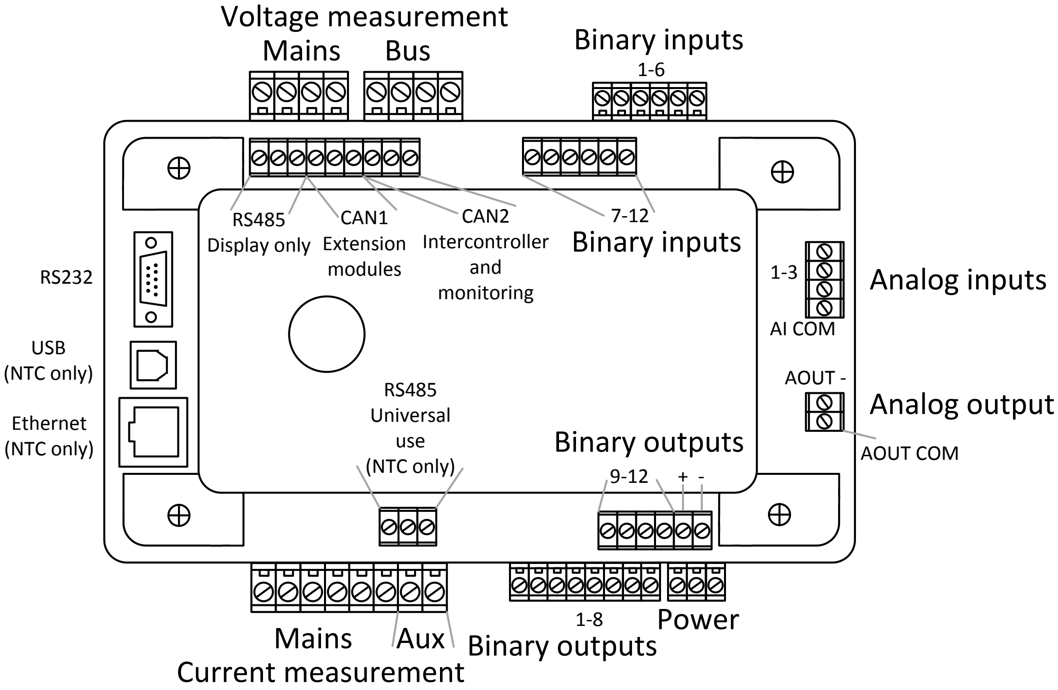
Mount InteliVision 5 into the switchboard cut-out (for more information on InteliVision 5 mounting please refer to the InteliVision 5 Reference Guide)

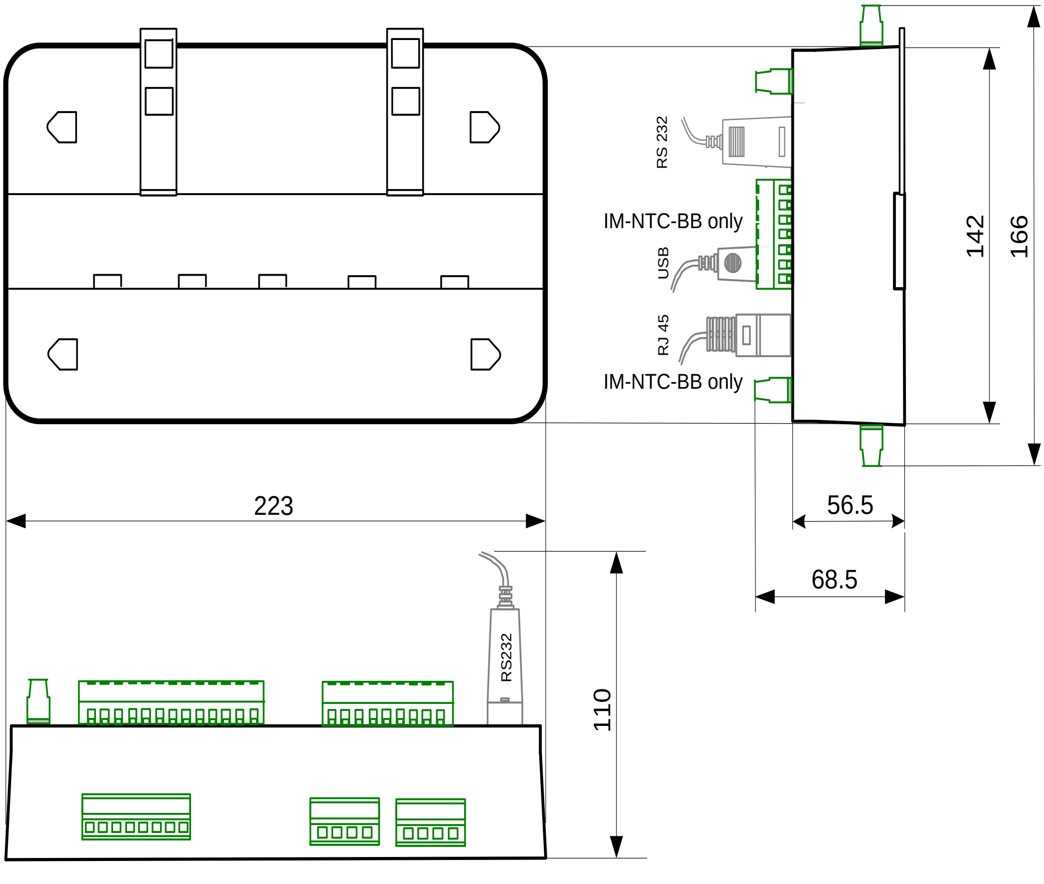
Use the rail provided on the back side of InteliVision 5 and mount the controller to it while following the same steps when mounting on standard rail (rail openings on InteliVision 5 are fixed so there is only one possible way how to mount the controller to it)

Locate four screw holes on the front of the controller

Insert provided screws and use them to secure the controller mounted to InteliVision 5 (screws fit into InteliVision 5 holder pieces)

3.2.2 Terminal diagram, Dimensions





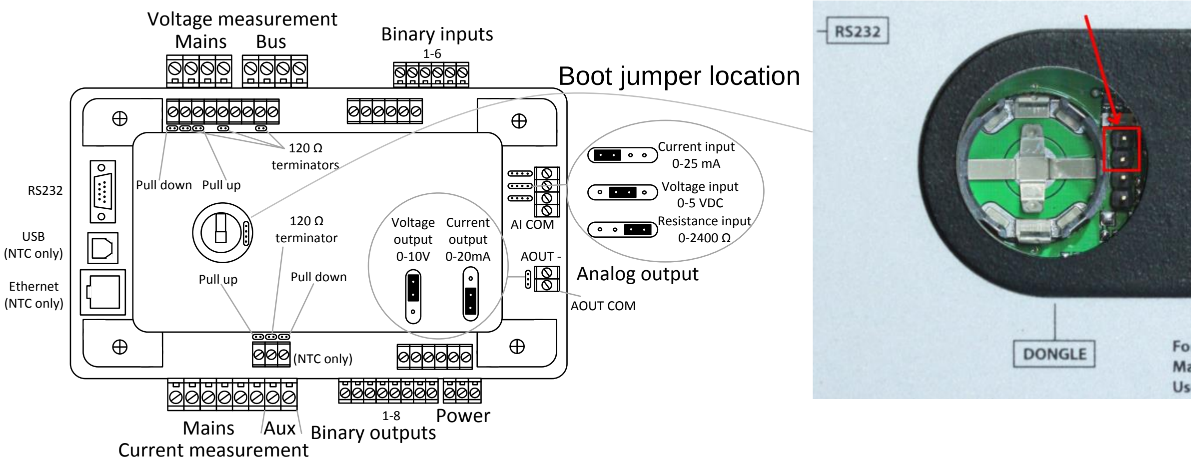
3.2.3 Package contents

The package contains:

- Controller
- Screws for optional screw mounting
- Terminal blocks

3.2.4 Jumper settings

There are several jumpers available on the unit. Their location and purpose is described below.



Use boot jumper if controller is not responding to communication (e.g. due to faulty programming sequence). Take off the rubber cover using screwdriver to acces boot jumper next to dongle slot.

Use 120 Ω terminators at the end of CAN1, CAN2 or RS485 buses. Do not use these terminators on units that are not terminating the bus.

Use pull up and pull down resitors on RS485 to bias the line when no device is active on the bus to prevent noise from undriven line to be interpreted as data.

3.3 *Wiring (general)*

To ensure proper function:

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

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

- For Mains(Bus) Voltage, Generator Voltage a Current terminals
    - Specified tightening torque is 0,56Nm (5,0 In-lb)
    - Use only diameter 2,0-0,5mm (12-26AWG) conductor, rated for 90°C minimum.

- For other controller field wiring terminals

  - Specified tightening torque 0,79Nm (7,0 In-lb)
  - Use only diameter 2,0-0,5mm (12-26AWG) conductor, rated for 75°C minimum.
  - Use copper conductors only.

3.4 Grounding (general)

The shortest possible piece of wire should be used for controller grounding. Use cable min. 2.5 mm^2. A brass M4x10 screw with star washer securing ring type grounding terminal shall be used.

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

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

3.5 Power supply (general)

To ensure proper function:

- Use power supply cable min. 2,5mm^2
- Use fuse
  - 1 amp for IM-NT
  - 2 amps for IM-NT-BB or IM-NTC-BB
- Maximal continuous DC power supply voltage is 36VDC.

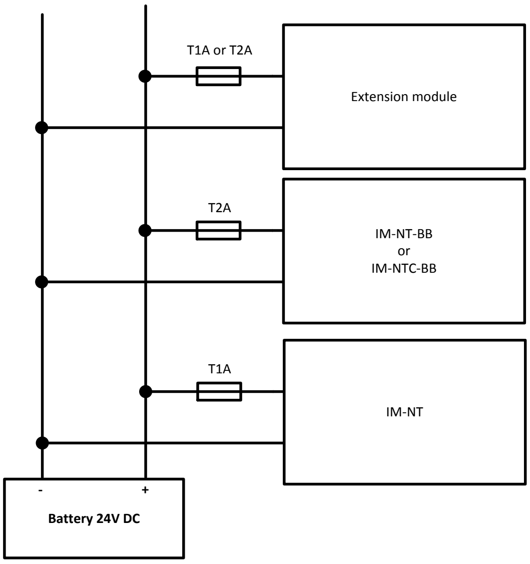
CAUTION!
Switchboard lightning strikes protection according standard regulation is expected!!!
The maximum allowable current through the controller negative terminal is 3 to 8A (depends on the controller type and binary output load).

HINT
For more information on technical data regarding supply, inputs, outputs etc. please refer to IGS-NT-Instalation Guide.

3.6 Power supply fusing (general)

Always use according fuse (1Amp or 2Amps) when connection controller, extension modules or relays to a power source.

See the diagram for proper fusing.



3.7 Voltage and current inputs (general)

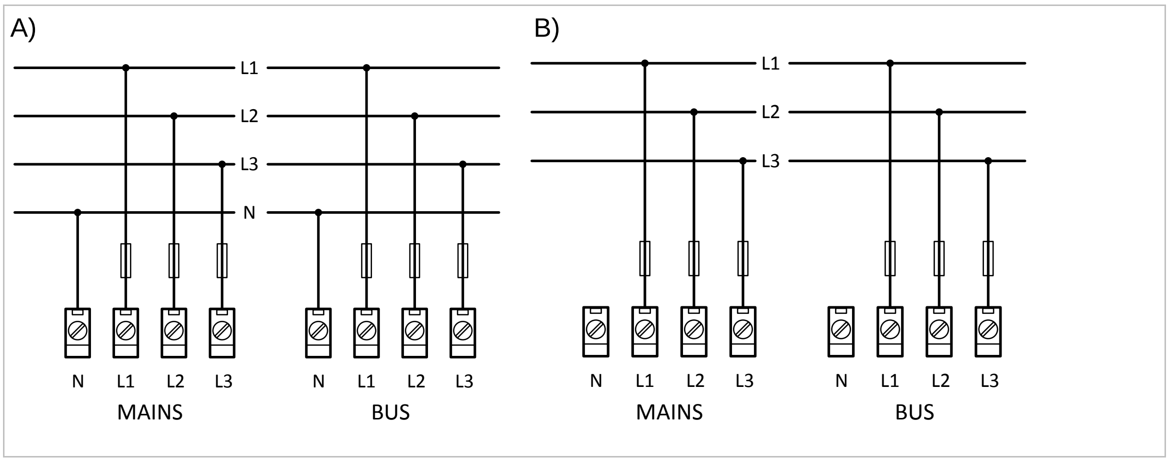
WARNING!
Risk of personal injury due to electric shock when manipulating voltage terminals under voltage! Be sure the terminals are not under voltage before touching them.

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

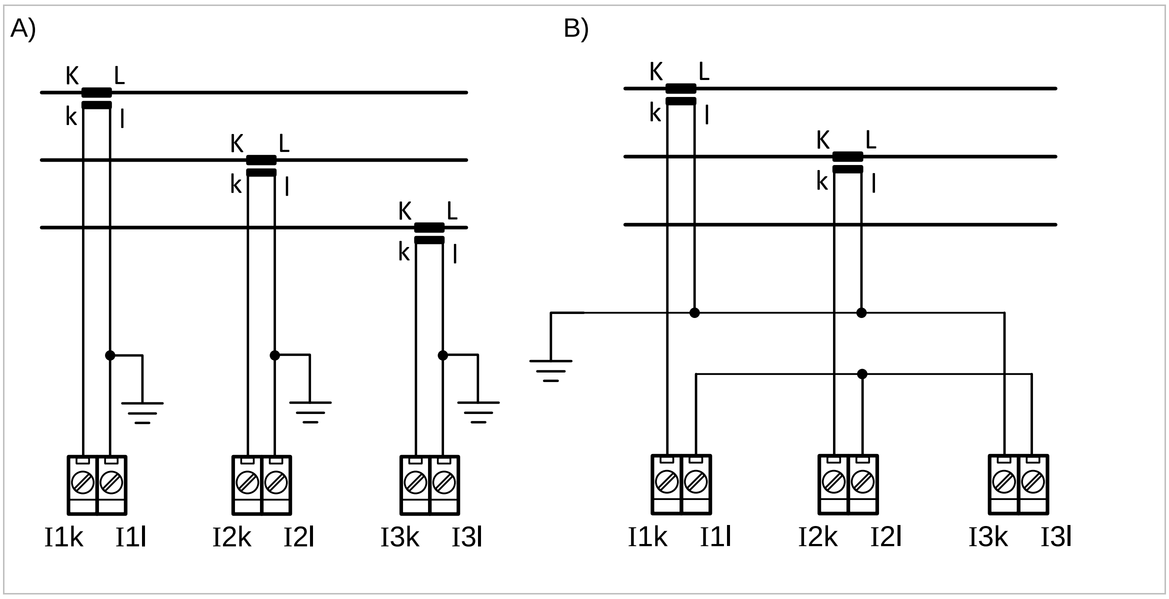
Use **1.5 mm^2** cables for voltage connection and **2.5 mm^2** for current transformers connection.

Adjust nominal voltage, nominal current, CT ratio and PT ratio by appropriate setpoints in the Basic Settings group.

VOLTAGE MEASUREMENT WIRING

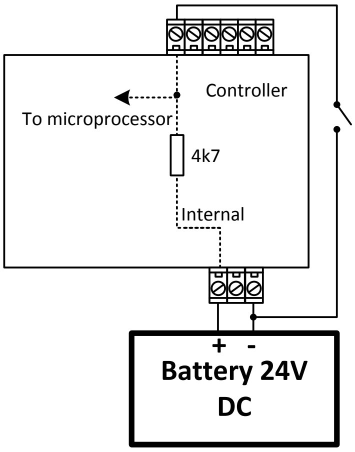


CURRENT MEASUREMENT WIRING



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

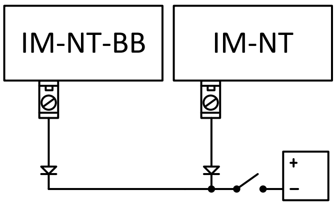
3.8 Binary Input wiring (general)



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. Binary inputs may be used in built-in PLC as well. Please refer to the manual of GenConfig for more information.

It is recommended to use separation diodes when multiple binary input terminals are connected together to prevent unwanted activation of binary input when one of the controllers is switched off.

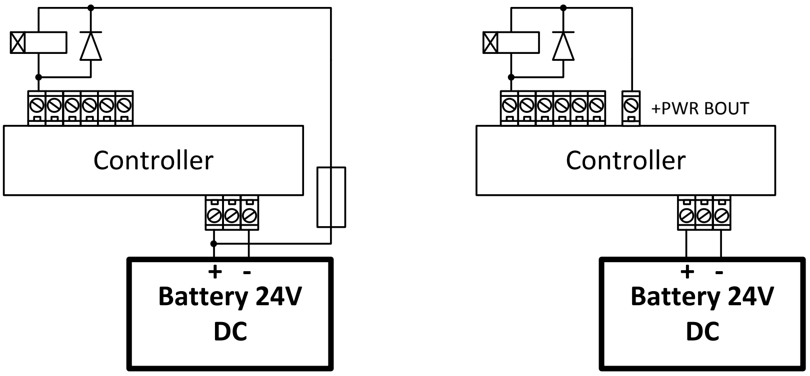


3.9 Binary Output wiring

3.9.1 IM-NT

	This portion of Instalation instructions is dedicated to the **InteliMains-NT-GC** controller with built-in display. If you have BaseBox type of the controller (without the built-in display), please refer to the section 3.8.2.

Correct wiring for Binary output is shown in the diagram below. On the left +PWR BOUT is not used, on the right +PWR BOUT is used. If Binary outputs are connected directly to the power source, additional fuse should be used.



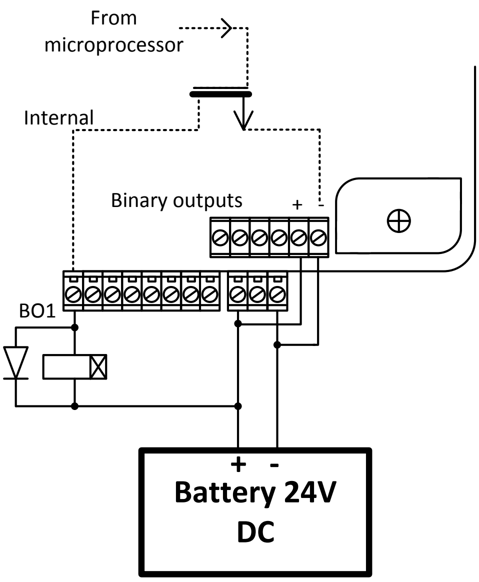
NOTE:
If +PWR BOUT is used, it increases power consumption of the controller.

3.9.2 IM-NT-BB and IM-NTC-BB

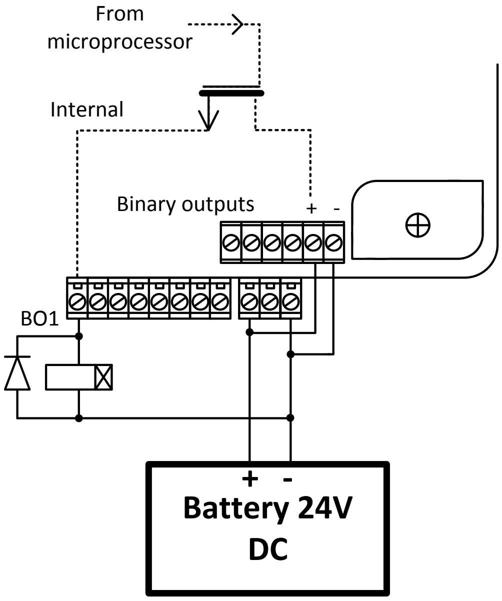
	This portion of Instalation instructions is dedicated to the **InteliMains-NT-BaseBox** and **InteliMains-NTC-BaseBox** controllers without built-in display. If you have version with built-in display of the controller, please refer to the section 3.8.1.

It is possible to use binary outputs as low side switch or high side switch in BaseBox type of controller. For correct wiring in both cases please refer to the following diagrams.

Low side switch



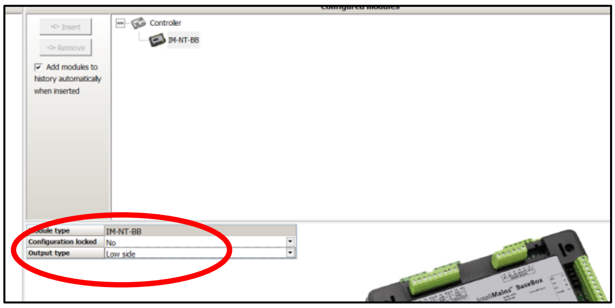
High side switch



CAUTION!
Both power supply sockets for binary outputs need to be connected to ensure proper function of binary outputs.

Never use DC relays without protection diods!

Low side or High side function of binary outputs can be chosen in configuration tool GenConfig in Modules tab. This configuration is used for all binary inputs available on the controller.



☑ Add modules to history automatically when inserted

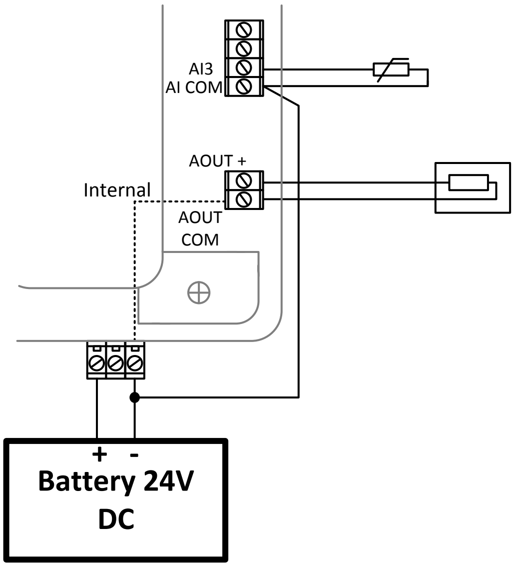
odule type: IM-NT-BB
Configuration locked: No
Output type: Low side

3.10 Analog Input and Output wiring

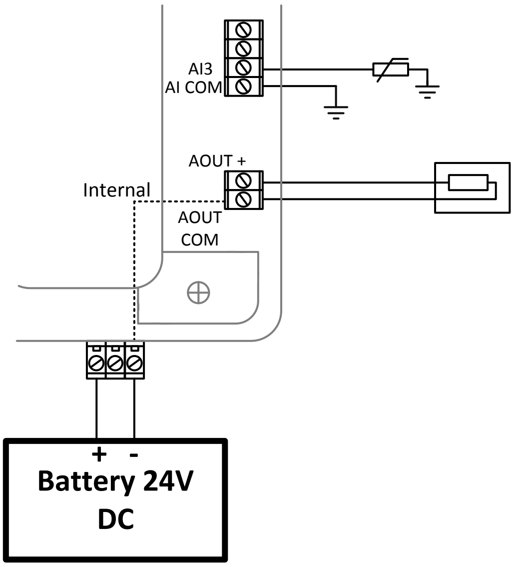
	This portion of Instalation instructions is dedicated to the **InteliMains-NT-BaseBox** and **InteliMains-NTC-BaseBox** controllers without built-in display. Analog inputs and output are not available in InteliMains-NT-GC.

HINT
For more information on technical data regarding supply, inputs, outputs etc. please refer to
For jumper setting of Analog inputs please refer to the section **3.2.4 Jumper settings**.

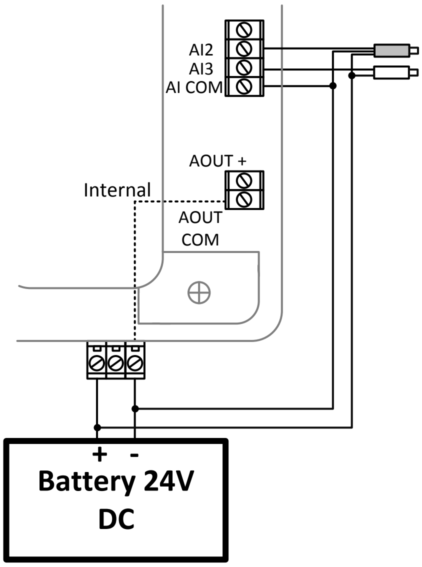
Resistive sensor on Analog input 3 and Analog output wiring



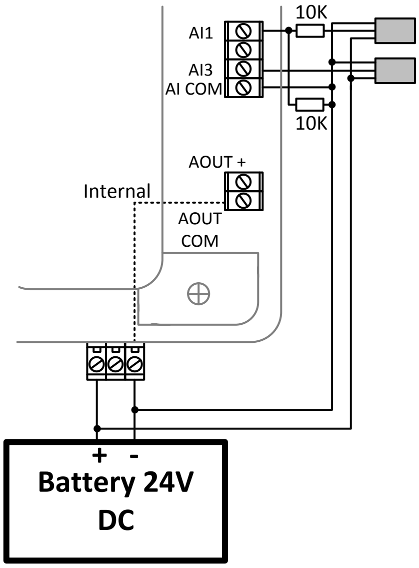
Resistive sensor with grounding on Analog input 3 and Analog output wiring. **Note, that battery should be also grounded to common ground in all cases!**



Passive Current sensor on Analog input 3 and Active Current sensor on ANalog input 2



Voltage sensors on Analog input 1 and 3

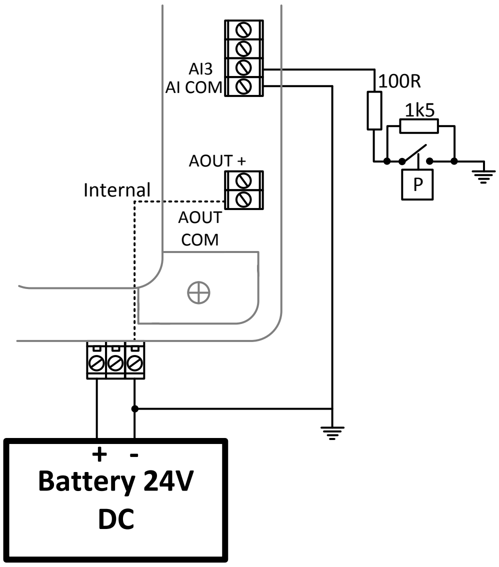


Tristate sensor (binary sensor with fail detection) on Analog input 3

Below 750Ω = Inactive

Between 750Ω and 2400Ω = Active

Below 10 Ω or Over 2400Ω = sensor failure (wire shorted or interrupted)



3.11 CAN and RS485 bus wiring

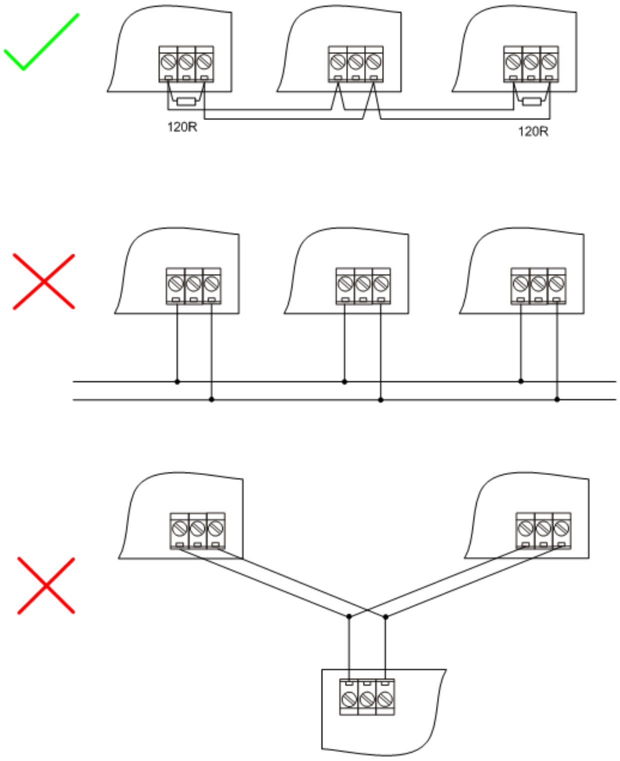
The wiring of the CAN bus communication should be provided in such a way that the following rules are observed:

- The maximum length of the CAN bus depends on the communication speed. For a speed of 250 kbps, which is used on the CAN1 bus (extension modules, ECU) and CAN2 bus if it is switched to 32C mode, the maximum length is 200 m. If the CAN2 bus is switched to 8C mode the speed is 50 kbps and the maximum length is 800 m.
- The maximum length of the RS485 bus is 1000 m
- The bus (CAN and RS485) must be wired in linear form with termination resistors at both ends. No nodes are allowed except on the controller terminals.

NOTE:
A termination resistors at the CAN and RS485 are already implemented on the PCB. For connecting, close the jumper near the appropriate CAN or RS485 terminal. For more information on jumper settings please refer to the section **3.1.4 Jumper setting**.

- Use a cable with following parameters:

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



CAN AND RS485 BUS TOPOLOGY

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

3.11.1 Wiring examples

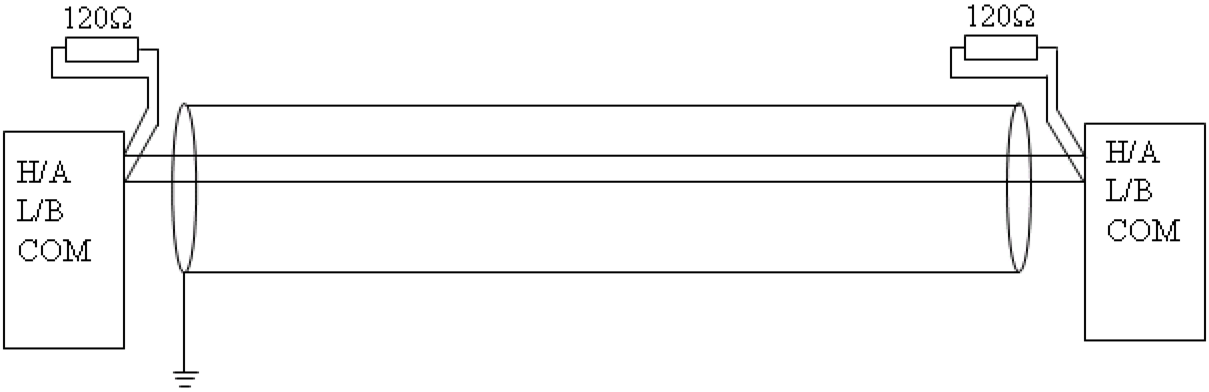
1. For shorter distances (all network components within one room) – picture 1
   interconnect A and B; shielding connect to PE on controller side
2. For longer distances (connection between rooms within one building) – picture 2
   interconnect A, B, COM; shielding connect to PE at one point
3. In case of surge hazard (connection out of building in case of storm etc.) – picture 3

   We recommend using the following protections:

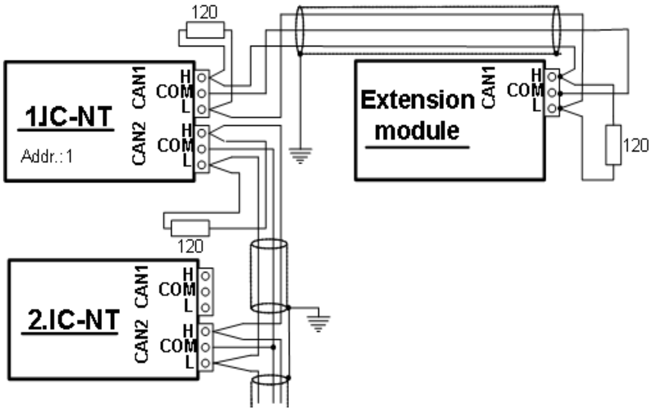
   - Phoenix Contact (http://www.phoenixcontact.com): PT 5-HF-5DC-ST with PT2x2-BE (base element)(or MT-RS485-TTL)
   - Saltek (http://www.saltek.cz): DM-006/2 R DJ

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

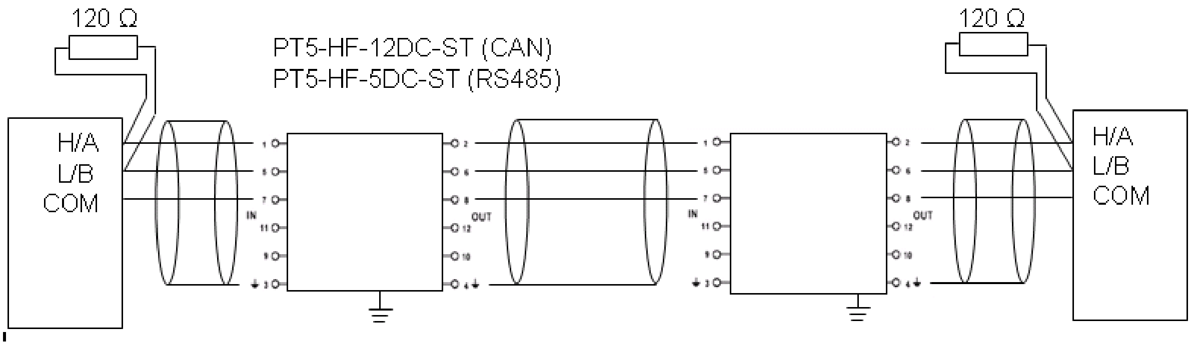
1. For shorter distances: 3105A Paired – EIA Industrial RS-485 PLTC/CM (1x2 conductors)
2. For shorter distances: 3105A Paired – EIA Industrial RS-485 PLTC/CM (1x2 conductors)
3. In case of surge hazard: 3106A Paired – EIA Industrial RS-485 PLTC/CM (1x2+1 conductors)



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



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



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

3.12 Extension modules (general)

For detailed description of several available extension modules for InteliMains^{NT} please refer to the IGS-NT-Instalation Guide.

4 Putting it into operation

In this section brief introduction how to

- connect to a controller,
- modify various settings,
- program controller and reprogram non-responsive controller,
- manage passwords and password protections and
- operate related tools (ScreenEditor, PLC Editor etc.)

is presented.

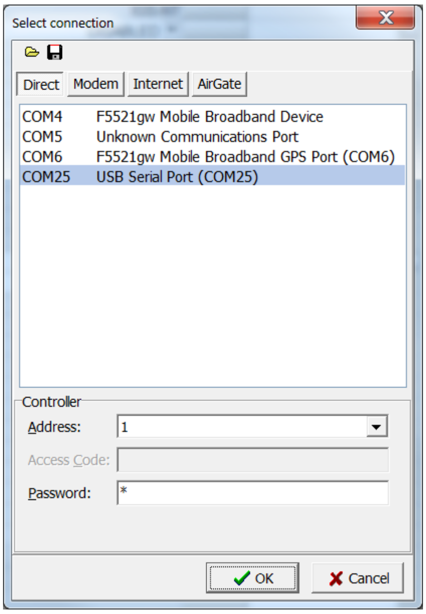
4.1 Connection to a controller using PC

There are several available ways to connect to controller using PC for monitoring, control or configuration/programming. For more information on related PC tools please refer to the section **2.2 Configurability and monitoring**.

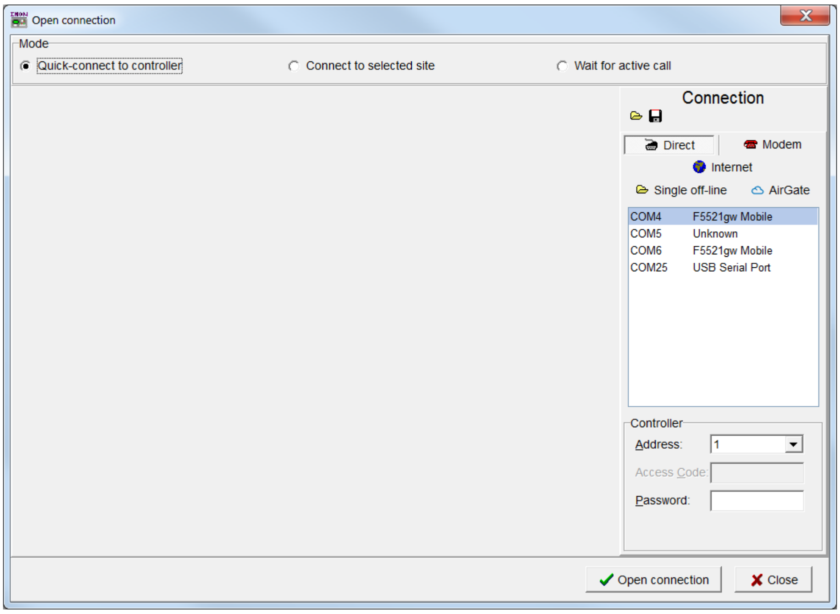
4.1.1 Direct connection

A direct connection can be realized by RS232 connection or USB connection (available on NTC BaseBox only). Figures below illustrate the connection setting in GenConfig and InteliMonitor.

GenConfig



InteliMonitor

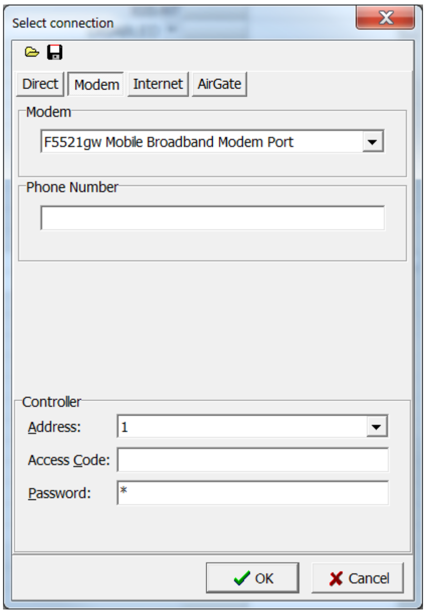


Select according COM port, adjust CAN address and enter password (optional for locked configuration).

4.1.2 Modem connection

A modem connection can be realized by suitable modem connected to the controller. Figures below illustrate the connection setting in GenConfig and InteliMonitor.

GenConfig

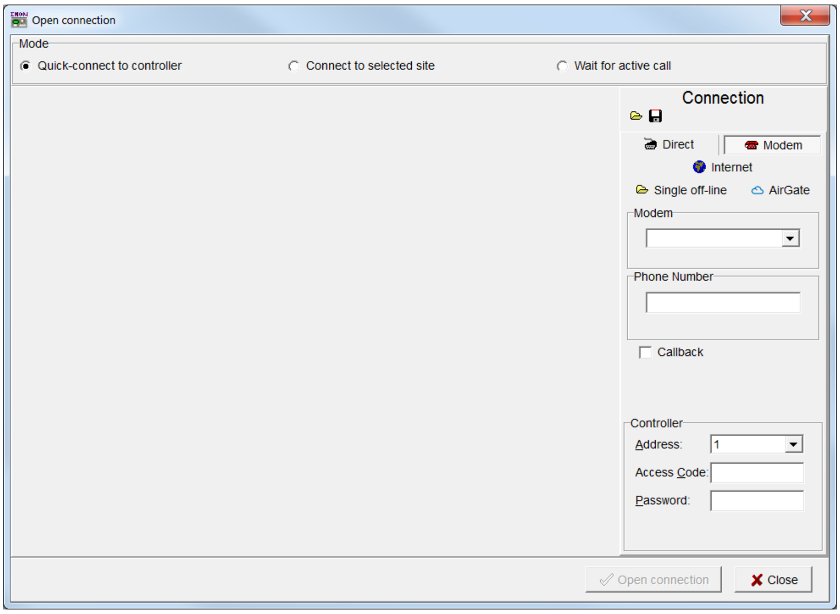


Modem: F5521gw Mobile Broadband Modem Port

Address: 1

Password: *

InteliMonitor



Address: 1

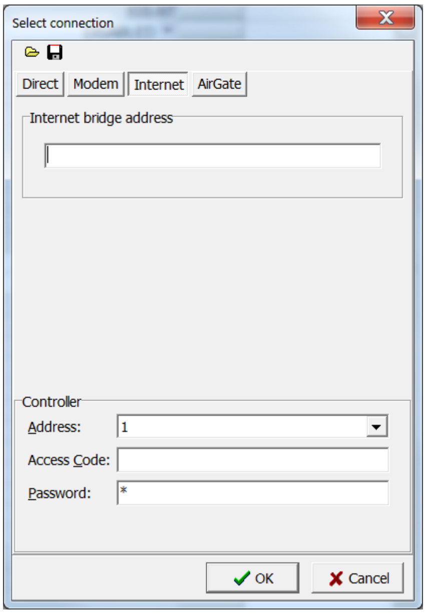
Select connected modem, adjust Phone number and enter CAN address and enter correct Access Code for remote connection. Enter password (optional for locked configuration).

It is possible to adjust number of rings before the controller accepts the connection from modem – use **Comms settings:***NumberRings AA*.

4.1.3 Internet connection

Internet (Ethernet) connection can be used directly in NTC BaseBox version of the controller. For connection to other versions, use IntenetBridge-NT device. Figures below illustrate the connection setting in GenConfig and InteliMonitor.

GenConfig

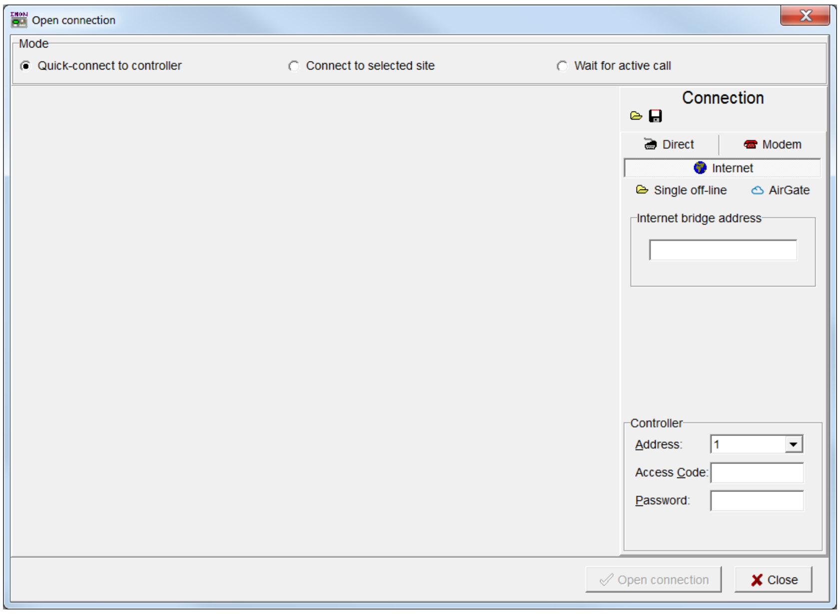


Address: 1

Access Code:

Password: *

InteliMonitor



Mode: ● Quick-connect to controller

Address: 1

Access Code:

Password:

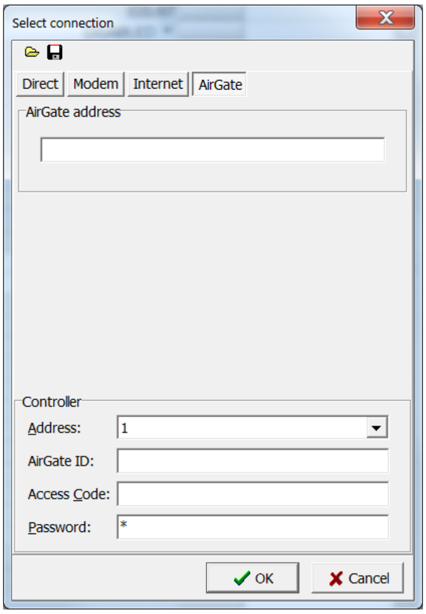
Adjust IP address of the controller (InternetBridge) you want to connect to. Select CAN address of the controller. Enter Access Code for remote connection. Enter password (optional for locked configuration).

NOTE:
The controller must have public IP address or it must be reachable for connection in the specific network.

4.1.4 Airgate connection

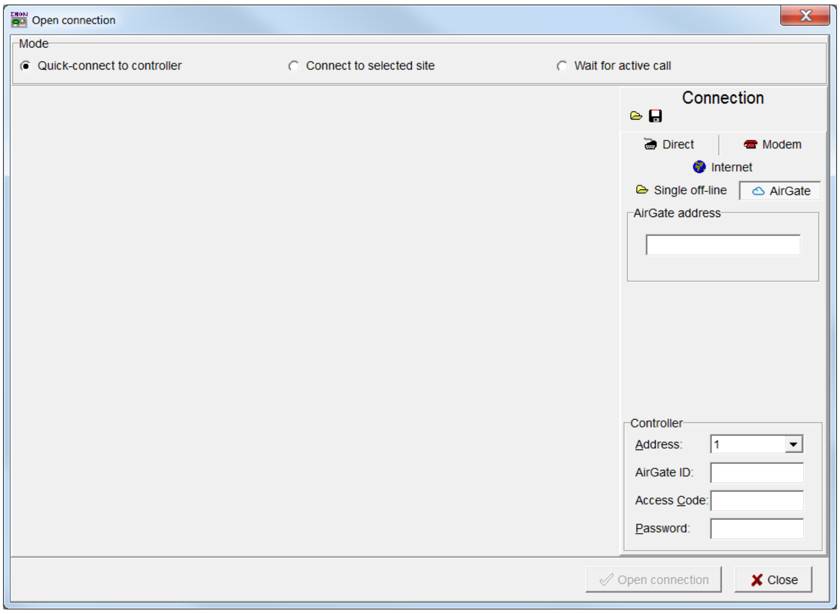
AirGate connection can be used directly in NTC BaseBox version of the controller. For connection to other versions, use IntenetBridge-NT device. Figures below illustrate the connection setting in GenConfig and InteliMonitor.

GenConfig



Address: 1
Password: *

InteliMonitor



Mode: ● Quick-connect to controller
Address: 1

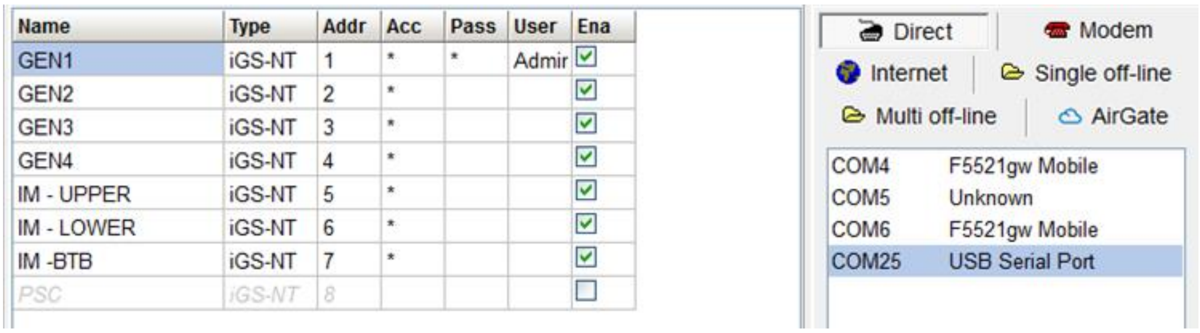
Enter AirGate address of a server with AirGate service (currently **airgate.comap.cz**). Select CAN address of the controller you want to connect to. Enter AirGate ID of the controller (InternetBridge) you want to connect to (AirGate ID is assigned automatically if the controller is properly connected to the Internet and corresponding AirGate setting is enabled. You can find AirGate ID in controller values.). Enter Access Code for remote connection. Enter password (optional for locked configuration).

NOTE:
What is AirGate service? AirGate is a service provided for free by ComAp which allows users to connect to controllers even though they are not assigned public IP address or if there are behind corporate firewalls. Controller connects to the AirGate server (secure and fast server located in Central Europe) and obtains AirGate ID (used in the connection, see above). Then it communicates with the server on a secure line and any user that know AirGate ID and access code for that particular controller can connect from anywhere (Internet access needed) to the controller and monitor and control it.

4.1.5 Connection to multiple controllers

Connection to multiple controller is available in InteliMonitor. It is possible to connect to multiple controller using Direct connection to I-LB+, using Internet connection to NTC BaseBox controllers or to InternetBridge, using modem connection capable of multiple connections or AirGate connection to multiple NTC BaseBox controllers or to IntenetBridge.

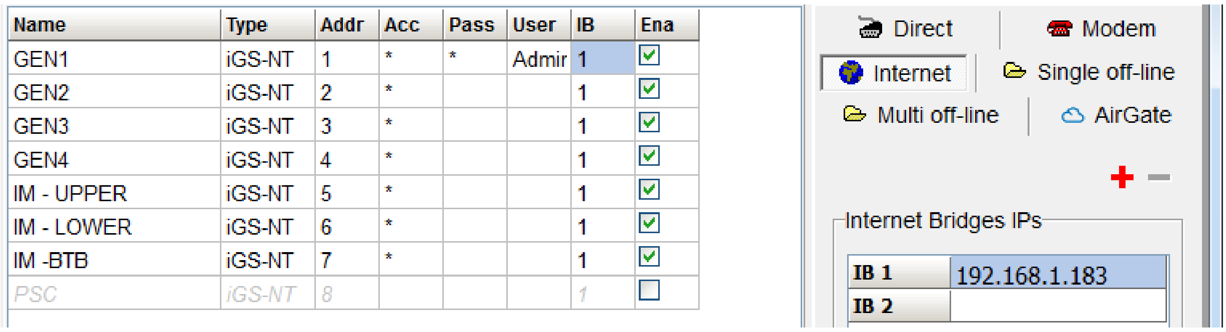
Direct multiple connection



Name	Type	Addr	Acc	Pass	User	Ena
GEN1	iGS-NT	1	*	*	Admir	☑
GEN2	iGS-NT	2	*			☑
GEN3	iGS-NT	3	*			☑
GEN4	iGS-NT	4	*			☑
IM - UPPER	iGS-NT	5	*			☑
IM - LOWER	iGS-NT	6	*			☑
IM -BTB	iGS-NT	7	*			☑
PSC	iGS-NT	8				☐

COM4	F5521gw Mobile
COM5	Unknown
COM6	F5521gw Mobile
COM25	USB Serial Port

Internet multiple connection (use Internet Bridges IPs for connection to NTC BaseBox controllers as well

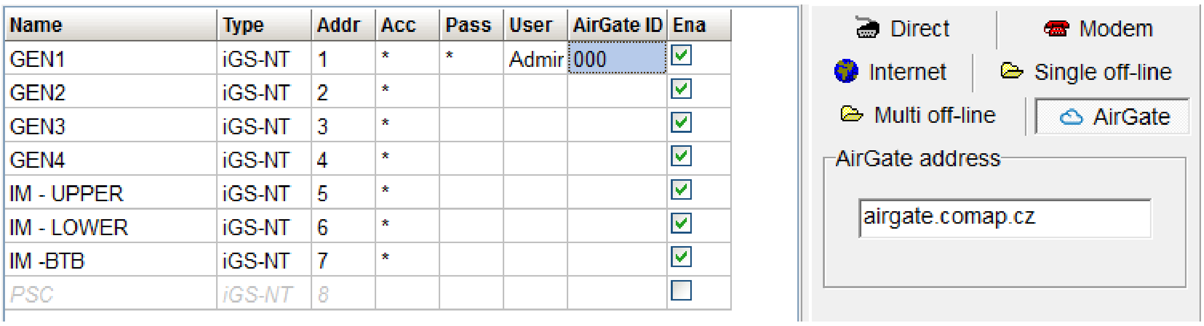


Name	Type	Addr	Acc	Pass	User	IB	Ena
GEN1	iGS-NT	1	*	*	Admir	1	☑
GEN2	iGS-NT	2	*			1	☑
GEN3	iGS-NT	3	*			1	☑
GEN4	iGS-NT	4	*			1	☑
IM - UPPER	iGS-NT	5	*			1	☑
IM - LOWER	iGS-NT	6	*			1	☑
IM -BTB	iGS-NT	7	*			1	☑
PSC	iGS-NT	8				1	☐

Internet Bridges IPs

IB 1	192.168.1.183
IB 2	

Airgate multiple connection (fill in AirGate IDs for each controller, when using InternetBridge fill in InternetBridge AirGate ID for each controller)



Name	Type	Addr	Acc	Pass	User	AirGate ID	Ena
GEN1	iGS-NT	1	*	*	Admir	000	☑
GEN2	iGS-NT	2	*				☑
GEN3	iGS-NT	3	*				☑
GEN4	iGS-NT	4	*				☑
IM - UPPER	iGS-NT	5	*				☑
IM - LOWER	iGS-NT	6	*				☑
IM -BTB	iGS-NT	7	*				☑
PSC	iGS-NT	8					☐

AirGate address: airgate.comap.cz

4.2 Modification of configuration, setpoints etc.

For full configuration of controller configuration use GenConfig. You may open archive prepared for specific application and upload it to the controller. You may also change:

- Controller type (Modules tab)
- Extension modules (Modules tab)
- Binary Input and Output logical functions and protections (I/O tab)
- Analog input sensor type, logical functions and protections (I/O tab)
- Analog output function, conversion, normalization, resolution (I/O tab)
- Setpoints and password level for particular setpoint (Setpoints tab)
- Commands password protection (Commands tab)
- Prepare custom protections (Protections tab)
- Modify History data selection (History tab)
- Prepare custom user sensor characteristics (User Sensor tab)
- Modify languages settings (Languages tab)
- Translate corresponding names to other language prepared in Languages tab (Translator tab)
- Prepare complex logical functions with built-in PLC functions (PLC Editor tab)
- Modify screens for InteliVision 5 and 8 (Screen Editor tab)
- Review and modify assigned logical binary functions (LBI tab)
- Review and modify assigned logical analog functions (LAI tab)
- Select power format, rename Pulse counters and Remote switches (Miscellaneous tab)

CAUTION!
Do not forget that changes in GenConfig are not sent to the controller unless you write them to the controller.

In InteliMonitor it is possible to configure:

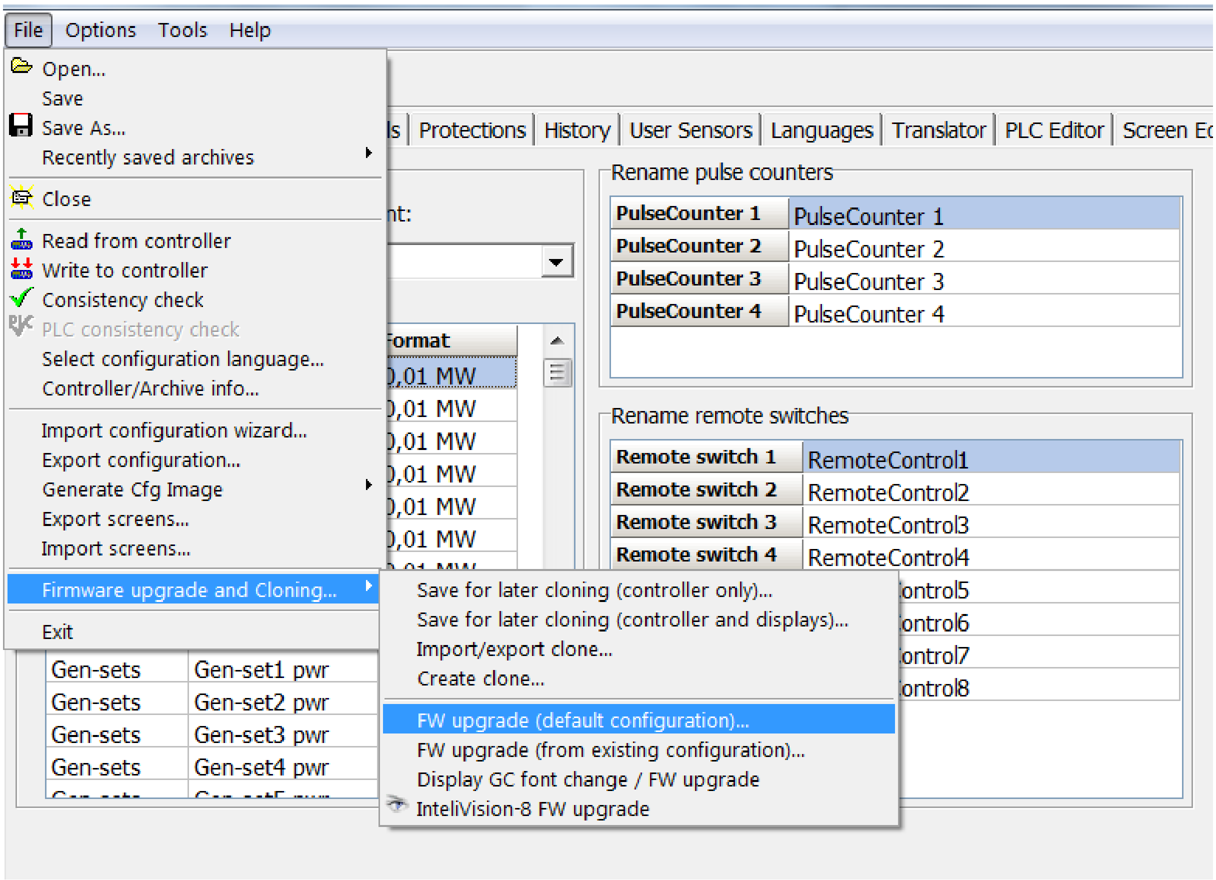
- Setpoints (multiple setpoint configuration in several controllers at once)
- Set/Reset statistics
- Administrate users and their rights

CAUTION!
Do not forget that all changes in InteliMonitor are sent to the connected controller and controller immediately acts on it. Do not change CAN address of the controller or connection is lost and need to be re-established with new CAN address.

4.3 Programming of a controller

4.3.1 Standard programming

For programming GenConfig is used. Select correct connection mode and then select the following option:

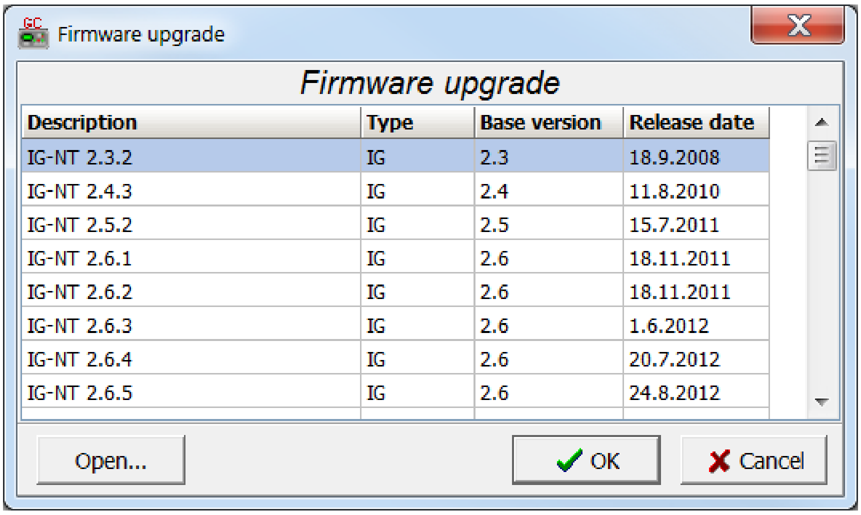


You may use “FW upgrade (from default configuration)” (this will overwrite all of the settings in the controller with default settings. If you need to upgrade firmware from existing configuration, select “FW upgrade (from existing configuration)”. This function will automatically open wizard which will help you update the existing configuration to be compatible with the newly selected firmware.

4.3.2 Programming of non-responsive controller

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

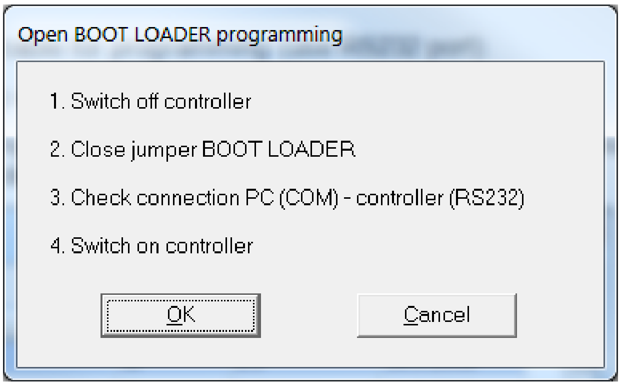
- Connect proper cable for programming (use RS232 port).
- Open GenConfig and select “FW upgrade (default configuration)”
- From the following table select FW that is required or click open and browse your files to find firmware in non-default location



Firmware upgrade

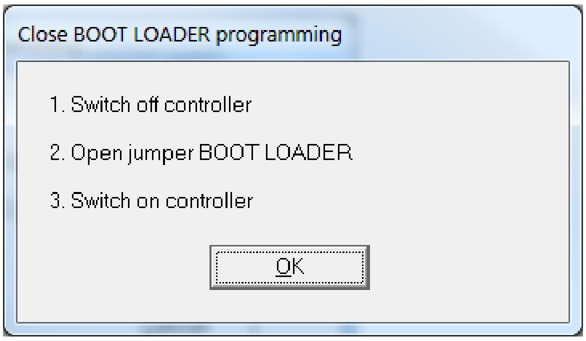
Description	Type	Base version	Release date
IG-NT 2.3.2	IG	2.3	18.9.2008
IG-NT 2.4.3	IG	2.4	11.8.2010
IG-NT 2.5.2	IG	2.5	15.7.2011
IG-NT 2.6.1	IG	2.6	18.11.2011
IG-NT 2.6.2	IG	2.6	18.11.2011
IG-NT 2.6.3	IG	2.6	1.6.2012
IG-NT 2.6.4	IG	2.6	20.7.2012
IG-NT 2.6.5	IG	2.6	24.8.2012

- Click OK
- Wait until the connection times out and following dialog appears



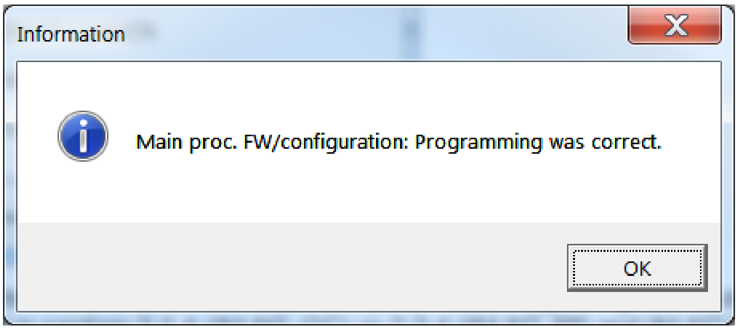
1. Switch off controller
2. Close jumper BOOT LOADER
3. Check connection PC (COM) - controller (RS232)
4. Switch on controller

- Follow the instructions and then click OK (information regarding the location of boot jumper can be found in section 3.1.4 (IM-NT-GC) or 3.2.4 (IM-NT-BB and IM-NTC-BB)
- Programming starts momentarily
- When the programming is done following dialog appears



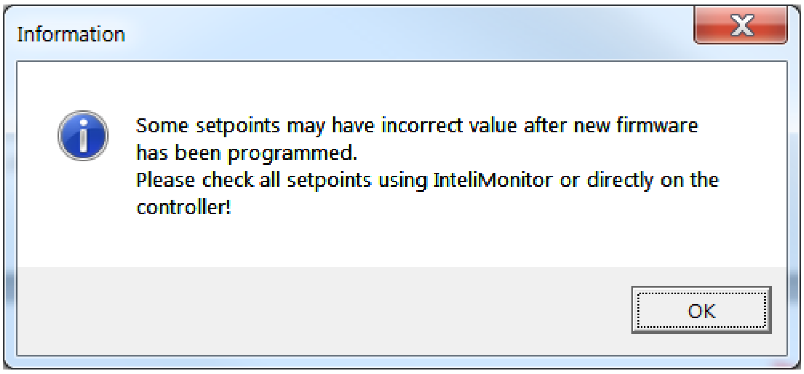
1. Switch off controller
2. Open jumper BOOT LOADER
3. Switch on controller

- Follow the instructions and press OK. Following diagram will appear and programming is done



Main proc. FW/configuration: Programming was correct.

- Additional dialog warns you that the setpoints may have improper values. Change the configuration in normal way.



Some setpoints may have incorrect value after new firmware has been programmed.
Please check all setpoints using InteliMonitor or directly on the controller!

4.4 Changing the language

There is step-by-step guide in GenConfig help available for the Languages and Translator tabs which contains all the information on how to prepare new languages in the configuration (press F1 in Languages or Translator tab or go to Help->GenConfig Help and locate corresponding chapters).

4.4.1 Selection of the language in InteliMains-NT GC

	This portion of instructions is dedicated to the **InteliMains-NT-GC** controller with built-in display. If you have BaseBox type of the controller (without the built-in display), please refer to the section 4.4.2.

Selection of the language can be either done by Binary Input selection (please refer to the section Functions description) or by selecting the language through the menu of built-in display. To select the language go to main menu and scroll down. Select “Languages” by pressing Enter. There is complete selection of languages configured in the controller. Using arrows select the preferred language and press Enter to confirm. Display reboots (controller itself remains fully functional) and new language is used.

HINT

If you need to use graphical language you may need to upload correct set of characters into the controller. By default Chinese character set is uploaded in the controller. If you need to use for example Korean characters (Hangul), in GenConfig select following menu while connected to the controller: File -> Firmware upgrade and Cloning -> Display GC font change / FW upgrade. GenConfig connects to the controller and new fonts may be uploaded to the controller as well as new firmware for the built-in display.

NOTE

If you are using InteliVision 5, InteliVision 8 or InteliVision 17 Touch with the GC type of the controller please refer also to the chapter 4.4.2 for more information on how to change language in the InteliVision.

4.4.2 Selection of the language in InteliMains-NT(C)-BaseBox

	This portion of instructions is dedicated to the **InteliMains-NT-BaseBox** and **InteliMains-NTC-BaseBox** controllers without built-in display. If you have version with built-in display of the controller, please refer to the section 4.4.2.

If using BaseBox version of the controller you may use InteliVision 5, InteliVision 8 or InteliVision 17 Touch. If you need to use for some reason IG or IS-Display please refer to the chapter 4.4.1 for the instructions regarding built-in display which works the same as the external displays.

For InteliVision 5 an 8 go to main menu and select Help/Others and Languages. Scroll up and down and select preferred langugue. Confirm by pressing enter.

If you are using InteliVision 17, it is running standard InteliMonitor software. Please refer to the manual of InteliMonitor how to change fonts in InteliMonitor and in custom SCADA.

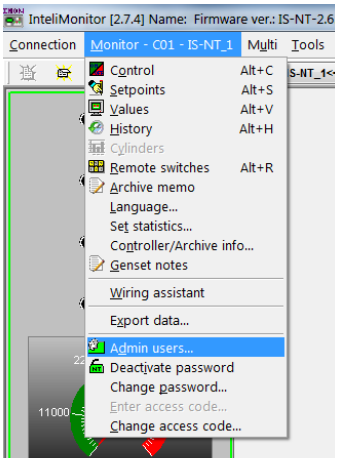
HINT
If you need to use graphical language you may need to upload correct set of characters into the InteliVision via controller. By default Chinese character set is uploaded in the controller. If you need to use for example Korean characters (Hangul), in GenConfig select following menu while connected to the controller: File -> Firmware upgrade and Cloning -> Display GC font change / FW upgrade. GenConfig connects to the controller and new fonts may be uploaded to the controller as well as new firmware for the built-in display.

4.5 Password management

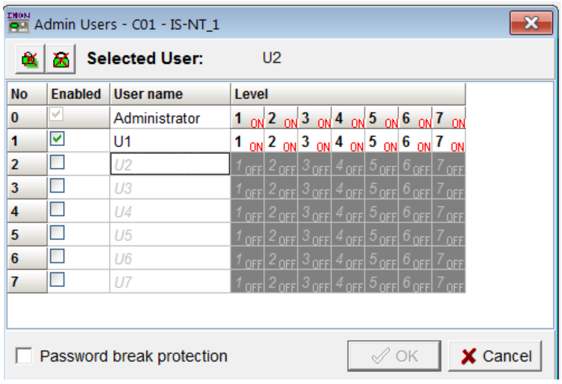
Password management requires InteliMonitor for user names, passwords and rights modification. It also requires GenConfig for assigning corresponding setpoints and command to correct right groups.

4.5.1 User administration

User administration is available only when logged in as an Administrator. Once logged in select "Admin users…" as shown on the right.



Following dialog is displayed:



Selected User: U2

No	Enabled	User name	Level						
0	☑	Administrator	1 ON	2 ON	3 ON	4 ON	5 ON	6 ON	7 ON
1	☑	U1	1 ON	2 ON	3 ON	4 ON	5 ON	6 ON	7 ON
2	☐	U2	1 OFF	2 OFF	3 OFF	4 OFF	5 OFF	6 OFF	7 OFF
3	☐	U3	1 OFF	2 OFF	3 OFF	4 OFF	5 OFF	6 OFF	7 OFF
4	☐	U4	1 OFF	2 OFF	3 OFF	4 OFF	5 OFF	6 OFF	7 OFF
5	☐	U5	1 OFF	2 OFF	3 OFF	4 OFF	5 OFF	6 OFF	7 OFF
6	☐	U6	1 OFF	2 OFF	3 OFF	4 OFF	5 OFF	6 OFF	7 OFF
7	☐	U7	1 OFF	2 OFF	3 OFF	4 OFF	5 OFF	6 OFF	7 OFF

☐ Password break protection

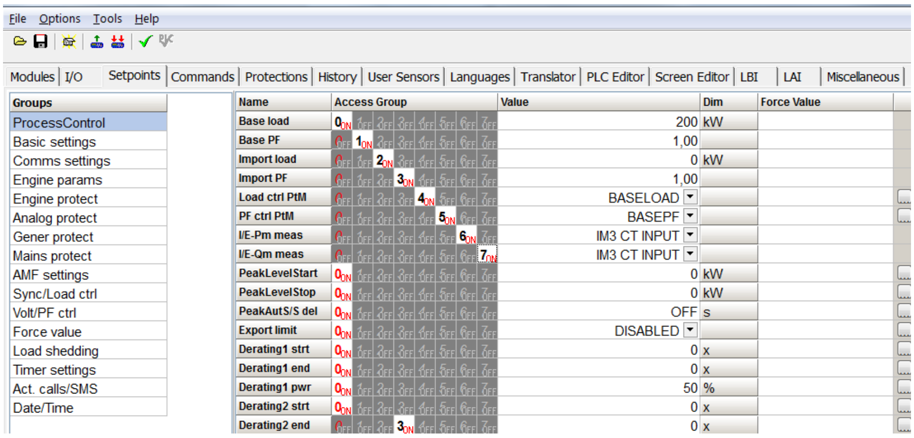
Enable or disable users. Change user names and by double clicking change the access groups that are accessible by particular user. Hold CTRL and click separate access groups to select only several of them with no access to lower groups.

Log in as a different user to change password for that particular user.

NOTE:
Newly enabled user has always default password "0".

4.5.2 Access group setting in GenConfig

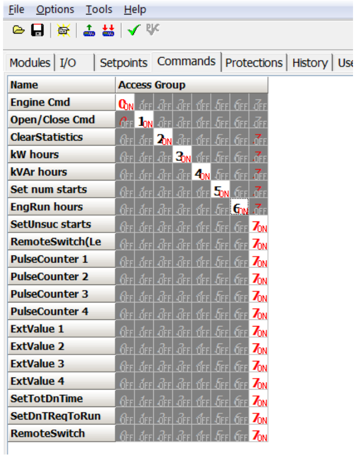
To assign particular setpoint to access group use the following function in GenConfig (by clicking select the correct access group).



Name	Access Group	Value	Dim	Force Value
Base load	0 ON	200	kW	
Base PF	1 ON	1,00		
Import load	2 ON	0	kW	
Import PF	3 ON	1,00		
Load ctrl PtM	4 ON	BASELOAD		
PF ctrl PtM	5 ON	BASEPF		
I/E-Pm meas	6 ON	IM3 CT INPUT		
I/E-Qm meas	7 ON	IM3 CT INPUT		
PeakLevelStart	0 ON	0	kW	
PeakLevelStop	0 ON	0	kW	
PeakAutS/S del	0 ON	OFF	s	
Export limit	0 ON	DISABLED		
Derating1 strt	0 ON	0	x	
Derating1 end	0 ON	0	x	
Derating1 pwr	0 ON	50	%	
Derating2 strt	0 ON	0	x	
Derating2 end	3 ON	0	x	

NOTE:
Each setpoint may be assigned to only one access group. This setpoint can be changed by all users with activated corresponding access rights.

To assign particular command to access group use the following function in GenConfig (by clicking select the correct access group).



Name	Access Group
Engine Cmd	0 ON
Open/Close Cmd	1 ON
ClearStatistics	2 ON
kW hours	3 ON
kVAr hours	4 ON
Set num starts	5 ON
EngRun hours	6 ON
SetUnsuc starts	7 ON
RemoteSwitch(Le	7 ON
PulseCounter 1	7 ON
PulseCounter 2	7 ON
PulseCounter 3	7 ON
PulseCounter 4	7 ON
ExtValue 1	7 ON
ExtValue 2	7 ON
ExtValue 3	7 ON
ExtValue 4	7 ON
SetTotDnTime	7 ON
SetDnTReqToRun	7 ON
RemoteSwitch	7 ON

NOTE:
Each command may be assigned to only one access group. This command can be used by all users with activated corresponding access rights.

4.5.3 Password break protection

- Password break protection (PBP) can be adjusted to ENABLED or DISABLE by a tick box in password management in InteliMonitor (see the figure below). Default value is ENABLED.
- Warning “PassInsertBlck” is displayed in alarm list during the blocking period.
- Controller does not accept attempts to insert correct or incorrect password during the blocking period. In case of this attempt there is a message displayed in InteliMonitor, GenConfig and InteliVision 5 and 8 which states the remaining time of blocking.

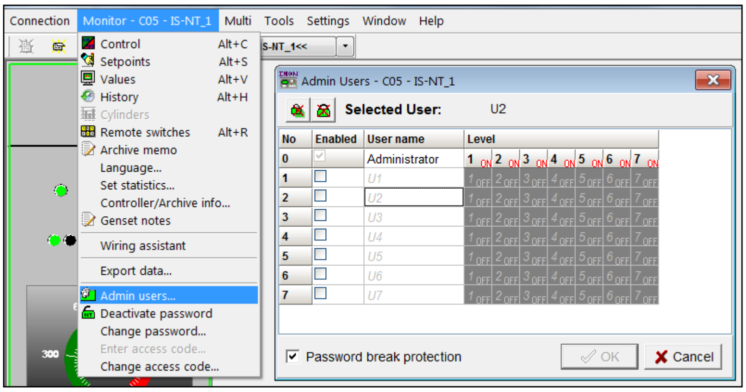
Controller is blocked for 5 minutes if there were 6 attempts to insert incorrect password. In case of another six failed attempts (after the period of blocking elapses) the blocking period is 30, 60, 120 and 240 minutes long respectively.

History record “Incorrect password” is written after the 6th failed attempt to enter password (i.e. this record is written once the PBP is activated). During the blocking no history records of inserting incorrect or correct password are written.

Entering of passwords during the blocking period does not prolong the blocking period (passwords are not actually entered because they are rejected by the controller at all).

When the controller is switched OFF and ON again (i.e. power down and up again) during the blocking period, the blocking period is reset back to the full length of currently active PBP (e.g. if there is 24 minutes remaining out of 30 minutes after the controller reset there will be again 30 minutes remaining).

After the correct password is inserted the PBP blocking period for next 6 failed attempts is reverted back to 5 minutes.



Selected User: U2

No	Enabled	User name	Level						
0	☑	Administrator	1 ON	2 ON	3 ON	4 ON	5 ON	6 ON	7 ON
1	☐	U1	1 OFF	2 OFF	3 OFF	4 OFF	5 OFF	6 OFF	7 OFF
2	☐	U2	1 OFF	2 OFF	3 OFF	4 OFF	5 OFF	6 OFF	7 OFF
3	☐	U3	1 OFF	2 OFF	3 OFF	4 OFF	5 OFF	6 OFF	7 OFF
4	☐	U4	1 OFF	2 OFF	3 OFF	4 OFF	5 OFF	6 OFF	7 OFF
5	☐	U5	1 OFF	2 OFF	3 OFF	4 OFF	5 OFF	6 OFF	7 OFF
6	☐	U6	1 OFF	2 OFF	3 OFF	4 OFF	5 OFF	6 OFF	7 OFF
7	☐	U7	1 OFF	2 OFF	3 OFF	4 OFF	5 OFF	6 OFF	7 OFF

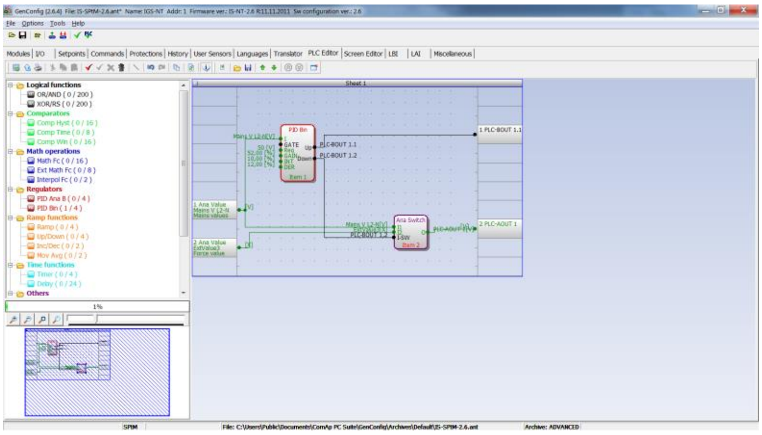
☑ Password break protection

4.6 Related tools

There are two tools available for user regarding the configuration of the controller:

- Screen Editor – it can be used to modify screens in InteliVision 5 and 8

- PLC Editor – it can be used to create and modify built-in PLC functions



HINT

For more information on Screen Editor use help in GenConfig (Help -> Screen Editor Help).
For more information on PLC Editor use GenConfig Reference Guide.

5 Operator guide

5.1 IM-NT

	This portion of instructions is dedicated to the **InteliMains-NT-GC** controller with built-in display. If you have BaseBox type of the controller (without the built-in display) or you are using also **InteliVision** with InteliMains-NT-GC, please refer to the section 5.2.

For extensive information regarding operator control use operator guide for IM-NT.

5.2 Systems with InteliVision displays

	This portion of instructions is dedicated to the **all three types** of controller with connected InteliVision 5 or 8. If you have InteliMains-NT-GC and you are not using InteliVision 5 or 8 please refer to the section 5.1.

For extensive information regarding operator control use operator guide for IGS-NT since general functions of InteliVision displays are the same for InteliGen, InteliSys and InteliMains.

6 Firmware and Archives

Since the version 3.0, controller firmware was differentiated for BaseBox type controllers and GC (Graphical Character, with built-in display) controllers. These firmwares are compatible but their functions differ slightly. It is not possible to upload BaseBox type firmware to GC controller and vice versa.

6.1 BaseBox type controllers

	InteliMains-NT-BaseBox and InteliMains-NTC-BaseBox

The firmware for these controllers has specific functions available which are not available in Graphical Character type controllers. The list of BaseBox-exclusive function is as follows:

- Peak Shaving based on kVA
- Distributed Binary Inputs and Outputs
- User MODBUS

6.2 Graphical Character type controllers

	InteliMains-NT-GC

The firmware for GC controllers do not support functions described above, although it can still be used in combination with BaseBox type controllers.

NOTE:
It is possible to use specialized InteliMains-NT firmware for InteliSys controllers. This firmware supports all the functions mentioned above.

7 Function description

7.1 Overview

Hint

There are numerous built-in functions in the controller that can be modified or combined to produce new functions for specific uses. Note that it is not possible to describe all the combinations or modifications in detail in this manual. Users are encouraged to find new way of how to use existing functions to their benefit.

ⓘ Click this symbol at the functions for more information on particular complex function.

FUNCTION NAME (ALPHABETICAL ORDER)	BRIEF DESCRIPTION	RELATED SETPOINTS, INPUTS AND OUTPUTS	
Access locking from various sources	There are vast options regarding access restrictions in the controller. It is possible to lock: • Buttons for various commands on the terminal. • External buttons for various commands on binary inputs. • Built-in terminal or terminal #1 to monitoring mode only. • External local terminal or terminal #2 to monitoring mode only. • All external remote terminals (PC connection, displays on all buses except on RS485 dedicated port).	*Local buttons* AccessLock int AccessLock D#2 AccessLock D#3 AccessLock ext FaultResButton HornResButton StopButton	StartButton MCBButton MGCBButton
Active call, emailing and SMS service ⓘ	This function allows user to choose under which conditions active emailing happens, what is the type of the message and separate addresses or numbers. Learn more about these functions in a separate chapter.	*History record* *Alarm only* *Warning* *Mains protect* *MainsP w/Reset* *AcallCH1-Type* *AcallCH2-Type* *AcallCH3-Type* *AcallCH4-Type* *AcallCH5-Type* *AcallCH1-Addr* *AcallCH2-Addr* *AcallCH3-Addr* *AcallCH4-Addr* *AcallCH5-Addr*	*ActCallAttempt* *Acall+SMS lang* IssueActCallC1 IssueActCallC2 IssueActCallC3 IssueActCallC4 IssueActCallC5 *SMTP authent* *SMTP user name* *SMTP password* *SMTP address* *Contr mailbox* *Time zone*
Alternative brightness for built-in InteliGen display.	It is possible to choose two different levels of brightness and switch them with logical binary input.	*Alt brightness*	

Function Name (alphabetical order)	Brief Description	Related Setpoints, Inputs and Outputs
Automatic CAN address assignement	It is possible to leave the assignement of CAN addresses on controllers themselves. If the function is activated controllers will look for possible collisions of CAN bus communication and they will change their addresses accordingly. This function need to be activated or deactivated in all controllers on CAN bus. It is available only in some applications.	*CANnegotiation*
Automatic display backlight timeout	It is possible to adjust timeout for backlight of built-in display of the controller. When using InteliVision display the backlight timeout is adjusted separately in the the display.	*DispBaklightTO*
Automatic Mains Failure function ⓘ	This is a complex function that ensures correct reaction of the system to detected Mains Failure. For more information please refer to a separate chapter.	*MFStart enable* *EmergStart del* *FwRet break* *MCB close del* *MCB opens on* *ReturnWithIntr* *BreakerOverlap* *RetFromIsland* *ReturnTo mains* *Mains ret del* *MGCB Close del*
Automatic synchronization ⓘ	Controller automatically performs synchronization sequence including corresponding regulations to achieve correct phase and voltage on both synchronized sides. It possible to set phase shift caused by transformers to be taken into acount during synchronization. Synchronization automatically closes corresponding breaker if the voltages on both sides do not differ more than Voltage window and their phases do not differ more than Phase window for time equal to Dwell time. For regulation loops functions please refer to a separate chapter.	*Voltage window* *BtoM AngleReq* *Phase window* *Dwell time* *Sync timeout* ForwardSynchro ReverseSynchro In synchronism
Basic Voltage and Current settings ⓘ	In the controller there are many parameters that are used for entering of nominal values of Mains and Bus characteristics. It also allows users to set measurement transformers ratio and select range of voltage measurement. All of these parameters are crucial for the right function of the controlle since regulations, protections and other function are directly dependant of these settings. For additional information on protections please refer to separate chapter Protections and Alarm Management.	*Vm VT ratio* *Vm InpRangeSel* *Bus VT ratio* *BusInpRangeSel* *MainsNomV* *MainsNomVph-ph* *BusNomV* *BusNomVph-ph* *Nomin current* *NominMainsImp* *MainsCTprim* *MainsCTsec* *AuxCurrCTprim* *AuxCurrCTsec* *Nominal freq* *Nom frq offset*

FUNCTION NAME (ALPHABETICAL ORDER)	BRIEF DESCRIPTION	RELATED SETPOINTS, INPUTS AND OUTPUTS
CAN bus communication mode	It is possible to change speed of communication on CAN2 bus (Intercontroller and Monitoring) to lower (longer distance, limited to 8 controllers) or to higher (shorter distance, limited to 32 controllers).	*CAN bus mode*
Circuit Breaker control	Circuit Breaker control depends on many various parameters. Please refer to a separate chapter.	MCB CLOSE/OPEN MCB ON COIL MCB OFF COIL MCB UV COIL MCB STATUS MGCB CLOSE/OPEN MGCB ON COIL MGCB OFF COIL MGCB UV COIL MGCB STATUS
Circuit breaker feedback sensing	Lear more about circuit breaker feedback sensing in a separate chapter.	MGCB FEEDBACK MGCB FDB NEG MCB FEEDBACK MCB FDB NEG
Communication log in controller history	It is possible to log communication events into the controller history (e.g. opened new communication, communication closed etc.).	*LB/UART Log*
Controller modes of operation	Controller can be switched to several modes of operation. It is possible to switch modes using buttons on terminal, using buttons in InteliMonitor, changing of a setpoint or activation of binary inputs for remote change of the mode of operation. For more information on modes of operation please refer to a separate chapter.	*ControllerMode* REMOTE OFF REMOTE MAN REMOTE AUT REMOTE TEST OFF MODE MAN MODE AUT MODE TEST MODE
Controller Redundancy	It is possible to use redundant controller which is in monitoring mode only unless the primary controller fails. This is a complex function and it is described in a separate chapter.	*Watched Contr* CTRLHEARTBEAT CTRLHBEAT FD EMERG. MANUAL CTRLHBEAT SENS
Detection of communication error of peripheral modules	Controller detects any problems in communication with extension modules (it is possible to adjust corresponding level of protection in GenConfig) and issues alarm based on it.	*PeriphCommErr*

Function Name (alphabetical order)	Brief Description	Related Setpoints, Inputs and Outputs
Detection of empty CAN bus	This function can be used to detect failed communication via CAN2 bus. If no other controllers are found on CAN2 bus, alarm is issued.	*CAN2emptDetect*
Disable Circuit breaker function	It is possible to disable one or both breakers via InteliMains. Disabled circuit breaker opens (if previously closed) and InteliMains keeps it open under any conditions.	MGCB disable MCB disable MGCB open
Evaluation of CAN2 communication collision	Controller automatically detects possible collisions on CAN2 bus (e.g. same shared binary outputs are broadcasted by two controllers on one CAN bus).	*SHxOcol detect*
External values available for repeated writing	It is not possible to repeatedly write setpoints from external device (although it is possible to repeatedly force different values or continuously changing values into setpoint because forced value is not stored in the memory) because of possible memory damage. If continuous writing of some value into a setpoint from external device is needed, External values should be used and their value should be subsequently forced to the setpoint for safe operation. For detailed guide to the usage of external value please refer to a separate chapter.	*ExtValue1deflt* *ExtValue2deflt* *ExtValue3deflt* *ExtValue4deflt* *ExtValue1LoLim* *ExtValue2LoLim* *ExtValue3LoLim* *ExtValue4LoLim* *ExtValue1HiLim* *ExtValue2HiLim* *ExtValue3HiLim* *ExtValue4HiLim* *ExtValue1 rate* *ExtValue2 rate* *ExtValue3 rate* *ExtValue4 rate* ExtValue1 up ExtValue2 up ExtValue3 up ExtValue4 up ExtValue1 down ExtValue2 down ExtValue3 down ExtValue4 down ExtValue1reset ExtValue2reset ExtValue3reset ExtValue4reset
Forcing of a value to the setpoint	It is possible to force up to 16 different values to one setpoint to change various functions of the controller. Any suitable setpoint or value can be forced into the setpoint provided that this setpoint is forcable. There are 16 Force value setpoints designed just for forcing (if correct value for forcing is not available in any other setpoint or value). For detailed step-by-step instruction on how to use value forcing please refer to a separate chapter.	*Force value 1* *Force value 2* *Force value 3* *Force value 4* *Force value 5* *Force value 6* *Force value 7* *Force value 8* *Force value 9* *Force value 10* *Force value 11* *Force value 12* *Force value 13* *Force value 14* *Force value 15* *Force value 16* ForceValueIn 1 ForceValueIn 2 ForceValueIn 3 ForceValueIn 4 ForceValueIn 5 ForceValueIn 6 ForceValueIn 7 ForceValueIn 8 ForceValueIn 9 ForceValueIn 10 ForceValueIn 11 ForceValueIn 12 ForceValueIn 13 ForceValueIn 14 ForceValueIn 15 ForceValueIn 16

FUNCTION NAME (ALPHABETICAL ORDER)	BRIEF DESCRIPTION	RELATED SETPOINTS, INPUTS AND OUTPUTS
Group Link function for complex installations (Bus Tie Breaker)	Group Link function enables ComAp controllers to work independently or together dependent on the state of a Bus Tie Breaker. For more information refer to the chapter Power management.	GROUPLINK *Control group* *GroupLinkLeft* *GroupLinkRight*
History related functions	It is possible to modify history records layout and set periodic time stamping in history. Controller has adjustable time and date setpoints (time is update each second) and there is inbuilt summer time mode function. Read about history layout modification in separate chapter.	*Time stamp act* *Time Stamp Per* *#SummerTimeMod* *#Time* *#Date* TIME STAMP ACT
Internet related communication functions	It is possible to connect controllers to Internet. AirGate function is also available when Internet connection is established. Active emails may be sent upon various reasons. For more information on these functions please refer to a separate chapter.	*IP Addr mode* *IP address* *Net mask* *Gateway IP* *ComApProtoPort* *AirGate* *AirGate IP* *DNS IP* *NumberRings AA*
Language selection	InteliMains can change language in its built-in display as well as in attached displayes by activation of binary inputs.	LANG SEL INT A LANG SEL INT B LANG SEL INT C LANG SEL D#2 A LANG SEL D#2 B LANG SEL D#2 C LANG SEL D#3 A LANG SEL D#3 B LANG SEL D#3 C
Load shedding function	Complex load shedding and reconnection function is available in the controller. It is described in the separate chapter.	*Ld shed active* *LdShedBased on* *Ld shed mode* *Ld shedStages* *Ld shedLevel1* *Ld shedLevel2* *Ld shedLevel3* *Ld shed f lvl1* *Ld shed f lvl2* *Ld shed f lvl3* *Ld shedDelay1* *Ld shedDelay2* *Ld shedDelay3* *Ld reconLevel1* *Ld reconLevel2* *Ld reconLevel3* *LdRecon f lvl1* *LdRecon f lvl2* *LdRecon f lvl3* *Ld reconDelay1* *Ld reconDelay2* *Ld reconDelay3* *AutoLd recon* LDSHED STAGE 1 LDSHED STAGE 2 LDSHED STAGE 3 MANUALLDRECON

Function Name (alphabetical order)	**Brief Description**	**Related Setpoints, Inputs and Outputs**
Mains Coupling	This function defines if Mains Coupling is enabled via controller breakers. It should be enabled only if two or more Mains incommers are in phase and it is allowed by local authorities.	*Mains coupling*
Measurement of P and Q selection	You may select the source of Mains current measurement or disable this measurement.	*I/E-Pm meas* *I/E-Qm meas* MLC:I/E-Pm MPF:I/E-Qm
Minimum required power in parallel to Mains operation	This function sets minimal power produced by gen-set group in parallel to Mains operation in % of nominal power of each gen-set regardless of Import/Export limit. This function is active only if InteliMains plays active role in load sharing.	*Min Power PtM*
Modbus switches ⓘ	There are two Modbus registers containing 16 bits each that can be easily written using Modbus. Their values are available in the form of a Value (BINARY) and in the form of logical binary ouputs that can be used further in the configuration.	ModbusSw1-32 *ModbusSw1* *ModbusSw2*
Overheat Protection ⓘ	This function is used to protect system from overheating. If the temperature rises above given limit, mode of load control is changed to prevent overheating. When temperature returns back the previous mode of load control is restored. For exact function of Temperature By Power control see separate chapter System Load Control.	*Overheat prot* *TempByPwr Treq* MLC:TByPwr
Peak Shaving function ⓘ	Peak Shaving function can be based on active power (kW) or reactive power (kVA). It is described in a separate chapter.	*PeakLevelStart* *PeakLevelStop* *PeakAutS/S del* *Peak kVA Start* *Peak kVA Stop* *PeakKVAS/S del*
Permanent logical 0 or 1 outputs	It is possible to use permanent logical binary function that is always logical 0 or logical 1. It may used for various purposes.	Logical 0 Logical 1

FUNCTION NAME (ALPHABETICAL ORDER)	BRIEF DESCRIPTION	RELATED SETPOINTS, INPUTS AND OUTPUTS
Power Management	Power management is a very complex function with many settings that is used if the gen-sets are in AUT mode of operation (and other requirements are fulfilled) to start and stop engines accordingly to set parameters for more efficient function of the system. Part of Power Management consists of automatic priority swapping for extended efficiency of the system. For complete information of all Power Management function please refer to a separate chapter.	*#Pwr mgmt mode* *#PriorAutoSwap* *Priority ctrl* *#SysAMFstrtDel* *#SysAMFstopDel* *LoadResStrt 1* *LoadResStop 1* *LoadResStrt 2* *LoadResStop 2* *LoadResStrt 3* *LoadResStop 3* *LoadResStrt 4* *LoadResStop 4* *%LdResStrt 1* *%LdResStop 1* *%LdResStrt 2* *%LdResStop 2* *%LdResStrt 3* *%LdResStop 3* *%LdResStrt 4* *%LdResStop 4* *NextStrt Del* *OverldNext Del* *NextStopDel* *SlowStopDel* *MinRunPower 1* *MinRunPower 2* *MinRunPower 3* *RunHrsMaxDiff* *PwrBandContr 1* *PwrBandContr 2* *PwrBandContr 3* *PwrBandContr 4* *PwrBnChngDlUp* *PwrBnChngDlDn* LOAD RES 2 LOAD RES 3 LOAD RES 4 SYSTREADY SYST RES OK SYST RES 1 OK SYST RES 2 OK SYST RES 3 OK SYST RES 4 OK ALLAVAILGS RUN ENGINES SWAPPED
Process limitation control	This function is used to limit process (e.g. parallel operation is not allowed). This function is complex and it is described in a separate chapter.	*Island enable* *ParallelEnable* *Synchro enable*

Function Name (alphabetical order)	Brief Description	Related Setpoints, Inputs and Outputs
Protections	Protections in the controller are very complex function with many settings. Please refer to a separate chapter for more information about protection functions in InteliMains.	*Horn Timeout* *BinInp delay 1* *BinInp delay 2* *BinInp delay 3* *ForceBlockDel1* *ForceBlockDel2* *ForceBlockDel3* *ResetActAlarms* *Force block 1* *Force block 2* *Force block 3* VMains <> VMains <> FMains <> FBus <> Mains fail Bus fail VectorShiftTrp VMains <> Horn Alarm Horn flashing Alarm flashing Common Wrn Common MPR Common Fls Common MP Common Al Common Hst CommonActLev 1 CommonAlLev 1 CommonActLev 2 CommonAlLev 2 *Mns2POvrldProt* *OverldStrtEval* *2POvrldStEvDel* *Mns2Inom prot* *Mains2Inom del* *Mains >V MP* *Mains <V MP* *Mains V del* *Mains Avg>V MP* *Mains >f* *Mains <f* *Mains f del* *VectorS prot* *VectorS CB sel* *VectorS limit* *ROCOF Win* *ROCOF df/dt* *Bus >V* *Bus <V* *Bus V del* *Bus >f* *Bus <f* *Bus f del* *BusMeasError*
Pulse Counters	The controller offers up to 4 pulse counters that can count incomming pulses of at least 100 ms (high and low) length with various conversion. The counted value is stored in the controller and can be displayed.	*ConvCoefPulse1* *ConvCoefPulse2* *ConvCoefPulse3* *ConvCoefPulse4* PulseCounter 1 PulseCounter 2 PulseCounter 3 PulseCounter 4
Regulation functions	There is whole variaty of regulation functions in the controller. Please refer to a separate chapter to find out more.	*Freq gain* *Freq int* *Angle Gain* *Load Ramp* *Load gain* *Load int* *Voltage gain* *Voltage Int* *PF gain* *PF int*

Function Name (alphabetical order)	Brief Description	Related Setpoints, Inputs and Outputs
Remote Control Function	This particular function enables user to close or open binary output assigned to RemoteControl function from InteliMonitor or via Modbus commands. For more information please refer to a separate chapter.	RemoteControl1 RemoteControl2 RemoteControl3 RemoteControl4 RemoteControl5 RemoteControl6 RemoteControl7 RemoteControl8
Remote start and stop of the system	System controlled by InteliMains can be started and stopped based on activation/deactivation of binary input Rem start/stop. Behavior of the system then depends on load control mode, power management, process control and other factors.	Rem Start/Stop
RS232 and RS485 communication functions	The controller has several settings regarding RS232 and RS485 functions. It is possible to set mode of communication on particular port, speed of communication and AT commands for modem connection.	*RS232(1) mode* *RS232(2) mode* *RS232(1)MBCSpd* *RS232(2)MBCSpd* *RS232(1)MdmIni* *RS232(2)MdmIni* *RS485(1) conv.* *RS485(2) conv.*
Soft unloading and Soft unloading based on Auxiliary measurement	Soft unloading can be performed in the standard way or it can be performed based on actual current to the load or through MGCB measurement to prevent sudden overloading of gen-sets because of other loads on bus. This function is using Auxiliary current measurement to ensure that soft unloading is performed correctly in case of complex installations (e.g. two Mains incommers).	*Soft Unload* *AuxCurrCTprim* *AuxCurrCTsec* *MGCB open lev* *MGCB open del*
Start Blocked indication	The controller indicates blocked start of the gen-set group based on process limitation setpoints by activation of logical binary output Start Blocked (previously it was indicated by alarm list message).	Start Blocked
StartUpSynchronization	StartUpSynchronization is now supported in InteliMains^{NT} controllers.	*MultiSoftStart*
Synchronization of separate gen-sets directly to the Mains voltage	This function enables or disables the direct synchronization of each gen-set to Mains voltage. This is beneficial for faster system reaction time after startup. Moreover, you can use this function to distribute Mains voltage along bus even if no gen-set is running.	*MGCBparalClose*

Function Name (alphabetical order)	Brief Description	Related Setpoints, Inputs and Outputs
System Isolated	There are two logical binary inputs that can be used for secondary CB feedbacks. When these binary inputs get activated the corresponding breakers are considered opened no matter what is the position of feedbacks of MCB or MGCB.	MCBIsolated MGCBIsolated
System Load Control	System Load is a complex function and it is described in a separate chapter.	*SysBaseLoad* *SysPwrFactor* *SysLdCtrl PtM* *SysPFCtrl PtM* *Import load* *Import PF* *MLoad ctrl PtM* *PF ctrl PtM* *Export limit* *TempByPwr Treq* *TempByPwr gain* *TempByPwr int* MLC:AnExSysBld MLC:AnExI/E MLC:TByPwr MPF:AnExI/E
System starting impuls	This is multipurpose starting impulse which serves as a starting input for gen-set controllers in the system.	Sys start/stop
Switchable Current measurement ratio	Using force value function on MainsCTprim, the controller can effectively switch the ratio of the current measurement on the fly (if the measurement transformers can switch their amplification).	*MainsCTprim*
Test on load and Test on load with break	InteliMains can perform controlled test on load in TEST mode. For detailed description of Test on load please refer to a separate chapter.	Test on load *Parallel enable* *Synchro enable* *Island enable* *FwRet break* *ReturnWithIntr* *BreakerOverlap* *RetFromIsland* *ReturnTo Mains*
Time synchronization and GPS positioning with InternetBridge-NT	InteliMains obtains data about precise time and GPS position from InternetBridge-NT-2.0 (and higher) connected to the CAN. Time is broadcasted to all the controllers on CAN bus. Position is available for monitoring and for WebSupervisor.	*Latitude* *Longitude*

Function Name (alphabetical order)	Brief Description	Related Setpoints, Inputs and Outputs
Timers	Up to 16 timers are provided in the controller (with 4 combined outputs). They can be used to trigger various internal functions as well as external devices. Please refer to a separate chapter for detailed information.	*Timer channel 1* *Timer channel 2* *Timer channel 3* *Timer channel 4* *Timer channel 5* *Timer channel 6* *Timer channel 7* *Timer channel 8* *Timer channel 9* *Timer channel 10* *Timer channel 11* *Timer channel 12* *Timer channel 13* *Timer channel 14* *Timer channel 15* *Timer channel 16* TimerAct 1-4 TimerAct 5-8 TimerAct 9-12 TimerAct 13-16 TimerActiveCom Timer block 1 Timer block 2 Timer block 3 Timer block 4 Timer block 5 Timer block 6 Timer block 7 Timer block 8 Timer block 9 Timer block 10 Timer block 11 Timer block 12 Timer block 13 Timer block 14 Timer block 15 Timer block 16
User Buttons	It is possible to use up to 16 user buttons. User buttons can be for example assigned to software buttons in InteliVision displays. Pressing of corresponding button then activates the output with function that is chosen in the configuration. For more information on how to use User Buttons please refer to a separate chapter.	*UserBtn pulse* User button 1 User button 2 User button 3 User button 4 User button 5 User button 6 User button 7 User button 8 User button 9 User button 10 User button 11 User button 12 User button 13 User button 14 User button 15 User button 16
User Configurable protections	There are several prepared user configurable protections in default archive. Please refer to a separate chapter for complex step-by-step instructions on user configurable protections.	*Batt >V* *Batt <V* *Batt volt del* *Mains I unbal* *Mains Iunb del* *Mains V unbal* *Mains Vunb del* *Bus V unbal* *Bus Vunb del*
User Mask	It is possible to use four separate Logical Binary Inputs to show or hide particular objects in InteliVision 5 and 8. It is possible to use these inputs to show particular screens in InteliVision 5. For more information on this function please refer to the separate chapter.	User mask 1 User mask 2 User mask 3 User mask 4

Function Name (alphabetical order)	Brief Description	Related Setpoints, Inputs and Outputs
User MODBUS ⓘ	Modbus registers (up to 128) can be defined for every value and setpoint in the controller. This can be used to prevent shift of Modbus numbers, to standardize Modbus communication for several applications or to make Batch reading and writing much more user friendly. For more information on Modbus please refer to the Communication Guide or to the context help in GenConfig.	
Variable connection of devices on CAN bus	It is possible to select number and type of devices connected on CAN2 bus (MODEM: I-LB+ or OTHER: InteliVision, I-RD). CAN addresses 123 and 124 are always dedicated to connection of OTHER devices (e.g. InteliVision 5 CAN). Using two setpoints dedicated to this function, it is possible to choose if addresses 122 and 125 are used for communication by OTHER devices or in MODEM mode (i.e. prepared for I-LB+ or IB-NT connection).	*CANAddrSwitch1* *CANAddrSwitch2*
Voltage protections mode Ph-N or Ph-Ph ⓘ	In the controller it is possible to select whether fixed protections are based on measured Ph-N voltage or on measured Ph-Ph voltage. For more information of fixed protections please refer to the separate chapter Protections and Alarm management.	*FixVoltProtSelect*
Wrong Phases sequence	Controller automatically detects if phases measurement is connected in wrong sequence (note that the wrong sequence is not detected if the phases are just rotated, i.e. L2-L3-L1)	WrongPhSeq

7.2 Modes

7.2.1 OFF mode

InteliMains NT has no influence at gen-set group.

If mains voltage is within limits and no mains alarm is active, MCB is closed after **AMF settings**:*MCB close del* if **AMF settings**:*MCB opens on* = MAINS FAIL.

If **AMF settings**:*MCB opens on* = GEN RUNNING, MCB stays closed all the time, regardless of the mains condition.

MCB application - if the controller is switched to OFF mode while the gen-sets are running and there is voltage on the bus, MCB is not closed before bus voltage disappears.

MGCB application – if the controller is switched to OFF mode while the gen-sets are running and there is voltage on the bus, MGCB is opened and after **AMF settings**:*FwRet break* MCB is closed (if there is Mains voltage).

Binary output SYS START/STOP is not active.

7.2.2 MAN mode

It is possible to close/open breakers manually under supervision of IM-NT controller which doesn't allow to close simultaneously breakers without synchronizing (e.g. MCB and MGCB).

If the Mains fails, controller opens MCB if **AMF settings**:*MCB opens on* = MAINS FAIL. After the Mains returns, MCB stays opened. Otherwise MCB is controlled manually by pressing MCB ON/OFF button or closing MCBBUTTON binary input.

MGCB application – if the Mains fails and group of gen-sets is started and there is voltage on the bus, then MGCB can be closed anytime by pressing MGCB ON/OFF button.

Pressing of Start/Stop buttons closes/opens binary output SYS START/STOP, i.e. cause start/stop of the gen-set group.

7.2.3 AUT mode

Controller performs automatically sequences after Mains failure, closing/opening MCB and MGCB, Peak shaving function, closing of SYS START/STOP binary output.

MCB is opened according to setpoint **AMF settings**:*MCB opens on* after Mains failure or after the gen-sets are running.

MGCB is closed after the start of gen-set group as soon as an appropriate load reserve is achieved (SYST RES OK binary output closed). If Mains fails and MCB is opened then MGCB stays closed unless voltage on the bus goes out of the limits.

Controller reacts on binary input REM START/STOP – if this input is closed, controller activates binary output SYS START/STOP in order to start gen-set group. In MGCB application, MGCB can be closed before the output activation (see also setpoint **Process control**:*MGCBparalClose*).

7.2.4 TEST mode

7.2.4.1 *MCB application*

In TEST mode gen-sets are automatically started (activation of binary output SYS START/STOP) and connect to the bus. System goes to parallel to Mains operation and remains there. The group required power is given by currently selected mode of Load control.

7.2.4.2 *Test on Load in MCB application*

This function is activated when TEST ON LOAD Binary Input is activated and gets deactivated when the Binary Input is deactivated. The load is taken over by gen-sets and MCB is opened. If the Mains fails during the test, load is transferred to the gen-sets. If there are not enough gen-sets (running with GCB closed) to cover the actual load, alarm is issued WrnTstOnLdFail and MCB stays closed. If the load goes down alarm is then deactivated and MCB is opened.

NOTE:
The settings of the controller must allow the Test on Load function to transfer the load to the gen-set group. If this is not allowed (e.g. SysBaseLoad is 0 kW), the system will not transfer the load.

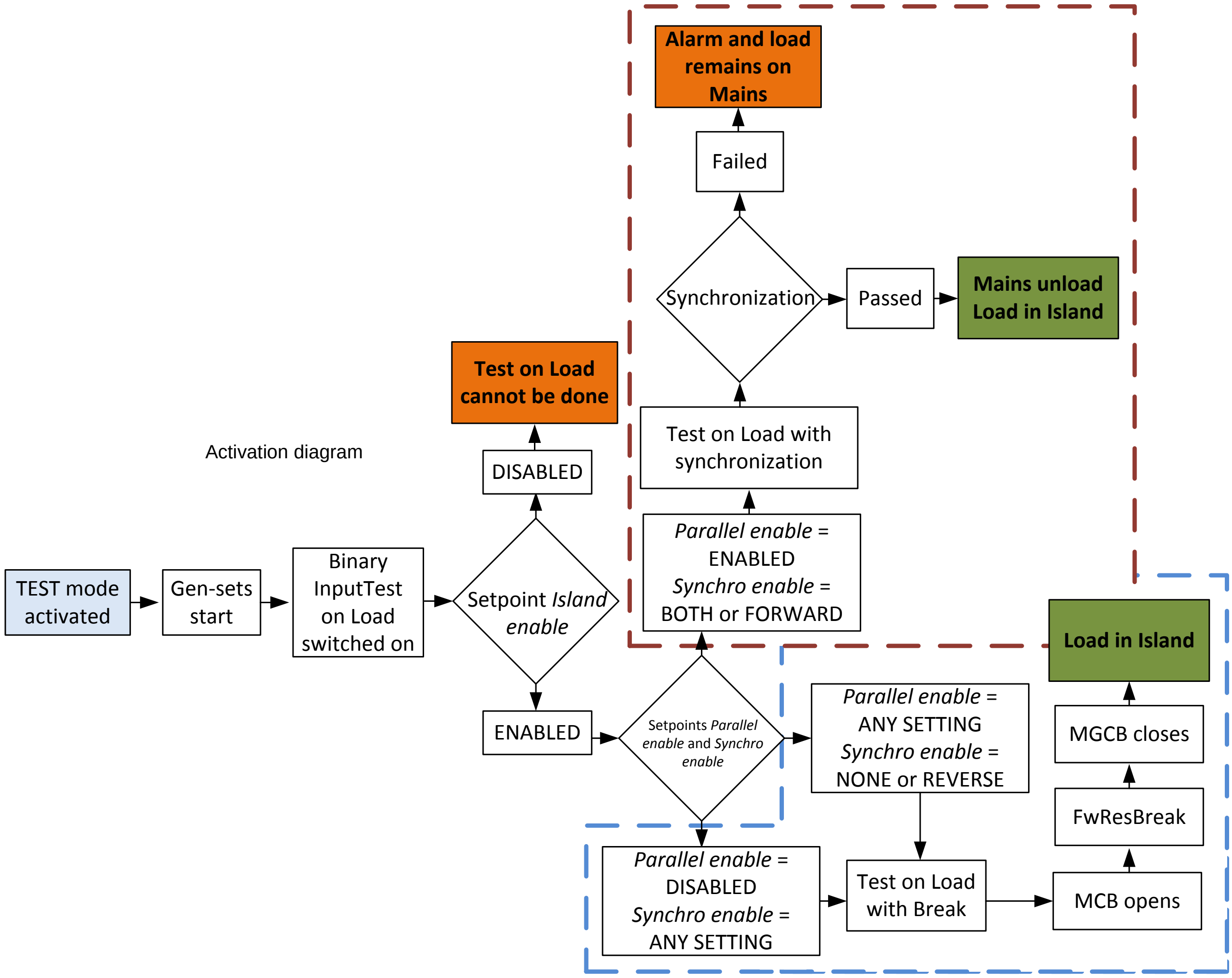
7.2.4.3 *MGCB application*

Gen-sets are started and synchronized on generator bus. If the **ProcessControl:***MGCBParalClose* is set to MCB CLOSED, MGCB is opened when switching to TEST mode. If **ProcessControl:***MCB opens on* is set to MAINSFAIL, MGCB is opened immediately after switching to TEST mode. If **ProcessControl:***MCB opens on* is set to GEN RUNNING, MGCB is opened when the first gen-set reaches Running state.

7.2.4.4 *Test on Load in MGCB application*

This function may be initiated by activation of Binary Input TEST ON LOAD or by pushing of MCB or MGCB button.

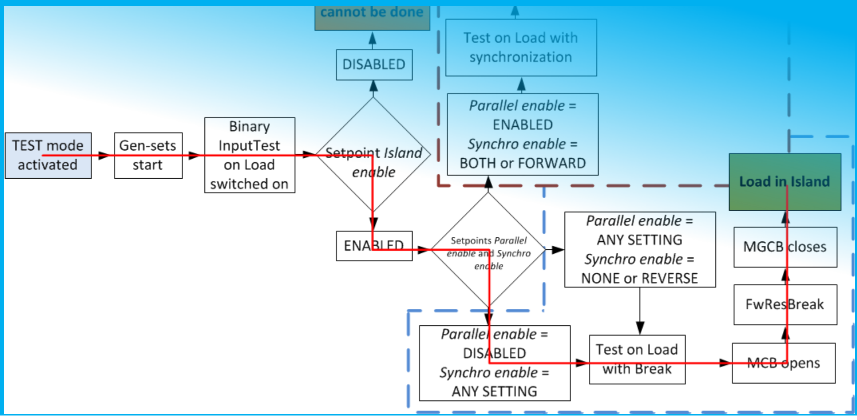
Activation and Deactivation by TEST ON LOAD Binary Input. Red area is Test on Load with synchronization. Blue area is Test on Load with break.



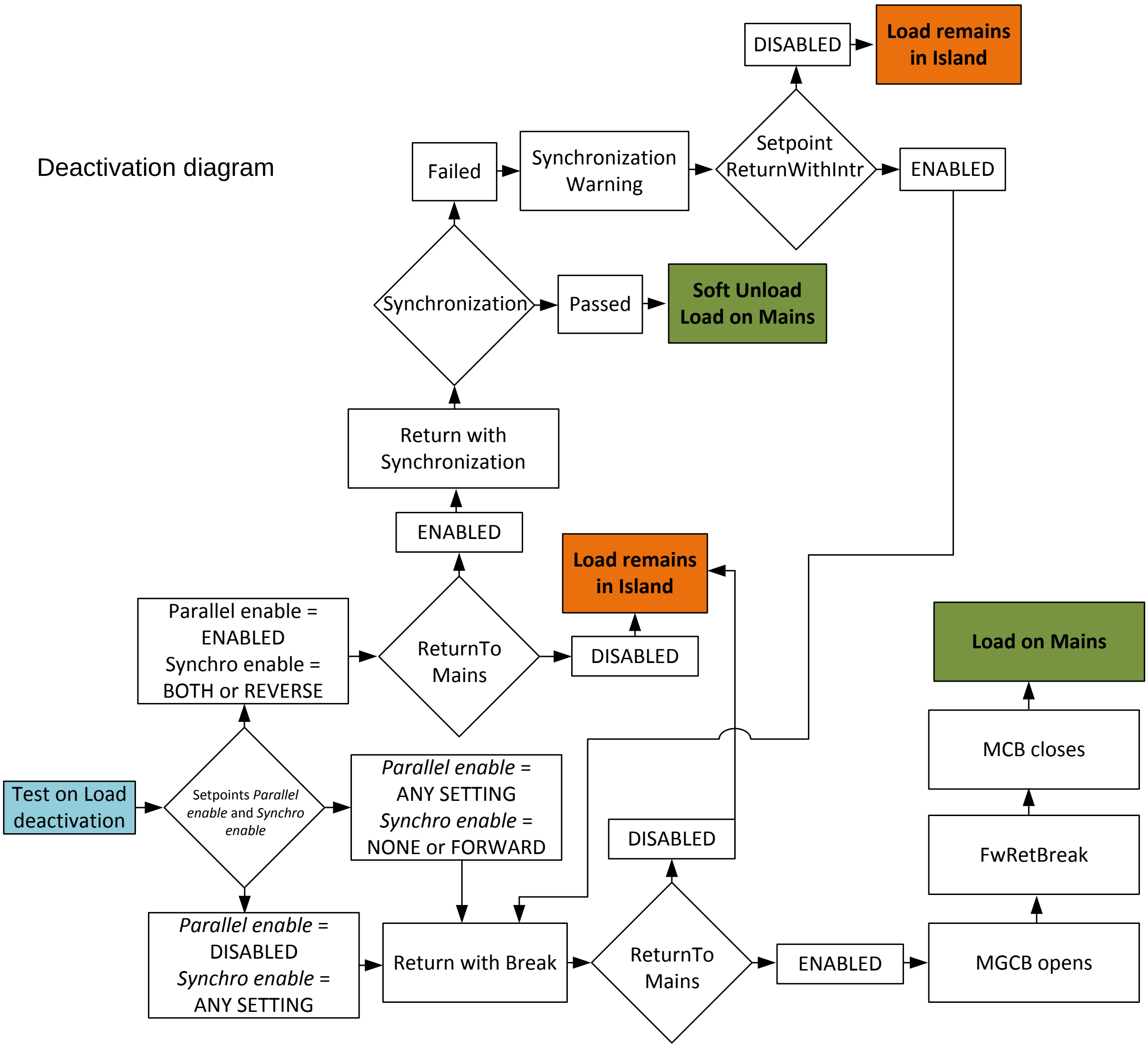
<u>EXAMPLE:</u>

This is an example of Test on Load function when: **ProcessControl:***Island enable* = ENABLED, **ProcessControl:***Parallel enable* = DISABLED and **ProcessControl:***Synchro enable* = NONE.

Controller mode is changed to TEST mode. Gen-sets are started by SYS START/STOP activation. Logical Binary Input TEST ON LOAD is activated. Because Island operation is enabled, but Parallel operation is disabled, controller will perform Test on Load with Break. See the figure below for detailed path.



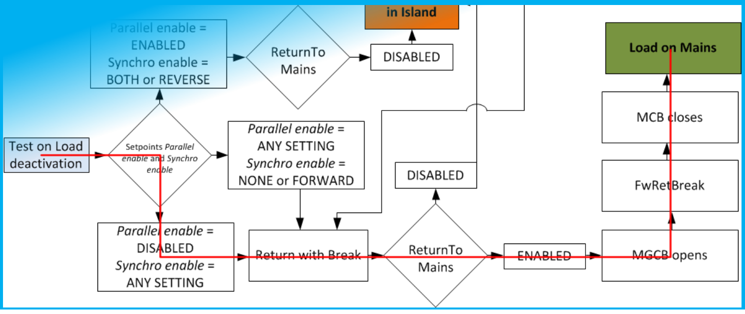
Deactivation diagram



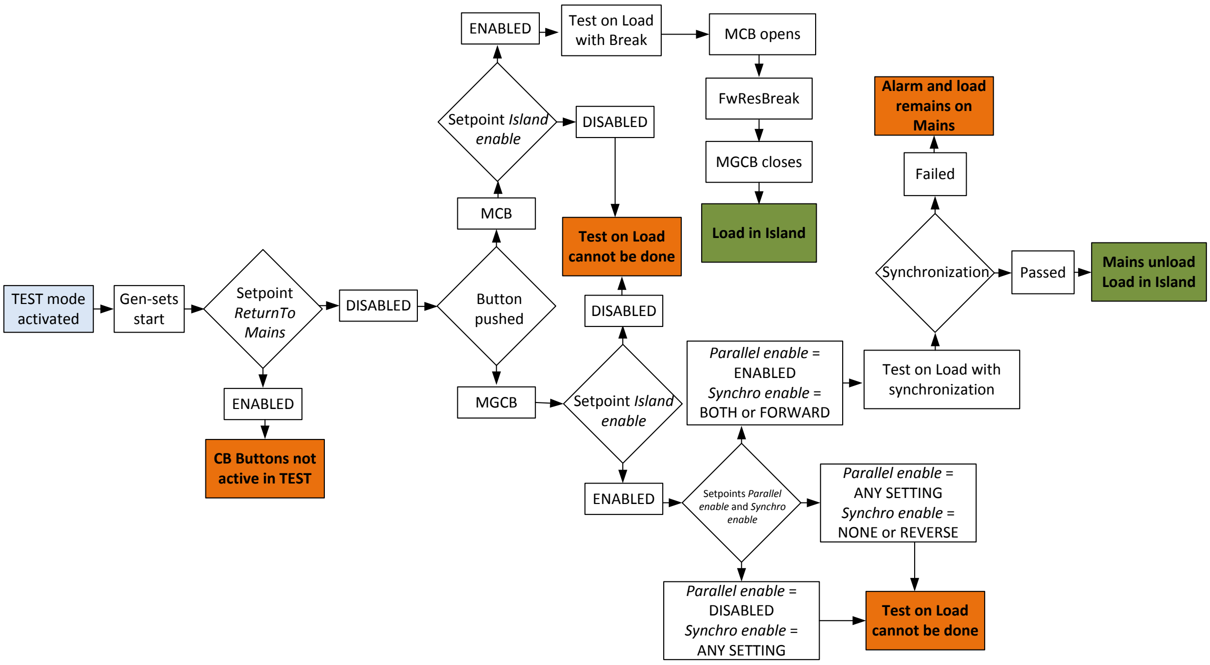
EXAMPLE:

This is an example of return from Test on Load function when the same setting are applied as in previous example and **AMF setting:***ReturnTo Mains* = ENABLED.

Logical Binary Input TEST ON LOAD is deactivated. Because Parallel operation is not allowed controller performs return with break. Because return to Mains is enabled, controller opens MGCB, waits for **AMF Settings:***FwRetBreak* and closed MCB. See the figure below for detailed path.



Activation by pushing MCB or MGCB button. This is available only if **AMF settings**:*ReturnTo mains* is set to DISABLED.



- MGCB button: Gen-sets are synchronized to Mains via MGCB and MGCB closes. If there are not enough gen-sets (running with GCB closed) to cover the actual load, alarm is issued WrnTstOnLdFail and MCB stays closed. If the load goes down alarm is then deactivated and MCB is opened.

- MCB button: MCB is opened and MGCB is closed after FwRetBreak if there is enough running gen-sets to support actual selected reserve for start.

Return to Mains after using buttons to initiate Test on Load function may be performed by changing or forcing to ENABLED value to **AMF settings**:*ReturnTo mains* or by changing into different mode (e.g. AUT mode). If the controller is switched to another mode, it behaves accordingly to that mode and the current situation.

EXAMPLE:

Test on Load was performed by pushing MCB button. **ProcessControl:***Parallel enable* = DISABLED and **ProcessControl:***Synchro enable* = NONE. Load is on gen-sets and the system is in Island operation. Mode is changed to AUT. Controller counts down **AMF settings:***Mains ret del* and if

AMF settings:*RetFromIsland* = AUTO, it starts break transfer of the load back to Mains if it is enabled by the setpoint **AMF settings:***ReturnWithIntr*.

NOTE:
The settings of the controller must allow the Test on Load function to transfer the load to the gen-set group. If this is not allowed (e.g. SysBaseLoad is 0 kW), the system will not transfer the load.

7.3 Process Limitation

This chapter brings overview of process limitations in AUT mode (whole system in AUT mode, if there are e.g. gen-set controllers in MAN mode, other settings conbinations may be used). There are many possibilities how to set the setpoints related to the process limitation, nonetheless there are several recommended settings (for whole system in AUT) that are shown the table below with short description of the function.

7.3.1 MGCB

ISLAND ENABLE	PARALLEL ENABLE	SYNCHRO ENABLE	MFSTART	MGCBPARALCLOSE	SHORT DESCRIPTION
YES	YES	BOTH	YES	NO	- Island and Parallel operations are possible. - Transfer with synchronization from Island to Parallel and from Mains to Parallel are enabled - Gen-sets will be started when the Mains fails. - Gen-sets will first synchronize on the bus before synchronizing via MGCB
YES	YES	BOTH	NO	NO	- Island and Parallel operations are possible. - Transfer with synchronization from Island to Parallel and from Mains to Parallel are enabled - Gen-sets will not be started when the Mains fails. - Gen-sets will first synchronize on the bus before synchronizing via MGCB
YES	YES	FORWARD	YES	NO	- Island and Parallel operations are possible. - Transfer with synchronization from Mains to Parallel is enabled (Island to Parallel N/A) - Gen-sets will be started when the Mains fails. - Gen-sets will first synchronize on the bus before synchronizing via MGCB
YES	YES	FORWARD	NO	NO	- Island and Parallel operations are possible. - Transfer with synchronization from Mains to Parallel is enabled (Island to Parallel N/A) - Gen-sets will not be started when the Mains fails. - Gen-sets will first synchronize on the bus before synchronizing via MGCB
YES	YES	NONE	YES	YES	- Island and Parallel operations are possible. - Transfer with synchronization via InteliMains is not available - Gen-sets will be started when the Mains fails. - Gen-sets will synchronize directly to the Mains (MGCB already closed) , i.e. synchronization transfer from Island to Parallel

ISLAND ENABLE	PARALLEL ENABLE	SYNCHRO ENABLE	MFSTART	MGCBPARALCLOSE	SHORT DESCRIPTION
YES	YES	NONE	NO	YES	- Island and Parallel operations are possible. - Transfer with synchronization via InteliMains is not available - Gen-sets will not be started when the Mains fails. - Gen-sets will synchronize directly to the Mains (MGCB already closed) , i.e. synchronization transfer from Island to Parallel
YES	YES	NONE	YES	MCB CLOSED	- Island and Parallel operations are possible. - Transfer with synchronization via InteliMains is not available - Gen-sets will be started when the Mains fails. - Gen-sets will synchronize directly to the Mains (MGCB already closed) , i.e. synchronization transfer from Island to Parallel - MGCB will be closed if the MCB is closed
YES	YES	NONE	NO	MCB CLOSED	- Island and Parallel operations are possible. - Transfer with synchronization via InteliMains is not available - Gen-sets will not be started when the Mains fails. - Gen-sets will synchronize directly to the Mains (MGCB already closed) , i.e. synchronization transfer from Island to Parallel - MGCB will be closed if the MCB is closed
YES	YES	REVERSE	YES	YES	- Island and Parallel operations are possible. - Transfer with synchronization from Island to Parallel is enabled - Gen-sets will be started when the Mains fails. - Gen-sets will synchronize directly to the Mains (MGCB already closed), i.e. synchronization transfer from Mains to Parallel
YES	YES	REVERSE	YES	NO	- Island and Parallel operations are possible. - Transfer with synchronization from Island to Parallel is enabled (Mains to Parallel N/A) - Gen-sets will be started when the Mains fails.
YES	YES	REVERSE	NO	YES	- Island and Parallel operations are possible. - Transfer with synchronization from Island to Parallel is enabled - Gen-sets will not be started when the Mains fails. - Gen-sets will synchronize directly to the Mains (MGCB already closed), i.e. synchronization transfer from Mains to Parallel
YES	YES	REVERSE	NO	NO	- Island and Parallel operations are possible. - Transfer with synchronization from Island to Parallel is enabled (Mains to Parallel N/A) - Gen-sets will not be started when the Mains fails.

ISLAND ENABLE	PARALLEL ENABLE	SYNCHRO ENABLE	MFSTART	MGCBPARALCLOSE	SHORT DESCRIPTION
YES	YES	REVERSE	YES	MCB CLOSED	- Island and Parallel operations are possible. - Transfer with synchronization from Island to Parallel is enabled - Gen-sets will be started when the Mains fails. - Gen-sets will synchronize directly to the Mains (MGCB already closed), i.e. synchronization transfer from Mains to Parallel - MGCB will be closed if the MCB is closed
YES	YES	REVERSE	NO	MCB CLOSED	- Island and Parallel operations are possible. - Transfer with synchronization from Island to Parallel is enabled - Gen-sets will not be started when the Mains fails. - Gen-sets will synchronize directly to the Mains (MGCB already closed), i.e. synchronization transfer from Mains to Parallel - MGCB will be closed if the MCB is closed
YES	NO	NONE	YES	NO	- Island operation is possible. - Transfer with synchronization is N/A - Gen-sets will be started when the Mains fails.
YES	NO	NONE	NO	NO	- Island operation is possible. - Transfer with synchronization is N/A - Gen-sets will not be started when the Mains fails.
YES	NO	NONE	YES	MCB CLOSED	- Island operation is possible. - Transfer with synchronization is N/A - Gen-sets will be started when the Mains fails. - MGCB will be closed if the MCB is closed
YES	NO	NONE	NO	MCB CLOSED	- Island operation is possible. - Transfer with synchronization is N/A - Gen-sets will not be started when the Mains fails. - MGCB will be closed if the MCB is closed
NO	YES	FORWARD	NO	NO	- Parallel operation is possible. - Transfer with synchronization from Mains to Parallel is enabled - Gen-sets will not be started when the Mains fails. - Gen-sets will first synchronize on the bus before synchronizing via MGCB
NO	YES	NONE	NO	YES	- Parallel operation is possible. - Transfer with synchronization via InteliMains is N/A - Gen-sets will not be started when the Mains fails. - Gen-sets will synchronize directly to the Mains (MGCB already closed), i.e. synchronization transfer from Mains to Parallel

ISLAND ENABLE	PARALLEL ENABLE	SYNCHRO ENABLE	MFSTART	MGCBPARALCLOSE	SHORT DESCRIPTION
NO	YES	NONE	NO	MCB CLOSED	- Parallel operation is possible. - Transfer with synchronization via InteliMains is N/A - Gen-sets will not be started when the Mains fails. - Gen-sets will synchronize directly to the Mains (MGCB already closed), i.e. synchronization transfer from Mains to Parallel - MGCB will be closed if the MCB is closed

7.3.2 MCB

ISLAND ENABLE	PARALLELENABLE	SYNCHRO ENABLE	MFSTART	SHORT DESCRIPTION
YES	YES	REVERSE	YES	• Island and Parallel operation is possible. • Transfer with synchronization via InteliMains is possible • Gen-sets will be started when the Mains fails.
YES	YES	REVERSE	NO	• Island and Parallel operation is possible. • Transfer with synchronization via InteliMains is possible • Gen-sets will not be started when the Mains fails.
YES	YES	NONE	YES	• Island and Parallel operation is possible. (Controller can transfer to Parallel operation from Mains operation.) • Transfer with synchronization via InteliMains is not possible • Gen-sets will be started when the Mains fails.
YES	YES	NONE	NO	• Island and Parallel operation is possible. (Controller can transfer to Parallel operation from Mains operation.) • Transfer with synchronization via InteliMains is not possible • Gen-sets will not be started when the Mains fails.
YES	NO	NONE	YES	• Island operation is possible. • Transfer with synchronization via InteliMains is not possible • Gen-sets will be started when the Mains fails.

ISLAND ENABLE	PARALLELENABLE	SYNCHRO ENABLE	MFSTART	SHORT DESCRIPTION
YES	NO	NONE	NO	• Island operation is possible. • Transfer with synchronization via InteliMains is not possible • Gen-sets will not be started when the Mains fails.
NO	YES	REVERSE	NO	• Parallel operation is possible. • Transfer with synchronization via InteliMains is possible • Gen-sets will not be started when the Mains fails.
NO	YES	NONE	NO	• Parallel operation is possible. (Controller can transfer to Parallel operation from Mains operation.) • Transfer with synchronization via InteliMains is not possible • Gen-sets will not be started when the Mains fails.

7.4 System start

There may be several reasons for system start. The most common are: pressing of Start button in MAN mode, activation of BI REM START/STOP in AUT mode, AMF in MAN or AUT mode, activation of BI TEST ON LOAD in TEST mode, power management in AUT mode and other reasons. Below there is description of power management initiated start of the system.

In the following section there is a description of system with several gen-sets and IM-NT controlling MCB and MGCB (see the lower diagram on the page 6). All gensets are taking part in power management (**Pwr management:***Pwr management* = ENABLED)

- Power management is set to Abs(kW) – for Abs(kVA) same setpoints are used, for Rel(%) setpoints **Pwr management:***#%LdResStrt* and **Pwr management:***#%LdResStop* are used.
- In Island operation IM-NT will not close MGCB untill sufficient nominal power (given by formula below) is reached (i.e. untill sufficient number of gen-sets with according nominal powers are running).

EXAMPLE:

First set of **Pwr management:***#LoadResStrt/Stop* setpoints is used -
Pwr management:*#LoadResStrt 1* = 300, **Pwr management:***#LoadResStop 1* = 500

There are 4 gensets, all with nominal power 100 kW. When Mains failure occurs (i.e. system goes to the Island operation mode) SYSTEM START/STOP is activated for all gensets and all gensets are starting because they need to fullfill load reserve 300 kW (supposing non zero load, such reserve is fullfiled only when all four gensets are running).

If **Pwr management:***#LoadResStrt 1* is set to 299, only three gensets will be started when Mains failure occurs before MGCB closes. The formula which determines how many gensets will be started is show below:

$$NominPower_{running} \overbrace{>}^{!} \#LoadReserveStrt\ X$$

- After MGCB closing power management is functioning accordingly to the description below.
- Different load reserve sets may be used for starting of the system and for its usual run (e.g. selection of second load reserve set may be conditioned by MGCB FEEDBACK). It is particularly

beneficial in combination with load shedding after Mains failure occurs (i.e. part of the load is supplied immediately and other parts are connected as other gensets start).

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

7.5 StartUpSynchronization

InteliMainsNT now supports StartUpSynchronization function which is available in standard firmware for InteliGen^{NT} and InteliSys^{NT} from version 3.1.0.

BusMeasError function was changed so it does not signalize Bus measurement error when there are gen-sets starting in start up synchronization with their closed GCB and there is no voltage on the bus.

In MGCB application there is a support for closing of MGCB in Island mode (MCB must be opened) when at lest one gen-set in the same control group indicates that it starts in SUS. This can be used for soft start on big transformers connected behind MGCB and therefore preventing dangerous magnetization currents. This behaviour is changed by setpoint **ProcessControl:***MultiSoftStart*.

7.6 Power management

It is important to note that InteliMains^{NT} in MCB or MGCB applications is not directly controlling the power management. The power management is decentralized system and it is resolved individually in each InteliGen^{NT} or InteliSys^{NT} running in MINT application (this system synchronizes setpoints so it is resolved based on the same rules in all controllers and the system is more robust because it does not depend on a single master). InteliMainsNT controller plays crucial role in the system in the control of required load in parallel to Mains operation (see the chapter 7.9) and also it can be switched to MASTER in Automatic priority swap function (see the chapter 7.6.2).

The Power management function decides how many gen-sets should run and selects particular gen-sets to run. The power management is applicable in cases multiple gen-sets run in parallel to mains or in the island operation. The function is based on the load evaluation in order to provide enough of available running power. Since it allows the system to start and stop gen-sets based on the load demand, it can vastly improve the system fuel efficiency. In other words, an additional gen-set starts when the load of the system rises above certain level. The additional gen-set stops, when the load of the system drops down below a certain level. The process of determining gen-set start and stop is done in each controller; there is no "master slave" system. Therefore, the system is very robust and resistant to failures of any unit in the system. Each of the controllers can be switched off without influencing the whole system. Except the situation the respective gen-set is not available for the power management.

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

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

7.6.1 Power management limitations

WARNING!
This section contains important information regarding power management function that are crucial for the correct function of power management.

The function of the controller is designed to handle the maximum sum of nominal power at 32000kW (3200.0kW, 320.00MW depending on the power format in the controller). If the sum of nominal power of all gen-sets connected to the intercontroller CAN exceeds these values the power format needs to be changed accordingly.

EXAMPLE:

There are 20 gen-sets each with 2000kW of nominal power. The sum of the nominal power is 40000kW. Therefore the power format in kW cannot be used because the sum exceeds 32767. Therefore power format in MW needs to be chosen because the sum in MW is 40MW (it does not exceeds 320.00MW).

7.6.2 Basic Power management

The setpoint **Pwr management:** *Pwr management* enables and disables the gen-set to be active within the power management and makes automatic load dependent starts and stops. If the power management is disabled, the start and stop of the gen-set do not depend on the load of the group. If the gen-set remains in AUT mode, the running condition depends only on the binary input *Sys start/stop*.

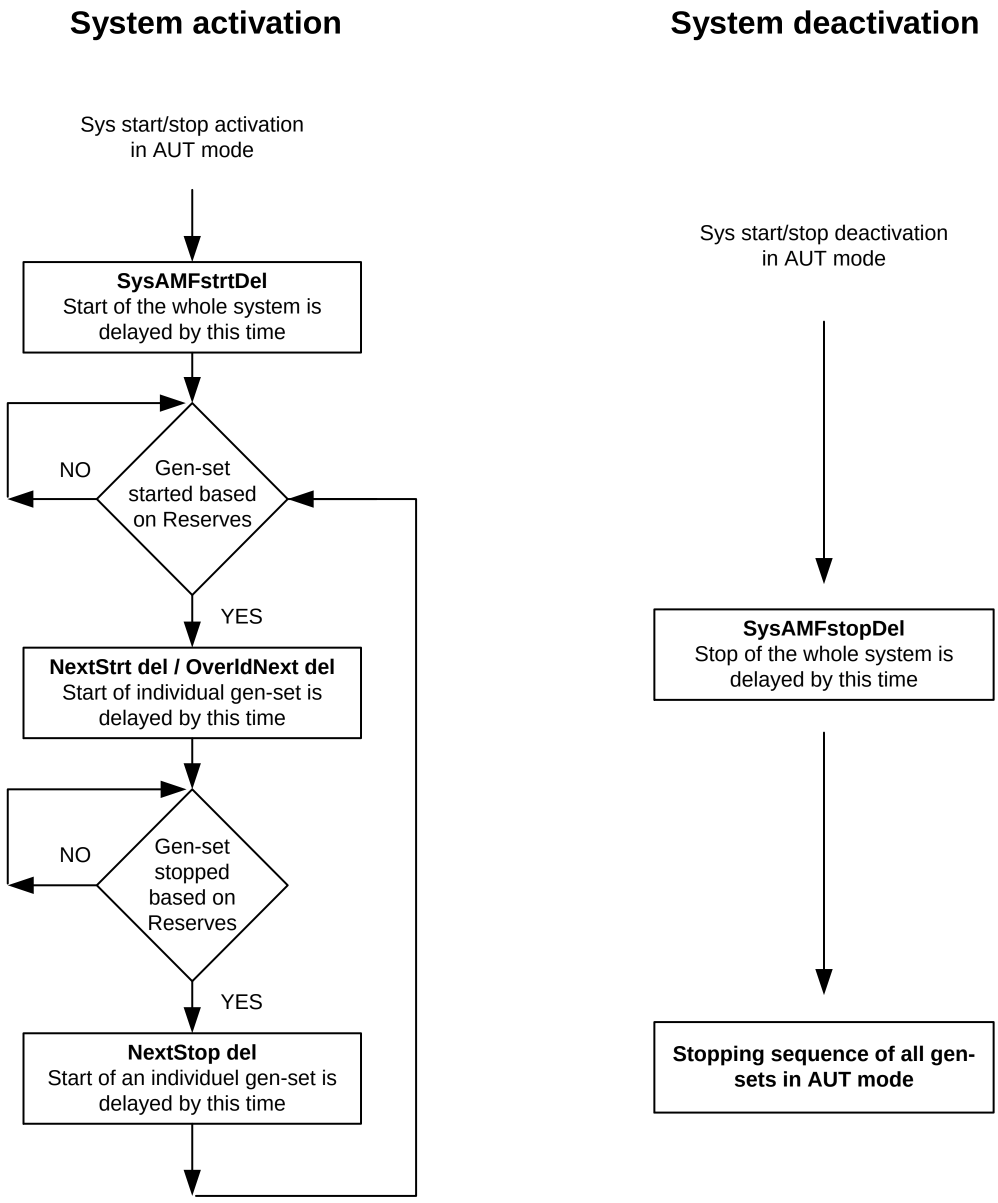
The binary input *Sys start/stop* requests the gen-set to start or stop. If the input is not active, the gen-set stops with delay **Pwr management:** *#SysAMFstopDel* after the input has been deactivated and will not start again if in AUT mode. If the input is activated again, the delay **Pwr management:** *#SysAMFstrtDel* starts to count down. Once the delay elapsed (+0.5s because of compatibility reasons with Load Demand Swapping), the gen-set is activated and can be started by the power management. In other words, the power management is activated only if the binary input Sys start/stop is activated, the option of setpoint **Pwr management:** *Pwr management* = ENABLED and the AUT mode are selected.

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

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

7.6.2.1 *Principles of Power management*

Internal conditions based on remaining load reserves and priorities are evaluated once a delay is elapsed. If the load reserve is insufficient the gen-set is started after delay given by the setpoint **Pwr management:** *#NextStrt del* is elapsed. Once the gen-set runs the controller evaluates stopping conditions based on load reserves and priorities. If the reserve is sufficient enough to stop a particular gen-set, it is stopped after delay given by the setpoint **Pwr management:** *#NextStopDel* is elapsed. All the time the system stop condition – i.e. the binary input *Sys start/stop* deactivated – is evaluated as well. Once the delay given by the setpoint **Pwr management:** *#SysAMFstopDel* has elapsed all gen-sets in AUT mode are stopped. Following figure depicts the system activation and deactivation logic.



NOTE:
The setpoint **Pwr management:** *OverldNext del* is used in the case gen-sets are running at 90% or more of their nominal power. The setpoint **Pwr management:** *OverldNext del* should be generally shorter than the setpoint **Pwr management:** *NextStrt del*. The shorter time always applies in such a case (counting in that part of NextStrt del may have already been elapsed).

7.6.2.2 *Load reserve*

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

Case #1:

- island operation
- or parallel to mains operation, **ProcessControl:** *#SysLdCtrl PtM* = LDSHARING

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

Case #2:

- parallel to mains operation, **ProcessControl:** *#SysLdCtrl PtM* = BASELOAD

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

Where

ARstrt	Actual Absolute reserve in kW or kVA - for engine start calculation.
ARstp	Actual Absolute reserves in kW or kVA - for engine stop calculation.
RRstrt	Actual Relative reserve in % - for engine start calculation.
RRstp	Actual Relative reserves in % - for engine stop calculation.
ΣPg_{Nom}	Sum of Nominal power of all gen-sets on the bus.
ΣPg^{*}_{Nom}	Sum of Nominal power of all gen-sets on the bus apart of the one, which is going to be stopped.
ΣPg_{Act}	Sum of Actual power of all gen-sets on the bus = system load.
BaseLd	Baseload is given by the setpoint **ProcessControl:** *#SysBaseLoad*

NOTE:
System starting sequences may be very different due to their complexity (i.e. gen-sets which do not take part in power management, various nominal powers etc.). Each system should be considered individually. Optional functions in absolute or relative Power management are:

- Running hours balancing (equalization) – in absolute or relative pwr mgmnt
- Load demand (different size) engines swap – **in absolute pwr mgmnt only**
- Power management of two or more gen-set groups (bus tie support) – in absolute or relative power management

NOTE:
The parallel operation to the mains of multiple gen-sets requires use of the InteliMains controller. The InteliMains controller supervises the mains. For further information, please refer to the **IM-NT-MCB-MGCB 3.0 Reference Guide** or newer version of the guide.

7.6.2.2.1 Starting sequence

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

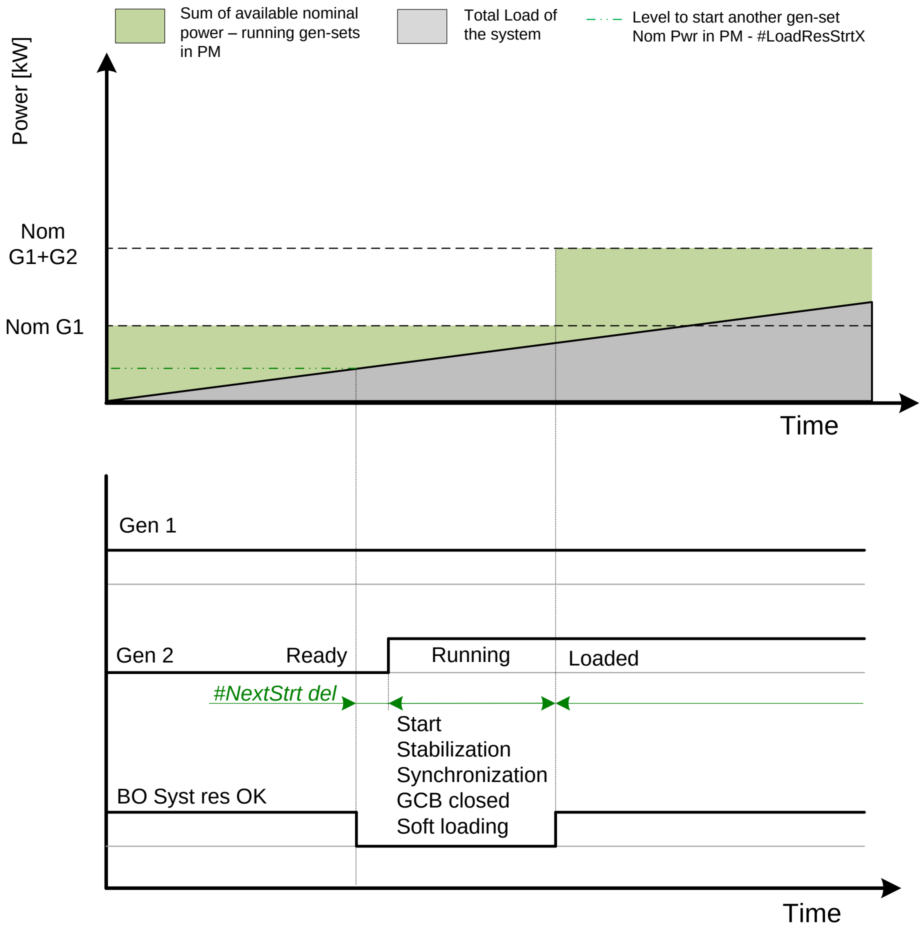


Figure: Starting sequence

As shown above, the load of the system has increased above the level defined by the start condition – i.e. the load reserve is not sufficient as required by the setpoint **Pwr management:** *#LoadResStrt*. Further explication is provided in chapters Absolute Power Management and Relative Power Management

The level is illustrated by the green dashed line. If the load reserve keeps insufficient for longer time than defined by the setpoint **Pwr management:** *#NextStrt del*, the next gen-set is actually started. The standard starting sequence follows. Please refer to the chapter Engine states for further information. Once the synchronization procedure is done, the GCB breaker is closed and the gen-set power is ramping up. Once loaded, the system load reserve is raised and becomes sufficient again. Please note the sum of nominal power of all gen-sets on the bus is increased by the nominal power of the additional gen-set.

7.6.2.2.2 Stopping sequence

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

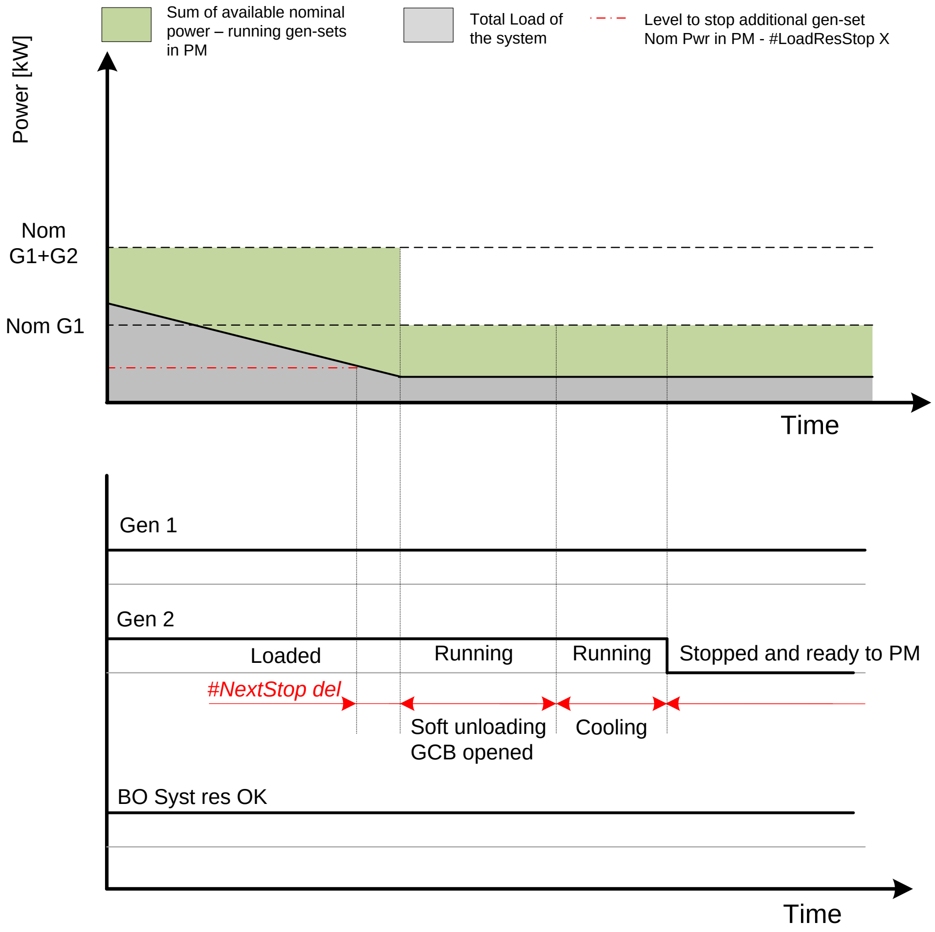


Figure: Stopping sequence

As shown above, the system load has decreased below the level defined by the stop condition – i.e. the load reserve is over a limit given by the setpoint **Pwr management:** *#LoadResStop*. Further explication is provided in chapters Absolute Power Management and Relative Power Management

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

7.6.2.2.3 Absolute Power Management

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

The absolute power management guarantees adjustable load reserve in kVA or kW.

Activation:

Pwr management: *#Pwr mgmt mode* = ABS (**kW**) -	Based on **active power** load reserve. Suitable for load demand-based optimization
Pwr management: *#Pwr mgmt mode* = ABS (**kVA**) -	Based on **apparent power** load reserve. Suitable for generator or busbar dimensioning-based optimization.

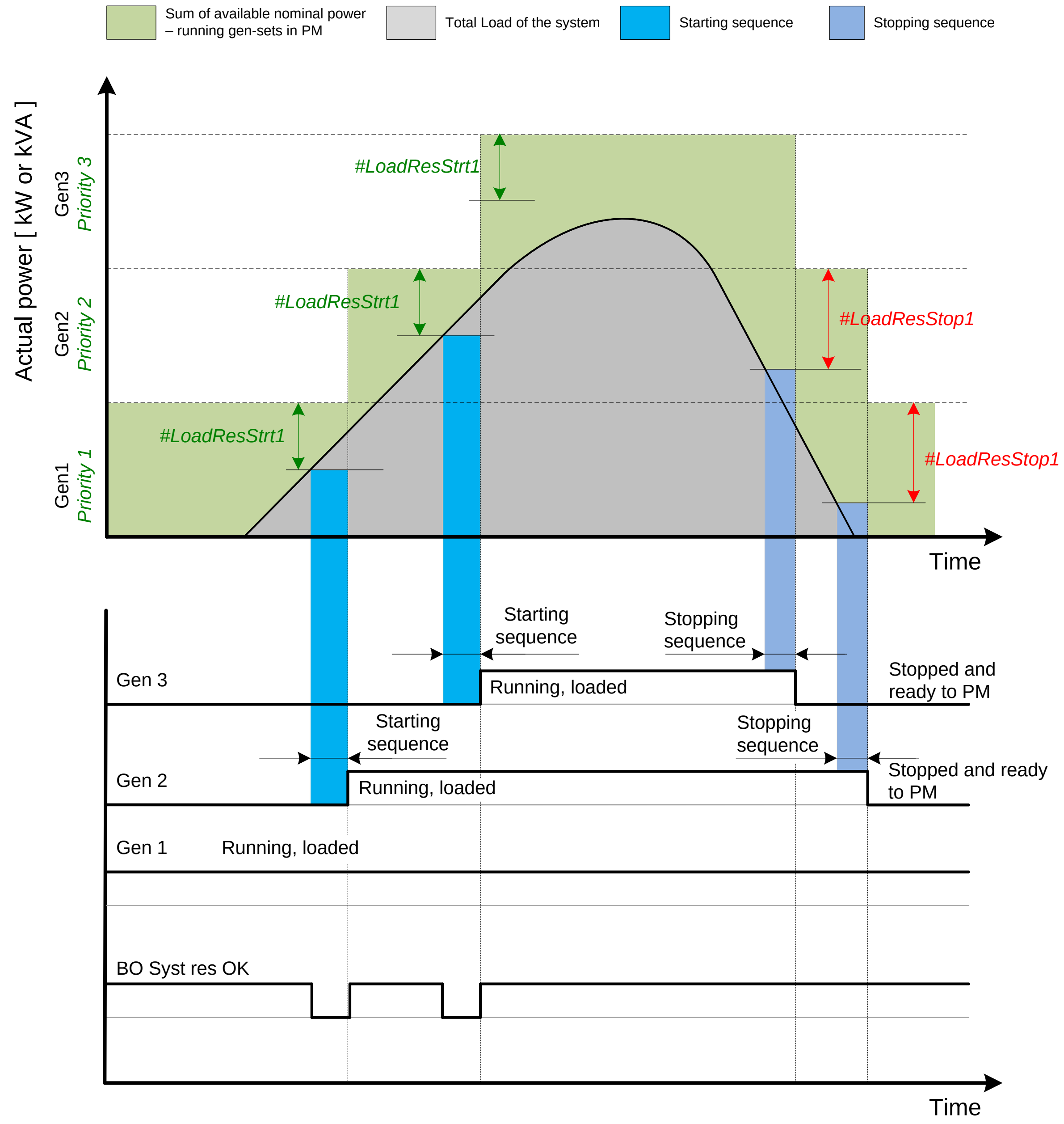


Figure: Power management based on absolute load reserve

An example of absolute power management is shown on the figure below. There are three gen-sets with following choice of setpoints:

Setpoint group	Basic settings	Pwr management					
Setpoint	Nomin power	Pwr management	#Pwr mgmt mode	Priority	#PriorityAuto Swap	#LoadRes Strt X	#LoadRes Stop X
Gen-set #1	200 kW	ENABLED	ABS (kW)	1	DISABLED	100 kW	125 kW
Gen-set #2	500 kW	ENABLED	ABS (kW)	2	DISABLED	100 kW	125 kW
Gen-set #3	1 000 kW	ENABLED	ABS (kW)	3	DISABLED	100 kW	125 kW

NOTE:
Gen-set #1 means that the CAN address of the controller is set to 1. The relevant setpoint is adjusted by **Comms settings:** *Contr. address*.

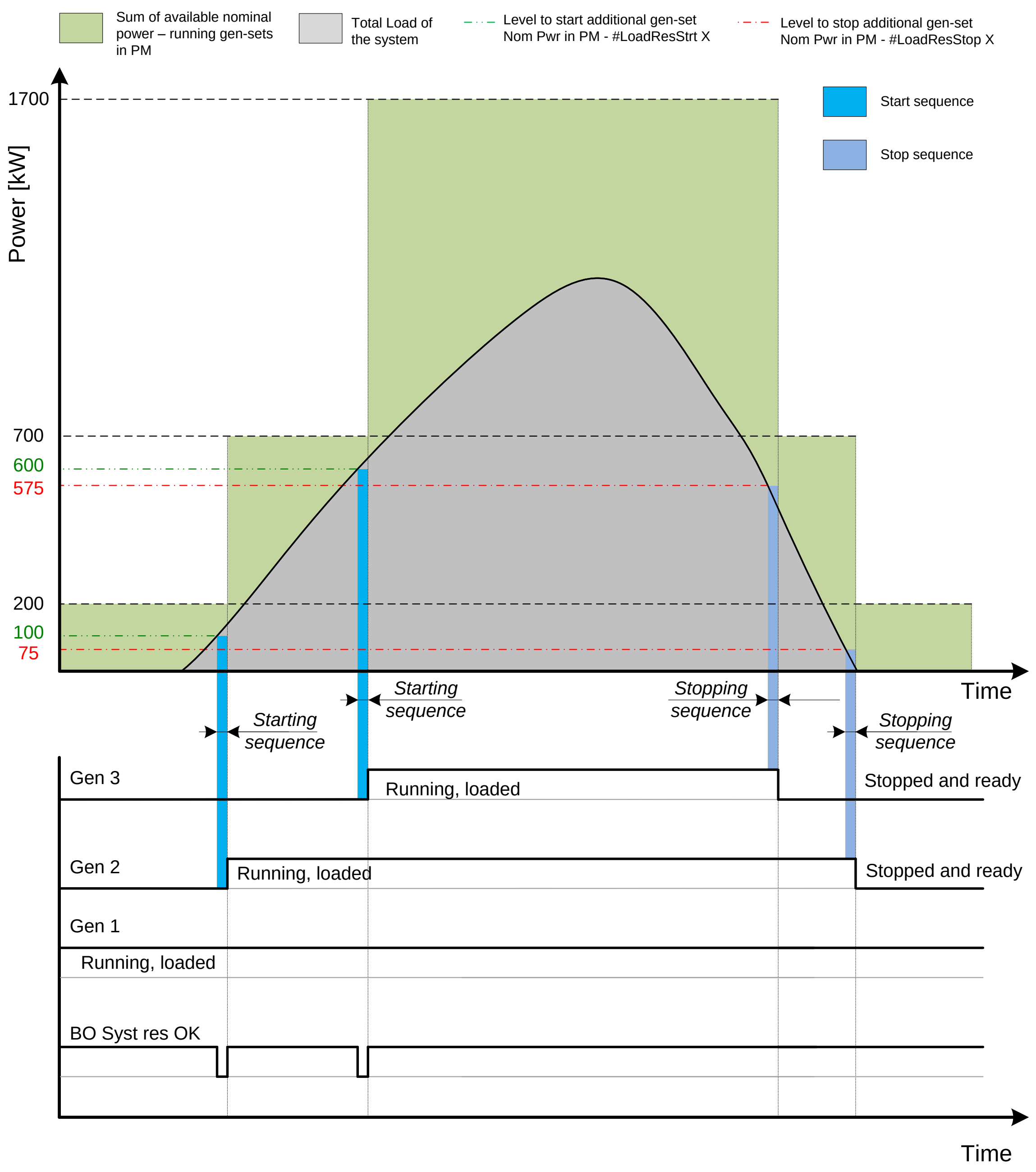


Figure: Absolute Power management example

As it is shown on both figures above, the addional gen-set is added once the actual load reserve is below the level given by the setpoint **Pwr management:** *#LoadResStrt X.* The addional gen-set is removed once the actual load reserve is above the level set by **Pwr management:** *#LoadResStop X*. The green dashed line depicts the value of load at which the additional gen-set is requested to start. This value of the load value is linked with the setpoint **Pwr management:** *#LoadResStrt X* in following way:

Sum of Nominal power - #LoadResStrt X = Value of load when additional gen-set requested to start

E.g.: 700 kW – 100 kW = 600 kW

The red dashed line depicts the value of load at which the additional gen-set is requested to stop. This value of the load value is linked with the setpoint **Pwr management:** *#LoadRes Stop X* in following way:

Sum of Nominal power - #LoadResStop X = Value of load when additional gen-set requested to stop

E.g.: 700 kW – 125 kW = 575 kW

There are 4 levels for starting and stoping gen-sets.

- *#LoadResStrt 1* / *#LoadResStop 1* considered **by default**.
- *#LoadResStrt 2* / *#LoadResStop 2* considered if LBI: *Load res 2 activated*
- *#LoadResStrt 3* / *#LoadResStop 3* considered if LBI: *Load res 3 activated*
- *#LoadResStrt 4* / *#LoadResStop 4* considered if LBI: *Load res 4 activated*

The option of switching the load reserves by LBI may be usefull in cases appliances with important power consumption are expected to be connected to the bus.

NOTE:

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

It is possible to use virtual shared peripheries for distribution of the binary signal to activate LBI *Load res 2,3* or *4* among controllers over the CAN bus. For further information, please refer to the chapter Shared Inputs and Outputs.

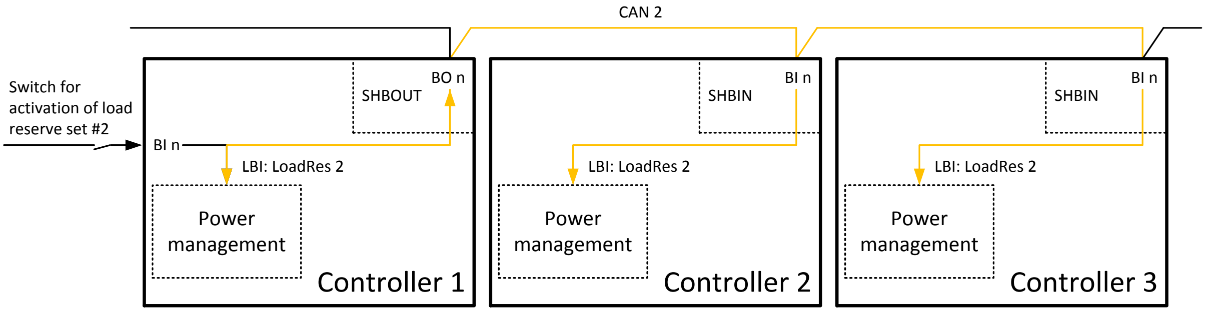


Figure: Example of using virtual shared peripheries for signal distribution

7.6.2.2.4 Relative Power Management

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

The relative power management guarantees that the engines are not continuously loaded more than to a certain level.

Activation: Pwr management:*#Pwr mgmt mode* = REL (%)

Suitable for engine life-based optimization.

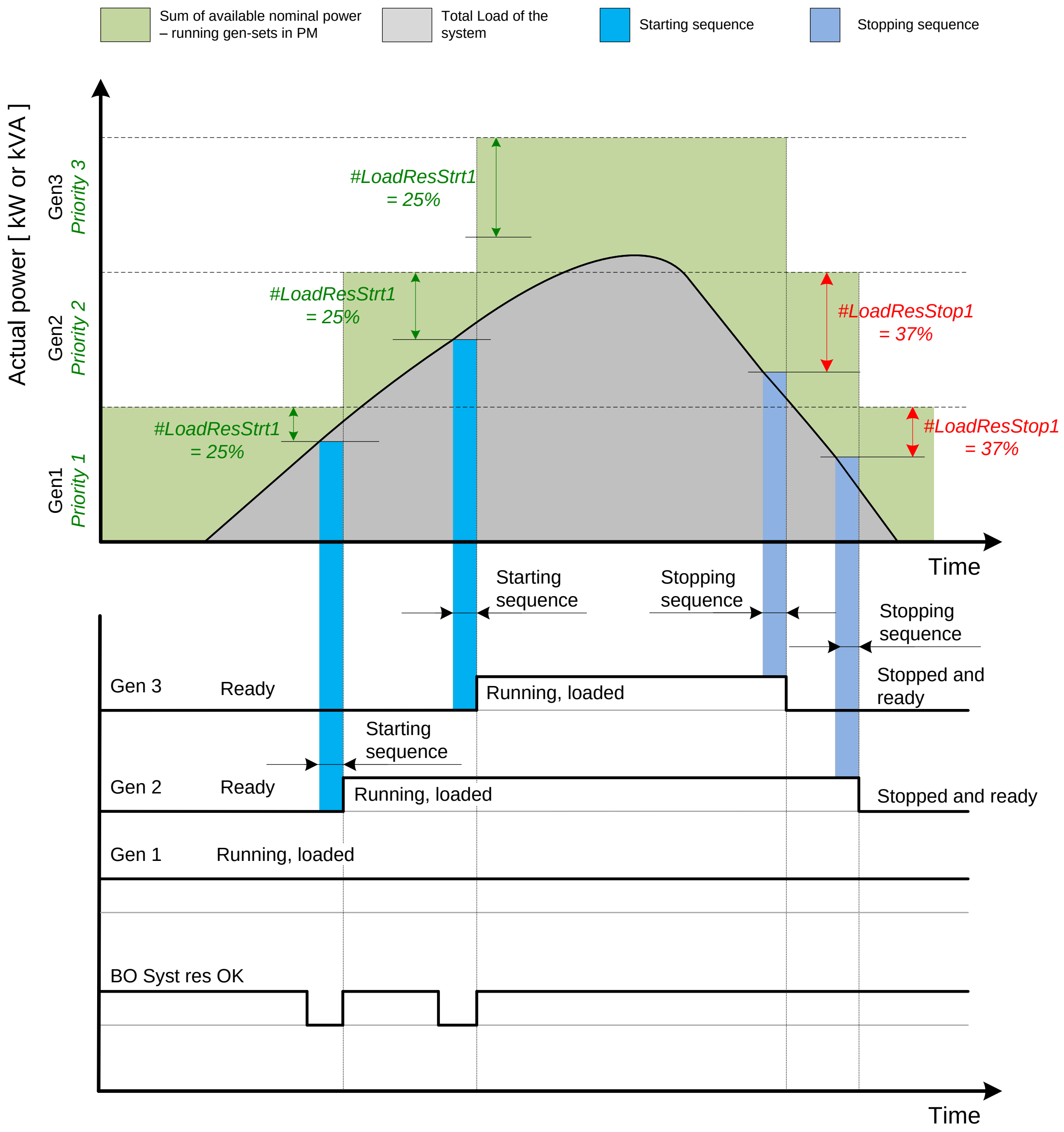


Figure: Power management based on relative load reserve

An example of relative power management is shown on the figure below. There are three gen-sets with following choice of setpoints:

Setpoint group	Basic settings	Pwr management					
Setpoint	Nomin power	Pwr management	#Pwr mgmt mode	Priority	#PriorityAuto Swap	#%LdRes Strt X	#%LdRes Stop X
Gen-set #1	200 kW	ENABLED	REL (%)	1	DISABLED	35 %	40 %
Gen-set #2	500 kW	ENABLED	REL (%)	2	DISABLED	35 %	40 %
Gen-set #3	1 000 kW	ENABLED	REL (%)	3	DISABLED	35 %	40 %

NOTE:
Gen-set #1 means that the CAN address of the controller is set to 1. The relevant setpoint is adjusted by **Comms settings:** *Contr. address*.

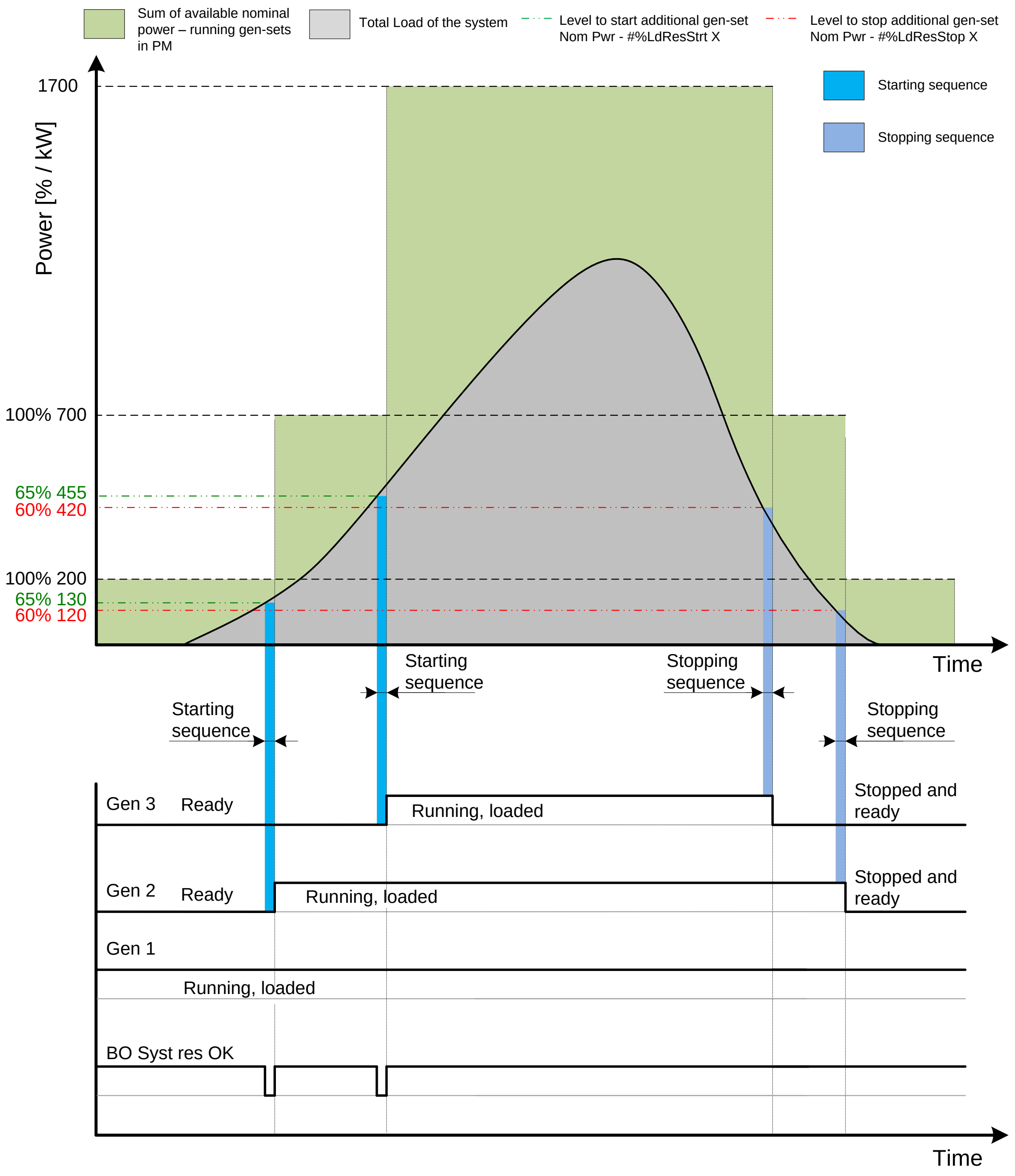


Figure: Relative Power management example

As it is shown on both figures above, the addional gen-set is added once the actual load reserve is below the level given by the setpoint **Pwr management:** *#%LdResStrt X.* The addional gen-set is removed once the actual load reserve is above the level set by **Pwr management:** *#%LdResStop X*. The green dashed line depicts the value of load at which the additional gen-set is requested to start. This value of the load value is linked with the setpoint **Pwr management:** *#%LdResStrt X* in following way:

(100 % - #%LdResStrt X) * Sum of Nominal power = Value of load when additional gen-set requested to start in kW (in % of nominal power)

E.g.: (100 % – 35 %) * 700 kW = 455 kW (65 % of nominal power)

The red dashed line depicts the value of load at which the additional gen-set is requested to stop. This value of the load value is linked with the setpoint **Pwr management:** *#LoadRes Stop X* in following way:

(100 % - #%LdResStop X) * Sum of Nominal power = Value of load when additional gen-set requested to stop in kW (in % of nominal power)

E.g.: (100 % – 40 %) * 700 kW = 420 kW (60 % of nominal power)

There are 4 levels for starting and stoping gen-sets.

- *#%LdResStrt 1* / *#%LdResStop 1* considered **by default**.
- *#%LdResStrt 2* / *#%LdResStop 2* considered if LBI: *Load res 2 activated*
- *#%LdResStrt 3* / *#%LdResStop 3* considered if LBI: *Load res 3 activated*
- *#%LdResStrt 4* / *#%LdResStop 4* considered if LBI: *Load res 4 activated*

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

It is possible to use virtual shared peripheries for distribution of the binary signal to activate LBI *Load res 2,3* or *4* among controllers over the CAN bus.

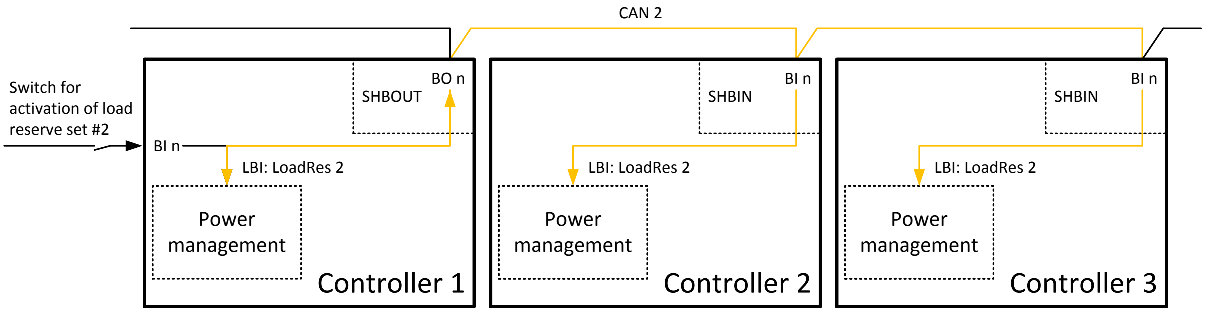


Figure: Example of using virtual shared peripheries for signal distribution

7.6.2.3 *Priorities*

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

Setpoint group	Basic settings	Pwr management					
Setpoint	Nomin power	Pwr management	#Pwr mgmt mode	Priority	#PriorityAutoSwap	#LoadResStrt X	#LoadResStop X
Gen-set #1	200 kW	ENABLED	ABS (kW)	4	DISABLED	50 kW	70 kW
Gen-set #2	200 kW	ENABLED	ABS (kW)	3	DISABLED	50 kW	70 kW
Gen-set #3	200 kW	ENABLED	ABS (kW)	2	DISABLED	50 kW	70 kW
Gen-set #4	200 kW	ENABLED	ABS (kW)	1	DISABLED	50 kW	70 kW

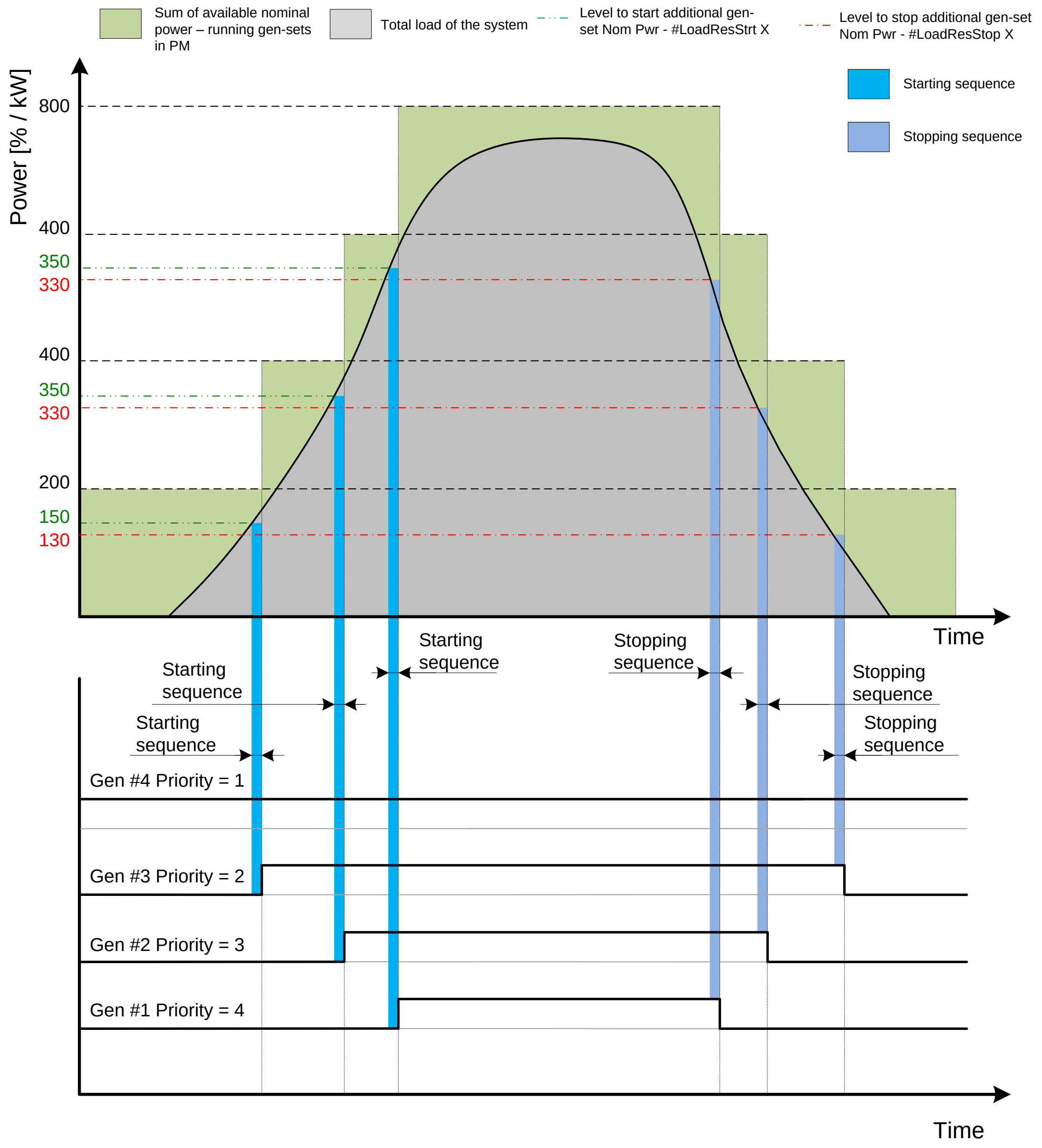


Figure: Power management example - Priorities

NOTE:
Gen-set #1 means that the CAN address of the controller is set to 1. The relevant setpoint is adjusted by **Comms settings:** *Contr. address*.

By choosing the setpoint **Pwr management:** *Priority* = 1, the gen-set #4 is running all the time in the example shown on the figure above (AUT mode selected, Pwr management enabled and LBI *Sys start/stop* activated).

The priority can be also adjusted by a set of logical binary inputs *Priority sw A*, *Priority sw B*, *Priority sw C* and *Priority sw D*. If at least one of these inputs is closed, the priority adjusted by the setpoint as mentioned above is overridden by the priority given by the combination (binary code) of the Priority SW inputs.

NOTE:
The inputs are intended for adjusting the priority by a rotary switch.

The force value function can be used to force priority 0 into the setpoint **Pwr management:** *Priority*. Priority 0 is the "highest" one, which means the gen-set will be running all the time while the power management is switched on.

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

7.6.3 Automatic priority swapping

As stated in the chapter Priorities, the operator is able to select the order of gen-set starting. There is also the option of automatic priority selection. The controllers are sharing data concerning the running hours and all important information relevant to the actual load. Thanks to the Automatic priority swapping function the controllers choose the gen-set(s) to be running with consideration of their running hours and the actual load. The *Running hours equalization* (RHE) function keeps a constant maximal difference of gen-sets' running hours. The *Load demand swap* (LDS) function keeps running only the gen-sets with suitable nominal power to avoid inefficient fuel consumption or gen-set overload.

At least one gen-set in the group must be set as the master for priority optimization (**Pwr Management:** *Priority ctrl* = MASTER). It is possible to have more than one master, the one with lowest CAN address will play the role of the master and if it is switched off the next one will take the master role.

Important setpoint: Pwr management: *#PriorAutoSwap*

The Automatic priority swapping function does not change the setpoint **Pwr management:** *Priority*. The function sets the order of gen-sets by virtual values "engine priority".

7.6.3.1 *Running hours equalization (RHE)*

The gen-sets “engine priorities” are automatically swapped to balance engine running hours. In other words, the controllers compare Run hours of each gen-set and select gen-set(s) to run in order to maintain constant maximal difference of running hours. Up to 32 controllers are supported.

Activation: Pwr management: *#PriorAutoSwap* = RUN HOURS EQU

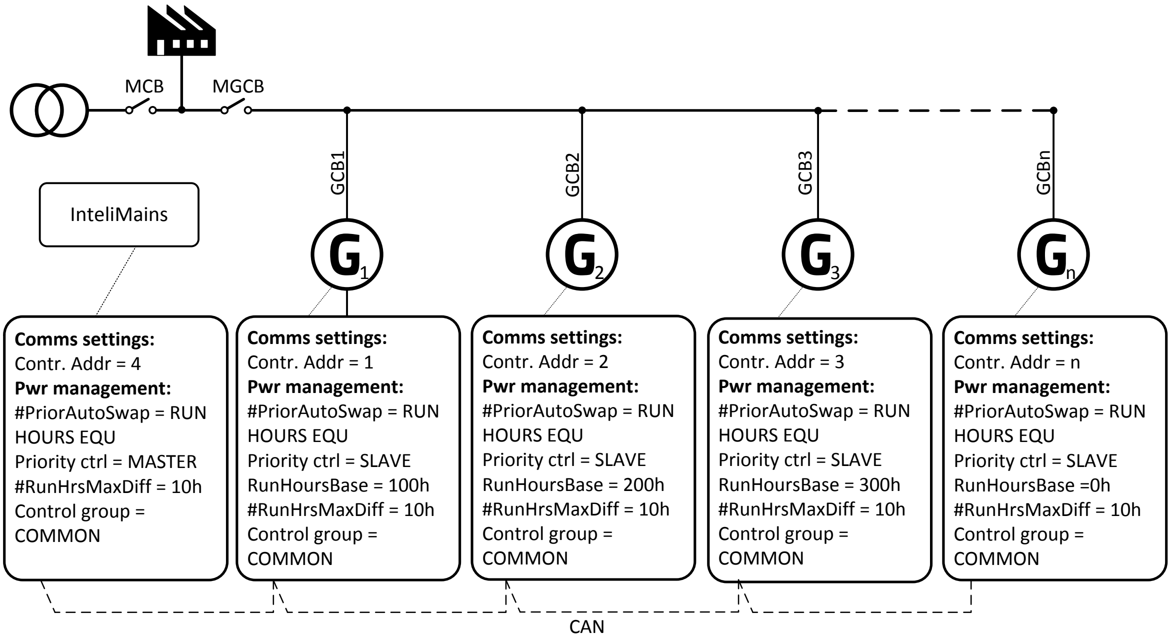
Important setpoints: *RunHoursBase*, *#RunHrsMaxDiff, Priority ctrl, Control group*

The actual values to be considered by the Running Hours Equalization are calculated from the following formula:

$RHE_i = Runhours_i - RunHoursBase_i$,

where ***RHE*** is considered value for Running hours equalization, ***i*** stands for a particular gen-set, ***Runhours*** is a cumulative sum of run hours available in statistic values of the controller, ***RunHoursBase*** is a setpoint. This setpoint may be used in the case of gen-sets with different runs hours are intended to be set at the same initial point (e.g. a new gen-set and a used gen-set after retrofit maintenance inspection).

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



Comms settings:
Contr. Addr = 4
Pwr management:
#PriorAutoSwap = RUN HOURS EQU
Priority ctrl = MASTER
#RunHrsMaxDiff = 10h
Control group = COMMON

Comms settings:
Contr. Addr = 1
Pwr management:
#PriorAutoSwap = RUN HOURS EQU
Priority ctrl = SLAVE
RunHoursBase = 100h
#RunHrsMaxDiff = 10h
Control group = COMMON

Comms settings:
Contr. Addr = 2
Pwr management:
#PriorAutoSwap = RUN HOURS EQU
Priority ctrl = SLAVE
RunHoursBase = 200h
#RunHrsMaxDiff = 10h
Control group = COMMON

Comms settings:
Contr. Addr = 3
Pwr management:
#PriorAutoSwap = RUN HOURS EQU
Priority ctrl = SLAVE
RunHoursBase = 300h
#RunHrsMaxDiff = 10h
Control group = COMMON

Comms settings:
Contr. Addr = n
Pwr management:
#PriorAutoSwap = RUN HOURS EQU
Priority ctrl = SLAVE
RunHoursBase =0h
#RunHrsMaxDiff = 10h
Control group = COMMON

Figure: Running Hours Equalization example

EXAMPLE:

The system structure is shown on the figure above. The InteliMains controller assumes the role of master in priority swapping and swaps priority of the engines based on their running hours.

3 cases are considered:

Case #1: 2 gen-gets available

Case #2: 3 gen-gets available with same initial RHE.

Case #3: 3 gen-gets available with different initial RHE.

Case #1:

Gen-set 1 running hours = 250 -> running hours considered in RHE = 100 (150-RunHoursBase)

Gen-set 2 running hours = 450 -> running hours considered in RHE = 200 (250-RunHoursBase)

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

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

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

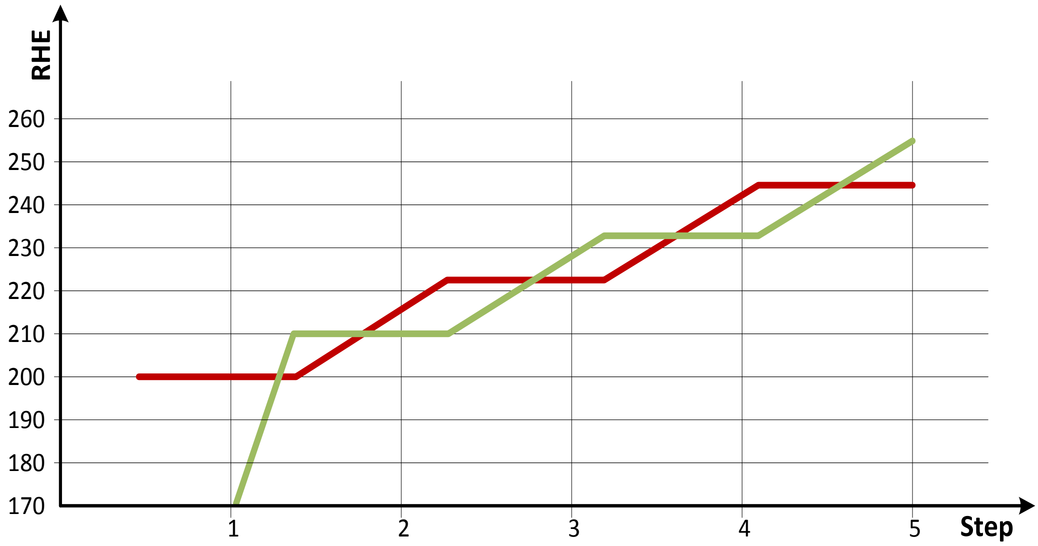


Figure: Running Hours Equalization example, 2 gen-sets

step	0	1	2	3	4	5
RHE1 🟩	100	211	211	233	233	255
RHE2 🟥	200	200	222	222	244	244
Run G1 (ΔRHE1)	0	111	0	22	0	22
Run G2 (Δ RHE2)	0	0	22	0	22	0

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

SwapTime = Second lowest considered running hours – Current lowest considered running hours + #RunHrsMaxDiff +1

Case #2:

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

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

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

Each gen-set has the same RHE = 0 h. By applying the SwapTime formula, we get the run time of gen-set 1 before next swapping:

SwapTimeG1 = 0 – 0 + 10 + 1 = 11

Similar way, we get the run time of gen-set 2 before next swapping:

SwapTimeG2 = 11 – 11 + 10 + 1 = 11

Finally, we get the run time of gen-set 3 before next swapping:

SwapTimeG2 = 11 – 0 + 10 + 1 = 22

Please refer to figure below to understand the evolution of RHE of gen-sets in this particular case.

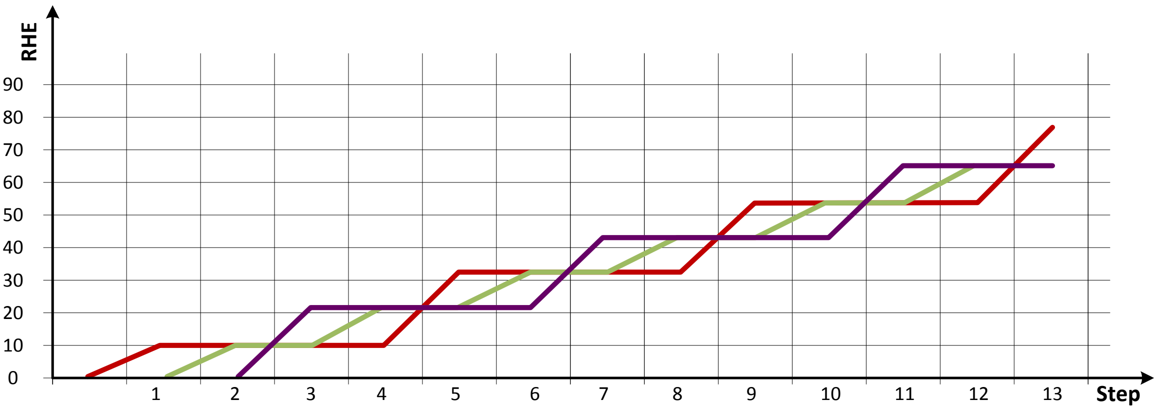


Figure: Running Hours Equalization example, 3 gen-sets with same initial RHE

step	0	1	2	3	4	5	6	7	8	9	10	11	12	13
RHE1 🟥	0	11	11	11	11	33	33	33	33	55	55	55	55	77
RHE2 🟩	0	0	11	11	22	22	33	33	44	44	55	55	66	66
RHE3 🟪	0	0	0	22	22	22	22	44	44	44	44	66	66	66
Run G1 (Δ RHE1)	0	11	0	0	0	22	0	0	0	22	0	0	0	22
Run G2 (Δ RHE2)	0	0	11	0	11	0	11	0	11	0	11	0	11	0
Run G3 (Δ RHE3)	0	0	0	22	0	0	0	22	0	0	0	22	0	0

Case #3:

Gen-set 1 running hours = 250 -> running hours considered in RHE = 100 (150-RunHoursBase)

Gen-set 2 running hours = 450 -> running hours considered in RHE = 200 (250-RunHoursBase)

Gen-set 3 running hours = 750 -> running hours considered in RHE = 250 (500-RunHoursBase)

The gen-set 1 has the lowest RHE1 = 100 h. By applying the SwapTime formula, we get the run time of gen-set 2 before next swapping:

SwapTimeG1 = 200 – 100 + 10 + 1 = 111

Till the step 5, the evolution of the gen-set swapping is the same as in the case #1, just gen-set 1 and gen-set 2 involve. In the step 6 the gen-set 2 can run only 17 hours (previously 22 hours) because the gen-set 3 involves. The evolution of RHE1, RHE2 and RHE3 is shown on the figure below.

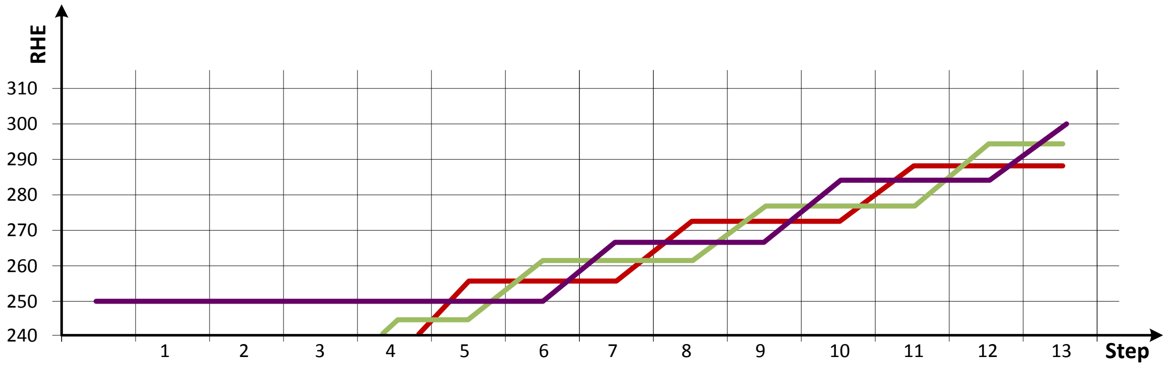


Figure: Running Hours Equalization example, 3 gen-sets with different initial RHE

step	0	1	2	3	4	5	6	7	8	9	10	11	12	13
RHE1 🟥	100	211	211	233	233	255	255	255	272	272	272	288	288	288
RHE2 🟩	200	200	222	222	244	244	261	261	261	277	277	277	294	294
RHE3 🟪	250	250	250	250	250	250	250	266	266	266	283	283	283	299
Run G1 (Δ RHE1)	0	111	0	22	0	22	0	0	17	0	0	16	0	0
Run G2 (Δ RHE2)	0	0	22	0	22	0	17	0	0	16	0	0	17	0
Run G3 (Δ RHE3)	0	0	0	0	0	0	0	16	0	0	17	0	0	16

NOTE:
Setting **Pwr management:** *#RunHrsMaxDiff* = 5 does not mean that gen-sets swap every 5 hours. The Swap time is determined by the formula stated above. Please read the entire chapter Running hours equalization for better understanding.

In the case **Pwr management:** *#RunHrsMaxDiff* is set to 0 and all gen-set in the group are at the same initial point (RHE are equal), the gen-set swapping happens every hour.

NOTE:

Core power management is still fully functional.

Priority setpoints are not actually changed. Virtual values “engine priority” are used. If changing of priority setpoints is required, they need to be changed and RHE needs to disabled and enabled again for the changes to take place.

7.6.3.2 *Load demand swap (LDS) – different sized engines*

If there are gen-sets of different size at the site, it may be required always to run such gen-sets that best fit to the actual load demand. The *Load demand swap* function is intended for this purpose and can control up to 3 gen-sets (priorities). Up to three running engines (priorities) can be swapped based on load demand (e.g. one “small” engine may run on “small” load and swaps to another one, “big” engine that runs when load increases). This function is available **only in combination with absolute power management**.

Activation: **Pwr management:***#PriorAutoSwap = LD DEMAND SWAP*

Important setpoints: *#PwrBandContr1*, *#PwrBandContr2*, *#PwrBandContr3, #PwrBandContr4*, *#PwrBandChngDlUp, #PwrBandChngDlDn, Load reserve setpoints (depending on selected load reserve set), Priority ctrl, Control group.*

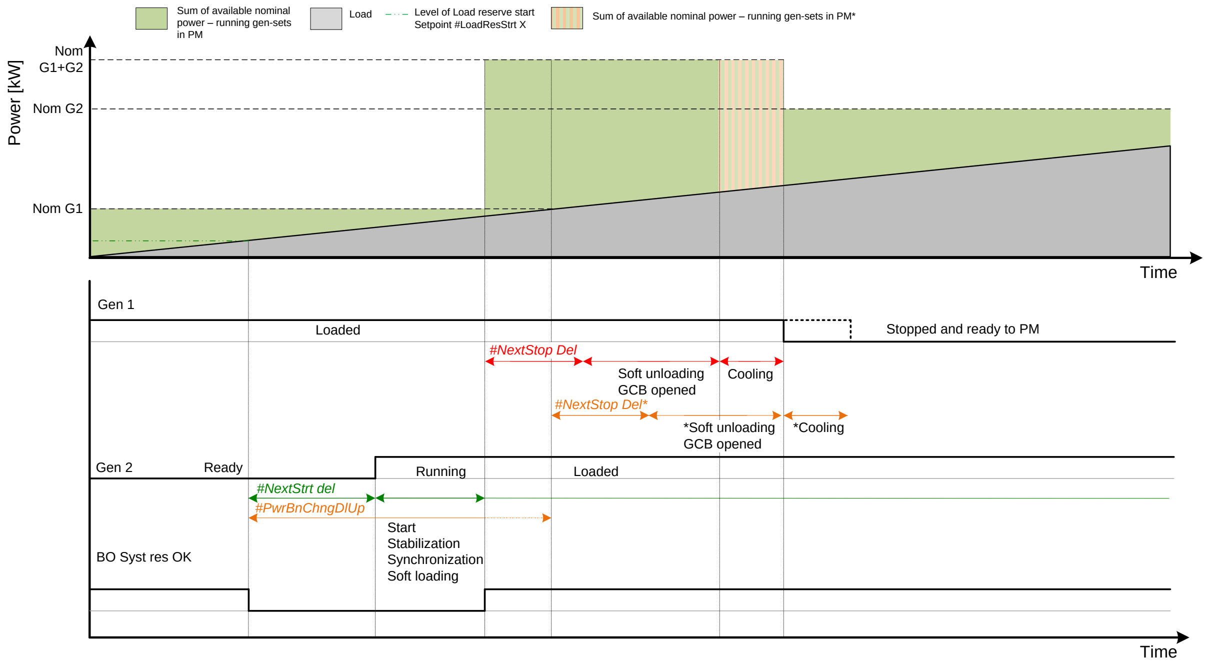
The gen-sets must have addresses 1, 2 and 3. There are four power bands; each of them has adjusted specific combination of gen-sets that run within it. Power bands are adjusted by setpoints *#PwrBandContr1, #PwrBandContr2, #PwrBandContr3* and *#PwrBandContr4*. The load levels of the power bands are defined by sum of nominal powers of gen-sets that are adjusted to run in each particular power band, and the load reserve for start. The combinations of gen-sets must be created in the way the total nominal power of the Power band #1 < #2 < #3 < #4. If the load demand is above the power band #4 then all gen-sets are ordered to run. In fact there is power band #5, which has fixedly selected all the gen-sets to run.

The currently active power band is given by the actual load demand. If the load demand changes and gets out from the current power band, the next/previous power band is activated with delay **Pwr management:** *#PwrBnChngDlUp* or **Pwr management:** *#PwrBnChngDlDn* depending on the direction of the change. The gen-sets which are included in the current power band get engine priority 1, the others get priority 32. The setpoint **Pwr management:** *Priority* is not influenced by this function. Virtual values “engine priority” are used.

NOTE:
If the power band change delays (i.e. **Pwr management:** *#PwrBnChngDlUp* and **Pwr management:** *#PwrBnChngDlDn*) are adjusted to higher values than **Pwr management:** *#NextStrt del* and **Pwr management:** *#OverldNextDel* setpoints then it may occur, that also the gen-sets not belonging to the current power band will start. This is normal and it prevents the system from overloading. Priority setpoints are not actually changed. Virtual values “engine priority” are used.

7.6.3.2.1 Handover UP Swap sequence

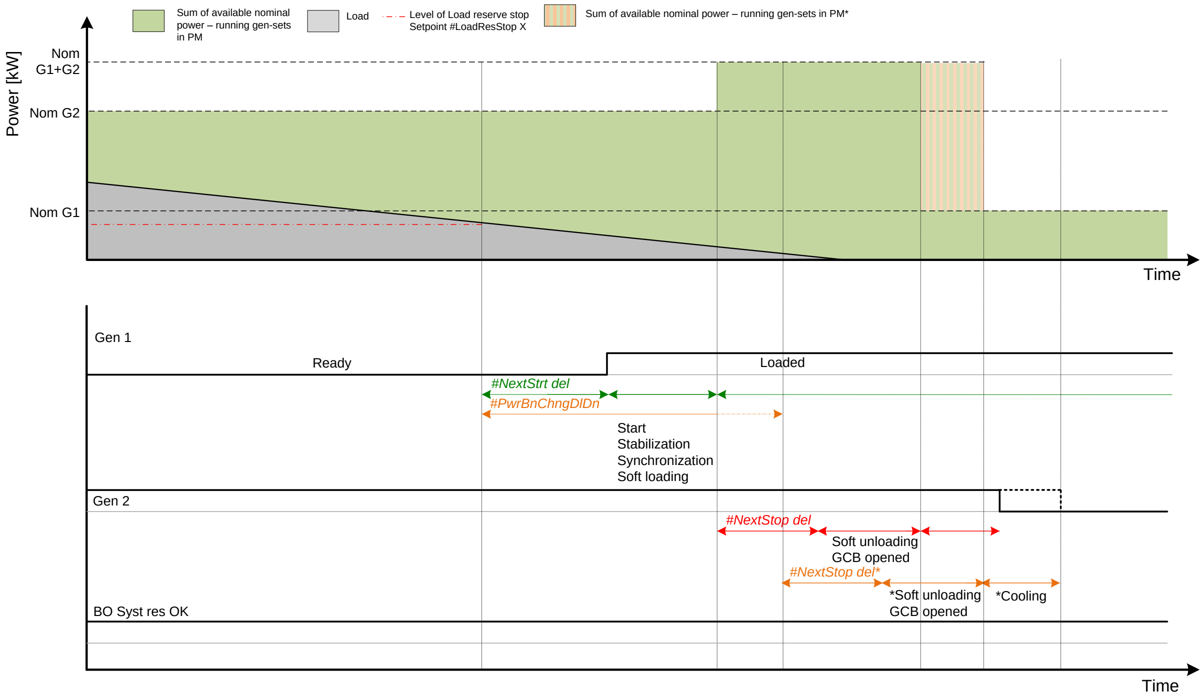
As explain above, the automatic priority swapping evaluates the load of the system and assigns the most appropriate power band. The handover UP sequence describes the situation the gen-set with lower nominal power is swapped by the gen-set with higher nominal power. The gen-set with lower nominal capacity is stopped once the sequence is over. The stopped gen-set is in ready state and keeps available in power management.



NOTE:
If the power band change delay **Pwr management:** *#PwrBnChngDlUp* is adjusted to that longer value than total time requiring start of other gen-set, stabilization, synchronization, GCB closing and soft loading, it postpones the soft unloading of the gen-set to be stopped. This delay is depicted by the dashed orange line. Consequently, the handover up swap sequence is postponed by this delay.

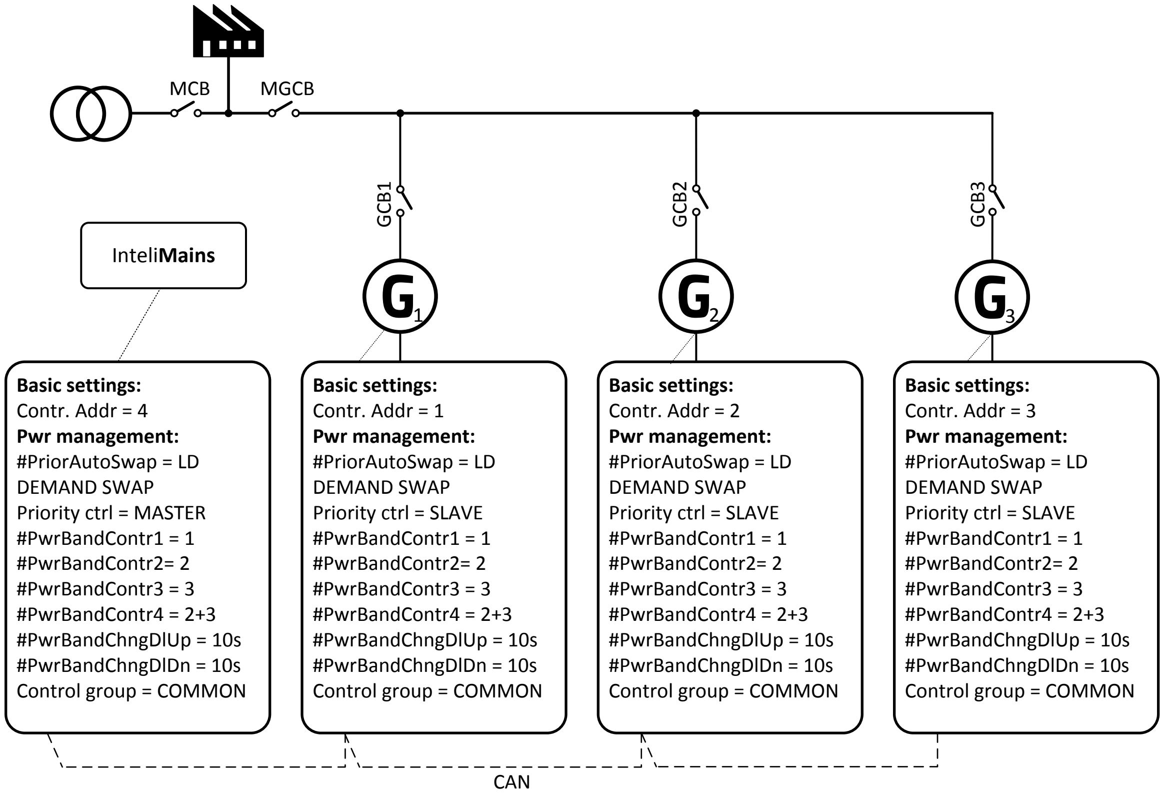
7.6.3.2.2 Handover DOWN Swap sequence

The handover DOWN sequence describes the opposite situation. The gen-set with higher nominal power is swapped by the gen-set with lower nominal power. The gen-set with higher nominal capacity is stopped once the sequence is over. The stopped gen-set is in ready state and keeps available in power management.



NOTE:
If the power band change delay **Pwr management:** *#PwrBnChngDlDn* is adjusted to that longer value than total time requiring start of other gen-set, stabilization, synchronization, GCB closing and soft loading, it postpones the soft unloading of the gen-set to be stopped. This delay is depicted by the dashed orange line. Consequently, the handover down swap sequence is postponed by this delay.

EXAMPLE:



Basic settings:
Contr. Addr = 4
Pwr management:
#PriorAutoSwap = LD DEMAND SWAP
Priority ctrl = MASTER
#PwrBandContr1 = 1
#PwrBandContr2= 2
#PwrBandContr3 = 3
#PwrBandContr4 = 2+3
#PwrBandChngDlUp = 10s
#PwrBandChngDlDn = 10s
Control group = COMMON

Basic settings:
Contr. Addr = 1
Pwr management:
#PriorAutoSwap = LD DEMAND SWAP
Priority ctrl = SLAVE
#PwrBandContr1 = 1
#PwrBandContr2= 2
#PwrBandContr3 = 3
#PwrBandContr4 = 2+3
#PwrBandChngDlUp = 10s
#PwrBandChngDlDn = 10s
Control group = COMMON

Basic settings:
Contr. Addr = 2
Pwr management:
#PriorAutoSwap = LD DEMAND SWAP
Priority ctrl = SLAVE
#PwrBandContr1 = 1
#PwrBandContr2= 2
#PwrBandContr3 = 3
#PwrBandContr4 = 2+3
#PwrBandChngDlUp = 10s
#PwrBandChngDlDn = 10s
Control group = COMMON

Basic settings:
Contr. Addr = 3
Pwr management:
#PriorAutoSwap = LD DEMAND SWAP
Priority ctrl = SLAVE
#PwrBandContr1 = 1
#PwrBandContr2= 2
#PwrBandContr3 = 3
#PwrBandContr4 = 2+3
#PwrBandChngDlUp = 10s
#PwrBandChngDlDn = 10s
Control group = COMMON

Figure: Load Demand Swapping example

The system is shown in previous figure. The InteliMains controller assumes the role of master in priority swapping and swaps engine priority based on user defined power bands. There are 4 available customizable power bands. The power band #5 is fixed – all available gen-set in power gen-set are running.

Power bands are changed up if:

(Nominal power of all gen-sets in a particular band - Total generated power by gen-sets in power management) < Reserve for start

or down if:

(Nominal power of all gen-sets in next lower band - Total generated power by gen-sets in power management) > Reserve for stop

The site contains 3 gen-sets, G1 is 200kW, G2 is 500kW and G3 is 1000kW. The reserve for start is adjusted to 50kW and for stop to 70kW. Following table describes available power bands:

Gen-sets	Nominal power [kW]	Power band [kW]
G1	200	0 .. 150
G2	500	151 .. 450

G1+G2	700	451 .. 650
G3	1000	651 .. 950
G1+G3	1200	951 .. 1150
G2+G3	1500	1151 .. 1450
G1+G2+G3	1700	>1450

Following table describes selected power bands:

Power band	Gen-sets	Nominal power [kW]	Power band range [kW]
#PwrBandContr1	G1	200	0 .. 150
#PwrBandContr2	G2	500	151 .. 450
#PwrBandContr3	G3	1000	451 .. 950
#PwrBandContr4	G2+G3	1500	951 .. 1450
Fixed power band #5	G1+G2+G3	1700	>1450

Following figure illustrates the power bands swapping in function of load evolution.

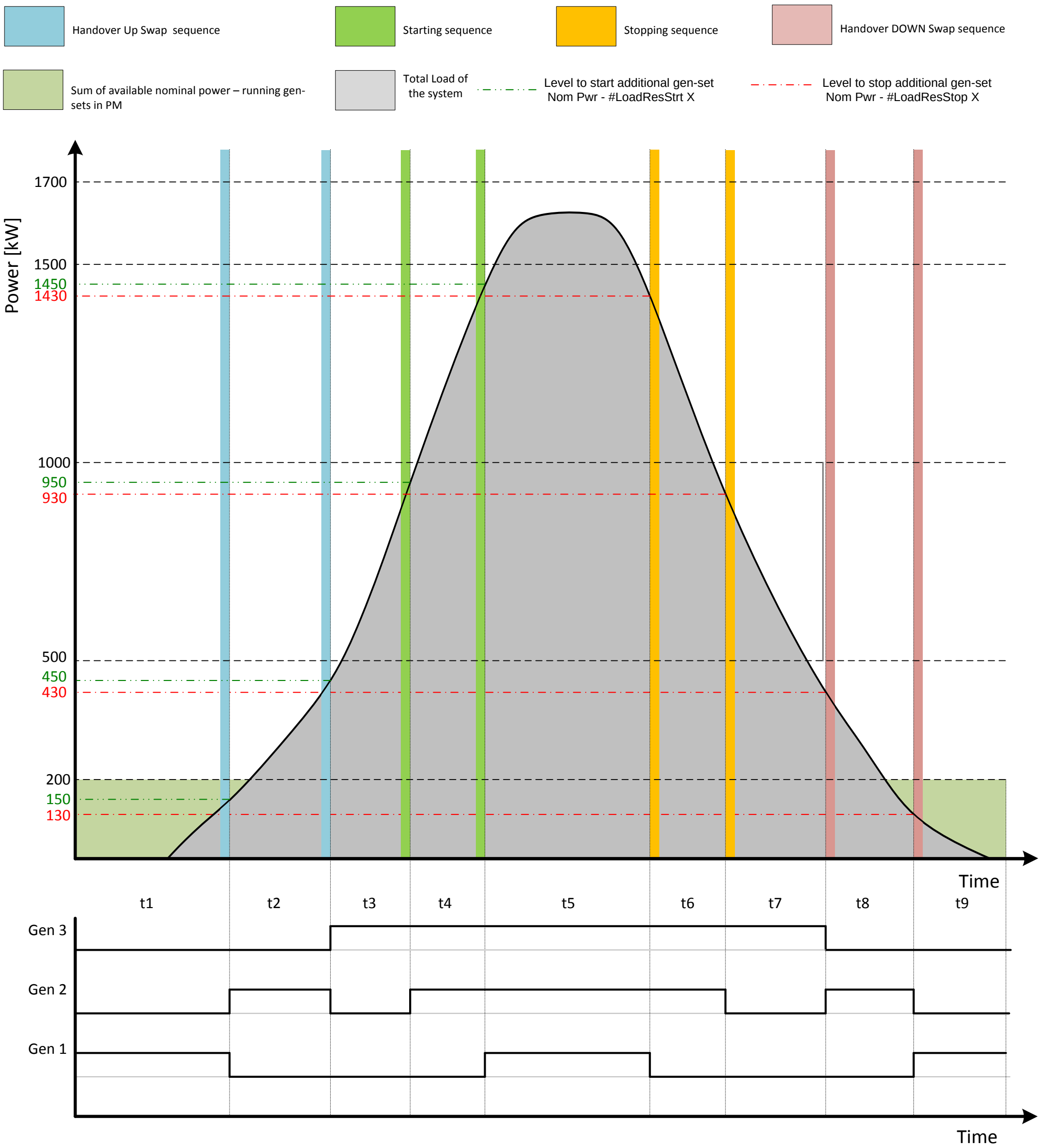


Figure: Load Demand Swapping example

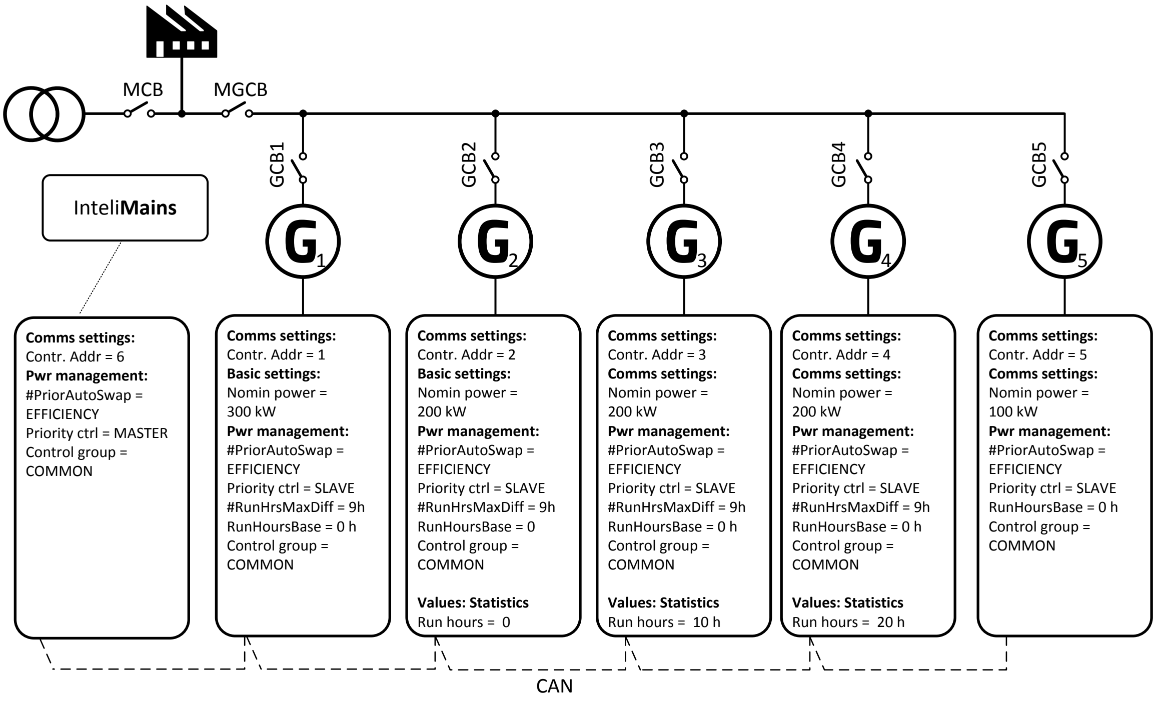
step		t1	t1 -> t2	t2	t2 -> t3	t3	t3 -> t4	t4	t4 -> t5	t5	t5 -> t6	t6	t6 -> t7	t7	t7 -> t8	t8	t8 -> t9	t9
Gen#1	200 kW	LOADED	handover UP	READY	handover UP	READY	starting of gen#2	READY	starting of gen#1	LOADED	stopping of gen#1	READY	stopping of gen#2	READY	handover DOWN	READY	handover DOWN	LOADED
Gen#2	500 kW	READY		LOADED		READY		LOADED		LOADED		LOADED		READY		LOADED		READY
Gen#3	1 000 kW	READY		READY		LOADED		LOADED		LOADED		LOADED		LOADED		READY		READY

7.6.3.3 *Efficiency*

The Efficiency mode is a combination of Running Hours Equalization and Load Demand Swap priority optimization modes. Please refer to chapters 7.6.3.1 and 7.6.3.2 for further information about RHE and LDS priority optimization function.

- In the first step, the controller sorts the gen-sets according to their nominal power.
- In the second step, the controller sorts the gen-sets with the same nominal power according to their RHE.
- The gen-set(s) their nominal power fits the most are chosen. From those with same nominal power, the gen-set(s) with lowest RHE are chosen.

EXAMPLE:



Comms settings:
Contr. Addr = 6
Pwr management:
#PriorAutoSwap =
EFFICIENCY
Priority ctrl = MASTER
Control group =
COMMON

Comms settings:
Contr. Addr = 1
Basic settings:
Nomin power =
300 kW
Pwr management:
#PriorAutoSwap =
EFFICIENCY
Priority ctrl = SLAVE
#RunHrsMaxDiff = 9h
RunHoursBase = 0 h
Control group =
COMMON

Comms settings:
Contr. Addr = 2
Basic settings:
Nomin power =
200 kW
Pwr management:
#PriorAutoSwap =
EFFICIENCY
Priority ctrl = SLAVE
#RunHrsMaxDiff = 9h
RunHoursBase = 0
Control group =
COMMON

Values: Statistics
Run hours = 0

Comms settings:
Contr. Addr = 3
Comms settings:
Nomin power =
200 kW
Pwr management:
#PriorAutoSwap =
EFFICIENCY
Priority ctrl = SLAVE
#RunHrsMaxDiff = 9h
RunHoursBase = 0 h
Control group =
COMMON

Values: Statistics
Run hours = 10 h

Comms settings:
Contr. Addr = 4
Comms settings:
Nomin power =
200 kW
Pwr management:
#PriorAutoSwap =
EFFICIENCY
Priority ctrl = SLAVE
#RunHrsMaxDiff = 9h
RunHoursBase = 0 h
Control group =
COMMON

Values: Statistics
Run hours = 20 h

Comms settings:
Contr. Addr = 5
Comms settings:
Nomin power =
100 kW
Pwr management:
#PriorAutoSwap =
EFFICIENCY
Priority ctrl = SLAVE
RunHoursBase = 0 h
Control group =
COMMON

Setpoint group	Basic settings	Pwr management					
Setpoint	Nomin power / RHE	Pwr management	#Pwr mgmt mode	Priority	#PriorityAutoSwap	#LoadResStrt X	#LoadResStop X
Gen-set #1	300 kW	ENABLED	ABS (kW)	1	EFFICIENCY	20 kW	30 kW
Gen-set #2	200 kW / 0 h	ENABLED	ABS (kW)	2	EFFICIENCY		
Gen-set #3	200 kW / 10 h	ENABLED	ABS (kW)	3	EFFICIENCY		
Gen-set #4	200 kW / 20 h	ENABLED	ABS (kW)	4	EFFICIENCY		
Gen-set #5	100 kW	ENABLED	ABS (kW)	5	EFFICIENCY		

NOTE:
Gen-set #1 means that the CAN address of the controller is set to 1. The relevant setpoint is adjusted by **Comms settings:** *Contr. address*.

Following table provide an example of gen-set selection in function of system load evolution. The table is an example of Efficiency priority optimization function.

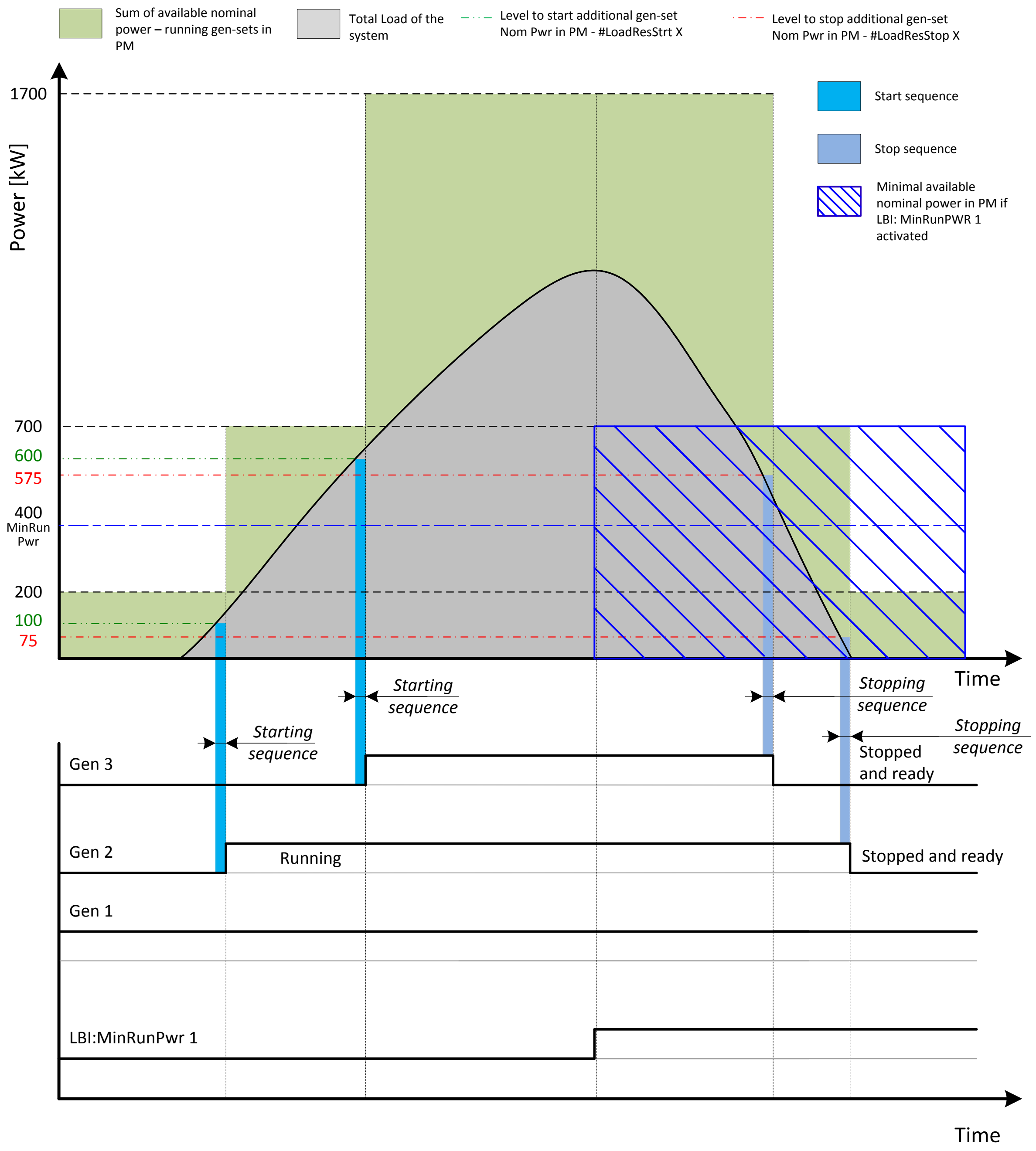
System Load [kW]	Running gen-sets		Description	Total Running power within PM [kW]	Relative load of gen-sets [%]
40	❺			100	40%
60	❺			100	60%
80	❺ ❷[0h]	start stop	LDS Swap	300	26%
100	❷[10h]			200	50%
120	❷[20h]			200	60%
120	❷[30h] ❸[10h]	Start stop	RHE Swap	400	30%
120	❸[20h]			200	60%
140	❸[30h]			200	70%
180	❸[40h] ❶	Start stop	LDS Swap	500	36%
200	❶			300	67%
240	❶			300	80%
280	❶ ❺	Start	Gen#5 joins (LDS)	400	70%
340	❶ ❺			400	85%
380	❶ ❺ ❹[20h]	start stop	LDS + RHE Swap	600	63%
400	❶ ❹			500	80%
440	❶ ❹			500	88%
480	❶ ❹ ❺	start	Gen#5 joins (LDS)	600	80%
540	❶ ❹ ❺			600	90%
580	❶ ❹ ❺ ❷[30h]	start stop	LDS Swap	800	73%
600	❶ ❹ ❷			700	86%
640	❶ ❹ ❷			700	91%
680	❶ ❹ ❷ ❺	start	Gen#5 joins (LDS)	800	85%
740	❶ ❹ ❷ ❺			800	93%
780	❶ ❹ ❷ ❺ ❸[40h]	start stop	LDS Swap	1000	78%
800	❶ ❹ ❷ ❸			900	89%
840	❶ ❹ ❷ ❸			900	93%
880	❶ ❹ ❷ ❸ ❺	start	Gen#5 joins	1000	88%

			(LDS)		
940	❶❹❷❸❺			1000	94%

7.6.4 Minimum Running Power

Minimum Running Power function is used to adjust a minimum value of the sum of nominal power of all running gen-sets. If the function is active, then the gen-sets would not be stopped, although the reserve for stop is fulfilled.

EXAMPLE:



The setpoint **Pwr management:** *#MinRunPower 1* is adjusted to 400 kW. Once the LBI: *MinRunPwr 1* is activated, the available nominal running power has to be equal or higher to 400 kW. Even if the load reserve is big enough to stop the gen-set #2 (nominal power 500 kW), the gen-set keeps running as at least 400 kW has to be available. The gen-set#1 (nominal power 200 kW) is not enough.

There are 3 different *MinRunPower* setpoints.

- *#MinRunPower 1* considered if LBI *MinRun power 1* activated
- *#MinRunPower 2* considered if LBI *MinRun power 2* activated
- *#MinRunPower 3* considered if LBI *MinRun power 3* activated

NOTE:
If more than one binary input for *MinRunPower* activation is closed *MinRunPower* setpoint with higher number is used (i.e. binary inputs with higher number have higher priority). When no binary input is closed, then minimal running power is 0.

NOTE:
All controllers cooperating together in Power management must have the same Minimal Running Power set selected.

It is possible to use virtual shared peripheries for distribution of the binary signal activating LBI MinRun Power 1,2 or 3 among controllers over the CAN bus.

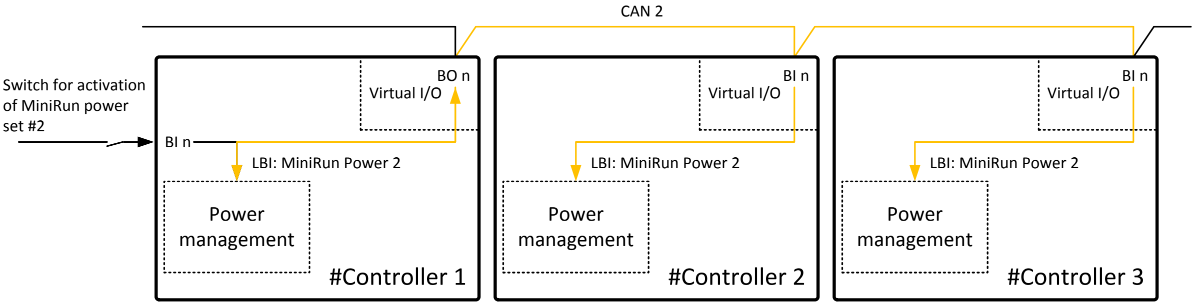


Figure: Example of using virtual shared peripheries for signal distribution

7.6.5 Control Groups

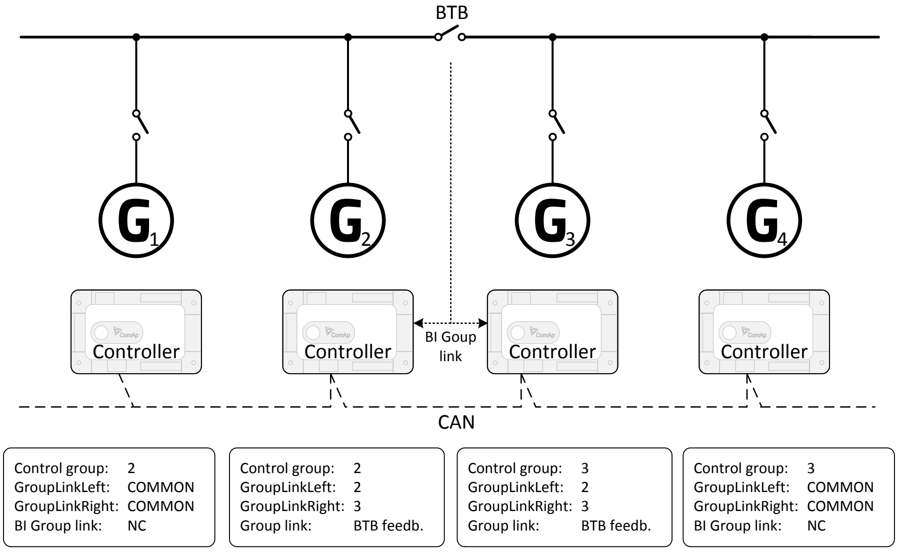
The physical group of the gen-sets (i.e. the site) can be separated into smaller logical groups, which can work independently even if they are interconnected by the CAN2 bus. The logical groups are intended to reflect the real topology of the site when the site is divided into smaller gen-set groups separated from each other by bus-tie breakers. If the bus-tie breakers are closed the sub-groups have to work as one large group and if the bus-tie breakers are open, the sub-groups have to work independently.

- The group which the particular controller belongs to is adjusted by the setpoint **Pwr management:** *Control group*. If there is only one group in the site, adjust the setpoint to 1 (=COMMON).
- The information which groups are currently linked together is being distributed via the CAN. Each controller can provide information about one BTB breaker. The breaker position is detected by the input *GroupLink* (i.e. this input is to be connected to the breaker feedback).
- The two groups which are connected together by the BTB breaker mentioned above are adjusted by setpoints **Pwr management:** *GroupLinkLeft* and **Pwr management:** *GroupLinkRight*.

NOTE:
The "group link" function is independent on the group, where the controller itself belongs to.
The controller can provide "group link" information about any two groups.

- If the "group link" is opened the two groups act as two separated groups. If it is closed the roups act as one large group.

The picture below shows an example of a site with 4 gen-sets separated by a BTB breaker into two groups of 2. The BTB position is detected by the controllers 2 and 3. The reason, why there are 2 controllers used for detection of the BTB position, is to have a backup source of the group link information if the primary source (controller) is switched off.



Control group: 2
GroupLinkLeft: COMMON
GroupLinkRight: COMMON
BI Group link: NC

Control group: 2
GroupLinkLeft: 2
GroupLinkRight: 3
Group link: BTB feedb.

Control group: 3
GroupLinkLeft: 2
GroupLinkRight: 3
Group link: BTB feedb.

Control group: 3
GroupLinkLeft: COMMON
GroupLinkRight: COMMON
BI Group link: NC

Figure: Example of control groups

Once the BTB breaker is closed, the control group 2 and 3 become new group 2+3. The closed BTB and the group link function influence the load reserve (i.e. increased by added gen-set of added gen-sets). Load sharing applies for all gen-sets.

7.6.6 Load shedding based on active power

Load shedding is a function that automatically disconnects and reconnects various loads depending on several user defined parameters. The load shedding based on active power is activated by setting the setpoint *Ld shed mode* to PWR ONLY.

Important setpoints*: all setpoints in group* ***Load shedding***

The load shedding function is active in all controller modes except OFF. Load shedding works based on mains import value or the total gen-set group active power (setpoint **Load shedding:***LdShedBased on*).

Load shedding has three steps and each step is linked with its own Load shed binary output (LDSHED STAGE X). There are three load shed levels and delays for all three steps as well as recon levels and delays (setpoints in **Load shedding** group *Ld shedLevel1-3, Ld shedDelay1-3, Ld reconLevel1-3, Ld reconDelay1-3*). Load shed can only move from one step to the next, e.g. "No LoadShed" to "LdShed stage 1" to "LdShed stage 2" to "LdShed stage 3" and vice versa.

If manual reconnection of the load is desired, the **Load shedding:***AutoLd recon* setpoint needs to be disabled (DISABLED) and the MANUALLDRECON binary input needs to be configured.

Rising edge on this input resets the controller to a lower stage, but only if the load is under the *Ld recon level* for *Ld recon delay* at that moment.

Depending on **Load shedding:***Ld shed active* setting load shedding is active never (DISABLE), during island operation (ISLAND ONLY), during island operation with special function when transition to island operation occurs (ISL + TRIP PARAL) or all the time (ALL THE TIME)

EXAMPLE:

When *Ld shed active* = ISL + TRIP PARAL, all load shed outputs are activated (closed) to trip the unessential load when gen-set group goes to island:

a) Immediately when MGCB closes after mains fail and gen-set group is instructed to start in AUT mode (MGCB application only).
b) After EmergStart del elapses when mains fail and gen-set group is instructed to start in AUT mode (MCB application only).
c) Immediately when MGCB is closed in MAN mode by button (transit to island from parallel operation).

NOTE:
If no Load Shedding outputs are configured, there is no record to history and no screen timer indication of the activity of this function.

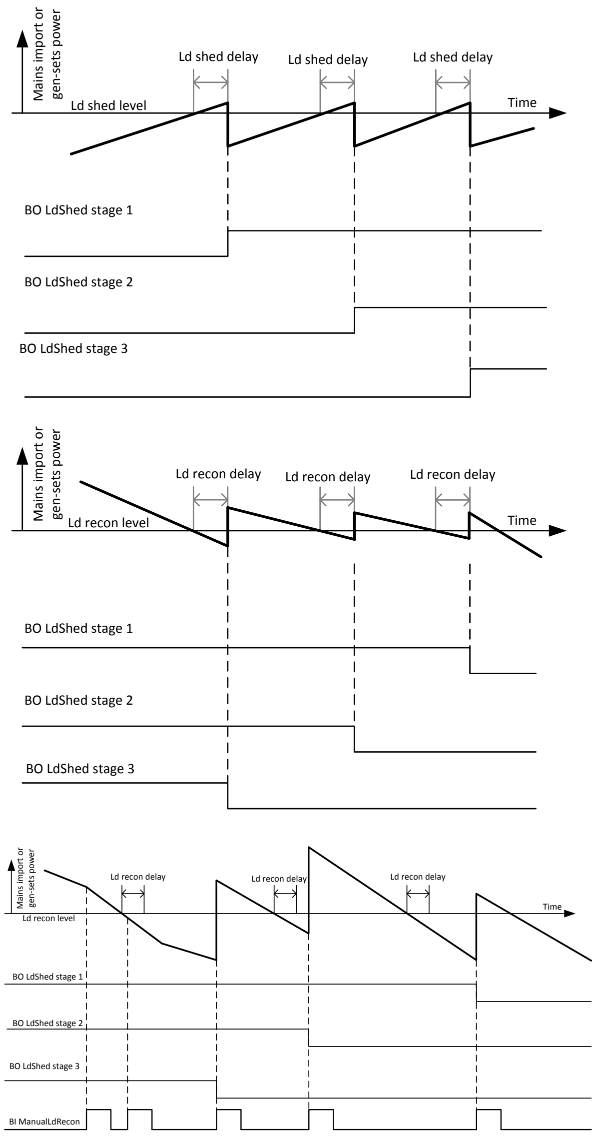


Figure: Examples of load shedding and load reconnection (load shed, load recon, manual load recon)

7.6.7 Load shedding based on frequency

Load shedding is a function that automatically disconnects and reconnects various loads depending on several user defined parameters. The load shedding based on frequency is activated by setting the setpoint *Ld shed mode* to FREQ ONLY.

Important setpoints*: all setpoints in group* ***Load shedding***

The load shedding function is active in all controller modes except OFF. Load shedding works based on Mains frequency or Bus frequency based on setting *LdShedBase on* (MAINS IMPORT is Mains frequency, GEN-SETS means Bus frequency).

Load shedding has three steps and each step is linked with its own Load shed binary output (LDSHED STAGE X). There are three load shed levels and delays for all three steps as well as recon levels and delays (setpoints in **Load shedding** group *Ld shed f lvl1-3, Ld shedDelay1-3, LdRecon f lvl1-3, Ld reconDelay1-3*). Load shed can only move from one step to the next, e.g. “No LoadShed” to “LdShed stage 1” to “LdShed stage 2” to “LdShed stage 3” and vice versa.

If manual reconnection of the load is desired, the **Load shedding:***AutoLd recon* setpoint needs to be disabled (DISABLED) and the MANUALLDRECON binary input needs to be configured.

Rising edge on this input resets the controller to a lower stage, but only if the load is under the *Ld recon level* for *Ld recon delay* at that moment.

Depending on **Load shedding:***Ld shed active* setting load shedding is active never (DISABLE), during island operation (ISLAND ONLY), during island operation with special function when transition to island operation occurs (ISL + TRIP PARAL) or all the time (ALL THE TIME)

EXAMPLE:

When *Ld shed active* = ISL + TRIP PARAL, all load shed outputs are activated (closed) to trip the unessential load when gen-set group goes to island:

d) Immediately when MGCB closes after mains fail and gen-set group is instructed to start in AUT mode (MGCB application only).
e) After EmergStart del elapses when mains fail and gen-set group is instructed to start in AUT mode (MCB application only).
f) Immediately when MGCB is closed in MAN mode by button (transit to island from parallel operation).

NOTE:
If no Load Shedding outputs are configured, there is no record to history and no screen timer indication of the activity of this function.

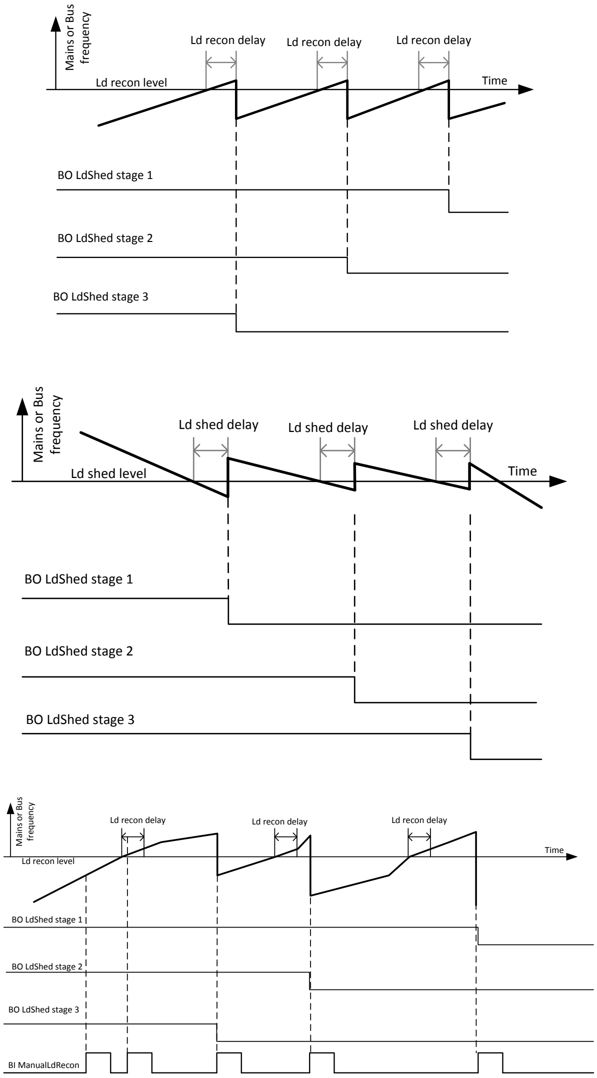


Figure: Examples of load shedding and load reconnection (load shed, load recon, manual load recon) based on frequency

7.6.8 Peak shaving based on Active and Apparent Power

The Peak shaving function is active only in AUT mode in parallel to Mains operation. Peak shaving is based on Object P or Apparent power consumption (consumption of load). If load consumption increases over **ProcessControl:***PeakLevelStart* or **ProcessControl:***PeakKVAStart* for period longer than **ProcessControl:***PeakAutS/S* or **ProcessControl:***PeakKVAS/S del* the gen-set group is started (BO Sys start/stop is activated). If load consumption decreases below **ProcessControl:***PeakLevelStop* or **ProcessControl:***PeakKVAStop* for period longer than **ProcessControl:***PeakAutS/S del* or **ProcessControl:***PeakKVAS/S del* the gen-set group is stopped. Both Peak shaving based on kW and kVA can work simultaneously (SYS START/STOP is activated if at least one condition is fulfilled).

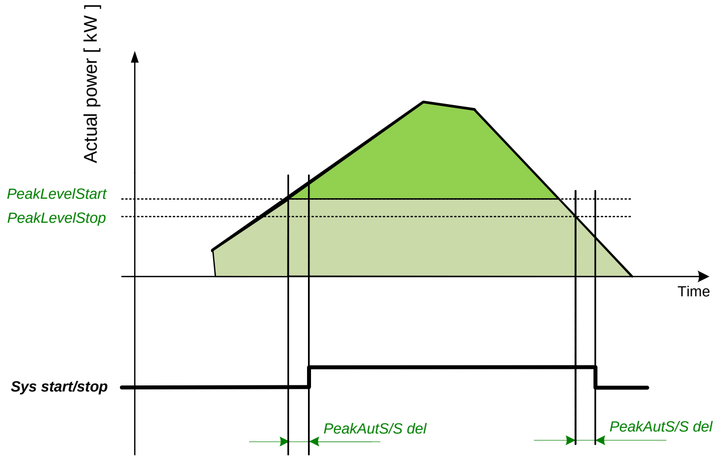


Figure: Example of peak shaving function based on Active power (the same function for Apparent power)

NOTE:
Function Peak Shaving based on Apparent power is not available for IM-NT-GC controller.

7.7 Remote Alarm Messaging

It is possible to use up to five channels for Active Call, Email and SMS upon defined type of Alarm. It is possible to define protection type for all ENABLED channels to react. All the possibilities in InteliMains are: History record, Alarm only, Warning, Mains protect and Mains protect with Reset. Find more information about alarm types in the chapter Protections and alarm management.

7.7.1 Communication Types for Remote Alarm Messaging

Below there all types of communication available for each Active Call channel.

DATA-ANA: This option sends a complete archive to the recipient's PC via analog modem. An analog modem must be connected either to one of controller COM ports or to one of I-LB modules connected to the controller via CAN2 bus. The channel address must contain complete telephone number of the recipient's PC where InteliMonitor is running in Active call receiving mode.

DATA-GSM: This option sends a complete archive to the recipient's PC via GSM modem. A GSM modem with activated CSD data transfers must be connected either to one of controller COM ports or to one of I-LB modules connected to the controller via CAN2 bus. The channel address must contain complete telephone number of the recipient's PC where InteliMonitor is running in Active call receiving mode.

DATA-ISDN: This option sends a complete archive to the recipient's PC via ISDN modem. An ISDN modem must be connected either to one of controller COM ports or to one of I-LB modules connected to the controller via CAN2 bus. The channel address must contain complete telephone number of the recipient's PC where InteliMonitor is running in Active call receiving mode.

DATA-CDMA: This option sends a complete archive to the recipient's PC via CDMA modem. A CDMA modem must be connected either to one of controller COM ports or to one of I-LB modules connected to the controller via CAN2 bus. The local CDMA network must allow point-to-point data transfers. The channel address must contain complete telephone number of the recipient's PC where InteliMonitor is running in Active call receiving mode.

SMS-GSM: This option sends a short text message (SMS) containing the actual Alarmlist contents to the recipient's mobile phone via the GSM modem. The channel address must contain complete telephone number of the recipient's mobile phone.

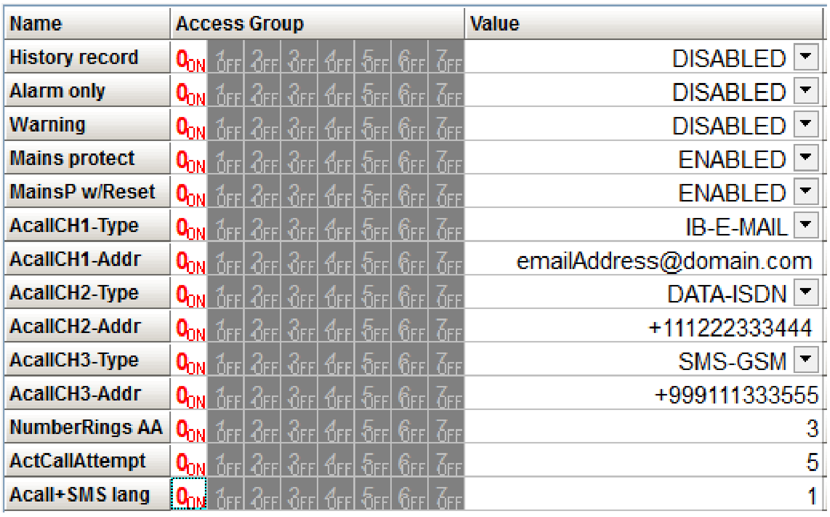
SMS-CDMA: This option sends a short text message (SMS) containing the actual Alarmlist contents to the recipient's mobile phone via the CDMA modem. The channel address must contain complete telephone number of the recipient's mobile phone.

IB-E-MAIL: This option sends an e-mail containing the actual Alarmlist contents and latest 20 history records (only date, time, reason) to the recipient's mailbox via the IB-COM module or IG-IB module. The channel address must contain valid e-mail address of the recipient.

NOTE:
The SMTP settings (SMTP authent,SMTP user name, SMTP password, SMTP address, Contr mailbox) must be properly adjusted for sending e-mails.

7.7.2 Example of setting

There is an example of setting of Remote Alarm Messaging. In this case active calls we be triggered on Mains protect and Mains protect with Reset alarms. Message is sent via email to emailAddress@domain.com (Channel 1 – available for NTC controller or with any controller with connected IB-NT or I-LB+), archive is sent via ISDN modem to the number +111222333444 (Channel 2) and SMS is sent to the number +999111333555 (Channel 3).



Name	Access Group	Value
History record	0ON 1OFF 2OFF 3OFF 4OFF 5OFF 6OFF 7OFF	DISABLED
Alarm only	0ON 1OFF 2OFF 3OFF 4OFF 5OFF 6OFF 7OFF	DISABLED
Warning	0ON 1OFF 2OFF 3OFF 4OFF 5OFF 6OFF 7OFF	DISABLED
Mains protect	0ON 1OFF 2OFF 3OFF 4OFF 5OFF 6OFF 7OFF	ENABLED
MainsP w/Reset	0ON 1OFF 2OFF 3OFF 4OFF 5OFF 6OFF 7OFF	ENABLED
AcallCH1-Type	0ON 1OFF 2OFF 3OFF 4OFF 5OFF 6OFF 7OFF	IB-E-MAIL
AcallCH1-Addr	0ON 1OFF 2OFF 3OFF 4OFF 5OFF 6OFF 7OFF	emailAddress@domain.com
AcallCH2-Type	0ON 1OFF 2OFF 3OFF 4OFF 5OFF 6OFF 7OFF	DATA-ISDN
AcallCH2-Addr	0ON 1OFF 2OFF 3OFF 4OFF 5OFF 6OFF 7OFF	+111222333444
AcallCH3-Type	0ON 1OFF 2OFF 3OFF 4OFF 5OFF 6OFF 7OFF	SMS-GSM
AcallCH3-Addr	0ON 1OFF 2OFF 3OFF 4OFF 5OFF 6OFF 7OFF	+999111333555
NumberRings AA	0ON 1OFF 2OFF 3OFF 4OFF 5OFF 6OFF 7OFF	3
ActCallAttempt	0ON 1OFF 2OFF 3OFF 4OFF 5OFF 6OFF 7OFF	5
Acall+SMS lang	0ON 1OFF 2OFF 3OFF 4OFF 5OFF 6OFF 7OFF	1

It is also possible to adjust number of attempts that controller performs in case of not successful Active Call – **Comms settings:***ActCallAttempt*. The language of messages can be changed – **Comms settings:***Acall+SMS lang* (use Translator and Languages tabs in GenConfig to adjust languages).

Up to five channels can be used.

7.8 Controller Redundancy

Redundant system is a general term for applications where there are two controllers at each gen-set. One is the main controller, which controls the gen-set in normal conditions, the other is the redundant controller, which takes over the control when the main controller fails. Both controllers have identical firmware and most of the configuration and setpoints. Only several things need to be adjusted/configured differently because of the rendundancy function itself.

Caution!
If there are shared binary or analog outputs used on InteliMains (e.g. for system start/stop), it is necessary to prepare the configuration in the way so each controller uses binary or analog output set with different address. Configuration in gen-set controllers then needs to be altered so it can receive signals from both InteliMains controller (e.g. using built-in PLC functions).

7.8.1 Redundant systems using binary signals

It is not possible to use this redundancy system since correct function of InteliMains depends on CAN bus communication and thus CAN redundancy should be always used.

7.8.2 Redundant systems using CAN bus

This system uses the CAN bus for detection whether the main controller is operational or not. If the redundant controller has not received two consequent messages from the main one (~100ms) it will take over the system control - it activates the binary output CtrlHBeat FD, which has to be wired in such a way, that it disconnects the dead main controller from the control, connects the redundancy controller instead and activates it by deactivation of the binary input Emerg. manual.

As there can be up to 16 pairs of controllers at the CAN bus it is necessary to select which main controller (address) belongs to which redundant one. The setpoint **ProcessControl:***Watched Contr* is used for this purpose. It must be adjusted to address of the respective main controller in each redundant controller and it must be adjusted to 0 in each main controller.

Caution!
Correct wiring of all inputs and outputs that should be used both by the main and the redundant controller needs to be done. Please refer to the corresponding chapter for wiring of binary inputs and outputs.

Do not use Shared Binary Inputs/Outputs for CtrlHBeat FD -> Emerg.manual connection since the failed controller may not interpret it correctly!

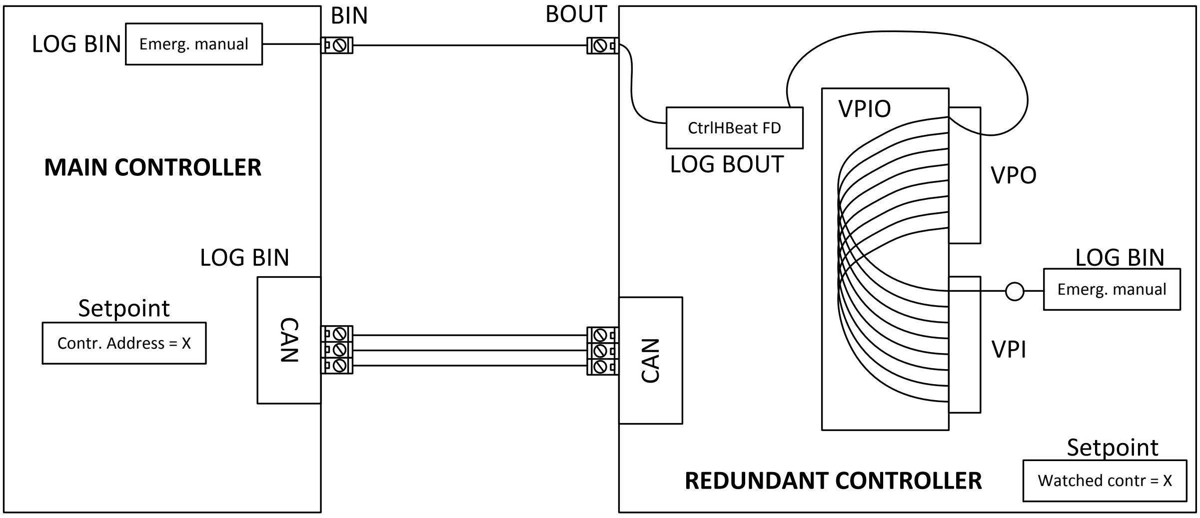


Figure: Example of redundancy function

In the figure above the signal of logical function CtrlHBeat FD is used to disable the main controller if it is lost from CAN bus or CAN bus communication from that controller becomes erratic. It is used also to disable the redundant controller when the communication on CAN bus is alright (it is negated). For more information on Virtual Binary Inputs and Outputs (VPIO) please refer to the chapter about Shared Binary Inputs and Outputs and Virtual Binary Inputs and Outputs.

NOTE:
Use pulse signals for control of circuit breakers. MCB ON COIL, MCB OFF COIL, MGCB ON COIL and MGCB OFF COIL should be used to prevent sudden opening for a short period of time when the controller fails and to ensure proper function of redundancy.

7.9 System load control modes

HINT
If you need more information on how to choose suitable load control mode, please refer to the chapter 6.8.7 Managing system load control modes.

System load control modes are determined by setpoints **ProcessControl**:*Mload ctrl PtM* and *SysLdCtrl PtM*.

If **ProcessControl:***#SysLdCtrl PtM* is set to BASELOAD, then Gen-set group requested load is not determined by InteliMains but it is given by setpoint **ProcessControl:***#SysBaseLoad* regardless of **ProcessControl:***Mload ctrl PtM* setting.

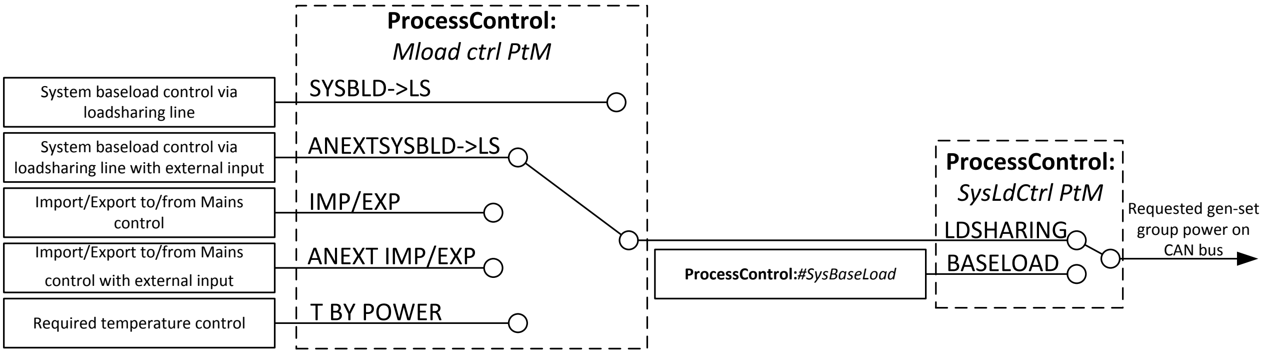
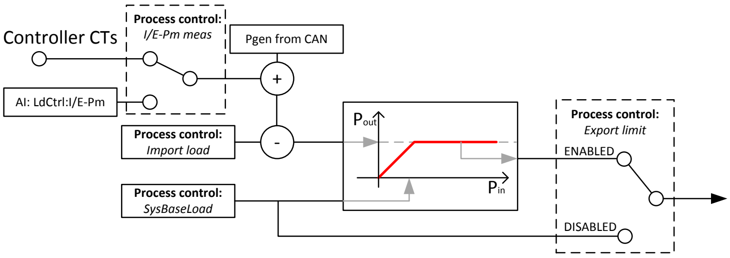


Figure: General schematic of system load control modes in gen-set group with InteliMains

Determination of actual value of requested gen-set group active power for various settings of **ProcessControl:***Mload ctrl PtM* is shown in separate diagrams below.

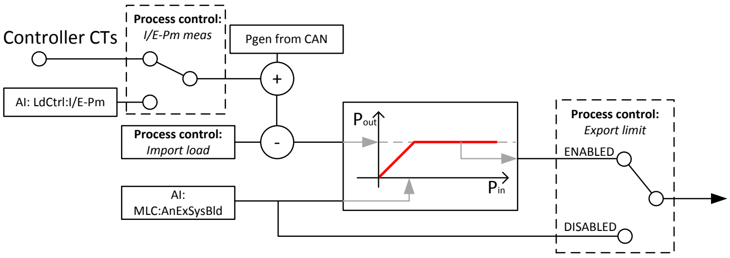
7.9.1 SYSBLD->LS

Following diagram shows the way of calculation of requested gen-set group active power if **ProcessControl**:*Mload ctrl PtM* = SYSBLD->LS.



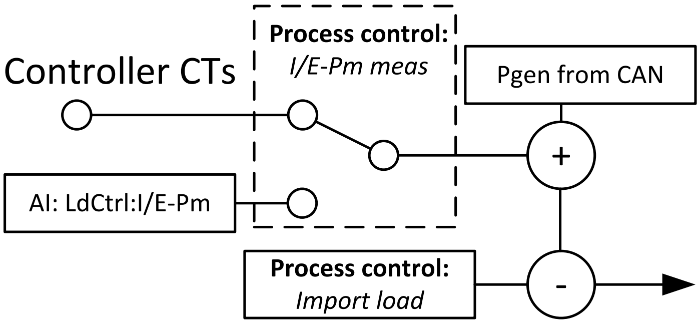
7.9.2 ANEXSYSBLD->LS

Following diagram shows the way of calculation of requested gen-set group active power if **ProcessControl**:*Mload ctrl PtM* = ANEXSYSBLD->LS.



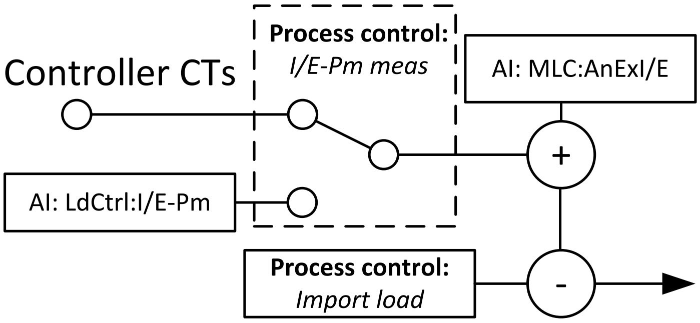
7.9.3 IMP/EXP

Following diagram shows the way of calculation of requested gen-set group active power if **ProcessControl**:*Mload ctrl PtM* = IMP/EXP.



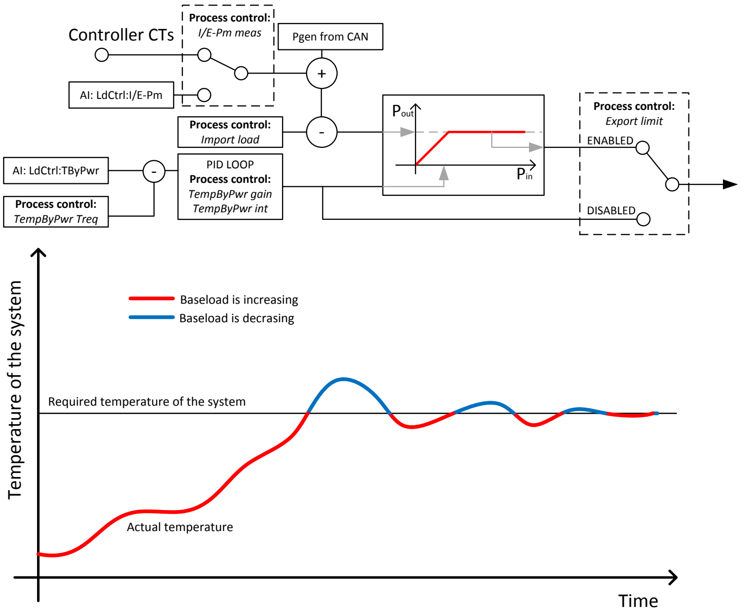
7.9.4 ANEXT IMP/EXP

Following diagram shows the way of calculation of requested gen-set group active power if **ProcessControl**:*Mload ctrl PtM* = ANEXT IMP/EXP.



7.9.5 T BY PWR

Following diagram shows the way of calculation of requested gen-set group active power if **ProcessControl**:*Mload ctrl PtM* = T BY PWR.



7.9.6 Managing system load control modes

It may be very complex task to select correct mode of operation for the whole system to meet all the requirements. This is a short guide that should illustrate which mode to select when particular requirements are to be fulfilled. There are graph examples of the operation for each setting.

First of all there are two different groups of load control – it is given by **ProcessControl:***SysLdCtrl PtM*. If you choose BASELOAD, InteliMains does not take part in Load sharing (load control is determined by InteliGen or InteliSys gen-set controller). If you choose LDSHARING, then InteliMains is determining System baseload for the gen-set group and plays active role in load sharing. If LDSHARING is chosen, it is possible to choose from several modes available.

SYSBLD ->LS: in this mode the function is similar to the function when BASELOAD is chosen but InteliMains acts as a master for the gen-set group. In this mode of operation ProcessControl:#SysBaseLoad is shared amongst gen-sets. Moreover, thanks to InteliMains measurement of Mains power, it is possible to employ also import/export limit so if the load demand goes down and export is not allowed, system baseload is lowered so there is no export or just limited export.

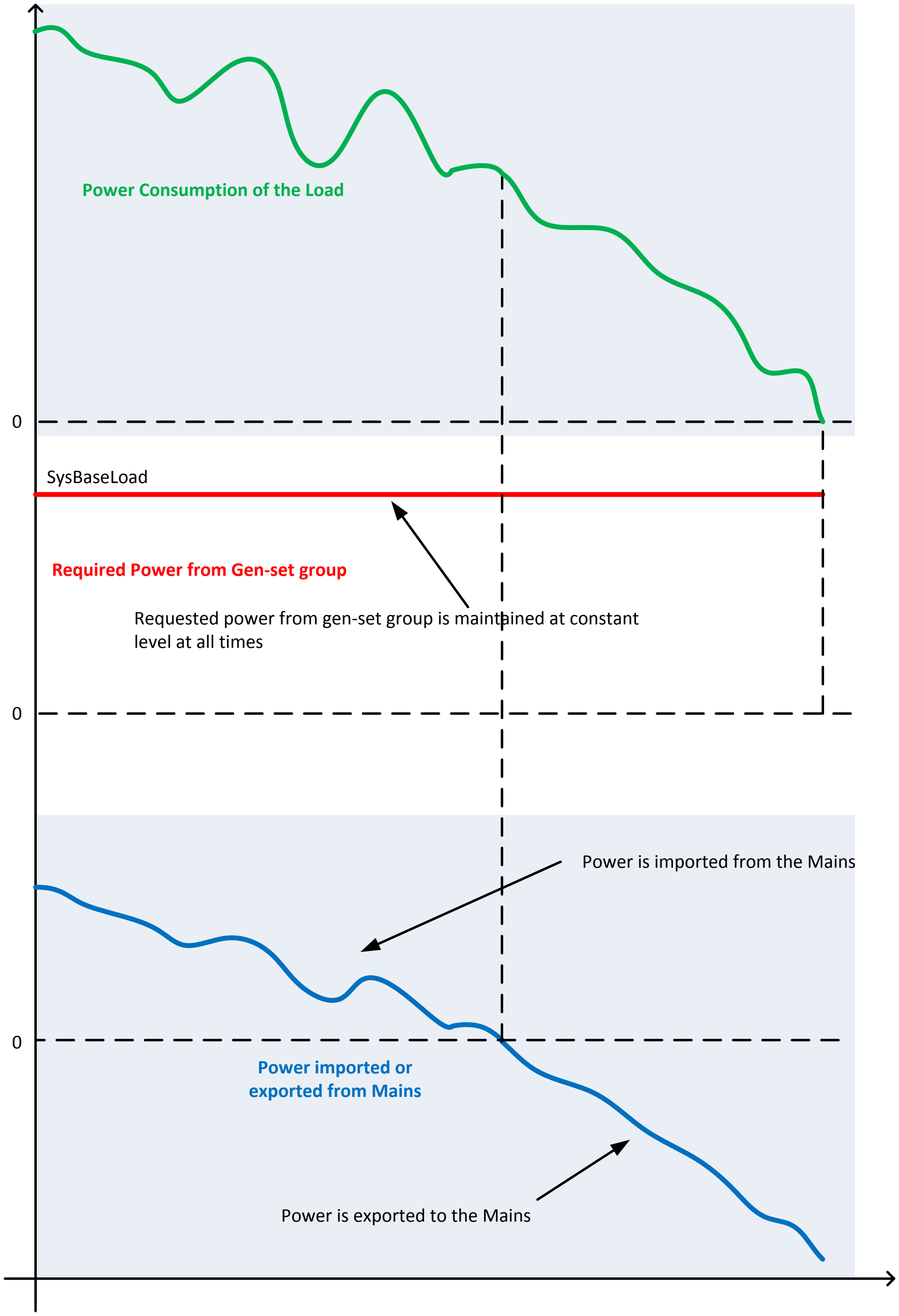
ANEXTSYSBLD ->LS: this mode works the same way as the previous one but its system baseload value is determined by external input (e.g. third party device providing required power of the system).

IMP/EXP: in this mode it is possible to adjust required import from or export to Mains. SysBaseLoad is internally changed so import or export value remain constant (adjusted by setpoint).

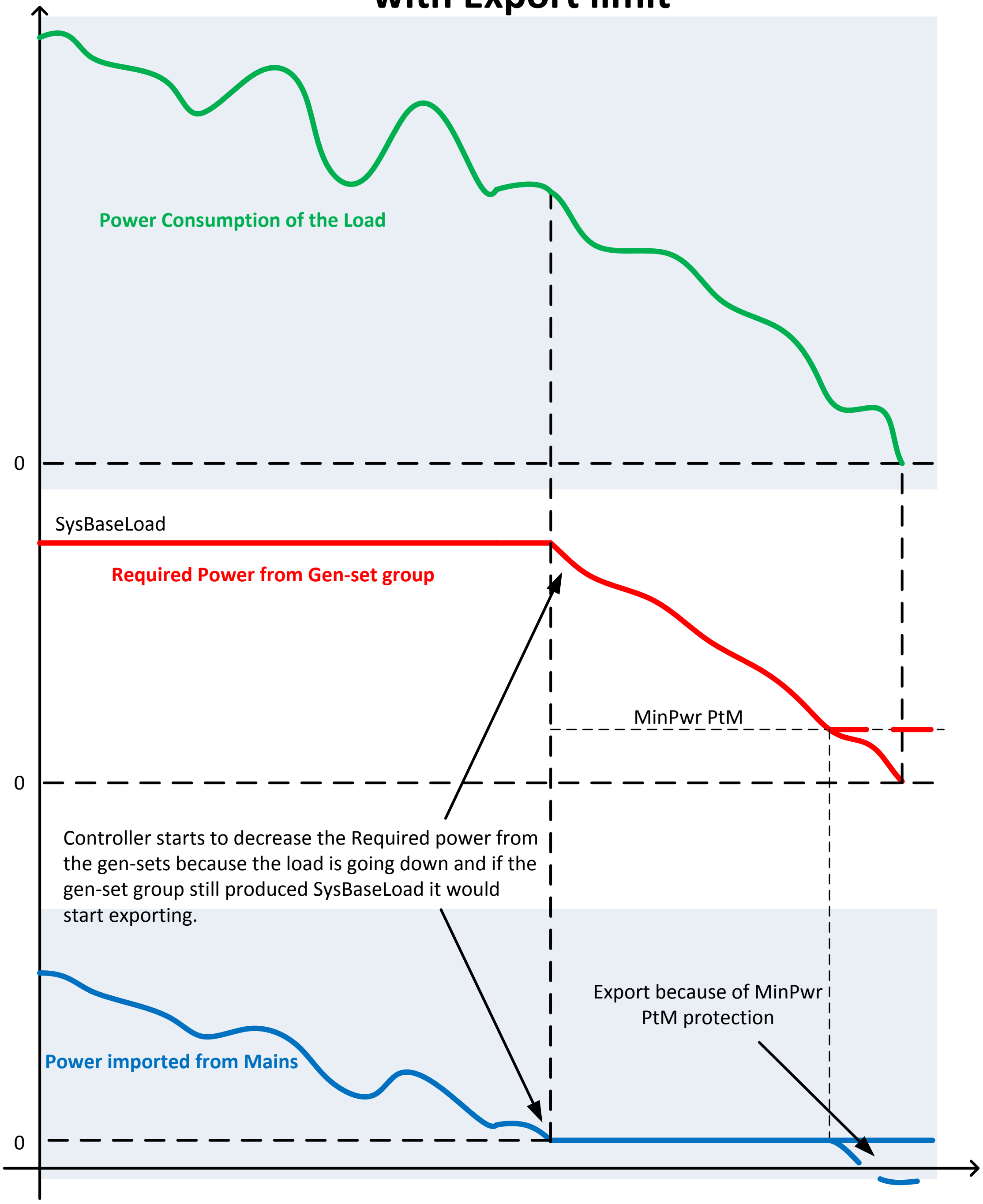
ANEXT IMP/EXP: this mode works the same way as the previous one but its import/export required power is determined by external input (e.g. third party device providing required import/export value of the system)

T BY PWR: in this mode the system baseload is determined by internal PID regulation loop based on temperature measured from external device and connected to the controller via analog input. It is possible to use also Import or Export limiting function which limits system baseload determined by T BY PWR function so there is no export to the Mains where it is not allowed.

SysBaseLoad ->LS

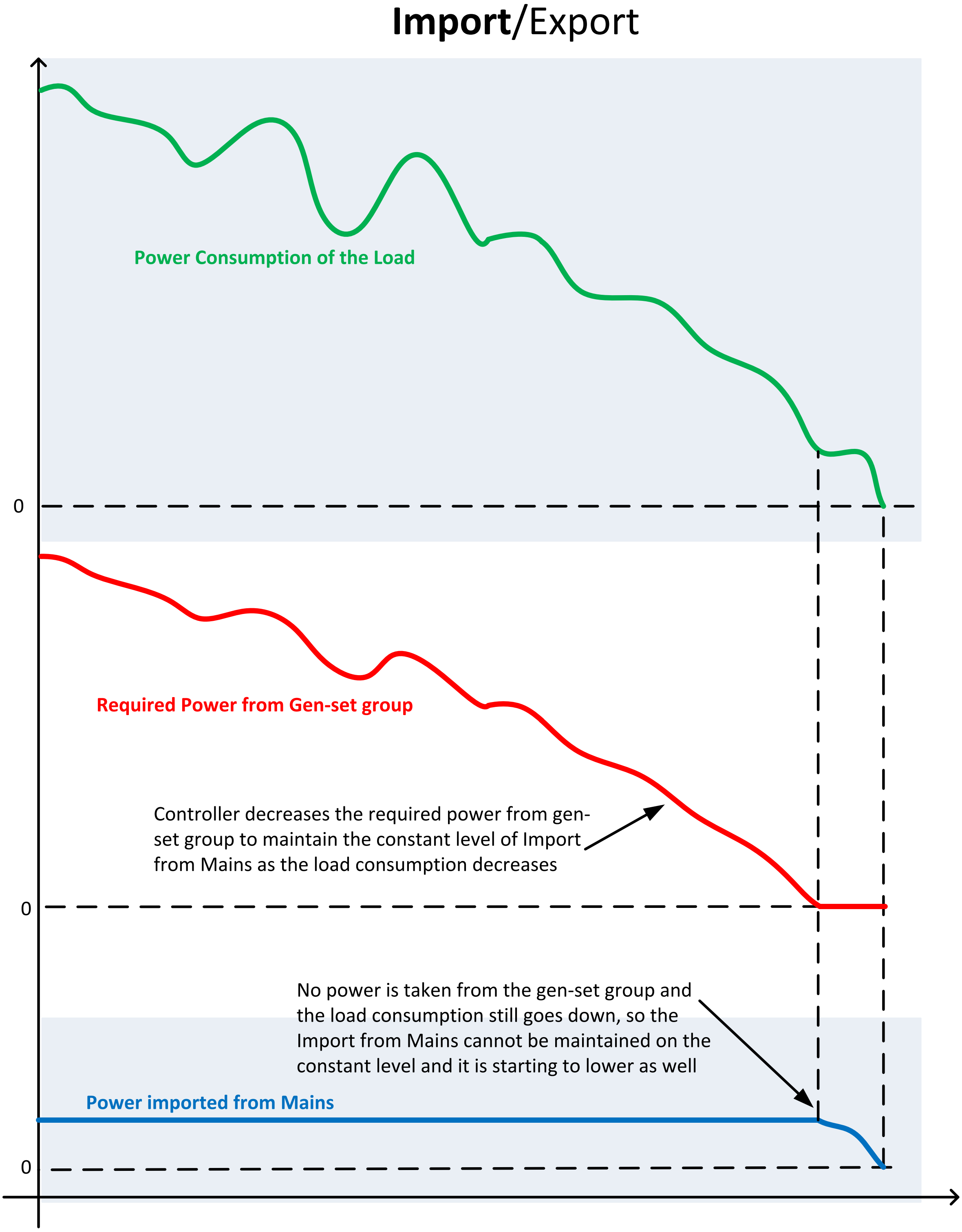


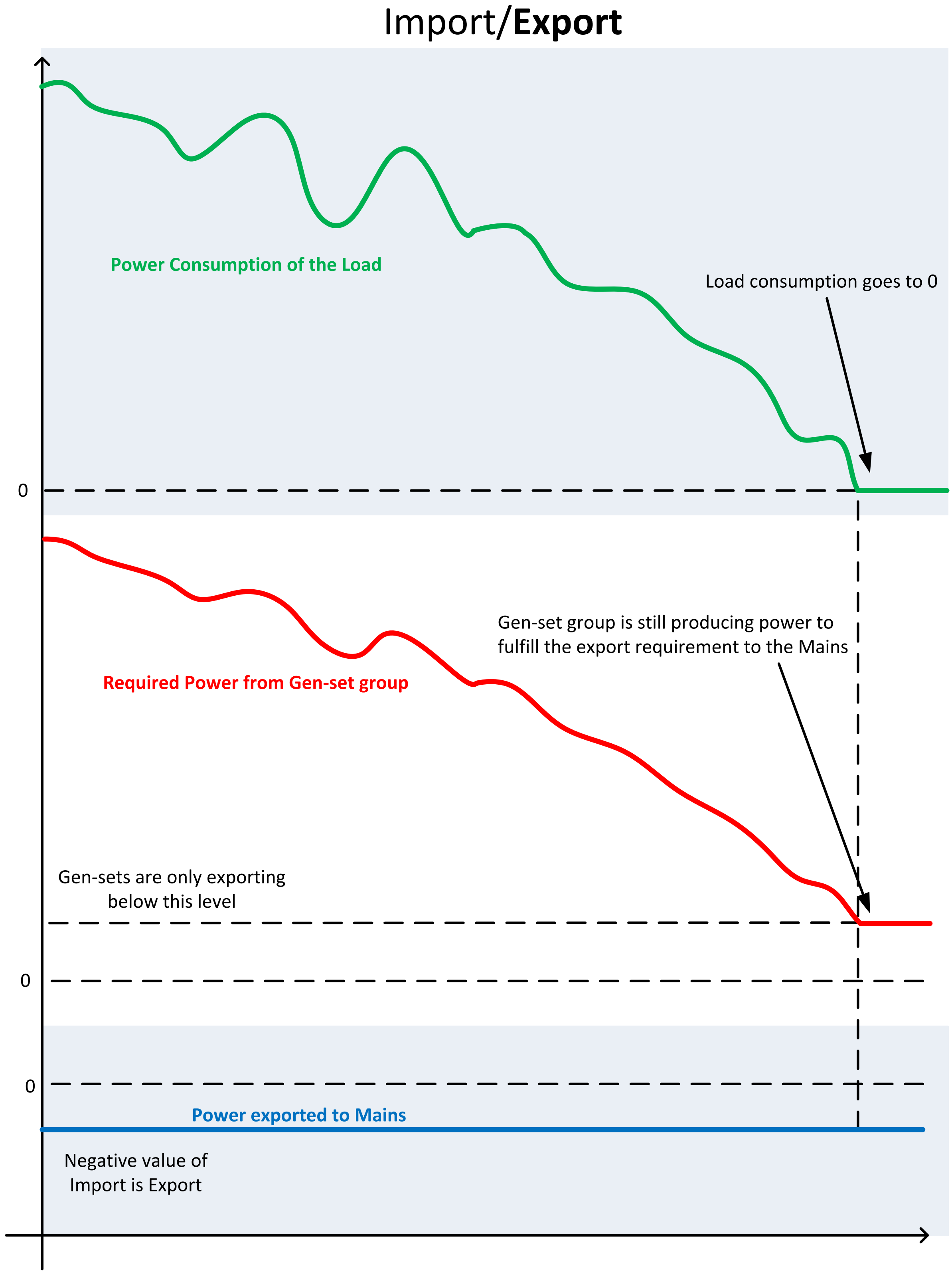
SysBaseLoad ->LS with Export limit



Controller starts to decrease the Required power from the gen-sets because the load is going down and if the gen-set group still produced SysBaseLoad it would start exporting.

Export because of MinPwr PtM protection


Import/Export
Power Consumption of the Load
0
Required Power from Gen-set group
Controller decreases the required power from gen-set group to maintain the constant level of Import from Mains as the load consumption decreases
0
No power is taken from the gen-set group and the load consumption still goes down, so the Import from Mains cannot be maintained on the constant level and it is starting to lower as well
Power imported from Mains
0


Import/Export
Power Consumption of the Load
Load consumption goes to 0
0
Gen-set group is still producing power to fulfill the export requirement to the Mains
Required Power from Gen-set group
Gen-sets are only exporting below this level
0
0
Power exported to Mains
Negative value of Import is Export

7.10 System PF control modes

System PF control modes are determined by setpoints **ProcessControl**:*PF ctrl PtM* and *SysPFCtrl PtM*.

If **ProcessControl:***#SysPFCtrl PtM* is set to BASEPF, then Gen-set group requested power factor is not determined by InteliMains but it is given by setpoint **ProcessControl:***#SysPwrFactor* regardless of **ProcessControl:***PF ctrl PtM* setting.

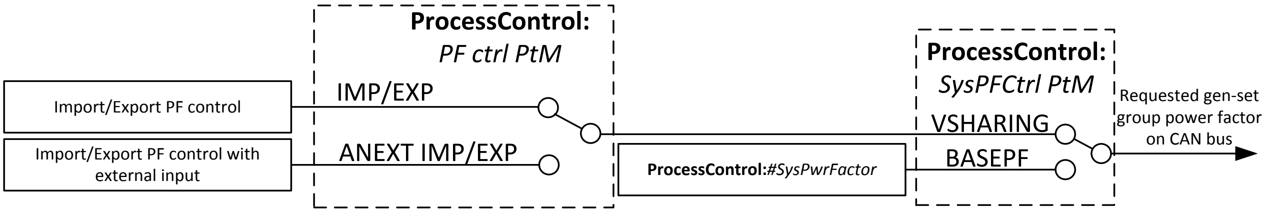
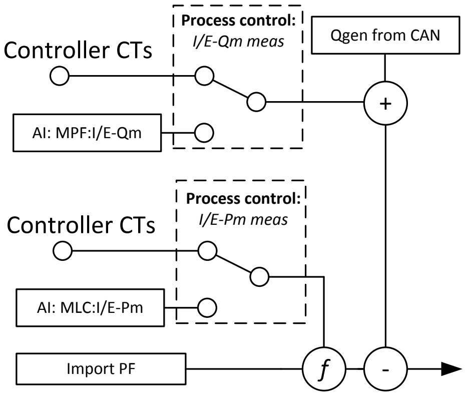


Figure: General schematic of system power factor control modes in gen-set group with InteliMains

Determination of actual value of requested gen-set group reactive power for various settings of **ProcessControl:***PF ctrl PtM* is shown in separate diagrams below. The block "f" represents the function of calculation of Q from PF and P.

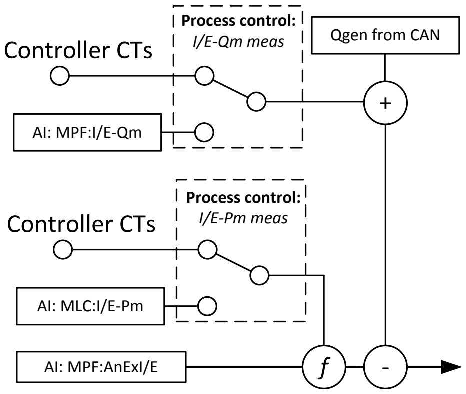
7.10.1 PF IMP/EXP

Following diagram shows the way of calculation of requested gen-set group reactive power if **ProcessControl**:*PF ctrl PtM* = PF IMP/EXP.



7.10.2 PF ANEXT IMP/EXP

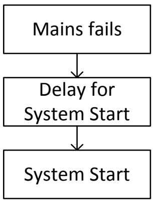
Following diagram shows the way of calculation of requested gen-set group reactive power if **ProcessControl**:*PF ctrl PtM* = PF ANEXT IMP/EXP.



7.11 Automatic Mains Failure function

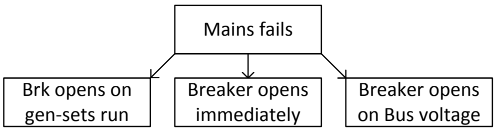
InteliMains MCB or MGCB application contains complex AMF function. There are several setpoints that allows user to adjust the function behavior. Detailed description is below.

When the Mains fail (Mains failure is determined based on existing fixed or custom protections that are set to be Mains protect or Mains protect with Reset – for more information on protection types please refer to the chapter Protections and Alarm management) the system is started with adjustable delay (**AMF setting:***EmergStart*



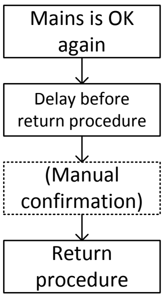
del) – i.e. logical binary output Sys start/stop activates. This output should be wired (or shared via CAN) to gen-set controllers logical binary input Sys start/stop.

In some cases it may be crucial to choose when the MCB opens after Mains failure (i.e. when there is protection of Mains protect or Mains protect with Reset type active). It is possible to choose whether the breaker opens directly when Mains failure is detected or when there is healthy bus voltage detected (MGCB only) or when there is at least one gen-set running. This is done via setpoint **AMF setting:***MCB opens on.*



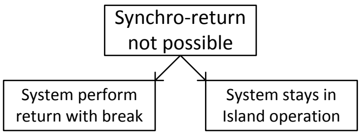
When the Mains parameters become OK again it is possible to adjust the delay time which must elapse before InteliMains starts the return to Mains procedure. This delay is adjusted by **AMF setting:***Mains ret del.* This function is particularly useful when the Mains fail happens several times in a row with short period of Mains being OK.

It is also possible to choose option that return to Mains needs manual confirmation before InteliMains starts the return procedure. You can choose this by setpoint **AMF setting:***RetFromIsland*. For the full description of manual confirmation of return procedure refer to the decription of the setpoint.

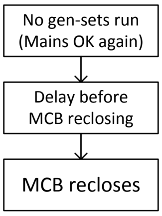


By default return to Mains (when the Mains parameters are OK again and **AMF setting:***Mains ret del* elapses) is done by reverse synchronization of gen-set group back to Mains, soft unload of gen-sets and opening of their GCBs or by opening MGCB (in case of MGCB application).

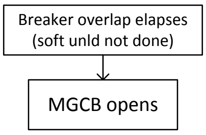
When it is not possible to synchronize to Mains (Parallel operation is not enabled, Synchronization is not enabled, Synchronization is unsuccesfull etc.), return with break may be enabled to ensure that the load returns to Mains even though parallel operation is not possible. **AMF setting:***ReturnWithIntr* enables the return with break (the duration of the break is given by the setpoint **AMF setting:***FwRet break*). If return with break is disabled and it is not (for whatever reason) possible to synchronize back to Mains, the systems stays running in Island operation even though the Mains is OK.



In some cases there may be no gen-sets running during the Mains fail (e.g. they are not able to start, not able to start in time, there may be alarms on all the gen-sets, they are not in AUT mode etc.). In this case AMF function recloses MCB back to healthy Mains after delay given by **AMF setting:***MCB close del* elapses.

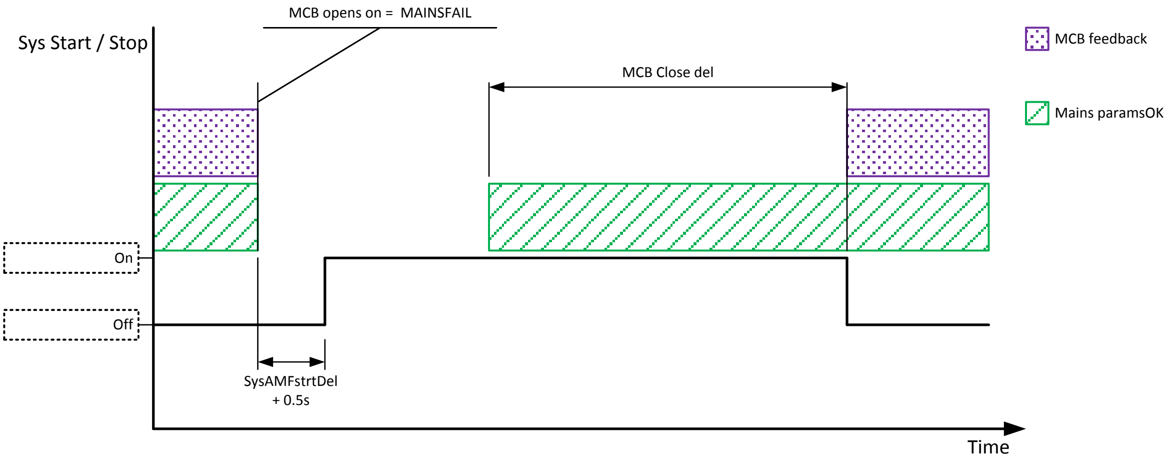


In MGCB application there is also setting for the duration of breaker overlap available. This time (given by the setpoint **AMF setting:***BreakerOverlap*) defines maximal time for run in parallel during return to once again healthy Mains (even though soft unloading is not completed, after **AMF setting:***BreakerOverlap* elapses the MGCB is opened regardless of load on gen-sets).



In the version IM-NT-3.1.0, there has been change in the behaviour of logical binary output Sys start/stop in AMF function. This behaviour prevents repetitive starting and stopping of gen-sets in case of fluctuating Mains parameters. The following diagram shows what the behaviour is now.

The change influences the situation when the Mains parameters are not OK, AMF start sequence is initiated but before gen-sets are capable to support the load Mains goes OK again. Previously the gen-sets were stopped immediately and the **AMF setting:***MCB close delay* was counted down. Now the gen-sets are kept in start sequence until the MCB is really closed. This prevents prolongued periods of time when the no power was delivered to the load if Mains parameters kept fluctuating, preventing continuous connection to Mains but also succesfull start and run of a gen-set group.



7.12 Regulation loops

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

<table>
<tr><td>FREQUENCY LOOP</td><td>The frequency loop is active in the following situations dependending on the application. For more information see the table below.
<table>
<tr><th>APPLICATION</th><th>FREQ GAIN AND FREQ INT SETPOINTS ARE ACTIVE DURING:</th></tr>
<tr><td>MCB</td><td>reverse synchronization of the gen-set group back to the mains</td></tr>
<tr><td>MGCB</td><td>forward or reverse synchronization of the gen-set group to the mains</td></tr>
</table>
See also setpoints: Sync/Load ctrl:<i>Freq gain</i> and Sync/Load ctrl:<i>Freq int</i>
When the Sync/Load ctrl:<i>Freq gain</i> is set to zero, this control loop is switched OFF.</td></tr>
<tr><td>ANGLE LOOP</td><td>The differential angle control loop is active during the synchronization (see Frequency loop above) when the "near to zero" slip frequency has been successfully achieved and then the differential angle between bus and mains voltage shall be controlled to the value adjusted by the setpoint Sync/Load ctrl:<i>BtoM AngleReq</i>.
See also setpoint: Sync/Load ctrl:<i>Angle Gain</i></td></tr>
<tr><td>LOAD CONTROL LOOP</td><td>This regulation loop is active if setpoint ProcessControl:<i>SysLdCtrl PtM</i> is set to LDSHARING.
Requested power is regulated depending on the setting of ProcessControl:<i>MLoad ctrl PtM</i>.</td></tr>
<tr><td>VOLTAGE LOOP</td><td>The Voltage loop is active in the following situations dependending on the application. For more information see the table below.</td></tr>
</table>

<table>
<tr><td></td><td><table><tr><th>APPLICATION</th><th>VOLTAGE GAIN AND VOLTAGE INT SETPOINTS ARE ACTIVE DURING:</th></tr><tr><td>MCB</td><td>reverse synchronization of the gen-set group back to the mains</td></tr><tr><td>MGCB</td><td>forward or reverse synchronization of the gen-set group to the mains</td></tr></table>See also setpoints: Volt/PF ctrl:<i>Voltage gain</i> and Volt/PF ctrl:<i>Voltage Int</i>
When the Voltage gain is set to zero, this control loop is switched OFF.</td></tr>
<tr><td>COS-PHI LOOP</td><td>This regulation loop is active if setpoint ProcessControl:<i>SysPFCtrl PtM</i> is set to VSHARING.
ProcessControl:<i>SysLdCtrl PtM</i> should be swithed to LDSHARING.
The IM power factor control mode is selected by the setpoint ProcessControl:<i>PF ctrl PtM</i>.
ProcessControl:<i>MLoad ctrl PtM</i> should be set to the same value as ProcessControl:<i>PF ctrl PtM</i>. Due to this Cos-phi regulation loop can be active only in the Import/Export mode.</td></tr>
</table>

7.12.1 PI regulation adjustment

The regulation loops have two adjustable factors: P-factor and I-factor (except angle regulation loop, which has P-factor only). The P-factor (gain) influences the stability and overshoot of the regulation loop and the I-factor influences the steady-state error as well as the settling time. See the picture below for typical responses of a PI regulation loop.

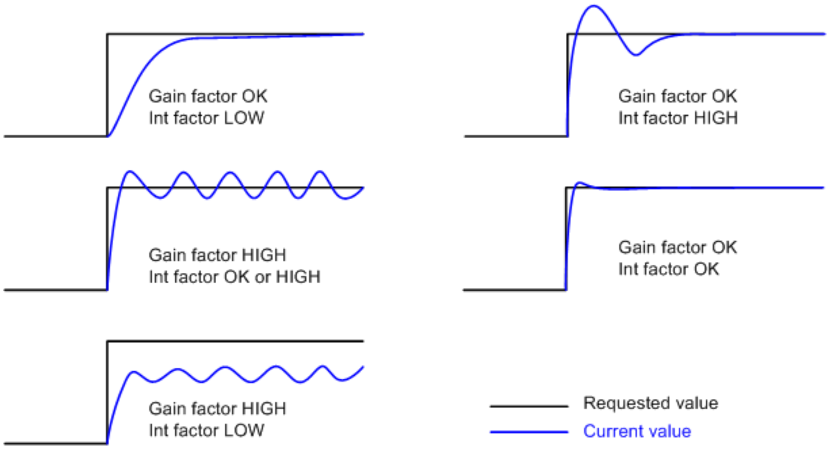


Figure: Typical responses of a PI regulator

For manual tunning of a control loop use following method:

1. Set both the I-factor and P-factor to 0.
2. Increase the P-factor slightly until the system starts to oscillate.
3. Adjust the P-factor back to approx. one half of the value where the oscillations started.
4. Increase the I-factor slightly to achieve optimal resulting response.

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

CAUTION!

Be ready to press emergency stop button in case the regulation loop would start to behave unacceptable while it is beeing adjusted.

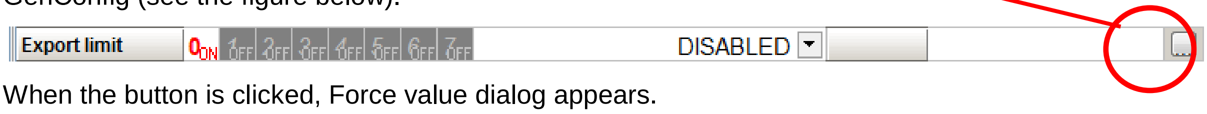
7.13 Force value – step by step guide

In this chapter there is complete step by step guide which shows how to use Force value function of the controller.

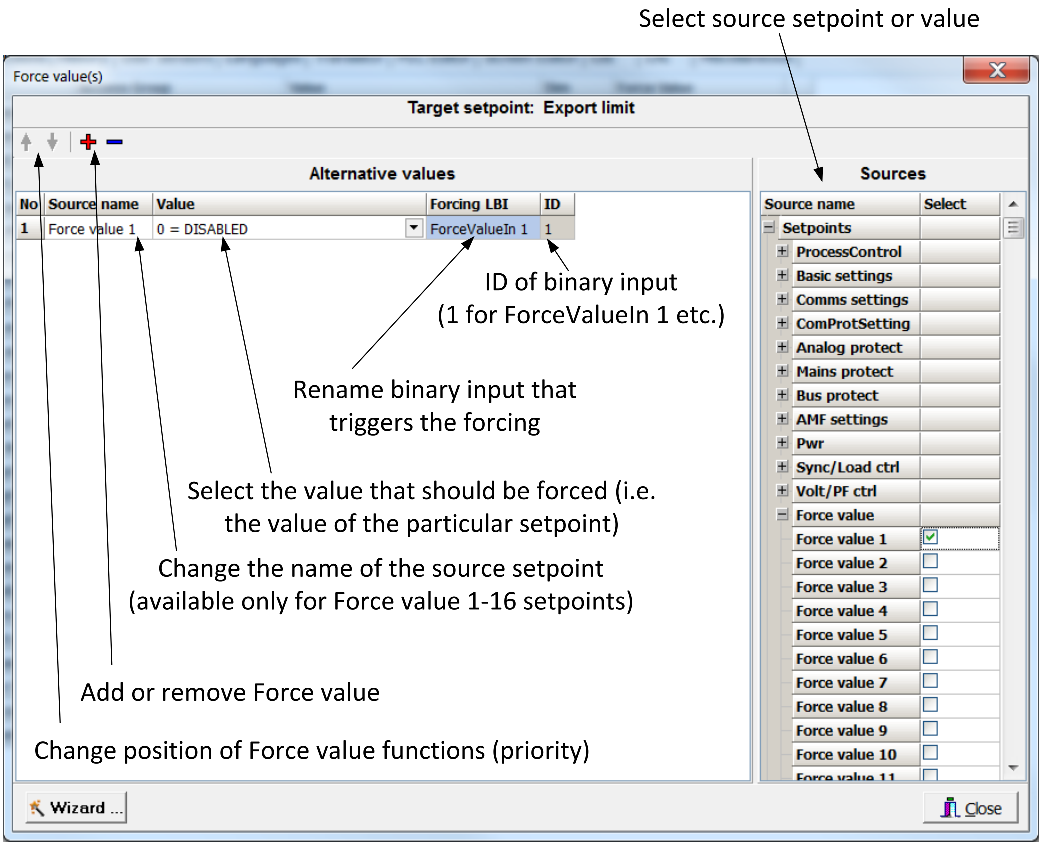
Forcing of values is used to change particular setpoint temporarily by activation of related Binary Input. This is used to change function of controller under given conditions (e.g. there are two different periods during the day when Export limit given by distribution network is required or not).

WARNING!
Setpoints must not be written **continuously** (e.g. via Modbus connection)! If continuous change of setpoints is required, combination of External values and Force value function needs to be used. The memory that holds setpoints is designed for up to 10^5 writings. Than memory may be damaged!

Setpoints that are available for forcing may be identified by Force value button on the right side in GenConfig (see the figure below).



When the button is clicked, Force value dialog appears.



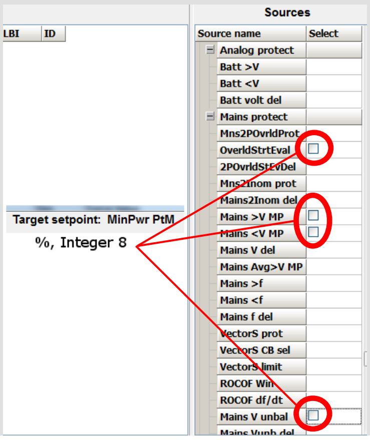
No	Source name	Value	Forcing LBI	ID
1	Force value 1	0 = DISABLED	ForceValueIn 1	1

For example if we add **Force value:***Force value 1* to be forced to **ProcessControl:***Export limit* as value 0 (DISABLED) by Binary Input FORCEVALUEIN 1 we can change the function of Export limit from ENABLED to DISABLED by activation of FORCEVALUEIN 1. It is possible to rename the setpoint to e.g. **Force value:***ExportDisabled* and Binary Input as well to e.g. DISABLEEXPLIM. The function will not change (only the corresponding names).

It is possible to use several force value functions for one setpoint. If more than one forcing Binary Input is active, the one with the highest position (lowest number in the Force value dialog) is used.

It is possible as well to use one Binary Input to force multiple setpoints (e.g. in case of complex function change).

NOTE:
It is possible only to force value or setpoint into other setpoint if their dimension and range are the same (e.g. only value with dimension in hours and which is Integer 16 can be force valued to a setpoint with dimension hours and which is as well Integer 16). You may use PLC block Convert to change the dimension and range if needed.



Target setpoint: MinPwr PtM

%, Integer 8

7.14 Values for continuous writing from external sources

This function is especially designed for continuous writing of setpoints from external sources (e.g. via Modbus connection).

WARNING!
Setpoints must not be written **continuously** (e.g. via Modbus connection)! If continuous change of setpoints is required, combination of External values and Force value function needs to be used. The memory that holds setpoints is designed for up to 10^5 writings. Than memory may be damaged!

It is possible to use up to four different External values for continuous writing from external sources. The values are adjusted by setpoints in **Force value** group. Default (also initial) value may be adjusted, rate of change of *ExtValueX* (by Binary Inputs EXTVALUEX UP and EXTVALUEX DOWN) can be adjusted as well as high and low limit of the value.

There are two way, how to adjust External values. One is using Binary Inputs mentioned above. Second one is to write the value directly using e.g. Modbus. External values then may be converted using PLC block convert and force into setpoint which is then continuously forced (**note: NOT WRITTEN**) by the value of ExtValueX. This way internal memory is safe and no damage may occur.

External values are reverted back to their default (initial) value (given by corresponding setpoint) when Binary Input for their reset is active (and they change to the previous value after Binary Input deactivates). When the Binary Input is active the External value cannot be changed by Modbus writing or by using Binary Inputs for up and down value.

NOTE:
External values are not available for external writing when any Binary Input (up, down or reset) related to them is active.

Note also that when the controller is reset (powered down and up again), all external values are reverted back to their default (initial) values.

HINT
For information on how to write (or read) objects from controller via Modbus, please refer to the latest Communication guide for InteliGen and InteliSys.

7.15 General Purpose Timers

There are 16 general-purpose timers in the controller, each 4 of them are joined together to one output. That means there are 4 fully independent timer blocks including 4 timer channels each. The combined outputs from the timer blocks are *TimerAct 1-4*, *TimerAct 5-8*, *TimerAct 9-12* and *TimerAct 13-16*.

The timers are intended for scheduling of any operations such as e.g. periodic tests of the gen-set, scheduled transfer of the load to the gen-set prior to an expected disconection of the mains etc. Each timer channel can be activated only once within a single day. The activation time and duration of each channel is adjustable (both as hh:mm).

7.15.1 Timer modes

Available modes of each timer:

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

The mode of each timer channel is adjusted by an assigned setpoint. The setpoints are located int the **Timer settings** group and can be adjusted via InteliMonitor and GenConfig.

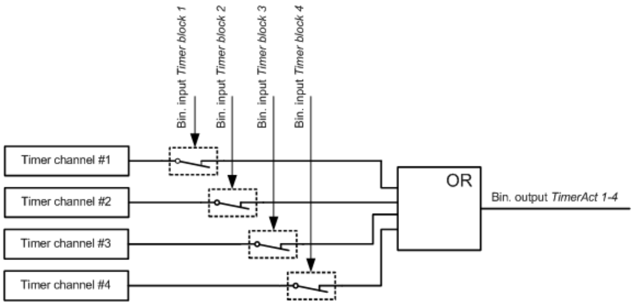
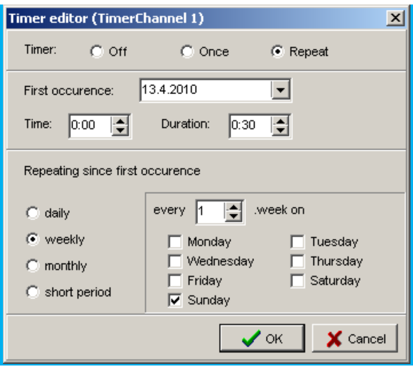


Figure: Principial scheme of one block containing 4 timers

EXAMPLE:

Below is an example how to use the timers for periodic tests of the gen-set performed every sunday with duration of 30 minutes and also for scheduled transfer of the load before expected mains failure announced by the local electricity distribution company to 1.5.2010 from 01:00 to 04:00.

1. The output *TimerAct 1-4* is configured internally in GenConfig (LBI tab) to the logical binary inputs *Remote TEST* and *Test on load*.
2. The setpoint **Timer settings:***TimerChannel 1* is adjusted to "repeated" mode, "weekly" period, only sundays, starting date/time next sunday at 0:00, timer duration 0:30 min.



Timer: ○ Off ○ Once ● Repeat

First occurence: 13.4.2010

Time: 0:00 Duration: 0:30

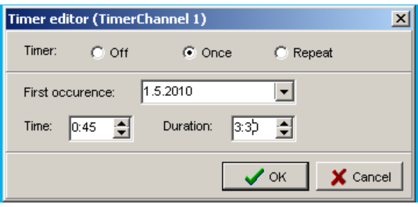
Repeating since first occurence

○ daily
● weekly
○ monthly
○ short period

every 1 .week on

☐ Monday ☐ Tuesday
☐ Wednesday ☐ Thursday
☐ Friday ☐ Saturday
☑ Sunday

3. The setpoint **Timer settings:***TimerChannel 2* is adjusted to "once" mode, starting date/time 1.5.2010 at 01:00, timer duration 3:00 hrs.



Timer: ○ Off ● Once ○ Repeat

First occurence: 1.5.2010

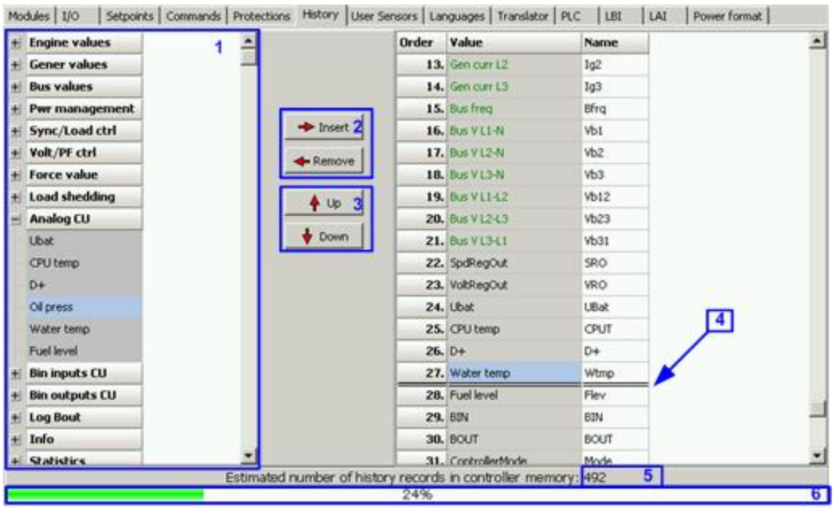
Time: 0:45 Duration: 3:30

7.16 History Related functions

7.16.1 History Records Adjustment

It is possible to change History records content. Each record contains date, time and cause of the record as obligatory columns. The rest of columns are configurable.

The history record structure has two parts. The upper part is so-called fast and is written into the history memory immediately in the moment when the written event occurs. The rest of the record may be written with a delay max. 100ms. The fast part is intended for fast changing values as e.g. currents, voltages or power. The parts are separated by a line in the record content list.



Order	Value	Name
13.	Gen curr L2	Ig2
14.	Gen curr L3	Ig3
15.	Bus freq	Bfrq
16.	Bus V L1-N	Vb1
17.	Bus V L2-N	Vb2
18.	Bus V L3-N	Vb3
19.	Bus V L1-L2	Vb12
20.	Bus V L2-L3	Vb23
21.	Bus V L3-L1	Vb31
22.	SpdRegOut	SRO
23.	VoltRegOut	VRO
24.	Ubat	UBat
25.	CPU temp	CPUT
26.	D+	D+
27.	Water temp	Wtmp
28.	Fuel level	Flev
29.	BIN	BIN
30.	BOUT	BOUT
31.	ControllerMode	Mode

Estimated number of history records in controller memory: 492

24%

1. Values selection tree
2. Buttons for adding/removing values into/from the record structure
3. Buttons for ordering of the values in the record structure
4. Fast history separator. The fast part is located above the separator
5. Estimated number of records depending on record size
6. Record capacity usage indicator

NOTE:
Values that are displayed in green color are recomended to be placed in the fast part.

If the checkbox Add modules to history automatically.. in the Modules tab is checked then all values of a module are automatically added into the history record when the module is inserted into the configuration.

7.16.2 Time Stamp function

The controller allows user to define when the history records are written even though there is no other reason for history record (so called Time Stamp).

It is possible to disable time stamping function (for example when time stamping is not needed and just floods the history). It may be conditioned by activation of logical Binary Input function (TIME STAMP ACT) or it may be enabled always.

Period of time stamping may be adjusted from 1 to 240 minutes.

NOTE:
Beware of History flooding by to many Time Stamps (vital information may be overwritten).

7.16.3 Time and Date Intercontroller Sharing

Time and Date are used mainly for History records. These values are shared between controllers that are connected to CAN. When the value is changed in one controller, it sends its new value to all other controllers that are connected to the same CAN bus and they update their time and date values and setpoints accordingly.

7.16.4 Summer Time Mode

Summer Time Mode function may be enabled and disabled by user. It is possible to set if the controller is located in the northern or southern hemisphere as well.

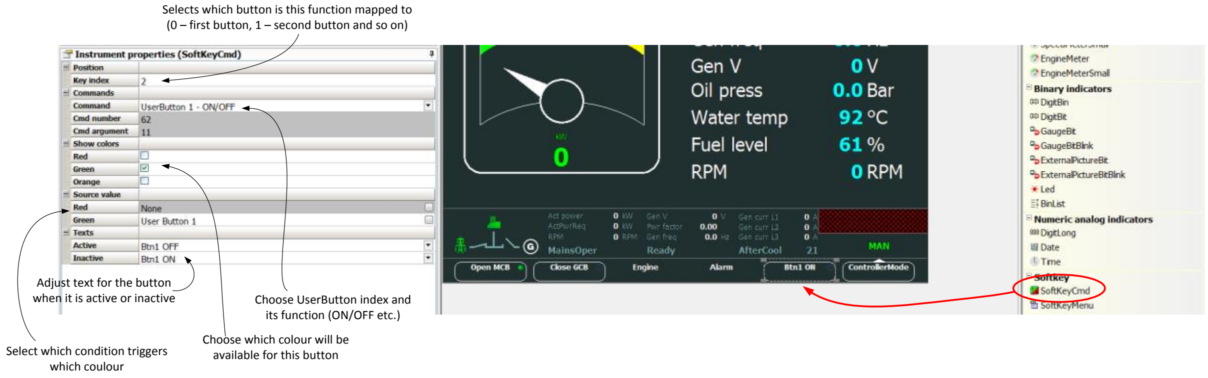
SummerTimeMode implemented in ComAp controllers is based on CET summer time which means:

- Clock goes forward 1 hour at 2:00 a.m. on the last Sunday in March
- Clock goes backwards 1 hour at 3:00 a.m. on the last Sunday in Octorber

NOTE:
Please be aware that in other regions summer time adjustments may be done in different time.

7.17 User Buttons

There are several User Buttons available in the controller. It is possible to set them on Soft Buttons in InteliVision 5 or 8.



Instrument properties (SoftKeyCmd)

Position	
Key index	2
Commands	
Command	UserButton 1 - ON/OFF
Cmd number	62
Cmd argument	11
Show colors	
Red	☐
Green	☑
Orange	☐
Source value	
Red	None
Green	User Button 1
Texts	
Active	Btn1 OFF
Inactive	Btn1 ON

Selects which button is this function mapped to (0 – first button, 1 – second button and so on)

Choose UserButton index and its function (ON/OFF etc.)

Choose which colour will be available for this button

Select which condition triggers which coulour

Adjust text for the button when it is active or inactive

Available functions for soft buttons are listed in the following table.

ON	Pressing the button changes the state of log. Binary Output USER BUTTON X to closed. When the output is closed and the button is pressed state is not changed.
OFF	Pressing the button changes the state of log. Binary Output USER BUTTON X to opened. When the output is opened and the button is pressed state is not changed.
ON/OFF	Pressing the button changes the state of log. Binary Output USER BUTTON X to opened or closed depending on previous state (it is changed to the opposite state).
PULSE ON	Pressing the button issues log. Binary Output USER BUTTON X to close for the time given by setpoint **Basic settings:***UserBtn pulse* (from 0.2s to 10s). **NOTE:** Repeated pressing of button during the closed period causes issuing other puls of length of the given length to be generated from the moment of button pushing.

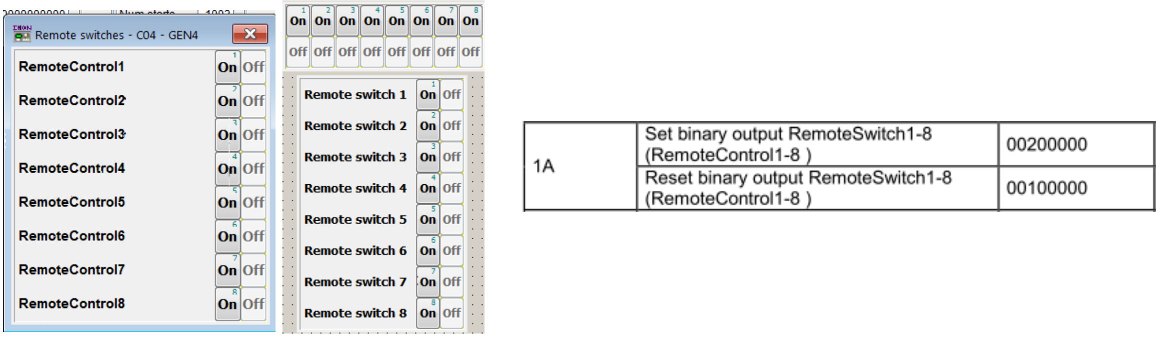
HINT

It is possible to lock User Button with password (go to tab Commands in GenConfig). User Buttons 1-5, 6-8 and 9-16 can be locked separately. It is also possible to use User Buttons in SCADA diagrams.

7.18 Remote Control Function

It is possible to remotely control several Binary Outputs in the controller. You can either use Remote Switches tool in InteliMonitor (select Remote switches in menu for corresponding controller), import Remote Switches tool to a SCADA diagram in Line Diagram Editor or use external device via Modbus (register #46361 and command #26 (1A hex), for more information on Modbus please refer to the InteliGen/InteliSys Communication guide).

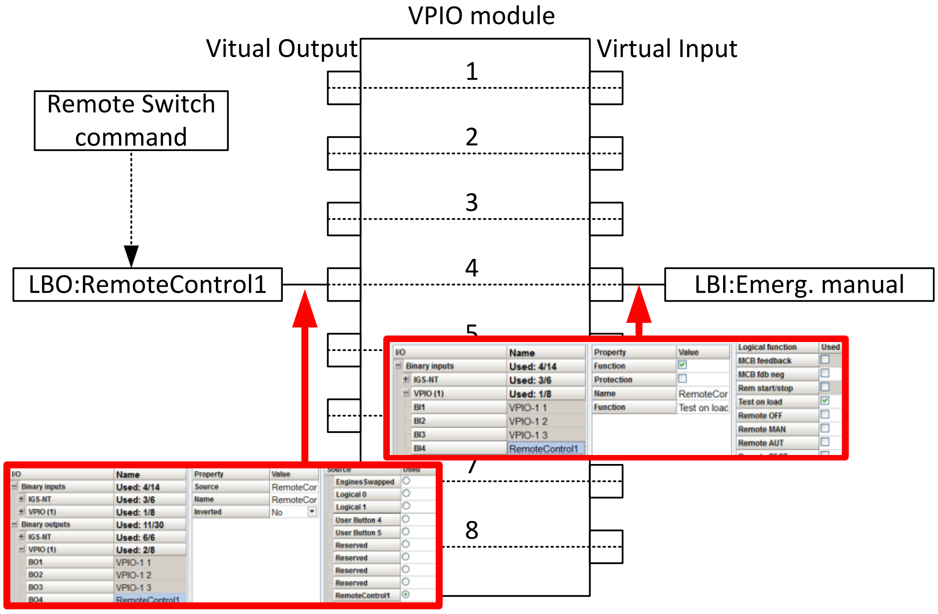
Remote Switch will activate or deactivate depending on remote control so it can be used to manually control devices, simulate malfunctions while commissioning etc.



1A	Set binary output RemoteSwitch1-8 (RemoteControl1-8)	00200000
	Reset binary output RemoteSwitch1-8 (RemoteControl1-8)	00100000

Figure: Remote Switches tool in InteliMonitor, Remote Switches tools in Line Diagram Editor and Mobus commands

Remote Switches may be easily used to trigger logical Binary Input function and all other related functions as normal switch on Binary Input. Module VPIO (Virtual Peripheral Inputs- Outputs) can be added to configuration and it will copy the state of Remote Switch on virtual output to its counterpart virtual input. Refer to the figure below for example.



I/O	Name
Binary inputs	Used: 4/14
IGS-NT	Used: 3/6
VPIO (1)	Used: 1/8
BI1	VPIO-1 1
BI2	VPIO-1 2
BI3	VPIO-1 3
BI4	RemoteControl1

Property	Value
Function	☑
Protection	☐
Name	RemoteCor
Function	Test on loac

Logical function	Used
MCB feedback	☐
MCB fdb neg	☐
Rem start/stop	☐
Test on load	☑
Remote OFF	☐
Remote MAN	☐
Remote AUT	☐

I/O	Name
Binary inputs	Used: 4/14
IGS-NT	Used: 3/6
VPIO (1)	Used: 1/8
Binary outputs	Used: 11/30
IGS-NT	Used: 6/6
VPIO (1)	Used: 2/8
BO1	VPIO-1 1
BO2	VPIO-1 2
BO3	VPIO-1 3
BO4	RemoteControl1

Property	Value
Source	RemoteCor
Name	RemoteCor
Inverted	No

Source	Used
EnginesSwapped	○
Logical 0	○
Logical 1	○
User Button 4	○
User Button 5	○
Reserved	○
Reserved	○
Reserved	○
Reserved	○
RemoteControl1	●

Figure: Using of Remote Switches to trigger logical binary inputs

7.19 Virtual Peripheral Inputs-Outputs (VPIO) module

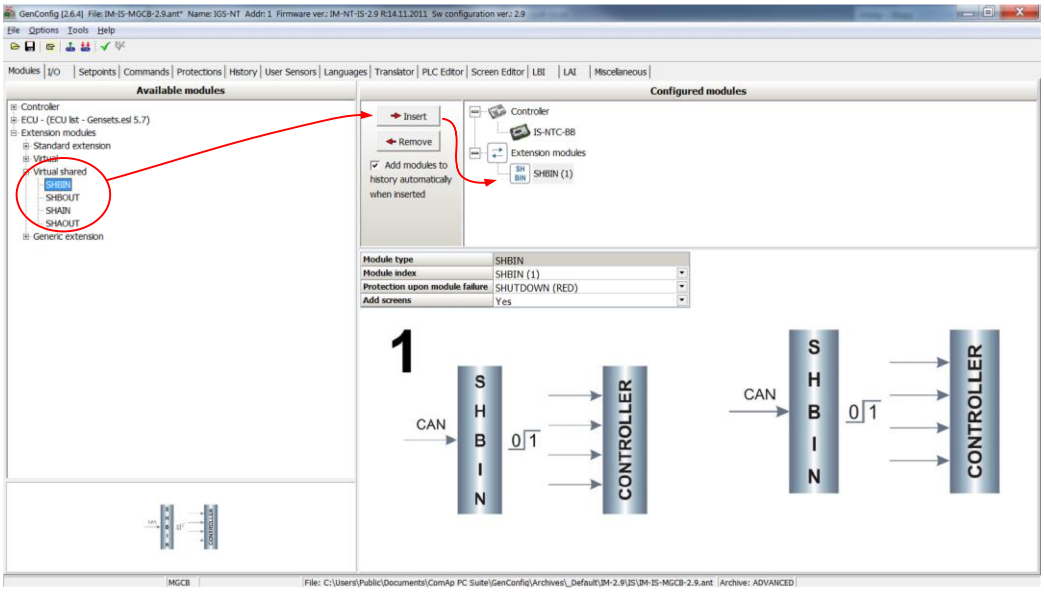
For InteliMains there are several modules available. One of them is Virtual Peripheral Inputs-Outputs module which is particularly usefull for connection of logical Binary Output functions to logical Binary Input functions. This way internal controller function may easily trigger other internal controller functions without unnecessary wiring or usage of PLC functions.

Module is functioning the same way as normal module with 8 outputs and 8 inputs, but the difference is, that each input copies its counterpart output. It is possible to select any logical Binary Output function for one of the outputs of VPIO module. Inputs on VPIO module work the same way as standard input of the controller (i.e. it can be assigned function and protection).

For example of this function please refer to the chapter Remote Control function.

7.20 Shared Inputs and Outputs

InteliMains uses the same type of Shared Inputs and Outputs (SHBOUT, SHBIN, SHAIN and SHAOUT modules) as InteliGen and InteliSys. Thanks to this, it is possible to share Binary and Analog values between all the controllers via CAN bus, thus saving physical Inputs and Outputs and excess wiring.



GenConfig [2.6.4] File: IM-IS-MGCB-2.9.ant* Name: IGS-NT Addr: 1 Firmware ver.: IM-NT-IS-2.9 R:14.11.2011 Sw configuration ver.: 2.9

☑ Add modules to history automatically when inserted

Module type	SHBIN
Module index	SHBIN (1)
Protection upon module failure	SHUTDOWN (RED)
Add screens	Yes

MGCB

File: C:\Users\Public\Documents\ComAp PC Suite\GenConfig\Archives_Default\IM-2.9\IS\IM-IS-MGCB-2.9.ant Archive: ADVANCED

Figure: Adding of various modules

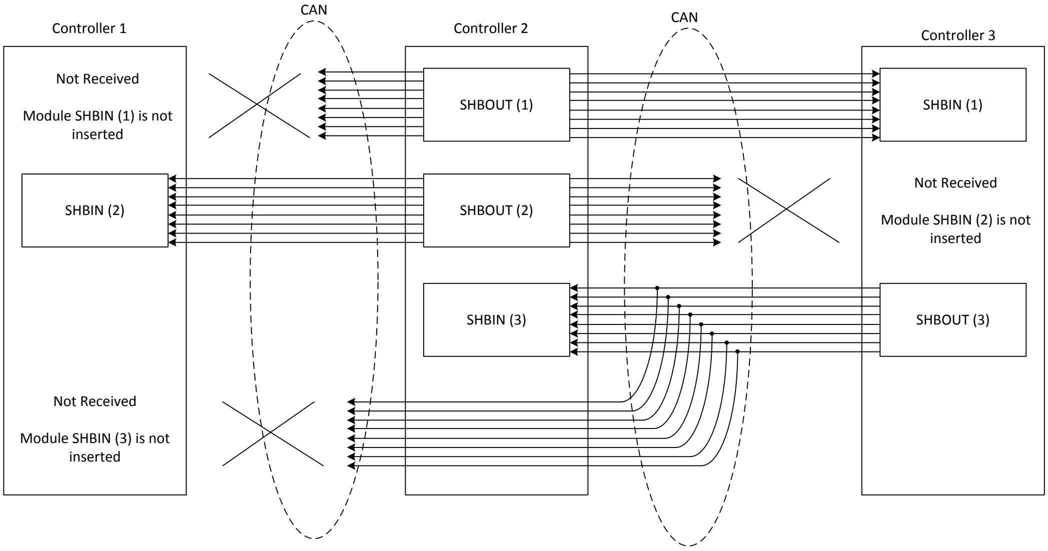


Figure: Principal Scheme (same for shared Binary I/O and shared Analogue I/O

Shared Binary Inputs and Outputs may be used exactly in the same way as standard physical Inputs and Outputs. If SHBIN or SHAIN modules are configured, at least one corresponding module of SHBOUT or SHAOUT (respectively) is needed. If it is not configured, corresponding protection appears because SHBIN or SHAIN will be missing. See the figure below for more information.

NOTE:

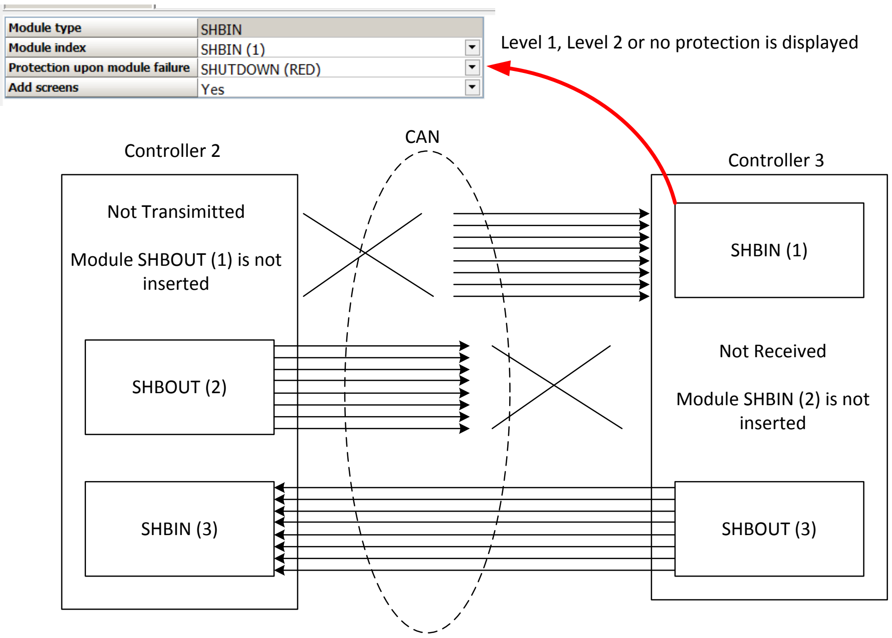
If SHUTDOWN (RED) protection is chosen, it is interpreted in InteliMains as Mains Protect with Reset type protection. For more information on Protection types and alarms please refet to the chapter Protection and Alarms management.

CAUTION!

For proper function of Shared Binary and Analog Inputs and Outputs, only one source of Shared Binary or Analog Outputs must be configured (i.e. it is not possible to configure in one controller SHBOUT1 and to another one as well SHBOUT1).

HINT

Controller sends Shared Binary Outputs each 100ms if there are any changes in any bit position. If there are no changes, controller sends the information with period 1s.



Module type	SHBIN
Module index	SHBIN (1)
Protection upon module failure	SHUTDOWN (RED)
Add screens	Yes

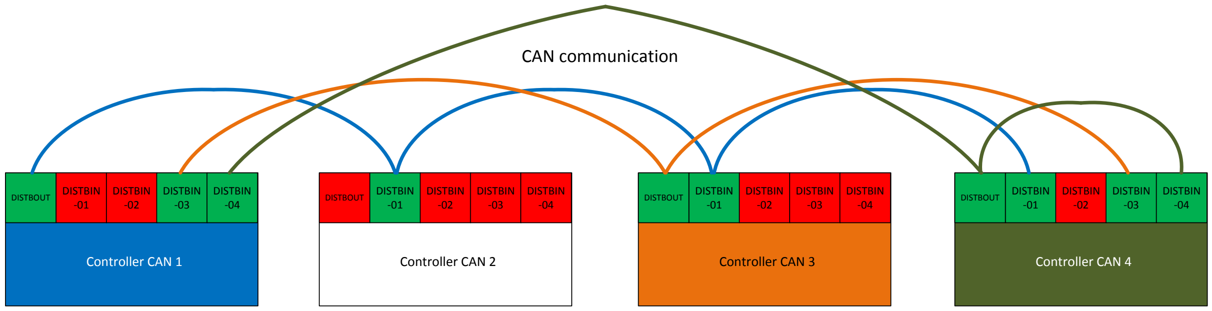
7.21 Distributed Binary Inputs and Outputs

InteliMains uses the same type of Distributed Binary Inputs and Outputs (DISTBIN and DISTBOUT modules) as InteliGen and InteliSys. Thanks to this, it is possible to share Binary and Analog values between all the controllers via CAN bus, thus saving physical Inputs and Outputs and excess wiring.

DISTBIN and DISTBOUT work in a different way than SHBIN and SHBOUT. Each controller has one pack of eight DISTBOUT available (if not configured or no function is assigned to any output, it does not broadcast them). The number of DISTBOUT module is not shown in the configuration and it is always corresponding to the CAN address of the controller (e.g. the controller with address 5 will be broadcasting DISTBOUT-05 which can be received if module DISTBIN-05 is configured in another controller. Up to 32 DISTBIN modules can be configured (meaning that the controller will be receiving all DISTBOUT from all the controller, even his own).

It is not possible to change the name of DISTBIN inputs or add protections.

In the example below you can see 4 controllers with various DISTBIN and DISTBOUT configuration.



NOTE:
If SHUTDOWN (RED) protection is chosen, it is interpreted in InteliMains as Mains Protect with Reset type protection. For more information on Protection types and alarms please refet to the chapter Protection and Alarms management.

HINT
Controller sends Distributed Binary Outputs each 100ms if there are any changes in any bit position. If there are no changes, controller sends the information with period 1s.

NOTE:

DISTBIN and DISTBOUT function is not available for IM-NT-GC controller.

7.22 Modbus Reading and Writing

Controller supports Modbus Slave functions (an external device may write or read from a controller). Modbus registers corresponding to objects in the controller can be exported to text form in GenConfig.

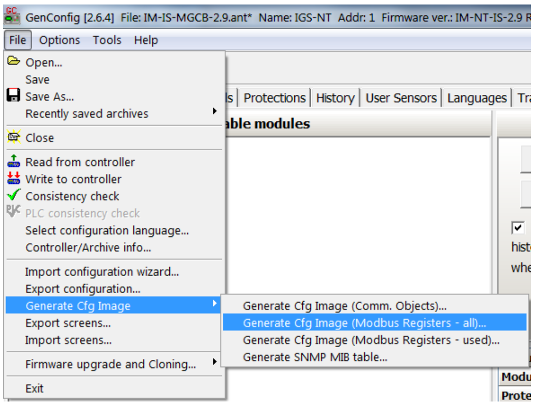


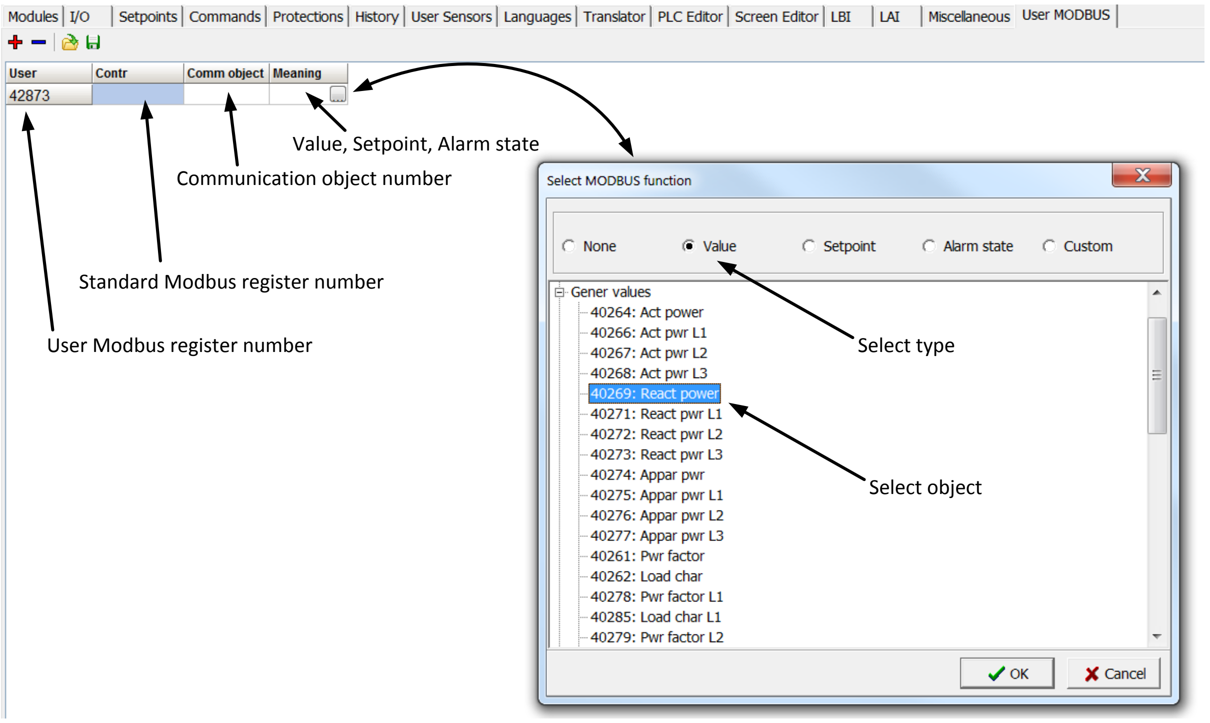
Figure: Exporting of Modbus registers

If Modbus Master function is required extension module I-CB/Modbus connected via CAN1 can be used. For more information on how to use this module please refer to InteliGen/InteliSys Communication Guide and to I-CBEdit manual.

7.23 User MODBUS

Users can define Modbus registers from 42873 to 43000. Values, setpoints and Alarm states can be specified for these new Modbus registers to prepare the Modbus protocol for batch reading and writing or to standardize Modbus protocol between FW versions or branches.

It is not possible to read or write both standard registers and User Modbus registers in one request (e.g. batch reading of registers 42998 to 43007 is not possible). It is perfectly fine to separate the request and read User Modbus registers and standard registers individually.



NOTE:
User MODBUS function is not available for IM-NT-GC controller.

7.24 Modbus Switches

The "Modbus Switches" are two Modbus registers dedicated for continuous writing of binary information via Modbus. Both registers are available on Modbus for simple writing (using command 6 or 16). The particular bits of these registers are available as binary status for universal use in logical binary outputs of the controller as "MODBUSSW1 .. MODBUSSW32". No password is required for writing of those registers (if there is no general password for Modbus writing). There are two Values "ModbusSw1" and "ModbusSw2" in group "Log Bout" available for back-reading.

Register for writing	Modbus register number	Value for back-reading	Modbus register number
ModbusSw1	46337	ModbusSw1	40547
ModbusSw2	46338	ModbusSw2	40548

NOTE:
The LSB of ModbusSw1 (46337) coresponds with LBO "ModbusSw1"

The LSB of ModbusSw2 (46338) coresponds with LBO "ModbusSw17"

Examples:

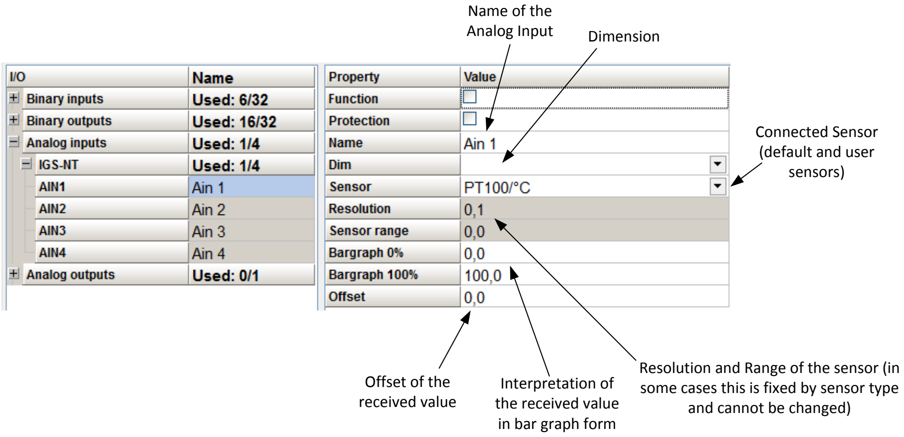
Register port for writing	Writen value	LBO ModbusSw16 ………………….ModbusSw1
ModbusSw1	000F	0000 0000 0000 1111

(46337)	HEX	

Register port for writing	Writen value	LBO ModbusSw32 …………………ModbusSw17
ModbusSw2 (46338)	F000 HEX	1111 0000 0000 0000

7.25 Analog Input Sensors and User Sensors

Controller and/or some extension modules allow connection of sensor outputs to Analog Inputs. There is whole variety of common sensor output characteristics prepared in configuration by default. Although if there is sensor that is not in the list, it is possible to prepare custom characteristics (up to 16) with up to 31 definition points.



Name of the Analog Input

Dimension

Connected Sensor (default and user sensors)

Offset of the received value

Interpretation of the received value in bar graph form

Resolution and Range of the sensor (in some cases this is fixed by sensor type and cannot be changed)

I/O	Name
⊞ Binary inputs	Used: 6/32
⊞ Binary outputs	Used: 16/32
⊟ Analog inputs	Used: 1/4
⊟ IGS-NT	Used: 1/4
AIN1	Ain 1
AIN2	Ain 2
AIN3	Ain 3
AIN4	Ain 4
⊞ Analog outputs	Used: 0/1

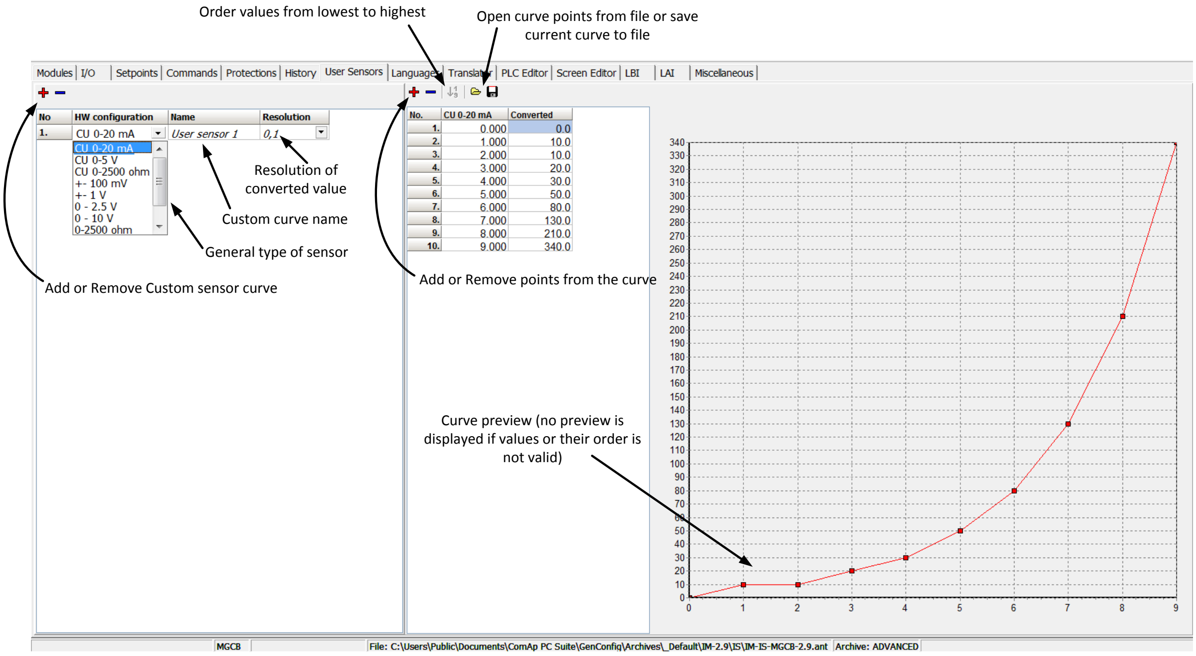
Property	Value
Function	☐
Protection	☐
Name	Ain 1
Dim	
Sensor	PT100/°C
Resolution	0,1
Sensor range	0,0
Bargraph 0%	0,0
Bargraph 100%	100,0
Offset	0,0

Figure: Sensor adjustment in GenConfig

Default sensors: PT100/°C, PT1000/°C, NI1000/°C, PT100/°F, PT1000/°F, NI1000/°F, 4-20mA active, 0-2400ohm, 0-2.4V, Tristate

HINT

There is “electronic” type of sensor available for Shared Analog Inputs which can be used to interpret shared data over CAN bus.



Order values from lowest to highest

Open curve points from file or save current curve to file

Resolution of converted value

Custom curve name

General type of sensor

Add or Remove Custom sensor curve

Add or Remove points from the curve

Curve preview (no preview is displayed if values or their order is not valid)

No	HW configuration	Name	Resolution
1.	CU 0-20 mA	*User sensor 1*	*0,1*

CU 0-20 mA
CU 0-5 V
CU 0-2500 ohm
+- 100 mV
+- 1 V
0 - 2.5 V
0 - 10 V
0-2500 ohm

No.	CU 0-20 mA	Converted
1.	0.000	0.0
2.	1.000	10.0
3.	2.000	10.0
4.	3.000	20.0
5.	4.000	30.0
6.	5.000	50.0
7.	6.000	80.0
8.	7.000	130.0
9.	8.000	210.0
10.	9.000	340.0

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Archive: ADVANCED

Figure: User Sensor definition

7.26 Languages and Translator tool in GenConfig

For detailed description of Languages and Translator tool please refer to GenConfig interactive help (press F1 when in corresponding tab or open Help -> GenConfig Help).

7.27 Power Formats

InteliMains allows user to choose from several Power Formats that affect dimensions in which values and some setpoints are interpreted or adjusted. Power formats may be changed in Miscellaneous tab in GenConfig. There are following Power Formats available:

- 1 kW kVAr kVA kX V
- 0,1 kW kVAr kVA kX V
- 0,01 MW MVAr MVA MX kV
- 0,01 MW MVAr MVA MX V

It is necessary to use power formats in MX when the sum of nominal power of gen-sets or any power in the system (e.g. power imported from Mains) is expected to be above 32000 kW.

NOTE:
Range of some setpoints and values is changed significantly when different Power Formats are selected.

Last Power Format is designed to be used in combined Power/High Voltage and Low Voltage instalations. High voltage is then interpreted in Volts (e.g. 33256V instead of 33kV).

Last two Power Formats can be used in combination on one CAN bus.

7.28 System Start/Stop

Many functions in InteliMains are directly connected to the standard functions of InteliGen and InteliSys that form complete system together with InteliMains. For proper function of the system, System start and stop signal needs to be used properly. Below there is scheme that shows how to use the Binary Output SYS START/STOP in the system using just CAN wiring (no physical wiring is needed to share the starting and stoping signal into all controllers in the system).

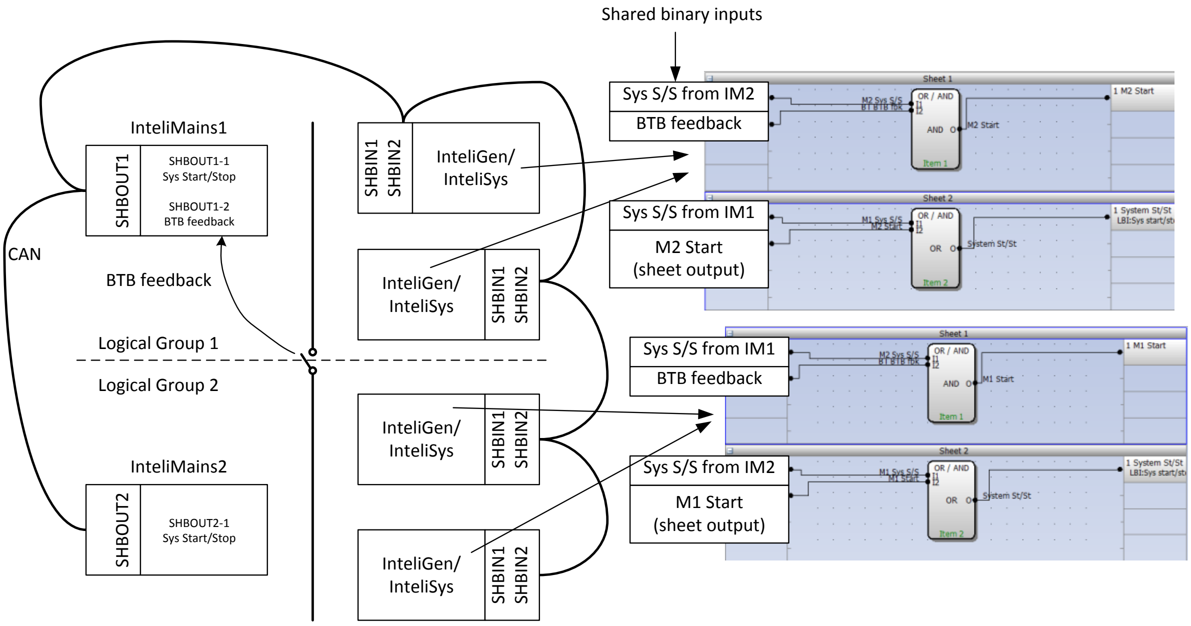
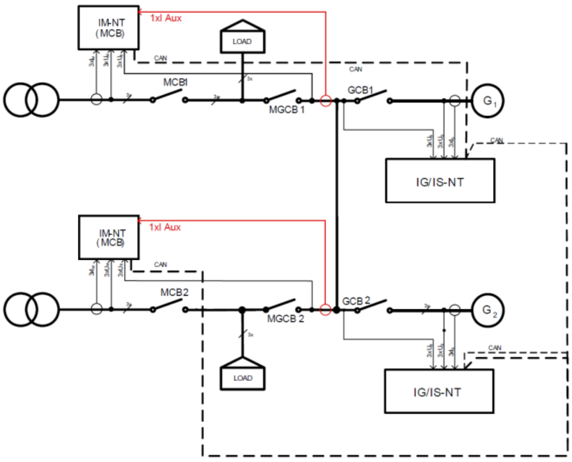


Figure: Preparation of correct system start/stop function for two logical groups

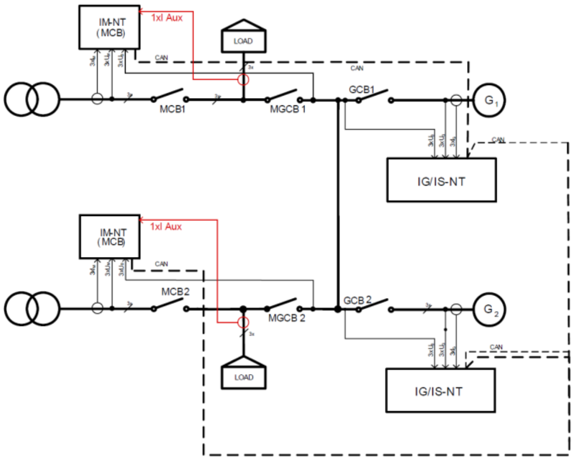
7.29 Soft Unload with support of I Aux measurement

When one group of gen-sets is connected to several Mains incomers in AMF function, the built-in Soft Unload with I Aux function can be used to do the soft unload in steps. This prevents powering of all loads from one Mains incomer for happening. There are two possible settings, that allow connecting of the auxiliary current measurement (one phase measurement on phase L3) to be connected either on bus or on the load line directly. Position of the measurement connection for both settings is shown below.

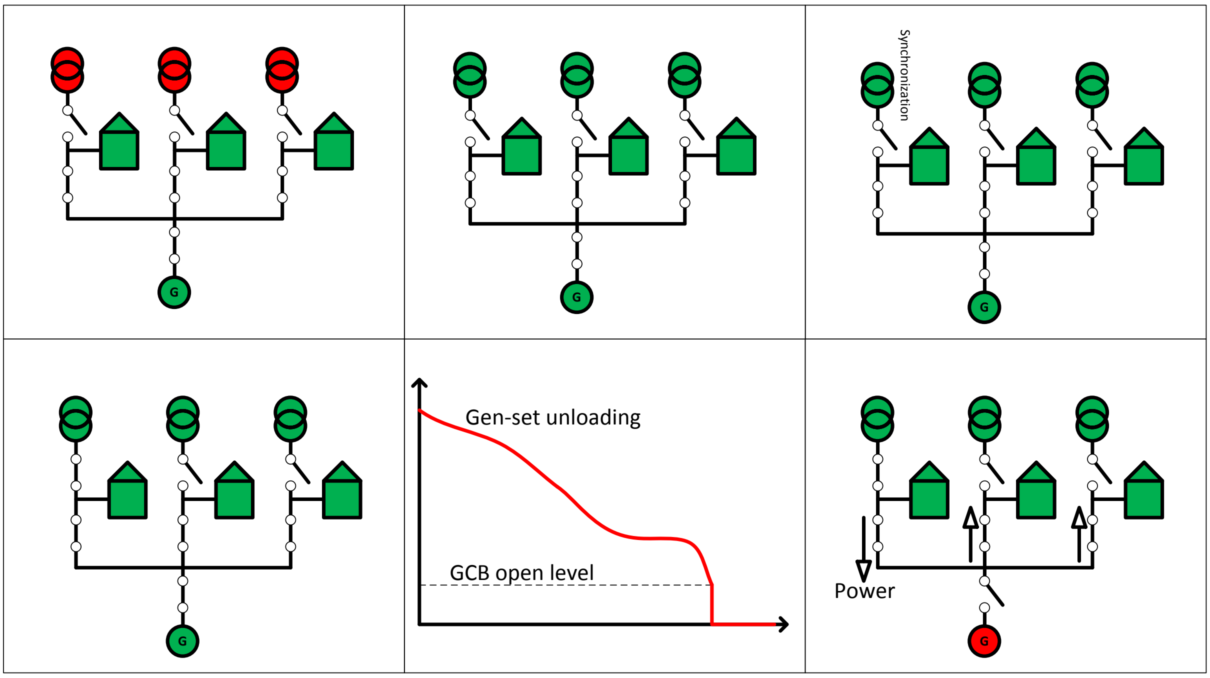
ProcessControl:*Soft Unload* = AuxCTGen



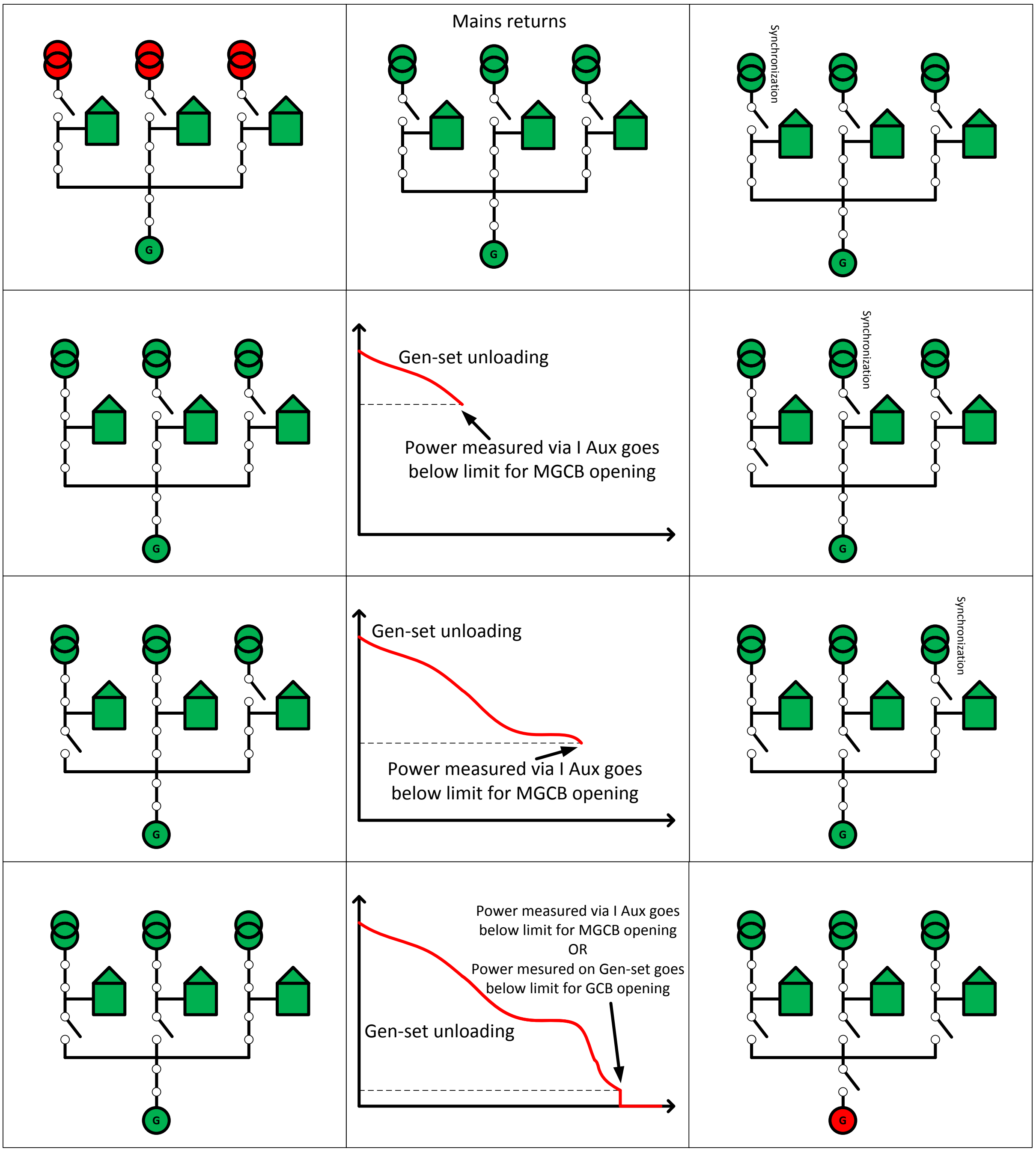
ProcessControl:*Soft Unload* = AuxCTLoad



Study the following example if you need to know more about this function. The first shematics shows what happens if the function is not used. Loads are returning from Island operation after Mains is OK again. This results in powering of all loads via first Mains incomer that is synchronized to the gen-set group.



If the Soft Unload is used, once the power measured using the auxiliary current measurement (multiplied by 3) goes below **Sync/Load ctrl:***MGCB open level* the MGCB is opened and InteliMains controlling the second Mains incomers starts the procedure. Finally the third InteliMains transfers its load and gen-set is stopped. This correct behaviour is shown in the next schematics.


Mains returns
Synchronization
G
Gen-set unloading
Power measured via I Aux goes
below limit for MGCB opening
Synchronization
Gen-set unloading
Power measured via I Aux goes
below limit for MGCB opening
Synchronization
Power measured via I Aux goes
below limit for MGCB opening
OR
Power mesured on Gen-set goes
below limit for GCB opening
Gen-set unloading

7.30 System Isolated

There are two logical binary inputs that can be used as feedbacks from secondary circuit breakers that isolated the system in case there is primary CB failure. If MCBIsolated or MGCBIsolated gets active, the controller will consider the corresponding breaker to be opened regardless of the position of feedback (and feedback negative).

The example of this function is described below:

The system is in normal operation. The load is connected to the Mains via MCB and MGCB is opened. Mains fails and the controller tries to open MCB. It does not open (because of faulty breaker or feedback). MCB fail alarm is issued and the controller does not start gen-sets since there is direct connection to the faulty Mains (to prevent connection of gen-sets to the faulty Mains). Automatic sequence (or the operator) opens the secondary (emergency) breaker that is next to the MCB. Its feedback is configured on the function MCBISOLATED. When this input gets activated (negative logic) the MCB is considered opened and the controller starts gen-sets, closes MGCB and the load is powered again.

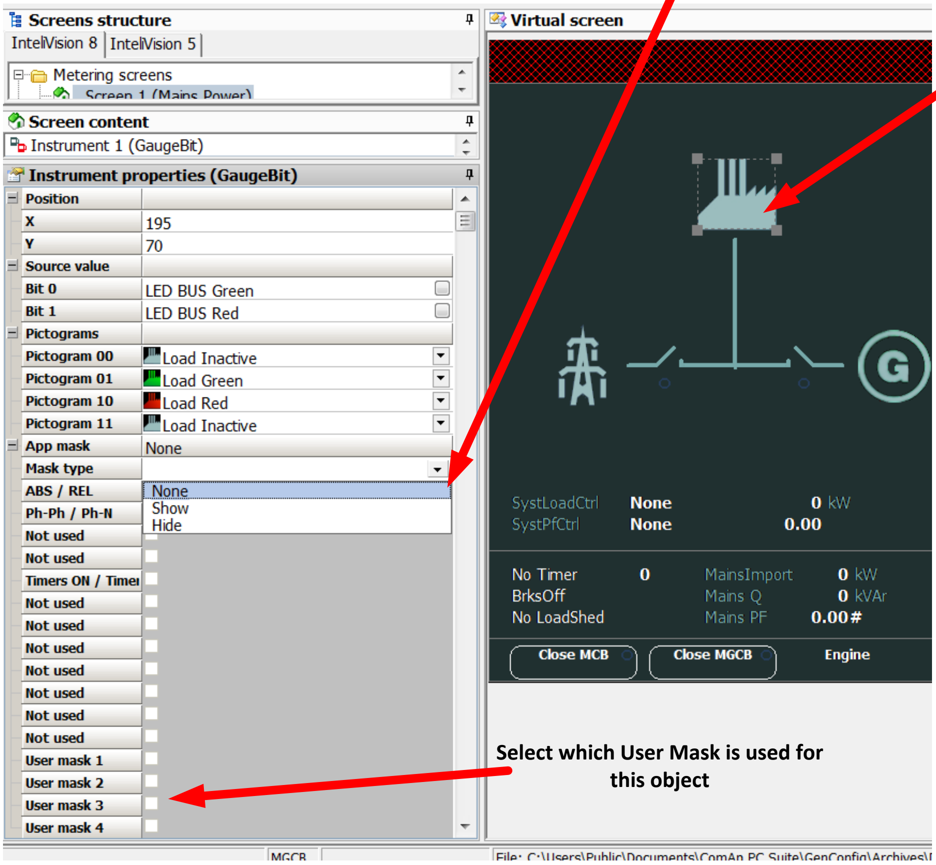
WARNING!
Be aware that when there is a faulty breaker (or even feedback only), such situation needs to be resolved carefully and only emergency run of the equipment should be allowed.

To recover from this state you should always repair or replace faulty circuit breaker or feedback and then recover the system completely. Before closing of the secondary breaker the primary breaker must be always opened to prevent hazardous closing of two voltages out of synchronization.

7.31 User Mask function

In GenConfig you can easily set any object in Screen Editor to show or hide based on activation of particular Logical Binary Input available for users. Below, there is diagram showing the setup of User Mask function in Screen Editor.

Select the proper function
Show = appears when LBI gets active
Hide = disappears when LBI gets active
None = no function



Select the object

Select which User Mask is used for this object

Instrument 1 (GaugeBit)

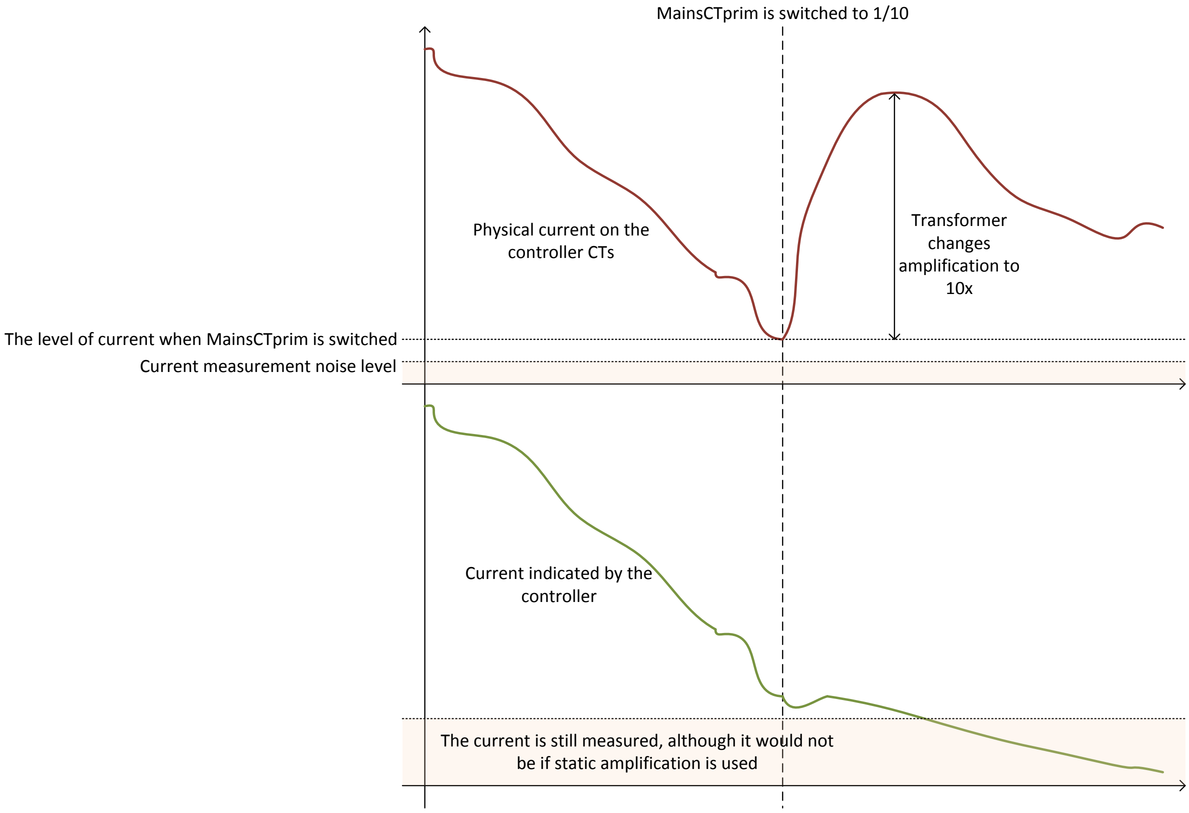
Position	
X	195
Y	70
Source value	
Bit 0	LED BUS Green
Bit 1	LED BUS Red
Pictograms	
Pictogram 00	Load Inactive
Pictogram 01	Load Green
Pictogram 10	Load Red
Pictogram 11	Load Inactive
App mask	None
Mask type	None Show Hide

NOTE:
Masking of screens in InteliVision 5 supports only Show function

Use also other masking functions (masking can react on several internal states, e.g. activation of Timers).

7.32 Switchable Current measurement ratio

The value of the setpoint Basic settings:MainsCTprim can be change using the force value function. This allows users to switch the transformer ratio of the current measurement on the fly. If a measurement transformer with switchable transforming ratio or amplifier with a switchable amplification is used, the range of the current measurement can be extended to accommodate measurement of very high values as well as required measurement of very low values. The principle of this function is shown in the following graph. For more information on Force value refer to a related chapter.



CAUTION!

Never exceed the maximum allowed current at the controller CTs. Adjust the amplification properly with hysteresis to prevent fluctuations and excesive current at controller CTs!

7.33 PLC functions

Number of PLC functions is the same for InteliMains-NT and InteliSys-NT. See description in IGS-NT-Application guide-05-2013.pdf.

7.34 Multi language support

NT Family controllers support up to three languages that can be switched during controller duty. Every terminal (i.e. Remote display or PC-InteliMonitor) can be switched to different language. Use PC-GenConfig - Translator tool to translate texts to another language.

Default application archives contain all texts in English only.

8 Protections and Alarm management

ComAp mains controllers provide following range of mains protections.

For each protection adjustable limit and time delay are available.

ANSI CODE	PROTECTION	IM-NT, IM-NT-BB
25	Synchronism Check	●
27	Undervoltage	●
32P	Load Shedding	●
37	Undercurrent	●[@]
46	Current Unbalance	●
47	Voltage Unbalance and Phase-sequence	●
49T	Temperature Monitoring (using configurable Analog input)	●[@]
51	AC Inverse Time Overcurrent	●
55	Power Factor	●[@]
59	Overvoltage	●
78	Vector Shift	●
79	AC Reclosing	●
81H	Overfrequency	●
81L	Underfrequency	●
81R	ROCOF	●

NOTE:
● - included
[@] - example of protections that can be created using universal protections (it is possible to utilize controller functions to prepare even more protections)

8.1.1 Protection groups

PROTECTION GROUP	COFIGURABILITY	SETPOINT GROUP
Analog protections	Configurable	Analog protect
Mains protections	Configurable	Mains protect
Fixed protections	Fixed	Mains protect Bus protect

8.1.2 Protection types

LEVEL	PROTECTION TYPE	ABBREVIATION	CONTROLLER ACTION	RECORD	FAULT RESET NEEDED

1	**History record**	Hst	none	History only	NO
1	**Alarm only**	Al	none	Alarmlist only	YES
1	**Warning**	Wrn	none	Alarmlist and History	YES
1	**AL indication**	ALI	none	Alarmlist only	NO
1	**A+H indication**	AHI	none	Alarmlist and History	NO
2	**Mains protection**	MP	Controller opens MCB, no fault reset needed after alarm inactivation When the breaker opens is given by the setpoint **AMF settings:***MCB open on*	History only	NO
2	**Mains protection with fault reset**	MPR	Controller opens MCB, MCB cannot be closed before alarm inactivation and fault reset When the breaker opens is given by the setpoint **AMF settings:***MCB open on*	Alarmlist and History	YES
X	**Fail sensor**	Fls	Can be indicated when Analog input value is ±6% out of sensor characteristic range. Fls can optionally activate corresponding (e.g. Sd) Analog input protection as well.	Alarmlist and History	Configurable

8.1.3 Default protections in MCB/MGCB applications

Following protections are firmware based

Protection	Protection Type	Corresponding Setpoints
Mains:		
IDMT Current	MPR	**Mains protect:** *Mns2Inom prot;Mains2Inom del*
IDMT Active Power	MPR	**Mains protect**: *Mns2POvrldProt; OverlStrtEval; 2POvrldStEvDel*
Vector Shift	MP	**Mains protect**: *VectorS prot; VectorS limit; Vector CB sel*
ROCOF	MP	**Mains protect:** *ROCOF prot; ROCOF Win, ROCOF df/dt*
Mains Voltage – over and under voltage in all phases	MP	**Mains protect**: *Mains >V MP; Mains <V MP; Mains V del*
Mains Frequency – over and under frequency	MP	**Mains protect**: *Mains >f; Mains <f; Mains f del*
Average Mains Overvoltage	MP	**Mains protect**: *Mains Avg>V MP*
Bus:		

Bus Voltage	Hst	**Bus protect**: *Bus >V Hst; Bus <V Hst; Bus V del*
Bus Frequency	Hst	**Bus protect**: *Bus >f; Bus <f; Bus f del*
Configured in Protections tab in default archive:		
Mains Voltage Unbalance	MP	**Mains protect:** *Mains V unbal; Mains Vunb del*
Mains Current Unbalance	MP	**Mains protect:** *Mains I unbal; Mains Iunb del*
Bus Voltage Unbalance	Hst	**Bus protect:** *Bus V unbal; Bus Vunb del*
Batt <V, Batt >V	Wrn	**Analog protect**: *Batt >V; Batt <V; Batt volt del*

8.1.4 Mains voltage and frequency protections - limits and indications

IDMT Current: This protection can be activated or deactivated by the setpoint **Mains protect:***Mns2Inom prot*. For more information on the dynamic delay of this protection refer to the setpoint **Mains protect:***Mains2Inom del* in the APPENDIX of this document or in context help in GenConfig.

IDMT Active Power: This protection can be activated or deactivated by the setpoint **Mains protect:***Mns2POvrldProt*. **Mains protect:***OverldStrtEval* setpoint defines when the IDMT Active Power protection starts to be evaluated. For more information on the dynamic delay of this protection refer to the setpoint **Mains protect:***2POvrldStEvDel* in the APPENDIX of this document or in context help in GenConfig.

Vector Shift: This protection may be enabled, disabled or enabled in parallel operation only by the setpoint **Mains protect:***VectorS Prot*. Corresponding breaker that will react to this protection is determined by the setpoint **Mains protect:***VS/ROCOF CB sel* (MGCB application only). Triggering limit is defined by **Mains protect:***VectorS limit*. There are logical binary outputs VECTORSHIFTTRP and VECTORSHIFTACT which activate for 3s each time vector shift causes corresponding breaker to trip (TRP) or when vector shift protection activates even though the breaker is not tripped because for example the corresponding breaker for Vector Shift is already opened or it fails to open (ACT).

ROCOF: This protection may be enabled, disabled or enabled in parallel operation only by the setpoint **Mains protect:***ROCOF Prot*. Corresponding breaker that will react to this protection is determined by the setpoint **Mains protect:***VS/ROCOF CB sel* (MGCB application only). Triggering limit is defined by **Mains protect:***ROCOF df/dt*. Evaluation window in number of periods is given by the setpoint **Mains protect:***ROCOF Win.* There are logical binary outputs ROCOFTRP and ROCOFACT which activate for 3s each time ROCOF causes corresponding breaker to trip (TRP) or when ROCOF protection activates eventhough the breaker is not tripped because for example the corresponding breaker for ROCOF is already opened or it fails to open (ACT).

Mains Over and Under Voltage: This protection limits are given by setpoints **Mains protect:***Mains >V MP,* **Mains protect:** *Mains <V MP*. Delay for over and under voltage is given by the setpoint **Mains protect:***Mains V del*. Protection is indicated by message “MP LX over” (X = number of corresponding phase) or “MP LX under”. When **Basic settings:***FixVoltProtSel* is adjusted to PHASE-PHASE then this protection is evaluated based on voltage between phases and it is indicated by “MP LXY over” or “MP LXY under” (where XY are number of corresponding phases).

Mains Over and Under Frequency: This protection limits are given by setpoints **Mains protect:***Mains >f,* **Mains protect:** *Mains <f*. Delay for over and under frequency is given by the setpoint **Mains protect:***Mains f del*. Protection is indicated by message “MP fm over” or “MP fm under”.

8.1.5 Bus voltage and frequency protections - limits and indications

Bus Over and Under Voltage: This protection limits are given by setpoints **Bus protect:***Bus >V,* **Bus protect:** *Bus <V*. Delay for over and under voltage is given by the setpoint **Bus protect:***Bus V*

del. Protection is indicated by message Vb LX over (X = number of corresponding phase) or Vb LX under. When **Basic settings:***FixVoltProtSel* is adjusted to PHASE-PHASE then this protection is evaluated based on voltage between phases and it is indicated by “Vb LXY over” or “Vb LXY under” (where XY are number of corresponding phases)

Bus Over and Under Frequency: This protection limits are given by setpoints **Bus protect:***Bus >f*, **Bus protect:** *Bus <f*. Delay for over and under frequency is given by the setpoint **Bus protect:***Bus f del*. Protection is indicated by message “fbus fm over” or “fbus fm under”.

8.1.6 User configurable protections

Controller provides vast possibilies for user configurable protections. There are several protections that configured by default in standard configuration. There are 63 available Alarm and History messages configurable by the user. For step-by-setp guide on how to configure your own protections please go to chapter 8.1.6.2.

8.1.6.1 *Configured protections by default*

Mains Voltage Unbalance: This protection is by default configured as Mains protect with indication “Mains V unbal”. For more information on this protection see the Protections tab in default archive.

Mains Current Unbalance: This protection is by default configured as Mains protect with indication “Mains I unbal”. For more information on this protection see the Protections tab in default archive.

Bus Voltage Unbalance: This protection is by default configured as HistoryRecOnly with indication “Bus V unbal”. For more information on this protection see the Protections tab in default archive.

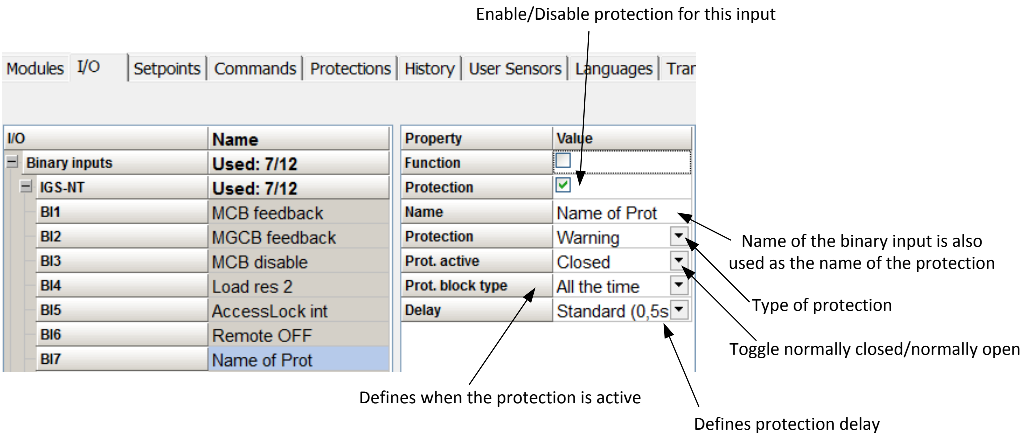
Battery Over and Under Voltage: There are two protections configured by default as Warnings with indication “Batt volt”. For more information on this protection see the Protections tab in default archive.

8.1.6.2 *Configuration of User configurable protections in GenConfig*

It is possible to configure protections on Binary Input, Analog Input or any value that is available in the controller.

8.1.6.2.1 Binary Input protection configuration

Open I/O tab in GenCofig and adjust parameters that are described below.



I/O	Name
Binary inputs	Used: 7/12
IGS-NT	Used: 7/12
BI1	MCB feedback
BI2	MGCB feedback
BI3	MCB disable
BI4	Load res 2
BI5	AccessLock int
BI6	Remote OFF
BI7	Name of Prot

Property	Value
Function	☐
Protection	☑
Name	Name of Prot
Protection	Warning
Prot. active	Closed
Prot. block type	All the time
Delay	Standard (0,5s

Enable/Disable protection for this input

Name of the binary input is also used as the name of the protection

Type of protection

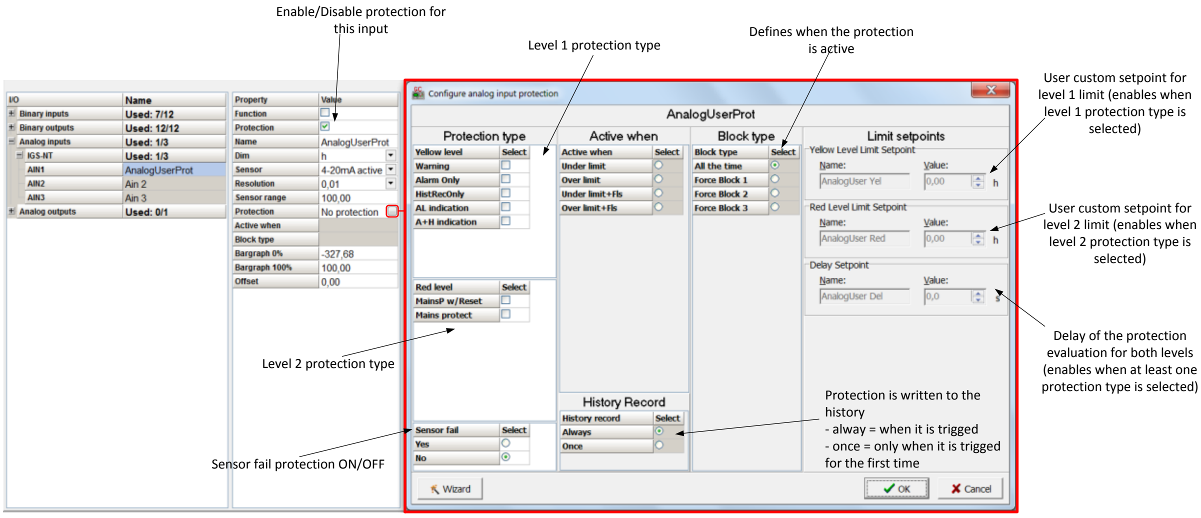
Toggle normally closed/normally open

Defines when the protection is active

Defines protection delay

8.1.6.2.2 Analog Input protection configuration

Open I/O tab in GenCofig and adjust parameters that are described below.



Enable/Disable protection for this input

Level 1 protection type

Defines when the protection is active

User custom setpoint for level 1 limit (enables when level 1 protection type is selected)

User custom setpoint for level 2 limit (enables when level 2 protection type is selected)

Delay of the protection evaluation for both levels (enables when at least one protection type is selected)

Level 2 protection type

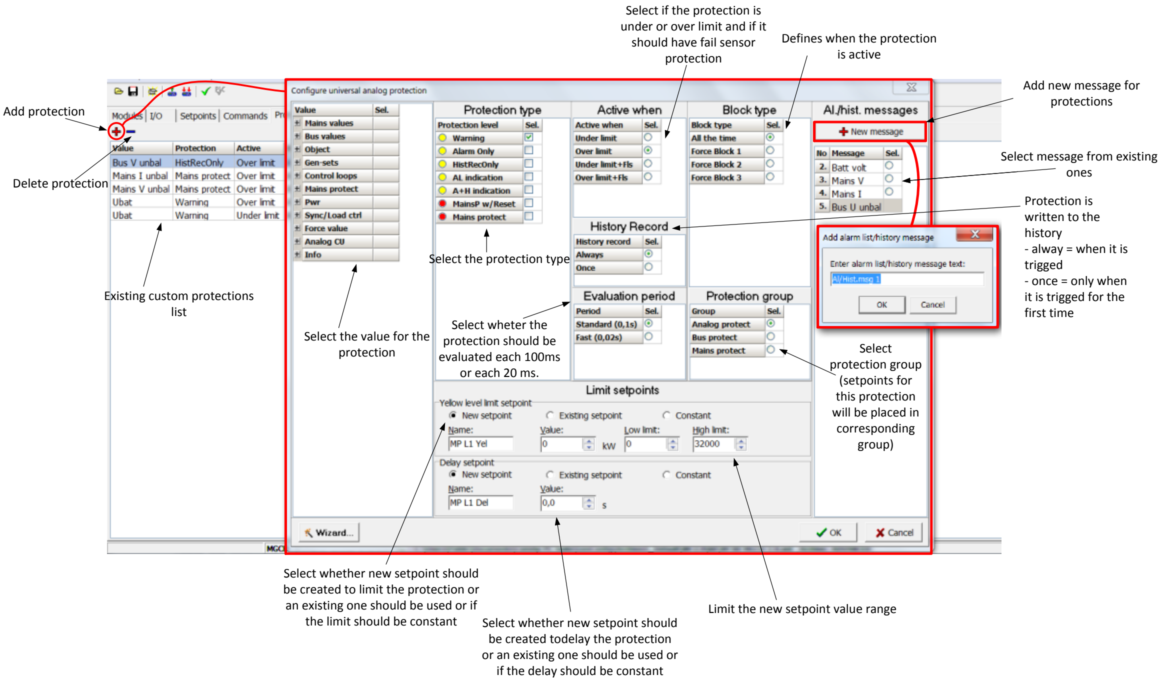
Protection is written to the history
- alway = when it is trigged
- once = only when it is trigged for the first time

Sensor fail protection ON/OFF

HINT
Fail Sensor protection (when activated) does not affect the function of the system itself. If you adjust "Active when" to Under limit + Fls or Over limit + Fls the protection will considered the value that is out of range (failed sensor) to be under or over limit (depending on the setting) and it will issue corresponding alarm after the delay of the protection. This can be used for example when the function of the particular sensor connected to an analog input is crucial for the operation of the system and its failure requires the system to be affected (open breakers etc.).

8.1.6.2.3 Custom configurable protection

Open Protections tab in GenCofig and adjust parameters that are described below.



Select if the protection is under or over limit and if it should have fail sensor protection

Defines when the protection is active

Add new message for protections

Add protection

Delete protection

Select message from existing ones

Protection is written to the history
- alway = when it is trigged
- once = only when it is trigged for the first time

Existing custom protections list

Select the protection type

Select the value for the protection

Select wheter the protection should be evaluated each 100ms or each 20 ms.

Select protection group (setpoints for this protection will be placed in corresponding group)

Select whether new setpoint should be created to limit the protection or an existing one should be used or if the limit should be constant

Select whether new setpoint should be created todelay the protection or an existing one should be used or if the delay should be constant

Limit the new setpoint value range

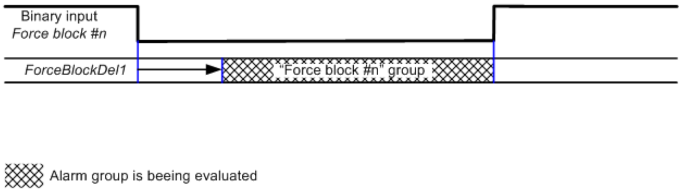
HINT
You need to prepare two separate protections for level 1 and level 2.

Select the value for protection first and then use Wizard – it will take you through all the steps and help you adjust them correctly.

8.1.6.2.4 Protection blocking

It is possible to block user defined protections (on binary inputs, analog inputs or any value available in the controller).

BLOCKING TYPE	DESCRIPTION
All the time	The alarms are beeing evaluated all the time the controller is switched on.
Force block 1	The alarms are beeing evaluated while the input *Force block 1* is not active. The evaluation begins *ForceBlockDel1* seconds after the input has been deactivated.
Force block 2	The alarms are beeing evaluated while the input *Force block 2* is not active. The evaluation begins *ForceBlockDel2* seconds after the input has been deactivated.
Force block 3	The alarms are beeing evaluated while the input *Force block 3* is not active. The evaluation begins *ForceBlockDel3* seconds after the input has been deactivated.



8.1.7 Reset Actual Alarms selection

It is possible to determine the behavior of alarms that are in alarm list when Fault Reset button is pressed. Select behavior with ComProtSetting:ResetActAlarms.

DISABLED	Pressing of the fault reset button (at any terminal or external button) resets only **inactive** alarms. Active alarms remain in the alarmlist unchanged and must be reset again when they become inactive.
ENABLED	Pressing of the fault reset button (at any terminal or external button) resets **all** alarms that are currently present in the alarm list. Inactive alarms disappear from the alarm list immediately, active alarms are changed to "confirmed" state and disappear when the alarm condition disappear or the alarm starts to be blocked.

NOTE:
ENABLED position corresponds to the method how the IG-classic and IS-classic controllers handled the alarms.

8.1.8 Bus Measurement Error detection

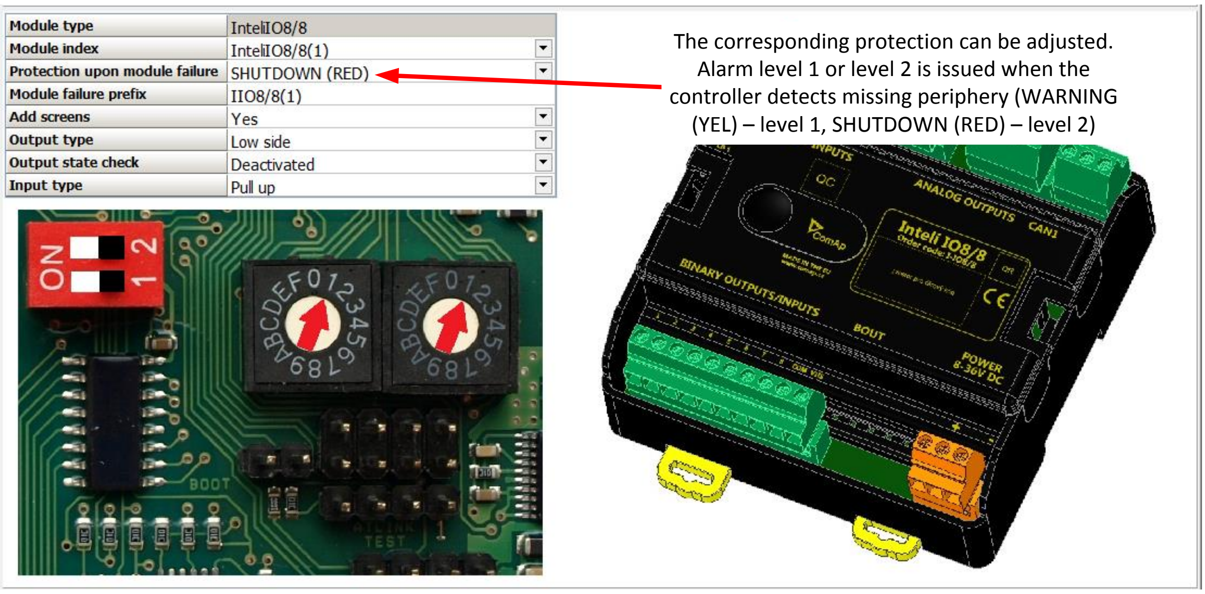
InteliMains is able to detect Bus Measurement Error. It is evaluated based on gen-sets and mains incommers.

GEN-SETS: If any gen-set from the logical group that is connected to the InteliMains has closed breaker and InteliMains is not measuring correct values on Bus it automatically detects bus measurement error.

MAINS: If any Mains incomer is connected to the bus (provided that all corresponding Bus Tie Breakers are closed as well) and InteliMains is not measuring correct values on Bus it automatically detects bus measurement error.

8.1.9 Peripheral Modules Error detection

It is possible to adjust the protection of level 1 (yellow) or level 2 (red) to any configured peripheral module. If the controller detects that this periphery is missing it issues the corresponding alarm. In MCB/MGCB applications Warning is issued when WARNING(YEL) option is selected and MPR (Mains Protect with Reset) is issued when SHUTDOWN(RED) option is selected (this alarm causes MCB to open and Mains is considered as failed, Fault Reset is required to remove this protection from the alarm list once inactive).



Module type	InteliIO8/8
Module index	InteliIO8/8(1)
Protection upon module failure	SHUTDOWN (RED)
Module failure prefix	IIO8/8(1)
Add screens	Yes
Output type	Low side
Output state check	Deactivated
Input type	Pull up

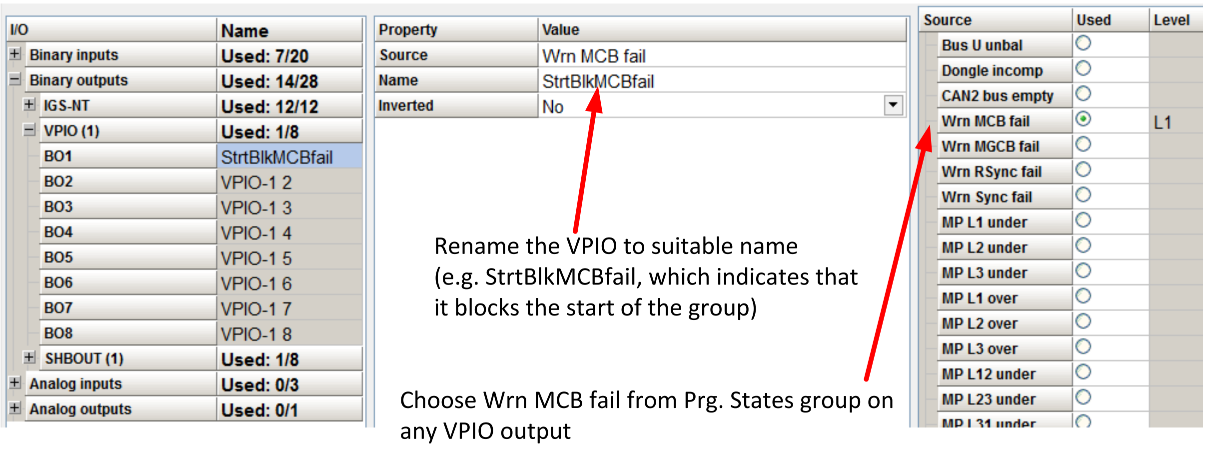
The corresponding protection can be adjusted. Alarm level 1 or level 2 is issued when the controller detects missing periphery (WARNING (YEL) – level 1, SHUTDOWN (RED) – level 2)

9 Circuit breakers operation sequence, MGCB/MCB fail detection

9.1 MCB fail Information

Opening of the MCB externally is allowed because external protection device may open it based on its protections. The controller will try to reclose the breaker if Mains protect type protection is not configured accordingly (e.g. external protection device/relay does not allow user to send this type of signal or such wiring is impractical). After failed attempt to close the breaker, the controller issues standard alarm and in AUT mode starts the engine and consequently closes GCB breaker.

WARNING!
In this case, if the supposed opening of the MCB is caused merely by MCB feedback failure and the actual position of the MCB is still closed, the controller will close GCB to the Mains voltage directly without synchronizing because it cannot be distinguished what exactly happened. Should this be the case, the following solution is proposed:



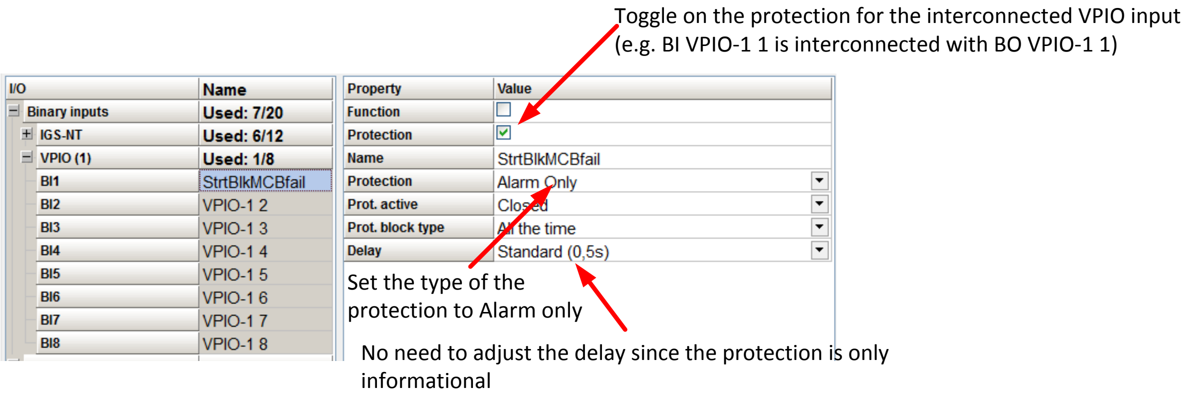
I/O	Name
⊞ Binary inputs	Used: 7/20
⊟ Binary outputs	Used: 14/28
⊞ IGS-NT	Used: 12/12
⊟ VPIO (1)	Used: 1/8
BO1	StrtBlkMCBfail
BO2	VPIO-1 2
BO3	VPIO-1 3
BO4	VPIO-1 4
BO5	VPIO-1 5
BO6	VPIO-1 6
BO7	VPIO-1 7
BO8	VPIO-1 8
⊞ SHBOUT (1)	Used: 1/8
⊞ Analog inputs	Used: 0/3
⊞ Analog outputs	Used: 0/1

Property	Value
Source	Wrn MCB fail
Name	StrtBlkMCBfail
Inverted	No

Source	Used	Level
Bus U unbal	○	
Dongle incomp	○	
CAN2 bus empty	○	
Wrn MCB fail	●	L1
Wrn MGCB fail	○	
Wrn RSync fail	○	
Wrn Sync fail	○	
MP L1 under	○	
MP L2 under	○	
MP L3 under	○	
MP L1 over	○	
MP L2 over	○	
MP L3 over	○	
MP L12 under	○	
MP L23 under	○	
MP L31 under	○	

Rename the VPIO to suitable name (e.g. StrtBlkMCBfail, which indicates that it blocks the start of the group)

Choose Wrn MCB fail from Prg. States group on any VPIO output



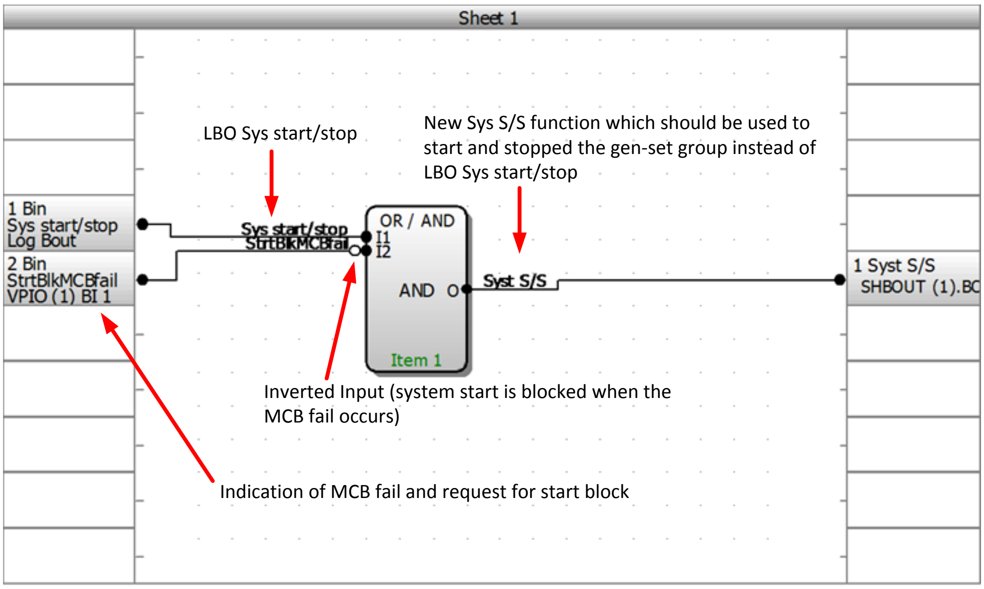
Toggle on the protection for the interconnected VPIO input (e.g. BI VPIO-1 1 is interconnected with BO VPIO-1 1)

I/O	Name
⊟ Binary inputs	Used: 7/20
⊞ IGS-NT	Used: 6/12
⊟ VPIO (1)	Used: 1/8
BI1	StrtBlkMCBfail
BI2	VPIO-1 2
BI3	VPIO-1 3
BI4	VPIO-1 4
BI5	VPIO-1 5
BI6	VPIO-1 6
BI7	VPIO-1 7
BI8	VPIO-1 8

Property	Value
Function	☐
Protection	☑
Name	StrtBlkMCBfail
Protection	Alarm Only
Prot. active	Closed
Prot. block type	All the time
Delay	Standard (0,5s)

Set the type of the protection to Alarm only

No need to adjust the delay since the protection is only informational



LBO Sys start/stop

New Sys S/S function which should be used to start and stopped the gen-set group instead of LBO Sys start/stop

Inverted Input (system start is blocked when the MCB fail occurs)

Indication of MCB fail and request for start block

9.2 General Information

NOTE:
In the following text, “CB” abbreviation is used for MCB or MGCB respectively.

9.2.1 Related binary inputs:

- CB FDB – CB feedback binary input.
- CB FDB NEG – negative CB feedback binary input. Used for increasing the reliability of CB status evaluated by the controller. In case that it is not configured, negative value of CB fdb is calculated internally within the controller.
- CB DISABLE – this input is used for disabling issuing of CB closing command (if CB is closed and this input is activated CB is opened immediately).

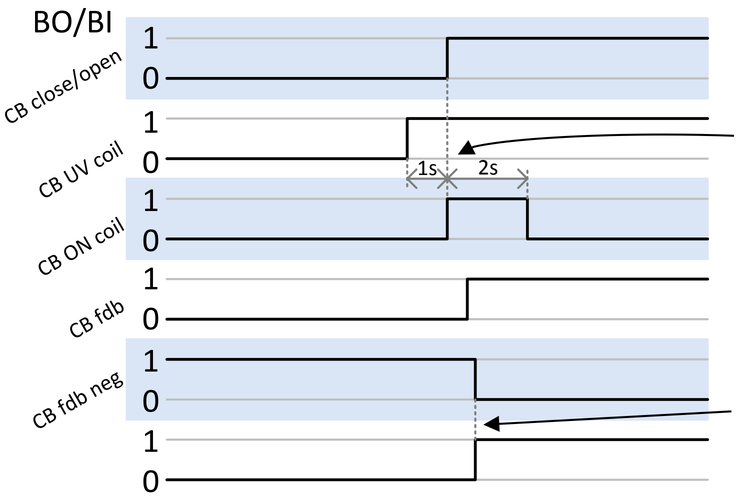
9.2.2 Related binary outputs:

- CB CLOSE/OPEN – output for circuit breaker. Equals to 1 during the time when CB is requested to be closed.
- CB ON COIL – output for closing coil of the CB. 2s pulse (5s if synchronising is not provided by the particuilar CB) is used for closing the CB.
- CB OFF COIL – output for opening coil of the CB. 2s pulse (5s if synchronising is not provided by the particuilar CB) is used for opening the CB.
- CB UV COIL – output for undervoltage coil of the CB. Permanently active, 2s negative pulse (5s if synchronising is not provided by the particuilar CB) is used for CB opening request.
- CB STATUS – output indicating CB status as evaluated by the controller. This signal is used for lighting
- LEDs on the panel, switching the regulations, CB fail evaluation, etc.

NOTE:
All pulse outputs for CB in following diagrams may be long 5s if the CB is not used for synchronization in that particular instance.

9.2.3 Following graphs depict possible CB sequences:

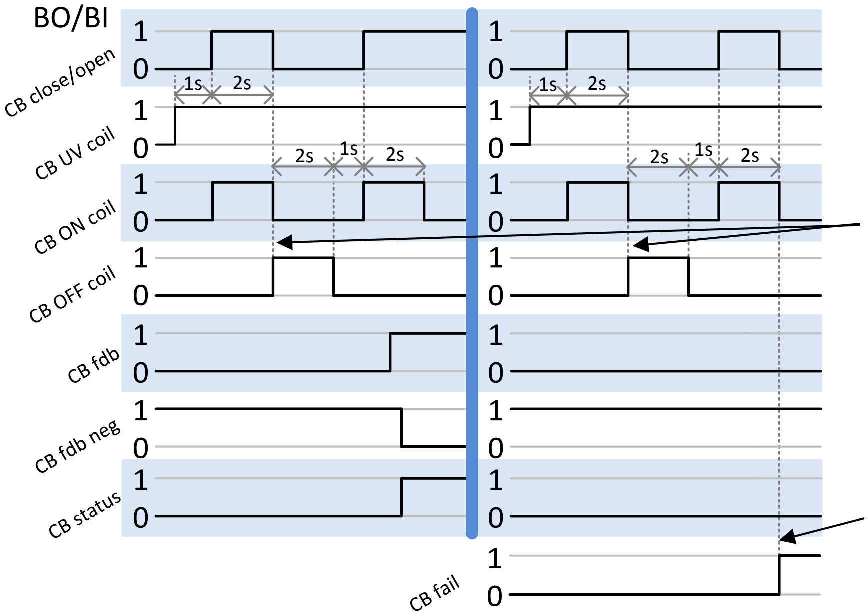
CB close command:



Minimum 1s delay after UV coil is switched on is needed before CB can be closed

CB status switches after both feedbacks (fdb and fdb neg) are in correct position.

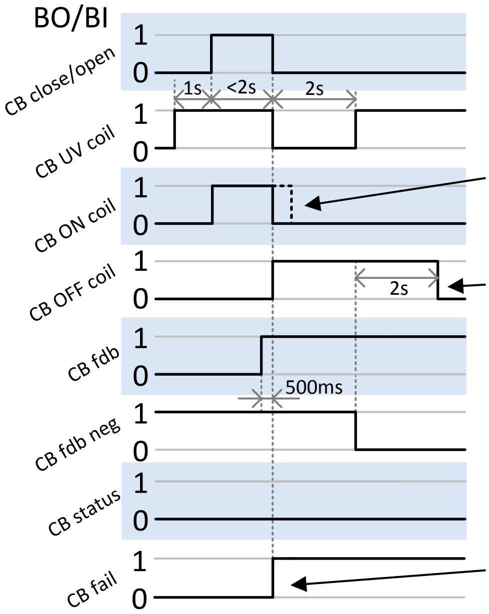
Repeated CB close command (second succesfull – left, second unsuccesfull – right):



If the CB is not closed after the first attempt, it is only reset by OFF pulse and no CB fail is issued. This would be issued after the second unsuccessfull attempt.

ON pulse has finished and CB status is not =1. CB fail is issued immediatelly

CB fail – fdb mismatch:

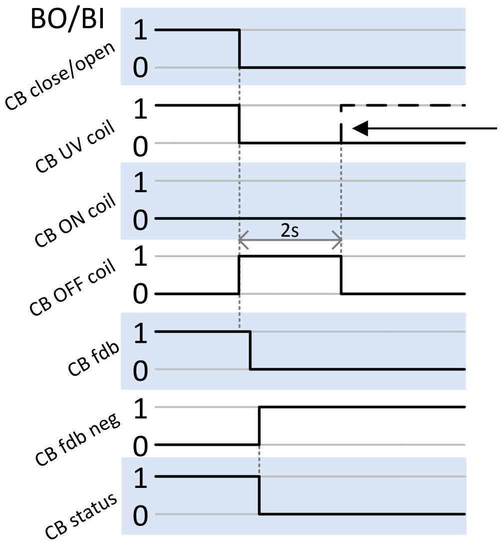


ON pulse is shortened/interrupted and replaced by UV and OFF pulse

OFF pulse is activated until both feedbacks return to the correct position +2 seconds.

CB fail – If any inconsistence between the two feedback signals is detected, CB fail is issued. Fail is active until Fault Reset is pushed.

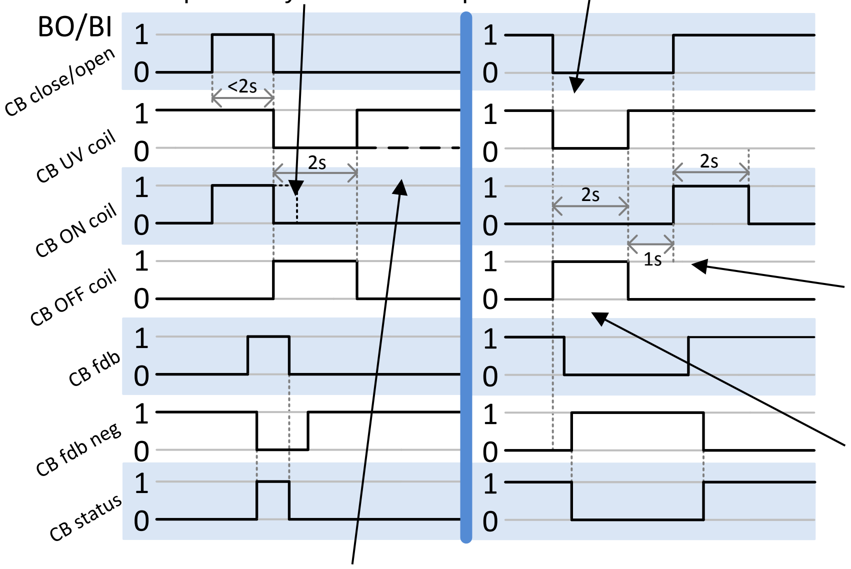
CB open command:



Further behavior of UV output depends on the system status. In case of transition to cooling stays off, if the Cb was opened manually and the engine keeps running, it activates again after timeout elapses.

Transition closing -> opening (opening command is issued during closing pulse) – Left

Transition opening -> closing (closing command is issued during opening pulse) – Right



ON pulse is shortened/interrupted and replaced by UV and OFF pulse

In this moment, the reason for closing the CB is activated again (e.g. Remote Start/Stop is activated).

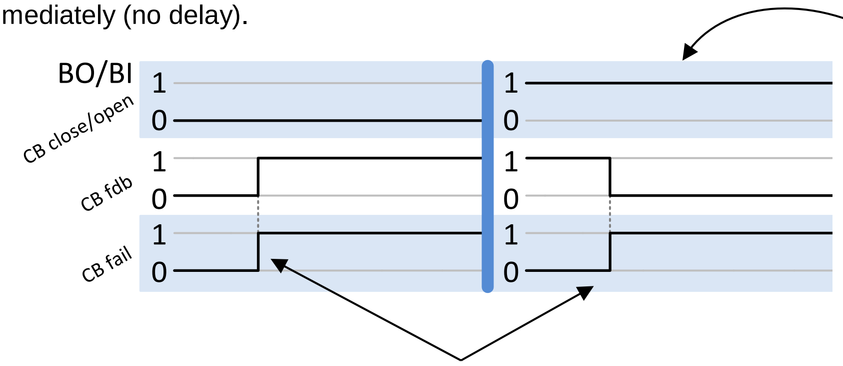
Minimum 1s delay after UV coil is switched on is needed before CB can be closed

OFF and UV pulses are always activated for the full time (2s). Manual control (= CB button) is deactivated during opening pulse.

Further behavior of UV output depends on the system status. In case of transition to cooling stays off, if the Cb was opened manually and the engine keeps running, it activates again after timeout elapses.

Other CB fail reasons:

When the BO CB close/open is in steady state and CB feedback is changed, the CB fail is detected immediately (no delay).



Alarm detection is immediate

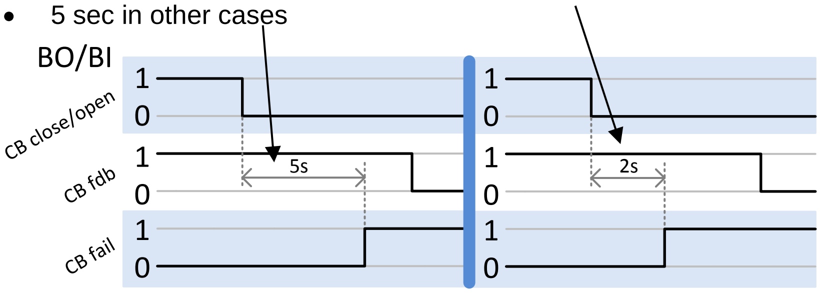
NOTE:

This is not valid for MCB. MCB fail is not detected in this case.

This is because there can be additional device which can open the MCB if one of its protections is triggered. If this configuration is used, binary input on the controller should be connected to the additional device and configured to Mains Protect with according delay for proper function. Otherwise MCB opens and the controller accepts this and no alarm is issued.

When the BO CB close/open opens, there is 5 resp. 2 sec delay for the breaker to respond before a CB fail is detected. In such case, if CB OFF coil is used for opening the CB and CB fail occurs during opening the CB, the signal CB OFF coil is automatically extended until the breaker opening is detected (evaluated as CB status).

- 2 sec when the CB is used for synchronizing
- 5 sec in other cases



- In case that CB fail is detected after switching the controller on (CB is closed), the CB OFF coil output is activated immediatelly.
- **Important:**
  In case that MCB feedback is active (MCB is expected to be closed) and "MCB fail" is reported due to previous incorrect manipulation of MCB, in the moment of Fault reset, the MCB fail is cleared and the controller internally goes to "closed" state. I.e. MCB fdb status is confirmed and the output MCB close/open is energized.

9.2.4 Follow function for breaker control in AUT mode

Only in MCB application.

Using setpoint **ProcessControl:***BrkCtrl in AUT* behavior of breaker control can be adjusted.

PROCESSCONTROL:*BRKCTRL IN AUT*	CONTROLLER BEHAVIOR
NORMAL	Breaker is controller by the controller. It is possible to fault reset (press fault reset twice) MCB fail alarm which happened due to previous incorrect manipulation with the breaker. This is possible if the breaker was closed externally and the Mains is healthy. Controller accepts the state of the breaker and continues in normal operation.
COX (FOLLOW)	Breaker is controlled externally and the controller does not attempt to control it nor any alarms are issued. Synchronization process can be started by the FORCE SYNC input if it is allowed by the setpoints **ProcessControl:***Synchro enable* and **ProcessControl:***ParallelEnable* (*Synchro enable* must be set to REVERSE and *ParallelEnable* must be set to ENABLED). Synchronization in COX(FOLLOW) does not have any timeout and controller keeps voltages synchronized indefinitely (i.e. until FORCE SYNC is opened or the breaker is closed externally).

9.2.5 Follow function for breaker control in MAN mode

Using setpoint **ProcessControl:***BrkCtrl in MAN* behavior of breaker control can be adjusted.

PROCESSCONTROL:*BRKCTRL IN MAN*	CONTROLLER BEHAVIOR
NORMAL	Breaker is controller by the controller. It is possible to fault reset (press fault reset twice) MCB fail alarm which happened due to previous incorrect manipulation with the breaker. This is possible if the breaker was closed externally and the Mains is healthy (there is no Level 2 alarm and no alarm with MGCB). Controller accepts the state of the breaker and continues in normal operation.
FOLLOW	Breaker is controlled externally and by the controller as well (closing or opening of the breaker can be done manually or can be issued by the pressing of MCB/MGCB button on the controller). Synchronization process can be started by the FORCE SYNC input if it is allowed by the setpoints **ProcessControl:***Synchro enable* and **ProcessControl:***ParallelEnable* (*Synchro enable* must be set to BOTH, REVERSE (MCB is not closed, MGCB is closed!), FORWARD (MGCB is not closed, MCB is closed!) and *ParallelEnable* must be set to ENABLED). Synchronization in FOLLOW does not have any timeout and controller keeps voltages synchronized indefinitely (i.e. until FORCE SYNC is opened or the breaker is closed externally). The synchronization can be also denied for other reasons (e.g. **ProcessControl:***MainsCoupling* is no enabled).

WARNING!
In the FOLLOW mode, the controller buttons are still active in MAN mode. Therefore it is possible to control the breaker manually or by the pressing of corresponding button on the controller! To ensure no injuries and/or damage always operate the breaker with extreme caution and prevent other personell from manipulating the breaker by the controller buttons. If necessary, use the MCB and/or MGCB DISABLE function!

10 Controller operation states

These states are given by requested breaker positions and other parameters (e.g. healthy Mains). Controller can operate in following states.

MainsOper	MCB application: MCB feedback is active, all GCB feedbacks are not active, Mains parameters are within limits MGCB application: MCB feedback is active, MGCB feedback is not active, Mains parameters are within limits
MainsFlt	MCB application: Mains parameters are not within limits MGCB application: MGCB feedback is not active, Mains parameters are not within limits
ValidFlt	MCB application: Mains parameters are not within limits and **AMF settings**:*EmergStart del* elapsed MGCB application: MGCB feedback is not active, Mains parameters are not within limits and **AMF settings**:*EmergStart del* elapsed
IslOper	MCB application: MCB feedback is not active, at least one GCB feedback is active, Mains parameters are not within limits MGCB application: MCB feedback is not active, MGCB feedback is active, Mains parameters are not within limits
MainsRet	MCB application: MCB feedback is not active, at least one GCB feedback is active, Mains parameters are within limits MGCB application: MCB feedback is not active, MGCB feedback is active, Mains parameters are within limits
BrksOff	MCB application: MCB and all GCB feedback are not active MGCB application: MCB and MGCB feedbacks are not active
Synchro	MGCB application: MCB feedback is active, MGCB feedback is not active, synchronization is allowed and started
RevSync	MCB application: MCB feedback is not active, at least one GCB feedback is active, reverse synchronization is allowed and started MGCB application: MCB feedback is not active, MGCB feedback is active, reverse synchronization is allowed and started
ParalOper	MCB application: MCB feedback is active, at least one GCB feedback is active MGCB application: MCB and MGCB feedbacks are active
EmergMan	Controller is in this state if BI EMERG. MANUAL is activated. In this state controller does not react on breaker changes and do not activate any of its binary outputs. For more information please refer to EMERG. MANUAL description in the APPENDIX of this manual or see context help in GenConfig.
Init	Initialization of controller. In this state, controller is not fully functional.

APPENDIX

11 Setpoints

11.1 Password Protection

Any setpoint can be password protected - 7 levels of password protection are available. The password is up to five-digit number (maximum is 65535). Only setpoints associated with the entered password level can be modified.

Even though one level may have been set from the front panel, the affected setpoints are not accessible from InteliMonitor (direct or Modem) until this level is set in InteliMonitor.

Setpoints opened from front panel are automatically closed 15 minutes after the last key has been pressed or when wrong value of password is set.

Any password can be changed once that level password or higher has been entered. The controller programming (configuration) requires the highest password – only Administrator.

11.2 Table of setpoints

11.2.1 Group: ProcessControl

11.2.1.1 Setpoint: #SysBaseLoad

<table>
<tr><td>Group</td><td>Process Control</td></tr>
<tr><td>Range [units]</td><td>0 .. 65000 [kW]</td></tr>
<tr><td>Related FW</td><td>standard v3.1.0</td></tr>
<tr><td>Description</td><td>This setpoint is used to adjust the baseload level for the whole gen-set group in parallel-to-mains operation. There are two methods of baseload control:
<table>
<tr><td>DISTRIBUTED MODE</td><td>#SysLdCtrl PtM = BASELOAD</td><td>Each gen-set takes proportionally equal part of the system baseload and then use load control loop (like in SPtM) to maintain the load. Load sharing is not performed, the InteliMains does not play active role.</td></tr>
</table></td></tr>
</table>

LOADSHARING MODE	*#SysLdCtrl PtM* = LDSHARING, *Load ctrl PtM* = SYSBLD->LS	The system baseload is maintained by the IM-NT over the load sharing.

NOTE:

sign in the name of this setpoint marks that this setpoint is shared among all controllers connected by CAN2 bus.

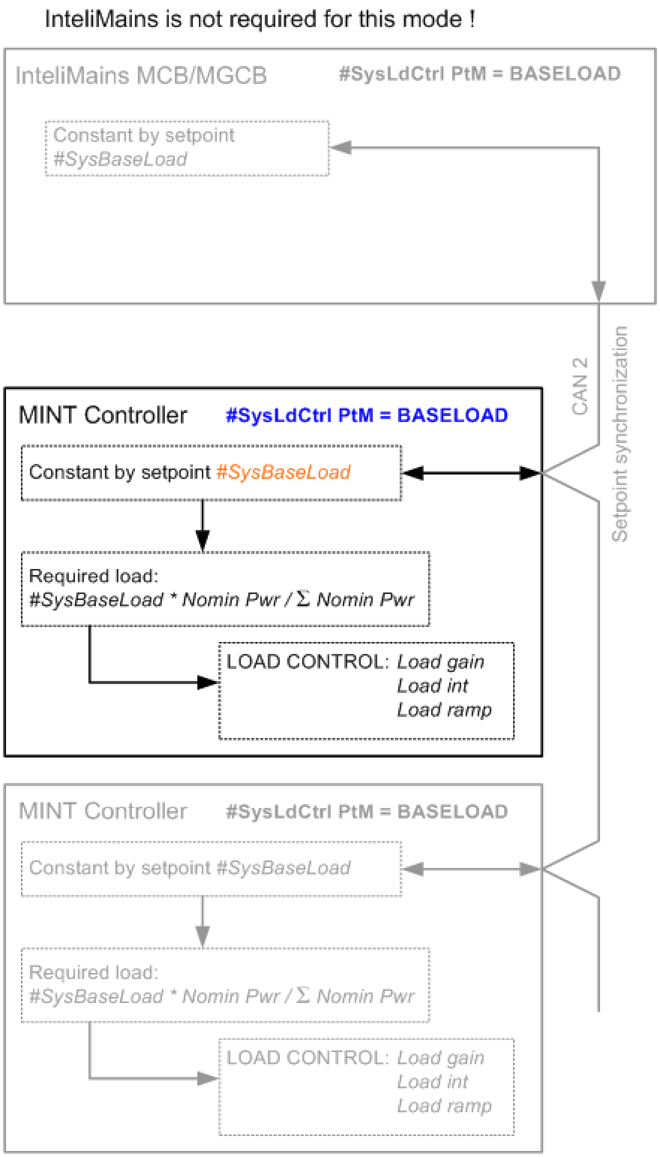
11.2.1.2 *Setpoint: #SysPwrFactor*

Group	Process Control
Range [units]	0.60 .. 1.20 [-]
Related FW	standard v3.1.0
Description	The setpoint is used for adjusting the requested base power factor of the gen-sets in the parallel-to-mains operation. The setpoint *#SysPFCtrl PtM* must be set to BASEPF for constant power factor control. The power factor of each gen-set is controlled by it's own PF control loop and InteliMains does not play active role in this type of control. Settings 0.60 – 0.99 correspond to inductive PF (0.60L - 0.99L), 1.01 – 1.20 correspond to capacitive PF (0.99C - 0.80C). **NOTE:** # sign in the name of this setpoint marks that this setpoint is shared among all controllers connected by CAN2 bus.

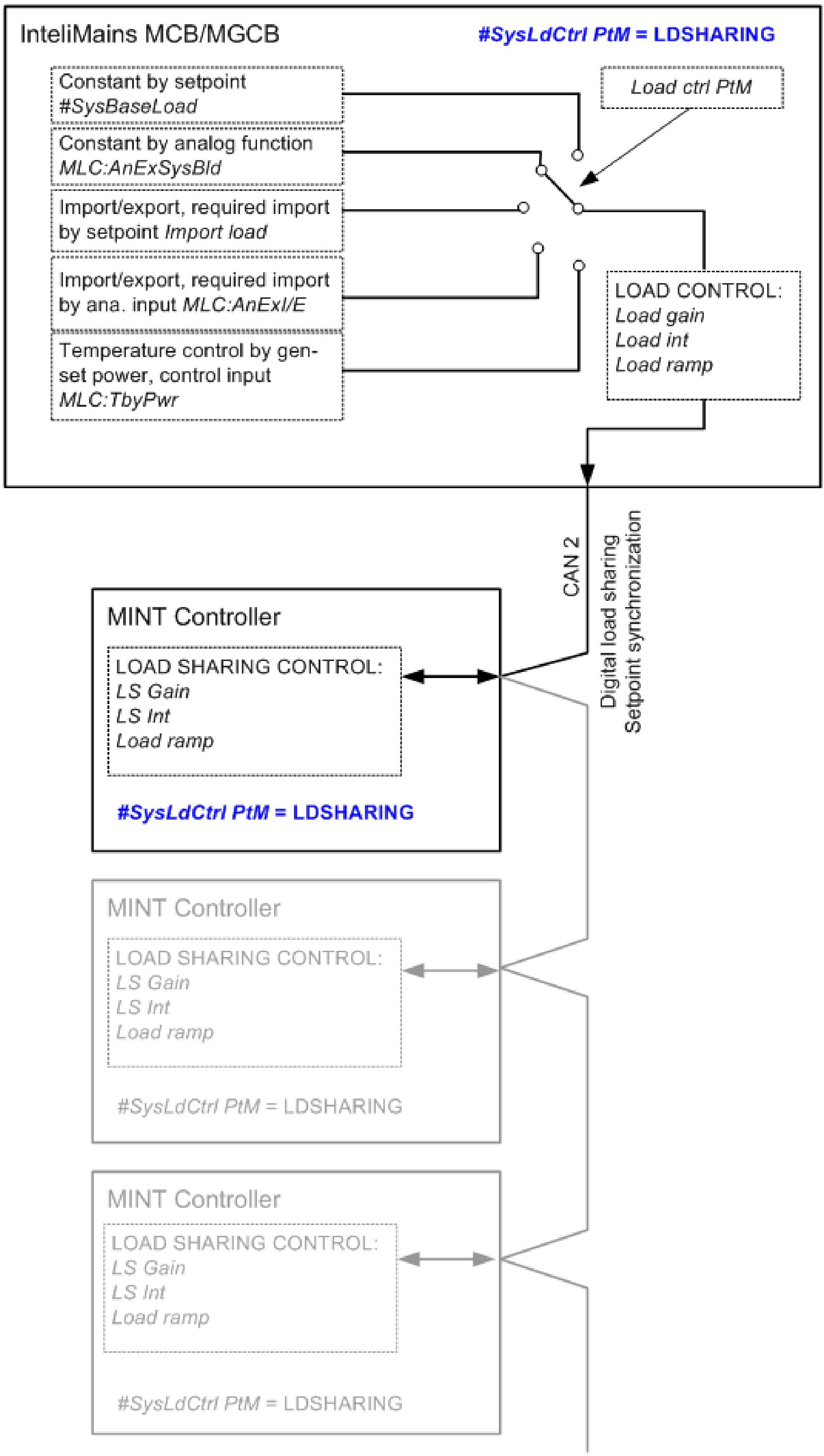
11.2.1.3 *Setpoint: #SysLdCtrl PtM*

Group	Process Control
Range [units]	BASELOAD, LDSHARING [-]
Related FW	standard v3.1.0
Description	This setpoint is used to adjust the load control type in parallel-to-mains operation.

<table>
<tr><td>BASELOAD</td><td>
The gen-sets are controlled by their load control loops (i.e. as in SPtM) to provide constant proportional part of the requested system baseload (see <i>#SysBaseLoad</i>). The InteliMains does not play active role regarding load control in parallel-to-mains operation.



LOAD CONTROL IN PTM - DISTRIBUTED SYSTEM BASELOAD
</td></tr>
<tr><td>LDSHARING</td><td>The gen-sets are controlled by the InteliMains through the load sharing line. The InteliMains load control mode is selected by the setpoint <i>Load ctrl PtM</i>.</td></tr>
</table>



LOAD CONTROL IN PTM FROM INTELIMAINS OVER LS

	NOTE: # sign in the name of this setpoint marks that this setpoint is shared among all controllers connected by CAN2 bus.

11.2.1.4 *Setpoint: #SysPFCtrl PtM*

Group	Process Control
Range [units]	BASEPF, VSHARING [-]
Related FW	standard v3.1.0
Description	This setpoint is used to adjust the power factor control type in parallel-to-mains operation. <table><tr><td>**BASEPF**</td><td>The gen-sets are controlled by their power factor control loops (i.e. as in SPtM) to provide constant power factor adjusted by the setpoint *#SysPwrFactor*. The InteliMains does not play active role regarding power factor control in parallel-to-mains operation.</td></tr><tr><td>**VSHARING**</td><td>The gen-sets are controlled by the InteliMains through the VAr sharing line (CAN2 bus). The InteliMains power factor control mode is selected by the setpoint *PF ctrl PtM*. **NOTE:** This type of power factor control is used for import/export mode only.</td></tr></table> **NOTE:** If the power factor control mode is switched to VSHARING the *load control type* must be switched to LDSHARING and the equivalent *load control mode* must be used. **NOTE:** # sign in the name of this setpoint marks that this setpoint is shared among all controllers connected by CAN2 bus.

11.2.1.5 *Setpoint: Import load*

Group	Process Control
Range [units]	-32000 .. 32000 [kW]
Related FW	standard v3.1.0
Description	This setpoint is used for adjusting of the requested **mains import** if the load control mode is set to IMP/EXP (*#SysLdCtrl PtM* = LDSHARING and *MLoad ctrl PtM* = IMP/EXP) This setpoint is also used for adjusting of the maximum allowed export if *export limit* function is active (*Export limit* = ENABLED). **NOTE:** Negative value of import is **export**, i.e. the power flows *into the mains*. **NOTE:** The actual setpoint units and range depend on setting of the Power format in GenConfig.

11.2.1.6 *Setpoint: Import PF*

Group	Process Control
Range [units]	0.60 .. 1.20 [-]
Related FW	standard v3.1.0
Description	The setpoint is used to adjust the requested power factor at the mains in import/export mode (i.e. *#SysPFCtrl PtM* = VSHARING and *PF ctrl PtM* = IMP/EXP). Values over 1.00 mean capacitive load character, i.e. setting 0.95 means 0.95L and setting 1.05 means 0.95C.

11.2.1.7 *Setpoint: MLoad ctrl PtM*

Group	Process Control
Range [units]	SYSBLD->LS, ANEXSYSBLD->LS, IMP/EXP, ANEXT IMP/EXP, T BY PWR [-]
Related FW	standard v3.1.0
Force value possible	YES

<table>
<tr><td>Description</td><td>The setpoint is used for selection of the load control mode in parallel to mains operation if the load is controlled by the InteliMains (i.e. <i>#SysLdCtrl PtM</i> = LDSHARING).

<table>
<tr><td>SYSBLD->LS</td><td>The load of the gen-set group is maintained at constant level adjusted by the setpoint <i>#SysBaseLoad</i>.</td></tr>
<tr><td>ANEXSYSBLD->LS</td><td>The load of the gen-set group is maintained at constant level given by the analog input <i>MLC:AnExSysBld</i>.</td></tr>
<tr><td>IMP/EXP</td><td>The load of the gen-set group is controlled so, that the mains import is maintained constant at the level adjusted by setpoint <i>Import load</i>.</td></tr>
<tr><td>ANEXT IMP/EXP</td><td>The load of the gen-set group is controlled so, that the mains import is maintained constant at the level given by the analog input <i>MLC:AnExI/E</i>.</td></tr>
<tr><td>T BY PWR</td><td>The load of the gen-set group is controlled so, that the analog input <i>MLC:TByPwr</i> is maintained at constant level given by setpoint <i>TempByPwr Treq</i>. The regulation loop is adjusted by setpoints <i>TempByPwr gain</i> and <i>TempByPwr int</i>.</td></tr>
</table>

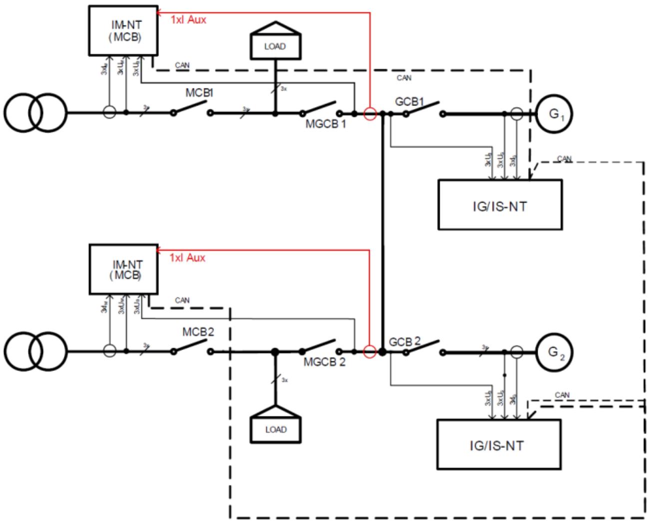
NOTE:
If the system baseload value needs to be changed remotely via a communication interface select the ANEXSYSBLD->LS mode and then configure one of the objects <i>ExtValue1</i> .. <i>ExtValue4</i> as the source for the analog input <i>MLC:AnExSysBld</i>. These objects can be written remotely via communication (e.g. via MODBUS).

CAUTION!
Do not use cyclic write of the baseload setpoint for remote load control. It may cause the internal EEPROM memory damage.</td></tr>
</table>

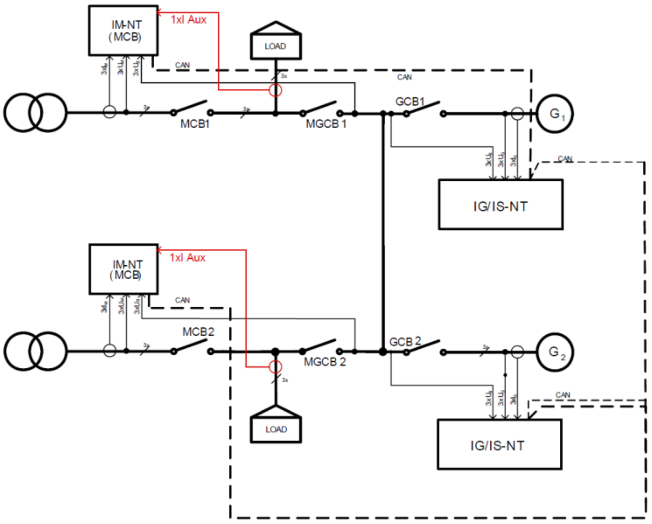
11.2.1.8 *Setpoint: Soft Unload*

Group	Process Control
Range [units]	STANDARD, AuxCTGen, AuxCTLoad [-]
Related FW	standard v3.1.0
Description	This setpoint adjusts the way MGCB opening is evaluated in case of unloaded

gen-sets. Non-standard functions presented by this setpoint are especially useful for multimains systems where a group of gen-sets supplies more loads.

STANDARD	The MGCB is opened at the moment when *TotRunPact* value is lower than *MGCB open lev* or after *MGCB open del* elapsed. Because of preventing potential oveloading of gen-sets (see example below) there are two different settings for MGCB-opening behavior which utilize auxiliary current measurement and thus prevent potentialy dangerous situations.
	EXAMPLE: For this example we will use Figure below. The upper mains incomer is feeding both loads and gen-set G1 is unloading (MCB1 is closed, MGCB1 is closed, GCB1 is closed, MCB2 is opened, MGCB2 is closed, GCB2 is opened). If standard SOFT UNLOAD behavior is used than MGCB1 is opened (after conditions mentioned above are fulfilled) and this leads to direct connection of G1 (unloaded but running gen-set) to the second load suddenly (very high load step may occur).
AUXCTGEN	Auxiliary current measurement (AUX CURRENT terminal) can be used to measure actual current through MGCB. This enables regulation of the incoming power from the Mains and from the gensets in the way that gensets stop supplying respective load but continue supplying other load in the system. The CT is expected to be placed between MGCB and bus and must be connected to L3. The MGCB is opened when the power over MGCB counted from this auxiliary current and voltage is lower than *MGCB open lev* or after *MGCB open del* elapsed. 
AUXCTLOAD	Auxiliary current measurement (AUX CURRENT terminal) can be used to measure actual current to the load. This enables regulation of the incoming power from the Mains

and from the gensets in the way that gensets stop supplying respective load but continue supplying other load in the system. The CT is expected to be placed on load connection and must be connected to L3. The MGCB is opened when the power to the load counted from this auxiliary current and voltage is lower than Mains import power plus *MGCB open lev* or after *MGCB open del* elapsed.



11.2.1.9 *Setpoint: PF ctrl PtM*

Group	Process Control
Range [units]	IMP/EXP, ANEXT IMP/EXP [-]
Related FW	standard v3.1.0
Force value possible	YES
Description	The setpoint is used for selection of the power factor control mode in parallel to mains operation. • IMP/EXP: The power factor of the gen-set group is controlled so, that the mains power factor is maintained constant at the level adjusted by setpoint *Import PF*. • ANEXT IMP/EXP: The power factor of the gen-set group is controlled so, that the mains power factor is maintained constant at the level adjusted by the analog input *MPF:AnExI/E*. **NOTE:** If you want to control the power factor to the constant given by *#SysPwrFactor*, switch the setpoint *#SysPFCtrl PtM* to BASEPF position.

11.2.1.10 *Setpoint: I/E-Pm meas*

Group	Process Control
Range [units]	NONE, CT INPUTS, ANALOG INPUT [-]
Related FW	standard v3.1.0
Description	This setpoint is used to select, which method is used for measurement of the active power (P) imported from the mains. • NONE: Active power from the mains is not measured. • CT INPUTS: Active power from the mains is calculated from the mains L-N voltages and mains currents measured at the controller CT terminals. • ANALOG INPUT: Active power from the mains is measured by an external device and passed the controller via analog input *MLC:I/E-Pm*. **NOTE:** If the active power is measured, then the measurement method should match the method used for reactive power measurement, i.e. if the setpoint *I/E-Pm meas* is set to CT INPUTS, the *I/E-Qm meas* should not be set to ANALOG INPUT and vice versa. If the setting differs, the measurement for both active and reactive power are both taken from CT input. Setting NONE can be used in any combination without changing the setting of the second measurement.

11.2.1.11 *Setpoint: I/E-Qm meas*

Group	Process Control
Range [units]	NONE, CT INPUTS, ANALOG INPUT [-]
Related FW	standard v3.1.0
Description	This setpoint is used to select, which method is used for measurement of the reactive power (Q) imported from the mains. • NONE: Reactive power from the mains is not measured. **NOTE:** It is possible to perform import/export load control without reactive power measurement, i.e. based on active power measuement only. The gen-set power factor will be maintained at constant level given by *#SysPwrFactor* setpoint. However, this kind of operation in certain conditions may cause bad power factor values at the mains. • CT INPUTS: Reactive power from the mains is calculated from the mains L-N voltages and mains currents measured at the controller CT terminals. • ANALOG INPUT: Rective power from the mains is measured by an external device and passed the controller via analog input *MPF:I/E-*

	Qm. **NOTE:** If the reactive power is measured, then the measurement method should match the method used for active power measurement, i.e. if the setpoint *I/E-Pm meas* is set to CT INPUTS, the *I/E-Qm meas* should not be set to ANALOG INPUT and vice versa. If the setting differs, the measurement for both active and reactive power are both taken from CT input. Setting NONE can be used in any combination without changing the setting of the second measurement.

11.2.1.12 *Setpoint: PeakLevelStart*

Group	Process control
Range [units]	*PeakLevelStop* .. 32000 [kW]
Related FW	standard v3.1.0
Force value possible	YES
Description	If the object consumption (*Object P*) exceeds this setpoint for time longer than *PeakAutS/Sdel*, the gen-set group is started. Adjusting the *PeakAutS/Sdel* to 0 (OFF) disables the autostart. See also the setpoint *PeakLevelStop*. **NOTE:** The IM-NT output *Sys Start/Stop* must be connected to the inputs *Sys Start/Stop* of all controllers in the group. This can be done either physically by wires or by CAN bus using shared peripherial modules. See the GenConfig help for more information about shared modules.

11.2.1.13 *Setpoint: PeakLevelStop*

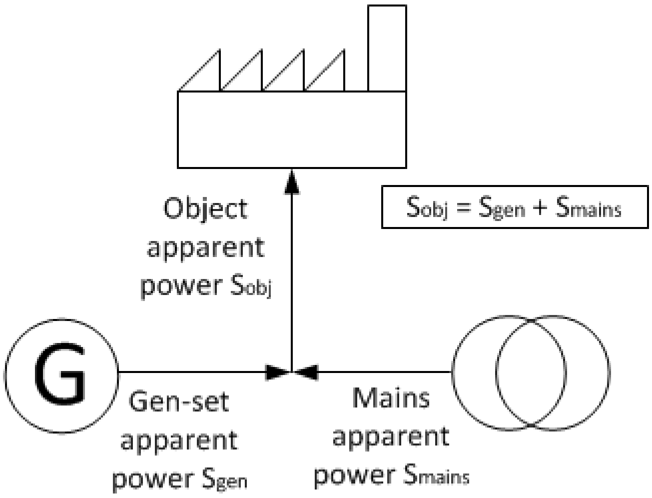
Group	Process control
Range [units]	0 .. *PeakLevelStart* [kW]
Related FW	standard v3.1.0
Force value possible	YES
Description	If the object consumption (*Object P*) drops below this setpoint for time longer than *PeakAutS/Sdel*, the gen-set group is stopped (if there isn't any other reason to keep the group running, such as binary input *Rem Start/Stop*). See also the setpoint *PeakLevelStart*.

11.2.1.14 *Setpoint: PeakAutS/S del*

Group	Process control
Range [units]	OFF, 1 .. 3200 [s]
Related FW	standard v3.1.0
Force value possible	YES
Description	The setpoints adjusts the delay for automatic Peak start/stop function. Set 0 (OFF) to disable Peak automatic start function. See also the setpoints *PeakLevelStart* and *PeakLevelStop*. **NOTE:** The delay for this function is counted down in any mode if the conditions are fulfilled (i.e. in OFF when the Mains Import in kW is higher than *PeakLevelStart*).

11.2.1.15 *Setpoint: Peak kVA Start*

Group	Process control
Range [units]	*Peak kVA Stop* .. 32000 [kVA]
Related FW	standard v3.1.0
Force value possible	YES
Description	If the object apparent consumption (*Object P* to the power of 2 + *Object Q* to the power of 2) exceeds this setpoint for time longer than *PeakKVAS/S del*, the gen-set starts automatically (in SPtM application) or group of gen-sets is started by InteliMains. Adjusting the *PeakKVAS/S del* to 0 (OFF) disables the autostart. See also the setpoint *Peak kVA Stop*.

	 **NOTE:** The actual setpoint units and range depend on setting of the Power format in GenConfig.

11.2.1.16 *Setpoint: Peak kVA Stop*

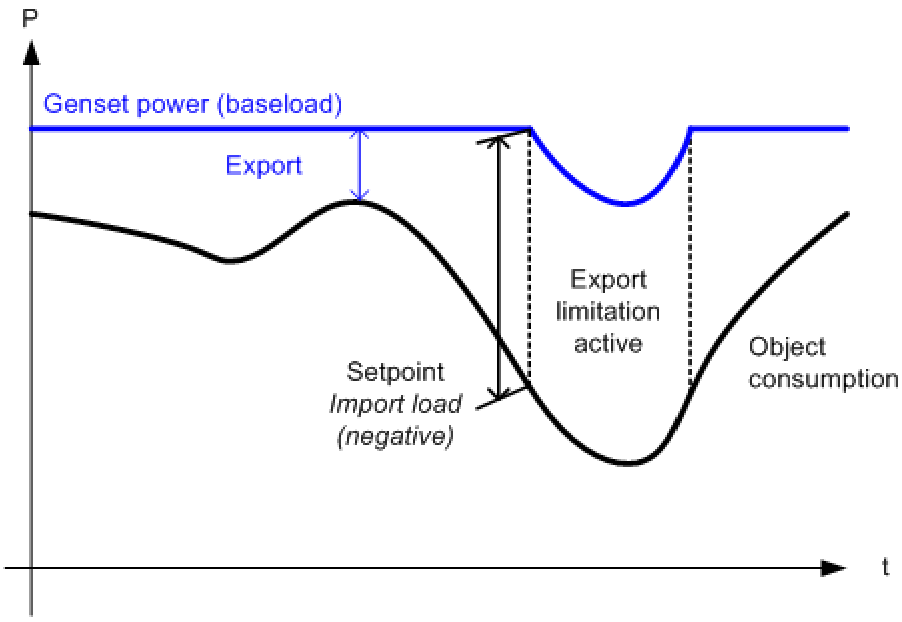
Group	Process control
Range [units]	0 .. *Peak kVA Start* [kW]
Related FW	standard v3.1.0
Force value possible	YES
Description	If the object apparent consumption (*Object P* to the power of 2 + *Object Q* to the power of 2) drops below this setpoint for time longer than *PeakKVAS/S del*, the gen-set stops automatically (in SPtM application) or gen-set group is stopped by InteliMains. See also the setpoint *Peak kVA Start*. **NOTE:** The actual setpoint units and range depend on setting of the Power format in GenConfig.

11.2.1.17 *Setpoint: PeakKVAS/S del*

Group	Process control
Range [units]	OFF, 1 .. 3200 [s]

Related FW	standard v3.1.0
Force value possible	YES
Description	The setpoints adjusts the delay for automatic Peak kVA start/stop function. Set 0 (OFF) to disable Peak kVA automatic start function. See also the setpoints *Peak kVA Start* and *Peak kVA Stop*. **NOTE:** The delay for this function is counted down in any mode if the conditions are fulfilled (i.e. in OFF when the Mains Import in kVA is higher than *Peak kVA Start*).

11.2.1.18 *Setpoint: Export limit*

Group	Process control
Range [units]	DISABLED, ENABLED [-]
Related FW	standard v3.1.0
Force value possible	YES
Description	The setpoint is used to enable and disable the *Export limit* function. If the function is enabled, the group power is limited so that mains import is always higher or equal to the setpoint *Import Load*.  PRINCIPLE OF THE EXPORT LIMIT FUNCTION This function can be used if the setpoint *Load Ctrl PtM* is set to SYSBLD-

	>LS, ANEXSYSBLD->LS or T BY PWR. **NOTE:** If the import value/setpoint is negative, it actually means export. This function can be used to protect the system from unwanted export. You may set maximum export value or you can set it possitive to keep some import even in cases that there are abrupt load changes. **NOTE:** See the setpoint *I/E-Pm meas* for details about mains import measurement methods.

11.2.1.19 *Setpoint: TempByPwr Treq*

Group	Process control
Range [units]	-32000 .. +32000 [°C]
Related FW	standard v3.1.0
Force value possible	YES
Description	The setpoint is used for adjusting the requested temperature for the *Temperature-By-Power* control loop. The *Temperature-By-Power* is active if the setpoint *Load ctrl PtM* is set to T BY PWR position and the logical analog input *MLC:TByPwr* is attached to the physical analog input where the temperature is measured. See also the setpoints *TempByPwr int* and *TempByPwr gain*. **NOTE:** As the "regulating action" of the *Temperature-By-Power* control loop is changing of the group power the regulated value (i.e. some temperature) must depend on the group power. Typical usage of this function is regulation of the output temperature of the heating water in a group of CHP units.

11.2.1.20 *Setpoint: TempByPwr gain*

Group	Process control
Range [units]	0.00 .. 100.00 [%]
Related FW	standard v3.1.0
Description	This setpoint is used to adjust the gain factor for the *Temperature-By-Power* control loop. See also the setpoints *TempByPwr Treq* and *TempByPwr int*.

11.2.1.21 *Setpoint: TempByPwr int*

Group	Process control
Range [units]	0.00 .. 100.00 [%]
Related FW	standard v3.1.0
Description	This setpoint is used to adjust the integration factor for the *Temperature-By-Power* control loop. See also the setpoints *TempByPwr Treq* and *TempByPwr gain*.

11.2.1.22 *Setpoint: Overheat prot*

Group	Process control
Range [units]	DISABLED, ENABLED
Related FW	standard v3.1.0
Force value possible	YES
Description	The setpoint is used to enable/disable the *Overheat protection*, which is used for limitation of the group power when there is not enough heat outlet from the gen-set group to avoid shutdown due to oveheating. If the *Overheat protection* is enabled and the temperature at the logical analog input *MLC:TByPwr*: • increases over the setpoint *TempByPwr Treq*, the *Temperature-By-Power* load control loop is temporarily activated to reduce the power and consequently the temperature. • returns back under the setpoint *TempByPwr Treq*, the *Temperature-By-Power* regulation loop is deactivated and previous load control mode (e.g. Baseload) takes place. **NOTE:** See more information about the *Temperature-By-Power* load control mode in the description of the setpoint *TempByPwr Treq*.

11.2.1.23 *Setpoint: Island enable*

Group	Process Control
Range [units]	NO, YES [-]

Related FW	standard v3.1.0
Force value possible	YES
Description	The setpoint is used to enable/disable the island operation, i.e. supplying the load while the mains is disconnected. • **Island mode** is recognized if the mains breaker is **open**, e.g. the feedback input *MCB feedback* is not active. • **Parallel mode** is recognized if the mains breaker is **closed**, e.g. the feedback input *MCB feedback* is active. If the island mode is recognized and island operation is disabled the controller will open the master generator breaker, and system will be stopped (i.e. gen-sets will cooldown and stop, GCBs will open). While this situation persists the controller behavior is following: • The gen-sets may be started in MAN mode but they will not start in AUT mode due to MGCB not closing. • The MGCB can't be closed. • The message *StartBlck* is present in the alarm list (see the alarm output *OfL StartBlck*). **NOTE:** See table with examples in the description of the setpoint *MFStart enable*.

11.2.1.24 *Setpoint: ParallelEnable*

Group	Process Control
Range [units]	NO, YES [-]
Related FW	standard v3.1.0
Force value possible	YES
Description	The setpoint is used to enable/disable the parallel operation, i.e. supplying the load in parallel with the mains. • **Island mode** is recognized if the mains breaker is **open**, e.g. the feedback input *MCB feedback* is not active. • **Parallel mode** is recognized if the mains breaker is **closed**, e.g. the feedback input *MCB feedback* is active. If the parallel mode is recognized and parallel operation is disabled the controller will open the master generator breaker, and the system will be stopped (gen-sets will cooldown and stop, their GCBs will open). While this situation persists the controller behavior is following:

	• The gen-sets may be started in MAN mode but they will not start in AUT mode due to MGCB not closing. • The MGCB can't be closed (if there is voltage on the bus). • The message *OfL StartBlck* is present in the alarm list (see the alarm output *OfL StartBlck*). **NOTE:** See table with examples in the description of the setpoint *MFStart enable*.

11.2.1.25 *Setpoint: Synchro enable*

Group	Process Control
Range [units]	NONE, FORWARD, REVERSE, BOTH [-]
Related FW	standard v3.1.0
Force value possible	YES
Description	The setpoint is used for enable/disable forward and reverse synchronization. • NONE: No synchronizing is enabled. • ONLY IN MGCB APPL: FORWARD: MGCB synchronizing is enabled. • REVERSE: MCB synchronizing is enabled. • ONLY IN MGCB APPL: BOTH: MGCB and MCB synchronizing are enabled. **NOTE:** Although synchronizing of the particular breaker is disabled the breaker can be closed to a "dead" (voltage-free) bus. **NOTE:** See table with examples in the description of the setpoint *MFStart enable*.

11.2.1.26 *Setpoint: MFStart enable*

Group	Process Control
Range [units]	NO, YES [-]
Related FW	standard v3.1.0

Force value possible	YES
Description	The setpoint is used to enable/disable automatic start of the gen-set group when a mains failure occurs.

EXAMPLES OF SETTINGS:

DESCRIPTION	BEHAVIOR	REQUIRED ADJUSTMENT
Pure parallel operation. No island operation, no AMF function. Neither MCB nor MGCB is synchronized.	The group is activated by the input *Sys Start/Stop*. Then MGCB is closed to power the genset bus. After that the gen-sets are started and sychronized to the already powered bus and continue in parallel operation until the group is deactivated or mains is failed.	*Island enable* = NO *ParallelEnable* = YES *Synchro enable* = NONE *MFStart enable* = NO *MGCBparalClose* = YES
Pure island operation with AMF feature. No parallel operation, neither MCB nor MGCB is synchronized.	The group is activated automatically after the mains failed. As soon as the system reserve is reached the MGCB is closed and the group supplies the load. When the mains returned MGCB is opened and the group is stopped.	*Island enable* = YES *ParallelEnable* = NO *Synchro enable* = NONE *MFStart enable* = YES
Parallel and island operation without AMF function. MCB is not synchronized.	The group is activated by the input *Sys Start/Stop*. Closing of MGCB while in parallel operation depends on the position of the setpoint *MGCBparalClose*. In island operation the MGCB is closed when the group has reached the adjusted system reserve. When the group is deactivated first the MGCB is opened and then the gen-sets are stopped. If a mains failure occurs while the group is in parallel operation the MCB is opened and the group continues in island operation. When the mains returns the group remains in island operation as reverse synchronizing is disabled.	*Island enable* = YES *ParallelEnable* = YES *Synchro enable* = NONE *MFStart enable* = NO *MGCBparalClose* = YES

	Parallel and island operation with AMF function and test on load feature. Both MCB and MGCB are synchronized.	The group is activated either by the input *Sys Start/Stop* or by a mains failure. Closing of MGCB while in parallel operation depends on the position of the setpoint *MGCBparalClose*. In island operation the MGCB is closed when the group has reached the adjusted system reserve. When the group is deactivated first the MGCB is opened and then the gen-sets are stopped. If a mains failure occurs while the group is in parallel operation the MCB is opened and the group continues in island operation. When the mains returns the group is reverse-synchronized to the mains and either deactivated or continues in parallel operation (depending on the input *Sys Start/Stop*). The *Test on load* function is possible.	*Island enable* = YES *ParallelEnable* = YES *Synchro enable* = BOTH *MFStart enable* = YES
	Island mode with AMF function and test on load feature. Both MCB and MGCB are synchronized.	The group is activated automatically when a mains failure occurs. The MGCB is closed when the group has reached the adjusted system reserve. When the mains returns the group is reverse-synchronized to the mains and then deactivated. The *Test on load* function is possible.	*Island enable* = YES *ParallelEnable* = NO *Synchro enable* = BOTH *MFStart enable* = YES

11.2.1.27 *Setpoint: MGCBparalClose*

Group	Process Control
Range [units]	NO, YES, MCB CLOSED [-]
Related FW	standard v3.1.0
Force value possible	YES

<table>
<tr><td>Description</td><td>MGCB application only
<table>
<tr><td>NO</td><td>Disables automatic MGCB closing in the case that the Sys start/stop output is activated.</td></tr>
<tr><td>YES</td><td>Enables automatic MGCB closing in the case that the Sys start/stop output is activated.
<u>NOTE:</u>
In AUT mode, if the gen-set group is about to be started to mains-parallel operation, it is suitable to close the MGCB first (i.e. before any GCB is closed). The first gen-set then synchronizes with the generator bus and directly with the mains (both MCB and MGCB are closed) and other gen-sets as well. If this is not desired (for whatever reason), the function can be blocked by adjusting this setpoint to NO. In that case, the first gen-set is connected to the generator bus (without load), and only after that the MGCB synchronizing starts. Other gensets are then synchronized through the bus to mains directly (the same behavior as in YES setting).
<u>NOTE:</u>
MCBparalClose = YES is a forbidden state if setpoint <i><u>MCB opens on</u></i> is set to BUS VOLTAGE. The second adjusted setpoint is reverted back to NO (MGCBparalClose) or GEN RUNNING (MCB opens on).</td></tr>
<tr><td>MCB CLOSED</td><td>Enables automatic MGCB closing after MCB is closed with 5s delay (in AUT mode).
<u>NOTE:</u>
MGCB is closed if there is zero voltage on bus and GCBs are open. Starting gen-sets are than directly synchornized to mains voltage.
If Mains fails MGCB is opened after MCB is opened (if there is no bus voltage).
<u>NOTE:</u>
MCBparalClose = MCBclosed is a forbidden state if setpoint <i><u>MCB opens on</u></i> is set to BUS VOLTAGE. The second adjusted setpoint is reverted back to NO (MGCBparalClose) or GEN RUNNING (MCB opens on).</td></tr>
</table>
</td></tr>
</table>

	CAUTION! IM-NT cannot influence behavior of another control unit that is in MAN mode. It is dangerous to close GCB on gen-set in MAN mode while parallel operation is disabled. IM-NT react on this with opening MGCB but it could take short time till it received feedback from GCB and MGCB breaker is automatically opened. **NOTE:** **Connecting of a genset with non-ComAp controller to a common bus** • In version 2.5 it was not possible to close MGCB in case that all ComAp genset controllers were switched off and there was another (hire) genset supplying voltage to the bus bar. • From version 2.6 the IM-NT closes MGCB based on voltage present on the bus (provided that load reserve is fulfilled) and is not checking the presence of IGS-NTs. For proper functionality in parallel to Mains operation it is then necessary that the MGCBparalClose setpoint is set to YES.

11.2.1.28 *Setpoint: MinPwr PtM*

Group	Process Control
Range [units]	1 .. 100 [%]
Related FW	standard v3.1.0
Force value possible	YES
Description	This function is active when *SysLdCtrl PtM* is set to LDSHARING (i.e. InteliMains is controlling the load sharing of the gen-set group). The value of *MinPwr PtM* is related to the nominal power of each gen-set (i.e. if one gen-set in the group has nominal power of 500 kW and another has 200 kW and *MinPwr PtM* is set to 50%, first gen-set will produce minimally 250 kW and the other will produce at least 100 kW). This function works regardless of selected import/export limit or selected IMP/EXP control in parallel to Mains operation. **NOTE:** If the setpoint *SysLdCtrl PtM* is set to BASELOAD, the load sharing is done by gen-set controller individually without any control from InteliMains. In this case setpoint **Gener protect:***Min power PtM* in gen-set controller is considered individually for each gen-set (i.e. it is possible to set different minimal running power for each gen-set).

11.2.1.29 *Setpoint: Mains coupling*

<table>
<tr><td>Group</td><td>Process Control</td></tr>
<tr><td>Range [units]</td><td>ENABLED, DISABLED [-]</td></tr>
<tr><td>Related FW</td><td>standard v3.1.0</td></tr>
<tr><td>Force value possible</td><td>YES</td></tr>
<tr><td>Description</td><td>This setpoint selects how the IM-NT cooperates with other IM-NT in systems where one common busbar is supplied from many mains incomers, which are controlled by many IM-NT controllers.
<table>
<tr><td>ENABLED</td><td>If there is voltage on Bus, however it is supplied from other mains incomer controlled by other IM-NT, the respective IM-NT may also close its MCB and MGCB and it will couple the two mains incomers together.</td></tr>
<tr><td>DISABLED</td><td>The IM-NT will not close it's MCB and MGCB if there is other IM-NT with closed MCB and MGCB detected on the CAN2 bus (in the same control group - control groups may be connected together via Group Link).</td></tr>
</table>
<u>NOTE:</u>
Passive phase/voltage check is performed before mains coupling.</td></tr>
</table>

11.2.1.30 *Setpoint: AUT ctrl mode*

<table>
<tr><td>Group</td><td>Process Control</td></tr>
<tr><td>Range [units]</td><td>NORMAL, COX(FOLLOW) [-]</td></tr>
<tr><td>Related FW</td><td>standard v3.1.0</td></tr>
<tr><td>Description</td><td>This setpoint selects how the MCB is handled in AUT mode.
<table>
<tr><td>NORMAL</td><td>The MCB is controlled by IM-NT and it's internal sequences and adjusted timers.</td></tr>
<tr><td>COX(FOLLOW)</td><td>The MCB is expected to be controlled by an external device (e.g. a PLC) and the IM-NT only follows it's position. Synchronizing can be activated by the input</td></tr>
</table></td></tr>
</table>

	Force sync.

11.2.1.31 *Setpoint: BrkCtrl in Man*

Group	ProcessControl
Range [units]	NORMAL, FOLLOW [-]
Related FW	standard v3.1.0
Force value possible	YES
Description	This setpoint selects how the MCB and MGCB are handled in MAN mode. **NORMAL**: The MCB and MGCB are controlled by IM-NT (close and open breakers based on MCB and MGCB buttons) and it's internal sequences and adjusted timers. **FOLLOW**: The MCB and MGCB can be still controlled by MCB and MGCB buttons but moreover it is possible to close and open breakers by external device or manually without controller issuing any alarms and taking any actions. It is also possible to start synchronization by activating *Force sync*. After Force sync is activated the controller synchronizes and keeps Mains and Bus synchronized until *Force sync* gets deactivated again (Sync timeout is not considered when *Force sync* is activated). Synchronization is also activated if the MCB or MGCB button are pressed as in NORMAL Breaker Control Mode. In this case Sync timeout applies. There are several situations and controller's reaction in FOLLOW mode in MAN: • If LBI *Force sync* is active and the forced synchronization takes place, pressing the corresponding CB button (even repeatidely) causes closing of the corresponding breaker when the synchronism conditions are met. • When the controller synchronizes because the corresponding CB button was closed, activating and deactivating of LBI *Force sync* does not influence the synchronization. • When the controller synchronizes because the LBI *Force sync* is activated, the controller will no issue any alarms even though the corresponding CB button is pressed during the forced synchronization and the breaker cannot close because synchronism conditions were not met in Sync timeout.

11.2.1.32 *Setpoint: MultiSoftStart*

Group	ProcessControl
Range [units]	DISABLED, ENABLED [-]
Related FW	standard v3.1.0
Description	This setpoint enables StartUpSynchronization of a group of gen-sets with closed MGCB prior to getting healthy voltage measurement on the bus. **DISABLED**: There is no change in the controller behavior. **ENABLED**: The controller will close MGCB in AUT and MAN right after at least one of gen-set controllers in its control group closes GCB and indicates StartUpSynchro sequence. MGCB is not closed if MCB is closed (e.g. due to healthy Mains)

11.2.1.33 *Setpoint: Watched Contr*

Group	Process Control
Range [units]	0 .. 16 [min]
Related FW	standard v3.1.0
Description	This setpoint is used at redundant controller to specify the address of the related main controller in CAN-based rendundant systems. Adjust this setpoint to 0 if the controller is not used as redundant or if wired rendundancy system is used. **NOTE:** Learn more about redundant systems in the chapter Redundant controllers.

11.2.2 Group: Basic settings

11.2.2.1 *Setpoint: Vm VT ratio*

Group	Basic Settings
Range [units]	0.10 .. 500.00 [V/V]

Related FW	standard v3.1.0
Description	The setpoint is used to adjust the mains voltage transformers ratio. **NOTE:** Adjust the setpoint to the value of **1.00** if the mains voltage is connected directly to the controller terminals, i.e. without transformers. **NOTE:** Example: if you have transformers with ratio 6000/100V adjust the setpoint to the value of **60.00**. **NOTE:** The range of the mains voltage inputs must be adjusted properly. See the setpoint *Vm InpRangeSel*.

11.2.2.2 *Setpoint: Vm InpRangeSel*

Group	Basic settings
Range [units]	277V, 120V [-]
Related FW	standard v3.1.0
Description	This setpoint selects the range of the mains voltage terminals. The 120V range is available only in IM-NTC hardware. The IM-NT has the range adjusted fixedly to 277V regardless of this setpoint. **NOTE:** The 277V range is suitable for both European (230V) and American (277V) measurement. The range 120V is intended for high-voltage applications where voltage transformers with 100V secondary range are used or for alternative American (120V) measurement.

11.2.2.3 *Setpoint: Bus VT ratio*

Group	Basic Settings
Range [units]	0.10 .. 500.00 [V/V]
Related FW	standard v3.1.0
Description	The setpoint is used to adjust the bus voltage transformers ratio. **NOTE:** Adjust the setpoint to the value of **1.00** if the bus voltage is connected directly to the controller terminals, i.e. without transformers.

	NOTE: Example: if you have transformers with ratio 6000/100V adjust the setpoint to the value of **60.00**. **NOTE:** The range of the bus voltage inputs must be adjusted properly. See the setpoint *BusInpRangeSel*.

11.2.2.4 *Setpoint: BusInpRangeSel*

Group	Basic settings
Range [units]	277V, 120V [-]
Related FW	standard v3.1.0
Description	This setpoint selects the range of the bus voltage terminals. The 120V range is available only in IM-NTC hardware. The IM-NT has the range adjusted fixedly to 277V regardless of this setpoint. **NOTE:** The 277V range is suitable for both European (230V) and American (277V) measurement. The range 120V is intended for high-voltage applications where voltage transformers with 100V secondary range are used or for alternative American (120V) measurement.

11.2.2.5 *Setpoint: MainsNomV*

Group	Basic Settings
Range [units]	10 .. 30000 [V]
Related FW	standard v3.1.0
Force value possible	YES
Description	This setpoint is used to adjust the nominal mains voltage (phase to neutral). If you do not know the phase-neutral nominal voltage, you can adjust the phase-phase nominal voltage *MainsNomVph-ph*. The controller will then recalculate the phase-neutral nominal voltage automatically. **NOTE:** The actual setpoint units and range depend on setting of the Power format in GenConfig.

	NOTE: If different voltage on Mains and on Bus is required the following procedure is required: Both setpoints (BusNomV and MainsNomV) must be adjusted to the same values according to the value of actual Bus nominal voltage. E.g. Bus nominal is 231 V but Mains nominal is 240 V. In this case both setpoints need to be adjusted to 231 V and setpoints of corresponding protections for Mains need to be set assymetrically. For 240 V on Mains it is typical to open MCB when voltage reaches 254 V or 225 V. Since the setpoint is adjusted to 231 V corresponding protection setpoints need to be adjusted to Bus >V = 106% and Bus <V = 97 % (hence the desired values are reached).

11.2.2.6 *Setpoint: MainsNomVph-ph*

Group	Basic Settings
Range [units]	17 .. 60000 [V]
Related FW	standard v3.1.0
Description	This setpoint is used to adjust the nominal mains voltage (phase to phase). This setpoint is also recalculated automatically when the phase-neutral nominal voltage MainsNomV is changed. This setpoint can be used if you know the phase-phase nominal voltage only. The controller will recalculate the phase-neutral nominal voltage automatically when this setpoint is changed. **NOTE:** The actual setpoint units and range depend on setting of the Power format in GenConfig. **NOTE:** If different voltage on Mains and on Bus is required the following procedure is required: Both setpoints (MainsNomVph-ph and BusNomVph-ph) must be adjusted to the same values according to the value of actual Bus nominal voltage. E.g. Bus nominal is 400 V but Mains nominal is 415 V. In this case both setpoints need to be adjusted to 400 V and setpoints of corresponding protections for Mains need to be set assymetrically. For 415 V on Mains it is typical to open MCB when voltage reaches 440 V or 390 V. Since the setpoint is adjusted to 400 V corresponding protection setpoints need to be adjusted to Bus >V = 106% and Bus <V = 97 % (hence the desired values are reached).

11.2.2.7 *Setpoint: BusNomV*

Group	Basic Settings

Range [units]	10 .. 30000 [V]
Related FW	standard v3.1.0
Force value possible	YES
Description	This setpoint is used to adjust the nominal bus voltage (phase to neutral). If you do not know the phase-neutral nominal voltage, you can adjust the phase-phase nominal voltage *BusNomVph-ph*. The controller will then recalculate the phase-neutral nominal voltage automatically. **NOTE:** The actual setpoint units and range depend on setting of the Power format in GenConfig. **NOTE:** If different voltage on Mains and on Bus is required the following procedure is required: Both setpoints (*BusNomV* and *MainsNomV*) must be adjusted to the same values according to the value of actual Bus nominal voltage. E.g. Bus nominal is 231 V but Mains nominal is 240 V. In this case both setpoints need to be adjusted to 231 V and setpoints of corresponding protections for Mains need to be set assymetrically. For 240 V on Mains it is typical to open MCB when voltage reaches 254 V or 225 V. Since the setpoint is adjusted to 231 V corresponding protection setpoints need to be adjusted to *Bus >V* = 106% and *Bus <V* = 97 % (hence the desired values are reached).

11.2.2.8 *Setpoint: BusNomVph-ph*

Group	Basic settings
Range [units]	17 .. 60000 [V]
Related FW	standard v3.1.0
Description	This setpoint is used to adjust the nominal bus voltage (phase to phase). This setpoint is also recalculated automatically when the phase-neutral nominal voltage *BusNomV* is changed. This setpoint can be used if you know the phase-phase nominal voltage only. The controller will recalculate the phase-neutral nominal voltage automatically when this setpoint is changed. **NOTE:** The actual setpoint units and range depend on setting of the Power format in GenConfig. **NOTE:** If different voltage on Mains and on Bus is required the following procedure is

	required: Both setpoints (*MainsNomVph-ph* and *BusNomVph-ph*) must be adjusted to the same values according to the value of actual Bus nominal voltage. E.g. Bus nominal is 400 V but Mains nominal is 415 V. In this case both setpoints need to be adjusted to 400 V and setpoints of corresponding protections for Mains need to be set assymetrically. For 415 V on Mains it is typical to open MCB when voltage reaches 440 V or 390 V. Since the setpoint is adjusted to 400 V corresponding protection setpoints need to be adjusted to *Bus >V* = 106% and *Bus <V* = 97 % (hence the desired values are reached).

11.2.2.9 *Setpoint: Nomin current*

Group	Basic Settings
Range [units]	1 .. 10000 [A]
Related FW	standard v3.1.0
Force value possible	YES
Description	This setpoint is used for adjusting the maximal allowed current at the mains feeder. The nominal current is used as the basis (100%) for mains thermal-overcurrent protection (*2POvrldStEvDel*), and for short current protection (*Mains2Inom del*). **NOTE:** The setpoints *MainsCTprim* and *MainsCTsec* must be adjusted properly to obtain correct mains current readings. **CAUTION!** The maximum measurable input current to the controller current terminals is 11A. **WARNING!** Do not discconnect the CT terminals from the controller while there is nonzero current in the CT primary circuit!

11.2.2.10 *Setpoint: NominMainsImp*

Group	Basic Settings
Range [units]	1 .. 32000 [kW]

Related FW	standard v3.1.0
Force value possible	YES
Description	This setpoint is used for adjusting the maximal allowed power imported from the mains. It is used as the 100% for the IDMT overload protection (*Mns2PovrldProt*) as well as for some regulation loops. **NOTE:** The actual setpoint units and range depend on setting of the Power format in GenConfig.

11.2.2.11 *Setpoint: MainsCTprim*

Group	Basic Settings
Range [units]	1 .. 15000 [A]
Related FW	standard v3.1.0
Force value possible	YES
Description	Nominal current of the **primary side** of the mains current transformers. The secondary side is adjusted by setpoint *MainsCTsec*.

11.2.2.12 *Setpoint: MainsCTsec*

Group	Basic settings
Range [units]	/5A, /1A [-]
Related FW	standard v3.1.0
Description	Nominal current of the **secondary side** of the mains current transformers. The primary side is adjusted by setpoint *MainsCTprim*. **NOTE:** The CT secondary nominal current is adjustable only in IM-NTC. The IM-NT has the CT secondary nominal current adjusted fixedly to 5A regardless of this setpoint.

11.2.2.13 *Setpoint: AuxCurrCTprim*

Group	Basic settings

Range [units]	1 .. 15000 [A]
Related FW	standard v3.1.0
Description	Auxiliaries Current Transformer ratio – primary side. **NOTE:** For more information on usage of auxiliary measurement of current please refer to *Soft Unload*.

11.2.2.14 *Setpoint: AuxCurrCTsec*

Group	Basic settings
Range [units]	/1A, /5A [A]
Related FW	standard v3.1.0
Description	Auxiliaries Current Transformer ratio – secondary side. **NOTE:** Restricted to selection of /5A or /1A. **NOTE:** For more information on usage of auxiliary measurement of current please refer to *Soft Unload*.

11.2.2.15 *Setpoint: FixVoltProtSelect*

Group	Basic settings
Range [units]	PHASE-NEUTRAL, PHASE-PHASE [-]
Related FW	standard v3.1.0
Description	**PHASE-NEUTRAL**: The mains/bus voltage protections are based on phase-to-neutral voltages. **PHASE-PHASE**: The mains/bus voltage protections are based on phase-to-phase voltages.

11.2.2.16 *Setpoint: Nominal Freq*

Group	Basic Settings
Range [units]	50 Hz, 60 Hz [-]
Related FW	standard v3.1.0
Force value possible	YES
Description	The setpoint adjusts nominal system frequency (choose 50 Hz or 60 Hz). Setpoint *Nom frq offset* is used for setting offset to the chosen nominal frequency (-2 to +2 Hz with step 0.01 Hz). Controller regulates to the *Nominal Freq* + *Nom frq offset* frequency. The value *Nominal Freq* + *Nom frq offset* is used as 100% for frequency protections.

11.2.2.17 *Setpoint: ControllerMode*

<table>
<tr><td>Group</td><td>Basic settings</td></tr>
<tr><td>Range [units]</td><td>OFF, MAN, AUT [-]</td></tr>
<tr><td>Related FW</td><td>standard v3.1.0</td></tr>
<tr><td>Force value possible</td><td>YES</td></tr>
<tr><td>Description</td><td>This setpoint can be used to select the controller mode. It is equivalent to selecting the mode by the buttons on the front panel or IntelliVision. Currently active mode is displayed on the controller main screen.

NOTE:
If any of the mode forcing inputs <i>Remote OFF</i>, <i>Remote MAN</i>, <i>Remote AUT</i> or <i>Remote TEST</i> is active, then the currenly active mode can be different than the mode selected by the setpoint (resp. panel buttons).

<table>
<tr><td>OFF</td><td>IM-NT does not influence gen-set group in this mode.
If Mains is healthy and no mains alarm is active, MCB is closed after <i>MCB close del</i> if <i>MCB opens on</i> is set to MAINSFAIL. If <i>MCB opens on</i> is set to GEN RUNNING, MCB stays closed all the time, regardless of the Mains condition.
In MCB application - if the controller is switched to OFF mode while the gen-sets are running and there is voltage on the bus, MCB is not closed before bus</td></tr>
</table>
</td></tr>
</table>

	voltage disappears. • In MGCB application - if the controller is switched to OFF mode while the gen-sets are running and there is voltage on the bus, MGCB is opened and after AMF settings:FwRet break MCB is closed (if there is Mains voltage). • Binary output *Sys start/stop* is not active.
MAN	• It is possible to close/open breakers manually under supervision of IM-NT controller which doesn't allow to close simultaneously breakers without synchronizing (e.g. MCB and MGCB). • If the Mains fails, controller opens MCB if *MCB opens on* is set to MAINSFAIL. After the Mains returns, MCB stays opened. Otherwise MCB is controlled manually by pressing MCB ON/OFF button or closing MCBButton binary input. • In MGCB application – if the Mains fails and group of gen-sets is started and there is voltage on the bus, then MGCB can be closed anytime by pressing MGCB ON/OFF button. • Pressing of Start/Stop buttons closes/opens binary output *Sys start/stop*, i.e. cause start/stop of the gen-set group.
AUT	Controller performs automatically sequences after Mains failure, closing/opening MCB and MGCB, Peak shaving function, closing of Sys start/stop binary output. • MCB is opened according to setpoint *MCB opens on* after Mains failure or after the gen-sets are running. • MGCB is closed after the start of gen-set group as soon as an appropriate load reserve is achieved (*Syst Res OK* binary output closed). If Mains fails and MCB is opened then MGCB stays closed unless voltage on the bus goes out of the limits. • Controller reacts on binary input *Rem start/stop* – if this input is closed, controller activates binary output *Sys start/stop* in order to start gen-set group. In MGCB application MGCB can be closed before the output activation (see also setpoint *MGCBparalClose*).
TEST	**MCB application** • Test on load - automatic start of the gen-sets (activation of binary output Sys start/stop), load takeover and opening of MCB is performed. If the Mains fails during test, load is transferred to the gen-sets. **MGCB application** • Engine Start Only - start of the gen/sets and their synchronization on generator bus is performed. After pressing MGCB button, it is synchronized and load is

	transferred to gen-sets. After pressing MCB button MCB is opened and MGCB stays closed, gen-sets are running in Island operation. • Test on load - MGCB is closed, gen-sets synchronized to the bus, load transferred to gen-sets and MCB opened. Return of the load to the Mains is adjusted via setpoint *ReturnTo mains*.

11.2.2.18 *Setpoint: ContrInitMode*

Group	Basic settings
Range [units]	PREVIOUS, OFF, MAN, AUT, [-]
Related FW	standard v3.2.0
Description	This setpoint adjusts which mode will be activated when the controllers is powered on.

11.2.2.19 *Setpoint: Local buttons*

Group	Basic settings
Range [units]	PANEL, EXTBUTTONS, BOTH [-]
Related FW	standard v3.1.0
Description	The setpoint selects which set of control buttons is currently active. Its function depends on which type of controller is used. Please refer to the section which suits your controller/display version. • First section deals with the case of IGS-NT with built-in monochrome display. • Second section deals with the case of IGS-NT-BB with IV5 display. • Third section deals with the case of IGS-NT-BB with IV8. **NOTE:** If you have IGS-NT (built-in display) and you use additional IV display all the sections may be relevant (depending on the type of additional displays). **IGS-NT (built-in monochrome display)**

PANEL	The built-in buttons on the controller front panel (IG-NT) or terminal #1 (IS-NT) are enabled, the binary inputs for external buttons are disabled.
EXTBUTTONS	The built-in buttons are disabled and the binary inputs for

	external buttons are enabled.
BOTH	Both built-in buttons and binary inputs for external buttons are enabled.

NOTE:

In case that additional IV display is connected to a controller it behaves in the way described below.

NOTE:

The binary inputs for external buttons may be the following: GCBButton, MCBButton, FaultResButton, HornResButton, StartButton, StopButton etc.

IGS-NT-BB with IV-5 display

These settings are applicable to IV5 or IV8 connected as NT terminal 1 only.

Situation is depicted in the following figure.

- Buttons in red box are inactive when EXTBUTTONS option is selected and active when PANEL or BOTH option is selected.
- Buttons in green box are active when any option is selected.
- Behavior of buttons in orange box depends on functions assigned to each button individually. If any function in the list in the note below is assigned to these buttons then it behaves as buttons in the red box, if any other function is assigned to these buttons it behaves as buttons in the green box.
- The binary inputs for external buttons are affected in the same way as in the case of IGS-NT (built-in monochrome display) by this setpoint.

NOTE:

In the case that more IV displays are connected they all behave the same (they are all clones of each other).

NOTE:

The binary inputs for external buttonst may be the following (depending on used application): *GCBButton*, *MCBButton*, *MGCBButton*, *FDRButton*, *BTBButton*, *FaultResButton*, *HornResButton*, *StartButton*, *StopButton* etc.

IGS-NT-BB with IV-8 display

These settings are applicable to IV5 or IV8 connected as NT terminal 1 only.

Situation is depicted in the following figure.

- Buttons in red box are inactive when EXTBUTTONS option is selected and active when PANEL or BOTH option is selected.
- Buttons in green box are active when any option is selected.
- Behavior of buttons in orange box depends on functions assigned to each button individually. If any function in the list in the note below is assigned to these buttons then it behaves as buttons in the red box, if any other function is assigned to these buttons it behaves as buttons in the green box.
- The binary inputs for external buttons are affected in the same way as in the case of IGS-NT (built-in monochrome display) by this setpoint.

	 **NOTE:** In the case that more IV displays are connected they all behave the same (they are all clones of each other). **NOTE:** The binary inputs for external buttonst may be the following (depending on used application): *GCBButton*, *MCBButton*, *MGCBButton*, *FDRButton*, *BTBButton*, *FaultResButton*, *HornResButton*, *StartButton*, *StopButton* etc.

11.2.2.20 *Setpoint: DispBaklightTO*

Group	Basic settings
Range [units]	OFF, 1-240 min, NO TIMEOUT [min]
Related FW	standard v3.1.0
Force value possible	YES
Description	This setpoint adjusts timeout after which the display (internal display or IS display #1) backlight is switched off. **NOTE:** When IntelliVision is used this setpoint does not adjust its behavior. Its backlight is adjusted by internal IntelliVision "setpoint".

OFF	The backlight is off all the time
NO TIMEOUT	The backlight is on all the time

11.2.2.21 *Setpoint: UserBtn pulse*

Group	Basic settings
Range [units]	0.2 .. 10.0 [s]
Related FW	standard v3.1.0
Force value possible	YES
Description	This setpoint adjusts the duration of User Button 1..16 pulse. For more information read the description of LBO *User Button 1*.

11.2.2.22 *Setpoint: ImpCountDef1-4*

Group	Basic settings
Range [units]	0 .. 65535 [-]
Related FW	standard v3.2.0
Force value possible	YES
Description	This setpoint adjusts the value to which the corresponding Impulse counter statistic is set when the binary input ImpCountSet1-4.

11.2.2.23 *Setpoint: ConvCoefPulse1*

Group	Basic settings
Range [units]	1 .. 65000 [/X]
Related FW	standard v3.1.0
Description	The conversion ratio between incoming pulses at binary inputs PulseCounter 1/2/3/4 and output statistic values PulseCounter 1/2/3/4. The ratio defines how many pulses (rising edges) have to be sensed at the input in order to increase the output value. Unfinished “invisible” parts are stored in the controller even in the case of power supply failure. Physical unit of the output statistic value has to correspond to the ratio unit “/X”.

	NOTE: Pulse width (both high/low levels) must be at least 100 ms in order to be correctly sensed! Conversion ratio can be selected using the setpoints ConvCoefPulse1/2/3/4. The converted values are visible in statistics – values PulseCounter 1/2/3/4. These values can be reset using Statistics window in InteliMonitor.

11.2.2.24 *Setpoint: ConvCoefPulse2*

Group	Basic settings
Range [units]	1 .. 65000 [/X]
Related FW	standard v3.1.0
Description	The conversion ratio between incoming pulses at binary inputs PulseCounter 1/2/3/4 and output statistic values PulseCounter 1/2/3/4. The ratio defines how many pulses (rising edges) have to be sensed at the input in order to increase the output value. Unfinished "invisible" parts are stored in the controller even in the case of power supply failure. Physical unit of the output statistic value has to correspond to the ratio unit "/X". **NOTE:** Pulse width (both high/low levels) must be at least 100 ms in order to be correctly sensed! Conversion ratio can be selected using the setpoints ConvCoefPulse1/2/3/4. The converted values are visible in statistics – values PulseCounter 1/2/3/4. These values can be reset using Statistics window in InteliMonitor.

11.2.2.25 *Setpoint: ConvCoefPulse3*

Group	Basic settings
Range [units]	1 .. 65000 [/X]
Related FW	standard v3.1.0
Description	The conversion ratio between incoming pulses at binary inputs PulseCounter 1/2/3/4 and output statistic values PulseCounter 1/2/3/4. The ratio defines how many pulses (rising edges) have to be sensed at the input in order to increase the output value. Unfinished "invisible" parts are stored in the controller even in the case of power supply failure. Physical unit of the output statistic value has to correspond to the ratio unit "/X". **NOTE:** Pulse width (both high/low levels) must be at least 100 ms in order to be correctly sensed! Conversion ratio can be selected using the setpoints

	ConvCoefPulse1/2/3/4. The converted values are visible in statistics – values PulseCounter 1/2/3/4. These values can be reset using Statistics window in InteliMonitor.

11.2.2.26 *Setpoint: ConvCoefPulse4*

Group	Basic settings
Range [units]	1 .. 65000 [/X]
Related FW	standard v3.1.0
Description	The conversion ratio between incoming pulses at binary inputs PulseCounter 1/2/3/4 and output statistic values PulseCounter 1/2/3/4. The ratio defines how many pulses (rising edges) have to be sensed at the input in order to increase the output value. Unfinished "invisible" parts are stored in the controller even in the case of power supply failure. Physical unit of the output statistic value has to correspond to the ratio unit "/X". **NOTE:** Pulse width (both high/low levels) must be at least 100 ms in order to be correctly sensed! Conversion ratio can be selected using the setpoints ConvCoefPulse1/2/3/4. The converted values are visible in statistics – values PulseCounter 1/2/3/4. These values can be reset using Statistics window in InteliMonitor.

11.2.3 Group: Comms settings

11.2.3.1 *Setpoint: Controller name*

Group	Comms settings
Range [units]	[-]
Related FW	standard v3.1.0
Description	This setpoint is intended for a custom name of the controller, which is used for identification of the controller in saved archives or remote connections. Maximal length of the name is 15 characters. The setpoint can't be modified via the IG-NT built-in terminal.

11.2.3.2 *Setpoint: LB/UART Log*

Group	Comms settings
Range [units]	DISABLED, ENABLED
Related FW	standard v3.1.0
Force value possible	YES
Description	The setpoint enables/disables logging of remote communication activity. If logging is enabled connection and disconnection of each remote terminal as well as entering access code are recorded into the history. **NOTE:** The terminal is disconnected automatically after 5 min of inactivity and next communication request from the same terminal is considered as a new connection. When logging is enabled in certain conditions the history may be filled up with large number of records related to the communication and important records may be overwritten quite fast.

11.2.3.3 *Setpoint: Contr. address*

Group	Comms settings
Range [units]	1 .. 32 [-]
Related FW	standard v3.1.0
Description	This setpoint adjusts the address of the particular controller at the CAN2 and/or RS485 bus. Each gen-set connected to the same bus **must have unique address**. If the setpoint *CANnegotiation* is in AUT position, the address is assigned automatically. The setpoint *Contr. address* is preffered then, however if it is in conflict with other controller present on the CAN2 bus other address will be assigned to aviod address collision. **NOTE:** Address 1 is reccommended for standalone gen-sets. **NOTE:** If you are connecting to the controller remotely you have to adjust the proper controller address in connection settings of the remote client (InteliMonitor, GenConfig, Modbus client etc.) **NOTE:** Address of the controller is also used for Modbus communication via RS485 etc. Address adjusted by this setpoint is therefore universal address of the controller.

11.2.3.4 *Setpoint: RS232(1) mode*

Group	Comms settings
Range [units]	DIRECT, MODEM (HW), MODEM (SW), MODBUS-DIRECT, MODBUS-MDM(HW), ECU LINK [-]
Related FW	standard v3.1.0
Description	This setpoint selects the connection type for the serial port COM1. • Available as RS232 in all controller types. • Available also as RS485 in the IG-NT if the external display bus is not used. Selectable by the setpoint *RS485(1) conv.* (not available in IG-NT-BB, IG-NTC-BB, IS-NTC-BB and IS-NT - see *RS485(1) conv.*). See the diagram of all related terminals in the chapter Communication.

DIRECT	Connection to a local PC via RS232 or RS485 (with internal or external converter) interface. Use this option also for IG-IB connected via RS232 cable. The internal RS485 converter is enabled/disabled by the setpoint *RS485(1) conv.*
MODEM (HW)	Modem point-to-point connection to a remote PC with hardware data flow control using signals RTS/CTS. Full modem cable is required for this option.
MODEM (SW)	Modem point-to-point connection to a remote PC with software data flow control. 3-wire cable (RX, TX, GND) is sufficient for this option. Use this option only if your modem does not provide RTS/CTS signals.
MODBUS	Modbus RTU connection in slave mode via RS232 or RS485 (with internal or external converter) interface. The internal RS485 converter is enabled/disabled by the setpoint *RS485(1) conv.*, the communication speed is adjustable by the setpoint *RS232(1)MBCSpd*. See the latest communication guide for more information about MODBUS protocol.
MODBUS-MDM(HW)	Modbus RTU connection in slave mode via modem with hardware data flow control. The communication speed is adjustable by the setpoint *RS232(1)MBCSpd*. See the latest

	communication guide for more information about MODBUS protocol.
ECU-LINK	Connection to an electronic-controlled engine which uses non-J1939 ECU. The proper ECU type must be also configured with GenConfig.

11.2.3.5 *Setpoint: RS232(2) mode*

Group	Comms settings
Range [units]	DIRECT, MODEM (HW), MODEM (SW), MODBUS-DIRECT, MODBUS-MDM(HW), ECU LINK [-]
Related FW	standard v3.1.0
Description	This setpoint selects the connection type for the serial port COM2. • Available as RS232 or RS485 in the IG-NTC and IS-NT controllers. Selectable by the setpoint *RS485(2) conv.*. • Available only as RS485 in the IG-NTC-BB and IS-NTC-BB controllers. • Not available in IG-NT. See the diagram of all related terminals in the chapter Communication.

DIRECT	Connection to a local PC via RS232 or RS485 (with internal or external converter) interface. Use this option also for IG-IB connected via RS232 cable. The internal RS485 converter is enabled/disabled by the setpoint *RS485(2) conv.*
MODEM (HW)	Modem point-to-point connection to a remote PC with hardware data flow control using signals RTS/CTS. Full modem cable is required for this option.
MODEM (SW)	Modem point-to-point connection to a remote PC with software data flow control. 3-wire cable (RX, TX, GND) is sufficient for this option. Use this option only if your modem does not provide RTS/CTS signals.
MODBUS	Modbus RTU connection in slave mode via RS232 or RS485 (with internal or external converter) interface. The internal RS485 converter is enabled/disabled by the setpoint *RS485(2) conv.*, the communication speed is adjustable by the setpoint *RS232(2)MBCSpd*. See the latest communication guide for more

	information about MODBUS protocol.
MODBUS-MDM(HW)	Modbus RTU connection in slave mode via modem with hardware data flow control. The communication speed is adjustable by the setpoint *RS232(2)MBCSpd*. See the latest communication guide for more information about MODBUS protocol.
ECU-LINK	Connection to an electronic-controlled engine which uses non-J1939 ECU. The proper ECU type must be also configured with GenConfig.

NOTE:

The COM2 prot is not available in the basic IG-NT version.

NOTE:

The RS232 connector is no more available in hardware version 2.0 and above. The COM2 port is redirected to the RS485(2) terminals all the time. That means modem is not supported at COM2 in these hardware versions. For modem use the COM1 port instead.

11.2.3.6 *Setpoint: RS232(1)MBCSpd*

Group	Comms settings
Range [units]	9600, 19200, 38400, 57600 [bps]
Related FW	standard v3.1.0
Description	The setpoint adjusts the communication speed on the COM1 connector when it is switched to MODBUS or MODBUS-MDM(HW) mode. See also the setpoint *RS232(1) mode*.

11.2.3.7 *Setpoint: RS232(2)MBCSpd*

Group	Comms settings
Range [units]	9600, 19200, 38400, 57600 [bps]
Related FW	standard v3.1.0
Description	The setpoint adjusts the communication speed on the COM2 connector when it is switched to MODBUS or MODBUS-MDM(HW) mode. See also the

	setpoint *RS232(2) mode*.

11.2.3.8 *Setpoint: RS232(1)MdmIni*

Group	Comms settings
Range [units]	[-]
Related FW	standard v3.1.0
Description	This setpoint can be used to add extra AT commands at the end of the initialization sequence of the modem connected to the COM1 port. The command can be entered with as well as without the "AT" prefix, are separated with semicolon and maximal length is 31 characters. The setpoint can't be modified via the IG-NT built-in terminal.

11.2.3.9 *Setpoint: RS232(2)MdmIni*

Group	Comms settings
Range [units]	[-]
Related FW	standard v3.1.0
Description	This setpoint can be used to add extra AT commands at the end of the initialization sequence of the modem connected to the COM2 port. The command can be entered with as well as without the "AT" prefix, are separated with semicolon and maximal length is 31 characters. The setpoint can't be modified via the IG-NT built-in terminal. Using a modem at the COM2 port is not supported since the hardware version 2.0. For modem use the COM1 port instead.

11.2.3.10 *Setpoint: RS485(1) conv.*

Group	Comms settings
Range [units]	DISABLED, ENABLED [-]
Related FW	standard v3.1.0
Description	This setpoint selects function of the built-in RS485(1) converter.

<table>
<tr><td></td><td>
<table>
<tr><td>ENABLED</td><td>The communication port COM1 is redirected to the integrated RS485(1) converter. The RS232(1) connector has no function and the external display interface is not available.</td></tr>
<tr><td>DISABLED</td><td>The communication port COM1 is present at the RS232(1) connector and the RS485(1) connector is used for the external display interface.</td></tr>
</table>
<p><u>NOTE:</u></p>
<p>The redirection is applied only for DIRECT, MODBUS and ECU-LINK modes. See the setpoint <i><u>RS232(1) mode</u></i>.</p>
<p><u>NOTE:</u></p>
<p>This setpoint must be set to DISABLED at controllers that do not have internal display. i.e. InteliVision-5 or InteliVision-8 is connected to the RS485(1) terminals.</p>
</td></tr>
</table>

11.2.3.11 *Setpoint: RS485(2) conv.*

<table>
<tr><td>Group</td><td>Comms settings</td></tr>
<tr><td>Range [units]</td><td>DISABLED, ENABLED [-]</td></tr>
<tr><td>Related FW</td><td>standard v3.1.0</td></tr>
<tr><td>Description</td><td>
<p>This setpoint selects function of the built-in RS485(2) converter.</p>
<table>
<tr><td>ENABLED</td><td>The communication port COM2 is redirected to the integrated RS485(2) converter. The RS232(2) connector has no function.</td></tr>
<tr><td>DISABLED</td><td>The communication port COM2 is present at the RS232(2) connector.</td></tr>
</table>
<p><u>NOTE:</u></p>
<p>The redirection is applied only for DIRECT, MODBUS and ECU-LINK modes. See the setpoint <i><u>RS232(2) mode</u></i>.</p>
<p><u>NOTE:</u></p>
<p>This setpoint has no function for IG-NT(C)-BB and IS-NTC-BB as this</p>
</td></tr>
</table>

	controller modifications do not provide the RS232 connector at the COM2 port. The port is redirected to the RS485 interface all the time regardless of this setpoint.

11.2.3.12 *Setpoint: CAN bus mode*

Group	Comms settings
Range [units]	32C,8C [-]
Related FW	standard v3.1.0
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. Change of this setpoint is applied after the **controller is switched off and on again**. **NOTE:** Use low speed for long distance connection only. Set all connected controllers to the same speed.

11.2.3.13 *Setpoint: CAN2emptDetect*

Group	Comms settings
Range [units]	DISABLED, ENABLED [-]
Related FW	standard v3.1.0
Force value possible	YES
Description	Enables the detection of missing other controllers on the CAN2 bus. If the setpoint is in ENABLED position and there aren't any other controllers detected on the CAN2 bus (the complete bus, not only within the logical group) the alarm *CAN2Empty* is issued.

11.2.3.14 *Setpoint: SHxOcol detect*

Group	Comms settings

Range [units]	DISABLED, ENABLED [-]
Related FW	standard v3.1.0
Description	This setpoint is used to enable/disable evaluation of collisions of virtual shared peripherial modules. A collision means that there is more than one source (shared outputs module) active on the CAN2 bus. **NOTE:** In certain situations multiple sites with bus tie breakers may need to have more shared outputs sources as the CAN bus line is in some points interrupted according to bus tie breakers position. Normally a collision would be indicated if there were more sources on the bus and this setpoint can be used to disable the evaluation of collisions in this special case.

11.2.3.15 *Setpoint: CANAddrSwitch1*

Group	Comms settings
Range [units]	[-]
Related FW	standard v3.1.0
Description	The setpoint selects function of the terminal address 122 at the CAN2 line. See the latest communication guide for details about this topic. **MODEM**: The address is used for modem connection via I-LB **OTHER**: The address is used for direct connection to any other device as e.g. IV8 or I-RD.

11.2.3.16 *Setpoint: CANAddrSwitch2*

Group	Comms settings
Range [units]	[-]
Related FW	standard v3.1.0
Description	The setpoint selects function of the terminal address 125 at the CAN2 line. See the latest communication guide for details about this topic. **MODEM**: The address is used for modem connection via I-LB

<table>
<tr><td></td><td><table><tr><td>OTHER</td><td>The address is used for direct connection to any other device as e.g. IV8 or I-RD</td></tr></table></td></tr>
</table>

11.2.3.17 *Setpoint: CANnegotiation*

<table>
<tr><td>Group</td><td>Comm settings</td></tr>
<tr><td>Range [units]</td><td>OFF, AUT [-]</td></tr>
<tr><td>Related FW</td><td>standard v3.1.0</td></tr>
<tr><td>Description</td><td>This setpoint defines if CAN address is used in the standard way or CAN addresses are reconfigured internally.<table>
<tr><td>OFF</td><td>The control unit has the same address which is necessary for communication. The address can be changed only from InteliMonitor or controller screen.</td></tr>
<tr><td>AUT</td><td>Controllers can change their addresses when are interconnected via CAN2 bus to prevent CAN bus collision. Controller address is set up to different address if another unit with the same address is detected on the CAN bus.
Caution!
Make sure all controllers have this setpoint set to AUT. It does not work properly if there are controllers with this setpoint adjusted to OFF and others with AUT setting.
Caution!
This function is not designed to cooperate with controllers which do not support it. Make sure it is adjusted to OFF if there are other controllers on the CAN without this setpoint.</td></tr>
</table></td></tr>
</table>

11.2.3.18 *Setpoint: IP Addr mode*

Group	Comms settings
Range [units]	[-]
Related FW	standard v3.1.0
Description	The setpoint is used to select the method how the ethernet connection is adjusted.

<table>
<tr><td></td><td>
<table>
<tr><td rowspan="2">FIXED</td><td>The ethernet connection is adjusted fixedly according to the setpoints <i>IP address</i>, <i>Net mask</i>, <i>Gateway IP</i>, <i>DNS IP</i>. .</td></tr>
<tr><td>This method should be used for classic ethernet or Internet connection. When this type of connection is opening the controller is specified by it's IP address. That means it would be inconvenient if the IP address were not fixed (static).</td></tr>
<tr><td rowspan="2">AUTOMATIC</td><td>The ethernet connection settings is obtained automatically from the DHCP server. The obtained settings is then copied to the related setpoints (it is not possible to set those setpoints manually in this setting, for more information please see the following setpoints: <i>IP address</i>, <i>Net mask</i>, <i>Gateway IP</i> and <i>DNS IP</i>). If the process of obtaining the settings from DHCP server is not successful the value <i>000.000.000.000</i> is copied to the setpoint <i>IP address</i> and the module continues trying to obtain the settings.</td></tr>
<tr><td>This method is beneficial for AirGate connection as it makes the connection very easy, in fact "plug and play". When this type of connection is opening the controller is specified by it's AirGate ID and the IP address does not play any role.</td></tr>
</table>
CAUTION!
If you need to use fixed ethernet settings you should consult the proper setting with your IT specialist.
</td></tr>
</table>

11.2.3.19 *Setpoint: IP address*

Group	Comms settings
Range [units]	[-]
Related FW	standard v3.1.0
Description	• In *fixed settings mode* this setpoint is used to adjust the IP address of the ethernet interface of the controller. Ask your IT specialist for help with this setting. • In *Automatic settings mode* this setpoint is used to display the IP address, which has been assigned by the DHCP server. It is not possible to change the setpoint value manually in this setting (the value is immediately reverted back by controller communication module IB-COM).

11.2.3.20 *Setpoint: Net mask*

Group	Comms settings
Range [units]	[-]
Related FW	standard v3.1.0
Description	• In *fixed settings mode* this setpoint is used to adjust the network mask of the network segment where the controller is connected. • In *Automatic settings mode* this setpoint is used to display the network mask which has been assigned by the DHCP server. It is not possible to change the setpoint value manually in this setting (the value is immediately reverted back by controller communication module IB-COM).

11.2.3.21 *Setpoint: Gateway IP*

Group	Comms settings
Range [units]	[-]
Related FW	standard v3.1.0
Description	• In *fixed settings mode* this setpoint is used to adjust the IP address of the gateway of the network segment where the controller is connected. • In *Automatic settings mode* this setpoint is used to display the gateway IP address which has been assigned by the DHCP server. It is not possible to change the setpoint value manually in this setting (the value is immediately reverted back by controller communication module IB-COM). A gateway is a device which connects the respective segment with the other segments and/or Internet.

11.2.3.22 *Setpoint: ComApProtoPort*

Group	Comms settings
Range [units]	1 .. 255 [-]
Related FW	standard v3.1.0

Description	This setpoint is used to adjust the port, which is used for ethernet connection to a PC with any of ComAp PC program (i.e. InteliMonitor, GenConfig). **This setpoint should be adjusted to 23**, which is the default port used by all ComAp PC programs. A different value should be used only in special situations as e.g. sharing one public IP address among many controllers or to overcome a firewall restrictions.

11.2.3.23 *Setpoint: AirGate*

Group	Comms settings
Range [units]	DISABLED, ENABLED [-]
Related FW	standard v3.1.0
Description	This setpoint selects the ethernet connection mode.

DISABLED	This is a standard mode, in which the controller listens to the incoming traffic and answers the TCP/IP queries addressed to him. This mode requires the controller to be accessible from the remote device (PC), i.e. it must be accessible at a public and static IP address if you want to connect to it from the Internet.
ENABLED	This mode uses the "AirGate" service, which hides all the issues with static/public address into a black box and you do not need to take care about it. You just need only a connection to the Internet. The AirGate server address is adjusted by the setpoint *AirGate addr*.

11.2.3.24 *Setpoint: AirGate IP*

Group	Comms settings
Range [units]	max. 32 characters [-]
Related FW	standard v3.1.0
Description	This setpoint is used for entering the domain name or IP address of the AirGate server. Use the free AirGate server provided by ComAp at address *airgate.comap.cz* if your company does not operate it's own AirGate server.

11.2.3.25 *Setpoint: SMTP authent*

Group	Comms settings

Range [units]	DISABLED, ENABLED [-]
Related FW	standard v3.1.0
Description	Switch this setpoint to ENABLED position if your *SMTP server* requires authentificated access. You have also adjust *SMTP user name* and *SMTP password*. Ask your internet provider or IT manager for this information. **NOTE:** Most of public free SMTP servers require authentification. You will get instructions when you register to the freemail service.

11.2.3.26 *Setpoint: SMTP user name*

Group	Comms settings
Range [units]	max. 32 characters [-]
Related FW	standard v3.1.0
Description	Use this setpoint to enter the user name for the SMTP server if *SMTP authentification* is enabled.

11.2.3.27 *Setpoint: SMTP password*

Group	Comms settings
Range [units]	max. 32 characters [-]
Related FW	standard v3.1.0
Description	Use this setpoint to enter the password for the SMTP server if *SMTP authentification* is enabled.

11.2.3.28 *Setpoint: SMTP address*

Group	Comms settings
Range [units]	max. 32 characters
Related FW	standard v3.1.0
Description	**CAUTION!** Proper setting of SMTP-related setpoints as well as controller mailbox are essential for sending alerts via e-mails.

	This setpoint is used for entering the domain name (e.g. *smtp.yourprovider.com*) or IP address (e.g. 74.125.39.109) of the SMTP server. Please ask your internet provider or IT manager for this information. **NOTE:** You may also use one of free SMTP servers, e.g. *smtp.gmail.com*. However, please note that some free SMTP servers may cause delays (in hours..) when sending e-mails. **NOTE:** If you do not want to send active e-mails, you may leave this setpoint blank, as well as other setpoints related to SMTP server and e-mail settings.

11.2.3.29 *Setpoint: Contr mailbox*

Group	Comms settings
Range [units]	max. 32 characters [-]
Related FW	standard v3.1.0
Description	Enter an **existing e-mail address** into this setpoint. This address will be used as **sender** address in active e-mails that will be sent from the controller. **Do not enter your** or other recipient's e-mail address. Recipient's addresses are to be entered into the setpoints *AcallCH1-Addr*, *AcallCH2-Addr* and *AcallCH3-Addr*. **NOTE:** Most of SMTP server will reject sending e-mails that contain nonexisting address in the sender address field.

11.2.3.30 *Setpoint: Time zone*

Group	Comms settings
Range [units]	- [-]
Related FW	standard v3.1.0
Description	This setpoint is used to select the time zone where the controller is located. See your computer time zone setting (click on the time indicator located in the rightmost position of the the windows task bar) if you are not sure about your time zone. **NOTE:** If the time zone is not selected properly the active e-mails may contain incorrect information about sending time, which may result in confusion when the respective problem actually occured.

11.2.3.31 *Setpoint: DNS IP*

Group	Comms settings
Range [units]	[-]
Related FW	standard v3.1.0
Description	• In *fixed settings mode* this setpoint is used to adjust the domain name server (DNS), which is needed to traslate domain names in e-mail addresses and server names into correct IP addresses. • In *Automatic settings mode* this setpoint is used to display DNS server, which has been assigned by the DHCP server. It is not possible to change the setpoint value manually in this setting (the value is immediately reverted back by controller communication module IB-COM).

11.2.4 Group: ComProtSetting

11.2.4.1 *Setpoint: Horn Timeout*

Group	Engine Protect
Range [units]	OFF, 1s - 3600s, NO TIMEOUT [-]
Related FW	standard v3.1.0
Force value possible	YES
Description	This setpoint adjusts time after which the *Horn* output is automatically deactivated although the alarms still haven't been reset. If the setpoint is adjusted to OFF the horn output is not activated at all, the NO TIMEOUT position means the horn output is not deactivated until the alarms are reset.

11.2.4.2 *Setpoint: BinInp delay 1*

Group	ComProtSetting
Range [units]	0.0 .. 600.0 [s]
Related FW	standard v3.1.0

Description	This setpoint adjusts the delay #1 which can be assigned to an input configured as alarm input (protection). **NOTE:** Protections configured at a binary inputs can have either fixed 0.5s evaluation delay or there are three independent delay setpoints and one of them can be assigned to each particular binary input protection.

11.2.4.3 *Setpoint: BinInp delay 2*

Group	ComProtSetting
Range [units]	0.0 .. 600.0 [s]
Related FW	standard v3.1.0
Description	This setpoint adjusts the delay #2 which can be assigned to an input configured as alarm input (protection). **NOTE:** Protections configured at a binary inputs can have either fixed 0.5s evaluation delay or there are three independent delay setpoints and one of them can be assigned to each particular binary input protection.

11.2.4.4 *Setpoint: BinInp delay 3*

Group	ComProtSetting
Range [units]	0.0 .. 600.0 [s]
Related FW	standard v3.1.0
Force value possible	YES
Description	This setpoint adjusts the delay #3 which can be assigned to an input configured as alarm input (protection). **NOTE:** Protections configured at a binary inputs can have either fixed 0.5s evaluation delay or there are three independent delay setpoints and one of them can be assigned to each particular binary input protection.

11.2.4.5 *Setpoint: ForceBlockDel1*

Group	ComProtSetting

Range [units]	0.0 .. 60.0 [s]
Related FW	standard v3.1.0
Description	This setpoint adjusts the delay after the binary input *Force block 1* has been deactivated, when the alarms configured as *Force block #1* are started to be evaluated.

11.2.4.6 *Setpoint: ForceBlockDel2*

Group	ComProtSetting
Range [units]	0.0 .. 60.0 [s]
Related FW	standard v3.1.0
Description	This setpoint adjusts the delay after the binary input *Force block 2* has been deactivated, when the alarms configured as *Force block #2* are started to be evaluated.

11.2.4.7 *Setpoint: ForceBlockDel3*

Group	ComProtSetting
Range [units]	0.0 .. 60.0 [s]
Related FW	standard v3.1.0
Force value possible	YES
Description	This setpoint adjusts the delay after the binary input *Force block 3* has been deactivated, when the alarms configured as *Force block #3* are started to be evaluated.

11.2.4.8 *Setpoint: ResetActAlarms*

Group	ComProtSetting
Range [units]	[-]
Related FW	standard v3.1.0
Description	**DISABLED** Pressing of the fault reset button (at any terminal or external button) resets only **inactive** alarms. Active alarms remain in the alarmlist unchanged and must be

	reset again when they become inactive.
ENABLED	Pressing of the fault reset button (at any terminal or external button) resets **all** alarms that are currently present in the alarm list. Inactive alarms disappear from the alarm list immediately, active alarms are changed to "confirmed" state and disappear when the alarm condition disappear or the alarm starts to be blocked.

NOTE:

ENABLED position corresponds to the method how the IG-classic and IS-classic controllers handled the alarms.

11.2.5 Group: Analog protect

11.2.5.1 *Setpoint: Batt >V*

Group	Analog protect
Range [units]	8.0 .. 40.0 [V]
Related FW	standard v3.1.0
Description	This setpoint adjusts the warning level for battery overvoltage alarm.

11.2.5.2 *Setpoint: Batt <V*

Group	Analog protect
Range [units]	8.0 .. 40.0 [V]
Related FW	standard v3.1.0
Description	This setpoint adjusts the warning level for battery undervoltage alarm.

11.2.5.3 *Setpoint: Batt volt del*

Group	Analog protect
Range [units]	0 .. 600 [s]
Related FW	standard v3.1.0

Description	This setpoint adjusts the delay for battery *overvoltage* and *undervoltage* alarms.

11.2.6 Group: Mains protect

11.2.6.1 *Setpoint: Mns2POvrldProt*

Group	Mains protect
Range [units]	DISABLED, ENABLED [-]
Related FW	standard v3.1.0
Force value possible	YES
Description	Enables or disables the mains overload (IDMT) protection. This protection is evaluated with variable delay. For more information see setpoint *2POvrldStEvDel*.

11.2.6.2 *Setpoint: OverldStrtEval*

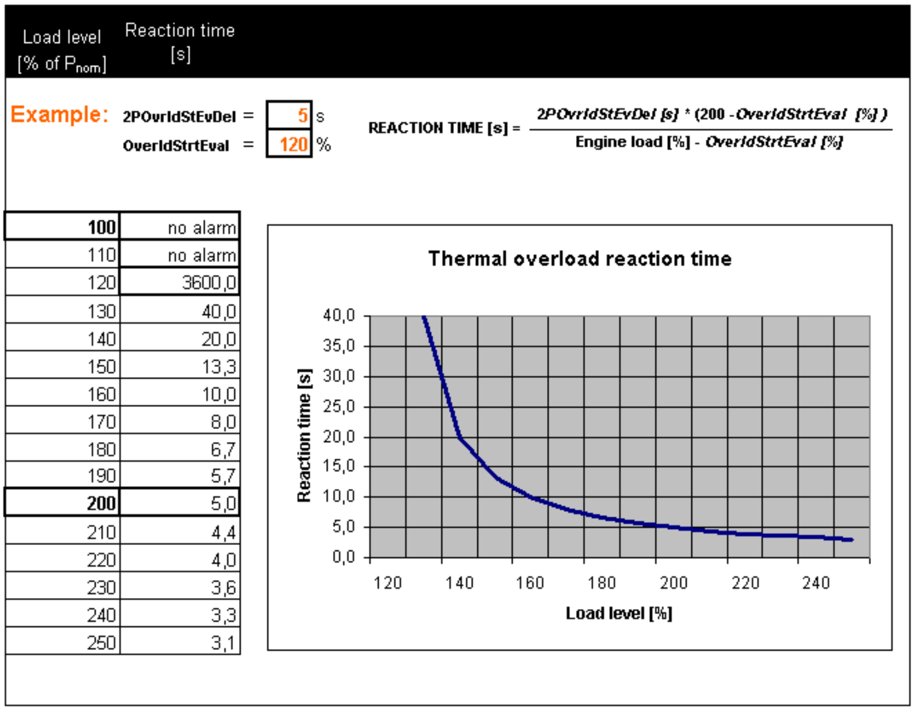
Group	Mains Protect
Range [units]	100 .. 200 [%]
Related FW	standard v3.1.0
Force value possible	YES
Description	This setpoint specifies the power level relative to the *nominal power*, where the mains overload (IDMT) protection starts to be evaluated. See the setpoint *2PovrldStEvDel* for more information about the mains overload (IDMT) protection.

11.2.6.3 *Setpoint: 2POvrldStEvDel*

Group	Mains Protect
Range [units]	0.0 .. 600.0 [s]
Related FW	standard v3.1.0
Description	This setpoint adjusts the reaction time of the mains overload (IDMT) protection if the load level is 200% of the base level given by the setpoint

OverldStrtEval.

The reaction time of the thermal overload protection is not fixed; it depends on how much is the load above the limit (base level). The higher is the load the shorter the reaction time will be.



Load level [% of P_{nom}]	Reaction time [s]

Example: **2POvrldStEvDel** = 5 s
OverldStrtEval = 120 %

$$\text{REACTION TIME [s]} = \frac{\textit{2POvrldStEvDel [s]} * (200 - \textit{OverldStrtEval [\%]})}{\text{Engine load [\%]} - \textit{OverldStrtEval [\%]}}$$

100	no alarm
110	no alarm
120	3600,0
130	40,0
140	20,0
150	13,3
160	10,0
170	8,0
180	6,7
190	5,7
200	5,0
210	4,4
220	4,0
230	3,6
240	3,3
250	3,1

EXAMPLE OF THERMAL OVERLOAD PROTECTION CURVE

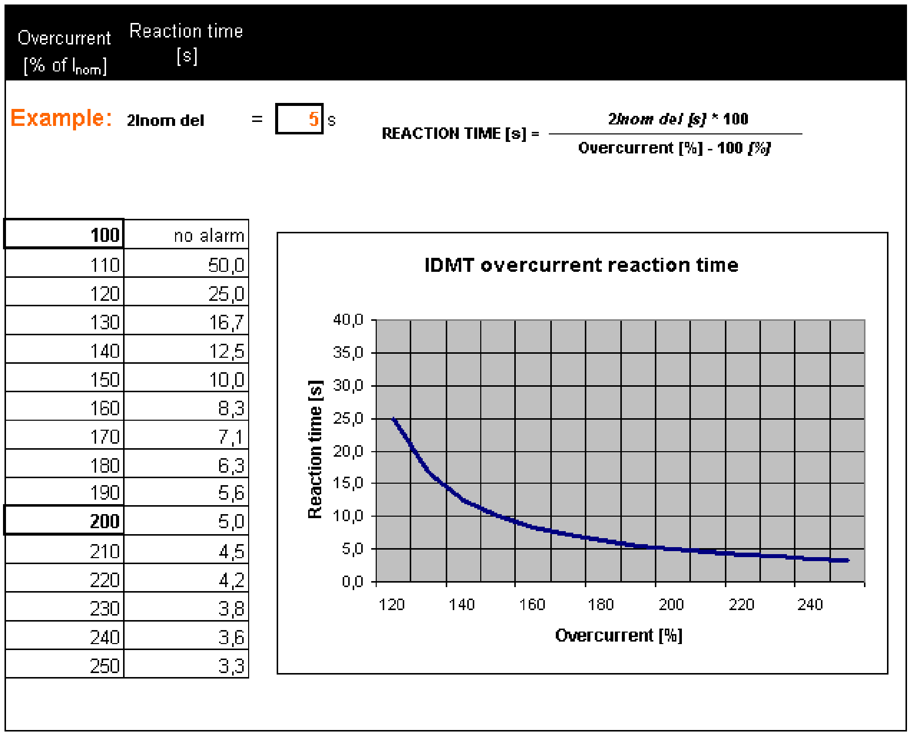
NOTE:

When the IDMT protection is activated the MCB is opened and the event is recorded in the Alarmlist and History. The further MCB closing is blocked until Fault Reset has been pressed to clear the alarm.

11.2.6.4 *Setpoint: Mns2Inom prot*

Group	Mains protect
Range [units]	DISABLED, ENABLED [-]
Related FW	standard v3.1.0
Force value possible	YES
Description	Enables or disables the mains overcurrent (IDMT) protection. This protection is evaluated with variable delay. For more information see setpoint *Mains2Inom del*.

11.2.6.5 Setpoint: Mains2Inom del

Group	Mains protect
Range [units]	0.0 .. 60.0 [-]
Related FW	standard v3.1.0
Description	This setpoint adjusts the reaction time of the IDMT overcurrent protection if the overcurrent level is 200% of the nominal current. The reaction time of the IDMT overcurrent protection is not fixed; it depends on how much is the actual current above the limit (nominal). The higher is the overcurrent the shorter the reaction time will be.  EXAMPLE OF IDMT OVERCURRENT PROTECTION CURVE **NOTE:** When the IDMT protection is activated the MCB is opened and the event is recorded in the Alarmlist and History. The further MCB closing is blocked until Fault Reset has been pressed to clear the alarm.

Example: 2Inom del = 5 s

$$\text{REACTION TIME [s]} = \frac{\text{2Inom del [s]} * 100}{\text{Overcurrent [\%]} - 100\ [\%]}$$

Overcurrent [% of I_{nom}]	Reaction time [s]
100	no alarm
110	50,0
120	25,0
130	16,7
140	12,5
150	10,0
160	8,3
170	7,1
180	6,3
190	5,6
200	5,0
210	4,5
220	4,2
230	3,8
240	3,6
250	3,3

11.2.6.6 Setpoint: Mains >V MP

Group	Mains protect
Range [units]	Mains <V MP .. 150 [%]

Related FW	standard v3.1.0
Force value possible	YES
Description	This setpoint adjusts threshold for mains overvoltage protection. **NOTE:** This protection is *Mains protection* type - for more information on protection types please refer to alarm types section.

11.2.6.7 *Setpoint: Mains <V MP*

Group	Mains protect
Range [units]	50 .. *Mains >V MP* [%]
Related FW	standard v3.1.0
Force value possible	YES
Description	This setpoint adjusts threshold for mains undervoltage protection. **NOTE:** This protection is *Mains protection* type - for more information on protection types please refer to alarm types section.

11.2.6.8 *Setpoint: Mains V del*

Group	Mains protect
Range [units]	0.00 .. 600.00 [s]
Related FW	standard v3.1.0
Description	The setpoint adjusts the delay for mains under- and overvoltage protections. The thresholds for these protections are adjusted by setpoints *Mains >V MP* and *Mains <V MP*. **NOTE:** Although the resolution of this setpoint is 0.01s, in fact the adjusted delay is rounded to the next higher multiple of the period of the mains voltage. The period is either 0.02s for 50Hz systems or 0.0166s for 60Hz systems. E.g. if the delay is set to 0.03s at 50Hz system the real delay will be 0.04s.

11.2.6.9 *Setpoint: Mains Avg>V MP*

Group	Mains protect
Range [units]	100 .. 150 [%]
Related FW	standard v3.1.0
Description	This setpoint defines the trip level for mains overvoltage protection based on 10-minutes moving average of mains phase voltage. This protection is evaluated in each phase and is activated immediately when the moving average value exceeds limit adjusted by this setpoint.

11.2.6.10 *Setpoint: Mains >f*

Group	Mains Protect
Range [units]	*Mains <f* .. 150 [%]
Related FW	standard v3.1.0
Force value possible	YES
Description	This setpoint adjusts the threshold level for the mains overfrequency protection. The threshold is adjusted in % of the mains system frequency which is given by *Nominal Freq* and its offset *Nom frq offset*. The protection activates if the frequency in phase L3 gets over the threshold for time longer than *Mains f del*. **NOTE:** The mains overfrequency protection is *Mains protection* type - for more information on protection types please refer to alarm types section.

11.2.6.11 *Setpoint: Mains <f*

Group	Mains Protect
Range [units]	50 .. *Mains >f* [%]
Related FW	standard v3.1.0
Force value possible	YES
Description	This setpoint adjusts the threshold level for the mains underfrequency protection. The threshold is adjusted in % of the mains system frequency which is given by *Nominal Freq* and its offset *Nom frq offset*. The protection activates if the frequency in phase L3 drops below the

	threshold for time longer than *Mains f del*. **NOTE:** The mains underfrequency protection is *Mains protection* type - for more information on protection types please refer to alarm types section.

11.2.6.12 *Setpoint: Mains f del*

Group	Mains protect
Range [units]	0.00 .. 600.00 [s]
Related FW	standard v3.1.0
Description	This setpoints determines the delay for mains under- (defined by *Mains <f*) and overfrequency (defined by *Mains >f*) protections. **NOTE:** Although the resolution of this setpoint is 0.01s, in fact the adjusted delay is rounded to the next higher multiple of the period of the generator voltage. The period is either 0.02s for 50Hz systems or 0.0166s for 60Hz systems. E.g. if the delay is set to 0.03s at 50Hz system the real delay will be 0.04s.

11.2.6.13 *Setpoint: VectorS prot*

Group	Mains protect
Range [units]	DISABLED, PARALLEL ONLY, ENABLED [-]
Related FW	standard v3.1.0
Force value possible	YES
Description	This setpoint selects the function of the built-in vectorshift protection.

DISABLED	The vectorshift protection is disabled.
PARALLEL ONLY	The vectorshift protection is enabled only while the both MCB and GCB (and MGCB for applications with MGCB) are closed.
ENABLED	The vectorshift protection is active always while the MCB is closed, regardless of the GCB (and MGCB for applications with MGCB) position.

	NOTE: The vectorshift protection is recorded into the history file, however it is not indicated in the Alarm list. When it occurs the controller opens either MCB or MGCB depending on the setpoint *VectorS CB sel*. If the MCB is not controlled in the particular application then MGCB is opened. **NOTE:** If a vectorshift is detected and consequently the MCB is opened, however mains voltage and frequency remain in limits, the MCB is then reclosed again after *Mains ret del*, as the mains is evaluated as healthy. **NOTE:** Parallel operation is in this case considered only if there is at least one ComAp controller with closed GCB to the bus. If MCB and MGCB are closed and there is no ComAp controller on the Bus connected via CAN2 to the InteliMains and with closed GCB, this situation cannot be considered as parallel operation because of the function of *MGCBparalClose*.

11.2.6.14 *Setpoint: VS/ROCOF CBsel*

Group	Mains protect
Range [units]	MCB, MGCB [-]
Related FW	standard v3.1.0
Force value possible	YES
Description	This setpoint selects which breaker will be opened when the *vectorshift* and *ROCOF protection* is detected. **NOTE:** If the MGCB is selected and a mains failure occurs the MGCB will be opened immediately when the vectorshift or ROCOF is detected, however also MCB will be opened consequently due to other mains protection as underfrequency or undervoltage.

11.2.6.15 *Setpoint: VectorS limit*

Group	Mains protect
Range [units]	1 .. 45 [°]

Related FW	standard v3.1.0
Description	This setpoint adjusts the thershold level for the vectorshift protection. **NOTE:** To adjust this setpoint properly, check the value *Max VectorS*. The value is available on the controller screen, contains the maximal measured vectorshift value since the bus has been synchronized to the mains and after opening of MGCB or MCB it is "frozen". In normal conditions the value should not be higher than 3° and the most common setting of the threshold is about 7°.

11.2.6.16 *Setpoint: ROCOF prot*

Group	Mains protect
Range [units]	DISABLED, PARALLEL ONLY, ENABLED [-]
Related FW	standard v3.1.0
Force value possible	YES
Description	This setpoint activates or deactivates ROCOF protection. See also setpoints *ROCOF Win*, *ROCOF df/dt* and *VS/ROCOF CB sel*. **NOTE:** Parallel operation is in this case considered only if there is at least one ComAp controller with closed GCB to the bus. If MCB and MGCB are closed and there is no ComAp controller on the Bus connected via CAN2 to the InteliMains and with closed GCB, this situation cannot be considered as parallel operation because of the function of *MGCBparalClose*.

11.2.6.17 *Setpoint: ROCOF Win*

Group	Mains protect
Range [units]	3 .. 30 [-]
Related FW	standard v3.1.0
Description	This setpoint adjusts the averaging level for the ROCOF protection. It defines number of periods of the mains voltage in which the ROCOF protection is evaluated. The higher is the ROCOF Win the less sensitive is the protection for short oscillations of the frequency to both directions from the nominal value and the higher is the delay of evaluation.

11.2.6.18 Setpoint: ROCOF df/dt

Group	Mains protect
Range [units]	0.1 .. 10.0 [Hz/s]
Related FW	standard v3.1.0
Description	This setpoint adjusts the trip level for ROCOF protection (Rate Of Change Of Frequency). The "filtration level" for the ROCOF protection is adjusted by setpoint ROCOF Win. **NOTE:** If measured value of df/dt exceeds ROCOF df/dt, ROCOF protection is activated. The message ROCOF is writen in history of controller and corresponding logical binary output is activated ROCOF Trp. Value of df/dt is evaluated from mains voltage. **NOTE:** To activate or deactivate ROCOF protection, please use ROCOF prot. Choose proper breaker which will be opened if ROCOF protection activates by adjusting setpoint VS/ROCOF CBsel.

11.2.6.19 Setpoint: Mains V unbal

Group	Mains protect
Range [units]	0 .. 200 [%]
Related FW	standard v3.1.0
Description	This setpoint defines the threshold level for Mains voltage unbalance protection. The voltage unbalance is calculated as a maximum difference between phase voltages. This protection is evaluated with delay given by Mains Vunb del.

11.2.6.20 Setpoint: Mains Vunb del

Group	Mains protect
Range [units]	0.0 .. 600.0 [s]
Related FW	standard v3.1.0
Description	This setpoint adjusts delay for mains voltage unbalance alarm (see Mains V unbal).

11.2.6.21 *Setpoint: Mains I unbal*

Group	Mains protect
Range [units]	0 .. 200 [%]
Related FW	standard v3.1.0
Description	This setpoint defines the threshold for Mains current asymmetry (unbalance). The current unbalance is calculated as a maximum difference between phase currents. This protection is tripped with delay set by setpoint *Mains Iunb del*.

11.2.6.22 *Setpoint: Mains Iunb del*

Group	Mains protect
Range [units]	0.0 .. 600.0 [s]
Related FW	standard v3.1.0
Description	Delay for Mains current asymmetry (unbalance). This protection treshold is adjusted by *Mains I unbal*

11.2.7 Group: Bus protect

11.2.7.1 *Setpoint: Bus >V*

Group	Bus protect
Range [units]	*Bus <V* .. 150 [%]
Related FW	standard v3.1.0
Force value possible	YES
Description	This setpoint determines treshold for bus overvoltage protection. This protection is evaluated with delay given by setpoint *Bus V del*. Protection type is history record. **NOTE:** All three phases are checked for bus voltage detection. Maximum out of those three is used. For high voltage applications, the BusNomVph-ph can be used for nominal voltage setting.

11.2.7.2 *Setpoint: Bus <V*

Group	Bus protect
Range [units]	50 .. *Bus >V* [%]
Related FW	standard v3.1.0
Force value possible	YES
Description	This setpoint determines treshold for bus undervoltage protection. This protection is evaluated with delay given by setpoint *Bus V del*. Protection type is history record. **NOTE:** All three phases are checked for bus voltage detection. Minimum out of those three is used. For high voltage applications, the BusNomVph-ph can be used for nominal voltage setting.

11.2.7.3 *Setpoint: Bus V del*

Group	Bus protect
Range [units]	0.00 .. 600.00 [s]
Related FW	standard v3.1.0
Description	This setpoint adjusts delay for under- (*Bus <V*) and overvoltage (*Bus >V*) protections. **NOTE:** Although the resolution of this setpoint is 0.01s, in fact the adjusted delay is rounded to the next higher multiple of the period of the bus voltage. The period is either 0.02s for 50Hz systems or 0.0166s for 60Hz systems. E.g. if the delay is set to 0.03s at 50Hz system the real delay will be 0.04s.

11.2.7.4 *Setpoint: Bus >f*

Group	Bus protect
Range [units]	*Bus <f* .. 150.0 [%]
Related FW	standard v3.1.0

Force value possible	YES
Description	This setpoint determines the treshold for bus overfrequency protection. This protection is evaluated with delay given by setpoint *Bus f del* and it is history record type.

11.2.7.5 *Setpoint: Bus <f*

Group	Bus protect
Range [units]	50.0 .. *Bus >f* [%]
Related FW	standard v3.1.0
Force value possible	YES
Description	This setpoint determines the treshold for bus underfrequency protection. This protection is evaluated with delay given by setpoint *Bus f del* and it is history record type.

11.2.7.6 *Setpoint: Bus f del*

Group	Bus protect
Range [units]	0.00 .. 600.00 [s]
Related FW	standard v3.1.0
Description	This setpoint adjusts delay for under- (*Bus <f*) and overfrequency (*Bus >f*) protections. **NOTE:** Although the resolution of this setpoint is 0.01s, in fact the adjusted delay is rounded to the next higher multiple of the period of the bus voltage. The period is either 0.02s for 50Hz systems or 0.0166s for 60Hz systems. E.g. if the delay is set to 0.03s at 50Hz system the real delay will be 0.04s.

11.2.7.7 *Setpoint: BusMeasError*

Group	Bus protect
Range [units]	DISABLED, ENABLED [-]
Related FW	standard v3.1.0

<table>
<tr><td>Force value possible</td><td>YES</td></tr>
<tr><td>Description</td><td>
<table>
<tr><td>DISABLED</td><td>Bus measure error protection is disabled.</td></tr>
<tr><td>RED</td><td>Bus measure error protection is enable and the corresponding alarm is of level 2 (RED). Bus measure error is detected in MCB / MGCB application when the voltage on controller‘s bus terminals is out of limits for 20 seconds under these conditions:
MCB application
• MCB (feedback)was closed in AUT mode.
• Any GCB in power management group (on CAN bus) was closed. The alarm is activated after 20 s, however the MCB closing is blocked immediately for safety reasons.
MGCB application
• MCB and MGCB (feedbacks) were closed in AUT mode.
• Any GCB in power management group (on CAN bus) was closed. The alarm is activated after 20 s, however the MGCB closing is blocked immediately from safety reasons.</td></tr>
<tr><td>YELLOW</td><td>Bus measure error protection is enable and the corresponding alarm is of level level 1 (YELLOW). Bus measure error is detected in MCB / MGCB application when the voltage on controller‘s bus terminals is out of limits for 20 seconds under these conditions:
MCB application
• MCB (feedback)was closed in AUT mode.
• Any GCB in power management group (on CAN bus) was closed. The alarm is activated after 20 s, however the MCB closing is blocked immediately for safety reasons.
MGCB application
• MCB and MGCB (feedbacks) were closed in AUT mode.
• Any GCB in power management group (on CAN bus) was closed. The alarm is activated after 20 s, however the MGCB closing is blocked immediately from safety reasons.</td></tr>
</table>
</td></tr>
</table>

EXAMPLE SITUATION	SETPOINT SETTING	RESULTING BEHAVIOUR
Island operation, no Mains voltage	Not important	MGCB stays closed even if bus voltage goes out of the limits
Island operation, Mains voltage present, e.g. during MainsRetDel	Not important	Bus voltage limits are active, i.e. MGCB opens if bus voltage goes out of the limits
Reverse synchronizing, load jump occurs	DISABLED	Gen-sets go to over/underfrequency state and are disconnected from the bus, InteliMains keeps synchronizing and at the end of synchro timeout it opens MGCB and closes MCB issuing alarm “Wrn Rsync timeout“
Reverse synchronizing, load jump occurs	ENABLED	After activation of bus protections InteliMains starts to count down MainsRetDel

11.2.7.8 *Setpoint: Bus V unbal*

Group	Bus protect
Range [units]	0 .. 200 [%]
Related FW	standard v3.1.0
Description	This setpoint adjusts threshold for bus voltage unbalance alarm. The voltage unbalance is calculated as a maximum difference between phase voltages. This protection is history record type and its delay is set by setpoint *Bus Vunb del*.

11.2.7.9 *Setpoint: Bus Vunb del*

Group	Bus protect
Range [units]	0.0 .. 600.0 [s]
Related FW	standard v3.1.0
Description	This setpoint determines the delay which is used in evaluation of Bus V unbal protection (threshold for this protection is set by setpoint *Bus V unbal*).

11.2.8 Group: AMF settings

11.2.8.1 *Setpoint: EmergStart del*

Group	AMF settings
Range [units]	0 .. 600 [s]
Related FW	standard v3.1.0
Force value possible	YES
Description	This setpoint sets the delay between the mains failure and the command to start the gen-set group, i.e. closing the binary output Sys start/stop. **NOTE:** Link the output Sys start/stop with the inputs Sys start/stop at the gen-set controllers to achieve the automatic start. Gen-set controllers have to be in AUT mode in order to react to this input.

11.2.8.2 *Setpoint: FwRet break*

<table>
<tr><td>Group</td><td>AMF settings</td></tr>
<tr><td>Range [units]</td><td>0 .. 60.0 [s]</td></tr>
<tr><td>Related FW</td><td>standard v3.1.0</td></tr>
<tr><td>Force value possible</td><td>YES</td></tr>
<tr><td>Description</td><td>
<table>
<tr><td>MGCB APPLICATION</td><td>This setpoint sets
- the delay between MGCB opening and MCB closing during the return to mains when reverse synchronizing (or mains parallel run) is not enabled.
and
- the delay between MCB opening and MGCB closing in TEST Mode, when ReturnTo mains = ENABLED and power cut comes.</td></tr>
<tr><td>MCB APPLICATION</td><td>This setpoint sets the delay between last GCB opening (from CAN2 bus) and MCB closing during the return to mains when reverse synchronizing</td></tr>
</table>
</td></tr>
</table>

<table>
<tr><td></td><td><table><tr><td></td><td>(or mains parallel run) is not enabled.</td></tr></table></td></tr>
</table>

11.2.8.3 *Setpoint: MCB close del*

Group	AMF settings
Range [units]	0.0 .. 60.0 [s]
Related FW	standard v3.1.0
Force value possible	YES
Description	This setpoint determines the delay for MCB closing after mains is restored. This delay is considered if no gen-sets are running (i.e. output Sys start/stop not active). **NOTE:** This setpoint is active in OFF and AUT mode.

11.2.8.4 *Setpoint: MCB opens on*

<table>
<tr><td>Group</td><td>AMF settings</td></tr>
<tr><td>Range [units]</td><td>MAINSFAIL, GEN RUNNING, BUS VOLTAGE [-]</td></tr>
<tr><td>Related FW</td><td>standard v3.1.0</td></tr>
<tr><td>Force value possible</td><td>YES</td></tr>
<tr><td>Description</td><td>This setpoint allows adjusting of condition of MCB opening after mains fail.
<table>
<tr><td>MAINSFAIL</td><td>Controller opens the MCB when Mains fail is detected (24 VDC controlled circuit breaker or contactor expected).</td></tr>
<tr><td>GEN RUNNING</td><td>Controller opens the MCB only after at least one gen-set starts, i.e. the generator voltage is present to open the MCB (230 VAC controlled breaker expected). In OFF mode, this means MCB stays closed all the time, regardless of the mains condition.</td></tr>
<tr><td>BUS VOLTAGE</td><td>Controller opens the MCB only after there is voltage present on the bus to open the MCB (230 VAC controlled breaker expected). In OFF mode, this</td></tr>
</table></td></tr>
</table>

<table>
<tr><td></td><td>
<table><tr><td></td><td>means MCB stays closed all the time, regardless of the mains condition.</td></tr></table>
<p>NOTE:</p>
<p>Link the output Sys start/stop with the inputs Sys start/stop at the gen-set controllers to achieve the automatic start. Gen-set controllers have to be in AUT mode in order to react on this input.</p>
<p>CAUTION!</p>
<p>There are forbidden states for setting BUS VOLTAGE of this setpoint. If MCB opens on = BUS VOLTAGE it is not possible to set <i>MGCBparalClose</i> to YES or MCB CLOSED. This setting is always reverted to NO. If the setpoint <i>MGCBparalClose</i> is already set to YES or MCB CLOSED than it is not possible to set MCB opens on to BUS VOLTAGE (setting is always reverted to GEN RUNNING).</p>
</td></tr>
</table>

11.2.8.5 *Setpoint: ReturnWithIntr*

<table>
<tr><td>Group</td><td>AMF settings</td></tr>
<tr><td>Range [units]</td><td>DISABLED, ENABLED [-]</td></tr>
<tr><td>Related FW</td><td>standard v3.1.0</td></tr>
<tr><td>Force value possible</td><td>YES</td></tr>
<tr><td>Description</td><td>
<table>
<tr><td>ENABLED</td><td>Break transfer of the load back to the mains is enabled. If reverse synchronizing is not successful, MGCB is opened and after <i>FwRet break</i> delay MCB is closed.</td></tr>
<tr><td>DISABLED</td><td>Gen-set stays running loaded in island when reverse synchronizing is not successful, even if mains is OK again. In this case warning Wrn RSync fail is issued.</td></tr>
</table>
<p>NOTE:</p>
<p>It is possible to use force values to change this setpoint.</p>
</td></tr>
</table>

11.2.8.6 *Setpoint: BreakerOverlap*

Group	AMF settings
Range [units]	0.0 .. 300.0 [s]
Related FW	standard v3.1.0
Force value possible	YES
Description	When limited time of running in parallel with mains is required, BreakerOverlap defines max time of running in parallel with mains. During this time soft transfer of load is activated. Used in AUT and TEST modes. This setpoint is valid during transfer of load from gen-set to the Mains and also in TEST mode. When entering the TestOnLoad the gen-sets remain in parallel until imported power from Mains goes under 5% of *NominMainsImp* without any timeout, if the Import/Export is not measured (i.e. *I/E-Pm meas* is set to NONE), the system remains in parallel operation exactly for *BreakerOverlap*. When returning from the TestOnLoad, the system remains in parallel operation until the gen-sets are unloaded to *MGCB open lev* or at maximum until *BreakerOverlap* elapses.

11.2.8.7 *Setpoint: RetFromIsland*

<table>
<tr><td>Group</td><td>AMF settings</td></tr>
<tr><td>Range [units]</td><td>MANUAL, AUTO [-]</td></tr>
<tr><td>Related FW</td><td>standard v3.1.0</td></tr>
<tr><td>Force value possible</td><td>YES</td></tr>
<tr><td>Description</td><td>
<table>
<tr><td>MANUAL</td><td>Controller remains in AUT mode and the manual return to Mains is done via MCB button. "Manual Restore" message is displayed in alarmlist to notify operator - it will disappear automatically after MCB close button is pushed (i.e. reverse synchronizing is started). In case that the gensets fail to supply the load, IM-NT automatically transfers load to the Mains.</td></tr>
<tr><td>AUTO</td><td>Load is automatically transferred in AUT mode after mains is OK again.</td></tr>
</table>
NOTE:
Select RetFromIsland = MANUAL when it is important at what time the load is transferred back to the mains. Setting to MANUAL might be important only
</td></tr>
</table>

	for applications with break transfers (with synchronizing disabled).

11.2.8.8 *Setpoint: ReturnTo mains*

Group	AMF settings
Range [units]	DISABLED, ENABLED [-]
Related FW	standard v3.1.0
Force value possible	YES
Description	**NOTE:** This setpoint is relevant only for MGCB application only! The setpoint influences the behavior of the **TEST mode**. If mains fail occurs during test (or is simulated using Test on load function), the controller opens the MCB and switches the load to generators. **DISABLED**: If the mains recovers, the generators stay running loaded until TEST mode is abandoned, typically to AUT mode where reverse synchronizing and soft unloading follows. **ENABLED**: After the mains recovers, the generators will be reverse synchronized back to the mains, softly unloaded and remain running without load (MGCB opens) until TEST mode is abandoned or another mains failure occurs.

11.2.8.9 *Setpoint: Mains ret del*

Group	AMF settings
Range [units]	0 .. 3600 [s]
Related FW	standard v3.1.0
Force value possible	YES
Description	This setpoint adjusts delay after the mains return to the start of synchronizing of MCB. **NOTE:** If synchronizing is disabled, a break transfer takes place after this delay elapses.

11.2.8.10 *Setpoint: MGCB Close Del*

Group	AMF settings
Range [units]	0 .. 60 [s]
Related FW	standard v3.1.0
Force value possible	YES
Description	This setpoint adjust the delay that is counted down before MGCB is closed in Island operation. This can be used to postpone immediate closing of all MGCBs in complex system to prevent sudden load jump. **WARNING!** Once the controller is in the process of delay countdown it will not close MCB even if the Mains goes OK again. The delay is counted down and then MGCB is closed and standard transition sequence continues.

11.2.9 Group: Pwr management

11.2.9.1 *Setpoint: #Pwr mgmt mode*

<table>
<tr><td>Group</td><td>Pwr management</td></tr>
<tr><td>Range [units]</td><td>ABS(kW), ABS(kVA), REL (%) [-]</td></tr>
<tr><td>Related FW</td><td>standard v3.1.0</td></tr>
<tr><td>Description</td><td>
<table>
<tr><td>ABS (kW)</td><td>The power management is based on actual sum of active power of gen-sets participating in the power management in particular control group (<i>TotRunPact</i>) and sum of active nominal power of gen-sets participating in the power management in particular control group (<i>TotRunPnom</i>). Setpoints #LoadResStrt X (e.g. <i>LoadResStrt 1</i>) and #LoadResStop X (e.g. <i>LoadResStop 1</i>) are set in absolute values in kW.</td></tr>
<tr><td>ABS (kVA)</td><td>The power management is based on actual sum of apparent power of gen-sets participating in the power management in particular control group (given by <i>TotRunPact</i> and total reactive power, S^2 = P^2 + Q^2) and sum of apparent nominal power of gen-sets</td></tr>
</table>
</td></tr>
</table>

	participating in the power management in particular control group (this value is given for each gen-set as *Nomin current* multiplied by *GenNomV*). Setpoints #LoadResStrt X (e.g. *LoadResStrt 1*) and #LoadResStop X (e.g. *LoadResStop 1*) are set in absolute values in kVA.
REL (%)	The power management is based on the relative load, i.e. ratio active power to nominal power. Setpoints #%LdResStrt X (e.g. *%LdResStrt 1*) and #%LdResStop X (e.g. *%LdResStop 1*) are set in relative values in %. Minimum allowable relative power reserve is evaluated from nominal power of all running gen-sets combined in %.

NOTE:

sign in the name of this setpoint marks that this setpoint is shared among all controllers connected by CAN2 bus.

11.2.9.2 *Setpoint: #PriorAutoSwap*

Group	Pwr management
Range [units]	DISABLED, RUN HOURS EQU, LD DEMAND SWAP [-]
Related FW	standard v3.1.0
Description	This setpoint selects the method of optimalization of priorities

DISABLED	IM-NT does not provide the AutoSwap functions for other controllers. Priorities in gen-set controllers have their original values which do not change.
RUN HOURS EQU	Running Hours Equalization mode. All gen-sets in the logical group are kept to work approximately the same number of running hours. See also setpoints RunHoursBase (e.g. IGS-MINT application) and *RunHrsMaxDiff*. Up to 32 engines can cooperate in this mode. For more information on this function please refer to running hours equalization.
LD DEMAND SWAP	For different sized engines, this mode allows to optimally select the running engines according to the actual site load. Up to 3 engines can cooperate in this mode (if more gen-sets are needed, please use IGS-NT-PSC firmware in additional controller - more information about this

	FW can be found on our webpages www.comap.cz). Note that this priority swapping function may be used only if *#Pwr mgmt mode* is set to ABS (kW).
EFFICIENCY	For different sized engines, this mode automatically select optimum running gen-sets. This function supports up to 32 gen-sets (or less based on how many other controllers are used in the installation). Not all combinations of gen-sets are considered.

NOTE:

Setpoint Priority in gen-set controllers is not actually changed by AutoSwap functions - the priority is changed only locally during AutoSwap function is enabled. Note that after RHE is activated any changes in the actual priority setpoints need to be confirmed by disabling and enabling RHE again to take effect.

NOTE:

If the optimization is enabled at least one gen-set in the group must be set as the master for the optimization (*Priority ctrl* = MASTER). It is possible to have more than one master, the one with lowest CAN address will play the role of the master and if it is switched off the next one will take the master role.

NOTE:

sign in the name of this setpoint marks that this setpoint is shared among all controllers connected by CAN2 bus.

CAUTION!

If the controller which is set to MASTER in PriorAutoSwap function is in *Emerg. manual*, priority autoswapping will not work and no other controller will assume MASTER role.

11.2.9.3 *Setpoint: Priority ctrl*

Group	Pwr management
Range [units]	DISABLED, MASTER [-]
Related FW	standard v3.1.0
Force value possible	YES

<table>
<tr><td>Description</td><td><table><tr><td>DISABLED</td><td>IM-NT does not provide the AutoSwap functions for other controllers.</td></tr><tr><td>MASTER</td><td>At least one controller in the logical group has to be selected as MASTER if some PriorityAuto Swapping mode is enabled. Only the controller with lowest CAN address becomes an active master, the other are ignored by SLAVE controllers. The MASTER controller evaluates the Priority changing for all other controllers in the group and sends them the “forced” Priority values.</td></tr></table></td></tr>
</table>

11.2.9.4 *Setpoint: #SysAMFstrtDel*

Group	Pwr management
Range [units]	0 .. 600 [s]
Related FW	standard v3.1.0
Description	System start delay between input *Sys start/stop* closing and start of Power Management System. When input *Sys start/stop* is controlled by mains decoupling relay, this setpoint adjusts the delay among the mains failure and the emergency start of the gen-sets. If the MCB feedback is closed, Power management is started with 1s delay after the input *Sys start/stop* closing - parallel operation with the mains. **NOTE:** # sign in the name of this setpoint marks that this setpoint is shared among all controllers connected by CAN2 bus.

11.2.9.5 *Setpoint: #SysAMFstopDel*

Group	Pwr management
Range [units]	0 .. 600 [s]
Related FW	standard v3.1.0
Description	System stop delay between input *Sys start/stop* opening and Power Management System deactivation. When input *Sys start/stop* is controlled by mains decoupling relay, this is a delay among the end of mains failure and opening of GCB. If the MCB feedback is closed, gen-sets are unloaded to mains prior to GCB opening. **NOTE:** # sign in the name of this setpoint marks that this setpoint is shared among all controllers connected by CAN2 bus.

11.2.9.6 *Setpoint: #LoadResStrt 1*

Group	Pwr Management
Range [units]	-32000 .. *LoadResStop 1* [kX]
Related FW	standard v3.1.0
Description	This setpoint is used to adjust the load reserve for start in absolute mode. i.e. *Pwr mgmt mode* = ABS (kW) or ABS (kVA) if the reserve set #1 is active. Learn more about reserves in the chapter Reserves, minimal running power. The currently active reserve set is selected by binary inputs *Load res 2*, *Load res 3* and *Load res 4*. If none of these inputs is active the set #1 is selected. **NOTE:** If the absolute power management is selected, this setpoint (or the setpoints *LoadResStrt 2*, *LoadResStrt 3* or *LoadResStrt 4* depending on which load reserve set is selected) determines also the number of gensets (that are part of the power management) which will start (according to their priority and nominal power). **NOTE:** There is a possiblity to assign this setpoint negative number. This can be used in some situations to allow genset start after Sys Start/Stop gets active. It is not destined for normal operation. Please refer to the Troubleshooting guide for more information (chapter "MGCB is not closed although gensets are running"). **NOTE:** # sign in the name of this setpoint marks that this setpoint is shared among all controllers connected by CAN2 bus.

11.2.9.7 *Setpoint: #LoadResStop 1*

Group	Pwr Management
Range [units]	*LoadResStrt 1* .. 32000 [kX]
Related FW	standard v3.1.0
Description	This setpoint is used to adjust the load reserve for stop in absolute mode. i.e. *Pwr mgmt mode* = ABS (kW) or ABS (kVA) if the reserve set #1 is active. Learn more about reserves in the chapter Reserves, minimal running power. The currently active reserve set is selected by binary inputs *Load res 2*, *Load res 3* and *Load res 4*. If none of these inputs is active the set #1 is selected. **NOTE:**

	The reserve for stop must be always adjusted higher than the reserve for start. **NOTE:** # sign in the name of this setpoint marks that this setpoint is shared among all controllers connected by CAN2 bus.

11.2.9.8 *Setpoint: #LoadResStrt 2*

Group	Pwr Management
Range [units]	-32000 .. *LoadResStop 2* [kX]
Related FW	standard v3.1.0
Description	This setpoint is used to adjust the load reserve for start in absolute mode. i.e. *Pwr mgmt mode* = ABS (kW) or ABS (kVA) if the reserve set #2 is active. Learn more about reserves in the chapter Reserves, minimal running power. The currently active reserve set is selected by binary inputs *Load res 2*, *Load res 3* and *Load res 4*. If none of these inputs is active the set #1 is selected. **NOTE:** If the absolute power management is selected, this setpoint (or the setpoints *LoadResStrt 1*, *LoadResStrt 3* or *LoadResStrt 4* depending on which load reserve set is selected) determines also the number of gensets (that are part of the power management) which will start (according to their priority and nominal power). **NOTE:** There is a possiblity to assign this setpoint negative number. This can be used in some situations to allow genset start after Sys Start/Stop gets active. It is not destined for normal operation. Please refer to the Troubleshooting guide for more information (chapter "MGCB is not closed although gensets are running"). **NOTE:** # sign in the name of this setpoint marks that this setpoint is shared among all controllers connected by CAN2 bus.

11.2.9.9 *Setpoint: #LoadResStop 2*

Group	Pwr Management
Range [units]	*LoadResStrt 2* .. 32000 [kX]

Related FW	standard v3.1.0
Description	This setpoint is used to adjust the load reserve for stop in absolute mode. i.e. *Pwr mgmt mode* = ABS (kW) or ABS (kVA) if the reserve set #2 is active. Learn more about reserves in the chapter Reserves, minimal running power. The currently active reserve set is selected by binary inputs *Load res 2*, *Load res 3* and *Load res 4*. If none of these inputs is active the set #1 is selected. **NOTE:** The reserve for stop must be always adjusted higher than the reserve for start. **NOTE:** # sign in the name of this setpoint marks that this setpoint is shared among all controllers connected by CAN2 bus.

11.2.9.10 *Setpoint: #LoadResStrt 3*

Group	Pwr Management
Range [units]	-32000 .. *LoadResStop 3* [kX]
Related FW	standard v3.1.0
Description	This setpoint is used to adjust the load reserve for start in absolute mode. i.e. *Pwr mgmt mode* = ABS (kW) or ABS (kVA) if the reserve set #3 is active. Learn more about reserves in the chapter Reserves, minimal running power. The currently active reserve set is selected by binary inputs *Load res 2*, *Load res 3* and *Load res 4*. If none of these inputs is active the set #1 is selected. **NOTE:** If the absolute power management is selected, this setpoint (or the setpoints *LoadResStrt 1*, *LoadResStrt 2* or *LoadResStrt 4* depending on which load reserve set is selected) determines also the number of gensets (that are part of the power management) which will start (according to their priority and nominal power). **NOTE:** There is a possiblity to assign this setpoint negative number. This can be used in some situations to allow genset start after Sys Start/Stop gets active. It is not destined for normal operation. Please refer to the Troubleshooting guide for more information (chapter "MGCB is not closed although gensets are running"). **NOTE:** # sign in the name of this setpoint marks that this setpoint is shared among all controllers connected by CAN2 bus.

11.2.9.11 *Setpoint: #LoadResStop 3*

Group	Pwr Management
Range [units]	*LoadResStrt 3* .. 32000 [kX]
Related FW	standard v3.1.0
Description	This setpoint is used to adjust the load reserve for stop in absolute mode. i.e. *Pwr mgmt mode* = ABS (kW) or ABS (kVA) if the reserve set #3 is active. Learn more about reserves in the chapter Reserves, minimal running power. The currently active reserve set is selected by binary inputs *Load res 2*, *Load res 3* and *Load res 4*. If none of these inputs is active the set #1 is selected. **NOTE:** The reserve for stop must be always adjusted higher than the reserve for start. **NOTE:** # sign in the name of this setpoint marks that this setpoint is shared among all controllers connected by CAN2 bus.

11.2.9.12 *Setpoint: #LoadResStrt 4*

Group	Pwr Management
Range [units]	-32000 .. *LoadResStop 4* [kX]
Related FW	standard v3.1.0
Description	This setpoint is used to adjust the load reserve for start in absolute mode. i.e. *Pwr mgmt mode* = ABS (kW) or ABS (kVA) if the reserve set #4 is active. Learn more about reserves in the chapter Reserves, minimal running power. The currently active reserve set is selected by binary inputs *Load res 2*, *Load res 3* and *Load res 4*. If none of these inputs is active the set #1 is selected. **NOTE:** If the absolute power management is selected, this setpoint (or the setpoints *LoadResStrt 1*, *LoadResStrt 2* or *LoadResStrt 3* depending on which load reserve set is selected) determines also the number of gensets (that are part of the power management) which will start (according to their priority and nominal power). **NOTE:** There is a possiblity to assign this setpoint negative number. This can be

	used in some situations to allow genset start after Sys Start/Stop gets active. It is not destined for normal operation. Please refer to the Troubleshooting guide for more information (chapter "MGCB is not closed although gensets are running"). **NOTE:** # sign in the name of this setpoint marks that this setpoint is shared among all controllers connected by CAN2 bus.

11.2.9.13 *Setpoint: #LoadResStop 4*

Group	Pwr Management
Range [units]	*LoadResStrt 4* .. 32000 [kX]
Related FW	standard v3.1.0
Description	This setpoint is used to adjust the load reserve for stop in absolute mode. i.e. *Pwr mgmt mode* = ABS (kW) or ABS (kVA) if the reserve set #4 is active. Learn more about reserves in the chapter Reserves, minimal running power. The currently active reserve set is selected by binary inputs *Load res 2*, *Load res 3* and *Load res 4*. If none of these inputs is active the set #1 is selected. **NOTE:** The reserve for stop must be always adjusted higher than the reserve for start. **NOTE:** # sign in the name of this setpoint marks that this setpoint is shared among all controllers connected by CAN2 bus.

11.2.9.14 *Setpoint: #%LdResStrt 1*

Group	Pwr Management
Range [units]	0 .. *%LdResStop 1* [%]
Related FW	standard v3.1.0
Description	This setpoint is used to adjust the load reserve for start in relative mode. i.e. *Pwr mgmt mode* = REL (%) if the reserve set #1 is active. Learn more about reserves in the chapter Reserves, minimal running power. The currently active reserve set is selected by binary inputs *Load res 2*, *Load res 3* and *Load res 4*. If none of these inputs is active the set #1 is selected.

	NOTE: If the relative power management is selected, this setpoint (or the setpoints *%LdResStrt 2*, *%LdResStrt 3* or *%LdResStrt 4* depending on which load reserve set is selected) determines also the number of gensets (that are part of the power management) which will start (according to their priority and nominal power). **NOTE:** # sign in the name of this setpoint marks that this setpoint is shared among all controllers connected by CAN2 bus.

11.2.9.15 *Setpoint: #%LdResStop 1*

Group	Pwr Management
Range [units]	*%LdResStrt 1* .. 110 [%]
Related FW	standard v3.1.0
Description	This setpoint is used to adjust the load reserve for stop in relative mode. i.e. *Pwr mgmt mode* = REL (%) if the reserve set #1 is active. Learn more about reserves in the chapter Reserves, minimal running power. The currently active reserve set is selected by binary inputs *Load res 2*, *Load res 3* and *Load res 4*. If none of these inputs is active the set #1 is selected. **NOTE:** The reserve for stop must be always adjusted higher than the reserve for start. **NOTE:** # sign in the name of this setpoint marks that this setpoint is shared among all controllers connected by CAN2 bus.

11.2.9.16 *Setpoint: #%LdResStrt 2*

Group	Pwr Management
Range [units]	0 .. *%LdResStop 2* [%]
Related FW	standard v3.1.0
Description	This setpoint is used to adjust the load reserve for start in relative mode. i.e. *Pwr mgmt mode* = REL (%) if the reserve set #2 is active. Learn more about reserves in the chapter Reserves, minimal running power. The currently active reserve set is selected by binary inputs *Load res 2*, *Load*

	res 3 and *Load res 4*. If none of these inputs is active the set #1 is selected. **NOTE:** If the relative power management is selected, this setpoint (or the setpoints *%LdResStrt 1*, *%LdResStrt 3* or *%LdResStrt 4* depending on which load reserve set is selected) determines also the number of gensets (that are part of the power management) which will start (according to their priority and nominal power). **NOTE:** # sign in the name of this setpoint marks that this setpoint is shared among all controllers connected by CAN2 bus.

11.2.9.17 *Setpoint: #%LdResStop 2*

Group	Pwr Management
Range [units]	*%LdResStrt 2* .. 110 [%]
Related FW	standard v3.1.0
Description	This setpoint is used to adjust the load reserve for stop in relative mode. i.e. *Pwr mgmt mode* = REL (%) if the reserve set #2 is active. Learn more about reserves in the chapter Reserves, minimal running power. The currently active reserve set is selected by binary inputs *Load res 2*, *Load res 3* and *Load res 4*. If none of these inputs is active the set #1 is selected. **NOTE:** The reserve for stop must be always adjusted higher than the reserve for start. **NOTE:** # sign in the name of this setpoint marks that this setpoint is shared among all controllers connected by CAN2 bus.

11.2.9.18 *Setpoint: #%LdResStrt 3*

Group	Pwr Management
Range [units]	0 .. *%LdResStop 3* [%]
Related FW	standard v3.1.0
Description	This setpoint is used to adjust the load reserve for start in relative mode. i.e. *Pwr mgmt mode* = REL (%) if the reserve set #3 is active. Learn more about

	reserves in the chapter Reserves, minimal running power. The currently active reserve set is selected by binary inputs *Load res 2*, *Load res 3* and *Load res 4*. If none of these inputs is active the set #1 is selected. **NOTE:** If the relative power management is selected, this setpoint (or the setpoints *%LdResStrt 1*, *%LdResStrt 2* or *%LdResStrt 4* depending on which load reserve set is selected) determines also the number of gensets (that are part of the power management) which will start (according to their priority and nominal power). **NOTE:** # sign in the name of this setpoint marks that this setpoint is shared among all controllers connected by CAN2 bus.

11.2.9.19 Setpoint: #%LdResStop 3

Group	Pwr Management
Range [units]	*%LdResStrt 3* .. 110 [%]
Related FW	standard v3.1.0
Description	This setpoint is used to adjust the load reserve for stop in relative mode. i.e. *Pwr mgmt mode* = REL (%) if the reserve set #3 is active. Learn more about reserves in the chapter Reserves, minimal running power. The currently active reserve set is selected by binary inputs *Load res 2*, *Load res 3* and *Load res 4*. If none of these inputs is active the set #1 is selected. **NOTE:** The reserve for stop must be always adjusted higher than the reserve for start. **NOTE:** # sign in the name of this setpoint marks that this setpoint is shared among all controllers connected by CAN2 bus.

11.2.9.20 Setpoint: #%LdResStrt 4

Group	Pwr Management
Range [units]	0 .. *%LdResStop 4* [%]
Related FW	standard v3.1.0

Description	This setpoint is used to adjust the load reserve for start in relative mode. i.e. *Pwr mgmt mode* = REL (%) if the reserve set #4 is active. Learn more about reserves in the chapter Reserves, minimal running power. The currently active reserve set is selected by binary inputs *Load res 2*, *Load res 3* and *Load res 4*. If none of these inputs is active the set #1 is selected. **NOTE:** If the relative power management is selected, this setpoint (or the setpoints *%LdResStrt 1*, *%LdResStrt 2* or *%LdResStrt 3* depending on which load reserve set is selected) determines also the number of gensets (that are part of the power management) which will start (according to their priority and nominal power). **NOTE:** # sign in the name of this setpoint marks that this setpoint is shared among all controllers connected by CAN2 bus.

11.2.9.21 Setpoint: #%LdResStop 4

Group	Pwr Management
Range [units]	*%LdResStrt 4* .. 110 [%]
Related FW	standard v3.1.0
Description	This setpoint is used to adjust the load reserve for stop in relative mode. i.e. *Pwr mgmt mode* = REL (%) if the reserve set #4 is active. Learn more about reserves in the chapter Reserves, minimal running power. The currently active reserve set is selected by binary inputs *Load res 2*, *Load res 3* and *Load res 4*. If none of these inputs is active the set #1 is selected. **NOTE:** The reserve for stop must be always adjusted higher than the reserve for start. **NOTE:** # sign in the name of this setpoint marks that this setpoint is shared among all controllers connected by CAN2 bus.

11.2.9.22 Setpoint: #NextStrt Del

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

Related FW	standard v3.1.0
Description	This setpoint is used to adjust the delay of starting the next gen-set when the actual load reserve drops below the adjusted reserve for start, but the group is still not overloaded. **NOTE:** # sign in the name of this setpoint marks that this setpoint is shared among all controllers connected by CAN2 bus.

11.2.9.23 *Setpoint: #OverldNext Del*

Group	Pwr Management
Range [units]	0 .. 3600 [s]
Related FW	standard v3.1.0
Description	If the system reserve drops below the start limit for next gen-set the delay *#NextStrt del* will begin to count down. But if the load raises too quickly it might happen that the system gets overloaded already before the delay *#NextStrt del* reaches zero. This setpoint is used to prevent this situation. If the *#NextStrt del* timer is already counting down (i.e. the condition for starting of next gen-set **based on reserves is fullfiled**), the total load of running gen-sets reach 90% of their nominal capacity and the remaining time of the running timer is higher than *#OverldNextDel*, the running timer is shortened to the value of *#OverldNextDel* to speed up the start-up of the next gen-set. **NOTE:** The setpoint takes place only in island operation. **NOTE:** # sign in the name of this setpoint marks that this setpoint is shared among all controllers connected by CAN2 bus.

11.2.9.24 *Setpoint: #NextStopDel*

Group	Pwr Management
Range [units]	0 .. 3600 [s]
Related FW	standard v3.1.0
Description	This setpoint is used to adjust the delay of stopping the next gen-set when the actual load reserve rises above the adjusted load reserve for stop. **NOTE:**

	# sign in the name of this setpoint marks that this setpoint is shared among all controllers connected by CAN2 bus.

11.2.9.25 *Setpoint: #SlowStopDel*

Group	Pwr Management
Range [units]	0 .. 600 [s]
Related FW	standard v3.1.0
Description	This setpoint is used to adjust how long the particular gen-set will suppress it's own *Slow stop* alarm to give chance to another gen-set to start and replace the defective one. If there isn't any available gen-set to start, the alarm is not suppressed. **NOTE:** # sign in the name of this setpoint marks that this setpoint is shared among all controllers connected by CAN2 bus.

11.2.9.26 *Setpoint: #MinRunPower 1*

Group	Power Management
Range [units]	0 .. 65000 [kW]
Related FW	standard v3.1.0
Description	This setpoint is used to adjust certain minimum value of the sum of nominal power of all running gen-sets. If the function is active, then the gen-sets would not be stopped, although the reserve for stop is fulfiled, if the total remaining nominal power dropped below this minimal value. There are 3 different *MinRunPower* setpoints, this particular one is activated by the input MinRun power 1 which is in MINT application (in InteliMains it is for compatibility purposes only). **NOTE:** When more than one binary input MinRunPower is activated then MinRunPower with the highest number is active. **NOTE:** # sign in the name of this setpoint marks that this setpoint is shared among all controllers connected by CAN2 bus.

11.2.9.27 *Setpoint: #MinRunPower 2*

Group	Power Management
Range [units]	0 .. 65000 [kW]
Related FW	standard v3.1.0
Description	This setpoint is used to adjust certain minimum value of the sum of nominal power of all running gen-sets. If the function is active, then the gen-sets would not be stopped, although the reserve for stop is fulfiled, if the total remaining nominal power dropped below this minimal value. There are 3 different *MinRunPower* setpoints, this particular one is activated by the input MinRun power 2 which is in MINT application (in InteliMains it is for compatibility purposes only). **NOTE:** When more than one binary input MinRunPower is activated then MinRunPower with the highest number is active. **NOTE:** # sign in the name of this setpoint marks that this setpoint is shared among all controllers connected by CAN2 bus.

11.2.9.28 *Setpoint: #MinRunPower 3*

Group	Power Management
Range [units]	0 .. 65000 [kW]
Related FW	standard v3.1.0
Description	This setpoint is used to adjust certain minimum value of the sum of nominal power of all running gen-sets. If the function is active, then the gen-sets would not be stopped, although the reserve for stop is fulfiled, if the total remaining nominal power dropped below this minimal value. There are 3 different *MinRunPower* setpoints, this particular one is activated by the input MinRun power 3 which is in MINT application (in InteliMains it is for compatibility purposes only). **NOTE:** When more than one binary input MinRunPower is activated then MinRunPower with the highest number is active. **NOTE:** # sign in the name of this setpoint marks that this setpoint is shared among all controllers connected by CAN2 bus.

11.2.9.29 *Setpoint: #RunHrsMaxDiff*

Group	Pwr management
Range [units]	0 .. 65000 [h]
Related FW	standard v3.1.0
Description	This setpoint adjusts the "deadband" for the running hours equalization function. The priorities are swapped not until the relative engine hours (RHE) difference is higher than this deadband. **NOTE:** # sign in the name of this setpoint marks that this setpoint is shared among all controllers connected by CAN2 bus.

11.2.9.30 *Setpoint: #PwrBandContr 1*

Group	Pwr management
Range [units]	1, 2, 1+2, 3, 1+3, 2+3, 1+2+3 [-]
Related FW	standard v3.1.0
Description	This setpoint is used to select the gen-sets which will run within the power band #1 if the optimalization according to gen-set size is active. Learn more about this topis in the chapter Gen-set size optimalization. **NOTE:** The combinations of gensets must be created so, that the total nominal power of the Power band #1 < #2 < #3 < #4. **NOTE:** # sign in the name of this setpoint marks that this setpoint is shared among all controllers connected by CAN2 bus.

11.2.9.31 *Setpoint: #PwrBandContr 2*

Group	Pwr management
Range [units]	1, 2, 1+2, 3, 1+3, 2+3, 1+2+3 [-]
Related FW	standard v3.1.0
Description	This setpoint is used to select the gen-sets which will run within the power band #2 if the optimalization according to gen-set size is active. Learn more

	about this topis in the chapter Gen-set size optimalization. **NOTE:** The combinations of gensets must be created so, that the total nominal power of the Power band #1 < #2 < #3 < #4. **NOTE:** # sign in the name of this setpoint marks that this setpoint is shared among all controllers connected by CAN2 bus.

11.2.9.32 *Setpoint: #PwrBandContr 3*

Group	Pwr management
Range [units]	1, 2, 1+2, 3, 1+3, 2+3, 1+2+3 [-]
Related FW	standard v3.1.0
Description	This setpoint is used to select the gen-sets which will run within the power band #3 if the optimalization according to gen-set size is active. Learn more about this topis in the chapter Gen-set size optimalization. **NOTE:** The combinations of gensets must be created so, that the total nominal power of the Power band #1 < #2 < #3 < #4. **NOTE:** # sign in the name of this setpoint marks that this setpoint is shared among all controllers connected by CAN2 bus.

11.2.9.33 *Setpoint: #PwrBandContr 4*

Group	Pwr management
Range [units]	1, 2, 1+2, 3, 1+3, 2+3, 1+2+3 [-]
Related FW	standard v3.1.0
Description	This setpoint is used to select the gen-sets which will run within the power band #4 if the optimalization according to gen-set size is active. Learn more about this topis in the chapter Gen-set size optimalization. **NOTE:** The combinations of gensets must be created so, that the total nominal power of the Power band #1 < #2 < #3 < #4.

	NOTE: # sign in the name of this setpoint marks that this setpoint is shared among all controllers connected by CAN2 bus.

11.2.9.34 *Setpoint: #PwrBnChngDlUp*

Group	Pwr management
Range [units]	0 .. 3600 [s]
Related FW	standard v3.1.0
Description	This setpoint is used for adjusting the delay of changing the power band if the load demand rose above the upper limit of the current power band. Learn more about this topis in the chapter Gen-set size optimalization. **NOTE:** # sign in the name of this setpoint marks that this setpoint is shared among all controllers connected by CAN2 bus.

11.2.9.35 *Setpoint: GroupLinkLeft*

Group	Pwr management
Range [units]	COMMON (=1), 2 .. 32 [-]
Related FW	standard v3.1.0
Description	**NOTE:** In MCB/MGCB application both *GroupLinkLeft* and *GroupLinkRight* should be set to 1 (=COMMON). If the input *GroupLink* of this particular controller is used to provide the "group link" information for two logical groups, then this setpoint is used to select which group is located at the left side of the group link breaker (bus tie breaker). If this particular controller is not used for the group link function adjust this setpoint to 1 (COMMON).

11.2.9.36 *Setpoint: GroupLinkRight*

Group	Pwr management
Range [units]	COMMON (=1), 2 .. 32 [-]
Related FW	standard v3.1.0

Description	**NOTE:** In MCB/MGCB application both *GroupLinkLeft* and *GroupLinkRight* should be set to 1 (=COMMON). If the input *GroupLink* of this particular controller is used to provide the "group link" information for two logical groups, then this setpoint is used to select which group is located at the right side of the group link breaker (bus tie breaker). If this particular controller is not used for the group link function adjust this setpoint to 1 (COMMON).

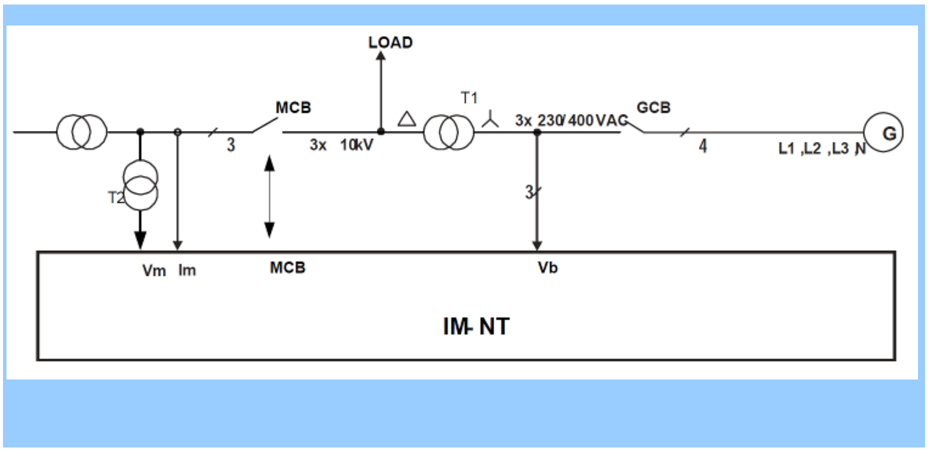
11.2.10 Group: Sync/Load ctrl

11.2.10.1 *Setpoint: Voltage window*

Group	Sync/Load Ctrl
Range [units]	0.0 .. 100.0 [%]
Related FW	standard v3.1.0
Force value possible	YES
Description	This setpoint adjusts maximum difference between bus and mains voltage in respective phases for voltage matching during synchronizing.

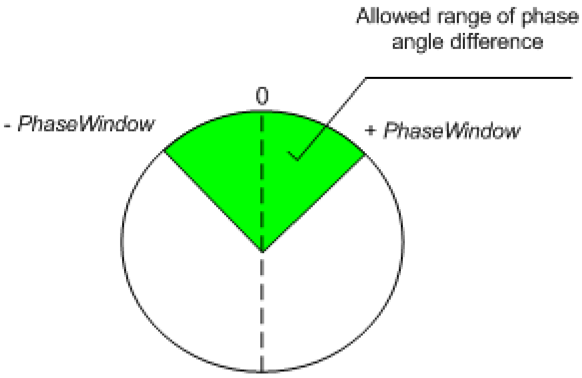
11.2.10.2 *Setpoint: BtoM AngleReq*

Group	Sync/Load ctrl
Range [units]	-45 .. 45 [°]
Related FW	standard v3.1.0
Description	Requested phase difference between mains and bus voltage during synchronizing. Use this setpoint for phase correction of potential transformers connection. **EXAMPLE:** Bellow there is an example of the controller connection to a high voltage system. T1 shifts phase +30° and no shift is on T2. BtoM AngleReq = +30° needs to be set for this example.

11.2.10.3 *Setpoint: Phase window*

Group	Sync/Load Ctrl
Range [units]	0 .. 90 [°]
Related FW	standard v3.1.0
Force value possible	YES
Description	This setpoint adjusts maximum absolute value of difference between actual phase angle between the bus and mains 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. **NOTE:** The setpoint works as a window surrounding the BtoM AngleReq setpoint. E.g. for BtoM AngleReq = +30° and Phase window = 5°, the breaker closure is allowed for phases +25° to +35°. If you want to lock out the breaker closing during synchronizing control loop test, set Phase window = 0. This allows the control loop setpoints to be tuned while actual breaker closing is blocked.

11.2.10.4 *Setpoint: Dwell time*

Group	Sync/Load Ctrl
Range [units]	0.0 .. 25.0 [s]
Related FW	standard v3.1.0
Force value possible	YES
Description	This setpoint adjusts the period of time that the phase angle difference must stay within +/-*Phase Window* and voltage difference within *Voltage Window* before the respective breaker, which is actually beeing synchronized, is closed.

11.2.10.5 *Setpoint: Freq gain*

Group	Sync/Load Ctrl
Range [units]	0.0 .. 200.0 [%]
Related FW	standard v3.1.0
Description	This setpoint adjusts the gain factor (P-factor) of the frequency control PI loop. The integration factor (I-factor) for the frequency loop is adjusted by the setpoint *Freq int*.

APPLICATION	FREQ GAIN AND FREQ INT SETPOINTS ARE ACTIVE DURING:
MCB	reverse synchronization of the gen-set group back to the mains

	<table><tr><td>MGCB</td><td>forward or reverse synchronization of the gen-set group to the mains</td></tr><tr><td>BTB</td><td>synchronization between “left” and “right” buses</td></tr></table> **NOTE:** When this setpoint is set to zero, the corresponding control loop is switched OFF. **NOTE:** See the chapter Regulation loops overview for general information about regulation loops and their adjustment.

11.2.10.6 *Setpoint: Freq int*

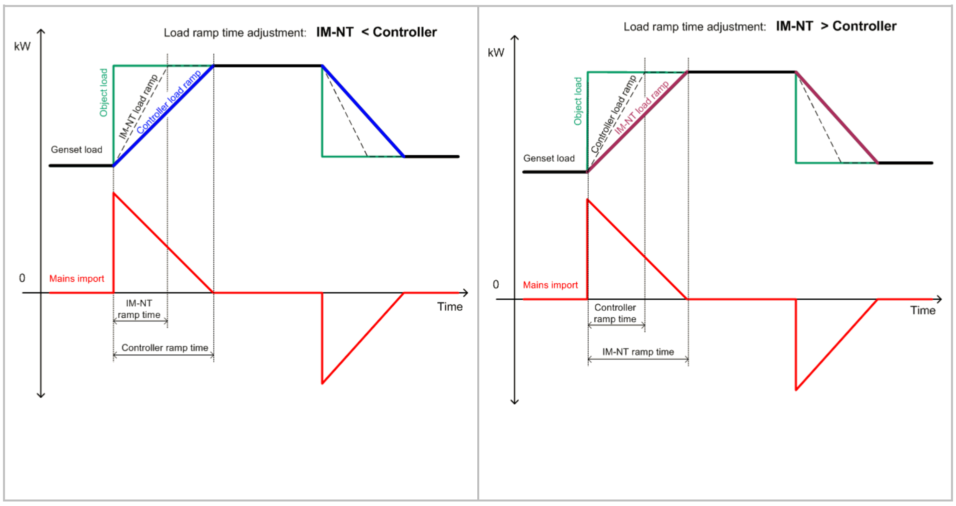
Group	Sync/Load Ctrl
Range [units]	0 .. 100 [%]
Related FW	standard v3.1.0
Description	This setpoint adjusts the relative integration factor (I-factor) of the frequency control PI loop. The gain factor (P-factor) for the frequency loop is adjusted by the setpoint *Freq gain*. <table><tr><th>APPLICATION</th><th>FREQ GAIN AND FREQ INT SETPOINTS ARE ACTIVE DURING:</th></tr><tr><td>MCB</td><td>reverse synchronization of the gen-set group back to the mains</td></tr><tr><td>MGCB</td><td>forward or reverse synchronization of the gen-set group to the mains</td></tr><tr><td>BTB</td><td>synchronization between “left” and “right” buses</td></tr></table> **NOTE:** See the chapter Regulation loops overview for general information about regulation loops and their adjustment.

11.2.10.7 *Setpoint: Angle Gain*

Group	Sync/Load Ctrl
Range [units]	0.0 .. 200.0 [%]
Related FW	standard v3.1.0
Description	This setpoint is used for adjusting of the gain factor (P-factor) of the phase angle P-control loop. The synchronizing process contains two following steps: 1. The first step is to match the bus frequency to the mains frequency. In this step the frequency regulation loop (*Freq reg loop*) is active. 2. The following step is to match the phase angle difference of the mains and bus voltages to the setpoint *BtoM AngleReg*. The angle regulation loop is active in this step. As soon as the phase angle difference stays within the window adjusted by *Phase window* and the voltage difference stays in the *Voltage window*, both for period *Dwell time*, the circuit breaker closing command is issued. **NOTE:** See the chapter Regulation loops overview for general information about regulation loops and their adjustment.

11.2.10.8 *Setpoint: Load Ramp*

Group	Sync/Load Ctrl
Range [units]	0 .. 1800 [s]
Related FW	standard v3.1.0
Force value possible	YES
Description	This setpoint adjusts loading/unloading rate. After time defined by this setpoint is reached NominMainsImp (NominBusLImp in BTB application) is reached. **NOTE:** You can achieve more different load ramps using Force Value function. E.g. for soft load in parallel with mains use longer ramp than for soft load in island parallel (multi-stand-by). **CAUTION!** Speed of load ramping to the Mains depends on setting of Load ramp in IM-NT and also in gen-set controllers. The Mains import increase/decrease behaves according to following images:

11.2.10.9 *Setpoint: Load gain*

<table>
<tr><td>Group</td><td>Sync/Load Ctrl</td></tr>
<tr><td>Range [units]</td><td>0.0 .. 200.0 [%]</td></tr>
<tr><td>Related FW</td><td>standard v3.1.0</td></tr>
<tr><td>Description</td><td>This setpoint adjusts the gain factor (P-factor) of the load control PI loop. The integration factor (I-factor) for the load control loop is adjusted by the setpoint <i>Load int</i>.
<table>
<tr><th>APPLICATION</th><th>LOAD GAIN AND LOAD INT SETPOINTS ARE ACTIVE DURING:</th></tr>
<tr><td>MCB,
MGCB</td><td>parallel to mains operation in any mode where IM-NT load control loop is active (see setpoint MLoad ctrl PtM), including load ramps</td></tr>
<tr><td>BTB</td><td>BusLeft or BusRight BaseLoad control in any mode where IM-NT load control loop is active (see setpoint MultiLoad ctrl), including load ramps</td></tr>
</table>
NOTE:
When this setpoint is set to zero, the corresponding control loop is switched</td></tr>
</table>

	OFF. **NOTE:** See the chapter Regulation loops overview for general information about regulation loops and their adjustment.

11.2.10.10 *Setpoint: Load int*

<table>
<tr><td>Group</td><td>Sync/Load Ctrl</td></tr>
<tr><td>Range [units]</td><td>0 .. 100 [%]</td></tr>
<tr><td>Related FW</td><td>standard v3.1.0</td></tr>
<tr><td>Description</td><td>This setpoint adjusts the relative integration factor (I-factor) of the load control PI loop. The gain factor (P-factor) for the load control loop is adjusted by the setpoint <i>Load gain</i>.
<table>
<tr><th>APPLICATION</th><th>LOAD GAIN AND LOAD INT SETPOINTS ARE ACTIVE DURING:</th></tr>
<tr><td>MCB,
MGCB</td><td>parallel to mains operation in any mode where IM-NT load control loop is active (see setpoint MLoad ctrl PtM), including load ramps</td></tr>
<tr><td>BTB</td><td>BusLeft or BusRight BaseLoad control in any mode where IM-NT load control loop is active (see setpoint MultiLoad ctrl), including load ramps</td></tr>
</table>
NOTE:
See the chapter Regulation loops overview for general information about regulation loops and their adjustment.</td></tr>
</table>

11.2.10.11 *Setpoint: MGCB open lev*

Group	Sync/Load Cont
Range [units]	0 .. 100 [%]
Related FW	standard v3.1.0
Description	This setpoint adjusts the end point of the bus unloading ramp, i.e. power level at which the MGCB is opened. If this level is not reached within time period

	adjusted by setpoint *MGCB open del* the MGCB is then opened regardless of the bus power. The actual value is calculated as percentage given by this setpoint from *NominMainsImp*. **NOTE:** The speed of the ramp is adjusted by the setpoint *Load ramp*.

11.2.10.12 *Setpoint: MGCB open del*

Group	Sync/Load Ctrl
Range [units]	*Load ramp* .. 1800 [s]
Related FW	standard v3.1.0
Force value possible	YES
Description	This setpoint adjusts the maximum duration of the bus unloading ramp. If the end point of the ramp (*MGCB open level*) is not reached within time period adjusted by this setpoint the MGCB is then opened regardless of the bus power. **NOTE:** The speed of the ramp is adjusted by the setpoint *Load ramp*.

11.2.10.13 *Setpoint: Sync timeout*

Group	Sync/Load Ctrl
Range [units]	1 .. 1800, NO TIMEOUT [s]
Related FW	standard v3.1.0
Description	This setpoint adjusts the maximum duration of forward or reverse synchronization. If the synchronizing is not successful within this period of time, the *Sync Timeout* or *RevSyncTimeout* alarm will be issued. **NOTE:** If the synchronizing is not successful within 1/10 of the *Sync timeout* or 60s (if *Sync timeout* <600s) the synchronization process is automatically restarted again, i.e. the speed governor output is reset to bias value in gen-set controllers and then frequency regulation loop is started again. If NO TIMEOUT is selected the automatic restart occurs every 180s. This method helps to sychronize successfully even in difficult conditions.

11.2.11 Group: Volt/PF ctrl

11.2.11.1 *Setpoint: Voltage gain*

Group	Volt/PF Ctrl
Range [units]	0.0 .. 200.0 [%]
Related FW	standard v3.1.0
Description	This setpoint adjusts the gain factor (P-factor) of the voltage control PI loop. The integration factor (I-factor) for the voltage control loop is adjusted by the setpoint *Voltage int*. **NOTE:** If this setpoint is set to 0 the regulation loop is disabled. **APPLICATION** / **VOLTAGE GAIN AND VOLTAGE INT SETPOINTS ARE ACTIVE DURING:** MCB – reverse synchronization of the gen-set group back to the mains MGCB – forward or reverse synchronization of the gen-set group to the mains BTB – synchronization between “left” and “right” buses **NOTE:** When this setpoint is set to zero, the corresponding control loop is switched OFF. **NOTE:** See the chapter Regulation loops overview for general information about regulation loops and their adjustment.

APPLICATION	VOLTAGE GAIN AND VOLTAGE INT SETPOINTS ARE ACTIVE DURING:
MCB	reverse synchronization of the gen-set group back to the mains
MGCB	forward or reverse synchronization of the gen-set group to the mains
BTB	synchronization between “left” and “right” buses

11.2.11.2 *Setpoint: Voltage Int*

Group	Volt/PF Ctrl
Range [units]	0 .. 100 [%]
Related FW	standard v3.1.0

Description	This setpoint adjusts the relative integration factor (I-factor) of the voltage control PI loop. The gain factor (P-factor) for the voltage control loop is adjusted by the setpoint *Voltage gain*. **APPLICATION** / **VOLTAGE GAIN AND VOLTAGE INT SETPOINTS ARE ACTIVE DURING:** MCB – reverse synchronization of the gen-set group back to the mains MGCB – forward or reverse synchronization of the gen-set group to the mains BTB – synchronization between "left" and "right" buses **NOTE:** See the chapter Regulation loops overview for general information about regulation loops and their adjustment.

11.2.11.3 *Setpoint: PF gain*

Group	Volt/PF Ctrl
Range [units]	0.0 .. 200.0 [%]
Related FW	standard v3.1.0
Description	This setpoint adjusts the gain factor (P-factor) of the cos-phi control PI loop. The integration factor (I-factor) for the cos-phi control loop is adjusted by the setpoint *PF int*. **NOTE:** If this setpoint is set to 0 the regulation loop is disabled. PF gain and PF int setpoints are active only when gen-sets run in parallel to mains. **NOTE:** See the chapter Regulation loops overview for general information about regulation loops and their adjustment.

11.2.11.4 *Setpoint: PF int*

Group	Volt/PF Ctrl

Range [units]	0 .. 100 [%]
Related FW	standard v3.1.0
Description	This setpoint adjusts the relative integration factor (I-factor) of the cos-phi control PI loop. The gain factor (P-factor) for the cos-phi control loop is adjusted by the setpoint *PF gain*.

11.2.12 Group: Force value

11.2.12.1 *Setpoint: Force value 1*

Group	Force value
Range [units]	[-]
Related FW	standard v3.1.0
Description	This is one of the 16 setpoints reserved for using as alternative setpoints for the force value functions. The alternative setpoint is to be assigned to a particular force value function and renamed in GenConfig. See also the input *Force value 1*. **NOTE:** It is not obligatory to use one of these reserved setpoints for a force value function. It is possible to use also any other setpoint or value with matching dimension and decimal resolution. **NOTE:** There isn't any relation between the default names of the force value function blocks, associated binary inputs and the default names of the reserved setpoints. In other words, the setpoint with default name *Force value 3* is **not related** to the *Force value 3* function block.

11.2.12.2 *Setpoint: Force value 2*

Group	Force value
Range [units]	[-]
Related FW	standard v3.1.0
Description	This is one of the 16 setpoints reserved for using as alternative setpoints for the force value functions. The alternative setpoint is to be assigned to a particular force value function and renamed in GenConfig. **NOTE:**

	It is not obligatory to use one of these reserved setpoints for a force value function. It is possible to use also any other setpoint or value with matching dimension and decimal resolution. **NOTE:** There isn't any relation between the default names of the force value function blocks, associated binary inputs and the default names of the reserved setpoints. In other words, the setpoint with default name *Force value 3* is **not related** to the *Force value 3* function block.

11.2.12.3 *Setpoint: Force value 3*

Group	Force value
Range [units]	[-]
Related FW	standard v3.1.0
Description	This is one of the 16 setpoints reserved for using as alternative setpoints for the force value functions. The alternative setpoint is to be assigned to a particular force value function and renamed in GenConfig. See also the input *Force value 1*. **NOTE:** It is not obligatory to use one of these reserved setpoints for a force value function. It is possible to use also any other setpoint or value with matching dimension and decimal resolution. **NOTE:** There isn't any relation between the default names of the force value function blocks, associated binary inputs and the default names of the reserved setpoints. In other words, the setpoint with default name *Force value 3* is **not related** to the *Force value 3* function block.

11.2.12.4 *Setpoint: Force value 4*

Group	Force value
Range [units]	[-]
Related FW	standard v3.1.0
Description	This is one of the 16 setpoints reserved for using as alternative setpoints for the force value functions. The alternative setpoint is to be assigned to a particular force value function and renamed in GenConfig.

	See also the input *Force value 1*. **NOTE:** It is not obligatory to use one of these reserved setpoints for a force value function. It is possible to use also any other setpoint or value with matching dimension and decimal resolution. **NOTE:** There isn't any relation between the default names of the force value function blocks, associated binary inputs and the default names of the reserved setpoints. In other words, the setpoint with default name *Force value 3* is **not related** to the *Force value 3* function block.

11.2.12.5 *Setpoint: Force value 5*

Group	Force value
Range [units]	[-]
Related FW	standard v3.1.0
Description	This is one of the 16 setpoints reserved for using as alternative setpoints for the force value functions. The alternative setpoint is to be assigned to a particular force value function and renamed in GenConfig. See also the input *Force value 1*. **NOTE:** It is not obligatory to use one of these reserved setpoints for a force value function. It is possible to use also any other setpoint or value with matching dimension and decimal resolution. **NOTE:** There isn't any relation between the default names of the force value function blocks, associated binary inputs and the default names of the reserved setpoints. In other words, the setpoint with default name *Force value 3* is **not related** to the *Force value 3* function block.

11.2.12.6 *Setpoint: Force value 6*

Group	Force value
Range [units]	[-]
Related FW	standard v3.1.0
Description	This is one of the 16 setpoints reserved for using as alternative setpoints for

	the force value functions. The alternative setpoint is to be assigned to a particular force value function and renamed in GenConfig. See also the input *Force value 1*. **NOTE:** It is not obligatory to use one of these reserved setpoints for a force value function. It is possible to use also any other setpoint or value with matching dimension and decimal resolution. **NOTE:** There isn't any relation between the default names of the force value function blocks, associated binary inputs and the default names of the reserved setpoints. In other words, the setpoint with default name *Force value 3* is **not related** to the *Force value 3* function block.

11.2.12.7 *Setpoint: Force value 7*

Group	Force value
Range [units]	[-]
Related FW	standard v3.1.0
Description	This is one of the 16 setpoints reserved for using as alternative setpoints for the force value functions. The alternative setpoint is to be assigned to a particular force value function and renamed in GenConfig. See also the input *Force value 1*. **NOTE:** It is not obligatory to use one of these reserved setpoints for a force value function. It is possible to use also any other setpoint or value with matching dimension and decimal resolution. **NOTE:** There isn't any relation between the default names of the force value function blocks, associated binary inputs and the default names of the reserved setpoints. In other words, the setpoint with default name *Force value 3* is **not related** to the *Force value 3* function block.

11.2.12.8 *Setpoint: Force value 8*

Group	Force value
Range [units]	[-]

Related FW	standard v3.1.0
Description	This is one of the 16 setpoints reserved for using as alternative setpoints for the force value functions. The alternative setpoint is to be assigned to a particular force value function and renamed in GenConfig. See also the input *Force value 1*. **NOTE:** It is not obligatory to use one of these reserved setpoints for a force value function. It is possible to use also any other setpoint or value with matching dimension and decimal resolution. **NOTE:** There isn't any relation between the default names of the force value function blocks, associated binary inputs and the default names of the reserved setpoints. In other words, the setpoint with default name *Force value 3* is **not related** to the *Force value 3* function block.

11.2.12.9 *Setpoint: Force value 9*

Group	Force value
Range [units]	[-]
Related FW	standard v3.1.0
Description	This is one of the 16 setpoints reserved for using as alternative setpoints for the force value functions. The alternative setpoint is to be assigned to a particular force value function and renamed in GenConfig. See also the input *Force value 1*. **NOTE:** It is not obligatory to use one of these reserved setpoints for a force value function. It is possible to use also any other setpoint or value with matching dimension and decimal resolution. **NOTE:** There isn't any relation between the default names of the force value function blocks, associated binary inputs and the default names of the reserved setpoints. In other words, the setpoint with default name *Force value 3* is **not related** to the *Force value 3* function block.

11.2.12.10 *Setpoint: Force value 10*

Group	Force value

Range [units]	[-]
Related FW	standard v3.1.0
Description	This is one of the 16 setpoints reserved for using as alternative setpoints for the force value functions. The alternative setpoint is to be assigned to a particular force value function and renamed in GenConfig. See also the input *Force value 1*. **NOTE:** It is not obligatory to use one of these reserved setpoints for a force value function. It is possible to use also any other setpoint or value with matching dimension and decimal resolution. **NOTE:** There isn't any relation between the default names of the force value function blocks, associated binary inputs and the default names of the reserved setpoints. In other words, the setpoint with default name *Force value 3* is **not related** to the *Force value 3* function block.

11.2.12.11 *Setpoint: Force value 11*

Group	Force value
Range [units]	[-]
Related FW	standard v3.1.0
Description	This is one of the 16 setpoints reserved for using as alternative setpoints for the force value functions. The alternative setpoint is to be assigned to a particular force value function and renamed in GenConfig. See also the input *Force value 1*. **NOTE:** It is not obligatory to use one of these reserved setpoints for a force value function. It is possible to use also any other setpoint or value with matching dimension and decimal resolution. **NOTE:** There isn't any relation between the default names of the force value function blocks, associated binary inputs and the default names of the reserved setpoints. In other words, the setpoint with default name *Force value 3* is **not related** to the *Force value 3* function block.

11.2.12.12 *Setpoint: Force value 12*

Group	Force value
Range [units]	[-]
Related FW	standard v3.1.0
Description	This is one of the 16 setpoints reserved for using as alternative setpoints for the force value functions. The alternative setpoint is to be assigned to a particular force value function and renamed in GenConfig. See also the input *Force value 1*. **NOTE:** It is not obligatory to use one of these reserved setpoints for a force value function. It is possible to use also any other setpoint or value with matching dimension and decimal resolution. **NOTE:** There isn't any relation between the default names of the force value function blocks, associated binary inputs and the default names of the reserved setpoints. In other words, the setpoint with default name *Force value 3* is **not related** to the *Force value 3* function block.

11.2.12.13 *Setpoint: Force value 13*

Group	Force value
Range [units]	[-]
Related FW	standard v3.1.0
Description	This is one of the 16 setpoints reserved for using as alternative setpoints for the force value functions. The alternative setpoint is to be assigned to a particular force value function and renamed in GenConfig. See also the input *Force value 1*. **NOTE:** It is not obligatory to use one of these reserved setpoints for a force value function. It is possible to use also any other setpoint or value with matching dimension and decimal resolution. **NOTE:** There isn't any relation between the default names of the force value function blocks, associated binary inputs and the default names of the reserved setpoints. In other words, the setpoint with default name *Force value 3* is **not related** to the *Force value 3* function block.

11.2.12.14 *Setpoint: Force value 14*

Group	Force value
Range [units]	[-]
Related FW	standard v3.1.0
Description	This is one of the 16 setpoints reserved for using as alternative setpoints for the force value functions. The alternative setpoint is to be assigned to a particular force value function and renamed in GenConfig. See also the input *Force value 1*. **NOTE:** It is not obligatory to use one of these reserved setpoints for a force value function. It is possible to use also any other setpoint or value with matching dimension and decimal resolution. **NOTE:** There isn't any relation between the default names of the force value function blocks, associated binary inputs and the default names of the reserved setpoints. In other words, the setpoint with default name *Force value 3* is **not related** to the *Force value 3* function block.

11.2.12.15 *Setpoint: Force value 15*

Group	Force value
Range [units]	[-]
Related FW	standard v3.1.0
Description	This is one of the 16 setpoints reserved for using as alternative setpoints for the force value functions. The alternative setpoint is to be assigned to a particular force value function and renamed in GenConfig. See also the input *Force value 1*. **NOTE:** It is not obligatory to use one of these reserved setpoints for a force value function. It is possible to use also any other setpoint or value with matching dimension and decimal resolution. **NOTE:** There isn't any relation between the default names of the force value function blocks, associated binary inputs and the default names of the reserved setpoints. In other words, the setpoint with default name *Force value 3* is **not related** to the *Force value 3* function block.

11.2.12.16 *Setpoint: Force value 16*

Group	Force value
Range [units]	[-]
Related FW	standard v3.1.0
Description	This is one of the 16 setpoints reserved for using as alternative setpoints for the force value functions. The alternative setpoint is to be assigned to a particular force value function and renamed in GenConfig. See also the input *Force value 1*. **NOTE:** It is not obligatory to use one of these reserved setpoints for a force value function. It is possible to use also any other setpoint or value with matching dimension and decimal resolution. **NOTE:** There isn't any relation between the default names of the force value function blocks, associated binary inputs and the default names of the reserved setpoints. In other words, the setpoint with default name *Force value 3* is **not related** to the *Force value 3* function block.

11.2.12.17 *Setpoint: ExtValue1LoLim*

Group	Force value
Range [units]	-32000 .. *ExtValue1HiLim* [X]
Related FW	standard v3.1.0
Description	This setpoint adjusts the low limit of the value of *ExtValue 1* if the value is lowered/raised by the binary inputs *ExtValue1 up* and *ExtValue1 down*. The *ExtValue 1* is never lowered below this limit. **NOTE:** This limit is not taken into account if the value *ExtValue 1* is written remotely from a terminal using the appropriate command *ExtValue #n*.

11.2.12.18 *Setpoint: ExtValue2LoLim*

Group	Force value

Range [units]	-32000 .. ExtValue2HiLim [X]
Related FW	standard v3.1.0
Description	This setpoint adjusts the low limit of the value of *ExtValue 2* if the value is lowered/raised by the binary inputs ExtValue2 up and ExtValue2 down. The *ExtValue 2* is never lowered below this limit. **NOTE:** This limit is not taken into account if the value *ExtValue 2* is written remotely from a terminal using the appropriate command *ExtValue #n*.

11.2.12.19 *Setpoint: ExtValue3LoLim*

Group	Force value
Range [units]	-32000 .. ExtValue3HiLim [X]
Related FW	standard v3.1.0
Description	This setpoint adjusts the low limit of the value of *ExtValue 3* if the value is lowered/raised by the binary inputs ExtValue3 up and ExtValue3 down. The *ExtValue 3* is never lowered below this limit. **NOTE:** This limit is not taken into account if the value *ExtValue 3* is written remotely from a terminal using the appropriate command *ExtValue #n*.

11.2.12.20 *Setpoint: ExtValue4LoLim*

Group	Force value
Range [units]	-32000 .. ExtValue4HiLim [X]
Related FW	standard v3.1.0
Description	This setpoint adjusts the low limit of the value of *ExtValue 4* if the value is lowered/raised by the binary inputs ExtValue4 up and ExtValue4 down. The *ExtValue 4* is never lowered below this limit. **NOTE:** This limit is not taken into account if the value *ExtValue 4* is written remotely from a terminal using the appropriate command *ExtValue #n*.

11.2.12.21 *Setpoint: ExtValue1HiLim*

Group	Force value
Range [units]	*ExtValue1LoLim* .. 32000 [X]
Related FW	standard v3.1.0
Description	This setpoint adjusts the high limit of the value of *ExtValue 1* if the value is lowered/raised by the binary inputs *ExtValue1 up* and *ExtValue1 down*. The *ExtValue 1* is never raised over this limit. **NOTE:** This limit is not taken into account if the value *ExtValue 1* is written remotely from a terminal using the appropriate command *ExtValue #n*.

11.2.12.22 *Setpoint: ExtValue2HiLim*

Group	Force value
Range [units]	*ExtValue2LoLim* .. 32000 [X]
Related FW	standard v3.1.0
Description	This setpoint adjusts the high limit of the value of *ExtValue 2* if the value is lowered/raised by the binary inputs *ExtValue2 up* and *ExtValue2 down*. The *ExtValue 2* is never raised over this limit. **NOTE:** This limit is not taken into account if the value *ExtValue 2* is written remotely from a terminal using the appropriate command *ExtValue #n*.

11.2.12.23 *Setpoint: ExtValue3HiLim*

Group	Force value
Range [units]	*ExtValue3LoLim* .. 32000 [X]
Related FW	standard v3.1.0
Description	This setpoint adjusts the high limit of the value of *ExtValue 3* if the value is lowered/raised by the binary inputs *ExtValue3 up* and *ExtValue3 down*. The *ExtValue 3* is never raised over this limit. **NOTE:** This limit is not taken into account if the value *ExtValue 3* is written remotely from a terminal using the appropriate command *ExtValue #n*.

11.2.12.24 *Setpoint: ExtValue4HiLim*

Group	Force value
Range [units]	*ExtValue4LoLim* .. 32000 [X]
Related FW	standard v3.1.0
Description	This setpoint adjusts the high limit of the value of *ExtValue 4* if the value is lowered/raised by the binary inputs *ExtValue4 up* and *ExtValue4 down*. The *ExtValue 4* is never raised over this limit. **NOTE:** This limit is not taken into account if the value *ExtValue 4* is written remotely from a terminal using the appropriate command *ExtValue #n*.

11.2.12.25 *Setpoint: ExtValue1 rate*

Group	Force value
Range [units]	1 .. 10000 [X/s]
Related FW	standard v3.1.0
Force value possible	YES
Description	This setpoint adjusts the rate pre second at which the *ExtValue 1* is beeing changed while the input *ExtValue1 up* or *ExtValue1 down* is active.

11.2.12.26 *Setpoint: ExtValue2 rate*

Group	Force value
Range [units]	1 .. 10000 [X/s]
Related FW	standard v3.1.0
Force value possible	YES
Description	This setpoint adjusts the rate pre second at which the *ExtValue 2* is beeing changed while the input *ExtValue2 up* or *ExtValue2 down* is active.

11.2.12.27 *Setpoint: ExtValue3 rate*

Group	Force value

Range [units]	1 .. 10000 [X/s]
Related FW	standard v3.1.0
Force value possible	YES
Description	This setpoint adjusts the rate pre second at which the *ExtValue 3* is beeing changed while the input *ExtValue3 up* or *ExtValue3 down* is active.

11.2.12.28 *Setpoint: ExtValue4 rate*

Group	Force value
Range [units]	1 .. 10000 [X/s]
Related FW	standard v3.1.0
Force value possible	YES
Description	This setpoint adjusts the rate pre second at which the *ExtValue 4* is beeing changed while the input *ExtValue4 up* or *ExtValue4 down* is active.

11.2.12.29 *Setpoint: ExtValue1deflt*

Group	Force value
Range [units]	-32000 .. 32000 [x]
Related FW	standard v3.1.0
Force value possible	YES
Description	This setpoint adjusts the reset (initial) value of the *ExtValue 1*. This initial value is applied either when the controller is powered-on or when the *ExtValue 1* is reset by the binary input *ExtValue1reset*.

11.2.12.30 *Setpoint: ExtValue2deflt*

Group	Force value
Range [units]	-32000 .. 32000 [x]
Related FW	standard v3.1.0
Force value	YES

possible	
Description	This setpoint adjusts the reset (initial) value of the *ExtValue 2*. This initial value is applied either when the controller is powered-on or when the *ExtValue 2* is reset by the binary input *ExtValue2reset*.

11.2.12.31 *Setpoint: ExtValue3deflt*

Group	Force value
Range [units]	-32000 .. 32000 [x]
Related FW	standard v3.1.0
Force value possible	YES
Description	This setpoint adjusts the reset (initial) value of the *ExtValue 3*. This initial value is applied either when the controller is powered-on or when the *ExtValue 3* is reset by the binary input *ExtValue3reset*.

11.2.12.32 *Setpoint: ExtValue4deflt*

Group	Force value
Range [units]	-32000 .. 32000 [x]
Related FW	standard v3.1.0
Force value possible	YES
Description	This setpoint adjusts the reset (initial) value of the *ExtValue 4*. This initial value is applied either when the controller is powered-on or when the *ExtValue 4* is reset by the binary input *ExtValue4reset*.

11.2.13 Group: Load shedding

11.2.13.1 *Setpoint: Ld shed active*

Group	Load shedding
Range [units]	DISABLED, ISLAND ONLY, ISL+TRIP PARAL, ALL THE TIME [-]
Related FW	standard v3.1.0
Force value	YES

<table>
<tr><td>possible</td><td></td></tr>
<tr><td>Description</td><td>The setpoint is used for adjustment when the load shedding function will be active.
<table>
<tr><td>DISABLED</td><td>The Load shedding function is disabled. All the outputs are open.</td></tr>
<tr><td>ISLAND ONLY</td><td>In Island operation (i.e. MCB is open and MGCB is closed) Load shedding outputs (e.g. <i>LdShed stage 1</i>) are controlled by load shedding function.</td></tr>
<tr><td>ISL+TRIP PARAL</td><td>This setting adjusts the same behavior as ISLAND ONLY but in addition to it all load shedding outputs are closed when gen-set group goes to island operation. For more information see the chapter Load shedding.</td></tr>
<tr><td>ALL THE TIME</td><td>Outputs are controlled by the load shedding function regardless of breaker positions.</td></tr>
</table>
NOTE:
Learn more about load shedding in the separate chapter Load shedding.</td></tr>
</table>

11.2.13.2 *Setpoint: LdShedBased on*

<table>
<tr><td>Group</td><td>Load shedding</td></tr>
<tr><td>Range [units]</td><td>MAINS IMPORT, GENSETS [-]</td></tr>
<tr><td>Related FW</td><td>standard v3.1.0</td></tr>
<tr><td>Force value possible</td><td>YES</td></tr>
<tr><td>Description</td><td>This setpoint is used to select the control quantity for the load shedding function.
<table>
<tr><td>MAINS IMPORT</td><td>The control quantity is active power imported from the mains taken relative to the nominal mains import: 100 * <i>MainsImport</i>/<i>NominMainsImp</i>.</td></tr>
<tr><td>GENSETS</td><td>The control quantity is sum of the actual power of all running gen-sets taken relative to he sum of their</td></tr>
</table></td></tr>
</table>

		nominal power: 100 * *TotRunPact*/*TotRunPnomAll*.

11.2.13.3 *Setpoint: Ld shed mode*

Group	Load shedding
Range [units]	PWR ONLY, FRQ ONLY [-]
Related FW	standard v3.1.0
Force value possible	YES
Description	This setpoint adjusts which type of load shedding is active. When PWR ONLY is selected the load shedding is based on active power. If FRQ ONLY is selected the load shedding is based on frequency. **NOTE:** Learn more about load shedding in the separate chapter Load shedding.

11.2.13.4 *Setpoint: Ld shedStages*

Group	Load shedding
Range [units]	1 .. 3 [-]
Related FW	standard v3.1.0
Force value possible	YES
Description	This setpoint adjusts the number of load shedding stages that are used in load shedding. **EXAMPLE:** If 1 load shedding stage is selected the controller will perform one load shedding stage and rest of the load shedding stages will be omitted.

11.2.13.5 *Setpoint: Ld shedLevel1*

Group	Load shedding
Range [units]	*Ld reconLevel1* .. 200 [%]
Related FW	standard v3.1.0

Force value possible	YES
Description	This setpoint is used to adjust the relative load level for load shedding stage 1 (in % of *sum of nominal power* of running gen-sets or *NominMainsImp*, depending on which *control quantity* is selected) for load shedding. When the *control quantity* exceeds this level for more than *Ld shedDelay1* time the next load shedding output is closed. **NOTE:** Learn more about load shedding in the separate chapter Load shedding.

11.2.13.6 *Setpoint: Ld shedLevel2*

Group	Load shedding
Range [units]	*Ld reconLevel2* .. 200 [%]
Related FW	standard v3.1.0
Force value possible	YES
Description	This setpoint is used to adjust the relative load level for load shedding stage 2 (in % of *sum of nominal power* of running gen-sets or *NominMainsImp*, depending on which *control quantity* is selected) for load shedding. When the *control quantity* exceeds this level for more than *Ld shedDelay2* time the next load shedding output is closed. **NOTE:** Learn more about load shedding in the separate chapter Load shedding.

11.2.13.7 *Setpoint: Ld shedLevel3*

Group	Load shedding
Range [units]	*Ld reconLevel3* .. 200 [%]
Related FW	standard v3.1.0
Force value possible	YES
Description	This setpoint is used to adjust the relative load level for load shedding stage 3 (in % of *sum of nominal power* of running gen-sets or *NominMainsImp*, depending on which *control quantity* is selected) for load shedding. When the *control quantity* exceeds this level for more than *Ld shedDelay3* time the next load shedding output is closed. **NOTE:**

	Learn more about load shedding in the separate chapter Load shedding.

11.2.13.8 *Setpoint: Ld shed f lvl1*

Group	Load shedding
Range [units]	50 .. *LdRecon f lvl1* [%]
Related FW	standard v3.1.0
Force value possible	YES
Description	This setpoint is used to adjust the relative frequency level for load shedding stage 1 (in % of nominal system frequency given by setpoints *Nominal Freq* and *Nom frq offset*). When the frequency goes below this level for more than *Ld shedDelay1* time the next load shedding output is closed. **NOTE:** Learn more about load shedding in the separate chapter Load shedding.

11.2.13.9 *Setpoint: Ld shed f lvl2*

Group	Load shedding
Range [units]	50 .. *LdRecon f lvl2* [%]
Related FW	standard v3.1.0
Force value possible	YES
Description	This setpoint is used to adjust the relative frequency level for load shedding stage 2 (in % of nominal system frequency given by setpoints *Nominal Freq* and *Nom frq offset*). When the frequency goes below this level for more than *Ld shedDelay2* time the next load shedding output is closed. **NOTE:** Learn more about load shedding in the separate chapter Load shedding.

11.2.13.10 *Setpoint: Ld shed f lvl3*

Group	Load shedding
Range [units]	50 .. *LdRecon f lvl3* [%]

Related FW	standard v3.1.0
Force value possible	YES
Description	This setpoint is used to adjust the relative frequency level for load shedding stage 3 (in % of nominal system frequency given by setpoints *Nominal Freq* and *Nom frq offset*). When the frequency goes below this level for more than *Ld shedDelay3* time the next load shedding output is closed. **NOTE:** Learn more about load shedding in the separate chapter Load shedding.

11.2.13.11 *Setpoint: Ld shedDelay1*

Group	Load shedding
Range [units]	0.0 .. 600.0 [s]
Related FW	standard v3.1.0
Force value possible	YES
Description	This setpoint is used to adjust time period for load shedding stage 1, that the *control quantity* must be above the *Ld shed level* limit to close the next load shedding output. **NOTE:** Learn more about load shedding in the separate chapter Load shedding.

11.2.13.12 *Setpoint: Ld shedDelay2*

Group	Load shedding
Range [units]	0.0 .. 600.0 [s]
Related FW	standard v3.1.0
Force value possible	YES
Description	This setpoint is used to adjust time period for the load shedding stage 2, that the *control quantity* must be above the *Ld shedLevel2* limit to close the next load shedding output. **NOTE:** Learn more about load shedding in the separate chapter Load shedding.

11.2.13.13 *Setpoint: Ld shedDelay3*

Group	Load shedding
Range [units]	0.0 .. 600.0 [s]
Related FW	standard v3.1.0
Force value possible	YES
Description	This setpoint is used to adjust time period for the load shedding stage 3, that the *control quantity* must be above the *Ld shedLevel3* limit to close the next load shedding output. **NOTE:** Learn more about load shedding in the separate chapter Load shedding.

11.2.13.14 *Setpoint: Ld reconLevel1*

Group	Load shedding
Range [units]	0 .. *Ld shedLevel1* [%]
Related FW	standard v3.1.0
Force value possible	YES
Description	This setpoint is used to adjust the relative load level for load shedding stage 1 (in % of *sum of nominal power* of running gen-sets or *NominMainsImp*, depending on which *control quantity* is selected) for load reconnection. When the *control quantity* drops below this level for more than *Ld reconDelay1* time the next load can be reconnected back. The appropriate load shedding output is either opened automatically when the condition above is fulfiled (*AutoLd recon* = ENABLED) or manually by activation of the input *ManualLdRecon*. **NOTE:** Learn more about load shedding in the separate chapter Load shedding.

11.2.13.15 *Setpoint: Ld reconLevel2*

Group	Load shedding
Range [units]	0 .. *Ld shedLevel2* [%]

Related FW	standard v3.1.0
Force value possible	YES
Description	This setpoint is used to adjust the relative load level for load shedding stage 2 (in % of *sum of nominal power* of running gen-sets or *NominMainsImp*, depending on which *control quantity* is selected) for load reconnection. When the *control quantity* drops below this level for more than *Ld reconDelay2* time the next load can be reconnected back. The appropriate load shedding output is either opened automatically when the condition above is fulfiled (*AutoLd recon* = ENABLED) or manually by activation of the input *ManualLdRecon*. **NOTE:** Learn more about load shedding in the separate chapter Load shedding.

11.2.13.16 *Setpoint: Ld reconLevel3*

Group	Load shedding
Range [units]	0 .. *Ld shedLevel3* [%]
Related FW	standard v3.1.0
Force value possible	YES
Description	This setpoint is used to adjust the relative load level for load shedding stage 3 (in % of *sum of nominal power* of running gen-sets or *NominMainsImp*, depending on which *control quantity* is selected) for load reconnection. When the *control quantity* drops below this level for more than *Ld reconDelay3* time the next load can be reconnected back. The appropriate load shedding output is either opened automatically when the condition above is fulfiled (*AutoLd recon* = ENABLED) or manually by activation of the input *ManualLdRecon*. **NOTE:** Learn more about load shedding in the separate chapter Load shedding.

11.2.13.17 *Setpoint: LdRecon f lvl1*

Group	Load shedding
Range [units]	*Ld shed f lvl1* .. 200 [%]
Related FW	standard v3.1.0

Force value possible	YES
Description	This setpoint is used to adjust the relative frequency level for load shedding stage 1 (in % of nominal system frequency given by setpoints *Nominal Freq* and *Nom frq offset*). When the frequency exceeds this level for more than *Ld reconDelay1* time the next load shedding output is opened. **NOTE:** Learn more about load shedding in the separate chapter Load shedding.

11.2.13.18 *Setpoint: LdRecon f lvl2*

Group	Load shedding
Range [units]	*Ld shed f lvl2* .. 200 [%]
Related FW	standard v3.1.0
Force value possible	YES
Description	This setpoint is used to adjust the relative frequency level for load shedding stage 2 (in % of nominal system frequency given by setpoints *Nominal Freq* and *Nom frq offset*). When the frequency exceeds this level for more than *Ld reconDelay2* time the next load shedding output is opened. **NOTE:** Learn more about load shedding in the separate chapter Load shedding.

11.2.13.19 *Setpoint: LdRecon f lvl3*

Group	Load shedding
Range [units]	*Ld shed f lvl3* .. 200 [%]
Related FW	standard v3.1.0
Force value possible	YES
Description	This setpoint is used to adjust the relative frequency level for load shedding stage 3 (in % of nominal system frequency given by setpoints *Nominal Freq* and *Nom frq offset*). When the frequency exceeds this level for more than *Ld reconDelay3* time the next load shedding output is opened. **NOTE:** Learn more about load shedding in the separate chapter Load shedding.

11.2.13.20 *Setpoint: Ld reconDelay1*

Group	Load shedding
Range [units]	0 .. 600 [s]
Related FW	standard v3.1.0
Force value possible	YES
Description	This setpoint is used to adjust time period for load shedding stage1, that the *control quantity* must be below the *Ld reconLevel1* limit to allow reconnection of next load group. **NOTE:** Learn more about load shedding in the separate chapter Load shedding.

11.2.13.21 *Setpoint: Ld reconDelay2*

Group	Load shedding
Range [units]	0 .. 600 [s]
Related FW	standard v3.1.0
Force value possible	YES
Description	This setpoint is used to adjust time period for the load shedding stage 2, that the *control quantity* must be below the *Ld reconLevel2* limit to allow reconnection of next load group. **NOTE:** Learn more about load shedding in the separate chapter Load shedding.

11.2.13.22 *Setpoint: Ld reconDelay3*

Group	Load shedding
Range [units]	0 .. 600 [s]
Related FW	standard v3.1.0
Force value possible	YES

Description	This setpoint is used to adjust time period for the load shedding stage 3, that the *control quantity* must be below the *Ld reconLevel3* limit to allow reconnection of next load group. **NOTE:** Learn more about load shedding in the separate chapter Load shedding.

11.2.13.23 *Setpoint: AutoLd recon*

Group	Engine Protect
Range [units]	DISABLED, ENABLED [-]
Related FW	standard v3.1.0
Force value possible	YES
Description	This setpoint selects whether the reconnection of the load occurs automatically when the *control quantity* stays below the *reconnection limit* for a period of the *reconnection delay* or the reconnection must be initiated manually by the input *ManualLdRecon*. **NOTE:** Learn more about load shedding in the separate chapter Load shedding.

11.2.14 Group: Timer settings

11.2.14.1 *Setpoint: Timer channel 1*

Group	Timer settings
Range [units]	[-]
Related FW	standard v3.1.0
Description	This setpoint adjusts the mode of the *Timer channel #1*. Output from this channel is available in the combined output *TimerAct 1-4*. **NOTE:** See the chapter Timers for more details about timers.

11.2.14.2 *Setpoint: Timer channel 2*

Group	Timer settings

Range [units]	[-]
Related FW	standard v3.1.0
Description	This setpoint adjusts the mode of the *Timer channel #2*. Output from this channel is available in the combined output *TimerAct 1-4*. **NOTE:** See the chapter Timers for more details about timers.

11.2.14.3 *Setpoint: Timer channel 3*

Group	Timer settings
Range [units]	[-]
Related FW	standard v3.1.0
Description	This setpoint adjusts the mode of the *Timer channel #3*. Output from this channel is available in the combined output *TimerAct 1-4*. **NOTE:** See the chapter Timers for more details about timers.

11.2.14.4 *Setpoint: Timer channel 4*

Group	Timer settings
Range [units]	[-]
Related FW	standard v3.1.0
Description	This setpoint adjusts the mode of the *Timer channel #4*. Output from this channel is available in the combined output *TimerAct 1-4*. **NOTE:** See the chapter Timers for more details about timers.

11.2.14.5 *Setpoint: Timer channel 5*

Group	Timer settings
Range [units]	[-]
Related FW	standard v3.1.0

Description	This setpoint adjusts the mode of the *Timer channel #5*. Output from this channel is available in the combined output *TimerAct 5-8*. **NOTE:** See the chapter Timers for more details about timers.

11.2.14.6 *Setpoint: Timer channel 6*

Group	Timer settings
Range [units]	[-]
Related FW	standard v3.1.0
Description	This setpoint adjusts the mode of the *Timer channel #6*. Output from this channel is available in the combined output *TimerAct 5-8*. **NOTE:** See the chapter Timers for more details about timers.

11.2.14.7 *Setpoint: Timer channel 7*

Group	Timer settings
Range [units]	[-]
Related FW	standard v3.1.0
Description	This setpoint adjusts the mode of the *Timer channel #7*. Output from this channel is available in the combined output *TimerAct 5-8*. **NOTE:** See the chapter Timers for more details about timers.

11.2.14.8 *Setpoint: Timer channel 8*

Group	Timer settings
Range [units]	[-]
Related FW	standard v3.1.0
Description	This setpoint adjusts the mode of the *Timer channel #8*. Output from this channel is available in the combined output *TimerAct 5-8*. **NOTE:**

	See the chapter Timers for more details about timers.

11.2.14.9 *Setpoint: Timer channel 9*

Group	Timer settings
Range [units]	[-]
Related FW	standard v3.1.0
Description	This setpoint adjusts the mode of the *Timer channel #9*. Output from this channel is available in the combined output *TimerAct 9-12*. **NOTE:** See the chapter Timers for more details about timers.

11.2.14.10 *Setpoint: Timer channel 10*

Group	Timer settings
Range [units]	[-]
Related FW	standard v3.1.0
Description	This setpoint adjusts the mode of the *Timer channel #10*. Output from this channel is available in the combined output *TimerAct 9-12*. **NOTE:** See the chapter Timers for more details about timers.

11.2.14.11 *Setpoint: Timer channel 11*

Group	Timer settings
Range [units]	[-]
Related FW	standard v3.1.0
Description	This setpoint adjusts the mode of the *Timer channel #11*. Output from this channel is available in the combined output *TimerAct 9-12*. **NOTE:** See the chapter Timers for more details about timers.

11.2.14.12 *Setpoint: Timer channel 12*

Group	Timer settings
Range [units]	[-]
Related FW	standard v3.1.0
Description	This setpoint adjusts the mode of the *Timer channel #12*. Output from this channel is available in the combined output *TimerAct 9-12*. **NOTE:** See the chapter Timers for more details about timers.

11.2.14.13 *Setpoint: Timer channel 13*

Group	Timer settings
Range [units]	[-]
Related FW	standard v3.1.0
Description	This setpoint adjusts the mode of the *Timer channel #13*. Output from this channel is available in the combined output *TimerAct 13-16*. **NOTE:** See the chapter Timers for more details about timers.

11.2.14.14 *Setpoint: Timer channel 14*

Group	Timer settings
Range [units]	[-]
Related FW	standard v3.1.0
Description	This setpoint adjusts the mode of the *Timer channel #14*. Output from this channel is available in the combined output *TimerAct 13-16*. **NOTE:** See the chapter Timers for more details about timers.

11.2.14.15 *Setpoint: Timer channel 15*

Group	Timer settings

Range [units]	[-]
Related FW	standard v3.1.0
Description	This setpoint adjusts the mode of the *Timer channel #15*. Output from this channel is available in the combined output *TimerAct 13-16*. **NOTE:** See the chapter Timers for more details about timers.

11.2.14.16 *Setpoint: Timer channel 16*

Group	Timer settings
Range [units]	[-]
Related FW	standard v3.1.0
Description	This setpoint adjusts the mode of the *Timer channel #16*. Output from this channel is available in the combined output *TimerAct 13-16*. **NOTE:** See the chapter Timers for more details about timers.

11.2.15 Group: Act. calls/SMS

11.2.15.1 *Setpoint: History record*

Group	Act. calls/SMS
Range [units]	DISABLED, ENABLED [-]
Related FW	standard v3.1.0
Force value possible	YES
Description	This setpoint is used to enable sending SMS and/or e-mail alerts when a "protection" configured as *History record* occurs. See the chapter Alarm management for more information about protection types. **NOTE:** As the *History record* protection does not appear in the alarmlist, the SMS or e-mail may contain empty alarmlist.

11.2.15.2 *Setpoint: Alarm only*

Group	Act. calls/SMS
Range [units]	DISABLED, ENABLED [-]
Related FW	standard v3.1.0
Force value possible	YES
Description	This setpoint is used to enable sending SMS and/or e-mail alerts when a "protection" configured as *Alarm only* occurs. See the chapter Alarm management for more information about protection types.

11.2.15.3 *Setpoint: Warning*

Group	Act. calls/SMS
Range [units]	DISABLED, ENABLED [-]
Related FW	standard v3.1.0
Force value possible	YES
Force value possible	YES
Description	This setpoint is used to enable sending SMS and/or e-mail alerts when a *warning*-type protection occurs. See the chapter Alarm management for more information about protection types.

11.2.15.4 *Setpoint: Mains protect*

Group	Act. calls/SMS
Range [units]	DISABLED, ENABLED [-]
Related FW	standard v3.1.0
Force value possible	YES
Description	This setpoint is used to enable sending SMS and/or e-mail alerts when a "protection" configured as *Mains protect* occurs. See the chapter Alarm management for more information about protection types. **NOTE:** As the *Mains protect* protection does not appear in the alarmlist, the SMS or e-mail may contain empty alarmlist.

11.2.15.5 *Setpoint: MainsP w/Reset*

Group	Act. calls/SMS
Range [units]	DISABLED, ENABLED [-]
Related FW	standard v3.1.0
Force value possible	YES
Description	This setpoint is used to enable sending SMS and/or e-mail alerts when a *MainsP w/Reset*-type alarm occurs. See the chapter Alarm management for more information about protection types.

11.2.15.6 *Setpoint: AcallCH1-Type*

Group	Act. calls/SMS
Range [units]	[-]
Related FW	standard v3.1.0
Force value possible	YES
Description	The setpoint is used to specify the alert type of the active calls - channel 1. See the chapter Alarm messaging for more details.

11.2.15.7 *Setpoint: AcallCH1-Addr*

Group	Act. calls/SMS
Range [units]	[-]
Related FW	standard v3.1.0
Description	The setpoint is used to specify the recipient address for the active calls - channel 1. The content of the address must correspond to the selected alert type (e.g. it must contain e-mail address if the alert type is e-mail). See the chapter Alarm messaging for more details.

11.2.15.8 *Setpoint: AcallCH2-Type*

Group	Act. calls/SMS
Range [units]	[-]
Related FW	standard v3.1.0
Force value possible	YES
Description	The setpoint is used to specify the alert type of the active calls - channel 2. See the chapter Alarm messaging for more details.

11.2.15.9 *Setpoint: AcallCH2-Addr*

Group	Act. calls/SMS
Range [units]	[-]
Related FW	standard v3.1.0
Description	The setpoint is used to specify the recipient address for the active calls - channel 2. The content of the address must correspond to the selected alert type (e.g. it must contain e-mail address if the alert type is e-mail). See the chapter Alarm messaging for more details.

11.2.15.10 *Setpoint: AcallCH3-Type*

Group	Act. calls/SMS
Range [units]	[-]
Related FW	standard v3.1.0
Force value possible	YES
Description	The setpoint is used to specify the alert type of the active calls - channel 3. See the chapter Alarm messaging for more details.

11.2.15.11 *Setpoint: AcallCH3-Addr*

Group	Act. calls/SMS
Range [units]	[-]
Related FW	standard v3.1.0

Description	The setpoint is used to specify the recipient address for the active calls - channel 2. The content of the address must correspond to the selected alert type (e.g. it must contain e-mail address if the alert type is e-mail). See the chapter Alarm messaging for more details.

11.2.15.12 *Setpoint: AcallCH4-Type*

Group	Act. calls/SMS
Range [units]	[-]
Related FW	standard v3.1.0
Force value possible	YES
Description	The setpoint is used to specify the alert type of the active calls - channel 4. See the chapter Alarm messaging for more details.

11.2.15.13 *Setpoint: AcallCH4-Addr*

Group	Act. calls/SMS
Range [units]	[-]
Related FW	standard v3.1.0
Description	The setpoint is used to specify the recipient address for the active calls - channel 4. The content of the address must correspond to the selected alert type (e.g. it must contain e-mail address if the alert type is e-mail). See the chapter Alarm messaging for more details.

11.2.15.14 *Setpoint: AcallCH5-Type*

Group	Act. calls/SMS
Range [units]	[-]
Related FW	standard v3.1.0
Force value possible	YES
Description	The setpoint is used to specify the alert type of the active calls - channel 5. See the chapter Alarm messaging for more details.

11.2.15.15 *Setpoint: AcallCH5-Addr*

Group	Act. calls/SMS
Range [units]	[-]
Related FW	standard v3.1.0
Description	The setpoint is used to specify the recipient address for the active calls - channel 5. The content of the address must correspond to the selected alert type (e.g. it must contain e-mail address if the alert type is e-mail). See the chapter Alarm messaging for more details.

11.2.15.16 *Setpoint: NumberRings AA*

Group	Act. calls/SMS
Range [units]	1 .. 30 [-]
Related FW	standard v3.1.0
Description	This setpoint is used to adjust the number of rings after which the modem, which is attached to he controller, answers the incoming call. Number of rings prior to answering the modem connection from PC to controller. **NOTE:** Any change of this setpoint is applied first after next switching the controller or modem off and on or after disconnecting the modem from the controller and connecting it back.

11.2.15.17 *Setpoint: ActCallAttempt*

Group	Act. calls/SMS
Range [units]	1 .. 250 [-]
Related FW	standard v3.1.0
Description	This setpoint is used to adjust the maximum number of consequent attempts to perform an active data call. The next attempt is performed 120s after the previous unsuccessful attempt.

11.2.15.18 *Setpoint: Acall+SMS lang*

Group	Act. calls/SMS

Range [units]	1 .. 7 [-]
Related FW	standard v3.1.0
Description	The setpoint specifies in which language the active SMS and e-mail messages are issued. Adjust the setpoint to the index of the required language. The index can be obtained from the tab Languages in GenConfig. Index 1 is always english.

11.2.16 Group: Date/Time

11.2.16.1 *Setpoint: Time stamp act*

Group	Date/Time
Range [units]	DISABLED, CONDITION, ALWAYS [-]
Related FW	standard v3.1.0
Description	The setpoint selects the *Time stamp* function mode. **DISABLED**: The function is disabled. **CONDITION**: While the binary input *Time stamp act* is active the *Time stamps* records are recorded into the history log with period adjusted by setpoint *Time Stamp Per*. **ALWAYS**: The *Time stamps* records are recorded into the history log with period adjusted by setpoint *Time Stamp Per* all the time while the controler is switched on.

11.2.16.2 *Setpoint: Time Stamp Per*

Group	Date/Time
Range [units]	1 .. 240 [min]
Related FW	standard v3.1.0
Description	The setpoint adjusts the time interval for *Time stamp* records. See also the setpoint *Time stamp act*.

11.2.16.3 *Setpoint: #SummerTimeMod*

Group	Date/Time
Range [units]	DISABLED, WINTER, SUMMER, WINTER-S, SUMMER-S [-]
Related FW	standard v3.1.0
Description	The setpoint is used to select the mode of automatic daylight saving time change.

DISABLED	The automatic change to daylight saving time and back is disabled.
WINTER	The automatic change is enabled, the current season is winter and the controller is located in the northern hemisphere.
SUMMER	The automatic change is enabled, the current season is summer and the controller is located in the northern hemisphere.
WINTER-S	The automatic change is enabled, the current season is winter and the controller is located in the southern hemisphere.
SUMMER-S	The automatic change is enabled, the current season is summer and the controller is located in the southern hemisphere.

NOTE:

sign in the name of this setpoint marks that this setpoint is shared among all controllers connected by CAN2 bus.

11.2.16.4 *Setpoint: #Time*

Group	Date/Time
Range [units]	[HH:MM:SS]
Related FW	standard v3.1.0
Description	The setpoint shows the current time from the internal RTC clock of the controller and can be also used to readjust it. **NOTE:** If the controller is connected to other controllers via the CAN2 bus, the

	setpoints #Time and #Date are automatically synchronized each hour with the controller that has lowest address. If date/time is changed at one controller it is automatically updated also in all other controllers in the group. **NOTE:** # sign in the name of this setpoint marks that this setpoint is shared among all controllers connected by CAN2 bus.

11.2.16.5 *Setpoint: #Date*

Group	Date/Time
Range [units]	[dd.mm.yyyy]
Related FW	standard v3.1.0
Description	The setpoint shows the date from the internal RTC clock of the controller and can be also used to readjust it. **NOTE:** If the controller is connected to other controllers via the CAN2 bus, the setpoints #Time and #Date are automatically synchronized each hour with the controller that has lowest address. If date/time is changed at one controller it is automatically updated also in all other controllers in the group. **NOTE:** # sign in the name of this setpoint marks that this setpoint is shared among all controllers connected by CAN2 bus.

12 Values

12.1 Table of values

12.1.1 Group: Mains values

12.1.1.1 Value: MainsImport

Group	Mains
Units	kW
Related FW	standard v3.1.0
Description	This value shows actual power imported from mains. This value is used for various purposes (e.g. peak shaving detremination etc.).

12.1.1.2 Value: MP L1

Group	Mains values
Units	kW
Related FW	standard v3.1.0
Description	Mains active power in phase L1.

12.1.1.3 Value: MP L2

Group	Mains values
Units	kW
Related FW	standard v3.1.0
Description	Mains active power in phase L2.

12.1.1.4 Value: MP L3

Group	Mains values
Units	kW
Related FW	standard v3.1.0

Description	Mains active power in phase L3.

12.1.1.5 *Value: Mains Q*

Group	Mains values
Units	kVAr
Related FW	standard v3.1.0
Description	Mains total reactive power.

12.1.1.6 *Value: MQ L1*

Group	Mains values
Units	kVAr
Related FW	standard v3.1.0
Description	Mains reactive power in phase L1.

12.1.1.7 *Value: MQ L2*

Group	Mains values
Units	kVAr
Related FW	standard v3.1.0
Description	Mains reactive power in phase L2.

12.1.1.8 *Value: MQ L3*

Group	Mains values
Units	kVAr
Related FW	standard v3.1.0
Description	Mains reactive power in phase L3.

12.1.1.9 *Value: Mains A*

Group	Mains values

Units	kVA
Related FW	standard v3.1.0
Description	Mains total apparent power.

12.1.1.10 *Value: MA L1*

Group	Mains values
Units	kVA
Related FW	standard v3.1.0
Description	Mains apparent power in phase L1.

12.1.1.11 *Value: MA L2*

Group	Mains values
Units	kVA
Related FW	standard v3.1.0
Description	Mains apparent power in phase L2.

12.1.1.12 *Value: MA L3*

Group	Mains values
Units	kVA
Related FW	standard v3.1.0
Description	Mains apparent power in phase L3.

12.1.1.13 *Value: Mains PF*

Group	Mains values
Units	-
Related FW	standard v3.1.0
Description	Mains cos-phi factor. **NOTE:**

	The "cos-phi" factor is widely used instead of power factor for pure harmonic waveforms, because a simplified method can be used for calculation of it's value. However, if this simplified method is used for significantly distorted waveforms, it may provide inaccurate results. This fact causes the controller "power factor" value may be different from a value measured by another true-rms measurement device if the waveform contains significant portion of higher harmonic frequencies.

12.1.1.14 *Value: Load Ld char*

Group	Mains values
Units	-
Related FW	standard v3.1.0
Description	Character of the Mains load. "L" means inductive load, "C" is capacitive and "R" is resistive load (power factor = 1).

12.1.1.15 *Value: MPf L1*

Group	Mains values
Units	-
Related FW	standard v3.1.0
Description	Mains power factor in phase L1.

12.1.1.16 *Value: M Ld char L1*

Group	Mains values
Units	-
Related FW	standard v3.1.0
Description	Character of the Mains load in the L1 phase. "L" means inductive load, "C" is capacitive and "R" is resistive load (power factor = 1).

12.1.1.17 *Value: MPf L2*

Group	Mains values
Units	-
Related FW	standard v3.1.0

Description	Mains power factor in phase L2.

12.1.1.18 *Value: M Ld char L2*

Group	Mains values
Units	-
Related FW	standard v3.1.0
Description	Character of the Mains load in the L2 phase. "L" means inductive load, "C" is capacitive and "R" is resistive load (power factor = 1).

12.1.1.19 *Value: MPf L3*

Group	Mains values
Units	-
Related FW	standard v3.1.0
Description	Mains power factor in phase L3.

12.1.1.20 *Value: M Ld char L3*

Group	Mains values
Units	-
Related FW	standard v3.1.0
Description	Character of the Mains load in the L3 phase. "L" means inductive load, "C" is capacitive and "R" is resistive load (power factor = 1).

12.1.1.21 *Value: Mains freq*

Group	Mains values
Units	Hz
Related FW	standard v3.1.0
Description	Mains frequency. The frequency is measured in the phase L3.

12.1.1.22 *Value: Mains V L1-N*

Group	Mains values
Units	V
Related FW	standard v3.1.0
Description	Mains voltage in phase L1. **NOTE:** The ratio between the voltage measured at the input terminals and the displayed voltage is adjusted by the setpoint *Vm VT ratio*.

12.1.1.23 *Value: Mains V L2-N*

Group	Mains values
Units	V
Related FW	standard v3.1.0
Description	Mains voltage in phase L2. **NOTE:** The ratio between the voltage measured at the input terminals and the displayed voltage is adjusted by the setpoint *Vm VT ratio*.

12.1.1.24 *Value: Mains V L3-N*

Group	Mains values
Units	V
Related FW	standard v3.1.0
Description	Mains voltage in phase L3. **NOTE:** The ratio between the voltage measured at the input terminals and the displayed voltage is adjusted by the setpoint *Vm VT ratio*.

12.1.1.25 *Value: Mains V*

Group	Mains values
Units	V
Related FW	standard v3.1.0
Description	Mains voltage. Average from all three phases. **NOTE:** The ratio between the voltage measured at the input terminals and the displayed voltage is adjusted by the setpoint *Vm VT ratio*.

12.1.1.26 *Value: Mains V L1-L2*

Group	Mains values
Units	V
Related FW	standard v3.1.0
Description	Mains voltage between phase L1 and phase L2. **NOTE:** The ratio between the voltage measured at the input terminals and the displayed voltage is adjusted by the setpoint *Vm VT ratio*.

12.1.1.27 *Value: Mains V L2-L3*

Group	Mains values
Units	V
Related FW	standard v3.1.0
Description	Mains voltage between phase L2 and phase L3. **NOTE:** The ratio between the voltage measured at the input terminals and the displayed voltage is adjusted by the setpoint *Vm VT ratio*.

12.1.1.28 *Value: Mains V L3-L1*

Group	Mains values
Units	V
Related FW	standard v3.1.0
Description	Mains voltage between phase L3 and phase L1. **NOTE:** The ratio between the voltage measured at the input terminals and the displayed voltage is adjusted by the setpoint *Vm VT ratio*.

12.1.1.29 *Value: Mains curr L1*

Group	Mains values
Units	A
Related FW	standard v3.1.0
Description	Mains current in phase L1. **NOTE:** The ratio between the current measured at the input terminals and the displayed current is adjusted by the setpoints *MainsCTprim* and *MainsCTsec*.

12.1.1.30 *Value: Mains curr L2*

Group	Mains values
Units	A
Related FW	standard v3.1.0
Description	Mains current in phase L2. **NOTE:** The ratio between the current measured at the input terminals and the displayed current is adjusted by the setpoints *MainsCTprim* and *MainsCTsec*.

12.1.1.31 *Value: Mains curr L3*

Group	Mains values
Units	A
Related FW	standard v3.1.0
Description	Mains current in phase L3. **NOTE:** The ratio between the current measured at the input terminals and the displayed current is adjusted by the setpoints *MainsCTprim* and *MainsCTsec*.

12.1.1.32 *Value: Mains V unbal*

Group	Mains values
Units	%
Related FW	standard v3.1.0
Description	Mains voltage unbalance. The value is calculated as maximal difference of two phase voltages at one moment and expressed in % of the nominal voltage. **NOTE:** This value can be used for creating the Mains voltage unbalance protection using the "universal analog protections".

12.1.1.33 *Value: Mains I unbal*

Group	Mains values
Units	V
Related FW	standard v3.1.0
Description	Mains current unbalance. The value is calculated as maximal difference of two phase currents at one moment and expressed in % of the nominal current. **NOTE:** This value can be used for creating the Mains current unbalance protection using the "universal analog protections".

12.1.1.34 *Value: Mains V [kV]*

Group	Mains values
Units	kV
Related FW	standard v3.1.0
Description	This value shows measured mains voltage in kV.

12.1.1.35 *Value: Mains Avg V1*

Group	Mains values
Units	V
Related FW	standard v3.1.0
Description	Measured average mains voltage in L1. *Mains average overvoltage* is determined from this value. See setpoint *Mains Avg>V MP* for more information.

12.1.1.36 *Value: Mains Avg V2*

Group	Mains values
Units	V
Related FW	standard v3.1.0
Description	Measured average mains voltage in L2. *Mains average overvoltage* is determined from this value. See setpoint *Mains Avg>V MP* for more information.

12.1.1.37 *Value: Mains Avg V3*

Group	Mains values
Units	V
Related FW	standard v3.1.0
Description	Measured average mains voltage in L3. *Mains average overvoltage* is determined from this value. See setpoint *Mains Avg>V MP* for more information.

12.1.2 Group: Bus values

12.1.2.1 *Value: Bus freq*

Group	Bus values
Units	Hz
Related FW	standard v3.1.0
Description	Bus frequency. The frequency is measured in the phase L3.

12.1.2.2 *Value: Bus V L1-N*

Group	Bus values
Units	V
Related FW	standard v3.1.0
Description	Bus voltage in phase L1. **NOTE:** The ratio between the voltage measured at the input terminals and the displayed voltage is adjusted by the setpoint *Bus VT ratio*.

12.1.2.3 *Value: Bus V L2-N*

Group	Bus values
Units	V
Related FW	standard v3.1.0
Description	Bus voltage in phase L2. **NOTE:** The ratio between the voltage measured at the input terminals and the displayed voltage is adjusted by the setpoint *Bus VT ratio*.

12.1.2.4 *Value: Bus V L3-N*

Group	Bus values
Units	V

Related FW	standard v3.1.0
Description	Bus voltage in phase L3. **NOTE:** The ratio between the voltage measured at the input terminals and the displayed voltage is adjusted by the setpoint *Bus VT ratio*.

12.1.2.5 *Value: Bus V*

Group	Bus values
Units	V
Related FW	standard v3.1.0
Description	Bus voltage. Average from all three phases. **NOTE:** The ratio between the voltage measured at the input terminals and the displayed voltage is adjusted by the setpoint *Bus VT ratio*.

12.1.2.6 *Value: Bus V L1-L2*

Group	Bus values
Units	V
Related FW	standard v3.1.0
Description	Bus voltage phase L1 to L2.

12.1.2.7 *Value: Bus V L2-L3*

Group	Bus values
Units	V
Related FW	standard v3.1.0
Description	Bus voltage phase L2 to L3.

12.1.2.8 *Value: Bus V L3-L1*

Group	Bus values
Units	V
Related FW	standard v3.1.0
Description	Bus voltage phase L3 to L1.

12.1.2.9 *Value: Bus V unbal*

Group	Bus values
Units	V
Related FW	standard v3.1.0
Description	Bus voltage unbalance. The value is calculated as maximal difference of two phase voltages at one moment and expressed in % of the bus nominal voltage.

12.1.2.10 *Value: I Aux*

Group	Bus values
Units	A
Related FW	standard v3.1.0
Description	This value shows actual current measured at auxiliar terminals.

12.1.2.11 *Value: Slip freq*

Group	Bus values
Units	Hz
Related FW	standard v3.1.0
Description	Differential frequency between the bus and the mains.

12.1.2.12 *Value: Angle*

Group	Bus values
Units	°

Related FW	standard v3.1.0
Description	The angle between the phasors of the bus and mains voltage.

12.1.2.13 *Value: Bus V [kV]*

Group	Bus values
Units	kV
Related FW	standard v3.1.0
Description	This value shows measured bus voltage in kV.

12.1.3 Group: Object values

12.1.3.1 *Value: Object P*

Group	Object
Units	kW
Related FW	standard v3.1.0
Description	This is actual active power consumption of the load. This value together with value *Object Q* is used for calculation of *Object PF*.

12.1.3.2 *Value: Object Q*

Group	Object
Units	kVAr
Related FW	standard v3.1.0
Description	This is actual reactive power consumption of the load. This value together with value *Object P* is used for calculation of *Object PF*.

12.1.3.3 *Value: Object PF*

Group	Object
Units	-

Related FW	standard v3.1.0
Description	Cos-phi factor at the load. This value is computed indirectly from the values *Object P* and *Object Q*.

12.1.3.4 *Value: Object Load char*

Group	Object
Units	-
Related FW	standard v3.1.0
Description	This value shows the characteristic of the load. The displayed value is R, L or C.

12.1.4 Group: Gen-sets

12.1.4.1 *Value: TotRun Q*

Group	Gen-sets
Units	kVAr
Related FW	standard v3.1.0
Description	This value shows total sum of reactive power of all gensets controlled by corresponding IM-NT (e.g. in one logical group or in two logical groups linked by Group link).

12.1.4.2 *Value: TotRun PF*

Group	Gen-sets
Units	-
Related FW	standard v3.1.0
Description	This value shows average of power factor of all gensets controlled by corresponding IM-NT (e.g. in one logical group or in two logical groups linked by Group link).

12.1.4.3 *Value: TotRun Ld char*

Group	Gen-sets
Units	-
Related FW	standard v3.1.0
Description	This value shows total load character of all running gensets in group controlled by IM-NT (e.g. in one logical group or in two logical groups linked by Group link).

12.1.4.4 *Value: Gen-set1 pwr*

Group	Gen-sets
Units	kW
Related FW	standard v3.1.0
Description	This value shows the actual power of corresponding genset (i.e. power of genset with CAN address 1 is shown in Gen-set1 pwr). If genset with corresponding address is not available (does not exist of function on the CAN bus) value "#####" is diplayed.

12.1.4.5 *Value: Gen-set2 pwr*

Group	Gen-sets
Units	kW
Related FW	standard v3.1.0
Description	This value shows the actual power of corresponding genset (i.e. power of genset with CAN address 1 is shown in Gen-set1 pwr). If genset with corresponding address is not available (does not exist of function on the CAN bus) value "#####" is diplayed.

12.1.4.6 *Value: Gen-set3 pwr*

Group	Gen-sets
Units	kW
Related FW	standard v3.1.0
Description	This value shows the actual power of corresponding genset (i.e. power of genset with CAN address 1 is shown in Gen-set1 pwr). If genset with corresponding address is not available (does not exist of function on the CAN

	bus) value "#####" is diplayed.

12.1.4.7 *Value: Gen-set4 pwr*

Group	Gen-sets
Units	kW
Related FW	standard v3.1.0
Description	This value shows the actual power of corresponding genset (i.e. power of genset with CAN address 1 is shown in Gen-set1 pwr). If genset with corresponding address is not available (does not exist of function on the CAN bus) value "#####" is diplayed.

12.1.4.8 *Value: Gen-set5 pwr*

Group	Gen-sets
Units	kW
Related FW	standard v3.1.0
Description	This value shows the actual power of corresponding genset (i.e. power of genset with CAN address 1 is shown in Gen-set1 pwr). If genset with corresponding address is not available (does not exist of function on the CAN bus) value "#####" is diplayed.

12.1.4.9 *Value: Gen-set6 pwr*

Group	Gen-sets
Units	kW
Related FW	standard v3.1.0
Description	This value shows the actual power of corresponding genset (i.e. power of genset with CAN address 1 is shown in Gen-set1 pwr). If genset with corresponding address is not available (does not exist of function on the CAN bus) value "#####" is diplayed.

12.1.4.10 *Value: Gen-set7 pwr*

Group	Gen-sets
Units	kW

Related FW	standard v3.1.0
Description	This value shows the actual power of corresponding genset (i.e. power of genset with CAN address 1 is shown in Gen-set1 pwr). If genset with corresponding address is not available (does not exist of function on the CAN bus) value "#####" is diplayed.

12.1.4.11 *Value: Gen-set8 pwr*

Group	Gen-sets
Units	kW
Related FW	standard v3.1.0
Description	This value shows the actual power of corresponding genset (i.e. power of genset with CAN address 1 is shown in Gen-set1 pwr). If genset with corresponding address is not available (does not exist of function on the CAN bus) value "#####" is diplayed.

12.1.4.12 *Value: Gen-set9 pwr*

Group	Gen-sets
Units	kW
Related FW	standard v3.1.0
Description	This value shows the actual power of corresponding genset (i.e. power of genset with CAN address 1 is shown in Gen-set1 pwr). If genset with corresponding address is not available (does not exist of function on the CAN bus) value "#####" is diplayed.

12.1.4.13 *Value: Gen-set10 pwr*

Group	Gen-sets
Units	kW
Related FW	standard v3.1.0
Description	This value shows the actual power of corresponding genset (i.e. power of genset with CAN address 1 is shown in Gen-set1 pwr). If genset with corresponding address is not available (does not exist of function on the CAN bus) value "#####" is diplayed.

12.1.4.14 *Value: Gen-set11 pwr*

Group	Gen-sets
Units	kW
Related FW	standard v3.1.0
Description	This value shows the actual power of corresponding genset (i.e. power of genset with CAN address 1 is shown in Gen-set1 pwr). If genset with corresponding address is not available (does not exist of function on the CAN bus) value "#####" is diplayed.

12.1.4.15 *Value: Gen-set12 pwr*

Group	Gen-sets
Units	kW
Related FW	standard v3.1.0
Description	This value shows the actual power of corresponding genset (i.e. power of genset with CAN address 1 is shown in Gen-set1 pwr). If genset with corresponding address is not available (does not exist of function on the CAN bus) value "#####" is diplayed.

12.1.4.16 *Value: Gen-set13 pwr*

Group	Gen-sets
Units	kW
Related FW	standard v3.1.0
Description	This value shows the actual power of corresponding genset (i.e. power of genset with CAN address 1 is shown in Gen-set1 pwr). If genset with corresponding address is not available (does not exist of function on the CAN bus) value "#####" is diplayed.

12.1.4.17 *Value: Gen-set14 pwr*

Group	Gen-sets
Units	kW
Related FW	standard v3.1.0
Description	This value shows the actual power of corresponding genset (i.e. power of genset with CAN address 1 is shown in Gen-set1 pwr). If genset with

	corresponding address is not available (does not exist of function on the CAN bus) value "#####" is diplayed.

12.1.4.18 *Value: Gen-set15 pwr*

Group	Gen-sets
Units	kW
Related FW	standard v3.1.0
Description	This value shows the actual power of corresponding genset (i.e. power of genset with CAN address 1 is shown in Gen-set1 pwr). If genset with corresponding address is not available (does not exist of function on the CAN bus) value "#####" is diplayed.

12.1.4.19 *Value: Gen-set16 pwr*

Group	Gen-sets
Units	kW
Related FW	standard v3.1.0
Description	This value shows the actual power of corresponding genset (i.e. power of genset with CAN address 1 is shown in Gen-set1 pwr). If genset with corresponding address is not available (does not exist of function on the CAN bus) value "#####" is diplayed.

12.1.4.20 *Value: Gen-set17 pwr*

Group	Gen-sets
Units	kW
Related FW	standard v3.1.0
Description	This value shows the actual power of corresponding genset (i.e. power of genset with CAN address 1 is shown in Gen-set1 pwr). If genset with corresponding address is not available (does not exist of function on the CAN bus) value "#####" is diplayed.

12.1.4.21 *Value: Gen-set18 pwr*

Group	Gen-sets

Units	kW
Related FW	standard v3.1.0
Description	This value shows the actual power of corresponding genset (i.e. power of genset with CAN address 1 is shown in Gen-set1 pwr). If genset with corresponding address is not available (does not exist of function on the CAN bus) value "#####" is diplayed.

12.1.4.22 *Value: Gen-set19 pwr*

Group	Gen-sets
Units	kW
Related FW	standard v3.1.0
Description	This value shows the actual power of corresponding genset (i.e. power of genset with CAN address 1 is shown in Gen-set1 pwr). If genset with corresponding address is not available (does not exist of function on the CAN bus) value "#####" is diplayed.

12.1.4.23 *Value: Gen-set20 pwr*

Group	Gen-sets
Units	kW
Related FW	standard v3.1.0
Description	This value shows the actual power of corresponding genset (i.e. power of genset with CAN address 1 is shown in Gen-set1 pwr). If genset with corresponding address is not available (does not exist of function on the CAN bus) value "#####" is diplayed.

12.1.4.24 *Value: Gen-set21 pwr*

Group	Gen-sets
Units	kW
Related FW	standard v3.1.0
Description	This value shows the actual power of corresponding genset (i.e. power of genset with CAN address 1 is shown in Gen-set1 pwr). If genset with corresponding address is not available (does not exist of function on the CAN bus) value "#####" is diplayed.

12.1.4.25 *Value: Gen-set22 pwr*

Group	Gen-sets
Units	kW
Related FW	standard v3.1.0
Description	This value shows the actual power of corresponding genset (i.e. power of genset with CAN address 1 is shown in Gen-set1 pwr). If genset with corresponding address is not available (does not exist of function on the CAN bus) value "#####" is diplayed.

12.1.4.26 *Value: Gen-set23 pwr*

Group	Gen-sets
Units	kW
Related FW	standard v3.1.0
Description	This value shows the actual power of corresponding genset (i.e. power of genset with CAN address 1 is shown in Gen-set1 pwr). If genset with corresponding address is not available (does not exist of function on the CAN bus) value "#####" is diplayed.

12.1.4.27 *Value: Gen-set24 pwr*

Group	Gen-sets
Units	kW
Related FW	standard v3.1.0
Description	This value shows the actual power of corresponding genset (i.e. power of genset with CAN address 1 is shown in Gen-set1 pwr). If genset with corresponding address is not available (does not exist of function on the CAN bus) value "#####" is diplayed.

12.1.4.28 *Value: Gen-set25 pwr*

Group	Gen-sets
Units	kW
Related FW	standard v3.1.0
Description	This value shows the actual power of corresponding genset (i.e. power of genset with CAN address 1 is shown in Gen-set1 pwr). If genset with

	corresponding address is not available (does not exist of function on the CAN bus) value "#####" is diplayed.

12.1.4.29 *Value: Gen-set26 pwr*

Group	Gen-sets
Units	kW
Related FW	standard v3.1.0
Description	This value shows the actual power of corresponding genset (i.e. power of genset with CAN address 1 is shown in Gen-set1 pwr). If genset with corresponding address is not available (does not exist of function on the CAN bus) value "#####" is diplayed.

12.1.4.30 *Value: Gen-set27 pwr*

Group	Gen-sets
Units	kW
Related FW	standard v3.1.0
Description	This value shows the actual power of corresponding genset (i.e. power of genset with CAN address 1 is shown in Gen-set1 pwr). If genset with corresponding address is not available (does not exist of function on the CAN bus) value "#####" is diplayed.

12.1.4.31 *Value: Gen-set28 pwr*

Group	Gen-sets
Units	kW
Related FW	standard v3.1.0
Description	This value shows the actual power of corresponding genset (i.e. power of genset with CAN address 1 is shown in Gen-set1 pwr). If genset with corresponding address is not available (does not exist of function on the CAN bus) value "#####" is diplayed.

12.1.4.32 *Value: Gen-set29 pwr*

Group	Gen-sets

Units	kW
Related FW	standard v3.1.0
Description	This value shows the actual power of corresponding genset (i.e. power of genset with CAN address 1 is shown in Gen-set1 pwr). If genset with corresponding address is not available (does not exist of function on the CAN bus) value "#####" is diplayed.

12.1.4.33 *Value: Gen-set30 pwr*

Group	Gen-sets
Units	kW
Related FW	standard v3.1.0
Description	This value shows the actual power of corresponding genset (i.e. power of genset with CAN address 1 is shown in Gen-set1 pwr). If genset with corresponding address is not available (does not exist of function on the CAN bus) value "#####" is diplayed.

12.1.4.34 *Value: Gen-set31 pwr*

Group	Gen-sets
Units	kW
Related FW	standard v3.1.0
Description	This value shows the actual power of corresponding genset (i.e. power of genset with CAN address 1 is shown in Gen-set1 pwr). If genset with corresponding address is not available (does not exist of function on the CAN bus) value "#####" is diplayed.

12.1.4.35 *Value: Gen-set32 pwr*

Group	Gen-sets
Units	kW
Related FW	standard v3.1.0
Description	This value shows the actual power of corresponding genset (i.e. power of genset with CAN address 1 is shown in Gen-set1 pwr). If genset with corresponding address is not available (does not exist of function on the CAN bus) value "#####" is diplayed.

12.1.5 Group: Control loops

12.1.5.1 *Value: LSO*

Group	Control loops
Units	%
Related FW	standard v3.1.0
Description	Control loop for active power in percentage.

12.1.5.2 *Value: VSO*

Group	Control loops
Units	%
Related FW	standard v3.1.0
Description	Control loop for reactive power in percentage.

12.1.6 Group: Mains protect

12.1.6.1 *Value: MaxVectorS*

Group	Mains protect
Units	º
Related FW	standard v3.1.0
Description	This is maximal measured value of vector shift of the mains voltage. The value is reset to 0 automatically at the moment of closing the MGCB.

12.1.6.2 *Value: ROCOF*

Group	Mains protect
Units	Hz/s
Related FW	standard v3.1.0
Description	This is actual measured ROCOF.

12.1.6.3 *Value: Max ROCOF*

Group	Mains protect
Units	Hz/s
Related FW	standard v3.1.0
Description	This is maximal measured value of ROCOF of the mains voltage. The value is reset to 0 automatically at the moment of closing the MGCB.

12.1.7 Group: Power management

12.1.7.1 *Value: TotRunPact*

Group	Pwr management
Units	kW
Related FW	standard v3.1.0
Description	Sum of **active** power of all loaded gen-sets within the group that are connected to the bus.

12.1.7.2 *Value: TotRunPnomAll*

Group	Pwr management
Units	kW
Related FW	standard v3.1.0
Description	Sum of **nominal** power of all loaded gensets within the group that are connected to the bus (e.g. all gensets in logical group controlled by IM-NT or in two logical groups linked by Group link). See also values *TotAvlbPnom* and *TotRunPnom*. For more information on power management please refer to the chapter Power management.

12.1.7.3 *Value: TotAvlbPnom*

Group	Pwr management
Units	kW
Related FW	standard v3.1.0

Description	This value shows the sum of nominal powers of all gensets that are available for power management (in any state - stopped, running etc.). See also values *TotRunPnomAll* and *TotRunPnom*. For more information on power management please refer to the chapter Power management.

12.1.7.4 *Value: TotRunPnom*

Group	Pwr management
Units	kW
Related FW	standard v3.1.0
Description	This value shows the sum of nominal powers of all running gensets that are participating in power management. See also values *TotRunPnomAll* and *TotAvlbPnom*. For more information on power management please refer to the chapter Power management.

12.1.7.5 *Value: Act Reserve*

Group	Pwr management
Units	-
Related FW	standard v3.1.0
Description	Actual absolute reserve.

12.1.7.6 *Value: LoadRes Start*

Group	Pwr management
Units	kX
Related FW	standard v3.1.0
Description	If the actual absolute reserve is lower than this value the next gen-set which is about to be started in power managament is started. This value is the exact copy of setpoint *#LoadResStrt X*.

12.1.7.7 *Value: Reserve Stp*

Group	Pwr management
Units	kX
Related FW	standard v3.1.0
Description	Actual absolute reserve - when the reserve is higher than this value the last started gen-set (the gen-set with the highest priority) is stopped. This value contains the following: *#LoadResStop* plus *Nominal power* of the genset which is first to stop. #LoadResStop is used from the currently selected reserve set.

12.1.7.8 *Value: ActRes rel*

Group	Power management
Units	%
Related FW	standard v3.1.0
Description	Actual relative reserve.

12.1.7.9 *Value: ResStart rel*

Group	Power management
Units	%
Related FW	standard v3.1.0
Description	If the actual relative reserve is lower than this value the next gen-set which is about to be started in power managament is started. This value is the exact copy of setpoint *#%LdResStrt X*.

12.1.7.10 *Value: ResStp rel*

Group	Power management
Units	%
Related FW	standard v3.1.0
Description	Actual relative reserve - when the relative reserve is higher than this value the last started gen-set (the gen-set with the highest priority) is stopped. This value contains the following:

	$ResStp\,rel = \frac{P_n + \frac{\%LdResStop}{100}\sum_{i=1}^{n-1} P_i}{\sum_{i=1}^{n} P_n}$ Pn is the nominal power of the gen-set which is next to be stopped, the upper sum is the sum of the rest of the gen-sets running in power management. The lower sum is the sum of all the gen-sets currently running in power management. #%LdResStop is used from the currently selected reserve set.

12.1.8 Group: Sync/Load ctrl

12.1.8.1 *Value: ActPwrReq*

Group	Sync/Load ctrl
Units	kW
Related FW	standard v3.1.0
Description	This value contains actual required load level, which is used as the input into the load regulation loop in the parallel to mains operation.

12.1.8.2 *Value: SystLoadCtrl*

Group	Sync/Load ctrl
Units	-
Related FW	standard v3.1.0
Description	Code of the current load control mode. The text representation of each code can be obtained by the procedure described at the value *Timer text*.

12.1.9 Group: Volt/PF ctrl

12.1.9.1 *Value: SystPfCtrl*

Group	Volt/PF ctrl
Units	-
Related FW	standard v3.1.0

Description	Code of the current power factor control mode. The text representation of each code can be obtained by the procedure described at the value *Timer text*.

12.1.10 Group: Force value

12.1.10.1 *Value: ExtValue1*

Group	Force value
Units	-
Related FW	standard v3.1.0
Description	This data object is intended for remote control of the gen-set via the communication if some kind of data is to be passed into the controller. This object can be written via the communication (e.g. Modbus) without any limitation. Use GenConfig function Generate Cfg Image to get the communication object number or register number of this particular value object. Below is a typical example of using this object. **EXAMPLE:** The gen-set group is required to be running in parallel-to-mains mode at constant load level (baseload), however the system baseload level is adjusted from a supervisory PLC system via Modbus. **CAUTION!** It is **not allowed** to solve this task by cyclic writing of the baseload setpoint from the supervisory device. The EEPROM memory may become damaged when any setpoint is written repeatedly with a short period. The proper solution is following: 1. Go to GenConfig, download the configuration from the controller, select the LAI tab and configure the logical analog input *MLC:AnExSysBld* onto the *ExtValue1*, which is located in the Force value group. If you do not see the LAI tab you have to switch the GenConfig to "advanced" mode. Then upload the configuration into the controller. 2. Go to InteliMonitor and change the setpoint *MLoad ctrl PtM* to ANEXSYSBLD->LS. 3. Now you have to program your PLC to write requested gen-set baseload into the Modbus register *ExtValue1* (register number 40392 for IG/IS-NT-2.4).

12.1.10.2 *Value: ExtValue2*

Group	Force value
Units	-
Related FW	standard v3.1.0
Description	This data object is intended for remote control of the IntelliMains via the communication if some kind of data is to be passed into the controller. This object can be written via the communication (e.g. Modbus) without any limitation. Use GenConfig function Generate Cfg Image to get the communication object number or register number of this particular value object. See an example at the object *ExtValue1*.

12.1.10.3 *Value: ExtValue3*

Group	Force value
Units	-
Related FW	standard v3.1.0
Description	This data object is intended for remote control of the IntelliMains via the communication if some kind of data is to be passed into the controller. This object can be written via the communication (e.g. Modbus) without any limitation. Use GenConfig function Generate Cfg Image to get the communication object number or register number of this particular value object. See an example at the object *ExtValue1*.

12.1.10.4 *Value: ExtValue4*

Group	Force value
Units	X
Related FW	standard v3.1.0
Description	This data object is intended for remote control of the IntelliMains via the communication if some kind of data is to be passed into the controller. This object can be written via the communication (e.g. Modbus) without any limitation. Use GenConfig function Generate Cfg Image to get the communication object number or register number of this particular value object. See an example at the object *ExtValue1*.

12.1.11 Group: Load shedding

12.1.11.1 *Value: StatLdShed*

Group	Load shedding
Units	-
Related FW	standard v3.1.0
Description	The value indicates the current load shedding stage. 0 indicates that the load shedding is not active. See the chapter Load shedding for more details.

12.1.12 Group: Analog CU

12.1.12.1 *Value: UBat*

Group	Analog CU
Units	V
Related FW	standard v3.1.0
Description	Voltage at the controller power supply terminals.

12.1.12.2 *Value: CPU Temp*

Group	Analog CU
Units	ºC
Related FW	standard v3.1.0
Description	Temperature inside the controller (on the CPU).

12.1.12.3 *Value: AIN CU-1*

Group	Analog CU
Units	configurable
Related FW	standard v3.1.0
Description	This is the value of the analog input 1 of the controller. Analog inputs are fully configurable so the name and units depend on configuration. In the default configuration the input is used for oil pressure measurement.

12.1.12.4 *Value: AIN CU-2*

Group	Analog CU
Units	configurable
Related FW	standard v3.1.0
Description	This is the value of the analog input 2 of the controller. Analog inputs are fully configurable so the name and units depend on configuration. In the default configuration the input is used for water temperature measurement.

12.1.12.5 *Value: AIN CU-3*

Group	Analog CU
Units	configurable
Related FW	standard v3.1.0
Description	This is the value of the analog input 3 of the controller. Analog inputs are fully configurable so the name and units depend on configuration. In the default configuration the input is used for fuel level measurement.

12.1.12.6 *Value: AIN CU-4*

Group	Analog CU
Units	configurable
Related FW	standard v3.1.0
Description	This is the value of the analog input 4 of the controller. Analog inputs are fully configurable so the name and units depend on configuration. In the default configuration the input is used for fuel level measurement.

12.1.13 Group: Bin inputs CU

12.1.13.1 *Value: BIN*

Group	Bin inputs CU
Units	-
Related FW	standard v3.1.0
Description	This is a bit array containing status of physical binary inputs of the controller. Bit0 represents BI1, bit1 represents BI2 etc.. **NOTE:**

	All terminals display binary values in **"human-readable" form** - from left to right. That means the bit 0 is displayed in the most left position. This is different from common use in computer science, where binary values are displayed from right to left. **NOTE:** Click on button with **"..."** to get a clear list of BI names with their corresponding values.

12.1.14 Group: Bin outputs CU

12.1.14.1 *Value: BOUT*

Group	Bin outputs CU
Units	-
Related FW	standard v3.1.0
Description	This is a bit array containing status of physical binary outputs of the controller. Bit0 represents BO1, bit1 represents BO2 etc.. **NOTE:** All terminals display binary values in **"human-readable" form** - from left to right. That means the bit 0 is displayed in the most left position. This is different from common use in computer science, where binary values are displayed from right to left. **NOTE:** Click on button with **"..."** to get a clear list of BI names with their corresponding values.

12.1.15 Group: Log Bout

12.1.15.1 *Value: LogBout 1*

Group	Log bout
Units	-
Related FW	standard v3.1.0
Description	This is a bit array containing status of logical binary outputs 1-16 of the

	controller. Bit0 represents LBO1, bit1 represents LBO2 etc.. **NOTE:** All terminals display binary values in **"human-readable" form** - from left to right. That means the bit 0 is displayed in the most left position. This is different from common use in computer science, where binary values are displayed from right to left. **NOTE:** Click on button with **"..."** to get a clear list of BI names with their corresponding values.

12.1.15.2 *Value: LogBout 2*

Group	Log bout
Units	-
Related FW	standard v3.1.0
Description	This is a bit array containing status of logical binary outputs 17-32 of the controller. Bit0 represents LBO17, bit1 represents LBO18 etc.. **NOTE:** All terminals display binary values in **"human-readable" form** - from left to right. That means the bit 0 is displayed in the most left position. This is different from common use in computer science, where binary values are displayed from right to left. **NOTE:** Click on button with **"..."** to get a clear list of BI names with their corresponding values.

12.1.15.3 *Value: LogBout 3*

Group	Log bout
Units	-
Related FW	standard v3.1.0
Description	This is a bit array containing status of logical binary outputs 33-48 of the controller. Bit0 represents LBO33, bit1 represents LBO34 etc.. **NOTE:**

	All terminals display binary values in **"human-readable" form** - from left to right. That means the bit 0 is displayed in the most left position. This is different from common use in computer science, where binary values are displayed from right to left. **NOTE:** Click on button with **"..."** to get a clear list of BI names with their corresponding values.

12.1.15.4 *Value: LogBout 4*

Group	Log bout
Units	-
Related FW	standard v3.1.0
Description	This is a bit array containing status of logical binary outputs 49-64 of the controller. Bit0 represents LBO49, bit1 represents LBO50 etc.. **NOTE:** All terminals display binary values in **"human-readable" form** - from left to right. That means the bit 0 is displayed in the most left position. This is different from common use in computer science, where binary values are displayed from right to left. **NOTE:** Click on button with **"..."** to get a clear list of BI names with their corresponding values.

12.1.15.5 *Value: LogBout 5*

Group	Log bout
Units	-
Related FW	standard v3.1.0
Description	This is a bit array containing status of logical binary outputs 65-80 of the controller. Bit0 represents LBO65, bit1 represents LBO66 etc.. **NOTE:** All terminals display binary values in **"human-readable" form** - from left to right. That means the bit 0 is displayed in the most left position. This is different from common use in computer science, where binary values are displayed from right to left.

	NOTE: Click on button with **"..."** to get a clear list of BI names with their corresponding values.

12.1.15.6 *Value: LogBout 6*

Group	Log bout
Units	-
Related FW	standard v3.1.0
Description	This is a bit array containing status of logical binary outputs 81-96 of the controller. Bit0 represents LBO81, bit1 represents LBO82 etc.. **NOTE:** All terminals display binary values in **"human-readable" form** - from left to right. That means the bit 0 is displayed in the most left position. This is different from common use in computer science, where binary values are displayed from right to left. **NOTE:** Click on button with **"..."** to get a clear list of BI names with their corresponding values.

12.1.15.7 *Value: LogBout 7*

Group	Log bout
Units	-
Related FW	standard v3.1.0
Description	This is a bit array containing status of logical binary outputs 97-113 of the controller. Bit0 represents LBO97, bit1 represents LBO98 etc.. **NOTE:** All terminals display binary values in **"human-readable" form** - from left to right. That means the bit 0 is displayed in the most left position. This is different from common use in computer science, where binary values are displayed from right to left. **NOTE:** Click on button with **"..."** to get a clear list of BI names with their

	corresponding values.

12.1.15.8 *Value: RemoteControls*

Group	Log bout
Units	-
Related FW	standard v3.1.0
Description	This is a bit array containing status of the binary outputs *Remote control1* ... *Remote control8*. **NOTE:** Click on button with **"..."** to get a clear list of BI names with their corresponding values.

12.1.15.9 *Value: ModbusSw1*

Group	Log Bout
Units	-
Related FW	standard v3.1.0
Description	This value mirrors the content of what has been written in Modbus register 46337. The same information decomposed to bits can be obtained in logical binary outputs from *ModbusSw 1* to *ModbusSw 16*.

12.1.15.10 *Value: ModbusSw2*

Group	Log Bout
Units	-
Related FW	standard v3.1.0
Description	This value mirrors the content of what has been written in Modbus register 46338. The same information decomposed to bits can be obtained in logical binary outputs from *ModbusSw 17* to *ModbusSw 32*.

12.1.16 Group: Info

12.1.16.1 *Value: Controller mode*

Group	Info
Units	-
Related FW	standard v3.1.0
Description	This value contains actual controller mode. The controller mode is selected by the setpoint *Controller mode* but the setpoint position can be overriden by binary inputs *Remote OFF*, *Remote MAN*, *Remote AUT* or *Remote TEST*.

12.1.16.2 *Value: SW Version*

Group	Info
Units	-
Related FW	standard v3.1.0
Description	Major and minor firmware version number. E.g. value "2,4" means version 2.4. Release version number is not included.

12.1.16.3 *Value: Application*

Group	Info
Units	-
Related FW	standard v3.1.0
Description	Code of the application type. E.g. 1 for SPtM, 2 for SPI, 3 for MINT etc. The value is intended for diagnostic purposes.

12.1.16.4 *Value: SW Branch*

Group	Info
Units	-
Related FW	standard v3.1.0
Description	Firmware branch code. Contains 1 in case of standard branches.

12.1.16.5 *Value: PasswordDecode*

Group	Info
Units	-
Related FW	standard v3.1.0
Description	This value contains encrypted serial number of the controller and administrator password and is intended for retrieving of the lost password. Send this number together with controller serial number to your distributor if you need to retrieve your password.

12.1.16.6 *Value: CAN16*

Group	Info
Units	-
Related FW	standard v3.1.0
Description	Bits of this value show "1" if the controller receives messages from the controller which has address corresponding with the bit position. Bit 0 represents address 1 etc. This value contains information about controllers with addresses 1-16. **NOTE:** The bit which corresponds to the own controller is always set to "1".

12.1.16.7 *Value: CAN32*

Group	Info
Units	-
Related FW	standard v3.1.0
Description	Bits of this value show "1" if the controller receives messages from the controller which has address corresponding with the bit position. Bit 0 represents address 17 etc. This value contains information about controllers with addresses 17-32. **NOTE:** The bit which corresponds to the own controller is always set to "1".

12.1.16.8 *Value: Reg16*

Group	Info
Units	-
Related FW	standard v3.1.0
Description	Bits of this value show "1" if the controller which has address corresponding with the bit position plays active role in the power management. Bit 0 represents address 1 etc. This value contains information about controllers with addresses 1-16.

12.1.16.9 *Value: Reg32*

Group	Info
Units	-
Related FW	standard v3.1.0
Description	Bits of this value show "1" if the controller which has address corresponding with the bit position plays active role in the power management. Bit 0 represents address 17 etc. This value contains information about controllers with addresses 17-32.

12.1.16.10 *Value: GL16*

Group	Info
Units	-
Related FW	standard v3.1.0
Description	Bits of this value show "1" if the controller which has address corresponding with the bit position has GCB closed. Bit 0 represents address 1 etc. This value contains information about controllers with addresses 1-16.

12.1.16.11 *Value: GL32*

Group	Info
Units	-
Related FW	standard v3.1.0
Description	Bits of this value show "1" if the controller which has address corresponding with the bit position has GCB closed. Bit 0 represents address 1 etc. This value contains information about controllers with addresses 17-32.

12.1.16.12 *Value: Breaker state*

Group	Info
Units	-
Related FW	standard v3.1.0
Description	Code of the current state of the breaker control. The text representation of each code can be obtained by the procedure described at the value *Timer text*.

12.1.16.13 *Value: Timer text*

Group	Info
Units	-
Related FW	standard v3.1.0
Description	Code of the currently running system process timer. The list of this value can be found in the cfg image which can be generated using GenConfing (open archive which you want to inspect and click on *File-Generate Cfg Image-Generate Cfg Image (Comm. objects)...*). Text file is generated, open it and find the communication object of your interest. According type of the list is found next to the name of the communication object. Search for the name of the list (e.g. LIST#3) and in the lower part of document there is a list of corrensponding values included in that particular list. **NOTE:** Remaining time of the timer is available in the value *Timer val*.

12.1.16.14 *Value: Timer val*

Group	Info
Units	-
Related FW	standard v3.1.0
Description	The value contains remaining time of the currently running system process timer. The name of the timer is available in the value *Timer text*.

12.1.16.15 *Value: NextTime1-4*

Group	Info

Units	-
Related FW	standard v3.1.0
Description	This value contains time of next activation of the timer block 1-4 (i.e. of the output *TimerAct 1-4*). The related date is available in the value *NextDate1-4*. **NOTE:** More information about timers is available in the chapter General purpose timers.

12.1.16.16 *Value: NextDate1-4*

Group	Info
Units	-
Related FW	standard v3.1.0
Description	This value contains date of next activation of the timer block 1-4 (i.e. of the output *TimerAct 1-4*). The related time is available in the value *NextTime1-4*. **NOTE:** More information about timers is available in the chapter General purpose timers.

12.1.16.17 *Value: NextTime5-8*

Group	Info
Units	-
Related FW	standard v3.1.0
Description	This value contains time of next activation of the timer block 5-8 (i.e. of the output *TimerAct 5-8*). The related date is available in the value *NextDate5-8*. **NOTE:** More information about timers is available in the chapter General purpose timers.

12.1.16.18 *Value: NextDate5-8*

Group	Info
Units	-

Related FW	standard v3.1.0
Description	This value contains date of next activation of the timer block 5-8 (i.e. of the output *TimerAct 5-8*). The related time is available in the value *NextTime5-8*. **NOTE:** More information about timers is available in the chapter General purpose timers.

12.1.16.19 *Value: NextTime9-12*

Group	Info
Units	-
Related FW	standard v3.1.0
Description	This value contains time of next activation of the timer block 9-12 (i.e. of the output *TimerAct 9-12*). The related date is available in the value *NextDate9-12*. **NOTE:** More information about timers is available in the chapter General purpose timers.

12.1.16.20 *Value: NextDate9-12*

Group	Info
Units	-
Related FW	standard v3.1.0
Description	This value contains date of next activation of the timer block 9-12 (i.e. of the output *TimerAct 9-12*). The related time is available in the value *NextTime9-12*. **NOTE:** More information about timers is available in the chapter General purpose timers.

12.1.16.21 *Value: NextTime13-16*

Group	Info
Units	-

Related FW	standard v3.1.0
Description	This value contains time of next activation of the timer block 13-16 (i.e. of the output *TimerAct 13-16*). The related date is available in the value *NextDate13-16*. **NOTE:** More information about timers is available in the chapter General purpose timers.

12.1.16.22 *Value: NextDate13-16*

Group	Info
Units	-
Related FW	standard v3.1.0
Description	This value contains date of next activation of the timer block 13-16 (i.e. of the output *TimerAct 13-16*). The related time is available in the value *NextTime13-16*. **NOTE:** More information about timers is available in the chapter General purpose timers.

12.1.16.23 *Value: AirGate ID*

Group	Info
Units	-
Related FW	standard v3.1.0
Description	If the controller is connected to an AirGate server this value displays the ID string assigned by the server. This ID string is to be used in ComAp PC tools (e.g. InteliMonitor) to specify the respective controller when the connection is opened.

12.1.16.24 *Value: AirGate status*

Group	Info
Units	-
Related FW	standard v3.1.0

Description	This value displays actual status of the connection to the AirGate server. 0 Not connected to AirGate. 1 Connected, registered, waiting for autorization. 2 Registration denied. 3 Can not register, no free capacity in the server. 4 Can not register, other reason. 5 Connected, registered, authorized.

12.1.16.25 *Value: Latitude*

Group	Info
Units	-
Related FW	standard v3.1.0
Description	This value contains latitude of the controller. This value is obtained from connected IB-NT with active GPS. Time is automatically synchronized as well when succesfull GPS fix is established. If no valid value is available from InternetBridge-NT, value ##### is displayed.

12.1.16.26 *Value: Longitude*

Group	Info
Units	-
Related FW	standard v3.1.0
Description	This value contains longitude of the controller. This value is obtained from connected IB-NT with active GPS. Time is automatically synchronized as well when succesfull GPS fix is established. If no valid value is available from InternetBridge-NT, value ##### is displayed.

12.1.17 Group: Statistics

12.1.17.1 *Value: Sum MWh*

Group	Statistics
Units	MWh
Related FW	standard v3.1.0
Description	In BTB - this value shows always 0. This value shows the total sum of MWh counted from all the genset in the according control group. If two separate control groups are connected by group link this value shows sum of MWh from both connected control groups. **NOTE:** The counter can be readjusted/reset from InteliMonitor menu Monitor -> Set statistics.

12.1.17.2 *Value: Sum MVAhr*

Group	Statistics
Units	-
Related FW	standard v3.1.0
Description	In BTB - this value shows always 0. This value shows the total sum of MVAhr counted from all the genset in the according control group. If two separate control groups are connected by group link this value shows sum of MVAhr from both connected control groups. **NOTE:** The counter can be readjusted/reset from InteliMonitor menu Monitor -> Set statistics.

12.1.17.3 *Value: M kWh I*

Group	Statistics
Units	kWh
Related FW	standard v3.1.0
Description	This value shows the sum of kWh imported from the mains.

	NOTE: The counter can be readjusted/reset from InteliMonitor menu Monitor -> Set statistics.

12.1.17.4 *Value: M kVAhr I*

Group	Statistics
Units	-
Related FW	standard v3.1.0
Description	This value shows the sum of kVAhr imported from the mains. **NOTE:** The counter can be readjusted/reset from InteliMonitor menu Monitor -> Set statistics.

12.1.17.5 *Value: M kVAh*

Group	Statistics
Units	kVAh
Related FW	standard v3.1.0
Description	This value shows sum of kVAh that were tranferred through CB.

12.1.17.6 *Value: M kWh E*

Group	Statistics
Units	kWh
Related FW	standard v3.1.0
Description	This value shows the sum of kWh exported to the mains. **NOTE:** The counter can be readjusted/reset from InteliMonitor menu Monitor -> Set statistics.

12.1.17.7 *Value: M kVAhr E*

Group	Statistics
Units	-
Related FW	standard v3.1.0
Description	This value shows the sum of kVAhr exported to the mains. **NOTE:** The counter can be readjusted/reset from InteliMonitor menu Monitor -> Set statistics.

12.1.17.8 *Value: PulseCounter 1*

Group	Statistics
Units	-
Related FW	standard v3.1.0
Description	This is the value of *PulseCounter #1* module. See the binary input *PulseCounter 1*.

12.1.17.9 *Value: PulseCounter 2*

Group	Statistics
Units	-
Related FW	standard v3.1.0
Description	This is the value of *PulseCounter #2* module. See the binary input *PulseCounter 2*.

12.1.17.10 *Value: PulseCounter 3*

Group	Statistics
Units	-
Related FW	standard v3.1.0
Description	This is the value of *PulseCounter #3* module. See the binary input *PulseCounter 3*.

12.1.17.11 *Value: PulseCounter 4*

Group	Statistics
Units	-
Related FW	standard v3.1.0
Description	This is the value of *PulseCounter #4* module. See the binary input *PulseCounter 4*.

13 Binary input functions

13.1 Virtual and physical modules

Number of I/O can be extended and project wiring can be reduced using the following extension and virtual modules.

MODULE NAME	BIN	BOUT	AIN	AOUT	NOTE	NUMBER OF MODULES SUPPORTED BY CONTROLLER
Controllers						
IM-NT(C)-BB controller	12	12	3	1	Controller I/O.	-
IM-NT controller	6	6	-	-	Controller I/O.	-
Extension modules						
IGS-PTM	8	8	4	1	Standard I/O extension module.	4
IS-AIN8	-	-	8	-	Standard I/O extension module.	10
I-AOUT8	-	-	-	8	Standard I/O extension module.	4
IS-BIN16/8	16	8	-	-	Standard I/O extension module.	6
IGL-RA15	-	15	-	-	15 Green, Red, Yellow LED panel.	4
Inteli-AIN8	-	-	8+1	-	Standard I/O extension module. One Frequency/Pulse input.	10
Inteli-AIN8TC	-	-	8	-	Standard I/O extension module	10
Inteli-IO8/8	8	8	-	2	Standard I/O extension module	12
Inteli-IO16/0	16	-	-	2	Standard I/O extension module	6
Virtual modules						
VPIO	8	8	-	-	Virtual periphery I/O module.	4
SHBIN	8	-	-	-	SHared (virtual) Binary INput module	6
SHBOUT	-	8	-	-	SHared (virtual) Binary OUTput module	6

SHAIN	-	-	4	-	Shared (virtual) Analog Input module	2
SHAOUT	-	-	-	4	Shared (virtual) Analog OUTput module	2
PLC	x	x	x	x	Programmable (internal) logic module.	1

NOTE:
Maximum number of configured modules (both extension and virtual) is given by available addresses. The numbers in the table are valid in the case that no other modules are configured.

13.2 Table of binary input functions

13.2.1.1 *Binary input: MCB feedback*

Related FW	standard v3.1.0
Description	This input is used for connection of the normally open feedback contact from the mains circuit breaker or contactor. If the input is active, the controller will consider the MCB as closed and vice versa. • If the feedback does not respond to a change of the control output *MCB close/open* within 2s, the alarm *MCB Fail* will be issued. • If the feedback indicates the MCB has unexpectedly closed without any command given by the control output, the alarm *MCB Fail* will be issued immediately. • If the feedback indicates the MCB has unexpectedly opened without any command given by the control output, the controller will accept this situation and the following behavior will depend on mains conditions (healthy or failure).

13.2.1.2 *Binary input: MCB feedback*

Related FW	standard v3.1.0
Description	This input is used for connection of the normally open feedback contact from the mains circuit breaker or contactor. If the input is active, the controller will consider the MCB as closed and vice versa. • If the feedback does not respond to a change of the control output *MCB close/open* within 2s, the alarm *MCB Fail* will be issued. • If the feedback indicates the MCB has unexpectedly closed without any command given by the control output, the alarm *MCB Fail* will be issued immediately. • If the feedback indicates the MCB has unexpectedly opened without any command given by the control output, the controller will accept this situation and the following behavior will depend on mains conditions (healthy or failure).

13.2.1.3 *Binary input: MCB fdb neg*

Related FW	standard v3.1.0
Description	This input is used for connection of the **normally closed** feedback contact from the mains circuit breaker or contactor. This input is optional and if it is configured, it must be always in inverse position to the normally open input *MCB feedback*. Maximal allowed time the both inputs are in the same position is 500ms, after this time the alarm *MCB Fail* is issued.

13.2.1.4 *Binary input: MGCB feedback*

Related FW	standard v3.1.0
Description	This input is used for connection of the normally open feedback contact from the master generator circuit breaker or contactor. If the input is active, the controller will consider the MGCB as closed and vice versa. • If the feedback does not respond to a change of the control output *MGCB close/open* within 2s, the alarm *MGCB Fail* will be issued. • If the feedback changes it's position unexpectedly without any command given by the control output, the alarm *MGCB Fail* will be issued immediately. **NOTE:** This input is obligatory.

13.2.1.5 *Binary input: MGCB fdb neg*

Related FW	standard v3.1.0
Description	This input is used for connection of the **normally closed** feedback contact from the master generator circuit breaker or contactor. This input is optional and if it is configured, it must be always in inverse position to the normally open input *MGCB feedback*. Maximal allowed time the both inputs are in the same position is 500ms, after this time the alarm *MGCB Fail* is issued.

13.2.1.6 *Binary input: Rem Start/Stop*

Related FW	standard v3.1.0
Description	If the input closes (AUT mode only), the controller activates the binary output Sys start/stop in order to start the gen-set group (to enable the start setpoint *ParallelEnable* should not be set to NO). In MGCB application, the MGCB can be closed before the output activation (see setpoint description *MGCBparalClose*).

13.2.1.7 *Binary input: Test on load*

<table>
<tr><td>Related FW</td><td>standard v3.1.0</td></tr>
<tr><td>Description</td><td>This binary input affects the behavior of controller in TEST mode.

NOTE:
Before activation of this function

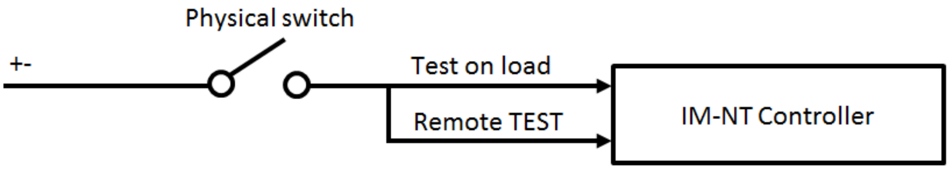
1. adjust setpoint <i>ReturnTo mains</i> to DISABLED (MGCB application only)
2. adjust <i>MFStart enable</i> to YES
3. switch controller to Test on load mode

Gen-set group starts and goes to load (in MGCB application, the MGCB is closed first; the gen-sets are synchronized to the mains and close their GCBs) automatically when this input is closed even if Mains is OK. Gen-set group stays running in parallel with mains during the soft load transfer from the mains to the gen-set group until power import from Mains goes under 5% of Nominal power but at least for <i>BreakerOverlap</i> time. When the load is bigger than the sum of Nominal power of all loaded gen-sets, MCB stays closed, BO WrnTstOnLdFail is closed and warning message is issued (WrnTstOnLdFail).

MCB application:
When the controller is switched from Test on load mode (and Mains is OK), it synchronizes the MCB and switches off the Sys start/stop output.

MGCB application:
When the controller is switched from Test on load mode (and Mains is OK), it synchronizes the MCB, stays running in parallel for BreakerOverlap time (soft load transfer), opens MGCB and switches off the Sys start/stop output.
During the load transfer from the gen-set group to the mains can the BreakerOverlap time be shortened due to the influence of: Load ramp, MGCB open level, MGCB open del setpoints.

NOTE:
You may cofigure both inputs needed for the Test on load function on one physical binary input (i.e. Test on load and Remote TEST). See the drawing below. Test on load is then switched on by only one physical switch.


 </td></tr>
</table>

13.2.1.8 *Binary input: REMOTE: Remote off*

Related FW	standard v3.1.0

Description	The controller is forced into OFF mode while this input is active. The controller will return into the previous mode after the input is deactivated. Use this input if you need to disable the controller temporarily from any reason (maintenance, control from a higher-level automation system etc..). Keep in mind that in OFF mode IM-NT automatically closes MCB if there is healthy Mains.

13.2.1.9 *Binary input: REMOTE: Remote MAN*

Related FW	standard v3.1.0
Description	The controller is forced into MAN mode while this input is active. **NOTE:** Programming of firmware and/or configuration is disabled while this input is active, as the programming is allowed in OFF mode only and GenConfig is not able to switch the controller to OFF mode while MAN mode is forced by this input.

13.2.1.10 *Binary input: REMOTE: Remote AUT*

Related FW	standard v3.1.0
Description	The controller is forced into AUT mode while this input is active. **NOTE:** Programming of firmware and/or configuration is disabled while this input is active, as the programming is allowed in OFF mode only and GenConfig is not able to switch the controller to OFF mode while AUT mode is forced by this input.

13.2.1.11 *Binary input: REMOTE: Remote TEST*

Related FW	standard v3.1.0
Description	This function is MCB/MGCB specific. The controller is forced into TEST mode while this input is active. This input can be used, among others, for following purposes: • In combination with a timer module for periodic testing of the engine. • In combination with the input *Test on load* for forcing the genset to start and take over the load by one binary signal (manual switch, higher-level automation system etc.)

13.2.1.12 *Binary input: REMOTE: Remote off*

Related FW	standard v3.1.0
Description	The controller is forced into OFF mode while this input is active. The controller will return into the previous mode after the input is deactivated. Use this input if you need to disable the controller temporarily from any reason (maintenance, control from a higher-level automation system etc..). Keep in mind that in OFF mode IM-NT automatically closes MCB if there is healthy Mains.

13.2.1.13 *Binary input: REMOTE: Remote MAN*

Related FW	standard v3.1.0
Description	The controller is forced into MAN mode while this input is active. **NOTE:** Programming of firmware and/or configuration is disabled while this input is active, as the programming is allowed in OFF mode only and GenConfig is not able to switch the controller to OFF mode while MAN mode is forced by this input.

13.2.1.14 *Binary input: REMOTE: Remote AUT*

Related FW	standard v3.1.0
Description	The controller is forced into AUT mode while this input is active. **NOTE:** Programming of firmware and/or configuration is disabled while this input is active, as the programming is allowed in OFF mode only and GenConfig is not able to switch the controller to OFF mode while AUT mode is forced by this input.

13.2.1.15 *Binary input: REMOTE: Remote TEST*

Related FW	standard v3.1.0
Description	This function is MCB/MGCB specific. The controller is forced into TEST mode while this input is active. This input can be used, among others, for following purposes: • In combination with a timer module for periodic testing of the engine. • In combination with the input *Test on load* for forcing the genset to start and take over the load by one binary signal (manual switch, higher-level automation system etc.)

13.2.1.16 *Binary input: REMOTE: Remote off*

Related FW	standard v3.1.0
Description	The controller is forced into OFF mode while this input is active. The controller will return into the previous mode after the input is deactivated. Use this input if you need to disable the controller temporarily from any reason (maintenance, control from a higher-level automation system etc..). Keep in mind that in OFF mode IM-NT automatically closes MCB if there is healthy Mains.

13.2.1.17 *Binary input: REMOTE: Remote MAN*

Related FW	standard v3.1.0
Description	The controller is forced into MAN mode while this input is active. **NOTE:** Programming of firmware and/or configuration is disabled while this input is active, as the programming is allowed in OFF mode only and GenConfig is not able to switch the controller to OFF mode while MAN mode is forced by this input.

13.2.1.18 *Binary input: REMOTE: Remote AUT*

Related FW	standard v3.1.0
Description	The controller is forced into AUT mode while this input is active. **NOTE:** Programming of firmware and/or configuration is disabled while this input is active, as the programming is allowed in OFF mode only and GenConfig is not able to switch the controller to OFF mode while AUT mode is forced by this input.

13.2.1.19 *Binary input: REMOTE: Remote TEST*

Related FW	standard v3.1.0
Description	This function is MCB/MGCB specific. The controller is forced into TEST mode while this input is active. This input can be used, among others, for following purposes: • In combination with a timer module for periodic testing of the engine. • In combination with the input *Test on load* for forcing the genset to start and take over the load by one binary signal (manual switch, higher-level automation system etc.)

13.2.1.20 *Binary input: REMOTE: Remote off*

Related FW	standard v3.1.0
Description	The controller is forced into OFF mode while this input is active. The controller will return into the previous mode after the input is deactivated. Use this input if you need to disable the controller temporarily from any reason (maintenance, control from a higher-level automation system etc..). Keep in mind that in OFF mode IM-NT automatically closes MCB if there is healthy Mains.

13.2.1.21 *Binary input: REMOTE: Remote MAN*

Related FW	standard v3.1.0
Description	The controller is forced into MAN mode while this input is active. **NOTE:** Programming of firmware and/or configuration is disabled while this input is active, as the programming is allowed in OFF mode only and GenConfig is not able to switch the controller to OFF mode while MAN mode is forced by this input.

13.2.1.22 *Binary input: REMOTE: Remote AUT*

Related FW	standard v3.1.0
Description	The controller is forced into AUT mode while this input is active. **NOTE:** Programming of firmware and/or configuration is disabled while this input is active, as the programming is allowed in OFF mode only and GenConfig is not able to switch the controller to OFF mode while AUT mode is forced by this input.

13.2.1.23 *Binary input: REMOTE: Remote TEST*

Related FW	standard v3.1.0
Description	This function is MCB/MGCB specific. The controller is forced into TEST mode while this input is active. This input can be used, among others, for following purposes: • In combination with a timer module for periodic testing of the engine. • In combination with the input *Test on load* for forcing the genset to start and take over the load by one binary signal (manual switch, higher-level automation system etc.)

13.2.1.24 *Binary input: AccessLock int*

Related FW	standard v3.1.0
Description	This input forces the controller **built-in** terminal into monitoring mode. • Setpoints changes are disabled. • Using control buttons on the panel is disabled even if the controller is in MAN mode. • Change of controller mode is disabled. **NOTE:** As the IS-NT and IGS-NT-BB do not have built-in terminal, this input is assigned to the terminal or IntelliVision (display) #1, which is supposed to be directly attached to the controller or mounted close to it.

13.2.1.25 *Binary input: AccessLock D#2*

Related FW	standard v3.1.0
Description	This input forces the external **local** terminal or IntelliVision (display) #2 into monitoring mode. **NOTE:** Local display means that it is connected to dedicated RS485. There is possibility to connect up to 2 external displays in IG-NT-BB or 1 in IG-NT. It is possible to connect up to 3 external displays in IS-NT-BB and in IS-NT. • Setpoints changes are disabled. • Using control buttons on the panel is disabled even if the controller is in MAN mode. • Change of controller mode is disabled.

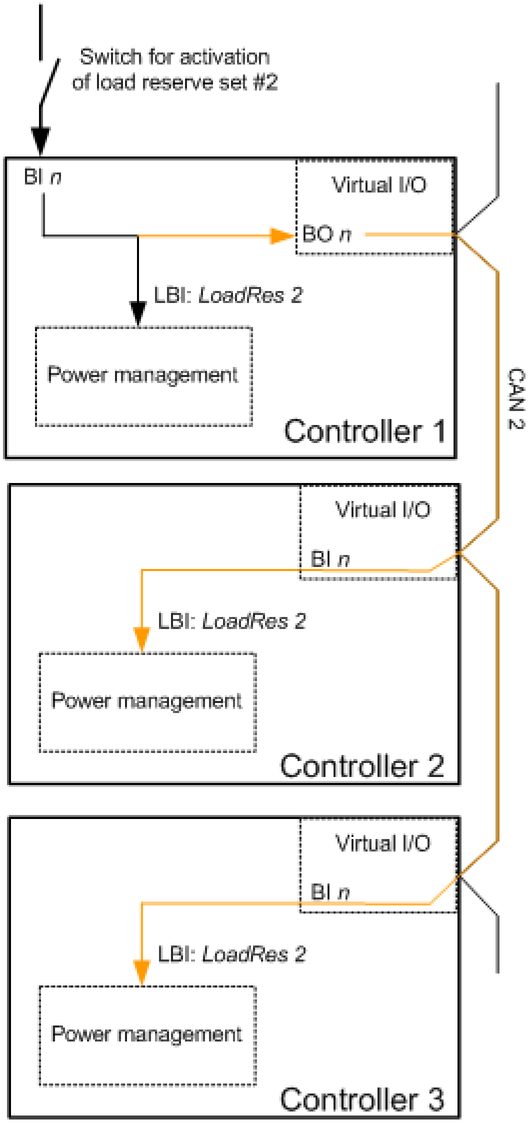
13.2.1.26 *Binary input: AccessLock ext*

Related FW	standard v3.1.0
Description	This input forces all external **remote** terminals into monitoring mode. • Setpoints changes are disabled. • Executing commands is disabled. • Change of controller mode is disabled. An external remote terminal is any device, which reads and/or writes data from/into the controller and is connected to the controller via any other communication bus than the dedicated terminal RS485 bus. **NOTE:** An example of such terminal is a PC with InteliMonitor, any kind of remote

	display connected via CAN2 or a PLC connected to the RS485 and communicating via MODBUS.

13.2.1.27 *Binary input: Load res 2*

Related FW	standard v3.1.0
Description	This input is used to activate the load reserve set #2 instead of the set #1, which is active by default. The set #2 is adjusted by setpoints: • *#LoadResStrt 2* and *#LoadResStop 2* if the power management is switched to absolute mode • *#%LdResStrt 2* and *#%LdResStop 2* if the power management is switched to relative mode. **CAUTION!** All controllers cooperating together in Power management must have **the same load reserve set selected.** **NOTE:** It is possible to use *virtual peripheries* for distribution of the binary signal from one physical switch connected to one controller to all other controllers over the CAN bus.

	 EXAMPLE OF USING VIRTUAL PERIPHERIES FOR SIGNAL DISTRIBUTION

13.2.1.28 *Binary input: Load res 3*

Related FW	standard v3.1.0
Description	This input is used to activate the load reserve set #3 instead of the set #1, which is active by default. The set #3 is adjusted by setpoints: - *#LoadResStrt 3* and *#LoadResStop 3* if the power management is switched to absolute (kW-based) mode - *#%LdResStrt 3* and *#%LdResStop 3* if the power management is switched to relative (%Pnom-based) mode. **CAUTION!** All controllers cooperating together in Power management must have **the same load reserve set selected.**

	NOTE: It is possible to use *virtual peripheries* for distribution of the binary signal from one physical switch connected to one controller to all other controllers over the CAN bus. See example in the description of the input *Load res 2*.

13.2.1.29 *Binary input: Load res 4*

Related FW	standard v3.1.0
Description	This input is used to activate the load reserve set #4 instead of the set #1, which is active by default. The set #4 is adjusted by setpoints: • *#LoadResStrt 4* and *#LoadResStop 4* if the power management is switched to absolute (kW-based) mode • *#%LdResStrt 4* and *#%LdResStop 4* if the power management is switched to relative (%Pnom-based) mode. **CAUTION!** All controllers cooperating together in Power management must have **the same load reserve set selected.** **NOTE:** It is possible to use *virtual peripheries* for distribution of the binary signal from one physical switch connected to one controller to all other controllers over the CAN bus. See example in the description of the input *Load res 2*.

13.2.1.30 *Binary input: MCB disable*

Related FW	standard v3.1.0
Description	The input is used to disable issuing the MCB closing command. • If the input is active during synchronizing, the controller will keep the loaded genset group synchronized with the mains without issuing the MCB closing command until the input is deactivated or *Sync timeout* is elapsed. • If the input is active and the MCB button is pressed in MAN mode to close the MCB to dead bus, the MCB will not be closed until the input is deactivated and the MCB button pressed again. • If the input is active and the MCB is to be closed to dead bus automatically, the MCB will not be closed until the input is deactivated.

13.2.1.31 *Binary input: MGCB disable*

Related FW	standard v3.1.0
Description	The input is used to disable issuing the MGCB closing command. • If the input is active during synchronizing, the controller will keep the controller will keep the genset group synchronized without issuing the MGCB closing command until the input is deactivated or *Sync timeout* is elapsed. • If the input is active and the MGCB button is pressed in MAN mode to close the MGCB to dead bus, the MGCB will not be closed until the input is deactivated and the MGCB button pressed again. • If the input is active and the MGCB is to be closed to dead bus automatically, the MGCB will not be closed until the input is deactivated.

13.2.1.32 *Binary input: ManualLdRecon*

Related FW	standard v3.1.0
Description	This input is used for manual reconnection of the last disconnected part of the load, if the load has dropped below the setpoint *Ld recon level*. This input works only if automatic reconnection is disabled, i.e. the setpoint *AutoLd recon* is set to DISABLED.

13.2.1.33 *Binary input: FaultResButton*

Related FW	standard v3.1.0
Description	This input is used for an external FAULT RESET button mounted on the switchboard. The function of the input is identical as function of the fault reset button on the controller front panel. The input is enabled only if the setpoint *Local Button* is set to position EXTBUTTONS or BOTH.

13.2.1.34 *Binary input: HornResButton*

Related FW	standard v3.1.0
Description	This input is used for an external HORN RESET button mounted on the switchboard. The function of the input is identical as function of the horn reset button on the controller front panel. The input is enabled only if the setpoint *Local Button* is set to position EXTBUTTONS or BOTH.

13.2.1.35 *Binary input: StartButton*

Related FW	standard v3.1.0
Description	This input is used for an external START button mounted on the switchboard. The function of the input is identical as function of the start button on the controller front panel. The input is enabled only if the setpoint *Local Button* is set to position EXTBUTTONS or BOTH.

13.2.1.36 *Binary input: StopButton*

Related FW	standard v3.1.0
Description	This input is used for an external STOP button mounted on the switchboard. The function of the input is identical as function of the stop button on the controller front panel. The input is enabled only if the setpoint *Local Button* is set to position EXTBUTTONS or BOTH.

13.2.1.37 *Binary input: MCBButton*

Related FW	standard v3.1.0
Description	This input is used for an external MCB button mounted on the switchboard. The function of the input is identical as function of the MCB button on the controller front panel. The input is enabled only if the setpoint *Local Button* is set to position EXTBUTTONS or BOTH.

13.2.1.38 *Binary input: GroupLink*

Related FW	standard v3.1.0
Description	This input can be mainly used in BTB application. Nonetheless, any IM-NT or IGS-NT controller can be used for group link function even if bus tie breaker is controlled manually or by third party device (only proper feedback from BTB is required). If this input is configured, the group linking function is active, i.e. this controller becomes the status server for two groups of gen-sets and informs them about the BTB status. Closing of this input indicates closing of BTB (i.e. two groups are linked together). Opening of this input indicates opening of BTB (i.e. two groups are working separately). **NOTE:** This input is intended for connecting to the BTB feedback.

	For more information see setpoints *Control group*, *GroupLinkLeft* and *GroupLinkRight* and the chapter logical groups.

13.2.1.39 *Binary input: MGCB open*

Related FW	standard v3.1.0
Description	If this input is closed MGCB closing is not possible. If MGCB is already closed and input *MGCB open* becomes active MGCB is opened immediately. All functions involving MGCB closing are blocked until MGCB open is opened again.

13.2.1.40 *Binary input: Emerg. manual*

<table>
<tr><td>Related FW</td><td>standard v3.1.0</td></tr>
<tr><td>Description</td><td>
<p>CAUTION!</p>
<p>Since InteliMains deactivates its regulation loops, it is not possible to use Emerg. manual when InteliMains has both its breakers closed and the system is running in parallel to Mains. If Emerg. manual needs to be used when the system is in parallel to Mains, make sure that the setpoint <i>SysLdCtrl PtM</i> is set to BASELOAD to prevent gen-sets from running unregulated.</p>
<p>CAUTION!</p>
<p>Running Hours Equalization and Load Demand Swapping are not active in InteliMains and if InteliMains is set to MASTER for these function, no other controller will assume its role eventhough InteliMains is in Emerg. manual.</p>
<p>The controller is accepting manual controll of breakers and other controlled components when the Emerg. manual is active. It deactivates all outputs. This function is also used in case of redundancy to disable redundant controller.</p>
<p>Controller opens following binary inputs (or if already opened these outputs stay inactive):</p>
<table>
<tr><td>BINARY OUTPUTS FOR START AND STOP OF GEN-SET GROUP</td><td>Sys start/stop</td></tr>
<tr><td>BINARY OUTPUTS FOR BREAKER CONTROL</td><td>MCB close/open,
MCB ON coil,
MCB OFF coil,
MCB UV coil,
MGCB ON coil,
MGCB OFF coil,
MGCB UV coil,</td></tr>
</table>
</td></tr>
</table>

	BTB close/open, BTB ON coil, BTB OFF coil, BTB UV coil, LCB close/open, LCB ON coil, LCB OFF coil, LCB UV coil
OTHER BINARY OUTPUTS	In synchronism, ReverseSynchro, ForwardSynchro, EnginesSwapped

The output terminals that are configured with inversion are closed. Voltage, current and power measurement is active all the time, regardless of the actual state of the mains. It is possible to influence breaker under IM-NT supervision without Wrn MCB fail or Wrn MGCB fail.

After the binary input EMERG. MANUAL is open again, the controller recovers to the previous mode and behaves according to the actual situation.

Function is active in any controller mode and activation of this input is written to history.

NOTE:
The function is intended especially for Marine gen-sets which are supposed to be started manually while the controller has no power supply. To recover successfully from this state, only the signals MCB ON/OFF coil should be used for mains and breaker control, as the other outputs are continuously active during Mains operation and it is not possible to switch them between more control sources.

NOTE:

In InteliMains informational outputs SystReady, Syst res OK and other outputs related to the power management are still active in Emerg. manual mode even though InteliMains does not play active role in power management and load sharing. If there are any user defined functions based on these outputs, blocking those functions (e.g. in PLC) in Emerg. manual mode should be considered.

CAUTION!

Be aware that all outputs related to PLC functions remain functional!

13.2.1.41 *Binary input: Alt brightness*

Related FW	standard v3.1.0

Description	This input is used to switch the **IG-NT built-in** terminal (display) to the alternative backlight intensity mode (e.g. "night mode"). The alternative intensity level is adjusted using the display buttons (see the operator guide for details) while this input is active and is stored in the nonvolatile memory. **NOTE:** A binary input with identical function (not configurable) is located in the power connector of the external IG-Display and IS-Display modules.

13.2.1.42 *Binary input: PulseCounter 1*

Related FW	standard v3.1.0
Description	This is the input of the *PulseCounter #1* module. The module counts pulses at the input and if the input pulses counter reaches value given by the setpoint *ConvCoefPulse1*, the counter value *PulseCounter 1* (in the group *Statistic*) is increased by 1 and input pulses conter is reset to 0. Both counter value and input pulses counter are stored in the nonvolatile memory. The *PulseCounter* modules are intended e.g. for connecting external energy or fuel meters with pulse outputs. **NOTE:** Minimal pulse width as well as minimal pause between two succesive pulses is 100ms. **NOTE:** The counter value can be reset in the InteliMonitor statistics window.

13.2.1.43 *Binary input: PulseCounter 2*

Related FW	standard v3.1.0
Description	This is the input of the *PulseCounter #2* module. The module counts pulses at the input and if the input pulses counter reaches value given by the setpoint *ConvCoefPulse2*, the counter value *PulseCounter 2* (in the group *Statistic*) is increased by 1 and input pulses conter is reset to 0. Both counter value and input pulses counter are stored in the nonvolatile memory. The *PulseCounter* modules are intended e.g. for connecting external energy or fuel meters with pulse outputs. **NOTE:** Minimal pulse width as well as minimal pause between two succesive pulses is 100ms. **NOTE:** The counter value can be reset in the InteliMonitor statistics window.

13.2.1.44 *Binary input: PulseCounter 3*

Related FW	standard v3.1.0
Description	This is the input of the *PulseCounter #3* module. The module counts pulses at the input and if the input pulses counter reaches value given by the setpoint *ConvCoefPulse3*, the counter value *PulseCounter 3* (in the group *Statistic*) is increased by 1 and input pulses conter is reset to 0. Both counter value and input pulses counter are stored in the nonvolatile memory. The *PulseCounter* modules are intended e.g. for connecting external energy or fuel meters with pulse outputs. **NOTE:** Minimal pulse width as well as minimal pause between two succesive pulses is 100ms. **NOTE:** The counter value can be reset in the InteliMonitor statistics window.

13.2.1.45 *Binary input: PulseCounter 4*

Related FW	standard v3.1.0
Description	This is the input of the *PulseCounter #4* module. The module counts pulses at the input and if the input pulses counter reaches value given by the setpoint *ConvCoefPulse4*, the counter value *PulseCounter 4* (in the group *Statistic*) is increased by 1 and input pulses conter is reset to 0. Both counter value and input pulses counter are stored in the nonvolatile memory. The *PulseCounter* modules are intended e.g. for connecting external energy or fuel meters with pulse outputs. **NOTE:** Minimal pulse width as well as minimal pause between two succesive pulses is 100ms. **NOTE:** The counter value can be reset in the InteliMonitor statistics window.

13.2.1.46 *Binary input: Timer block 1*

Related FW	standard v3.1.0

Description	This input is used to disable temporarily the output from the *Timer channel #1*. **NOTE:** See also the setpoint *TimerChannel 1* and output *TimerAct 1-4*. **NOTE:** See the chapter Timers for more details about timers.

13.2.1.47 *Binary input: Timer block 2*

Related FW	standard v3.1.0
Description	This input is used to disable temporarily the output from the *Timer channel #2*. **NOTE:** See also the setpoint *TimerChannel 2* and output *TimerAct 1-4*. **NOTE:** See the chapter Timers for more details about timers.

13.2.1.48 *Binary input: Timer block 3*

Related FW	standard v3.1.0
Description	This input is used to disable temporarily the output from the *Timer channel #3*. **NOTE:** See also the setpoint *TimerChannel 3* and output *TimerAct 1-4*. **NOTE:** See the chapter Timers for more details about timers.

13.2.1.49 *Binary input: Timer block 4*

Related FW	standard v3.1.0
Description	This input is used to disable temporarily the output from the *Timer channel #4*. **NOTE:**

	See also the setpoint *TimerChannel 4* and output *TimerAct 1-4*. **NOTE:** See the chapter Timers for more details about timers.

13.2.1.50 *Binary input: Timer block 5*

Related FW	standard v3.1.0
Description	This input is used to disable temporarily the output from the *Timer channel #5*. **NOTE:** See also the setpoint *TimerChannel 5* and output *TimerAct 5-8*. **NOTE:** See the chapter Timers for more details about timers.

13.2.1.51 *Binary input: Timer block 6*

Related FW	standard v3.1.0
Description	This input is used to disable temporarily the output from the *Timer channel #6*. **NOTE:** See also the setpoint *TimerChannel 6* and output *TimerAct 5-8*. **NOTE:** See the chapter Timers for more details about timers.

13.2.1.52 *Binary input: Timer block 7*

Related FW	standard v3.1.0
Description	This input is used to disable temporarily the output from the *Timer channel #7*. **NOTE:** See also the setpoint *TimerChannel 7* and output *TimerAct 5-8*.

	NOTE: See the chapter Timers for more details about timers.

13.2.1.53 *Binary input: Timer block 8*

Related FW	standard v3.1.0
Description	This input is used to disable temporarily the output from the *Timer channel #8*. **NOTE:** See also the setpoint *TimerChannel 8* and output *TimerAct 5-8*. **NOTE:** See the chapter Timers for more details about timers.

13.2.1.54 *Binary input: Timer block 9*

Related FW	standard v3.1.0
Description	This input is used to disable temporarily the output from the *Timer channel #9*. **NOTE:** See also the setpoint *TimerChannel 9* and output *TimerAct 9-12*. **NOTE:** See the chapter Timers for more details about timers.

13.2.1.55 *Binary input: Timer block 10*

Related FW	standard v3.1.0
Description	This input is used to disable temporarily the output from the *Timer channel #10*. **NOTE:** See also the setpoint *TimerChannel 10* and output *TimerAct 9-12*. **NOTE:** See the chapter Timers for more details about timers.

13.2.1.56 *Binary input: Timer block 11*

Related FW	standard v3.1.0
Description	This input is used to disable temporarily the output from the *Timer channel #11*. **NOTE:** See also the setpoint *TimerChannel 11* and output *TimerAct 9-12*. **NOTE:** See the chapter Timers for more details about timers.

13.2.1.57 *Binary input: Timer block 12*

Related FW	standard v3.1.0
Description	This input is used to disable temporarily the output from the *Timer channel #12*. **NOTE:** See also the setpoint *TimerChannel 12* and output *TimerAct 9-12*. **NOTE:** See the chapter Timers for more details about timers.

13.2.1.58 *Binary input: Timer block 13*

Related FW	standard v3.1.0
Description	This input is used to disable temporarily the output from the *Timer channel #13*. **NOTE:** See also the setpoint *TimerChannel 13* and output *TimerAct 13-16*. **NOTE:** See the chapter Timers for more details about timers.

13.2.1.59 *Binary input: Timer block 14*

Related FW	standard v3.1.0
Description	This input is used to disable temporarily the output from the *Timer channel #14*. **NOTE:** See also the setpoint *TimerChannel 14* and output *TimerAct 13-16*. **NOTE:** See the chapter Timers for more details about timers.

13.2.1.60 *Binary input: Timer block 15*

Related FW	standard v3.1.0
Description	This input is used to disable temporarily the output from the *Timer channel #15*. **NOTE:** See also the setpoint *TimerChannel 15* and output *TimerAct 13-16*. **NOTE:** See the chapter Timers for more details about timers.

13.2.1.61 *Binary input: Timer block 16*

Related FW	standard v3.1.0
Description	This input is used to disable temporarily the output from the *Timer channel #16*. **NOTE:** See also the setpoint *TimerChannel 16* and output *TimerAct 13-16*. **NOTE:** See the chapter Timers for more details about timers.

13.2.1.62 *Binary input: ExtValue1 up*

Related FW	standard v3.1.0

Description	While this input is active the value of *ExtValue 1* is contiously beeing increased at the rate of *ExtValue1 rate* until it reaches *ExtValue1HiLim*. **NOTE:** If this input is used (configured), the *ExtValue 1* can't be written remotely from a remote terminal using the command *ExtValue 1*.

13.2.1.63 *Binary input: ExtValue1 down*

Related FW	standard v3.1.0
Description	While this input is active the value of *ExtValue 1* is contiously beeing decreased at the rate of *ExtValue1 rate* until it reaches *ExtValue1LoLim*. **NOTE:** If this input is used (configured), the *ExtValue 1* can't be written remotely from a remote terminal using the command *ExtValue 1*.

13.2.1.64 *Binary input: ExtValue2 up*

Related FW	standard v3.1.0
Description	While this input is active the value of *ExtValue 2* is contiously beeing increased at the rate of *ExtValue2 rate* until it reaches *ExtValue2HiLim*. **NOTE:** If this input is used (configured), the *ExtValue 2* can't be written remotely from a remote terminal using the command *ExtValue 2*.

13.2.1.65 *Binary input: ExtValue2 down*

Related FW	standard v3.1.0
Description	While this input is active the value of *ExtValue 2* is contiously beeing decreased at the rate of *ExtValue2 rate* until it reaches *ExtValue2LoLim*. **NOTE:** If this input is used (configured), the *ExtValue 2* can't be written remotely from a remote terminal using the command *ExtValue 2*.

13.2.1.66 *Binary input: ExtValue3 up*

Related FW	standard v3.1.0

Description	While this input is active the value of *ExtValue 3* is contiously beeing increased at the rate of *ExtValue3 rate* until it reaches *ExtValue3HiLim*. **NOTE:** If this input is used (configured), the *ExtValue 3* can't be written remotely from a remote terminal using the command *ExtValue 3*.

13.2.1.67 *Binary input: ExtValue3 down*

Related FW	standard v3.1.0
Description	While this input is active the value of *ExtValue 3* is contiously beeing decreased at the rate of *ExtValue3 rate* until it reaches *ExtValue3LoLim*. **NOTE:** If this input is used (configured), the *ExtValue 3* can't be written remotely from a remote terminal using the command *ExtValue 3*.

13.2.1.68 *Binary input: ExtValue4 up*

Related FW	standard v3.1.0
Description	While this input is active the value of *ExtValue 4* is contiously beeing increased at the rate of *ExtValue4 rate* until it reaches *ExtValue4HiLim*. **NOTE:** If this input is used (configured), the *ExtValue 4* can't be written remotely from a remote terminal using the command *ExtValue 4*.

13.2.1.69 *Binary input: ExtValue4 down*

Related FW	standard v3.1.0
Description	While this input is active the value of *ExtValue 4* is contiously beeing decreased at the rate of *ExtValue4 rate* until it reaches *ExtValue4LoLim*. **NOTE:** If this input is used (configured), the *ExtValue 4* can't be written remotely from a remote terminal using the command *ExtValue 4*.

13.2.1.70 *Binary input: ExtValue1reset*

Related FW	standard v3.1.0

Description	The *ExtValue 1* is reset to it's default value when this input is activated and held there until the input is deactivated. The default value is given by the setpoint *ExtValue1deflt*. While the reset input is active: • The value does not respond to up and down inputs. • The value does not accept new data that are written remotely from a remote terminal using the *ExtValue* command. **NOTE:** Configuring of the reset input does not block writing the ExtValue remotely, in comparison to the up and down inputs, which does. However, if the reset input is active, the remotely written data are not accepted.

13.2.1.71 *Binary input: ExtValue2reset*

Related FW	standard v3.1.0
Description	The *ExtValue 2* is reset to it's default value when this input is activated and held there until the input is deactivated. The default value is given by the setpoint *ExtValue2deflt*. While the reset input is active: • The value does not respond to up and down inputs. • The value does not accept new data that are written remotely from a remote terminal using the *ExtValue* command. **NOTE:** Configuring of the reset input does not block writing the ExtValue remotely, in comparison to the up and down inputs, which does. However, if the reset input is active, the remotely written data are not accepted.

13.2.1.72 *Binary input: ExtValue3reset*

Related FW	standard v3.1.0
Description	The *ExtValue 3* is reset to it's default value when this input is activated and held there until the input is deactivated. The default value is given by the setpoint *ExtValue3deflt*. While the reset input is active: • The value does not respond to up and down inputs. • The value does not accept new data that are written remotely from a remote terminal using the *ExtValue* command. **NOTE:** Configuring of the reset input does not block writing the ExtValue remotely, in

	comparison to the up and down inputs, which does. However, if the reset input is active, the remotely written data are not accepted.

13.2.1.73 *Binary input: ExtValue4reset*

Related FW	standard v3.1.0
Description	The *ExtValue 4* is reset to it's default value when this input is activated and held there until the input is deactivated. The default value is given by the setpoint *ExtValue4deflt*. While the reset input is active: • The value does not respond to up and down inputs. • The value does not accept new data that are written remotely from a remote terminal using the *ExtValue* command. **NOTE:** Configuring of the reset input does not block writing the ExtValue remotely, in comparison to the up and down inputs, which does. However, if the reset input is active, the remotely written data are not accepted.

13.2.1.74 *Binary input: IssueActCallC1*

Related FW	standard v3.1.0
Description	This input forces the controller to issue an active call/e-mail/SMS via the channel #1. Type of the channel is to be adjusted by the setpoint *AcallCH1-Type*. This input can be used to inform a remote user about a specific non-alarm situation, e.g. mains failure and/or mains return: 1. Select a binary signal in the controller, which indicates, that the particular situation occured, about which you want to be informed remotely. There are many predefined binary informations provided directly by the controller or use PLC functions to create the desired binary signal. 2. Configure an universal protection block to the binary signal mentioned above and select protection type *AL indication*. 3. Configure the binary signal mentioned above onto the logical binary input *IssueActCallC1*.

13.2.1.75 *Binary input: IssueActCallC2*

Related FW	standard v3.1.0

Description	This input forces the controller to issue an active call/e-mail/SMS via the channel #2. Type of the channel is to be adjusted by the setpoint *AcallCH2-Type*. This input can be used to inform a remote user about a specific non-alarm situation, e.g. mains failure and/or mains return: 1. Select a binary signal in the controller, which indicates, that the particular situation occured, about which you want to be informed remotely. There are many predefined binary informations provided directly by the controller or use PLC functions to create the desired binary signal. 2. Configure an universal protection block to the binary signal mentioned above and select protection type *AL indication*. 3. Configure the binary signal mentioned above onto the logical binary input *IssueActCallC2*.

13.2.1.76 *Binary input: IssueActCallC3*

Related FW	standard v3.1.0
Description	This input forces the controller to issue an active call/e-mail/SMS via the channel #3. Type of the channel is to be adjusted by the setpoint *AcallCH3-Type*. This input can be used to inform a remote user about a specific non-alarm situation, e.g. mains failure and/or mains return: 1. Select a binary signal in the controller, which indicates, that the particular situation occured, about which you want to be informed remotely. There are many predefined binary informations provided directly by the controller or use PLC functions to create the desired binary signal. 2. Configure an universal protection block to the binary signal mentioned above and select protection type *AL indication*. 3. Configure the binary signal mentioned above onto the logical binary input *IssueActCallC3*.

13.2.1.77 *Binary input: Time stamp act*

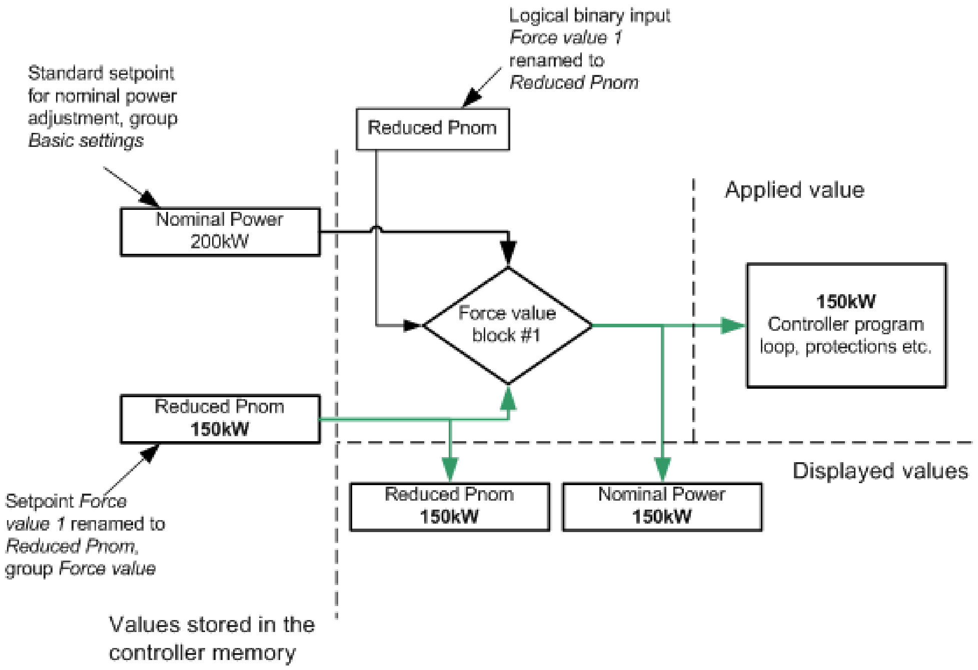
Related FW	standard v3.1.0
Description	Binary input activates time stamp writing to history depending on Date/Time:*Time stamp act* and *Time Stamp Per* setpoints.

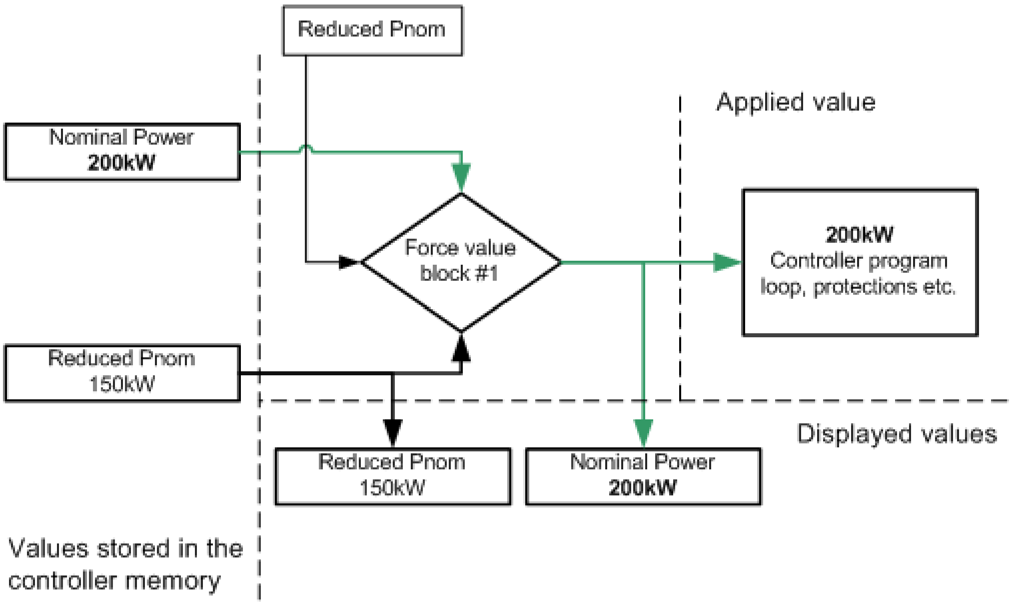
13.2.1.78 *Binary input: CtrlHBeat sens*

Related FW	standard v3.1.0

Description	This input is used at a redundant controller to sense the "heart beat" from the main controller. The input is to be connected to the output *CtrlHeartBeat* of the main controller. If the redundant controller does not sense the heart beat from the main one, it will activate the binary output *CtrlHBeat FD*, which has to be wired in such a way, that it disconnects the dead main controller, connects the redundant controller instead and activates it. **NOTE:** Learn more about redundancy in separate chapter Redundant controllers.

13.2.1.79 *Binary input: ForceValueIn 1*

Related FW	standard v3.1.0
Description	This input activates the *Force value #1* block. If the input is active, the value of the setpoint, to which the Force value #1 block is configured, will be overriden by value of the alternative setpoint assigned to the Force value #1 block. **NOTE:** If there are more than one force value blocks configured onto one setpoint then the highest priority has the block with the lowest index (i.e. the first active block according to the list displayed in GenConfig in the Force value window at the related setpoint). **NOTE:** Watch a training video about force value function here: http://www.comap.cz/support/training/training-videos/. 

	EXAMPLE OF AN ACTIVE FORCE VALUE BLOCK  EXAMPLE OF AN INACTIVE FORCE VALUE BLOCK

13.2.1.80 *Binary input: ForceValueIn 2*

Related FW	standard v3.1.0
Description	This input activates the *Force value #2* block. If the input is active, the value of the setpoint, to which the Force value #2 block is configured, will be overriden by value of the alternative setpoint assigned to the Force value #2 block. **NOTE:** If there are more than one force value blocks configured onto one setpoint then the highest priority has the block with the lowest index (i.e. the first active block according to the list displayed in GenConfig in the Force value window at the related setpoint). **NOTE:** Watch a training video about force value function here: http://www.comap.cz/support/training/training-videos/. **NOTE:** See an example in the description of the binary input *Force value 1*.

13.2.1.81 *Binary input: ForceValueIn 3*

Related FW	standard v3.1.0
Description	This input activates the *Force value #3* block. If the input is active, the value of the setpoint, to which the Force value #3 block is configured, will be overriden by value of the alternative setpoint assigned to the Force value #3 block. **NOTE:** If there are more than one force value blocks configured onto one setpoint then the highest priority has the block with the lowest index (i.e. the first active block according to the list displayed in GenConfig in the Force value window at the related setpoint). **NOTE:** Watch a training video about force value function here: http://www.comap.cz/support/training/training-videos/. **NOTE:** See an example in the description of the binary input *Force value 1*.

13.2.1.82 *Binary input: ForceValueIn 4*

Related FW	standard v3.1.0
Description	This input activates the *Force value #4* block. If the input is active, the value of the setpoint, to which the Force value #4 block is configured, will be overriden by value of the alternative setpoint assigned to the Force value #4 block. **NOTE:** If there are more than one force value blocks configured onto one setpoint then the highest priority has the block with the lowest index (i.e. the first active block according to the list displayed in GenConfig in the Force value window at the related setpoint). **NOTE:** Watch a training video about force value function here: http://www.comap.cz/support/training/training-videos/. **NOTE:** See an example in the description of the binary input *Force value 1*.

13.2.1.83 *Binary input: ForceValueIn 5*

Related FW	standard v3.1.0
Description	This input activates the *Force value #5* block. If the input is active, the value of the setpoint, to which the Force value #5 block is configured, will be overriden by value of the alternative setpoint assigned to the Force value #5 block. **NOTE:** If there are more than one force value blocks configured onto one setpoint then the highest priority has the block with the lowest index (i.e. the first active block according to the list displayed in GenConfig in the Force value window at the related setpoint). **NOTE:** Watch a training video about force value function here: http://www.comap.cz/support/training/training-videos/. **NOTE:** See an example in the description of the binary input *Force value 1*.

13.2.1.84 *Binary input: ForceValueIn 6*

Related FW	standard v3.1.0
Description	This input activates the *Force value #6* block. If the input is active, the value of the setpoint, to which the Force value #6 block is configured, will be overriden by value of the alternative setpoint assigned to the Force value #6 block. **NOTE:** If there are more than one force value blocks configured onto one setpoint then the highest priority has the block with the lowest index (i.e. the first active block according to the list displayed in GenConfig in the Force value window at the related setpoint). **NOTE:** Watch a training video about force value function here: http://www.comap.cz/support/training/training-videos/. **NOTE:** See an example in the description of the binary input *Force value 1*.

13.2.1.85 *Binary input: ForceValueIn 7*

Related FW	standard v3.1.0
Description	This input activates the *Force value #7* block. If the input is active, the value of the setpoint, to which the Force value #7 block is configured, will be overriden by value of the alternative setpoint assigned to the Force value #7 block. **NOTE:** If there are more than one force value blocks configured onto one setpoint then the highest priority has the block with the lowest index (i.e. the first active block according to the list displayed in GenConfig in the Force value window at the related setpoint). **NOTE:** Watch a training video about force value function here: http://www.comap.cz/support/training/training-videos/. **NOTE:** See an example in the description of the binary input *Force value 1*.

13.2.1.86 *Binary input: ForceValueIn 8*

Related FW	standard v3.1.0
Description	This input activates the *Force value #8* block. If the input is active, the value of the setpoint, to which the Force value #8 block is configured, will be overriden by value of the alternative setpoint assigned to the Force value #8 block. **NOTE:** If there are more than one force value blocks configured onto one setpoint then the highest priority has the block with the lowest index (i.e. the first active block according to the list displayed in GenConfig in the Force value window at the related setpoint). **NOTE:** Watch a training video about force value function here: http://www.comap.cz/support/training/training-videos/. **NOTE:** See an example in the description of the binary input *Force value 1*.

13.2.1.87 *Binary input: ForceValueIn 9*

Related FW	standard v3.1.0
Description	This input activates the *Force value #9* block. If the input is active, the value of the setpoint, to which the Force value #9 block is configured, will be overriden by value of the alternative setpoint assigned to the Force value #9 block. **NOTE:** If there are more than one force value blocks configured onto one setpoint then the highest priority has the block with the lowest index (i.e. the first active block according to the list displayed in GenConfig in the Force value window at the related setpoint). **NOTE:** Watch a training video about force value function here: http://www.comap.cz/support/training/training-videos/. **NOTE:** See an example in the description of the binary input *Force value 1*.

13.2.1.88 *Binary input: ForceValueIn10*

Related FW	standard v3.1.0
Description	This input activates the *Force value #10* block. If the input is active, the value of the setpoint, to which the Force value #10 block is configured, will be overriden by value of the alternative setpoint assigned to the Force value #10 block. **NOTE:** If there are more than one force value blocks configured onto one setpoint then the highest priority has the block with the lowest index (i.e. the first active block according to the list displayed in GenConfig in the Force value window at the related setpoint). **NOTE:** Watch a training video about force value function here: http://www.comap.cz/support/training/training-videos/. **NOTE:** See an example in the description of the binary input *Force value 1*.

13.2.1.89 *Binary input: ForceValueIn11*

Related FW	standard v3.1.0
Description	This input activates the *Force value #11* block. If the input is active, the value of the setpoint, to which the Force value #11 block is configured, will be overriden by value of the alternative setpoint assigned to the Force value #11 block. **NOTE:** If there are more than one force value blocks configured onto one setpoint then the highest priority has the block with the lowest index (i.e. the first active block according to the list displayed in GenConfig in the Force value window at the related setpoint). **NOTE:** Watch a training video about force value function here: http://www.comap.cz/support/training/training-videos/. **NOTE:** See an example in the description of the binary input *Force value 1*.

13.2.1.90 *Binary input: ForceValueIn12*

Related FW	standard v3.1.0
Description	This input activates the *Force value #12* block. If the input is active, the value of the setpoint, to which the Force value #12 block is configured, will be overriden by value of the alternative setpoint assigned to the Force value #12 block. **NOTE:** If there are more than one force value blocks configured onto one setpoint then the highest priority has the block with the lowest index (i.e. the first active block according to the list displayed in GenConfig in the Force value window at the related setpoint). **NOTE:** Watch a training video about force value function here: http://www.comap.cz/support/training/training-videos/. **NOTE:** See an example in the description of the binary input *Force value 1*.

13.2.1.91 *Binary input: ForceValueIn13*

Related FW	standard v3.1.0
Description	This input activates the *Force value #13* block. If the input is active, the value of the setpoint, to which the Force value #13 block is configured, will be overriden by value of the alternative setpoint assigned to the Force value #13 block. **NOTE:** If there are more than one force value blocks configured onto one setpoint then the highest priority has the block with the lowest index (i.e. the first active block according to the list displayed in GenConfig in the Force value window at the related setpoint). **NOTE:** Watch a training video about force value function here: http://www.comap.cz/support/training/training-videos/. **NOTE:** See an example in the description of the binary input *Force value 1*.

13.2.1.92 *Binary input: ForceValueIn14*

Related FW	standard v3.1.0
Description	This input activates the *Force value #14* block. If the input is active, the value of the setpoint, to which the Force value #14 block is configured, will be overriden by value of the alternative setpoint assigned to the Force value #14 block. **NOTE:** If there are more than one force value blocks configured onto one setpoint then the highest priority has the block with the lowest index (i.e. the first active block according to the list displayed in GenConfig in the Force value window at the related setpoint). **NOTE:** Watch a training video about force value function here: http://www.comap.cz/support/training/training-videos/. **NOTE:** See an example in the description of the binary input *Force value 1*.

13.2.1.93 *Binary input: ForceValueIn15*

Related FW	standard v3.1.0
Description	This input activates the *Force value #15* block. If the input is active, the value of the setpoint, to which the Force value #15 block is configured, will be overriden by value of the alternative setpoint assigned to the Force value #15 block. **NOTE:** If there are more than one force value blocks configured onto one setpoint then the highest priority has the block with the lowest index (i.e. the first active block according to the list displayed in GenConfig in the Force value window at the related setpoint). **NOTE:** Watch a training video about force value function here: http://www.comap.cz/support/training/training-videos/. **NOTE:** See an example in the description of the binary input *Force value 1*.

13.2.1.94 *Binary input: ForceValueIn16*

Related FW	standard v3.1.0
Description	This input activates the *Force value #16* block. If the input is active, the value of the setpoint, to which the Force value #16 block is configured, will be overriden by value of the alternative setpoint assigned to the Force value #16 block. **NOTE:** If there are more than one force value blocks configured onto one setpoint then the highest priority has the block with the lowest index (i.e. the first active block according to the list displayed in GenConfig in the Force value window at the related setpoint). **NOTE:** Watch a training video about force value function here: http://www.comap.cz/support/training/training-videos/. **NOTE:** See an example in the description of the binary input *Force value 1*.

13.2.1.95 *Binary input: Force block 1*

Related FW	standard v3.1.0
Description	This is one of three binary inputs used for user-defined blocking of protections. If the input is active, all the protections that have *Protection block type* configured as *Force block 1* block type are blocked (i.e. temporarily disabled).

13.2.1.96 *Binary input: Force block 2*

Related FW	standard v3.1.0
Description	This is one of three binary inputs used for user-defined blocking of protections. If the input is active, all the protections that have *Protection block type* configured as *Force block 2* block type are blocked (i.e. temporarily disabled).

13.2.1.97 *Binary input: Force block 3*

Related FW	standard v3.1.0
Description	This is one of three binary inputs used for user-defined blocking of protections. If the input is active, all the protections that have *Protection block type* configured as *Force block 3* block type are blocked (i.e. temporarily disabled).

13.2.1.98 *Binary input: Lang sel int A*

Related FW	standard v3.1.0
Description	This is one of three binary inputs *Lang sel int A*, *Lang sel int B*, *Lang sel int C*, used for selecting language of the **built-in** IG-NT terminal (display). As the IS-NT does not have built-in terminal, this input is assigned to the terminal (display) #1, which is supposed to be directly attached to the controller or mounted close to it. **NOTE:** Using these inputs for language selection is an option only. If the inputs are not configured, the language can be selected using the menus on the terminal. ENCODING TABLE

LANGUAGE INDEX	INPUT A	INPUT B	INPUT C
0	0	0	0

1	1	0	0
2	0	1	0
3	1	1	0
4	0	0	1
5	1	0	1
6	0	1	1
7	1	1	1

NOTE:

"0" in the table means the input is not active or not configured.

NOTE:

Language index 0 selects the default language of the terminal, i.e. the language, which is adjusted in the terminal using it's menus.

NOTE:

The reaction on changes of these inputs is delayed about 1 sec to ensure the new combination is valid (e.g. if a rotary selector switch is used).

CAUTION!

Each language change causes the reinitialization of the display. Function of the controller is not influenced.

13.2.1.99 *Binary input: Lang sel int B*

Related FW	standard v3.1.0
Description	This is one of three binary inputs *Lang sel int A*, *Lang sel int B*, *Lang sel int C*, used for selecting language of the **built-in** IG-NT terminal (display). As the IS-NT does not have built-in terminal, this input is assigned to the terminal (display) #1, which is supposed to be directly attached to the controller or mounted close to it. **NOTE:** Using these inputs for language selection is an option only. If the inputs are not configured, the language can be selected using the menus on the terminal.

ENCODING TABLE

LANGUAGE INDEX	INPUT A	INPUT B	INPUT C
0	0	0	0
1	1	0	0
2	0	1	0
3	1	1	0
4	0	0	1
5	1	0	1
6	0	1	1
7	1	1	1

NOTE:

"0" in the table means the input is not active or not configured.

NOTE:

Language index 0 selects the default language of the terminal, i.e. the language, which is adjusted in the terminal using it's menus.

NOTE:

The reaction on changes of these inputs is delayed about 1 sec to ensure the new combination is valid (e.g. if a rotary selector switch is used).

CAUTION!

Each language change causes the reinitialization of the display. Function of the controller is not influenced.

13.2.1.100 *Binary input: Lang sel int C*

Related FW	standard v3.1.0
Description	This is one of three binary inputs *Lang sel int A*, *Lang sel int B*, *Lang sel int C*, used for selecting language of the **built-in** IG-NT terminal (display). As the IS-NT does not have built-in terminal, this input is assigned to the terminal (display) #1, which is supposed to be directly attached to the controller or

mounted close to it.

NOTE:
Using these inputs for language selection is an option only. If the inputs are not configured, the language can be selected using the menus on the terminal.

ENCODING TABLE

LANGUAGE INDEX	INPUT A	INPUT B	INPUT C
0	0	0	0
1	1	0	0
2	0	1	0
3	1	1	0
4	0	0	1
5	1	0	1
6	0	1	1
7	1	1	1

NOTE:

"0" in the table means the input is not active or not configured.

NOTE:

Language index 0 selects the default language of the terminal, i.e. the language, which is adjusted in the terminal using it's menus.

NOTE:

The reaction on changes of these inputs is delayed about 1 sec to ensure the new combination is valid (e.g. if a rotary selector switch is used).

CAUTION!

Each language change causes the reinitialization of the display. Function of the controller is not influenced.

13.2.1.101 *Binary input: Lang sel D#2 A*

<table>
<tr><td>Related FW</td><td>standard v3.1.0</td></tr>
<tr><td>Description</td><td>This is one of three binary inputs <i>Lang sel D#2 A</i>, <i>Lang sel D#2 B</i>, <i>Lang sel D#2 C</i>, used for selecting language of the external local terminal #2.

NOTE:
Using these inputs for language selection is an option only. If the inputs are not configured, the language can be selected using the menus on the terminal.

ENCODING TABLE

<table>
<tr><th>LANGUAGE INDEX</th><th>INPUT A</th><th>INPUT B</th><th>INPUT C</th></tr>
<tr><td>0</td><td>0</td><td>0</td><td>0</td></tr>
<tr><td>1</td><td>1</td><td>0</td><td>0</td></tr>
<tr><td>2</td><td>0</td><td>1</td><td>0</td></tr>
<tr><td>3</td><td>1</td><td>1</td><td>0</td></tr>
<tr><td>4</td><td>0</td><td>0</td><td>1</td></tr>
<tr><td>5</td><td>1</td><td>0</td><td>1</td></tr>
<tr><td>6</td><td>0</td><td>1</td><td>1</td></tr>
<tr><td>7</td><td>1</td><td>1</td><td>1</td></tr>
</table>

NOTE:
"0" in the table means the input is not active or not configured.

NOTE:
Language index 0 selects the default language of the terminal, i.e. the language, which is adjusted in the terminal using it's menus.

NOTE:
The reaction on changes of these inputs is delayed about 1 sec to ensure the new combination is valid (e.g. if a rotary selector switch is used).

CAUTION!
Each language change causes the reinitialization of the display. Function of the controller is not influenced.</td></tr>
</table>

13.2.1.102 *Binary input: Lang sel D#2 B*

Related FW	standard v3.1.0
Description	This is one of three binary inputs *Lang sel D#2 A*, *Lang sel D#2 B*, *Lang sel D#2 C*, used for selecting language of the **external** local terminal #2. **NOTE:** Using these inputs for language selection is an option only. If the inputs are not configured, the language can be selected using the menus on the terminal. ENCODING TABLE (see table below) **NOTE:** "0" in the table means the input is not active or not configured. **NOTE:** Language index 0 selects the default language of the terminal, i.e. the language, which is adjusted in the terminal using it's menus. **NOTE:** The reaction on changes of these inputs is delayed about 1 sec to ensure the new combination is valid (e.g. if a rotary selector switch is used).

ENCODING TABLE

LANGUAGE INDEX	INPUT A	INPUT B	INPUT C
0	0	0	0
1	1	0	0
2	0	1	0
3	1	1	0
4	0	0	1
5	1	0	1
6	0	1	1
7	1	1	1

	CAUTION! Each language change causes the reinitialization of the display. Function of the controller is not influenced.

13.2.1.103 *Binary input: Lang sel D#2 C*

Related FW	standard v3.1.0
Description	This is one of three binary inputs *Lang sel D#2 A*, *Lang sel D#2 B*, *Lang sel D#2 C*, used for selecting language of the **external** local terminal #2. **NOTE:** Using these inputs for language selection is an option only. If the inputs are not configured, the language can be selected using the menus on the terminal. ENCODING TABLE

LANGUAGE INDEX	INPUT A	INPUT B	INPUT C
0	0	0	0
1	1	0	0
2	0	1	0
3	1	1	0
4	0	0	1
5	1	0	1
6	0	1	1
7	1	1	1

NOTE:

"0" in the table means the input is not active or not configured.

NOTE:

Language index 0 selects the default language of the terminal, i.e. the language, which is adjusted in the terminal using it's menus.

NOTE:

	The reaction on changes of these inputs is delayed about 1 sec to ensure the new combination is valid (e.g. if a rotary selector switch is used). **CAUTION!** Each language change causes the reinitialization of the display. Function of the controller is not influenced.

13.2.1.104 *Binary input: MinRun power 1*

Related FW	standard v3.1.0
Description	This input is used to activate the function Minimal running power #1, which is adjusted by setpoint *#MinRunPower 1*. **NOTE:** The default value of minimal running power, which takes place while none of the inputs *MinRun power x*, is 0kW. **NOTE:** If more then one binary input for MinRunPower is activated, the one with the highest number is used (i.e. its corresponding value). **CAUTION!** All controllers cooperating together in Power management must have **the same minimal running power selected.** **NOTE:** It is possible to use *virtual peripheries* for distribution of the binary signal from one physical switch connected to one controller to all other controllers over the CAN bus. See the principial diagram of such distribution in the description of the input *Load res 2*.

13.2.1.105 *Binary input: MinRun power 2*

Related FW	standard v3.1.0
Description	This input is used to activate the function Minimal running power #2, which is adjusted by setpoint *#MinRunPower 2*. **NOTE:** The default value of minimal running power, which takes place while none of the inputs *MinRun power x*, is 0kW. **NOTE:**

	If more then one binary input for MinRunPower is activated, the one with the highest number is used (i.e. its corresponding value). **CAUTION!** All controllers cooperating together in Power management must have **the same minimal running power selected.** **NOTE:** It is possible to use *virtual peripheries* for distribution of the binary signal from one physical switch connected to one controller to all other controllers over the CAN bus. See the principial diagram of such distribution in the description of the input *Load res 2*.

13.2.1.106 *Binary input: MinRun power 3*

Related FW	standard v3.1.0
Description	This input is used to activate the function Minimal running power #3, which is adjusted by setpoint *#MinRunPower 3*. **NOTE:** The default value of minimal running power, which takes place while none of the inputs *MinRun power x*, is 0kW. **NOTE:** If more then one binary input for MinRunPower is activated, the one with the highest number is used (i.e. its corresponding value). **CAUTION!** All controllers cooperating together in Power management must have **the same minimal running power selected.** **NOTE:** It is possible to use *virtual peripheries* for distribution of the binary signal from one physical switch connected to one controller to all other controllers over the CAN bus. See the principial diagram of such distribution in the description of the input *Load res 2*.

13.2.1.107 *Binary input: MCBIsolated*

Related FW	standard v3.1.0
Description	This input can be used for secondary breaker feedback. When this logical binary input gets activated the controller will consider the corresponding CB

	to be opened regardless of the position of normal and negative feedback of that CB.

13.2.1.108 *Binary input: MGCBIsolated*

Related FW	standard v3.1.0
Description	This input can be used for secondary breaker feedback. When this logical binary input gets activated the controller will consider the corresponding CB to be opened regardless of the position of normal and negative feedback of that CB.

13.2.1.109 *Binary input: ImpCountSet1-4*

Related FW	standard v3.2.0
Description	This binary input sets the according impulse counter to a value in setpoint ImpCountDef.

14 Binary output functions

14.1 Virtual and physical modules

Number of I/O can be extended and project wiring can be reduced using the following extension and virtual modules.

MODULE NAME	BIN	BOUT	AIN	AOUT	NOTE	NUMBER OF MODULES SUPPORTED BY CONTROLLER
					Controllers	
IM-NT(C)-BB controller	12	12	3	1	Controller I/O.	-
IM-NT controller	6	6	-	-	Controller I/O.	-
					Extension modules	
IGS-PTM	8	8	4	1	Standard I/O extension module.	4
IS-AIN8	-	-	8	-	Standard I/O extension module.	10
I-AOUT8	-	-	-	8	Standard I/O extension module.	4
IS-BIN16/8	16	8	-	-	Standard I/O extension module.	6
IGL-RA15	-	15	-	-	15 Green, Red, Yellow LED panel.	4
Inteli-AIN8	-	-	8+1	-	Standard I/O extension module. One Frequency/Pulse input.	10
Inteli-AIN8TC	-	-	8	-	Standard I/O extension module	10
Inteli-IO8/8	8	8	-	2	Standard I/O extension module	12
Inteli-IO16/0	16	-	-	2	Standard I/O extension module	6
					Virtual modules	
VPIO	8	8	-	-	Virtual periphery I/O module.	4
SHBIN	8	-	-	-	SHared (virtual) Binary INput module	6
SHBOUT	-	8	-	-	SHared (virtual) Binary OUTput module	6

SHAIN	-	-	4	-	Shared (virtual) Analog Input module	2
SHAOUT	-	-	-	4	Shared (virtual) Analog OUTput module	2
PLC	x	x	x	x	Programmable (internal) logic module.	1

NOTE:
Maximum number of configured modules (both extension and virtual) is given by available addresses. The numbers in the table are valid in the case that no other modules are configured.

14.2 Table of binary output functions

14.2.1.1 *Binary output: Sys start/stop*

Related FW	standard v3.1.0
Description	The output serves for easy interfacing with gen-set IG/IS-NT controllers. It can be directly connected to their Sys start/stop inputs which serve to control a group of gen-sets. Sys start/stop output is closed if: • If binary input Rem start/stop gets active (AUT mode only). • If binary input *Test on load* gets active (TEST mode only). • If AMF condition is sensed in IM-NT and the gen-set group should be started as stand-by power source (AUT mode only). • If PeakShaving function senses that it is suitable to start the gen-set group in order to lower the mains import (AUT mode only). • If Start button is pressed on IM-NT front panel or remotely (MAN mode only). The signal can be deactivated by pressing the Stop button. If the controller is switched from AUT to MAN mode, the internal status of the flip-flop circuit created by Start-Stop buttons is set to follow the previous state in AUT mode. E.g. if the gen-set group has run in an AMF situation in AUT mode, switching to MAN will not stop it (= Sys start/stop output stays active). Sys start/stop output is opened if: • If binary inpu Rem start/stop gets inactive (AUT mode only). • If binary input *Test on load* gets inactive (TEST mode only). • If mains is recovered and after MCB is clossed (synchro enable). If Synchro enable = none than Sys start/stop signal gets inactive after mains is recovered. • If required power is under PeakLevelStop during PeakAutS/S del Sys start/stop gets inactive. • If STOP button is pressed on IM-NT front panel or remotely (MAN mode only). Sys start/stop button stayed in the previous state despite of mode changing. **NOTE:** For MGCB application - in first and third case (output closing - first paragraph), before the output Sys start/stop is activated, the MGCB close

	command is issued. This makes it easier to bring the gen-sets to the mains-parallel operation. If MGCB should stay open until all required gen-sets are synchronized on the generator bus (without load), adjust the setpoint *MGCBparalClose* to NO.

14.2.1.2 *Binary output: MGCB close/open*

Related FW	standard v3.1.0
Description	MGCB application only This output is intended for control of the MGCB if a **contactor** is used as MGCB. The output provides continuous signal while the MGCB has to be closed. See timing diagram of all available breaker control outputs in the description of the *MCB close/open* output. **NOTE:** Use *invert* function when configuring the output in GenConfig to obtain **inverted function** of the output, i.e. output is closed while the MGCB has to be open. There are also other outputs availabe for MGCB control: • *MGCB ON coil* • *MGCB OFF coil* • *MGCB UV coil*

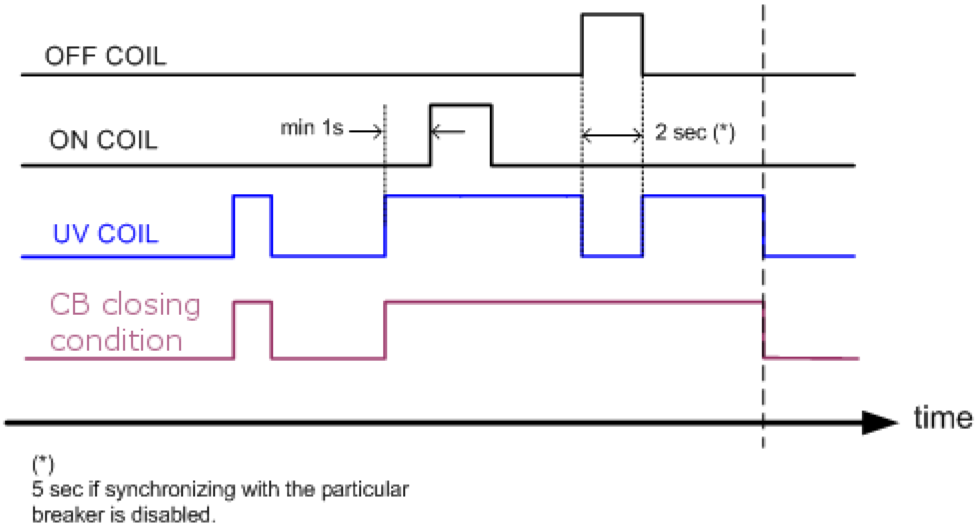
14.2.1.3 *Binary output: MGCB ON Coil*

Related FW	standard v3.1.0
Description	This output is intended for closing of the MGCB using ON coil if a **circuit breaker** is used as MGCB. The output provides 2 sec pulse when the MGCB has to close. If synchronizing is disabled with the particular breaker, the pulse length is extended to 5sec. See timing diagram of all available breaker control outputs in the description of the *MCB close/open* output. There are also other outputs availabe for MGCB control: • *MGCB close/open* • *MGCB OFF coil* • *MGCB UV coil*

14.2.1.4 *Binary output: MGCB OFF Coil*

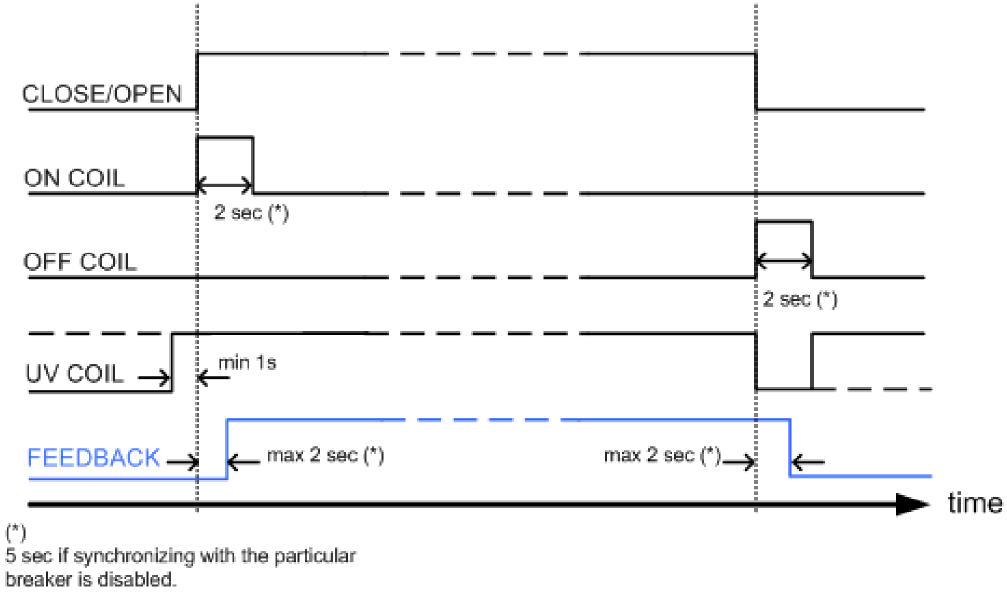
Related FW	standard v3.1.0
Description	This output is intended for opening of the MGCB using OFF coil if a **circuit breaker** is used as MGCB. The output provides 2 sec pulse when the MGCB has to open. If synchronizing is disabled with the particular breaker, the pulse length is extended to 5sec. See timing diagram of all available breaker control outputs in the description of the *MCB close/open* output. There are also other outputs availabe for MGCB control: • *MGCB close/open* • *MGCB ON coil* • *MGCB UV coil*

14.2.1.5 *Binary output: MGCB UV Coil*

Related FW	standard v3.1.0
Description	This output is intended for opening of the MGCB using an undervoltage coil if a **circuit breaker** is used as MGCB. • The output is closed while bus values are within limits. MGCB closing command is blocked for 1 sec after the UV coil has been closed to allow the breaker mechanical system getting ready for closing. • The output is opened for 2 sec when the MGCB has to open. If synchronizing is disabled with the particular breaker, the length of the inverse pulse is extended to 5sec.  MGCB UV COIL OUTPUT TIMING

	There are also other outputs availabe for GCB control: • *MGCB close/open* • *MGCB ON coil* • *MGCB OFF coil*

14.2.1.6 *Binary output: MCB Close/Open*

Related FW	standard v3.1.0
Description	This output is intended for control of the MCB if a **contactor** is used as MCB. The output provides continuous signal while the MCB has to be closed. See timing diagram of all available breaker control outputs at the bottom of this description. **NOTE:** Use *invert* function when configuring the output in GenConfig to obtain **inverted function** of the output, i.e. output is closed while the MCB has to be open. There are also other outputs availabe for MCB control: • *MCB ON coil* • *MCB OFF coil* • *MCB UV coil*  TIMING OF BREAKER CONTROL OUTPUTS

14.2.1.7 *Binary output: MCB ON Coil*

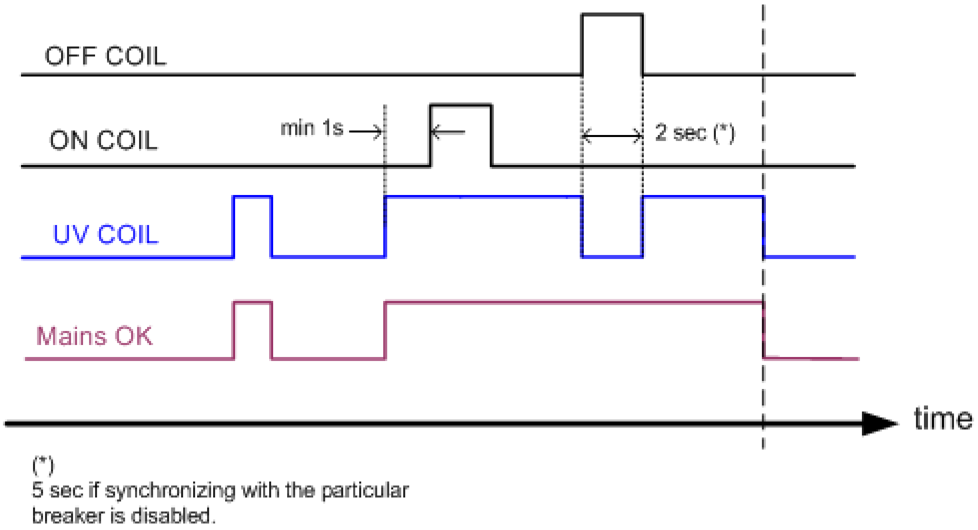
Related FW	standard v3.1.0
Description	This output is intended for closing of the MCB using ON coil if a **circuit breaker** is used as MCB. The output provides 2 sec pulse when the MCB has to close. If synchronizing is disabled with the particular breaker, the pulse length is extended to 5sec. See timing diagram of all available breaker control outputs in the description of the *MGCB close/open* output. There are also other outputs availabe for MCB control: • *MCB close/open* • *MCB OFF coil* • *MCB UV coil*

14.2.1.8 *Binary output: MCB OFF Coil*

Related FW	standard v3.1.0
Description	This output is intended for opening of the MCB using OFF coil if a **circuit breaker** is used as MCB. The output provides 2 sec pulse when the MCB has to open. If synchronizing is disabled with the particular breaker, the pulse length is extended to 5sec. See timing diagram of all available breaker control outputs in the description of the *MGCB close/open* output. There are also other outputs availabe for MCB control: • *MCB close/open* • *MCB ON coil* • *MCB UV coil*

14.2.1.9 *Binary output: MCB UV Coil*

Related FW	standard v3.1.0
Description	This output is intended for opening of the MCB using an undervoltage coil if a **circuit breaker** is used as MCB. • The output is closed while mains values are within limits. MCB closing command is blocked for 1 sec after the UV coil has been closed to allow the breaker mechanical system getting ready for closing. • The output is opened for 2 sec when the MCB has to open. If synchronizing is disabled with the particular breaker, the length of the inverse pulse is extended to 5sec.



MCB UV COIL OUTPUT TIMING

There are also other outputs availabe for GCB control:

- *MCB close/open*
- *MCB ON coil*
- *MCB OFF coil*

14.2.1.10 *Binary output: Vmains <>*

Related FW	standard v3.1.0
Description	The output is closed while the *mains over/under voltage* alarm is present in the alarm list.

14.2.1.11 *Binary output: Vmains <>*

Related FW	standard v3.1.0
Description	The output is closed while the *mains or bus over/under voltage* alarm is present in the alarm list.

14.2.1.12 *Binary output: Vbus <>*

Related FW	standard v3.1.0
Description	The output is closed while the *bus over/under voltage* alarm is present in the alarm list.

14.2.1.13 *Binary output: fmains <>*

Related FW	standard v3.1.0
Description	The output is closed while the *mains over/under frequency* alarm is present in the alarm list.

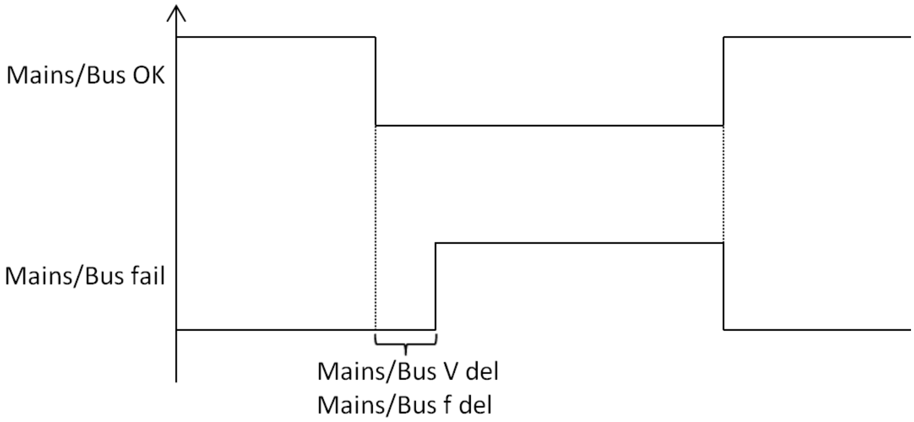
14.2.1.14 *Binary output: fbus <>*

Related FW	standard v3.1.0
Description	The output is closed while the *bus over/under frequency* alarm is present in the alarm list.

14.2.1.15 *Binary output: Bus OK*

Related FW	standard v3.1.0
Description	The output is closed if healthy bus voltage is present. It opens immediately if bus voltage or frequency gets out of the limits.

14.2.1.16 *Binary output: Mains fail*

Related FW	standard v3.1.0
Description	The output is open if healthy mains voltage is present and stays open if mains protection configured on binary input is active regardless of MCB status. It closes with a delay given by mains protections if mains voltage or frequency gets out of the limits. 

14.2.1.17 *Binary output: Bus fail*

Related FW	standard v3.1.0
Description	The output is open if healthy bus voltage is present. It closes with a delay given by bus protections if bus voltage or frequency gets out of the limits. For example see *Mains fail*.

14.2.1.18 *Binary output: VectorShiftTrp*

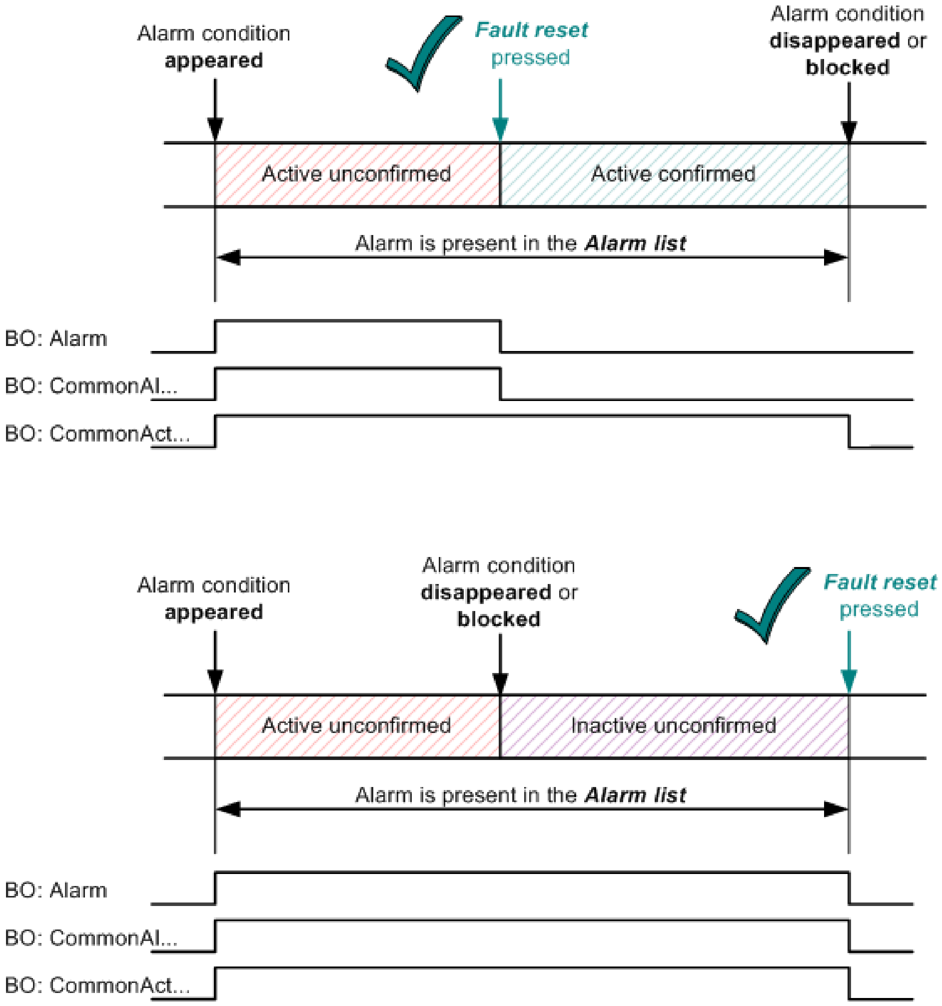
Related FW	standard v3.1.0
Description	The output closes if the *Vector shift* protection gets active. The output stays closed for 3s, then opens again.

14.2.1.19 *Binary output: Horn*

Related FW	standard v3.1.0
Description	The output closes together with the output *Alarm*. It opens when the output *Alarm* is opened or *Horn reset* button is pressed or *Horn timeout* has elapsed.

14.2.1.20 *Binary output: Alarm*

Related FW	standard v3.1.0
Description	The output is closed if there is at least one **unconfirmed** alarm in the alarm list. **NOTE:** Some alarm types as e.g. *Off load*, *History record*, *Low power*, *Mains protection* do not require confirmation, they disappear from the alarm list automatically when the alarm condition disappears. That means the *Alarm* output is not activated by alarms of these types.

	 ALARM STATES AND BEHAVIOR OF RELATED OUTPUTS

14.2.1.21 *Binary output: SystReady*

Related FW	standard v3.1.0
Description	The output is closed while the group of gen-sets has enough capacity to fulfil the requested power reserve. If this output is not closed it means the system has not enough capacity to fulfil the reserve even if all the gen-sets will run. **NOTE:** *Fulfiled reserve* means the actual reserve is above the requested reserve for start. **NOTE:** This output **do not indicate the requested reserve has been already fulfiled**. It only indicates whether the system is able to fulfil it or not.

14.2.1.22 *Binary output: Syst res OK*

Related FW	standard v3.1.0
Description	The output is closed while the actual reserve is above the selected reserve for start.

14.2.1.23 *Binary output: Syst res 1 OK*

Related FW	standard v3.1.0
Description	The output is closed while the actual reserve is above the reserve for start from the reserve set #1.

14.2.1.24 *Binary output: Syst res 2 OK*

Related FW	standard v3.1.0
Description	The output is closed while the actual reserve is above the reserve for start from the reserve set #2.

14.2.1.25 *Binary output: Syst res 3 OK*

Related FW	standard v3.1.0
Description	The output is closed while the actual reserve is above the reserve for start from the reserve set #3.

14.2.1.26 *Binary output: Syst res 4 OK*

Related FW	standard v3.1.0
Description	The output is closed while the actual reserve is above the reserve for start from the reserve set #4.

14.2.1.27 *Binary output: GSG params OK*

Related FW	standard v3.1.0
Description	The output is closed if bus electric values are in limits and there is a sufficient number of loaded gen-sets that do not have 2nd level alarm active (this output is closed regardless of 1st level alarms on gen-sets). For more information on alarm types please refer to Alarms and protections chapter.

14.2.1.28 *Binary output: AllAvailGS run*

Related FW	standard v3.1.0
Description	The output closes if all gen-sets available to take part in PMS are running and loaded. All gen-sets having the same logical group (*Control group*) as this controller has are considered + gen-sets from other logical groups if those are currently linked with controller's logical group (using group link function).

14.2.1.29 *Binary output: Common Wrn*

Related FW	standard v3.1.0
Description	The output is closed while there is at least one alarm of the *Warning* type present in the alarm list. The alarm can be in any state, i.e. active unconfirmed, active confirmed or inactive unconfirmed. See the chapter Alarm management for more information.

14.2.1.30 *Binary output: Common Fls*

Related FW	standard v3.1.0
Description	The output is closed while there is at least one alarm of the *Sensor fail* type present in the alarm list. The alarm can be in **any state**, i.e. active unconfirmed, active confirmed or inactive unconfirmed.See the chapter Alarm management for more information.

14.2.1.31 *Binary output: Common Al*

Related FW	standard v3.1.0
Description	The output is closed while there is at least one alarm of the *Alarm only* type present in the alarm list. The alarm can be in any state, i.e. active unconfirmed, active confirmed or inactive unconfirmed. See the chapter Alarm management for more information.

14.2.1.32 *Binary output: Common Hst*

Related FW	standard v3.1.0
Description	The output is closed for 1s when any alarm of *History record* type appears. See the chapter Alarm management for more information.

14.2.1.33 *Binary output: CommonActLev 1*

Related FW	standard v3.1.0
Description	The output is closed while there is at least one 1st level (yellow) alarm present in the alarm list. The alarm can be in **any state**, i.e. active unconfirmed, active confirmed or inactive unconfirmed. See the chapter Alarm management for more information.

14.2.1.34 *Binary output: CommonAlLev 1*

Related FW	standard v3.1.0
Description	This output is active if there is at least one **unconfirmed** 1st-level (yellow) alarm present in the alarm list. See the chapter Alarm management for more information.

14.2.1.35 *Binary output: CommonActLev 2*

Related FW	standard v3.1.0
Description	The output is closed while there is at least one 2nd level (red) alarm present in the alarm list. The alarm can be in **any state**, i.e. active unconfirmed, active confirmed or inactive unconfirmed.See the chapter Alarm management for more information.

14.2.1.36 *Binary output: CommonAlLev 2*

Related FW	standard v3.1.0
Description	This output is active if there is at least one **unconfirmed** 2nd-level (red) alarm present in the alarm list. See the chapter Alarm management for more information.

14.2.1.37 *Binary output: Alarm flashing*

Related FW	standard v3.1.0
Description	This is the flashing alternative of the output *Alarm*, i.e. the output flashes with period 1s/1s while the output *Alarm* is closed.

14.2.1.38 *Binary output: Horn flashing*

Related FW	standard v3.1.0

Description	This is the flashing alternative of the output *Horn*, i.e. the output flashes with period 1s/1s while the output *Horn* is closed.

14.2.1.39 *Binary output: FltResButnEcho*

Related FW	standard v3.1.0
Description	This output provides 1s pulse when: • *Fault reset* button is pressed on the controller front panel or • *Fault reset* button is pressed on any of external local/remote terminals or • *fault reset* command is received via communication line or • the input *FaultResButton* is activated.

14.2.1.40 *Binary output: HrnResButnEcho*

Related FW	standard v3.1.0
Description	This output provides 1s pulse when: • *Horn reset* button is pressed on the controller front panel or • *Horn reset* button is pressed on any of external local/remote terminals or • *horn reset* command is received via communication line or • the input *HornResButton* is activated.

14.2.1.41 *Binary output: StopButnEcho*

Related FW	standard v3.1.0
Description	This output provides 1s pulse when: • *Stop* button is pressed on the controller front panel or • *Stop* button is pressed on any of external local/remote terminals or • *stop* command is received via communication line or • the input *StopButton* is activated.

14.2.1.42 *Binary output: StartButnEcho*

Related FW	standard v3.1.0
Description	This output provides 1s pulse when: • *Start* button is pressed on the controller front panel or • *Start* button is pressed on any of external local/remote terminals or • *start* command is received via communication line or • the input *StartButton* is activated.

14.2.1.43 *Binary output: MCBButnEcho*

Related FW	standard v3.1.0
Description	This output provides 1s pulse when: • *MCB* button is pressed on the controller front panel or • *MCB* button is pressed on any of external local/remote terminals or • *MCB close/open* command is received via communication line or • the input *MCBButton* is activated.

14.2.1.44 *Binary output: MGCBButnEcho*

Related FW	standard v3.1.0
Description	This output provides 1s pulse when: • *MGCB* button is pressed on the controller front panel or • *MGCB* button is pressed on any of external local/remote terminals or • *MGCB close/open* command is received via communication line or • the input *MGCBButton* is activated.

14.2.1.45 *Binary output: MODES: Off mode*

Related FW	standard v3.1.0
Description	The output is closed while the controller is currently in OFF mode (either switched by the mode selector on the front panel or by the input *Remote OFF*).

14.2.1.46 *Binary output: MODES: Man mode*

Related FW	standard v3.1.0
Description	The output is closed while the controller is currently in MAN mode (either switched by the mode selector on the front panel or by the input *Remote MAN*).

14.2.1.47 *Binary output: MODES: Aut mode*

Related FW	standard v3.1.0
Description	The output is closed while the controller is currently in AUT mode (either switched by the mode selector on the front panel or by the input *Remote AUT*).

14.2.1.48 *Binary output: MODES: Test mode*

Related FW	standard v3.1.0
Description	The output is closed while the controller is currently in TEST mode (either switched by the mode selector on the front panel or by the input *Remote TEST*).

14.2.1.49 *Binary output: MODES: Off mode*

Related FW	standard v3.1.0
Description	The output is closed while the controller is currently in OFF mode (either switched by the mode selector on the front panel or by the input *Remote OFF*).

14.2.1.50 *Binary output: MODES: Man mode*

Related FW	standard v3.1.0
Description	The output is closed while the controller is currently in MAN mode (either switched by the mode selector on the front panel or by the input *Remote MAN*).

14.2.1.51 *Binary output: MODES: Aut mode*

Related FW	standard v3.1.0
Description	The output is closed while the controller is currently in AUT mode (either switched by the mode selector on the front panel or by the input *Remote AUT*).

14.2.1.52 *Binary output: MODES: Test mode*

Related FW	standard v3.1.0
Description	The output is closed while the controller is currently in TEST mode (either switched by the mode selector on the front panel or by the input *Remote TEST*).

14.2.1.53 *Binary output: MODES: Off mode*

Related FW	standard v3.1.0
Description	The output is closed while the controller is currently in OFF mode (either switched by the mode selector on the front panel or by the input *Remote OFF*).

14.2.1.54 *Binary output: MODES: Man mode*

Related FW	standard v3.1.0
Description	The output is closed while the controller is currently in MAN mode (either switched by the mode selector on the front panel or by the input *Remote MAN*).

14.2.1.55 *Binary output: MODES: Aut mode*

Related FW	standard v3.1.0
Description	The output is closed while the controller is currently in AUT mode (either switched by the mode selector on the front panel or by the input *Remote AUT*).

14.2.1.56 *Binary output: MODES: Test mode*

Related FW	standard v3.1.0
Description	The output is closed while the controller is currently in TEST mode (either switched by the mode selector on the front panel or by the input *Remote TEST*).

14.2.1.57 *Binary output: MODES: Off mode*

Related FW	standard v3.1.0
Description	The output is closed while the controller is currently in OFF mode (either switched by the mode selector on the front panel or by the input *Remote OFF*).

14.2.1.58 *Binary output: MODES: Man mode*

Related FW	standard v3.1.0
Description	The output is closed while the controller is currently in MAN mode (either switched by the mode selector on the front panel or by the input *Remote MAN*).

14.2.1.59 *Binary output: MODES: Aut mode*

Related FW	standard v3.1.0
Description	The output is closed while the controller is currently in AUT mode (either switched by the mode selector on the front panel or by the input *Remote AUT*).

14.2.1.60 *Binary output: MODES: Test mode*

Related FW	standard v3.1.0
Description	The output is closed while the controller is currently in TEST mode (either switched by the mode selector on the front panel or by the input *Remote TEST*).

14.2.1.61 *Binary output: MainsParams OK*

Related FW	standard v3.1.0
Description	This output indicates that the mains is healthy. The output is closed while **all mains electrical parameters** are in limits. If MCB is closed, the output deactivates after the the delay for fixed voltage or frequency protections elapses. If MCB is opened, the output deactivates immediately after electrical parameters get out of limit (e.g. frequency, voltage, voltage unbalance etc.).

14.2.1.62 *Binary output: Bus Params OK*

Related FW	standard v3.1.0
Description	This output indicates that the bus is healthy. The output is closed while **all bus electrical parameters** are in limits.

14.2.1.63 *Binary output: TimerAct 1-4*

Related FW	standard v3.1.0
Description	This is combined output from timer channels 1-4. The output is closed if at

	least one of the channels is active. **NOTE:** See the chapter Timers for more details about timers.

14.2.1.64 *Binary output: TimerAct 5-8*

Related FW	standard v3.1.0
Description	This is combined output from timer channels 5-8. The output is closed if at least one of the channels is active. **NOTE:** See the chapter Timers for more details about timers.

14.2.1.65 *Binary output: TimerAct 9-12*

Related FW	standard v3.1.0
Description	This is combined output from timer channels 9-12. The output is closed if at least one of the channels is active. **NOTE:** See the chapter Timers for more details about timers.

14.2.1.66 *Binary output: TimerAct 13-16*

Related FW	standard v3.1.0
Description	This is combined output from timer channels 13-16. The output is closed if at least one of the channels is active. **NOTE:** See the chapter Timers for more details about timers.

14.2.1.67 *Binary output: TimerActiveCom*

Related FW	standard v3.1.0
Description	This is combined output from all timer channels. The output is active if at least one timer channel is active.

14.2.1.68 *Binary output: ReverseSynchro*

Related FW	standard v3.1.0
Description	The output is closed during reverse synchronizing (synchronizing of loaded gen-set group back to the mains) and opens when the output *MCB status* is activated (= MCB was closed). **NOTE:** The output can be used for external synchronizing module control.

14.2.1.69 *Binary output: In synchronism*

Related FW	standard v3.1.0
Description	This output is closed **during synchronization** when all synchro conditions have been fulfilled. The output is opened either when: • the synchro conditions are lost **or** • the corresponding breaker has been closed **or** • the sychronizing was interrupted or timed out. Synchro conditions are following: • Slip frequency is lower than 0.25 Hz • Phase shift between mains and bus (BusLeft and BusRight - in BTB application) voltage must be within range of ±*Phase window* for period longer than *Dwell time*. • Voltage difference between mains and bus (BusLeft and BusRight - in BTB application) voltage (in all phases) must be lower or equal to *Voltage window* for period longer than *Dwell time*. The output is intended for manual synchronization. Automatic closing of MCB/MGCB **must be disabled** for this case. Use the input *MGCB disable* or *MCB disable*.

14.2.1.70 *Binary output: Ready for Load*

Related FW	standard v3.1.0
Description	**MGCB application only!** The output closes when the gen-set group is running (Sys start/stop is active) and output SystReady is active (i.e. sufficient number of gen-sets in Power management is available). The MGCB may be already closed or is available to closing.

14.2.1.71 *Binary output: ForwardSynchro*

Related FW	standard v3.1.0
Description	MGCB application only The output is closed during forward synchronizing and opens when the output *MGCB status* is activated (= MGCB was closed). **NOTE:** The output can be used for control of an external synchronizing module.

14.2.1.72 *Binary output: MGCB status*

Related FW	standard v3.1.0
Description	This output indicates the MGCB position, how it is internally considered in the controller. The position is based on *MGCB feedback* input and optionally also on the *MGCB fdb neg* input. • If only the positive feedback input is used the output mirrors the feedback. • If both feedbacks are used and they match each other the output indicates the MGCB position according to the feedbacks. • If both feedbacks are used, however they do not match each other, the output remains in previous position when they matched. The output can be used for indication of the MGCB position.

14.2.1.73 *Binary output: MCB status*

Related FW	standard v3.1.0
Description	This output indicates the MCB position, how it is internally considered in the controller. The position is based on *MCB feedback* input and optionally also on the *MCB fdb neg* input. • If only the positive feedback input is used the output mirrors the feedback. • If both feedbacks are used and they match each other the output indicates the MCB position according to the feedbacks. • If both feedbacks are used, however they do not match each other, the output remains in previous position when they matched.

	The output can be used for indication of the MCB position.

14.2.1.74 *Binary output: LdShed stage 1*

Related FW	standard v3.1.0
Description	This output is used for control of first load group. This is the group which is disconnected as **first** one when the load shedding function becomes active. Connect **least important** loads to this group. **NOTE:** Learn more about load shedding in the separate chapter Load shedding.

14.2.1.75 *Binary output: LdShed stage 2*

Related FW	standard v3.1.0
Description	This output is used for control of second load group. This group is disconnected as **second** one when the first group is already disconnected and the condition for disconnecting of next group is still fulfiled. **NOTE:** Learn more about load shedding in the separate chapter Load shedding.

14.2.1.76 *Binary output: LdShed stage 3*

Related FW	standard v3.1.0
Description	This output is used for control of third load group. This group is disconnected as **last** one when the first two groups are already disconnected and the condition for disconnecting of next group is still fulfiled. **NOTE:** Learn more about load shedding in the separate chapter Load shedding.

14.2.1.77 *Binary output: CtrlHeartBeat*

Related FW	standard v3.1.0
Description	The output provides alternating signal with rate 500ms active / 500ms inactive while the controller is **operational**, i.e. it has passed all checks after startup and no failure was detected. If the output does not provide the alternating signal it may indicate following:

	• controller is switched off **or** • controller is damaged **or** • incorrect/missing firmware and/or application **or** • corrupted setpoints The output is intended for using in wired redundancy systems at the main controller. Learn more about redundancy in separate chapter Redundant controllers.

14.2.1.78 *Binary output: CtrlHBeat FD*

Related FW	standard v3.1.0
Description	This output is used at a redundant controller to disconnect the main controller, connect the redundant one instead and activate it. The output is closed: • If the input *CtrlHBeat sens* is configured onto any input terminal and the redundancy controller does not sense the "heart beat" signal from the main controller at that terminal. • If the redundant controller has not received two consequent messages from the main controller. The address of the main controller for the particular redundant one is selected by the the setpoint *Watched Contr* . **NOTE:** Learn more about redundancy in separate chapter Redundant controllers.

14.2.1.79 *Binary output: Engines swapped*

Related FW	standard v3.1.0
Description	This output is activated by the master controller for 100 ms pulse when the priority of two gen-sets was swapped by the Running hours equalization function.

14.2.1.80 *Binary output: Logical 0*

Related FW	standard v3.1.0
Description	This output is always opened. It may be used in functions (e.g. ECU outputs

	or PLC modules inputs) where a binary value is required, however it has to be continously inactive.

14.2.1.81 *Binary output: Logical 1*

Related FW	standard v3.1.0
Description	This output is always closed. It may be used in functions (e.g. ECU outputs or PLC modules inputs) where continuously active binary value is required.

14.2.1.82 *Binary output: PeriphCommErr*

Related FW	standard v3.1.0
Description	The output is closed while there is an error in the communication with any peripheral unit (e.g. IS-AIN8, IGS-PTM, ...).

14.2.1.83 *Binary output: WrongPhSeq*

Related FW	standard v3.1.0
Description	Binary output WrongPhSeq is active when at least one of the following conditions is fulfilled: Mains/Bus phase is inverted or wrong mains/bus phase sequence or opposed mains/bus phase sequence is detected.

14.2.1.84 *Binary output: User Button 1*

<table>
<tr><td>Related FW</td><td>standard v3.1.0</td></tr>
<tr><td>Description</td><td>This output can be specified for example on buttons on IV-5/8 or in SCADA diagram in InteliMonitor. Its state depends on function assigned to the related button.
It is possible to lock UserButton commands in configuration to specific user level. Buttons 1-8 and 9-16 are locked separately.
<table>
<tr><td>ON</td><td>Pressing the button changes the state of log. binary output User Button X to closed. When the output is closed and the button is pressed state is not changed.</td></tr>
<tr><td>OFF</td><td>Pressing the button changes the state of log. binary output User Button X to opened. When the output is opened and the button is pressed state is not changed.</td></tr>
</table></td></tr>
</table>

<table>
<tr><td></td><td><table>
<tr><td>ON/OFF</td><td>Pressing the button changes the state of log. binary output User Button X to opened or closed depending on previous state (it is changed to the opposite state).</td></tr>
<tr><td>PULSE ON</td><td>Pressing the button issues log. binary output User Button X to close for time given by setpoint UserBtn pulse.
NOTE:
Repeated pressing of button during the closed period causes issuing another puls to be generated from the moment of button pushing.</td></tr>
</table></td></tr>
</table>

14.2.1.85 *Binary output: User Button 2*

<table>
<tr><td>Related FW</td><td>standard v3.1.0</td></tr>
<tr><td>Description</td><td>This output can be specified for example on buttons on IV-5/8 or in SCADA diagram in InteliMonitor. Its state depends on function assigned to the related button.
It is possible to lock UserButton commands in configuration to specific user level. Buttons 1-8 and 9-16 are locked separately.<table>
<tr><td>ON</td><td>Pressing the button changes the state of log. binary output User Button X to closed. When the output is closed and the button is pressed state is not changed.</td></tr>
<tr><td>OFF</td><td>Pressing the button changes the state of log. binary output User Button X to opened. When the output is opened and the button is pressed state is not changed.</td></tr>
<tr><td>ON/OFF</td><td>Pressing the button changes the state of log. binary output User Button X to opened or closed depending on previous state (it is changed to the opposite state).</td></tr>
<tr><td>PULSE ON</td><td>Pressing the button issues log. binary output User Button X to close for time given by setpoint UserBtn pulse.
NOTE:
Repeated pressing of button during the closed period causes issuing another puls to be generated from the moment of button pushing.</td></tr>
</table></td></tr>
</table>

14.2.1.86 *Binary output: User Button 3*

Related FW	standard v3.1.0

Description	This output can be specified for example on buttons on IV-5/8 or in SCADA diagram in InteliMonitor. Its state depends on function assigned to the related button. It is possible to lock UserButton commands in configuration to specific user level. Buttons 1-8 and 9-16 are locked separately. **ON**: Pressing the button changes the state of log. binary output User Button X to closed. When the output is closed and the button is pressed state is not changed. **OFF**: Pressing the button changes the state of log. binary output User Button X to opened. When the output is opened and the button is pressed state is not changed. **ON/OFF**: Pressing the button changes the state of log. binary output User Button X to opened or closed depending on previous state (it is changed to the opposite state). **PULSE ON**: Pressing the button issues log. binary output User Button X to close for time given by setpoint *UserBtn pulse*. **NOTE:** Repeated pressing of button during the closed period causes issuing another puls to be generated from the moment of button pushing.

14.2.1.87 *Binary output: User Button 4*

Related FW	standard v3.1.0
Description	This output can be specified for example on buttons on IV-5/8 or in SCADA diagram in InteliMonitor. Its state depends on function assigned to the related button. It is possible to lock UserButton commands in configuration to specific user level. Buttons 1-8 and 9-16 are locked separately. **ON**: Pressing the button changes the state of log. binary output User Button X to closed. When the output is closed and the button is pressed state is not changed. **OFF**: Pressing the button changes the state of log. binary output User Button X to opened. When the output is opened and the button is pressed state is not changed. **ON/OFF**: Pressing the button changes the state of log. binary output User Button X to opened or closed depending on previous

	state (it is changed to the opposite state).
PULSE ON	Pressing the button issues log. binary output User Button X to close for time given by setpoint *UserBtn pulse*. **NOTE:** Repeated pressing of button during the closed period causes issuing another puls to be generated from the moment of button pushing.

14.2.1.88 *Binary output: User Button 5*

Related FW	standard v3.1.0
Description	This output can be specified for example on buttons on IV-5/8 or in SCADA diagram in InteliMonitor. Its state depends on function assigned to the related button. It is possible to lock UserButton commands in configuration to specific user level. Buttons 1-8 and 9-16 are locked separately.

ON	Pressing the button changes the state of log. binary output User Button X to closed. When the output is closed and the button is pressed state is not changed.
OFF	Pressing the button changes the state of log. binary output User Button X to opened. When the output is opened and the button is pressed state is not changed.
ON/OFF	Pressing the button changes the state of log. binary output User Button X to opened or closed depending on previous state (it is changed to the opposite state).
PULSE ON	Pressing the button issues log. binary output User Button X to close for time given by setpoint *UserBtn pulse*. **NOTE:** Repeated pressing of button during the closed period causes issuing another puls to be generated from the moment of button pushing.

14.2.1.89 *Binary output: User Button 6*

Related FW	standard v3.1.0
Description	This output can be specified for example on buttons on IV-5/8 or in SCADA diagram in InteliMonitor. Its state depends on function assigned to the related

	button. It is possible to lock UserButton commands in configuration to specific user level. Buttons 1-8 and 9-16 are locked separately.

ON	Pressing the button changes the state of log. binary output User Button X to closed. When the output is closed and the button is pressed state is not changed.
OFF	Pressing the button changes the state of log. binary output User Button X to opened. When the output is opened and the button is pressed state is not changed.
ON/OFF	Pressing the button changes the state of log. binary output User Button X to opened or closed depending on previous state (it is changed to the opposite state).
PULSE ON	Pressing the button issues log. binary output User Button X to close for time given by setpoint *UserBtn pulse*. **NOTE:** Repeated pressing of button during the closed period causes issuing another puls to be generated from the moment of button pushing.

14.2.1.90 *Binary output: User button 7*

Related FW	standard v3.1.0
Description	This output can be specified for example on buttons on IV-5/8 or in SCADA diagram in InteliMonitor. Its state depends on function assigned to the related button. It is possible to lock UserButton commands in configuration to specific user level. Buttons 1-8 and 9-16 are locked separately.

ON	Pressing the button changes the state of log. binary output User button X to closed. When the output is closed and the button is pressed state is not changed.
OFF	Pressing the button changes the state of log. binary output User button X to opened. When the output is opened and the button is pressed state is not changed.
ON/OFF	Pressing the button changes the state of log. binary output User button X to opened or closed depending on previous state (it is changed to the opposite state).

	PULSE ON — Pressing the button issues log. binary output User Button X to close for time given by setpoint *UserBtn pulse*. **NOTE:** Repeated pressing of button during the closed period causes issuing another puls to be generated from the moment of button pushing.

14.2.1.91 *Binary output: User Button 8*

Related FW	standard v3.1.0
Description	This output can be specified for example on buttons on IV-5/8 or in SCADA diagram in InteliMonitor. Its state depends on function assigned to the related button. It is possible to lock UserButton commands in configuration to specific user level. Buttons 1-8 and 9-16 are locked separately.

ON	Pressing the button changes the state of log. binary output User Button X to closed. When the output is closed and the button is pressed state is not changed.
OFF	Pressing the button changes the state of log. binary output User Button X to opened. When the output is opened and the button is pressed state is not changed.
ON/OFF	Pressing the button changes the state of log. binary output User Button X to opened or closed depending on previous state (it is changed to the opposite state).
PULSE ON	Pressing the button issues log. binary output User Button X to close for time given by setpoint *UserBtn pulse*. **NOTE:** Repeated pressing of button during the closed period causes issuing another puls to be generated from the moment of button pushing.

14.2.1.92 *Binary output: User Button 9*

Related FW	standard v3.1.0
Description	This output can be specified for example on buttons on IV-5/8 or in SCADA diagram in InteliMonitor. Its state depends on function assigned to the related button.

<table>
<tr><td></td><td>It is possible to lock UserButton commands in configuration to specific user level. Buttons 1-8 and 9-16 are locked separately.
<table>
<tr><td>ON</td><td>Pressing the button changes the state of log. binary output User Button X to closed. When the output is closed and the button is pressed state is not changed.</td></tr>
<tr><td>OFF</td><td>Pressing the button changes the state of log. binary output User Button X to opened. When the output is opened and the button is pressed state is not changed.</td></tr>
<tr><td>ON/OFF</td><td>Pressing the button changes the state of log. binary output User Button X to opened or closed depending on previous state (it is changed to the opposite state).</td></tr>
<tr><td>PULSE ON</td><td>Pressing the button issues log. binary output User Button X to close for time given by setpoint <i>UserBtn pulse</i>.
NOTE:
Repeated pressing of button during the closed period causes issuing another puls to be generated from the moment of button pushing.</td></tr>
</table></td></tr>
</table>

14.2.1.93 *Binary output: User Button 10*

<table>
<tr><td>Related FW</td><td>standard v3.1.0</td></tr>
<tr><td>Description</td><td>This output can be specified for example on buttons on IV-5/8 or in SCADA diagram in InteliMonitor. Its state depends on function assigned to the related button.
It is possible to lock UserButton commands in configuration to specific user level. Buttons 1-8 and 9-16 are locked separately.
<table>
<tr><td>ON</td><td>Pressing the button changes the state of log. binary output User Button X to closed. When the output is closed and the button is pressed state is not changed.</td></tr>
<tr><td>OFF</td><td>Pressing the button changes the state of log. binary output User Button X to opened. When the output is opened and the button is pressed state is not changed.</td></tr>
<tr><td>ON/OFF</td><td>Pressing the button changes the state of log. binary output User Button X to opened or closed depending on previous state (it is changed to the opposite state).</td></tr>
<tr><td>PULSE ON</td><td>Pressing the button issues log. binary output User Button X</td></tr>
</table></td></tr>
</table>

	<table><tr><td></td><td>to close for time given by setpoint <i>UserBtn pulse</i>. NOTE: Repeated pressing of button during the closed period causes issuing another puls to be generated from the moment of button pushing.</td></tr></table>

14.2.1.94 *Binary output: User Button 11*

Related FW	standard v3.1.0
Description	This output can be specified for example on buttons on IV-5/8 or in SCADA diagram in InteliMonitor. Its state depends on function assigned to the related button. It is possible to lock UserButton commands in configuration to specific user level. Buttons 1-8 and 9-16 are locked separately. <table><tr><td>ON</td><td>Pressing the button changes the state of log. binary output User Button X to closed. When the output is closed and the button is pressed state is not changed.</td></tr><tr><td>OFF</td><td>Pressing the button changes the state of log. binary output User Button X to opened. When the output is opened and the button is pressed state is not changed.</td></tr><tr><td>ON/OFF</td><td>Pressing the button changes the state of log. binary output User Button X to opened or closed depending on previous state (it is changed to the opposite state).</td></tr><tr><td>PULSE ON</td><td>Pressing the button issues log. binary output User Button X to close for time given by setpoint <i>UserBtn pulse</i>. NOTE: Repeated pressing of button during the closed period causes issuing another puls to be generated from the moment of button pushing.</td></tr></table>

14.2.1.95 *Binary output: User Button 12*

Related FW	standard v3.1.0
Description	This output can be specified for example on buttons on IV-5/8 or in SCADA diagram in InteliMonitor. Its state depends on function assigned to the related button. It is possible to lock UserButton commands in configuration to specific user

<table>
<tr><td></td><td>level. Buttons 1-8 and 9-16 are locked separately.
<table>
<tr><td>ON</td><td>Pressing the button changes the state of log. binary output User Button X to closed. When the output is closed and the button is pressed state is not changed.</td></tr>
<tr><td>OFF</td><td>Pressing the button changes the state of log. binary output User Button X to opened. When the output is opened and the button is pressed state is not changed.</td></tr>
<tr><td>ON/OFF</td><td>Pressing the button changes the state of log. binary output User Button X to opened or closed depending on previous state (it is changed to the opposite state).</td></tr>
<tr><td>PULSE ON</td><td>Pressing the button issues log. binary output User Button X to close for time given by setpoint <i>UserBtn pulse</i>.
NOTE:
Repeated pressing of button during the closed period causes issuing another puls to be generated from the moment of button pushing.</td></tr>
</table>
</td></tr>
</table>

14.2.1.96 *Binary output: User Button 13*

<table>
<tr><td>Related FW</td><td>standard v3.1.0</td></tr>
<tr><td>Description</td><td>This output can be specified for example on buttons on IV-5/8 or in SCADA diagram in InteliMonitor. Its state depends on function assigned to the related button.

It is possible to lock UserButton commands in configuration to specific user level. Buttons 1-8 and 9-16 are locked separately.
<table>
<tr><td>ON</td><td>Pressing the button changes the state of log. binary output User Button X to closed. When the output is closed and the button is pressed state is not changed.</td></tr>
<tr><td>OFF</td><td>Pressing the button changes the state of log. binary output User Button X to opened. When the output is opened and the button is pressed state is not changed.</td></tr>
<tr><td>ON/OFF</td><td>Pressing the button changes the state of log. binary output User Button X to opened or closed depending on previous state (it is changed to the opposite state).</td></tr>
<tr><td>PULSE ON</td><td>Pressing the button issues log. binary output User Button X to close for time given by setpoint <i>UserBtn pulse</i>.</td></tr>
</table>
</td></tr>
</table>

	NOTE: Repeated pressing of button during the closed period causes issuing another puls to be generated from the moment of button pushing.

14.2.1.97 *Binary output: User Button 14*

Related FW	standard v3.1.0
Description	This output can be specified for example on buttons on IV-5/8 or in SCADA diagram in InteliMonitor. Its state depends on function assigned to the related button. It is possible to lock UserButton commands in configuration to specific user level. Buttons 1-8 and 9-16 are locked separately.

ON	Pressing the button changes the state of log. binary output User Button X to closed. When the output is closed and the button is pressed state is not changed.
OFF	Pressing the button changes the state of log. binary output User Button X to opened. When the output is opened and the button is pressed state is not changed.
ON/OFF	Pressing the button changes the state of log. binary output User Button X to opened or closed depending on previous state (it is changed to the opposite state).
PULSE ON	Pressing the button issues log. binary output User Button X to close for time given by setpoint *UserBtn pulse*. **NOTE:** Repeated pressing of button during the closed period causes issuing another puls to be generated from the moment of button pushing.

14.2.1.98 *Binary output: User Button 15*

Related FW	standard v3.1.0
Description	This output can be specified for example on buttons on IV-5/8 or in SCADA diagram in InteliMonitor. Its state depends on function assigned to the related button. It is possible to lock UserButton commands in configuration to specific user

<table>
<tr><td></td><td>level. Buttons 1-8 and 9-16 are locked separately.
<table>
<tr><td>ON</td><td>Pressing the button changes the state of log. binary output User Button X to closed. When the output is closed and the button is pressed state is not changed.</td></tr>
<tr><td>OFF</td><td>Pressing the button changes the state of log. binary output User Button X to opened. When the output is opened and the button is pressed state is not changed.</td></tr>
<tr><td>ON/OFF</td><td>Pressing the button changes the state of log. binary output User Button X to opened or closed depending on previous state (it is changed to the opposite state).</td></tr>
<tr><td>PULSE ON</td><td>Pressing the button issues log. binary output User Button X to close for time given by setpoint <i>UserBtn pulse</i>.
NOTE:
Repeated pressing of button during the closed period causes issuing another puls to be generated from the moment of button pushing.</td></tr>
</table>
</td></tr>
</table>

14.2.1.99 *Binary output: User Button 16*

<table>
<tr><td>Related FW</td><td>standard v3.1.0</td></tr>
<tr><td>Description</td><td>This output can be specified for example on buttons on IV-5/8 or in SCADA diagram in InteliMonitor. Its state depends on function assigned to the related button.
It is possible to lock UserButton commands in configuration to specific user level. Buttons 1-8 and 9-16 are locked separately.
<table>
<tr><td>ON</td><td>Pressing the button changes the state of log. binary output User Button X to closed. When the output is closed and the button is pressed state is not changed.</td></tr>
<tr><td>OFF</td><td>Pressing the button changes the state of log. binary output User Button X to opened. When the output is opened and the button is pressed state is not changed.</td></tr>
<tr><td>ON/OFF</td><td>Pressing the button changes the state of log. binary output User Button X to opened or closed depending on previous state (it is changed to the opposite state).</td></tr>
<tr><td>PULSE ON</td><td>Pressing the button issues log. binary output User Button X to close for time given by setpoint <i>UserBtn pulse</i>.</td></tr>
</table>
</td></tr>
</table>

	NOTE: Repeated pressing of button during the closed period causes issuing another puls to be generated from the moment of button pushing.

14.2.1.100 *Binary output: ROCOF Trp*

Related FW	standard v3.1.0
Description	The output closes if the ROCOF protection gets active. The output stays closed for 3s, then opens again.

14.2.1.101 *Binary output: PeakShaveAct*

Related FW	standard v3.1.0
Description	Binary output is active when the gen-set is running (in SPtM application) or gen-set group is activated by InteliMains due to Peak Shaving or Peak kVA Shaving (dependence on parameters *PeakLevelStart*, *PeakLevelStop*, *PeakAutS/S del*, *Peak kVA Start*, *Peak kVA Stop*, *PeakKVAS/S del* in ProcessControl group).

14.2.1.102 *Binary output: Initialized*

Related FW	standard v3.1.0
Description	This LBO indicates that the controller finished the reboot after the restart. It can be used in internal PLC for blocking some binary inputs to avoid the hazards after restart of the controller.

14.2.1.103 *Binary output: Start Blocked*

Related FW	standard v3.1.0
Description	Activation of this logical binary output indicates that the start of the engine is blocked. This can be caused by conditions given by setpoints in ProcessControl group (Island enable, ParalEnable, Synchro enable, MFStart enable, MGCBparalClose - where aplicable). **EXAMPLE:** The start of the gen-set is blocked when Mains is not OK and Island enable is set to NO. Therefore this output is activated and letting you know that the gen-set will not start because the island operation is not allowed.

14.2.1.104 *Binary output: RemoteControl1*

Related FW	standard v3.1.0
Description	This is a general purpose output, which can be closed and opened remotely, e.g. from InteliMonitor using the "Remote switches" tool or via MODBUS using the register #46361 and command #26. **NOTE:** See the *Remote switches* chapter in the InteliMonitor help for details about how to control the output from InteliMonitor and the Modbus chapter in the latest communication guide for information about control the output using Modbus.

14.2.1.105 *Binary output: RemoteControl2*

Related FW	standard v3.1.0
Description	This is a general purpose output, which can be closed and opened remotely, e.g. from InteliMonitor using the "Remote switches" tool or via MODBUS using the register #46361 and command #26. **NOTE:** See the *Remote switches* chapter in the InteliMonitor help for details about how to control the output from InteliMonitor and the Modbus chapter in the latest communication guide for information about control the output using Modbus.

14.2.1.106 *Binary output: RemoteControl3*

Related FW	standard v3.1.0
Description	This is a general purpose output, which can be closed and opened remotely, e.g. from InteliMonitor using the "Remote switches" tool or via MODBUS using the register #46361 and command #26. **NOTE:** See the *Remote switches* chapter in the InteliMonitor help for details about how to control the output from InteliMonitor and the Modbus chapter in the latest communication guide for information about control the output using Modbus.

14.2.1.107 *Binary output: RemoteControl4*

Related FW	standard v3.1.0

Description	This is a general purpose output, which can be closed and opened remotely, e.g. from InteliMonitor using the "Remote switches" tool or via MODBUS using the register #46361 and command #26. **NOTE:** See the *Remote switches* chapter in the InteliMonitor help for details about how to control the output from InteliMonitor and the Modbus chapter in the latest communication guide for information about control the output using Modbus.

14.2.1.108 *Binary output: RemoteControl5*

Related FW	standard v3.1.0
Description	This is a general purpose output, which can be closed and opened remotely, e.g. from InteliMonitor using the "Remote switches" tool or via MODBUS using the register #46361 and command #26. **NOTE:** See the *Remote switches* chapter in the InteliMonitor help for details about how to control the output from InteliMonitor and the Modbus chapter in the latest communication guide for information about control the output using Modbus.

14.2.1.109 *Binary output: RemoteControl6*

Related FW	standard v3.1.0
Description	This is a general purpose output, which can be closed and opened remotely, e.g. from InteliMonitor using the "Remote switches" tool or via MODBUS using the register #46361 and command #26. **NOTE:** See the *Remote switches* chapter in the InteliMonitor help for details about how to control the output from InteliMonitor and the Modbus chapter in the latest communication guide for information about control the output using Modbus.

14.2.1.110 *Binary output: RemoteControl7*

Related FW	standard v3.1.0
Description	This is a general purpose output, which can be closed and opened remotely, e.g. from InteliMonitor using the "Remote switches" tool or via MODBUS using the register #46361 and command #26. **NOTE:** See the *Remote switches* chapter in the InteliMonitor help for details about

	how to control the output from InteliMonitor and the Modbus chapter in the latest communication guide for information about control the output using Modbus.

14.2.1.111 *Binary output: RemoteControl8*

Related FW	standard v3.1.0
Description	This is a general purpose output, which can be closed and opened remotely, e.g. from InteliMonitor using the "Remote switches" tool or via MODBUS using the register #46361 and command #26. **NOTE:** See the *Remote switches* chapter in the InteliMonitor help for details about how to control the output from InteliMonitor and the Modbus chapter in the latest communication guide for information about control the output using Modbus.

14.2.1.112 *Binary output: ModbusSw 1*

Related FW	standard v3.1.0
Description	This logical binary output gets activated when the corresponding bit is written to the Modbus register number 46337. The mirror of the written value can be also seen in the value *ModbusSw1*. **EXAMPLE:** If value 255 is written in the Modbus register number 46337, first eight ModbusSw logical binary outputs get activated.

14.2.1.113 *Binary output: ModbusSw 17*

Related FW	standard v3.1.0
Description	This logical binary output gets activated when the corresponding bit is written to the Modbus register number 46338. The mirror of the written value can be also seen in the value *ModbusSw2*. **EXAMPLE:** If value 255 is written in the Modbus register number 46338, first eight ModbusSw logical binary outputs get activated.

15 Analog Input functions

15.1 Virtual and physical modules

Number of I/O can be extended and project wiring can be reduced using the following extension and virtual modules.

MODULE NAME	BIN	BOUT	AIN	AOUT	NOTE	NUMBER OF MODULES SUPPORTED BY CONTROLLER
Controllers						
IM-NT(C)-BB controller	12	12	3	1	Controller I/O.	-
IM-NT controller	6	6	-	-	Controller I/O.	-
Extension modules						
IGS-PTM	8	8	4	1	Standard I/O extension module.	4
IS-AIN8	-	-	8	-	Standard I/O extension module.	10
I-AOUT8	-	-	-	8	Standard I/O extension module.	4
IS-BIN16/8	16	8	-	-	Standard I/O extension module.	6
IGL-RA15	-	15	-	-	15 Green, Red, Yellow LED panel.	4
Inteli-AIN8	-	-	8+1	-	Standard I/O extension module. One Frequency/Pulse input.	10
Inteli-AIN8TC	-	-	8	-	Standard I/O extension module	10
Inteli-IO8/8	8	8	-	2	Standard I/O extension module	12
Inteli-IO16/0	16	-	-	2	Standard I/O extension module	6
Virtual modules						
VPIO	8	8	-	-	Virtual periphery I/O module.	4
SHBIN	8	-	-	-	SHared (virtual) Binary INput module	6
SHBOUT	-	8	-	-	SHared (virtual) Binary OUTput module	6

SHAIN	-	-	4	-	Shared (virtual) Analog Input module	2
SHAOUT	-	-	-	4	Shared (virtual) Analog OUTput module	2
PLC	x	x	x	x	Programmable (internal) logic module.	1

NOTE:
Maximum number of configured modules (both extension and virtual) is given by available addresses. The numbers in the table are valid in the case that no other modules are configured.

15.2 Table of analog input functions

15.2.1.1 *Analog input: MLC:AnExSysBld*

Related FW	standard v3.1.0
Description	This input is used for external determination of system load.

15.2.1.2 *Analog input: MLC:AnExI/E*

Related FW	standard v3.1.0
Description	This functional input is used for requesting the **mains import** value externally by an analog input. The setpoint *Load ctrl PtM* must be set to ANEXT IM/EX position.

15.2.1.3 *Analog input: MLC:TByPwr*

Related FW	standard v3.1.0
Description	This functional input is used as the temperature input into the load control loop if the loop is switched into "T BY PWR" position. More information is available at the setpoint *Load ctrl PtM*.

15.2.1.4 *Analog input: MPF:AnExI/E*

Related FW	standard v3.1.0
Description	This functional input is used for requesting the **mains cos phi factor** externally by an analog input. The setpoint *PF ctrl PtM* must be set to ANEXT PF-IM/EX position. The analog value is transformed to the requested cos phi factor following way:

	<table><tr><th>ANALOG VALUE</th><th>COS PHI FACTOR</th></tr><tr><td><60</td><td>0.6L</td></tr><tr><td>60 .. 100</td><td>0.6L .. 1.00</td></tr><tr><td>101 .. 120</td><td>0.99C .. 0.80C</td></tr></table>

15.2.1.5 *Analog input: MLC:I/E-Pm*

Related FW	standard v3.1.0
Description	This functional input is used for connecting of an external device, which measures the **active** power imported from the mains. The device is connected to the controller via an analog input (e.g. -20 .. 20mA). The setpoint *I/E-Pm meas* must be set to the ANALOG INPUT position for this case.

15.2.1.6 *Analog input: MPF:I/E-Qm*

Related FW	standard v3.1.0
Description	This functional input is used for connecting of an external device, which measures the **reactive** power imported from the mains. The device is connected to the controller via an analog input (e.g. -20 .. 20mA). The setpoint *I/E-Qm meas* must be set to the ANALOG INPUT position for this case.

15.2.1.7 *Analog input: LCD brightness*

Related FW	standard v3.1.0
Description	This functional input is used to adjust the backlight intensity of the **IG-NT built-in** terminal (display) by an analog input (e.g. a potentiometer). If this input is configured to a physical analog input or other value, the brightness adjusted by buttons at the terminal is overriden by this analog input.

15.2.1.8 *Analog input: Cold temp 1*

Related FW	standard v3.1.0
Description	If there is an additional terminal board between a thermocouple and the IS-AIN8 module and there is a significant temperature difference between this terminal board and the module, it is necessary to measure the temperature at

	this terminal board and use this temperature for the thermocouple compensation instead of the internal temperature of the module. This analog input is intended for measement of this thermocouple compensation temperature for the IS-AIN8 module with index #1. **NOTE:** Thermocouples without internal compensation "Thermo(nc)..." must be used for this case.

15.2.1.9 *Analog input: Cold temp 2*

Related FW	standard v3.1.0
Description	If there is an additional terminal board between a thermocouple and the IS-AIN8 module and there is a significant temperature difference between this terminal board and the module, it is necessary to measure the temperature at this terminal board and use this temperature for the thermocouple compensation instead of the internal temperature of the module. This analog input is intended for measement of this thermocouple compensation temperature for the IS-AIN8 module with index #2. **NOTE:** Thermocouples without internal compensation "Thermo(nc)..." must be used for this case.

15.2.1.10 *Analog input: Cold temp 3*

Related FW	standard v3.1.0
Description	If there is an additional terminal board between a thermocouple and the IS-AIN8 module and there is a significant temperature difference between this terminal board and the module, it is necessary to measure the temperature at this terminal board and use this temperature for the thermocouple compensation instead of the internal temperature of the module. This analog input is intended for measement of this thermocouple compensation temperature for the IS-AIN8 module with index #3. **NOTE:** Thermocouples without internal compensation "Thermo(nc)..." must be used for this case.

15.2.1.11 *Analog input: Cold temp 4*

Related FW	standard v3.1.0

Description	If there is an additional terminal board between a thermocouple and the IS-AIN8 module and there is a significant temperature difference between this terminal board and the module, it is necessary to measure the temperature at this terminal board and use this temperature for the thermocouple compensation instead of the internal temperature of the module. This analog input is intended for measuement of this thermocouple compensation temperature for the IS-AIN8 module with index #4. **NOTE:** Thermocouples without internal compensation "Thermo(nc)..." must be used for this case.

16 User Notes