Compact Controller for Stand-by and Parallel Operating Gen-sets

Inteli New Technology Modular Gen-set Controller

RENTAL – Combined applications SPtM, SPI and MINT

IG-NT, IG-NTC, IS-NT, IG-NT-BB, IG-NTC-BB, IS-NTC-BB

Software version IGS-NT-Rental-2.2.0, March 2015

LEADER IN GEN–SET
COMMUNICATION SOLUTION

REFERENCE GUIDE

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Document information

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1	2.2.0	12.3. 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.

Available related documentation

PDF files	Description
IGS-NT-Rental-2.2.0 New features	New features of IGS-NT-Rental 2.1.0 firmware, basic differencies from Standard Combi application.
IGS-NT Application Guide 05-2013.pdf	Applications of InteliGen NT, InteliSys NT and InteliMains NT, examples of connection, description of PLC functions, Virtual and Shared peripheries.
IGS-NT Operator Guide 01-2014.pdf	Operator Guide for all hardware variation of InteliGen NT and InteliSys NT, InteliVision 5 and InteliVision 8.
IGS-NT Installation Guide 08-2014.pdf	Thorough description of installation and technical information about InteliGen NT, InteliSys NT and InteliMains NT and related accessories.
IGS-NT Communication Guide 05-2013.pdf	Thorough description of connectivity and communication for InteliGen NT, InteliSys NT and InteliMains NT and related accessories.
IGS-NT Troubleshooting Guide 08-2014.pdf	How to solve most common troubles with InteliGen NT and InteliSys NT controllers. Including the list of alarm massages.
IGS-NT & ID-DCU Accessory Modules 07-2014.pdf	Thorough description of accessory modules for IGS-NT family, technical data, information about installation of the modules, how to connect them to controller and set them properly.

General guidelines

What is described in this manual?

This manual describes IG/IS-NT-Combi application which covers the SPtM, SPI and MINT applications. The SPtM, SPI and MINT applications can be switched by the binary inputs (see more at Switching the SPtM, SPI and MINT applications chapter). The IG/IS-NT-Combi has been designed especially for rental gensets.

Selection among setpoints as Nominal voltage, Nominal RPM, Nominal frequency and enabling or disabling of synchronization can be done by setpoint or by using of force value that can be changed by corresponding binary inputs (see more at Force value chapter).

The IG/IS-NT-Combi application also enables increasing and decreasing of baseload value SPtM or SPI application Binary inputs (BaseLoad Up and BaseLoad Down) or manual fuse synchronizing function (MCB).

What is the purpose of this manual?
This manual provides general information on how to configure and operate the controller.
This manual is intended for use by:

- Operators of gen-sets
- Gen-set control panel builders
- For everybody who is concerned with installation, operation and maintenance of the gen-set

!! Warnings !!

The NT controller can be remotely controlled. In the event that maintenance needs to be done to the gen-set, check the following to ensure that the engine cannot be started.

To be sure:

- Disconnect remote control via RS232 line
- Disconnect input REMOTE START/STOP

or

- Disconnect output STARTER and outputs GCB CLOSE/OPEN and MCB CLOSE/OPEN

The controller contains a large number of configurable setpoints, because of this it is impossible to describe all of its functions. These are subject to change from SW version to SW version. This manual only describes the product and is not guaranteed to be set for your application on arrival.

Text

ESC	(Capital letters in the frame) buttons on the front panel
Break Return	(Italic) set points
Generator protections	(Bold) Set point group
Cyan background	Valid for IS-NT only

Conformity declaration

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.

Note:
ComAp believes that all information provided herein is correct and reliable and reserves the right to update at any time. ComAp does not assume any responsibility for its use unless otherwise expressly undertaken.

WARNING – VERY IMPORTANT !!!

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

Every time you want to disconnect following NT controller terminals:

- Mains voltage measuring and / or
- Binary output for MCB control and / or
- MCB feedback

Be aware that the MCB can be switched off and gen-set can start !!!

Switch the controller to MAN mode and disconnect the Binary outputs Starter and Fuel to avoid unexpected automatic start of gen-set and GCB closing.

!!! CAUTION !!!

Dangerous voltage

The terminals for voltage and current measurement should never be touched.
Properly connect the grounding terminals.
Do not disconnect the CT terminals for any reason.

Adjust set points

All setpoints are preadjusted to their typical values. But the set points in the "**Basic settings**" settings group **!!must!!** be adjusted before the first startup of the gen-set.

!!! WRONG ADJUSTMENT OF BASIC PARAMETERS CAN DESTROY THE GEN-SET !!!

The following instructions are for qualified personnel only. To avoid personal injury do not perform any action not specified in this User guide !!!

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.

Available Firmware and Archive sets

Since version 2.0 of IGS-NT Standard firmware is the firmware differentiated for **InteliGen NT GC** and **InteliGen NT BaseBox** type controllers. For suitable firmware for your controller please consult this table:

InteliGen NT GC InteliGen NTC GC	InteliGen NT BaseBox InteliGen NTC BaseBox	InteliSys NT BaseBox InteliSys NTC BaseBox
IG-NT-GC-Rental-2.2.0	IG-NT-BB-Rental-2.2.0	IS-NT-Rental-2.2.0

Archives (*.ant)

For IG-NT(C) GC	For IG-NT-BB and IG-NTC-BB	For IS-NT-BB and IS-NTC-BB
IG-GC-Rental-2.2.0	IG-BB-Rental-2.2.0	IS-Rental-2.2.0

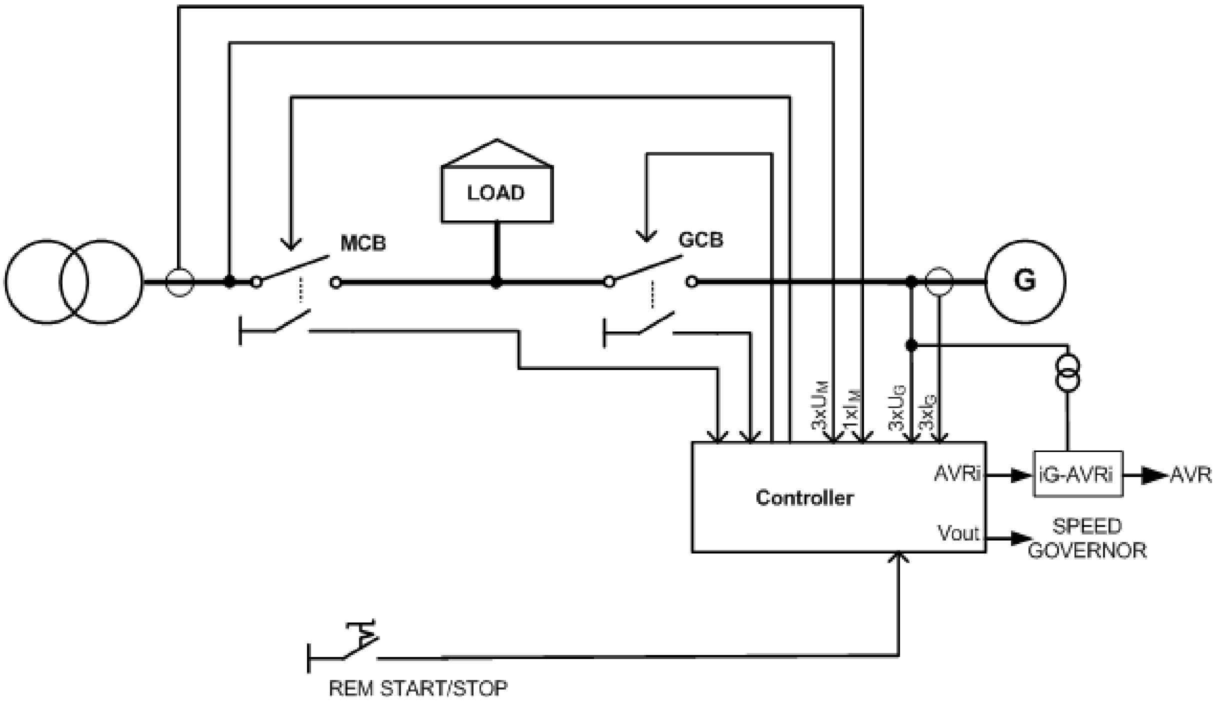
Some features are available only in InteliGen NT Basebox, InteliGen NTC Basebox and InteliSys NT. These features are highlighted by green background.

General description

Basic description of Rental (COMBI) application

The SPtM application is intended for single gen-sets and includes following main features:

- Automatic startup and stop sequences with adjustable timing
- Wide range of generator and engine protections, additional freely configurable protections
- **Parallel to the mains operation**, many different load control modes (baseload, import/export control and other)
- **Island operation**
- **Integrated mains protection** (mains decoupling relay) including vector shift
- **AMF function** (automatic start if mains fails) with test feature
- **Two breaker control** (GCB, MCB) including **synchronizing**
- Soft loading and unloading



Switching the SPtM, SPI and MINT applications

The default application of IG/IS-NT-Combi is the SPtM application. The SPI and MINT applications can be activated during the "emergency manual" state only.

To change the application from the SPtM to SPI application close both BI: Emerg. manual and BI: SPI Enable and after that open BI: Emerg. manual only. The controller is set to SPI application now.

To change the application from the SPtM to MINT application close both BI: Emerg. manual and BI: MultipleEnable and after that open BI: Emerg. manual only. The controller is set to MINT application now.

To change the application from either SPI or MINT to the default SPtM application close the BI: Emerg. manual and open either BI: SPI Enable or BI: MultipleEnable. After that open the BI: Emerg. manual. The controller is set to SPtM application now.

Another way of changing the SPtM application to either SPI or MINT one is by switching on BI: SPI Enable / BI: MultipleEnable before switching on the power supply of the controller to activate SPI / MINT application. In this case is not necessary to use BI: Emerg. manual to change the application.

NOTE:
In the case of an accidental contemporary activation of both BI: SPI Enable and BI: MultipleEnable the MINT application remains active.

Functions

OFF-MAN-AUT-TEST mode

OFF mode

Outputs STARTER, GCB CLOSE/OPEN and FUEL SOLENOID are not energized.
Genset cannot be started. If START,STOP,GCB ON/OFF,MCB ON/OFF buttons are pressed the controller will not respond.
When the gen-set is running it is not possible to switch directly to OFF mode. First you have to stop the engine.

SPtM application:
MCB behavior depends on **AMF settings**: *MCB opens on* setpoint if the **Sync/Load ctrl:** *ManualFuseSync* = DISABLED.
MAINSFAIL: When power-cut comes, MCB opens. After mains returns, MCB closes with *MCB close del.*
GEN RUNNING: When power-cut comes, MCB stays closed.

MAN mode

In MAN mode the genset can be controlled by the front panel buttons.

1) START - starts the gen-set.
2) GCB ON/OFF
   If generator voltage is out of the limits (adjusted in the set point group **Gener protect**) controller does not to respond to the GCB ON/OFF
   a) controller closes GCB to dead bus.
   b) controller starts GCB synchronizing when mains is OK and MCB is closed. Closes the GCB when synchronized and stays running in parallel. Operational mode in parallel depends on **ProcCtrlSingle** setting.
   c) Unloads gen-set and opens the GCB if gen-set was running in parallel to the mains.
3) MCB ON/OFF
   a) controller closes MCB to dead bus (even if the mains voltage is out of limits).
   b) controller starts MCB synchronizing when gen-set is running and GCB is closed. Closes the MCB when synchronized and stays running in parallel. Operational mode in parallel depends on **ProcCtrlSingle** setting.
   c) Unloads gen-set and opens the MCB if gen-set was running in parallel to the mains.
4) STOP
   a) When gen-set is running in parallel: transfers load to the mains, opens GCB, goes into cooling state and stops the engine.
   b) When gen-set is running island (MCB is opened): opens GCB, goes into cooling state and stops the engine.
   c) When engine is running unloaded: activates cooling sequence and then stops the engine.
   d) During cooling state causes immediate engine stop.

HINT
The genset is permitted to run unloaded for an unlimited time.
Controller does not automatically start the gen-set when power cut comes or REM START/STOP is closed.
SPtM, SPI applications:
Controller does not automatically change the MCB state depends on mains changes.
Load control in parallel depends on **ProcCtrlSingle**: *Load control* = BASELOAD or IMP/EXP setpoint.
MINT application:
Load control type in mains parallel depends on **ProcCtrlMulti**: #Sys*LdCtrlPtM* = BASELOAD or LDSHARING setpoint.

SEM

In SEM mode, pressing of START or STOP buttons performs a predefined sequence:

1) START – starts the engine, synchronizes and runs in parallel.
2) STOP – softly unloads the gen-set, opens GCB, provides cooldown and stops the engine.
3) In case of mains failure and **Process control:** *MFStart enable* set to YES, allows automatic start/stop same as in AUT mode.

AUT mode – (Stand-by)

In AUT mode genset can't be controlled by the front panel buttons of the controller. Controller function can be different depends on selected Application mode (SPtM, SPI and MINT) as described below.

SPtM application:
Automatic mode is influenced by **ProcCtrlSingle**: *Island enable, ParallelEnable, Synchro enable and MFStart enable* setpoints.

No.	*Island enable*	*Parallel enable*	*Synchro enable*	*MFStart enable*	Function
1	YES	YES	BOTH	YES	SPTM application, stand-by, soft load transfer
2	NO	YES	BOTH	X	SPTM – long parallel, no Stand-by
3	YES	NO	NO	YES	SSB with break transfer; Gen-set start is blocked.
4	NO	NO	NO	NO	Gen-set start is blocked. Binary output OflStartBlck indicates those states.
	NO	NO	BOTH	NO	
	NO	NO	REV	NO	
	NO	YES	REV	NO	
	NO	YES	NO	YES	
	NO	NO	X	X	
	YES	NO	NO	NO	
	YES	NO	NO	NO	

Following procedure corresponds to setting No.1 from table above.

1) Mains failure is recognized

Controller opens MCB when **AMF settings**: *MCB opens on* = MAINSFAIL.

   a) After **AMF settings**:*EmergStart del* elapsed, Controller starts the gen-set. Controller opens MCB after engine starts when **AMF settings**: *MCB opens on* = GENRUN.
   b) If mains recovers during the start-up process, Controller closes MCB again after **AMF settings**: *MCB close del* and stops the gen-set.

2) When the gen-set is above *Underspeed* level and the generator voltage is within limits (adjust in the set point group **Gener protect**) Controller closes the GCB. If the generator voltage is out of the limits for Engine params: *Max stab time*, Controller alarms the failure and stops the gen-set.
3) After mains recovers:
   a) After **AMF settings**: *Mains ret del* Controller starts synchronizing to mains and closes the MCB and unloads the gen-set.
   b) After the **AMF settings**:*BreakerOverlap* delay Controller opens the GCB.
   c) The gen-set is cooled down and stopped.

SPI application:
Automatic mode is influenced by **ProcCtrlSingle**: *Island enable, ParallelEnable, Synchro enable* setpoints.

No.	*Island enable*	*Parallel enable*	*Synchro enable*	Function
1	YES	YES	FORWARD	Basic SPI application
2	YES	NO	NO	SPM application
3	NO	YES	FORWARD	SPI application, no island (stand-by) operation allowed
4	NO	NO	NO	Gen-set start is blocked. Binary output OflStartBlck indicates those states.
	NO	NO	FORWARD	
	NO	YES	NO	

Following procedure corresponds to setting No.1 from table above.

2) After the input Rem start/stop is energized, controller starts the gen-set. If MCB feedack is active, the controller will synchronize the gen-set to mains and ramp up the load, depending on the ProcCtrlSingle set points adjustment.
3) If a mains failure is recognized, the controller will open the GCB to separate the failed mains from the generator. After the mains breaker has been open (MCB feedback is de-energized), the controller will close the GCB again to the island (stand-by) operation.
4) If mains recovers again, the GCB is open again to allow the MCB to be closed (manually or in general not with a command from the controller). After both mains is present and MCB closed, the controller will synchronize again with the healthy mains and close the GCB.
5) If input Rem start/stop is de-energized, controller will softly unload the gen-set back to the mains, then open the GCB, cool down and stop the gen-set.

MINT application (the IGS-NT-LSM+PMS dongle is required to enable POWER MANAGEMENT function):

1) All gen-sets necessary to cover selected *LoadRes strt* are started when binary input SYS START/STOP is closed and *Pwr management* is ENABLED. Power management can be based on kW, kVA or on relative % reserve.
    a) 1 sec delayed when MCB FEEDBACK binary input is closed (mains parallel)
    b) delayed *#SysAMFstrt del* when MCB FEEDBACK binary input is opened – start to island parallel (multi AMF) situation
2) The first gen-set closes the GCB to the dead bus, the rest are synchronized to the bus.
3) When all necessary gen-sets are connected to the bus and *LoadRes strt* is achieved, SYST RES OK output is closed. Output could be used to close the MGCB (Master GCB).
4) Total load and power factor are shared between parallel operating gen-sets.
5) Close input LOAD RESERVE 2 (or 3 or 4) and use setpoint *LoadRes strt2*(or 3 or 4) to switch to another load reserve setting. E.g. high load reserve during system start to be able to switch-on big devices, then during normal operation lower reserve to save engines (and fuel).
6) If total load increases and selected *LoadRes strt* is no more fulfilled, after a *Next start del* next ready gen-set with the highest priority (lowest priority number) is started and synchronized to the bus.
7) If load decreases and selected *LoadRes stp* is exceeded, after a *Next stop del* the running gen-set with the lowest priority is unloaded, got off line, cooled and stopped.
8) Complete gen-sets group stops when binary input SYS START/STOP opens. If the input MCB FEEDBACK is closed (gen-sets are in parallel to mains) controllers softly transfer the load to the mains. When gen-set is unloaded (see *GCB open level* or *GCB open del*) opens the output GCB CLOSE/OPEN.
9) The Running hours balancing or Load demand engines swap can be activated in power management.

HINT
Controller does not respond to GCB ON/OFF , STOP, START buttons and corresponding remote InteliMonitor or Modbus commands in AUT mode.

Set **Basic setting**: *FltRes GoToMAN* = ENABLED to avoid automatic engine start when pressing FAULT RESET after any 2nd level alarm (Shutdown, Slow stop, Breaker Open&Cooldown).

TEST mode (SPtM application only)

Use TEST mode for Gen-set start test if the Mains is OK or to transfer the load to the gen-set when Mains fail is announced in advance.

HINT
The controller does not respond to GCB ON/OFF , STOP, START in *Return To mains* = ENABLED.
Engine automatically starts, when TEST mode is selected.
Engine can start automatically without warning when pressing FAULT RESET after shut down alarm.

Test on load (SPtM application only)

Affects the behavior in TEST mode. Before the activation of this function

1. adjust setpoint **AMF settings**: *ReturnTo mains* = DISABLED
2. adjust Process control: MFStart enable = YES.
3. switch controller to Test on load mode (see drawing below)

Gen-set starts and goes to load (synchronizes to the mains, closes GCB and opens MCB) automatically when this input is closed even if Mains is OK.

Transmition of power from mains to generator

Behaviour of function depends on settings of setpoint **ProcCtrlSingle:***I/E-Pm meas.* If the mains import is measured (**ProcCtrlSingle:***I/E-Pm meas* = IM3 CT INPUT or ANALO INPUT) then there is no time limitation for unloading and opening of MCB. The MCB is opened when the Import/Export goes below 0 ± 5% of **Basic settings:** *Nomin power*. *If the setpoint* **ProcCtrlSingle:***I/E-Pm meas* = NONE then the MCB is opened after delay given by setpoint **AMF settings:** *BreakerOverlap.*

Transmition of power from generator back to mains

GCB is opened when the power on gen-set is drops under level given by setpoint **Sync/Load ctrl:** *GCB open level* at the least after delay given by setpoint **AMF settings:** *BreakerOverlap.*

Test on load with break (interruption)

The transfer of the load in TEST mode can be performed with interruption in case that the parallel to mains operation is undesirable. Set setpoints **ProcCtrlSingle:***Parallel enable* = NO or **ProcCtrlSingle:***Synchro enable* = NONE or REVERSE, **ProcCtrlSingle:***Island enable* = YES: If the LBI *Test on Load* gets active the load is passed from the mains to the gen-set with interruption. Controller opens MCB and closes GCB after delay given by **AMF settings:***FwRet break*. After deactivation of LBI *Test on Load* GCB is opened and and MCB Is closed after delay given by **AMF settings:***FwRet break*.

HINT
It is possible to configure both binary inputs (Remote TEST and Test on load) to only one controller physical binary input internally.

DROOP

The droop regulation of kW/kVAr is the alternative to the isochronous Load Sharing and VAr Sharing. In the isochronous regulation are all information about the kW/kVAr shared via intercontroller communication line whereas in droop no intercontroller communication is needed. The droop regulation is based on voltage and frequency which are measured on the common bus. The requested kW/kVAr are calculated in each controller from the actual bus voltage and bus frequency. This principle of regulation needs the voltage and frequency beeing changing within defined limits. Type of regulation depends on settings of setpoint **ProcCrtlMulti:** *Reg kW/kVAr.*

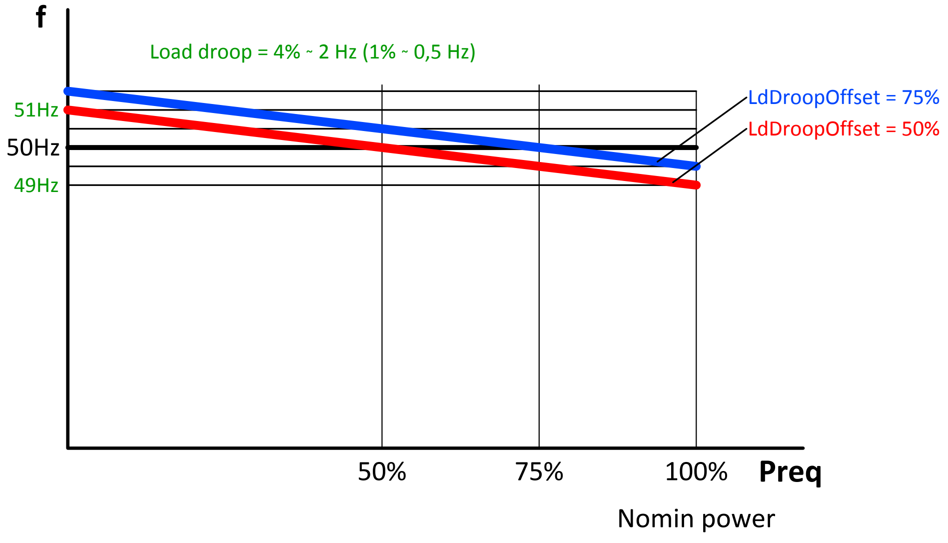
ProcCrtlMulti: *Reg kW/kVAr*	
STD	Standard isochronous Load Sharing and VAr Sharing are based on CAN intercontroller communication.
DROOP	Load Sharing and VAr Sharing regulations are based on droop. Requested power of each gen-set is calculated based on bus voltage and bus frequency.
EMERG DROOP	Load Sharing and VAr Sharing regulation are based on standard CAN intercontroller communication, but can be conditionally switched to droop. All controllers are continually checking the CAN16/CAN32 register (value in group “Info”) to see witch addresses are they in cooperation (use the LBI *EmergDroopEnab* to confirm the supervised constalation of addresses on CAN). In case of lost of any controller from CAN the regulations are automatically switched to droop (yellow alarm *EmergDroop act* appears in alarm list, message *EmergDROOPon* is writen in history). Load Sharing and VAr Sharing regulation are switched back to the standard mode 60 s after the constalation of addresses on CAN returns back to the original state (message *EmergDROOPoff* is written in history, alarm *EmergDroop act* has to be confirmed manually). The purpose of this function is protection against the cut off the CAN intercontroller line.

Load Sharing in droop

Characteristics of Load Sharing in droop are given by settings of these parameters:

Sync/load ctrl: *Load droop, LdDroopOffset*	
Load droop	This setpoint defines the slope of the load droop correlation. The slope is set as a droop of frequency in percentages of the requested frequency (**Basic settings:** *Nominal freq* + *Nom frq offset*) on the range of the requested power from 0 to 100% of **Basic settings:** *Nomin power.*
LdDroopOffset	This setpoint defines the value of requested power on the requested frequency (**Basic settings**: *Nominal freq* + *Nom frq offset*). Allows to shift the droop correlation line up or down.

Example: *Load droop = 4%, LdDroopOffset = 50% (75%)*

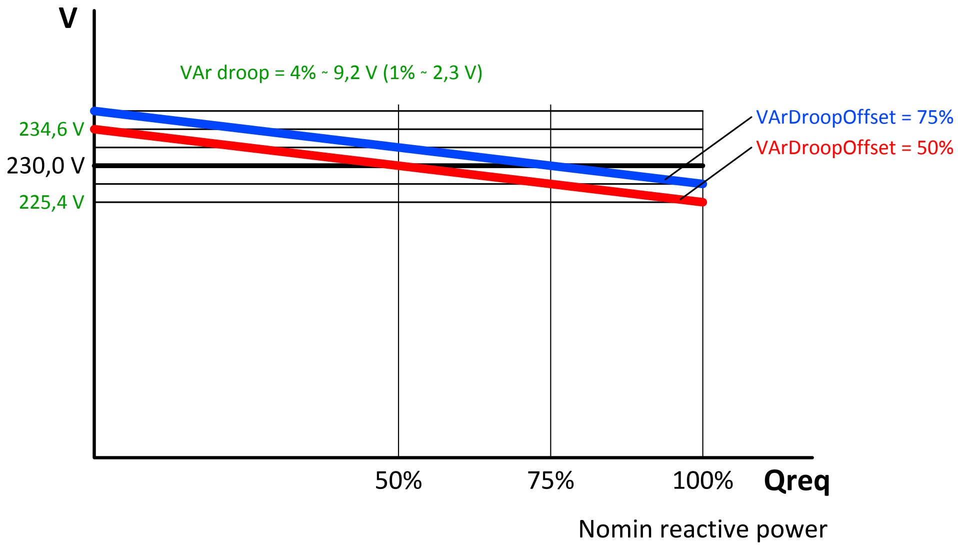


VAr Sharing in droop

Characteristics of VAr Sharing in droop are given by settings of these parameters:

Sync/load ctrl: *VAr droop, VArDroopOffset*	
VAr droop	This setpoint defines the slope of the VAr droop correlation. The slope is set as a droop of voltage in percentages of the generator nominal voltage (**Basic settings:** *GenNomV*) on the range of the requested reactive power from 0 to 100% of nominal reactive power (value of nominal reactive power is not given by setpoint but it is calculated from setpoint *Nomin power* whilst the PF=0,8).
VArDroopOffset	This setpoint defines the value of requested reactive power on the nominal voltage (**Basic settings:** *GenNomV*). Allows to shift the droop correlation line up or down.

Example: *VAr droop = 4%, VArDroopOffset = 50% (75%)*



Hint:

Droop mode allows cooperation of gen-set equipped by ComAp control system with gen-set equipped by any third party control system. The steady bus voltage and bus frequency has to be regulated by this third party control system. Active and reactive power of gen-set equipped by ComAp controller is kept on values given by droop settings.

Note:

Over frequency and under frequency protections are active in droop. Be aware that the gen-set frequency in droop can cross the levels of these protections. The force value on the under/over frequency protection limits can be used if it is needed to set the different limits in droop.

GCB control in AUT mode

The warning *DeadBusGCBblck* is issued and the GCB control is disabled when the mode of regulations is set to DROOP or EMERG DROOP, controller is set to AUT mode, Sys start/stop command is active (gen-set is running) and the dead bus is detected. It is the protection against the situation when two gen-set are started and are expected to close the GCB on one the same bus. Droop mode and emergency droop mode are expected to be used primarily without the CAN intercontroller communication and this function ensures the protection that two or more gen-sets will not close the GCB in one moment. This situation has to be solved by closing the GCB of one of the controllers in MAN mode.

Note:

Since the droop mode of regulations primarily expect the cooperation without intercontroller communication line, the Powermanagement does not calculate the load reserve. However the controller still reacts on signal Sys start/stop. As a result if the system fall into the emergency droop, all available gensets are started up. The dongle LSM+PMS (enabling load sharing and power management) is still needed even the regulations are switched to droop mode.

Soft unload in droop

Since the version 2.0 is the function of soft unload of the genset in droop implemented. The gen-set which is supposed to be stopped is being unloaded in accordance with settings of setpoints **Sync/Load ctrl:** *Load ramp, GCB open level, GCB open del.* The Logical Binary Input DROOP UNLD DIS has to be active in case that there is no other gen-set or grid available connected to the bus to take over the load. This input must be permanently activated to achieve the original behavior known from previous version (the GCB opens immediately after the stop command).

Independent activation of Voltage droop (kVAr Droop regulations)

The VArsharing based on droop regulation can be activated independently on loadsharing droop (frequency droop). The loadsharing with third party control system can run in isochronous mode based on analog voltage line (accessory tool NT-Converter is needed) while the varsharing is running based on droop regulation. The new Logical Binary Input KVARDROOPACT added. This input is used for activation of voltage droop. The LBO DROOP ACTIVE gets active when droop regulations are active because of any reason, e.g. when Logical Binary Input KVARDROOPACT is activated.

Cleaning mode

Use the LBI *Cleaning* to set the gen-set to cleaning mode. Under voltage and under frequency protections are blocked in this mode (**Gener protect:** *Gen>V BOC, Gen<V BOC, Gen>f, Gen<f*). It allows to switch off the excitation of generator while the gen-set is washed. Under voltage and under frequency protections are not active and do not stop the engine. Yellow warning *Cleaning* appears in alarm list.

Note:
RPM of the gen-set has to be measured using pick up or via ECU. It is not possible to evaluate the RPM form frequency of the generator voltage when cleaning mode is in use.

Warning !!!
Be aware that activation LBI *Cleaning* ensures only that under voltage and under frequency protection is not active and allows gen-set to run with frequency and voltage out of limits of protections. Activating of this input does not ensures that the voltage excitation is realy switched off. The excitation of the generator has to be unconditionally switched off directly on the AVR of generator while the cleaning function is in use!

Island Autodetect (SPtM application only)

This function can be used for automatic detection of island operation. The typical situation is that the MCB is not controlled by ComAp controller (i.e. manual fuses) and there is a long distance between the switchboard where the manual fuses are placed in and the rental gen-set. The detection of island operation is based on slow shift of mains frequency.

Typical situatioin:

- Rental gen-set is placed long distance from the switchboard. Mains voltage sensing is connected directly to mains (no contactor between the GCB and mains).
- Start of the gen-set and synchronizing to the mains (MCB feedback has to be switched on manually). Gen-set runs in parallel operation. Set baseload to achieve import from load close to zero. It is recommended to deactivate the vector shift and ROCOF protection.
- Activation of LBI *IslAdetectEnab* – manual decoupling from the mains by removing the fuses. Gen-set will recognize the decoupling from the mains based on the shift of frequency and switch over the regulations from parallel (load control) to island operation (speed control).
- Put the fuses back and deactivate manually the LBI *IslAdetectEnab.* Gen-set will automatically switch over the regulations of power back to parallel operation. (The reverse coupling to the mains is not recognized automatically but can be recognized based on wotching the gen-set power beeing in defined limits using the PLC logic. LBI *IslAdetectEnab* can be deactivated automatically by the PLC function.)

Related setpoints and LBI:

Gener protect: IslAdetFr+diff, IslAdetFr-diff, IslAdetFr del	
IslAdetFr+diff,	The plus difference of the mains frequency from the requested frequency (**Basic settings**: *Nominal freq* + *Nom frq offset*) used for detection of island operation.
IslAdetFr-diff	The minus difference of the mains frequency from the requested frequency (**Basic settings**: *Nominal freq* + *Nom frq offset*) used for detection of island operation.
IslAdetFr del	Island operation is automatically detected with the delay *IslAdetFr del* after the frequency cross the limit *IslAdetFr+diff* or *IslAdetFr-diff*.
LBI: IslAdetectEnab	
Actived	Automatic detection of decoupling from the mains is enabled (the MCB feedback must be wired up and be activated manually).
Deactived	Confirmation that the gen-set has been coupled back to mains (regulations are automatically switch over to parallel operation, if the MCB feedback is active).

Mains parameters out of limits during synchronising (SPI, SPtM appl.)

In case that mains parameters get out of permitted limits during synchronizing to mains (reverse or forward), the regulation of gen-set speed and voltage according to mains frequency and voltage is interrupted. During the state, when parameters reach out of limits, until “Mains fail” is issued, the engine speed and voltage regulation output is kept on the last value.

Manual fuse synchronizing (SPtM application only)

Function is enabled or disabled by setpoint ManualFuseSync [ENABLED, DISABLED] or by binary input using the force value. Setpoint select binary MCB output function when reverse synchronization is in process.

ENABLED: External device controls connecting of MCB. The unlimited timeout of synchronization can be reached **Sync/Load ctrl:** *Sync timeout* = NO TIMEOUT.
DISABLED: InteliGen controls MCB output.

Synchro state is indicated by Binary output In synchronism. Manual fuse switches can be closed only when Binary output: In synchronism is closed.
Binary input: MCB feedback can be closed after all Manual fuse switches are closed.
MCB feedback activates Load control function.

If Sync/Load ctrl:ManualFuseSync = ENABLED and binary input Synchro Enable is activated:
The vector shift protection controls the GCB instead of MCB when **Mains protect:** *VectorS CB sel* = GCB only.
Other Mains protections are deactivated, only generator voltage and frequency protections are active. Side effect is the gen-set does not start in case of Mains failure, as it is not detected.
MCB is neither controlled by MCB button in MAN mode in case of stopped engine, nor in case of the Return of the mains. The only function of the MCB button will be in starting/stopping the back synchronization.
The MCB feedback can be activated ONLY when the Mains is measured by the controller otherwise the Wrn MCB fail warning is reported.

Baseload change by Binary inputs (SPtM or SPI application)

The function is available in SPtM and SPI applications mode in parallel to the mains.
Binary inputs: BaseLoad Up and BaseLoad Down increase/decrease ActReqPower (Active required generator power value) that is in principle Baseload value by predefined setting of the External value1. For more details see a description of the binary inputs BaseLoad Up and BaseLoad Down)

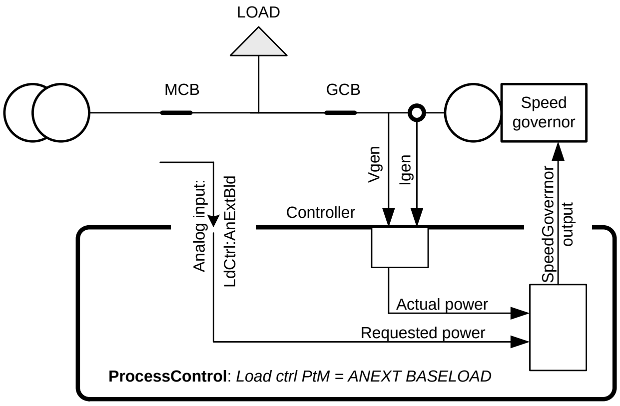
Active Power control modes in SPtM or SPI application

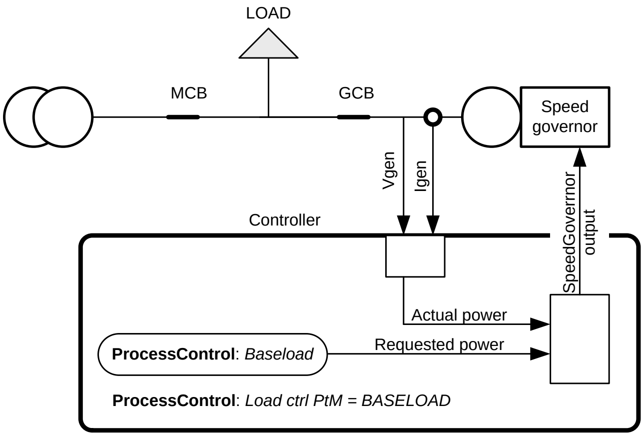
kW control modes

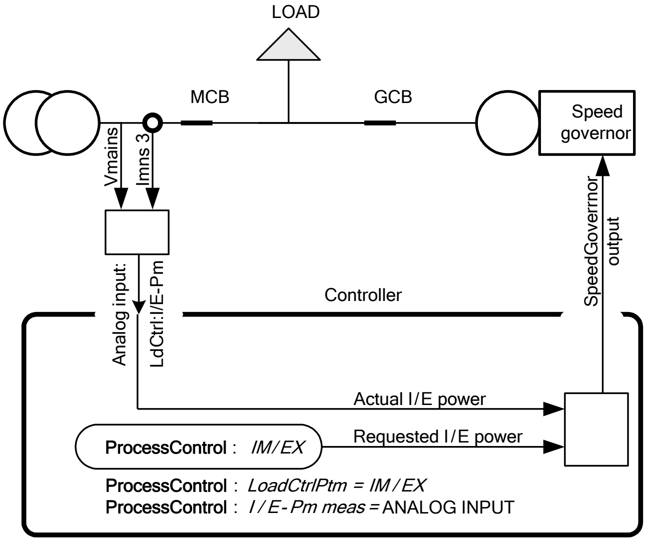
The type of control of the active power in parallel to mains operation can be selected by setpoint **ProcCtrlSingle:** *Load ctrl PtM*

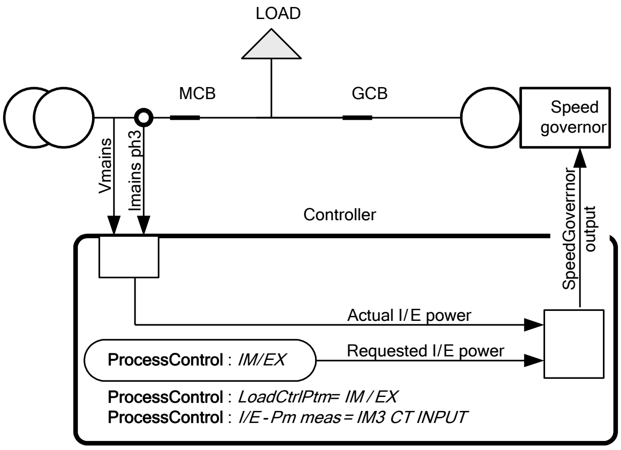
ProcCtrlSingle: *Load ctrl PtM*		
Mode	Function	Related setpoints and LBI
BASELOAD	Gen-set power is regulated to value given by *Base load* setpoint.	**ProcCtrlSingle**: *Base load*
IM/EX	Gen-set load is controlled so, that the mains import is maintained constant at the level given by *Import load* setpoint – I/E power is measured by controller on auxiliary CT input or by analog input.	**ProcCtrlSingle**: *Import load, I/E Pm-meas*
ANEXT BASELOAD	Gen-set power is set by analog input.	Analog input: LdCtrlAnextBld
V BY PWR	Gen-set power (baseload) in parallel to mains operation is controlled to keep the line voltage within predefined limits.	**ProcCtrlSingle**: *VoltByPwr Vreq, VoltByPwr Vmin, VoltByPwrStart, VoltByPwrStop, VoltByPwrSSdel*
ANEXT IM/EX	Gen-set load is controlled so, that the mains import is maintained constant at the level given by the analog input *LdCtrl:AnExI/E* – I/E power is measured by controller on auxiliary CT input or by analog input.	**ProcCtrlSingle**: *I/E Pm-meas,* **Analog input:** *PFCtrl:AnExI/E*
T BY PWR	Gen-set power is controlled to keep the required temperature, that is measured via an analog input.	**ProcCtrlSingle**: *TempByPwr Treq, TempByPwr gain, TempByPwr int,* **Analog input:** *LdCtrl:TByPwr*

Another modes of active power control		
Mode	Function	Related setpoints
Export limit	Limits export to the mains in the baseload mode. If the function is enabled, the gen-set power is limited so that mains import is always higher or equal to the setpoint *Import Load*.	**ProcCtrlSingle**: *Export limit = ENABLE, Import load*
Warming	The controller limits gen-set power for requested time or until the water temperature reach the requested value. After warming the gen-set goes to the requested (e.g. Baseload) power.	**ProcCtrlSingle**: *Warming load; Warming temp; Max warm time*
Peak shaving	Automatic gen-set start/stop based on object (load) consumption.	**ProcCtrlSingle**: *PeakLevelStart; PeakLevelStop; PeakAutS/S del*





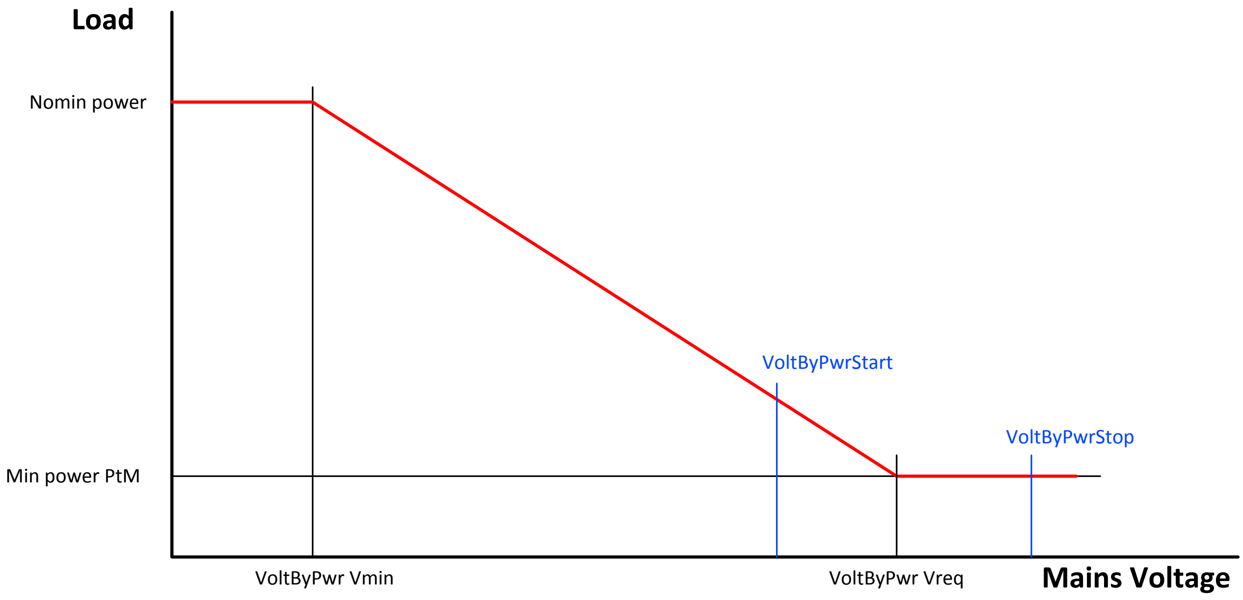




V BY PWR control mode

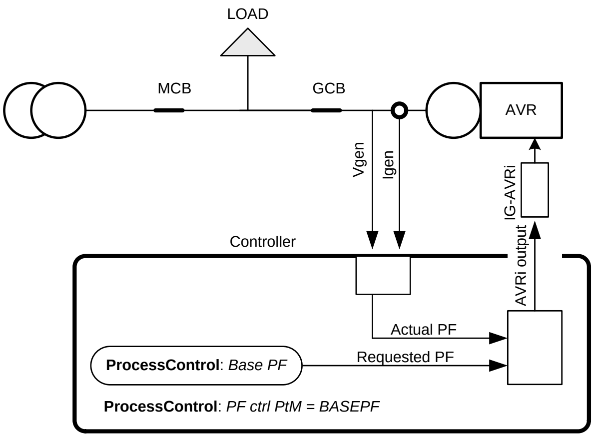
Gen-set power (baseload) in parallel to mains operation is controlled to keep the line voltage within predefined limits. The requested power is calculated from these setpoints from **ProcCtrlSingle** group.
V BY PWR control is based on measuring of mains voltage.

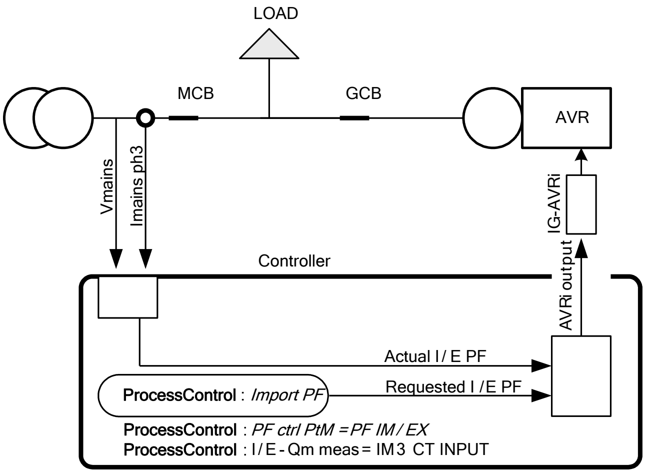
ProcCtrlSingle: *VoltByPwr Vreq, VoltByPwr Vmin, VoltByPwrStart, VoltByPwrStop, VoltByPwrSSdel*	
VoltByPwr Vreq	This setpoint defines the line voltage that is considered as OK. Gen-set is not supposed to run on higher power than is given by setpoint **Gener protect:** *Min power PtM*.
VoltByPwr Vmin	This setpoint defines the line voltage on witch is the gen-set supposed to be running on maximum available power witch is given by setpoint **Basic settings:** *Nomin power.*
VoltByPwrStart	This setpoint defines the low limit of voltage when the gen-set is automatically started (in AUT mode only). Gen-set is started when the voltage cross the limit with delay given by *VoltByPwrSSdel* setpoint.
VoltByPwrStop	This setpoint defines the high limit of voltage when the gen-set is automatically stopped (in AUT mode only). Gen-set is stopped when the voltage cross the limit with delay given by *VoltByPwrSSdel* setpoint.
VoltByPwrSSdel	This setpoint defines Start/Stop delay of V BY PWR function.

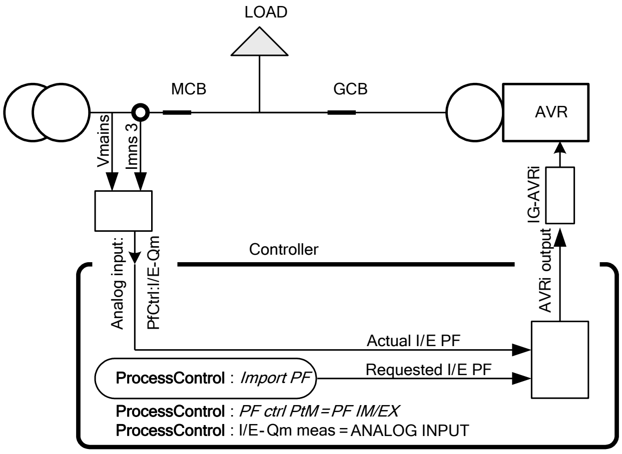


PF control modes in SPtM or SPI application

ProcCtrlSingle: *PF ctrl PtM*		
Mode	Function	Setpoints
BASEPF	Gen-set power factor is maintained at constant level adjusted by the setpoint *Base PF.*	**ProcCtrlSingle**: *PF ctrl PtM*
PF-IM/EX	Gen-set power factor is controlled so, that the mains power factor is maintained constant at the level adjusted by setpoint *Import PF*	**ProcCtrlSingle**: *Import PF*, *I/E Qm-meas*
ANEXT BASEPF	Gen-set power factor is maintained at constant level given by the analog input *PFCtrl:AnExBPF*	**Analog input:** *PFCtrl:AnExBPF*
ANEXT PF-IM/EX	Gen-set load is controlled so, that the mains power factor is maintained constant at the level given by the analog input *PFCtrl:AnExI/E* – I/E power factor is measured by controller on auxiliary CT input or by analog input.	**ProcCtrlSingle**: *I/E Qm-meas* **Analog input:** *PFCtrl:AnExI/E*







Active and Reactive Power control modes (MINT application only)

System Base load

Gen-set group is controlled on constant (or adjustable) power. The Baseload value can by changed by setpoint or via analog input.
Important setpoints: **ProcCtrlMulti**: *#SysLdCtrlPtM* = BASELOAD; *#SysBaseload*; *SysBaseLdMode.*

Local Baseload

Selected gen-set from island or mains parallel running group can be loaded to constant *LocalBaseload* value. This engine is taken out from Load sharing and Power management. *LocalBaseload* value is reduced only when common group (actual) load is lower than this value. The gen-sets in the group will try to match their *LocalBaseload*s (when more than one) based on their controller addresses, so the first limited would be the one with the highest CAN address. I.e. this function will switch-off automatically in one or more controllers if there is not enough load to cover all the requested LocalBaseloads.
Important setpoints: **ProcCtrlMulti**: *LocalBaseload.*

System Base power factor

Gen-set group is controlled in mains parallel to keep a constant (or adjustable) power factor.
Important setpoints: **ProcCtrlMulti**: *#SysPFCtrlPtM* = BASEPF; *#SysPwrFactor.*

Import-Export

Gen-set group is controlled to keep constant (or adjustable) Import or Export value. The external controller InteliMains NT must be connected on the CAN2 to control gen-set group kW I/E.
Important setpoints: **ProcCtrlMulti**: *#SysLdCtrlPtM* = LDSHARING*.*

Import/Export power factor

Gen-set group is controlled to keep constant (or adjustable) Import or Export power factor.
Important setpoints: **ProcCtrlMulti**: *#SysLdCtrlPtM* = VSHARING*.* The external InteliMains NT controller must be connected on the CAN2 to control gen-set group PF I/E.

Power management

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

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

NOTE:
The power management is related to MINT application only.

CAUTION!
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).

1. 1. 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*.

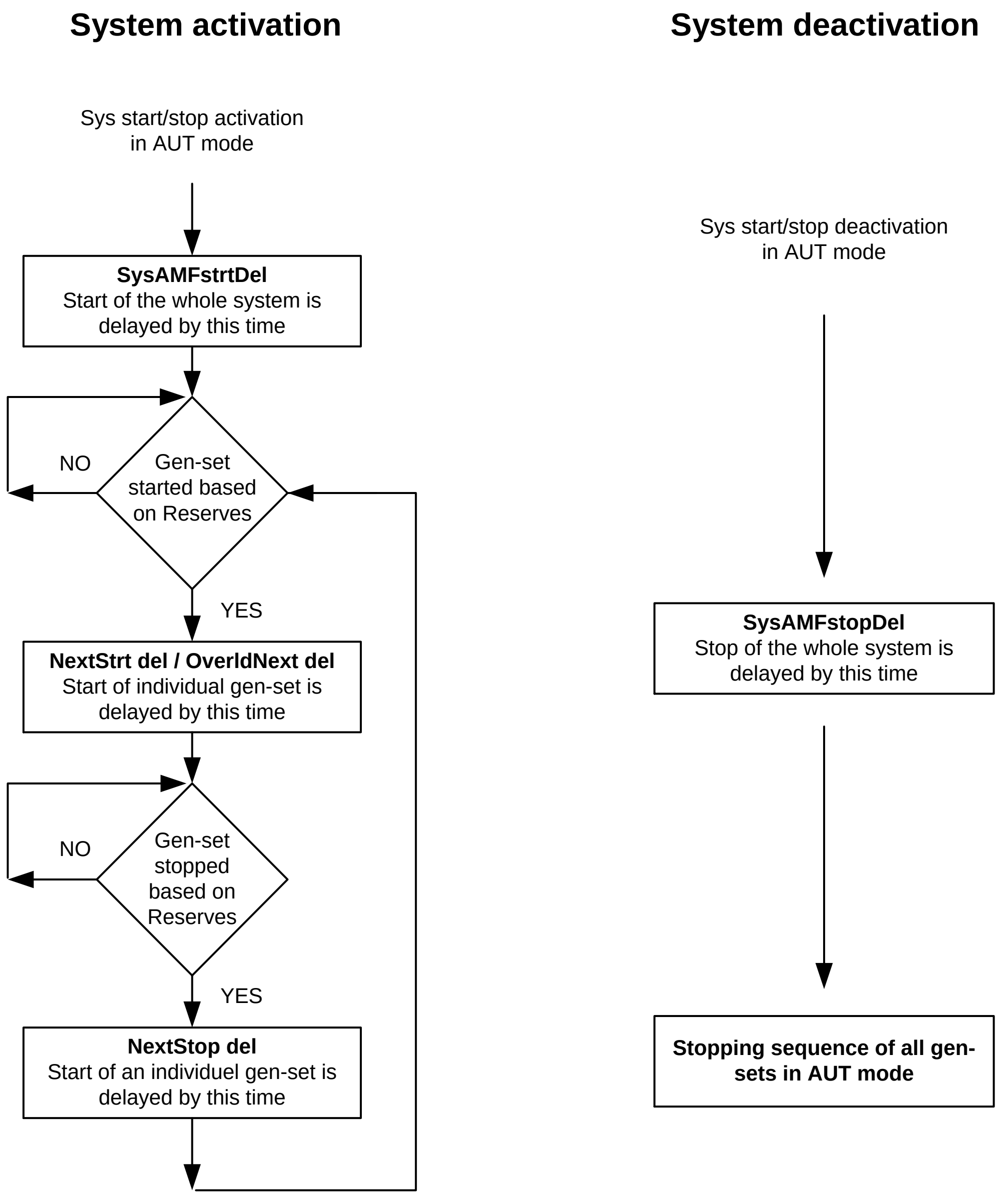
The binary input *Sys start/stop* requests the gen-set to start or stop. If the input is not active, the gen-set stops with delay **Pwr management:** *#SysAMFstopDel* after the input has been deactivated and will not start again if in AUT mode. If the input is activated again, the delay **Pwr management:** *#SysAMFstrtDel* starts to count down. Once the delay elapsed, 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.

1.1.1 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).

1.1.2 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.

1.1.2.1 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.

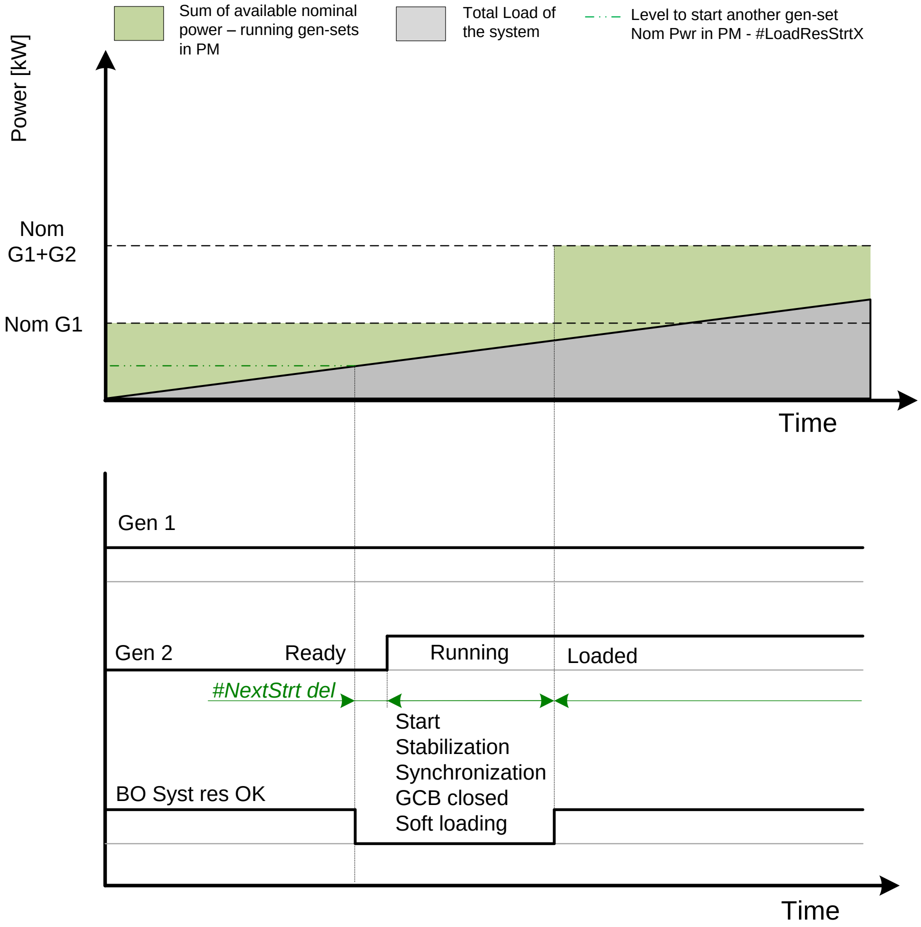


Figure: Starting sequence

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.

1.1.2.2 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.

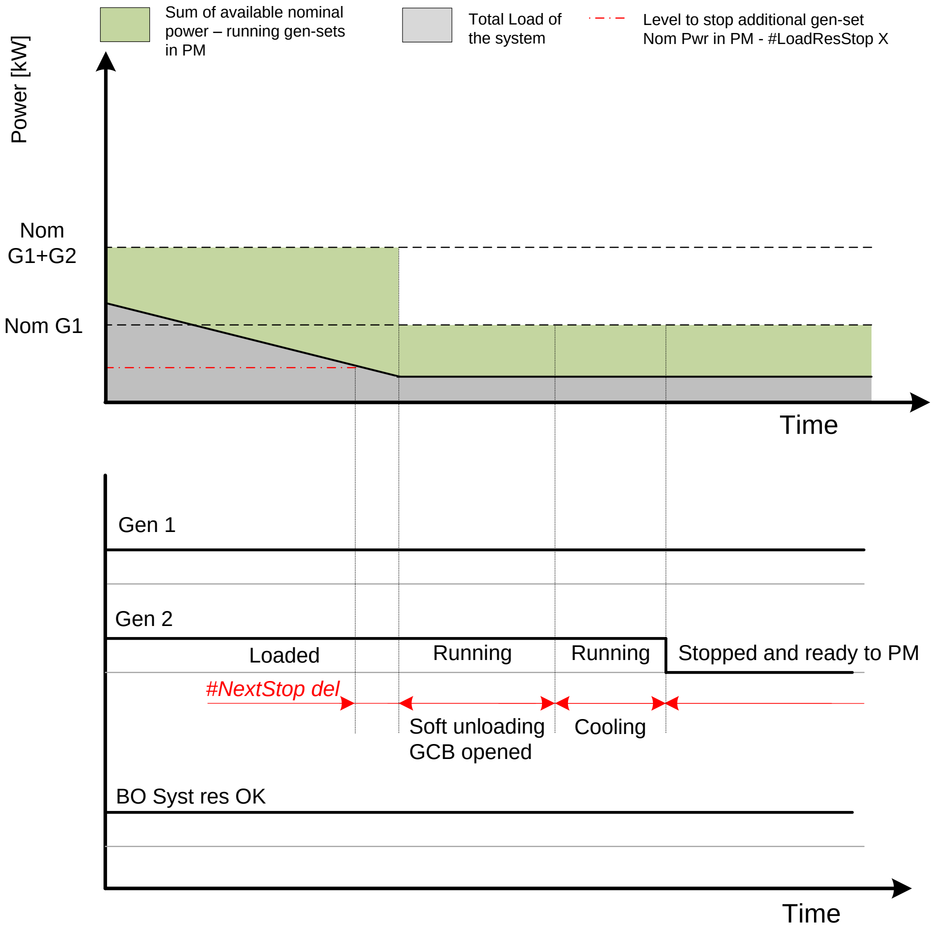


Figure: Stopping sequence

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.

1.1.2.3 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.

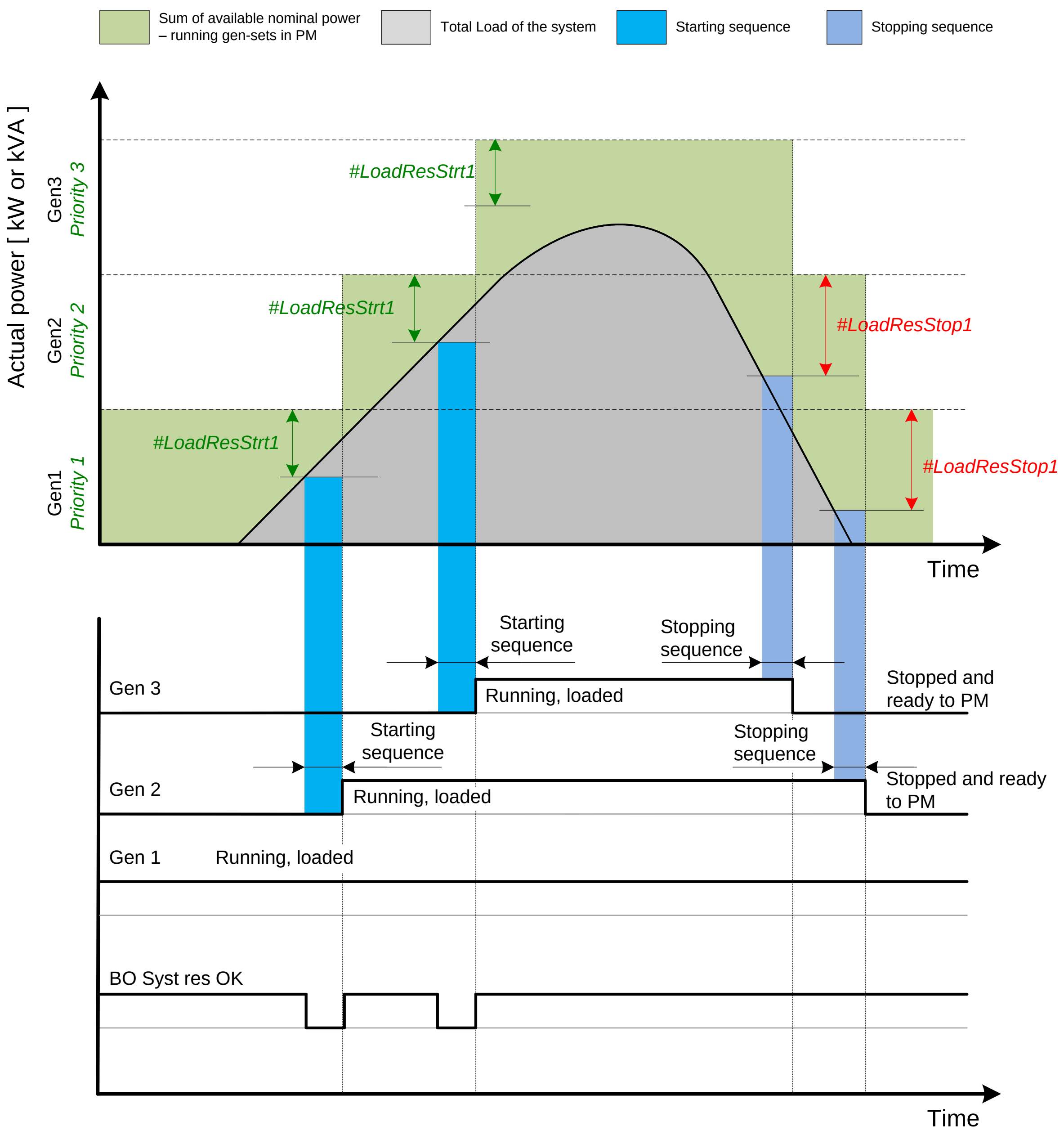


Figure: Power management based on absolute load reserve

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*.

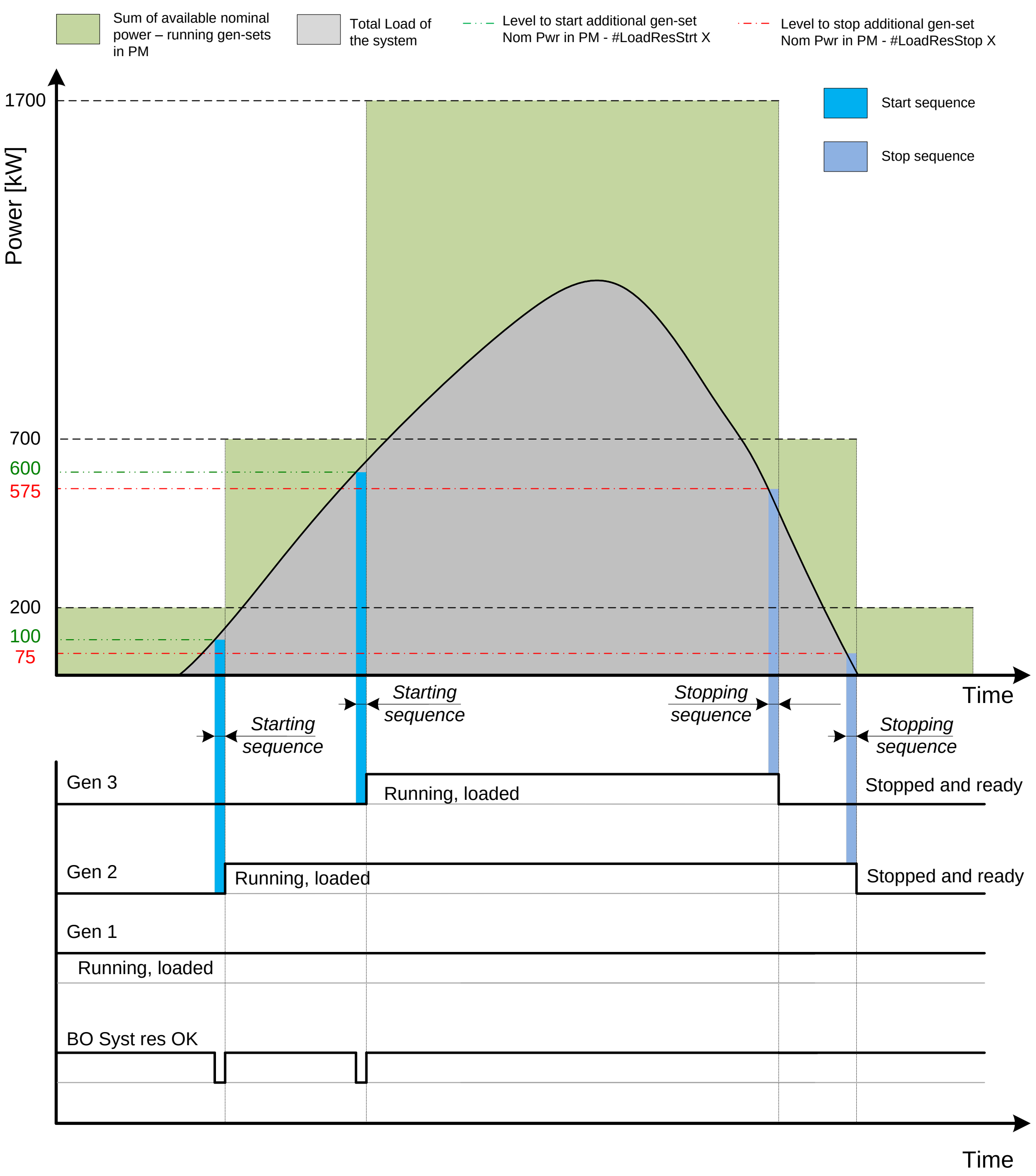


Figure:

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.

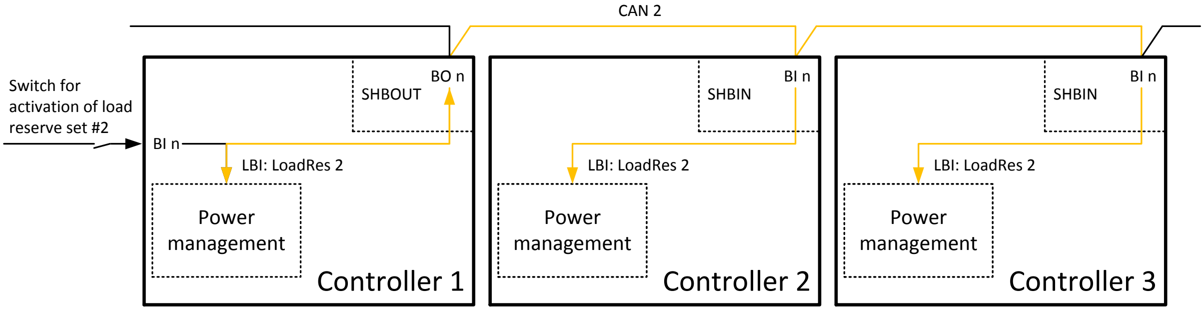


Figure: Example of using virtual shared peripheries for signal distribution

1.1.2.4 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.

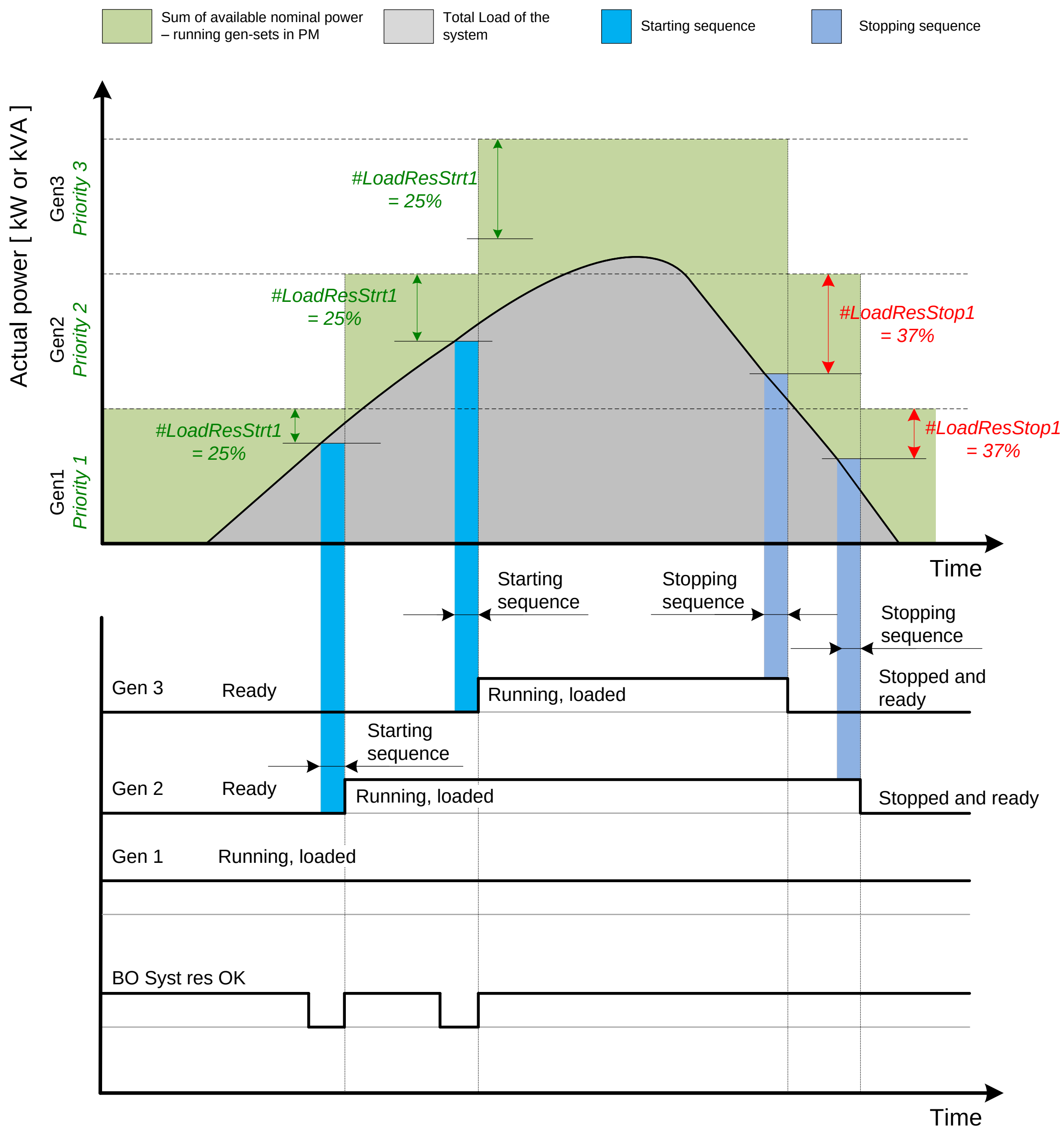


Figure:

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*.

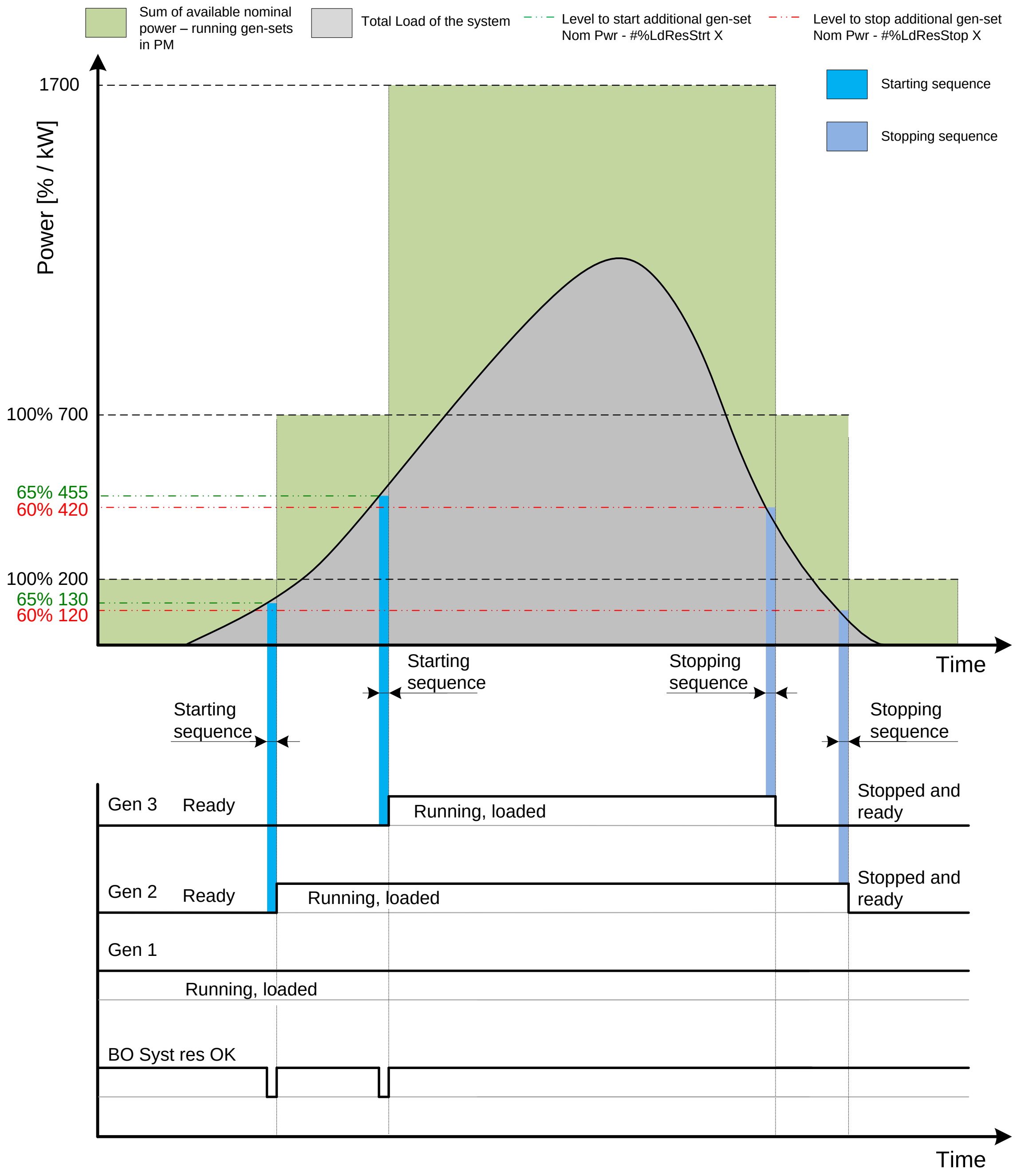


Figure:

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.

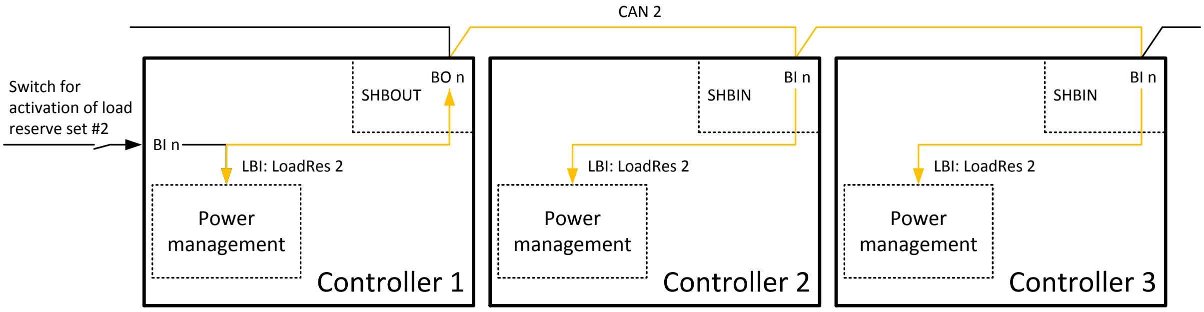


Figure: Example of using virtual shared peripheries for signal distribution

1.1.3 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

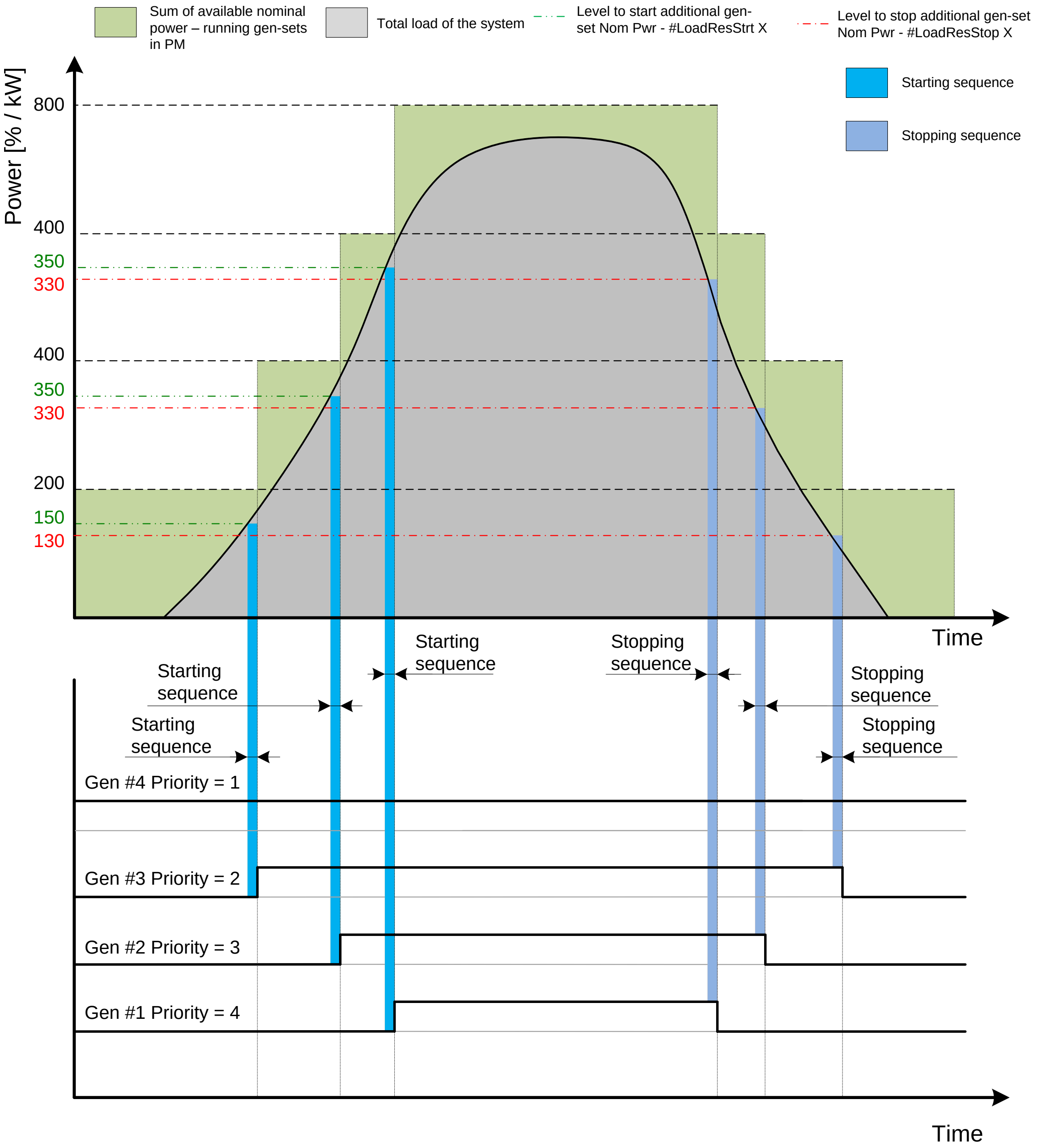


Figure: Power management example - Priorities

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.

1.2. 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".

1.2.1. 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.

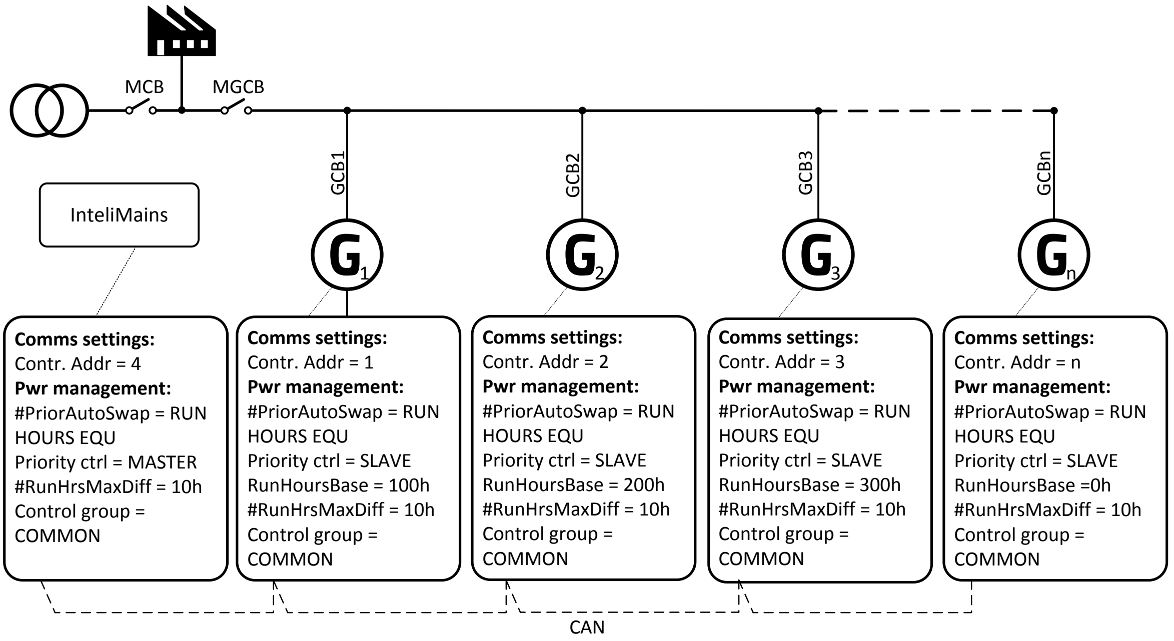
Activation: Pwr management: *#PriorAutoSwap* = RUN HOURS EQU
Important setpoints: *RunHoursBase*, *#RunHrsMaxDiff, Priority ctrl, Control group*

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

$\underline{RHE_i = Runhours_i - RunHoursBase_i}$,

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.

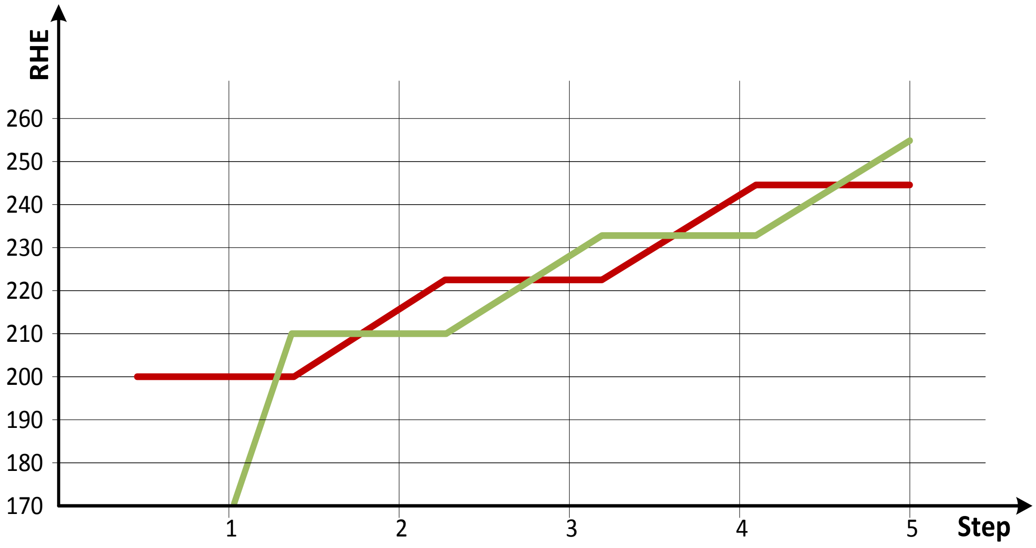


Figure: Running Hours Equalization example, 2 gen-sets

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.

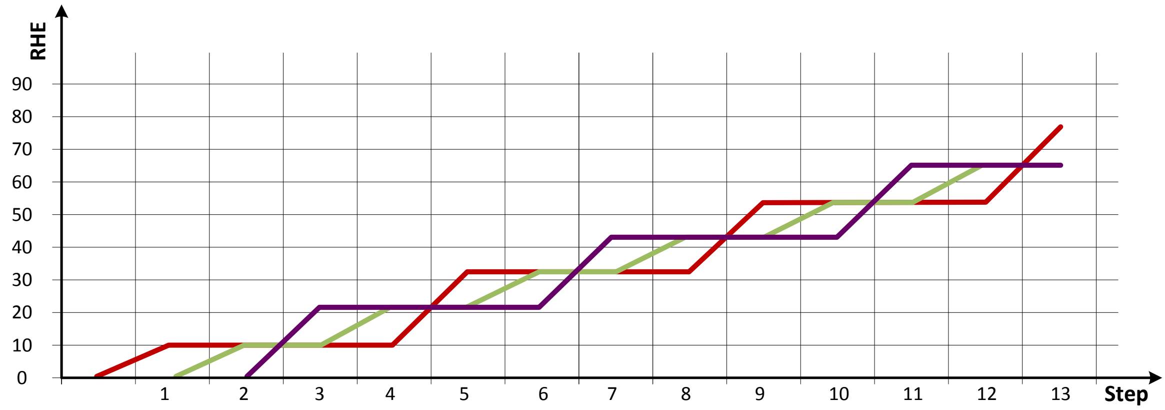


Figure: Running Hours Equalization example, 3 gen-sets with same initial RHE

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.

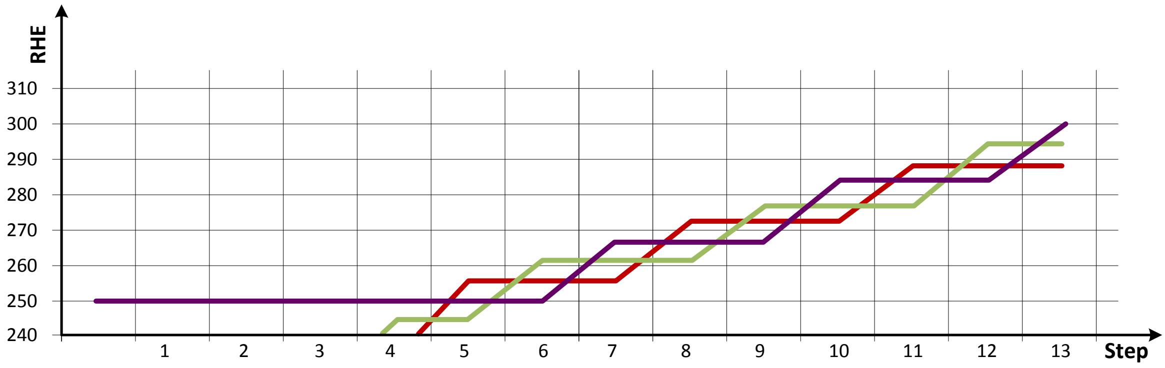


Figure: Running Hours Equalization example, 3 gen-sets with different initial RHE

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.

1.2.2. 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.*

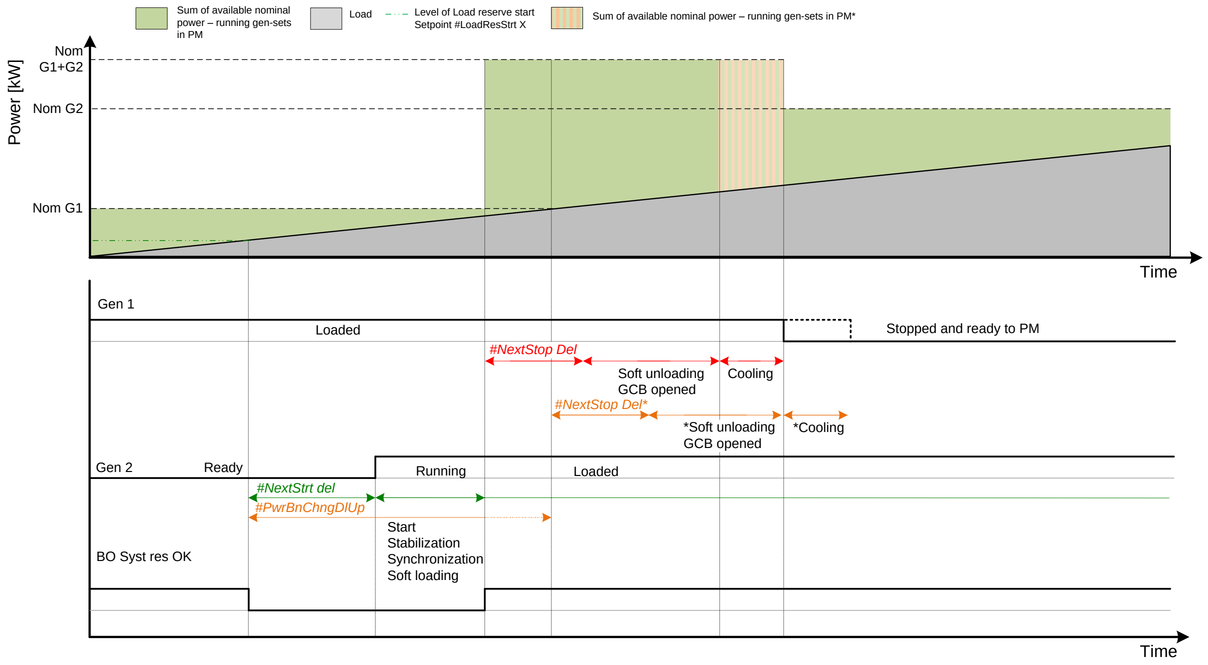
The gen-sets must have addresses 1, 2 and 3. There are four power bands; each of them has adjusted specific combination of gen-sets that run within it. Power bands are adjusted by setpoints *#PwrBandContr1, #PwrBandContr2, #PwrBandContr3* and *#PwrBandContr4*. The load levels of the power bands are defined 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.

1.2.2.1. Handover UP Swap sequence

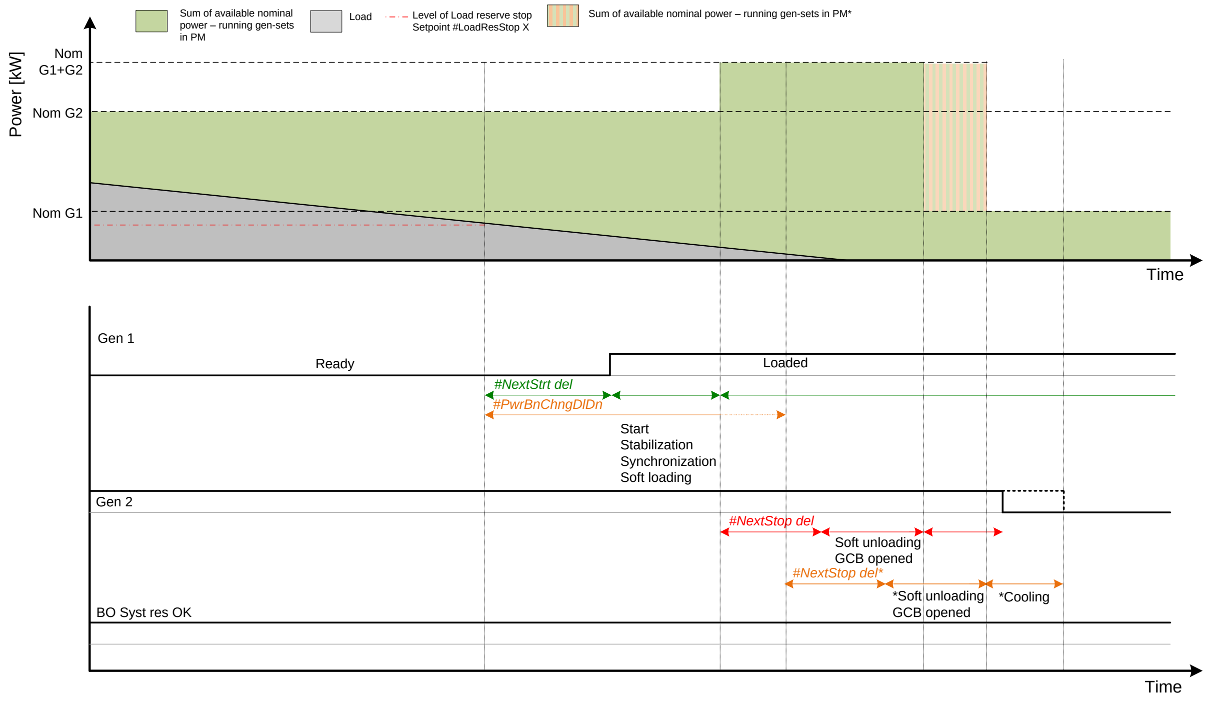
As explain above, the automatic priority swapping evaluates the load of the system and assigns the most appropriate power band. The handover UP sequence describes the situation the gen-set with lower nominal power is swapped by the gen-set with higher nominal power. The gen-set with lower nominal capacity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

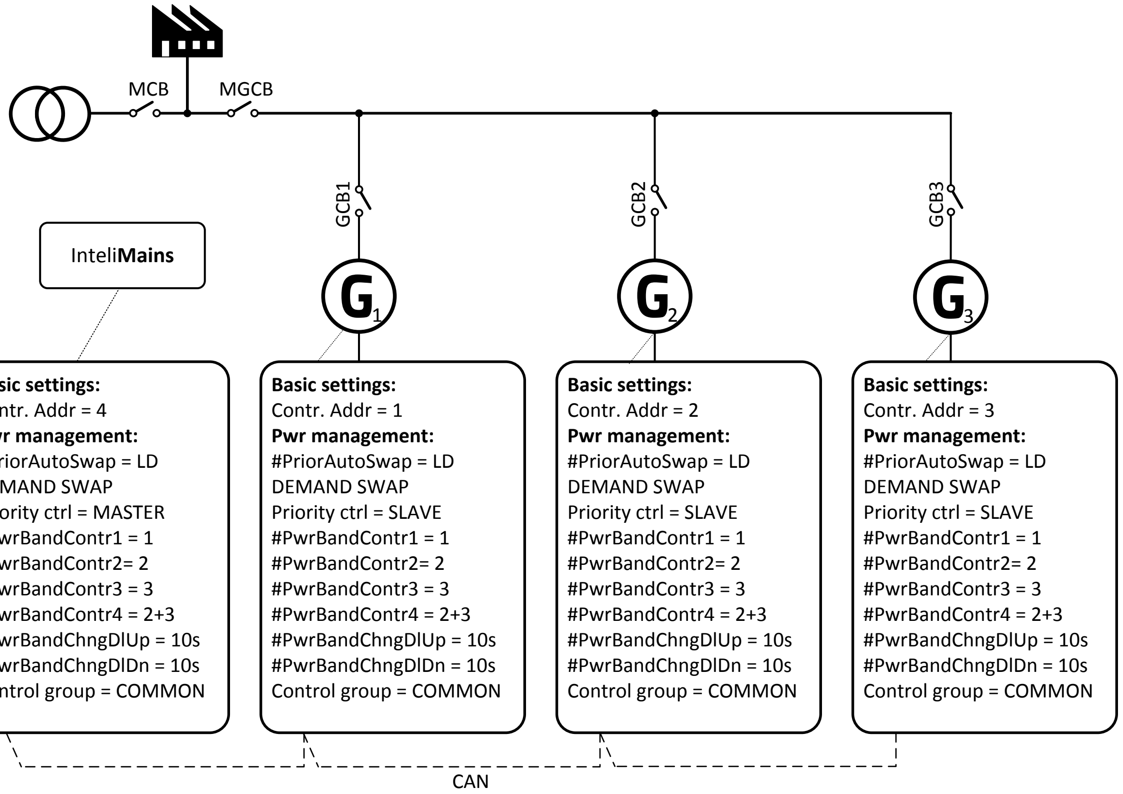
1.2.2.2. Handover DOWN Swap sequence

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.

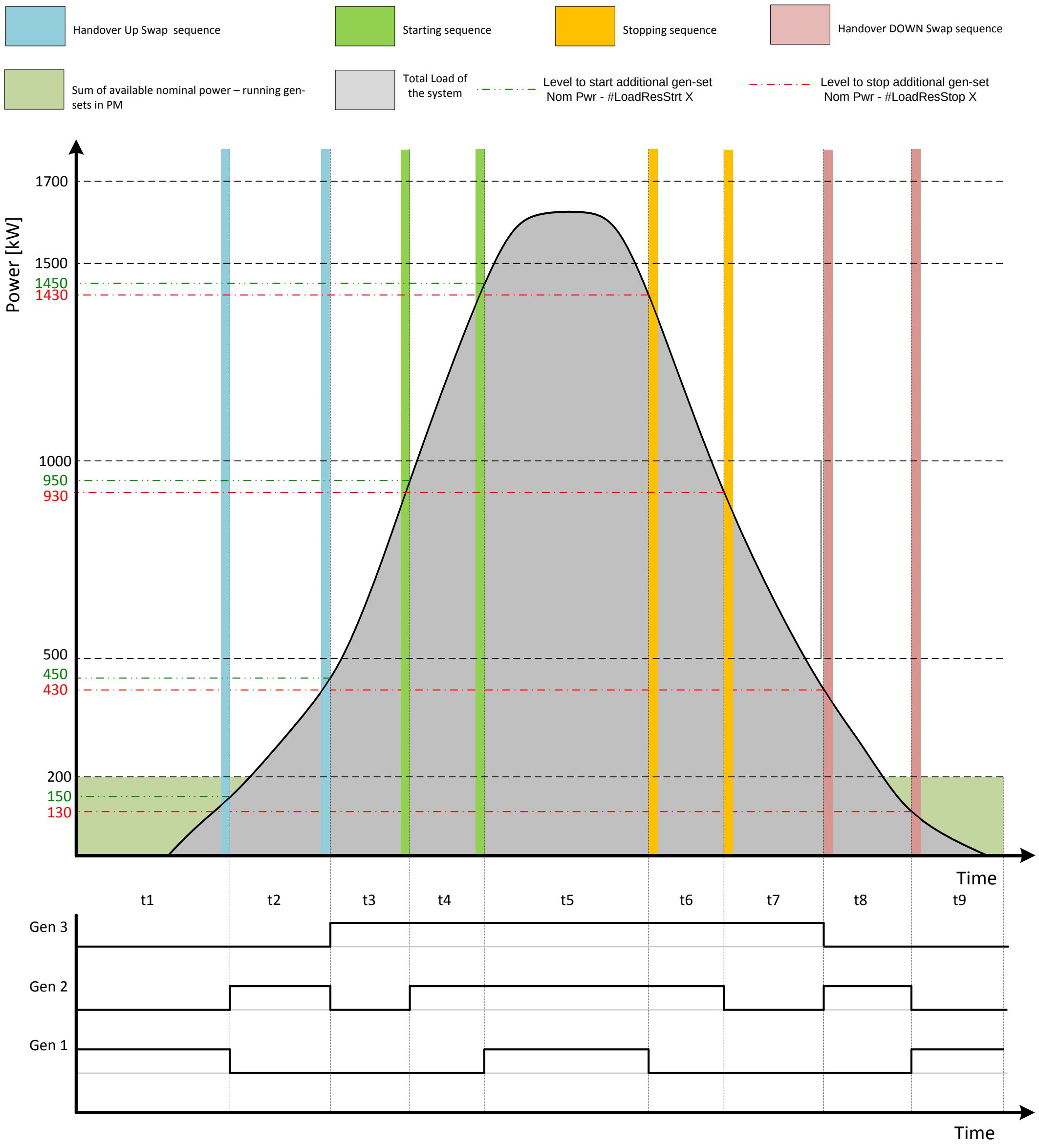


Figure: Load Demand Swapping example

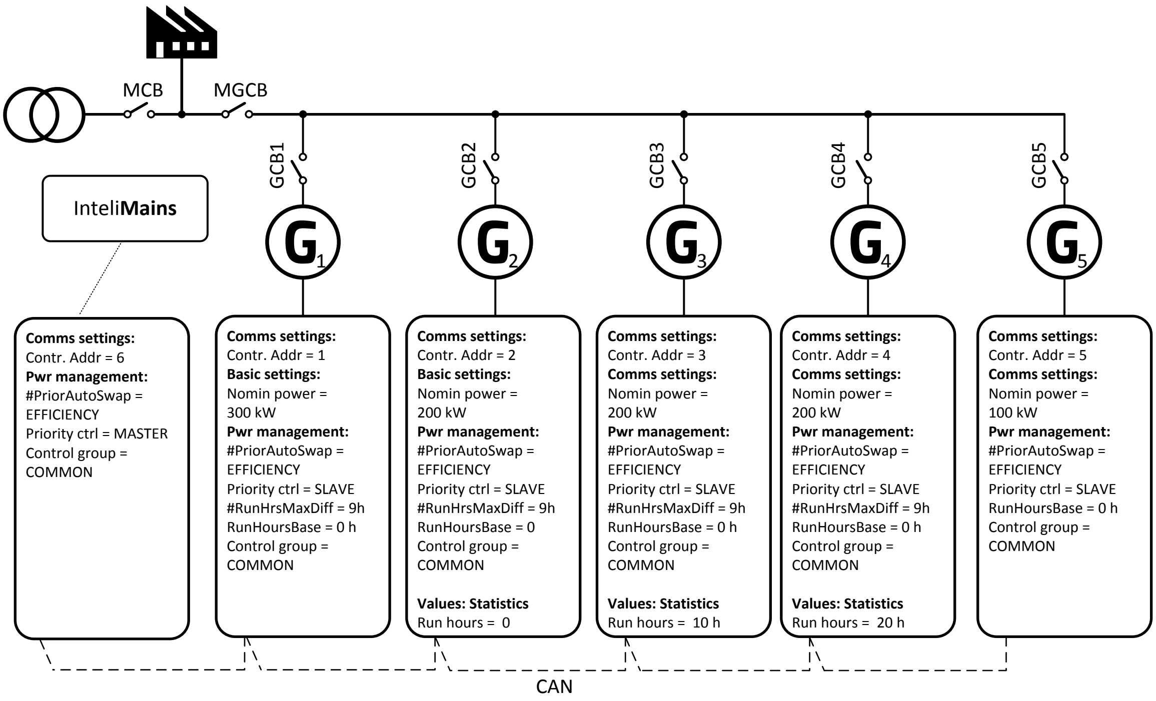
step		t1	t1 -> t2	t2	t2-> t3	t3	t3 -> t4	t4	t4 -> t5	t5	t5 -> t6	t6	t6 -> t7	t7	t7 -> t8	t8	t8 -> t9	t9
Gen#1	200 kW	LOADED	handover UP	READY	handover UP	READY	starting of gen#2	READY	starting of gen#1	LOADED	stopping of gen#1	READY	stopping of gen#2	READY	handover DOWN	READY	handover DOWN	LOADED
Gen#2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

1.2.3. Efficiency

The Efficiency mode is a combination of Running Hours Equalization and Load Demand Swap priority optimization modes. Please refer to chapters 1.2.1 and 1.2.2 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*.

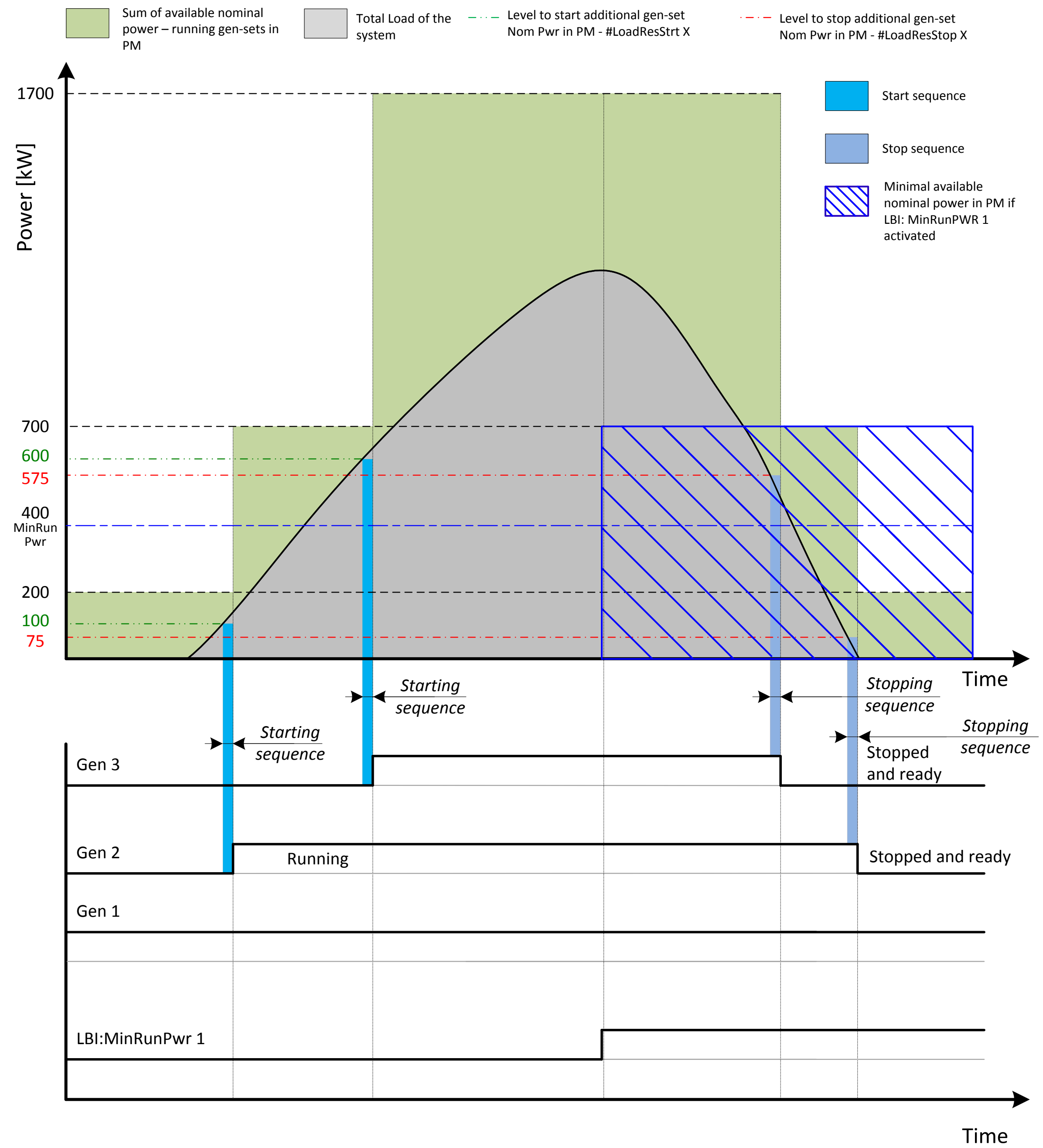
Following table provide an example of gen-set selection in function of system load evolution. The table is an example of Efficiency priority optimization function.

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] ❸[10h]	Start stop	RHE Swap	400	30%
120	❸[20h]			200	60%
180	❸[30h] ❶	Start stop	LDS Swap	500	36%
200	❶			300	67%
240	❶			300	80%
280	❶❺	Start	Gen#5 joins (LDS)	400	70%
340	❶❺			400	85%
380	❶❺❹[20h]	start stop	LDS + RHE Swap	600	63%
400	❶❹			500	80%
440	❶❹			500	88%
480	❶❹❺	start	Gen#5 joins (LDS)	600	80%
540	❶❹❺			600	90%
580	❶❹❺❷[20h]	start stop	LDS Swap	800	73%
600	❶❹❷			700	86%
640	❶❹❷			700	91%
680	❶❹❷❺	start	Gen#5 joins (LDS)	800	85%
740	❶❹❷❺			800	93%
780	❶❹❷❺ ❸[30h]	start stop	LDS Swap	1000	78%
800	❶❹❷❸			900	89%
840	❶❹❷❸			900	93%
880	❶❹❷❸❺	start	Gen#5 joins (LDS)	1000	88%
940	❶❹❷❸❺			1000	94%

1.3. 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.

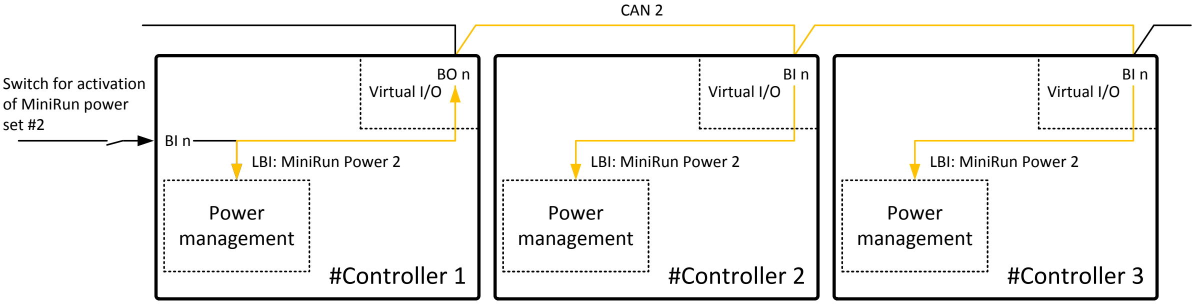


Figure: Example of using virtual shared peripheries for signal distribution

1.4. Control Groups

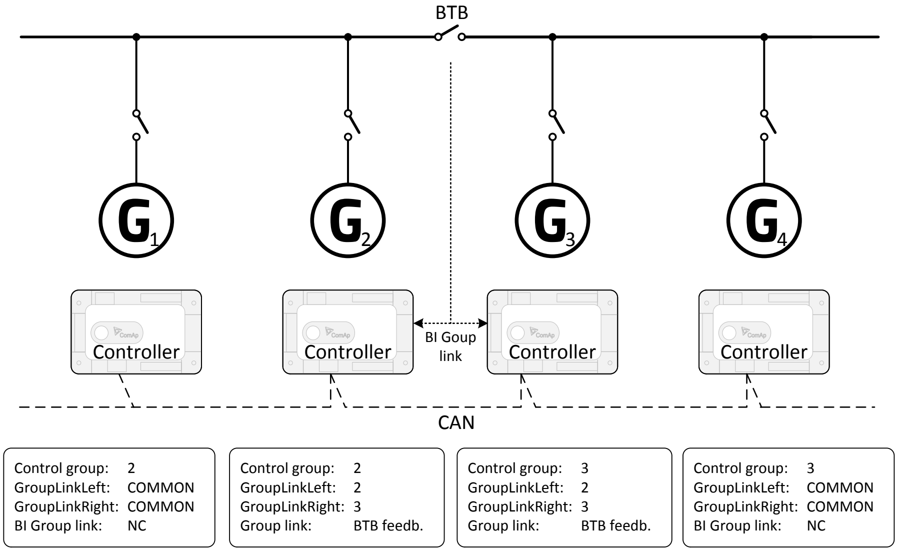
The physical group of the gen-sets (i.e. the site) can be separated into smaller logical groups, which can work independently even if they are interconnected by the CAN2 bus. The logical groups are intended to reflect the real topology of the site when the site is divided into smaller gen-set groups 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

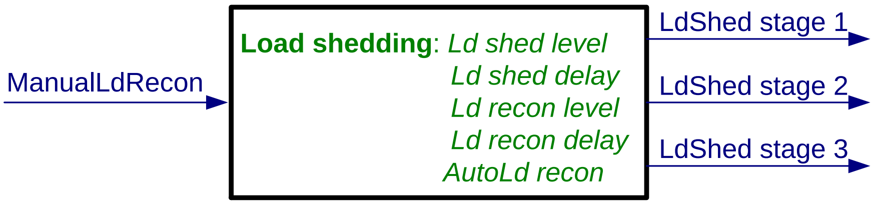
Once the BTB breaker is closed, the control group 2 and 3 become new group 2+3. The closed BTB and the group link function influence the load reserve (i.e. increased by added gen-set of added gen-sets). Load sharing applies for all gen-sets.

Load shedding

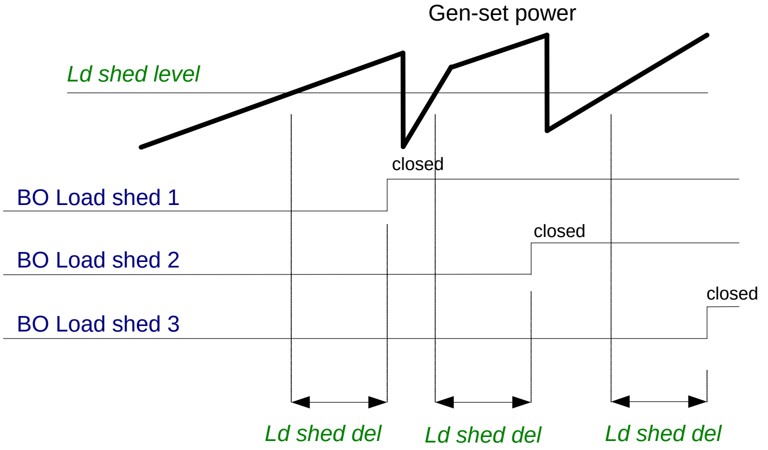
All LOAD SHED outputs are activated (closed) to trip the unessential load when gen-set goes to island:

a) When GCB is closed after mains fail and gen-set starts in SEM / AUT mode.
b) When MCB opens from parallel to mains operation in SEM / AUT mode.
c) Before MCB is opened in MAN mode by button.

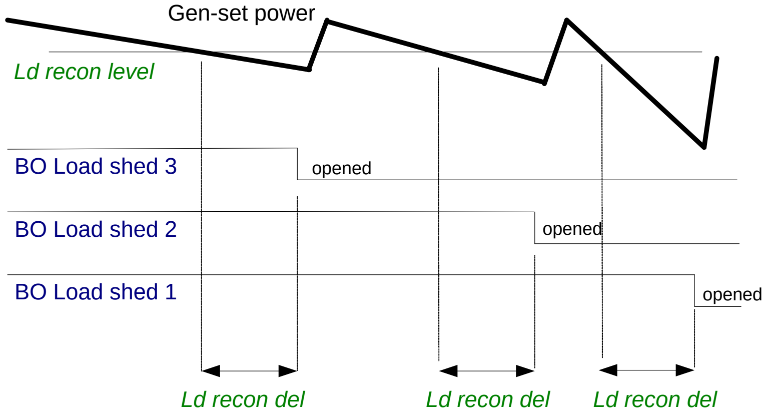
The load shedding function is active in all controller modes except OFF.
Load shedding has three steps and each step is linked with its own Load shed x binary output. There is only one load shed level and delay for all three steps as well as recon level and delay. Load shed can only move from one step to the next, e.g. No LoadShed to LdShed S1 to LdShed S2 to LdShed S3 and vice versa.
If manual reconnection of the load is desired, the AutoLd recon setpoint needs to be disabled (*AutoLd recon* = DISABLED) and the MAN load recon 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* at that moment.



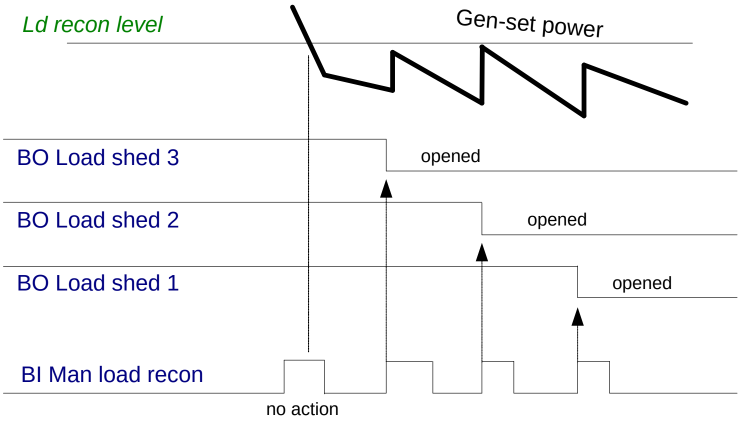
HINT
If no Load Shedding outputs are configured, there is no record to history and no scrren timer indication of the activity of this function.



Load reconnection – automatic -> *AutoLd recon* = ENABLED



Load reconnection – manual -> *AutoLd recon* = DISABLED



Power derating

This function linearly **decreases genset nominal power** according to analog input value.
Gen-set power starts decreasing when temperature measured by Analog input PowerDeratingX exceeds *DeratingX strt* value.
Gen-set power is at *DeratedX pwr* value when temperature measured by Analog input Power deratingX is equal or higher than *DeratingX end* value.

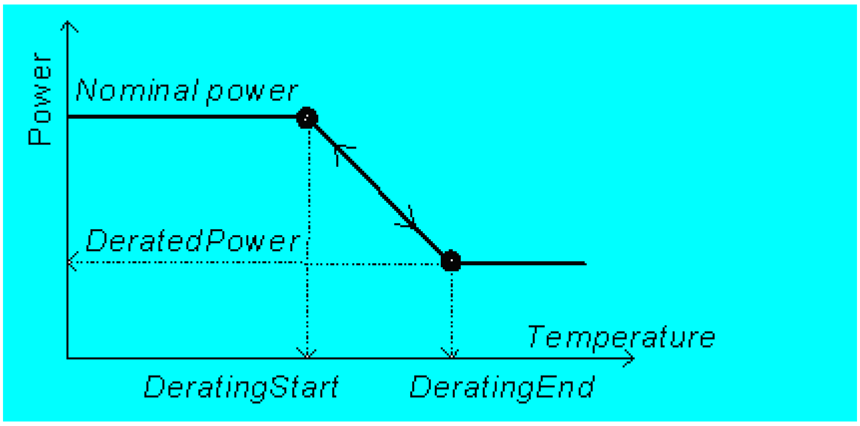
HINT
To use Power derating function configure at first Analog input PowerDeratingX to any IGS-NT or IS-AIN analog input terminal by GenConfig.

When Power derating function is active the generator overload protection is based on the Derated power! ! !

Derated power value **Pg derated** is visible in the controller measure screen.

When derating function is not active the Derating power is equal to Nominal power.

Example :
Nomin power = 200 kW, *Derating1 strt* = 70 °C, *Derating1 end* = 100 °C, *Derated1 pwr* = 70 %.
Genset is running at Nominal power 200 kW. When temperature reached 70 °C the genset power starts decreasing. When temperature reached 100 °C genset runs at 70 % of Nominal power = 140 kW. When temperature increased above *DeratingX end* temperature level, gen-set power stays at *DeratedX pwr* level 140 kW.



Temperature derating function decreases genset power depend on setpoints *DeratingX strt*, *DeratingX end* and *DeratedX pwr*.

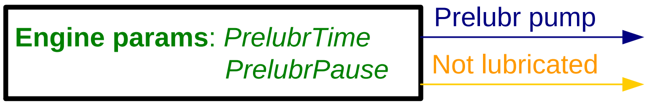
Temperature derating starts at *DeratingX strt* temperature.

At *DeratingX end* temperature runs genset at *DeratedX pwr* level.

Above *DeratingX end* temperature Genset runs at constant *DeratedX pwr*.

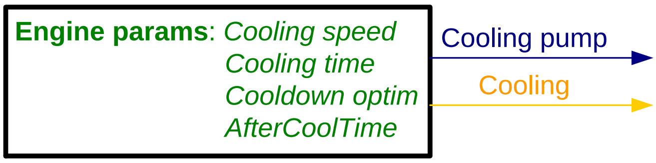
Engine states

Engine prelubrication

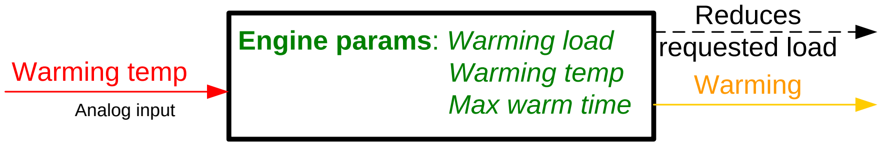


HINT
To use Prelubrication, configure Binary output PRELUBR PUMP first.
Prelubrication is disabled in controller OFF mode or if *Prelubr time* is set to zero.
Binary output PRELUBR PUMP is opened when engine is running.
Prelubrication cycle starts with *PrelubrPause* after engine stop.
Prelubrication cycle starts immediately when controller power supply is switched on or when mode changes from OFF to MAN or AUT or after Emergency stop was reset. An Alarmlist message “Not lubricated” is active until this first lubrication cycle has been completed.

Engine cooling

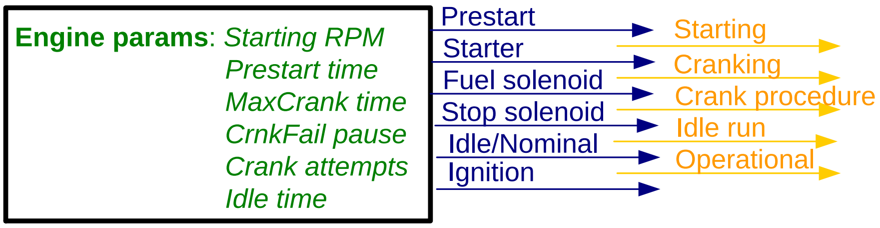


Engine warming

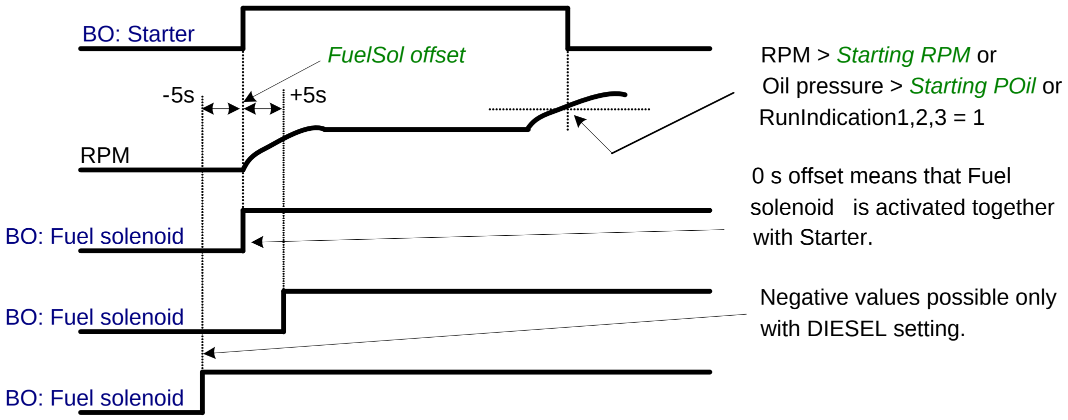


Service time alarm

Engine starting procedures



Engine starting procedure if **Engine params**: *Fuel solenoid* = DIESEL ENGINE with different setting of *FuelSol offset*.

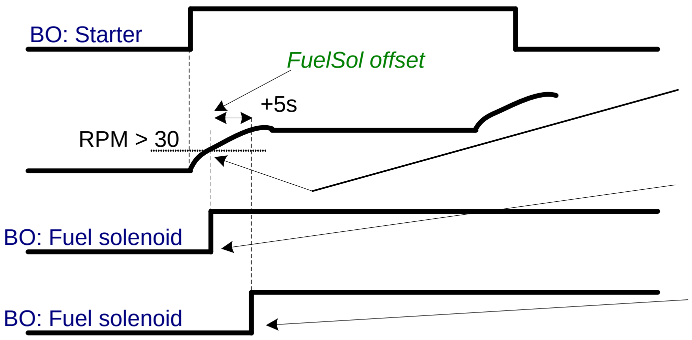


RPM > *Starting RPM* or
Oil pressure > *Starting POil* or
RunIndication1,2,3 = 1

0 s offset means that Fuel solenoid is activated together with Starter.

Negative values possible only with DIESEL setting.

Engine starting procedure if **Engine params**: *Fuel solenoid* = GAS ENGINE

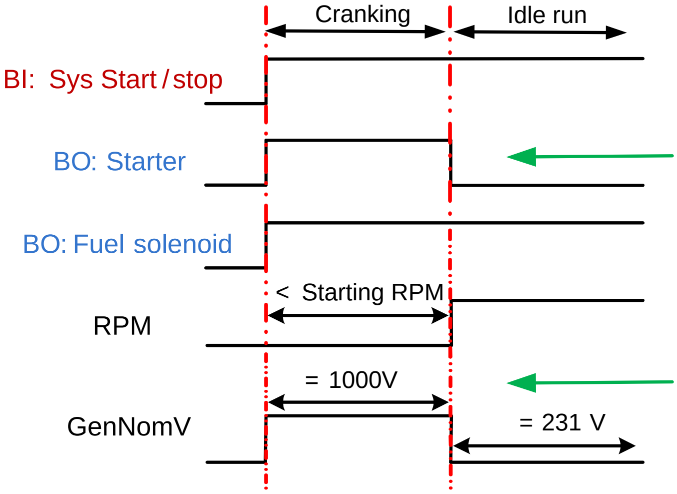


FuelSol ofset countdown is started if RPM > 30.

0 s FuelSol offset activates the Fuel solenoid immediately if RPM > 30.

Max up to 5s Fuel solenoid activation

Engine starting procedure with ***own starting procedure***:
Engine is started after **Starting RPM** reach starting leve or other condition. BO: Starter is deactivated only if one of those condition is fulfilled.

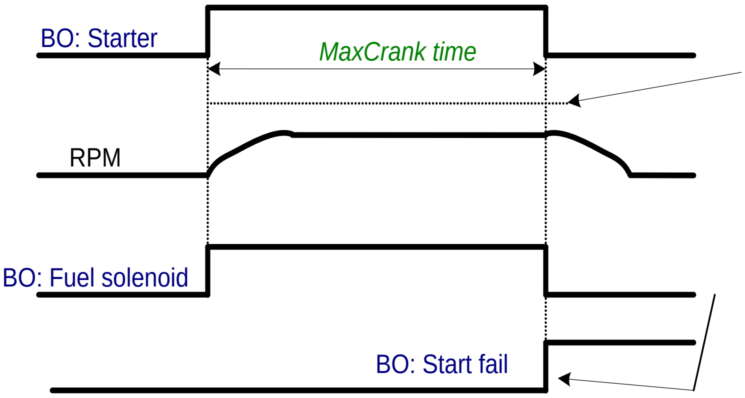


BO: Starter is deactivated

GenNomV is forced during cranking untill **Starting RPM** > 1000

Generator nominal voltage is 231V but during *Cranking* is forced to 1000V until engine in *Idle state* (at least one of condition has to be fulfilled).

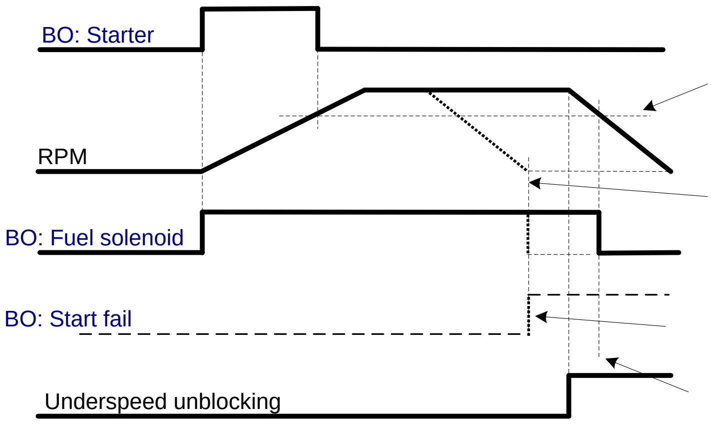
Unsuccessful start – no **Engine params**: *Starting RPM* reached



Starting RPM level not reached and no other signs of running engine is present.

Start fail activated only if this has been the last start attempt in a series.

Unsuccessful start – RPM disappeared before/after Underspeed protection got active:



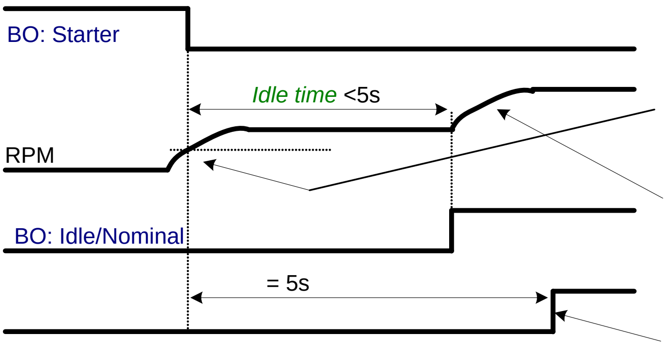
Starting RPM level.

Underspeed protection is not yet Active. Underspeed is detected only if RPM <= 2 and other signs of moving engine present = „still engine“.

Start fail activated because of RPM loss.

RPM dropped under *Starting RPM* level and Underspeed enabled > protection activated.

Underspeed protection unblocking if *Idle time* < 5s:

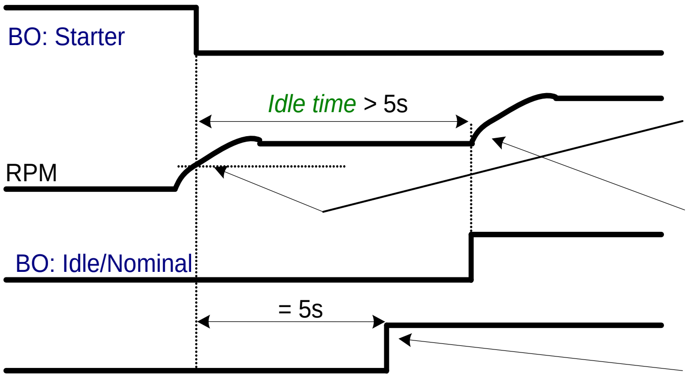


Starter switched off after reaching *Starting RPM* or other engine „running“ condition.

Transition Idle - > Nominal RPM.

Underspeed protection unblocked

Underspeed protection unblocking if *Idle time* > 5s:

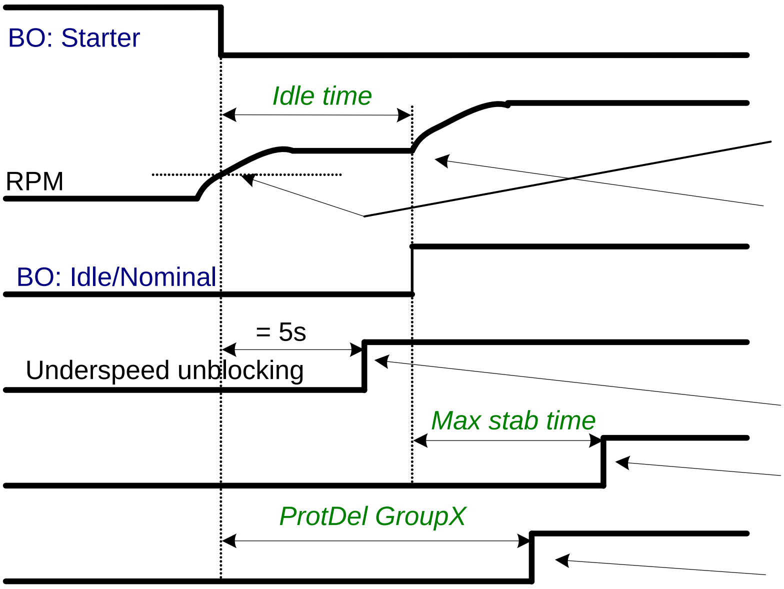


Starter switched off after reaching *Starting RPM* or other „running“ condition.

Transition Idle - > Nominal RPM.

Underspeed protection unblocked.

Transition Idle -> Nominal RPM, protections unblocking:



Starter switched off.

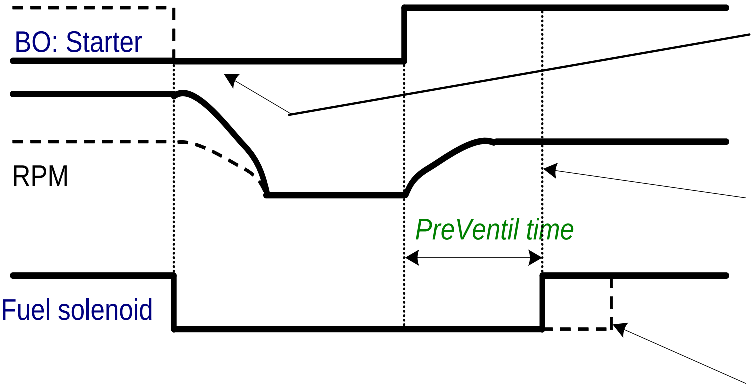
Transition Idle - > Nominal RPM.

Underspeed protection unblocked.

Electrical protections enabled.

„Engine running only“ protections of group X (=1 -3) enabled.

Preventilation (if *Fuel solenoid* = GAS):

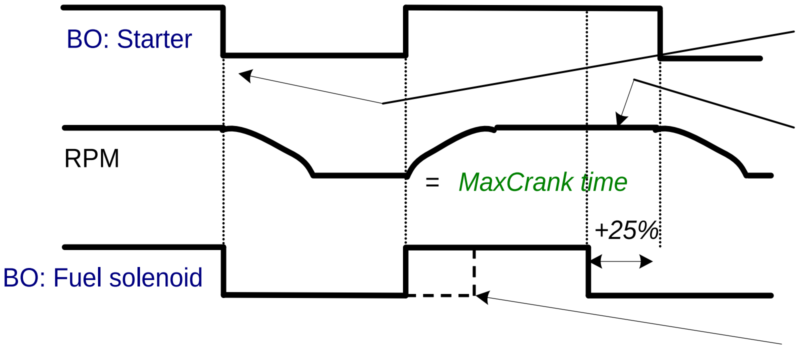


Last unsuccessful start attempt or engine Shutdown.

Starter activated, but Fuel solenoid delayed for *PreVentil time* because:
last start attempt wasn‘t successful or engine Shutdown or
this is the first start attempt after the controller switch -on.

Additional Fuel solenoid activation delay can be caused by *FuelSol offset* setting.

Ventilation (if *Fuel solenoid* = GAS ENGINE):



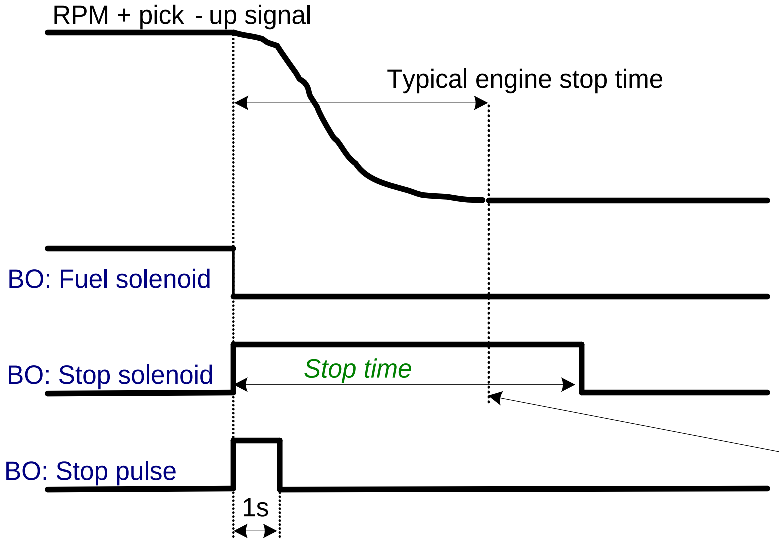
(*CrankAttempts* - 1) the attempt

The last crank attempt is extended by 25% of *MaxCrank* time, with Fuel solenoid closed, to ventilate the gas from the engine.

Fuel solenoid activation delay can be set using *FuelSol offset*

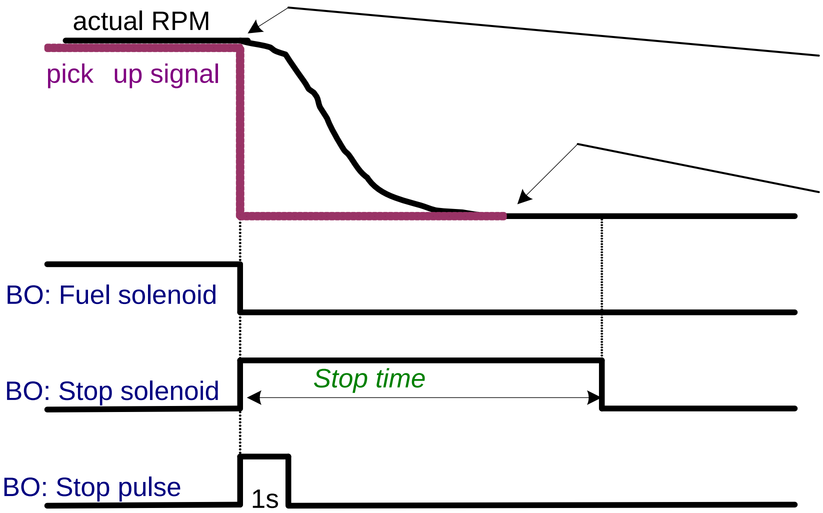
Engine stopping procedures

Normal engine stop:



Correct setting – *Stop time* setpoint is set to longer time than typical engine stop time.

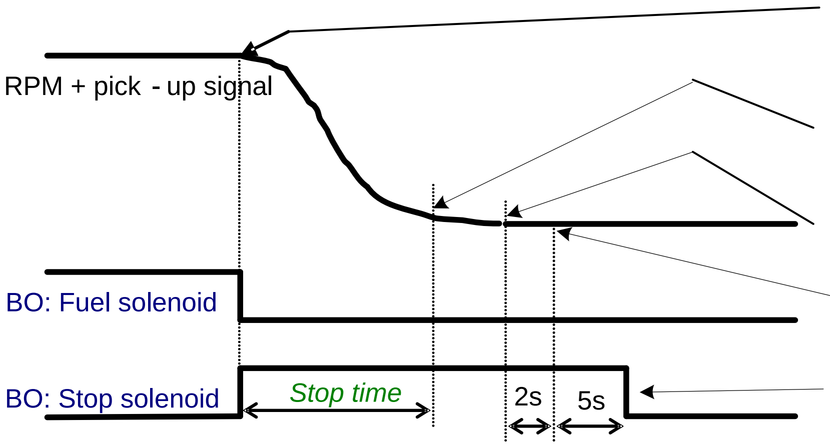
Pick-up sensor fault – forced engine stop:



Moment of the pick up sensor fault – measured RPM=0.

In this moment „still engine“ is detected. If pick-up sensor failed, there may be other signals determining if engine is still moving or not.

Normal engine stop, but *Stop time* is set too short:



Stop command issued.

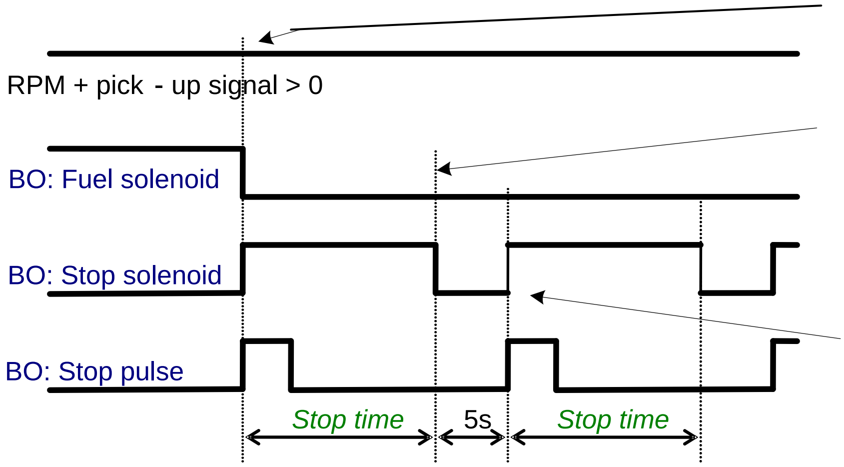
In this moment the *Stop time* elapsed, but the engine is still moving. „Sd Stop fail“ alarm appears.

In this moment „still engine“ is detected.

„Still engine“ confirmed.

Additional 5s delay elapsed, Stop solenoid deactivated.

Unsuccessful engine stop:

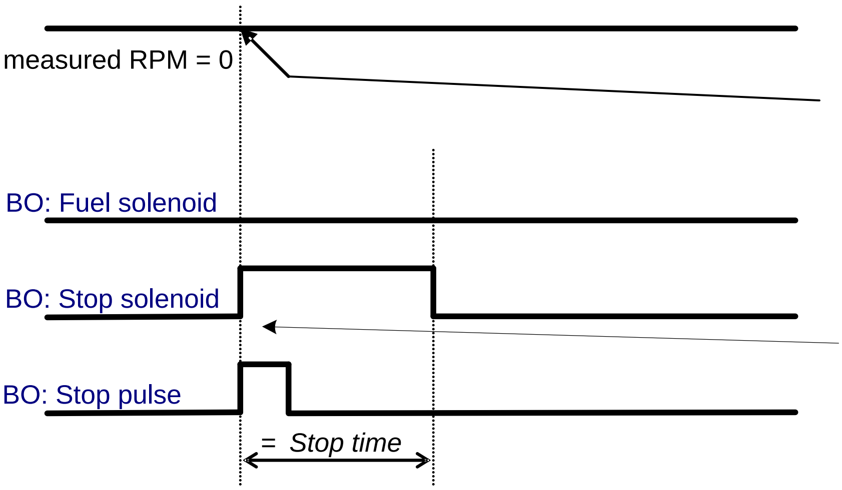


Stop command issued, but no reaction.

In this moment the *Stop time* elapsed, but the engine is still moving. „Sd Stop fail“ alarm appears.
The fuel or stop valve probably stucked in wrong position.

The cyclic stop attempts continue until the engine actually stops.

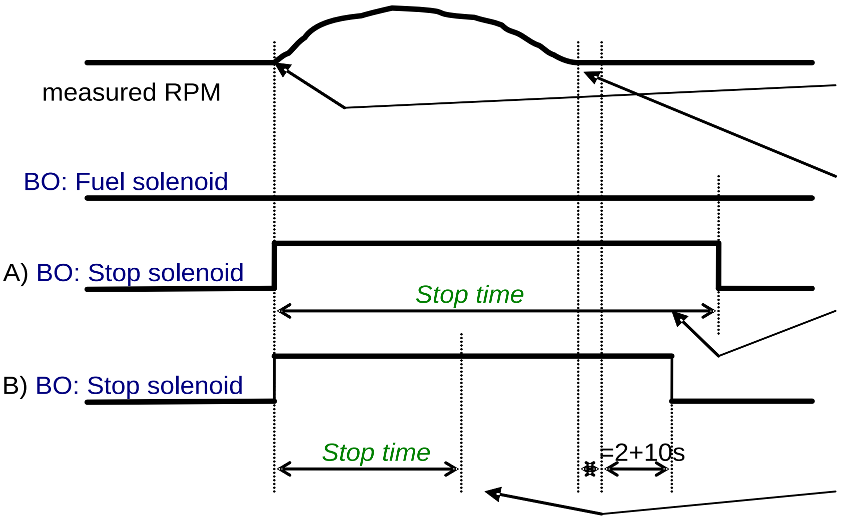
“Forced” stop in still state:



Stop button pressed (MAN mode).

Stop solenoid activated for *Stop time* period.
Stop pulse activated for 1s.

Spontaneous engine start-up:



„Engine running“ condition detected. Alarm „Sd Stop fail“ appears.

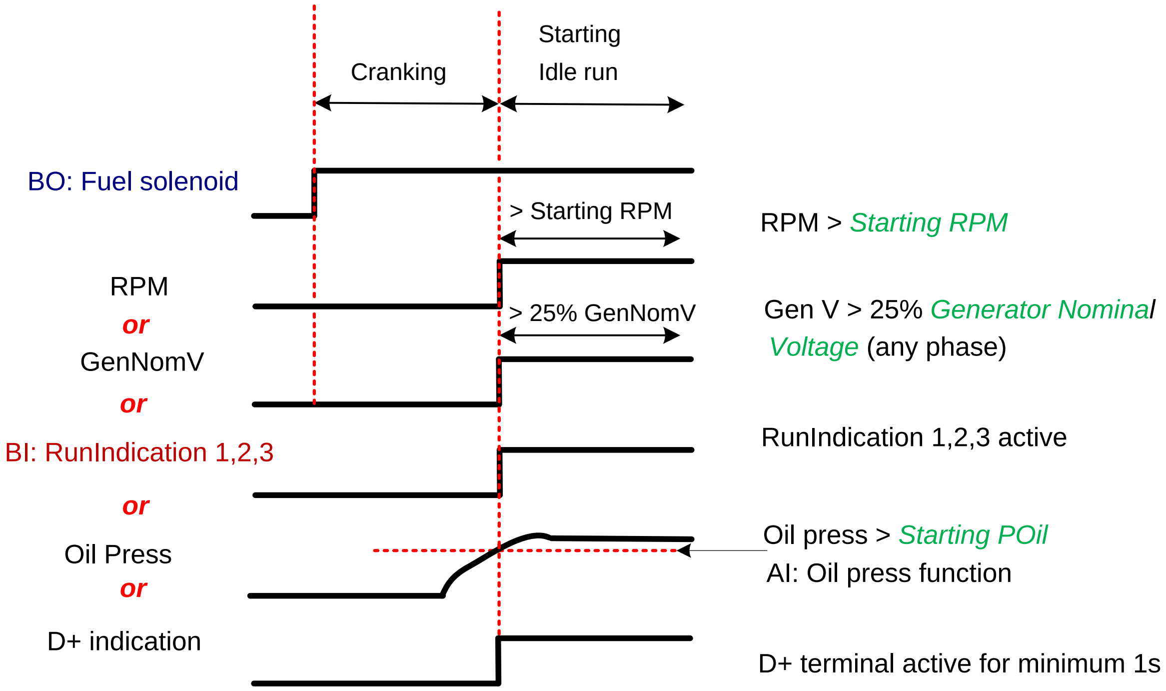
„Still engine“ condition achieved.

A) *Stop time* long enough to stop the engine.

B) *Stop time* too short, additional Stop solenoid activation needed.
The overlay is 2+10s since „still engine“ condition achieved.

"Engine started" conditions

- Engine speed (RPM) > *Starting RPM* or
- AI: Oil press > *Starting POil* or
- D+ terminal active for minimum 1s or
- BI: RunIndication 1 or 2 or 3 = active or
- Generator voltage > 25% of *GenNomV* (any phase)
-



"Engine running" conditions

- RPM > **Engine params**: *Starting RPM* or
- Analog input Oil pressure > **Engine params**: *Starting POil* or
- D+ terminal active and **Engine params**: *D+ function* = ENABLED or
- Active Binary input RunIndication1 or
- Active Binary input RunIndication2 or
- Active Binary input RunIndication3 or
- Vgen > 15 V (any phase).

"Still engine" conditions

- Engine speed (RPM) = 0 and
- AI: Oil press < *Starting POil* and
- D+ terminal not active and
- BI: RunIndication 1 and 2 and 3 = not active and
- Generator voltage < 15V (all phases) and
- Generator frequency = 0 Hz and
- if all above conditions are fulfilled, additional 2s delay is necessary to confirm "still engine"

NOTE:
If any of the functions not used (e.g. BI RunIndication3 not configured), it's state is omitted in the evaluation. This is not valid for RPM comparisons, this condition is always active.

Circuit breakers operation sequence, GCB/MCB fail detection

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

Related binary inputs:

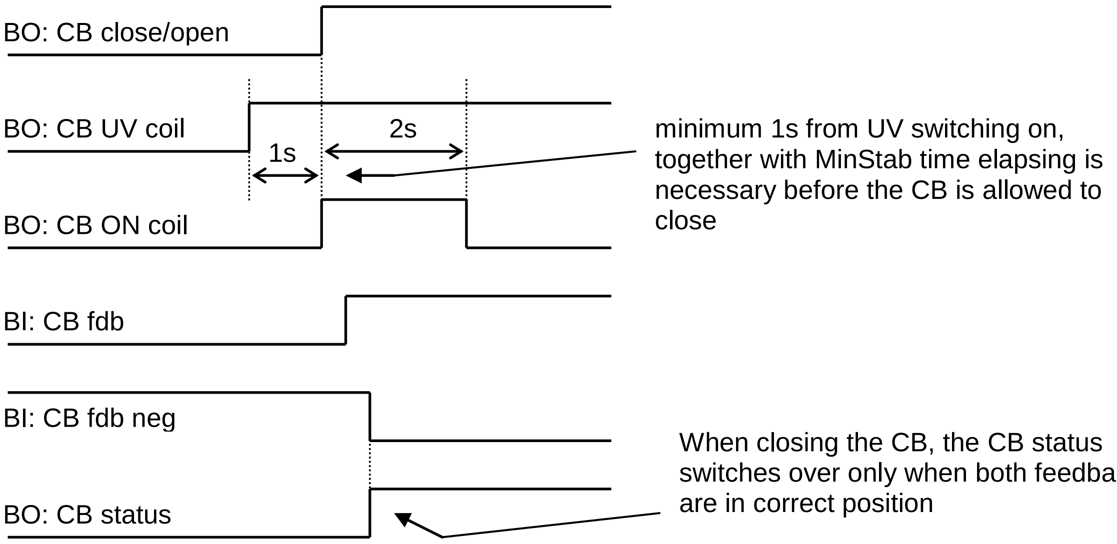
- CB fdb – CB feedback binary input
- CB fdb neg – negative CB feedback binary input. Used for increasing the reliability of CB status evaluated by the controller. In case that it is not configured, negative value of CB fdb is calculated internally within the controller.

Related binary outputs:

- CB close/open – output for circuit breaker. Equals to 1 during the time when CB is requested o 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.

Possible CB sequences:

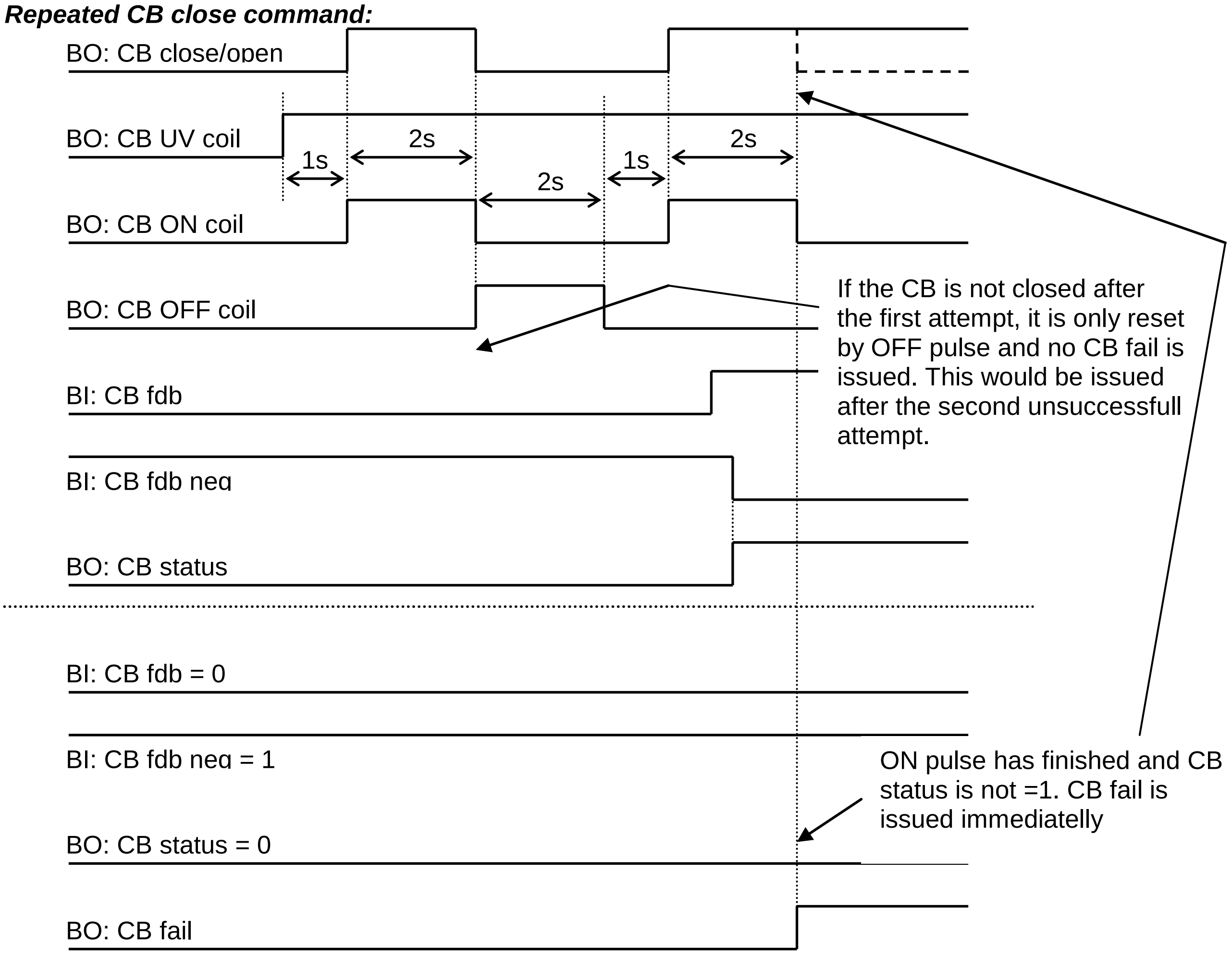
CB close command:



minimum 1s from UV switching on, together with MinStab time elapsing is necessary before the CB is allowed to close

When closing the CB, the CB status LBO switches over only when both feedbacks are in correct position

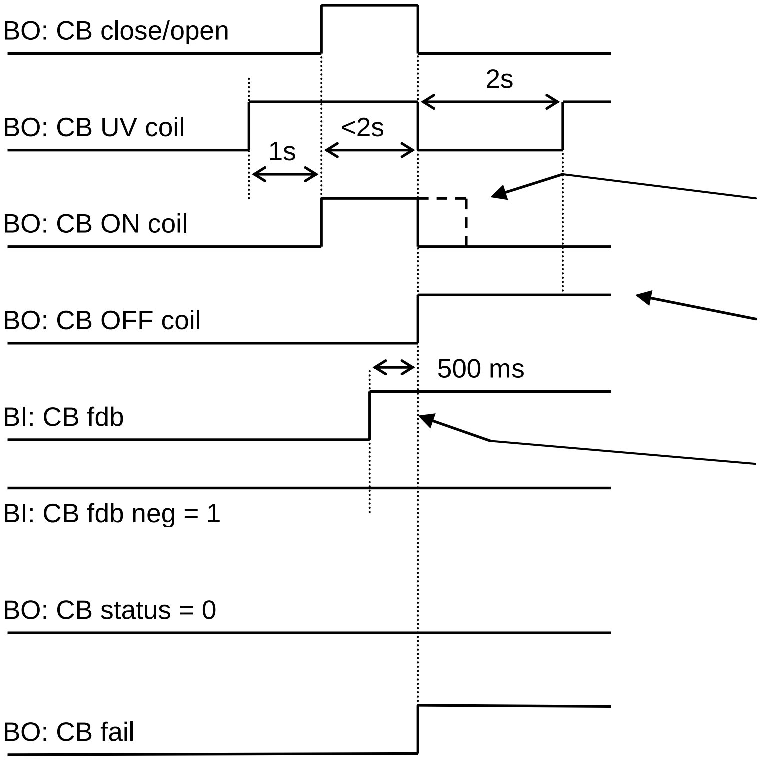
Repeated CB close command:



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:

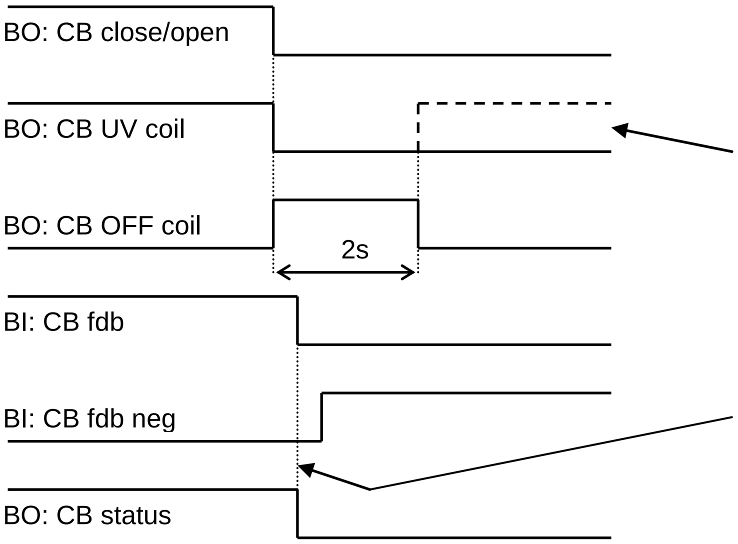


ON pulse is shortened/interrupted and replaced by UV and OFF pulse

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.

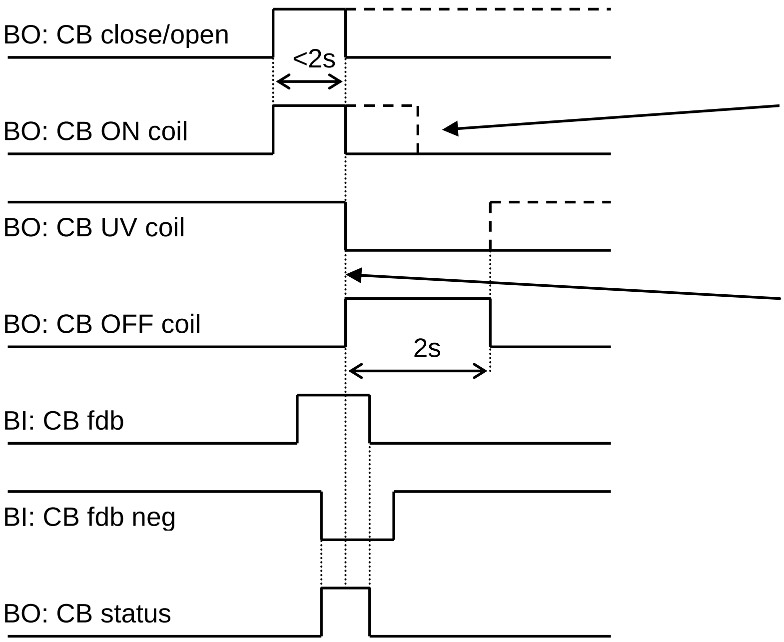
CB open command:



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.

During CB opening the CB status LBO is deactivated with change of the first feddback status

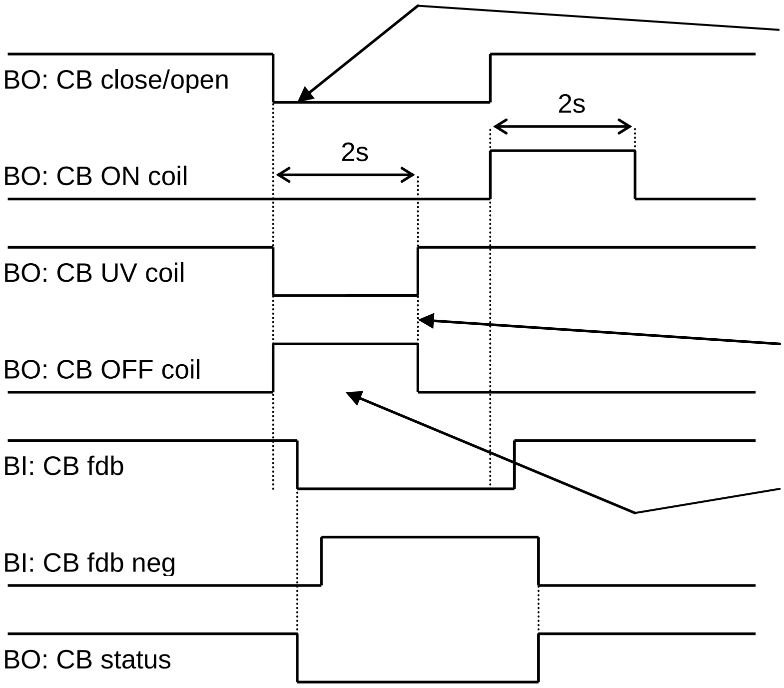
Transition closing -> opening (opening command is issued during closing pulse):



Closing pulse is shortened, opening sequence is started immediatelly

CB opening by protection or manual command (button pressed)

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

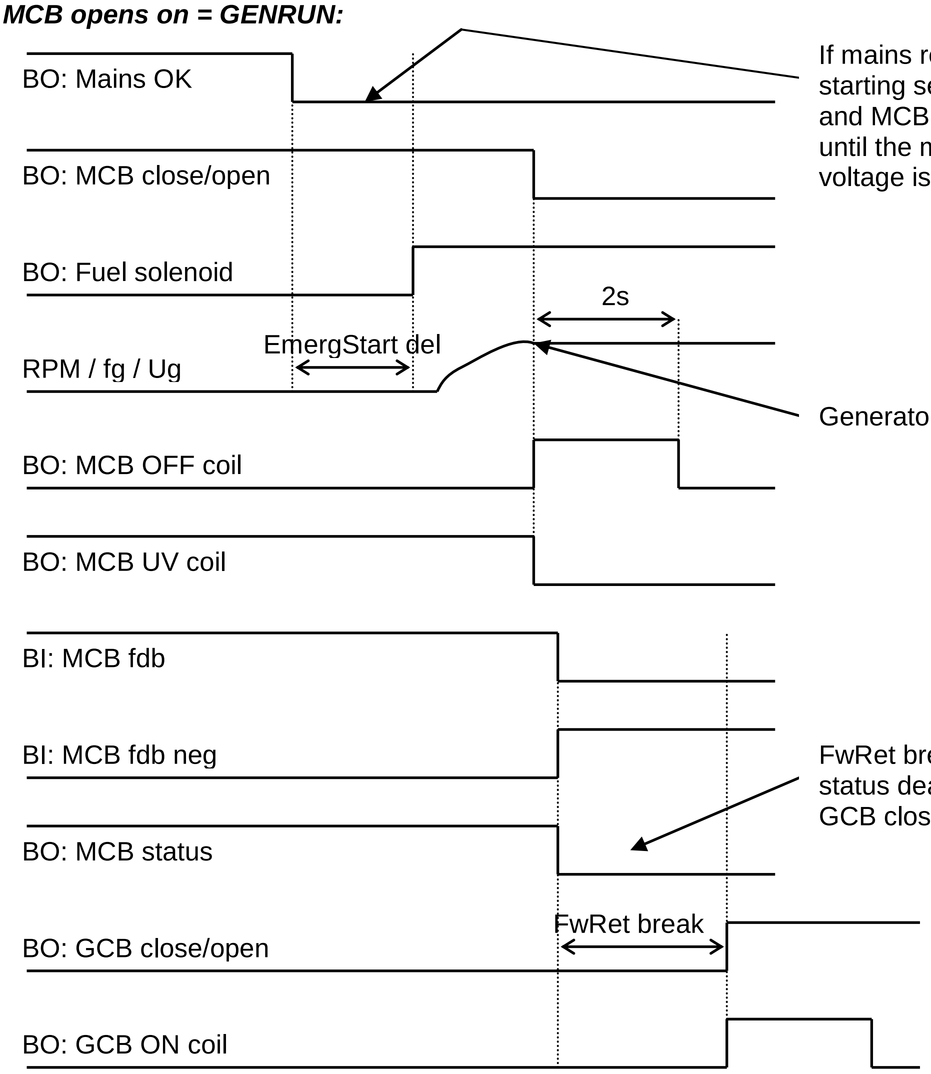


In this moment, the reason for closing the CB is activated again (e.g. Remote Start/Stop is activated)

Here starts the standard closing sequence – see CB close command.

OFF a UV pulse is always activated for the full time. manual control (= CB button) is deactivated during opening pulse.

MCB opens on = GENRUN:



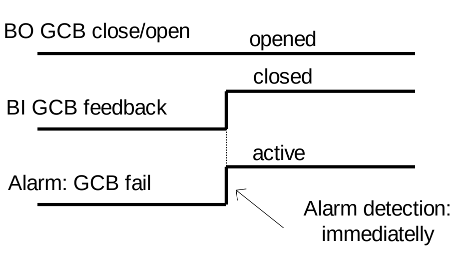
If mains returns in this moment, starting sequence is interrupted and MCB stays closed. It is valid until the moment when generator voltage is within limits.

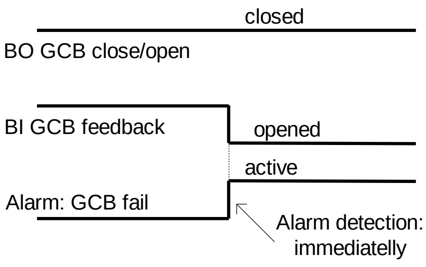
Generator voltage is within limits

FwRet break dealy is between MCB status deactivation and command for GCB closing.

Other CB fail reasons:

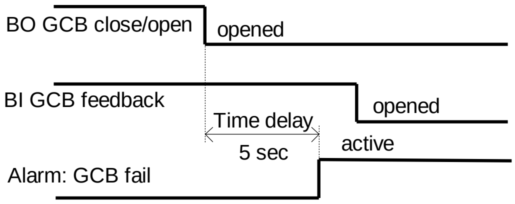
- When the BO CB close/open is in steady state and CB feedback is changed, the CB fail is detected immediately (no delay).





- 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.

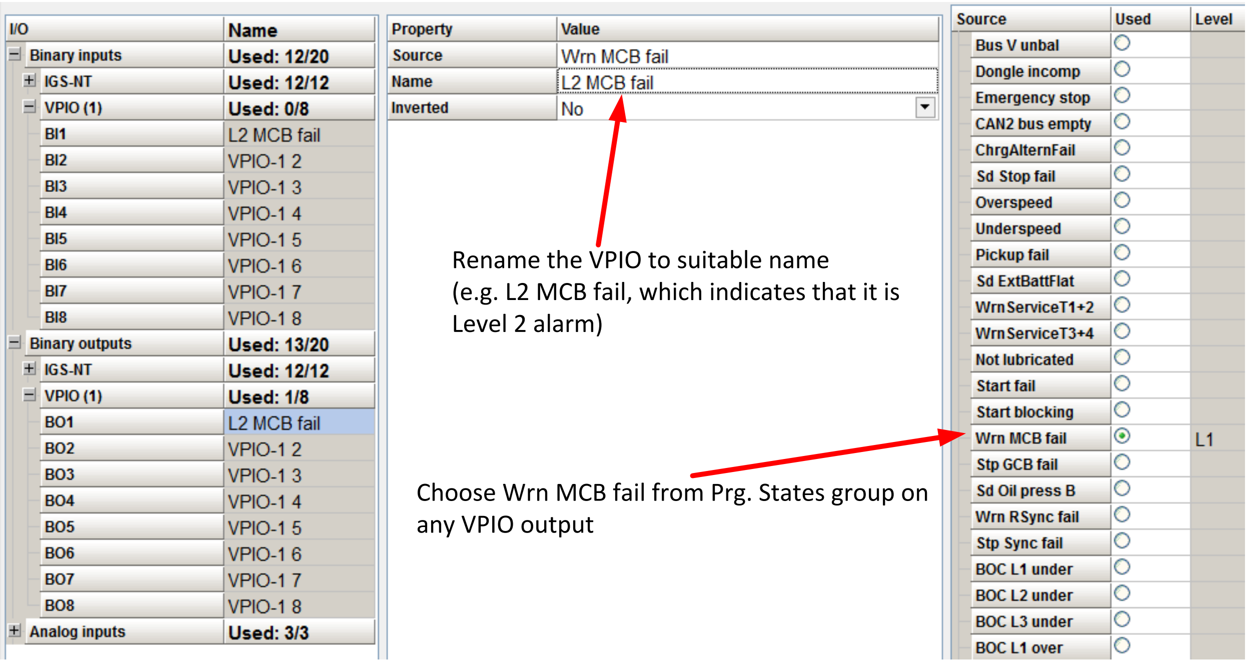
NOTE:
If the MCB or GCB feedback gets active during synchronization the breaker is imediately closed.

CAUTION!
In case that MCB feedback is active (MCB is expected as 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.

MCB fail Information (Only in SPtM application)

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. This situation can be possibly harmful to the personnel or the equipment. Should this be the case, the following solution is proposed:



I/O	Name
⊟ Binary inputs	Used: 12/20
⊞ IGS-NT	Used: 12/12
⊟ VPIO (1)	Used: 0/8
BI1	L2 MCB fail
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
⊟ Binary outputs	Used: 13/20
⊞ IGS-NT	Used: 12/12
⊟ VPIO (1)	Used: 1/8
BO1	L2 MCB fail
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
⊞ Analog inputs	Used: 3/3

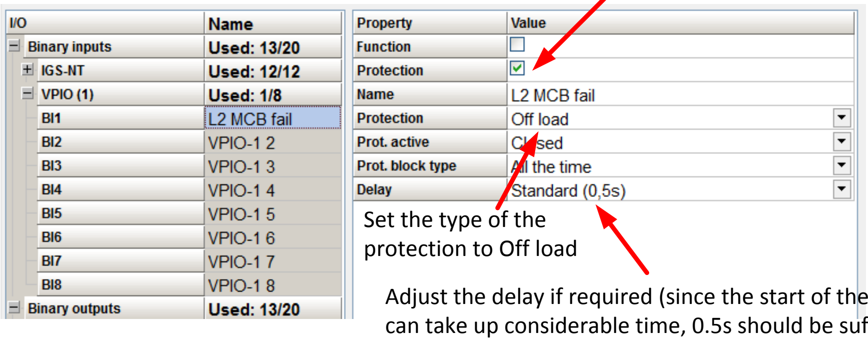
Property	Value
Source	Wrn MCB fail
Name	L2 MCB fail
Inverted	No

Rename the VPIO to suitable name (e.g. L2 MCB fail, which indicates that it is Level 2 alarm)

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

Source	Used	Level
Bus V unbal	○	
Dongle incomp	○	
Emergency stop	○	
CAN2 bus empty	○	
ChrgAlternFail	○	
Sd Stop fail	○	
Overspeed	○	
Underspeed	○	
Pickup fail	○	
Sd ExtBattFlat	○	
WrnServiceT1+2	○	
WrnServiceT3+4	○	
Not lubricated	○	
Start fail	○	
Start blocking	○	
Wrn MCB fail	●	L1
Stp GCB fail	○	
Sd Oil press B	○	
Wrn RSync fail	○	
Stp Sync fail	○	
BOC L1 under	○	
BOC L2 under	○	
BOC L3 under	○	
BOC L1 over	○	

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: 13/20
⊞ IGS-NT	Used: 12/12
⊟ VPIO (1)	Used: 1/8
BI1	L2 MCB fail
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
⊟ Binary outputs	Used: 13/20

Property	Value
Function	☐
Protection	☑
Name	L2 MCB fail
Protection	Off load
Prot. active	Closed
Prot. block type	All the time
Delay	Standard (0,5s)

Set the type of the protection to Off load

Adjust the delay if required (since the start of the engine can take up considerable time, 0.5s should be sufficient)

Peak shaving based on Active and Apparent power (SPtM or SPI appl.)

The Peak shaving function is active only in AUT mode in parallel to Mains operation. Peak shaving is based on Object P or Object Q (consumption of load). If load consumption increases over **ProcCtrlSingle:***PeakLevelStart* or **ProcCtrlSingle:***PeakKVAStart* for period longer than **ProcCtrlSingle:***PeakAutS/S* or **ProcCtrlSingle:***PeakKVAS/S del* the gen-set group is started (BO Sys start/stop is activated). If load consumption decreases below **ProcCtrlSingle:***PeakLevelStop* or **ProcessControl:***PeakKVAStop* for period longer than **ProcCtrlSingle:***PeakAutS/S del* or **ProcCtrlSingle:***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). Peak shaving based on Apparent power is available in InteliGen-NT Basebox, InteliGen-NTC Basebox and InteliSys-NT only.

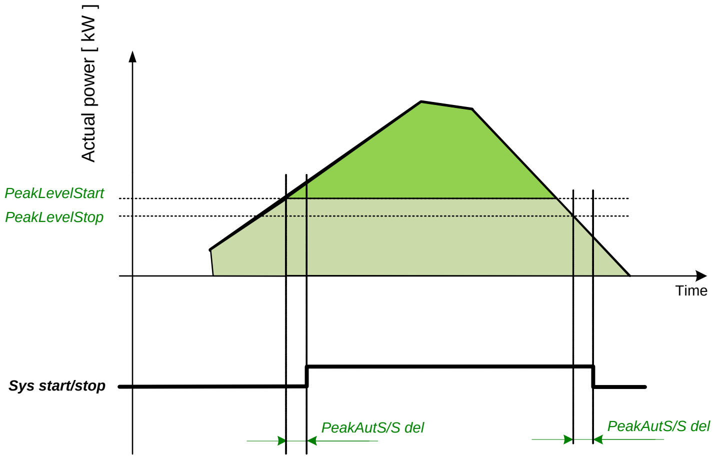


Figure: Example of peak shaving function based on Active power (the same function for Reactive power)

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

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 controller 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.

Communication Types for Remote Alarm Messaging

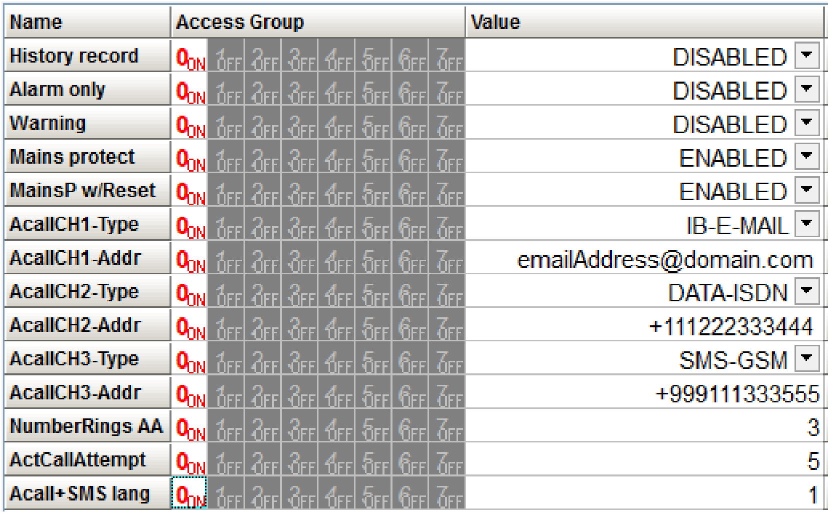
Below there all types of communication available for each Active Call channel.

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.

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.

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 controller (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 controller controller (e.g. using built-in PLC functions).

Redundant systems using binary signals

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

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 **ProcCtrlSingle:***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!

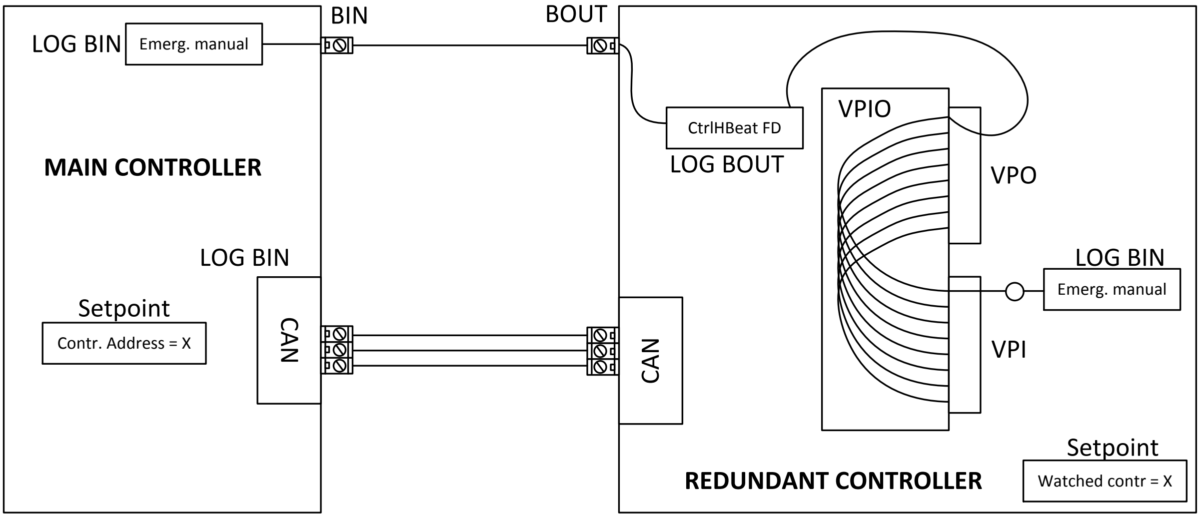


Figure: Example of redundancy function

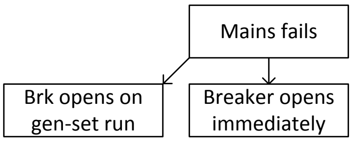
In the figure above the signal of logical function CtrlHBeat FD is used to disable the main controller if it is lost from CAN bus or CAN bus communication from that controller becomes erratic. It is used also to disable the redundant controller when the communication on CAN bus is alright (it is negated). For more information on

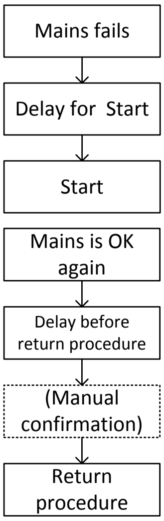
Virtual Binary Inputs and Outputs (VPIO) please refer to the chapter about Shared Binary Inputs and Outputs and Virtual Binary Inputs and Outputs.

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.

Automatic Mains Failure function in SPtM application

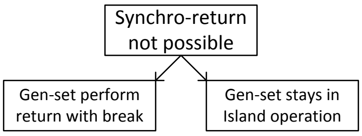
SPtM application contains complex AMF function. There are several setpoints that allows user to adjust the function behavior. Detailed description is below.



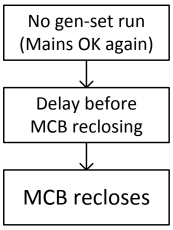


When the Mains fail occurs the system is started with adjustable delay (**AMF setting:***EmergStart del*).
In some cases it may be crucial to choose when the MCB opens after Mains failure). It is possible to choose whether the breaker opens directly when Mains failure is detected or when the generator is running. This is done via setpoint **AMF setting:***MCB opens on.*

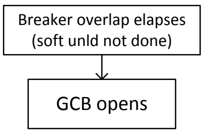
When the Mains parameters become OK again it is possible to adjust the delay time which must elapse before the controller starts the return to Mains procedure. This delay is adjusted by **AMF setting:***Mains ret del.* This function is particularly useful when the Mains fail happens several times in a row with short period of Mains being OK.
It is also possible to choose option that return to Mains needs manual confirmation before the controller 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 the gen-set and opening of its GCB or by opening GCB.



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 gen-set stays running in Island operation even though the Mains is OK.
In case that the genset is not able to start (e.g. it is not not in AUT mode etc.) the AMF function recloses MCB back to healthy Mains after delay given by **AMF setting:***MCB close del* elapses.



InSPtM 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 GCB is opened regardless of load on gen-set).



Cleaning mode

Use the LBI *Cleaning* to set the gen-set to cleaning mode. Under voltage and under frequency protections are blocked in this mode (**Gener protect:** *Gen>V BOC, Gen<V BOC, Gen>f, Gen<f*). It allows to switch off the excitation of generator while the gen-set is washed. Under voltage and under frequency protections are not active and do not stop the engine. Yellow warning *Cleaning* appears in alarm list.

NOTE:
RPM of the gen-set has to be measured using pick up or via ECU. It is not possible to evaluate the RPM form frequency of the generator voltage when cleaning mode is in use.

WARNING!
Be aware that activation of LBI CLEANING ensures only that under voltage and under frequency protection is not active and allows gen-set to run with frequency and voltage out of limits of protections. Activating of this input does not ensure that the voltage excitation is really switched off. The excitation of the generator has to be unconditionally switched off directly on the AVR of generator while the cleaning function is in use!

Automaticallocation of addresses on intercontroller CAN2

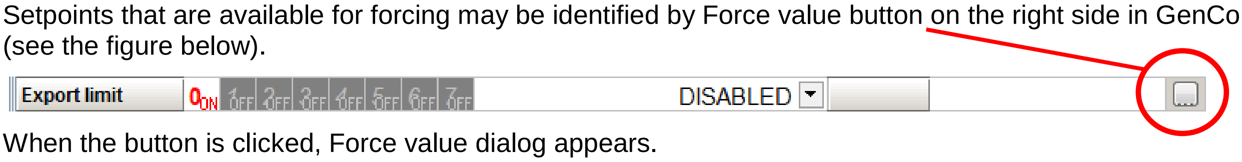
In Combi application it is possible to use the function of automatic negotiation of addresses of controller on CAN2. For more information about this function se the description of setpoint CANnegotiation.

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).

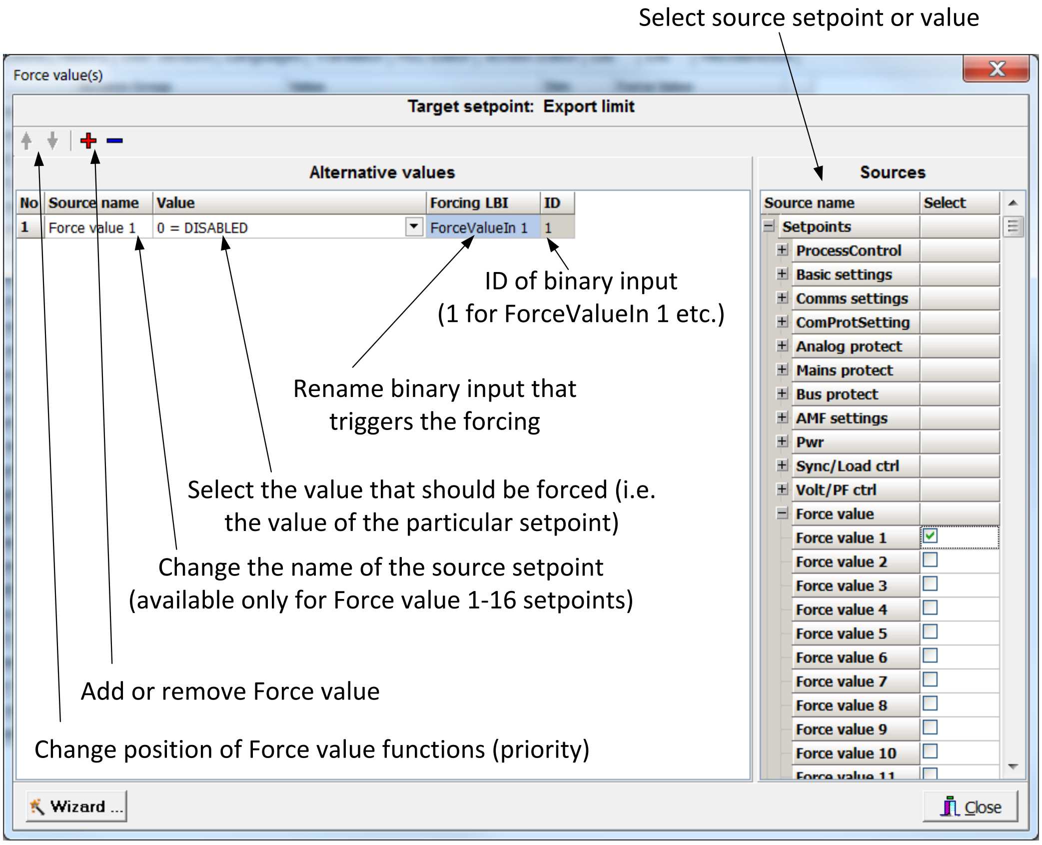
WARNING!
Setpoints must not be written **continuously** (e.g. via Modbus connection)! If continuous change of setpoints is required, combination of External values and Force value function needs to be used. The memory that holds setpoints is designed for up to 10^5 writings. Than memory may be damaged!

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



Export limit DISABLED

When the button is clicked, Force value dialog appears.



Select source setpoint or value

ID of binary input
(1 for ForceValueIn 1 etc.)

Rename binary input that
triggers the forcing

Select the value that should be forced (i.e.
the value of the particular setpoint)

Change the name of the source setpoint
(available only for Force value 1-16 setpoints)

Add or remove Force value

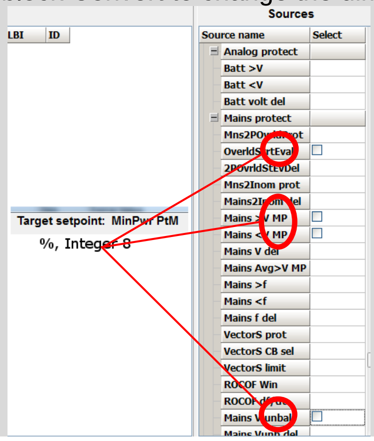
Change position of Force value functions (priority)

For example if we add **Force value:***Force value 1* to be forced to **ProcCtrlSingle:***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 in other setpoint if their dimension and range are the same (e.g. only value with dimension in hours and which is Integer 16 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.



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.

General Purpose Timers

There is 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).

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.

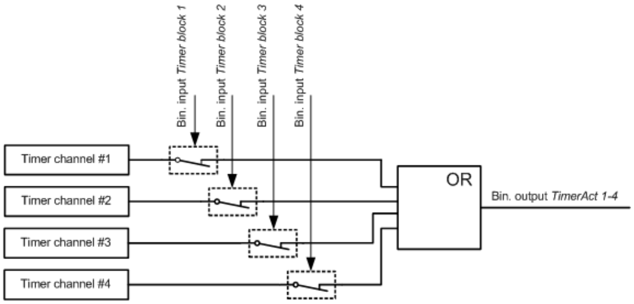
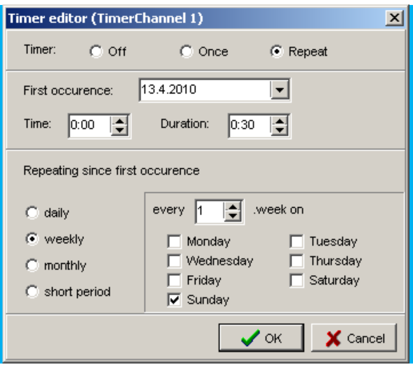


Figure: Principial scheme of one block containing 4 timers

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

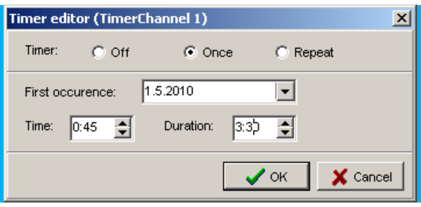
Repeating since first occurence

○ 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

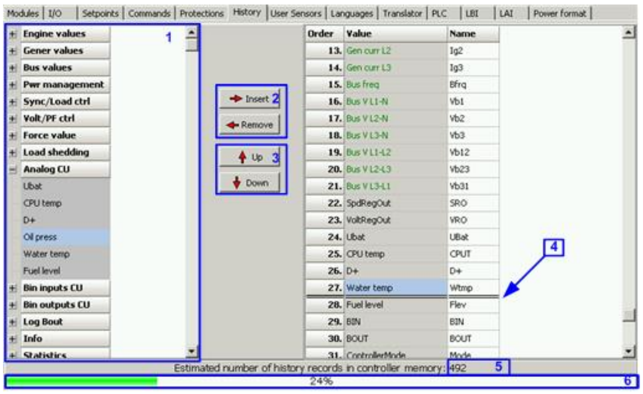
Time: 0:45 Duration: 3:3

History Related functions

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

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.

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).

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.

Summer Time Mode

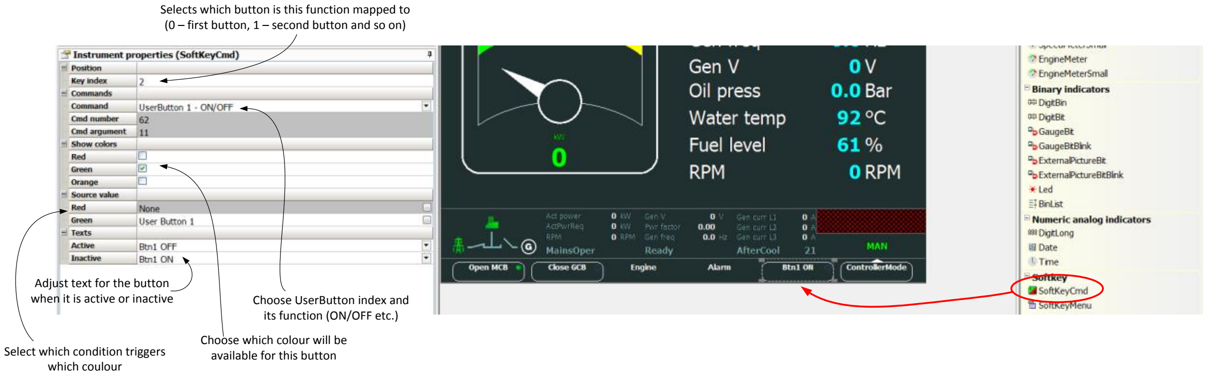
Summer Time Mode function may be enabled and disabled by user. It is possible to set if the controller is located in the northern or southern hemisphere as well.
SummerTimeMode implemented in ComAp controllers is based on CET summer time which means:

- 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.

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.



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

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

Adjust text for the button when it is active or inactive

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

Choose which colour will be available for this button

Select which condition triggers which coulour

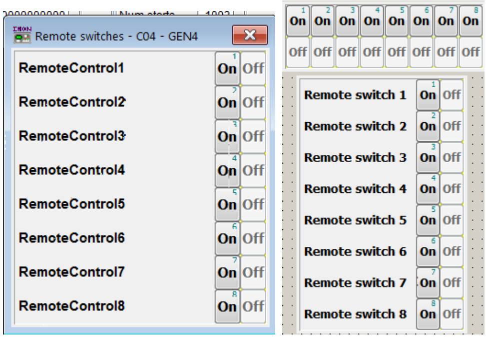
Available functions for soft buttons are listed in the following table.

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 one second. **NOTE:** Repeated pressing of button during the closed period (one second) causes issuing other puls of length of one second 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.

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.

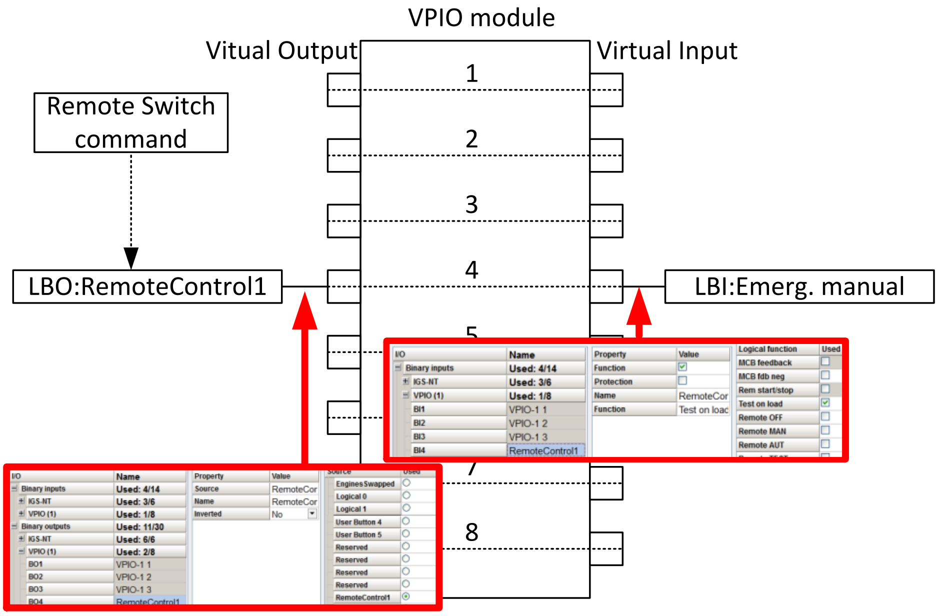


Figure: Using of Remote Switches to trigger logical binary inputs

Virtual Peripheral Inputs-Outputs (VPIO) module

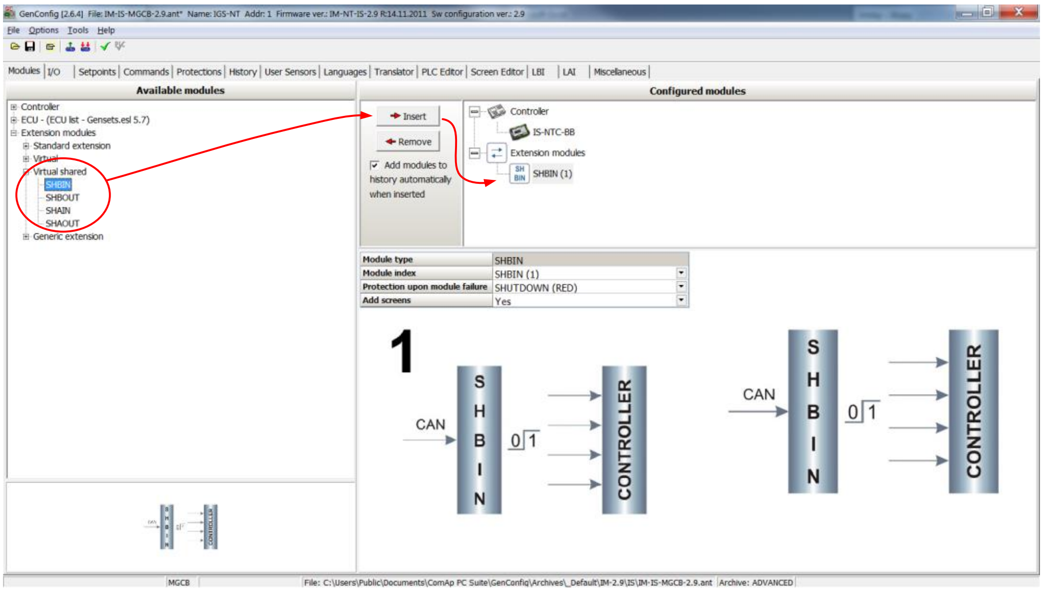
For IGS-NT controllers there are several modules available. One of them is Virtual Peripheral Inputs-Outputs module which is particularly usefull for connection of logical Binary Output functions to logical Binary Input functions. This way internal controller function may easily trigger other internal 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.

Shared Inputs and Outputs

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

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

☑ Add modules to history automatically when inserted

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

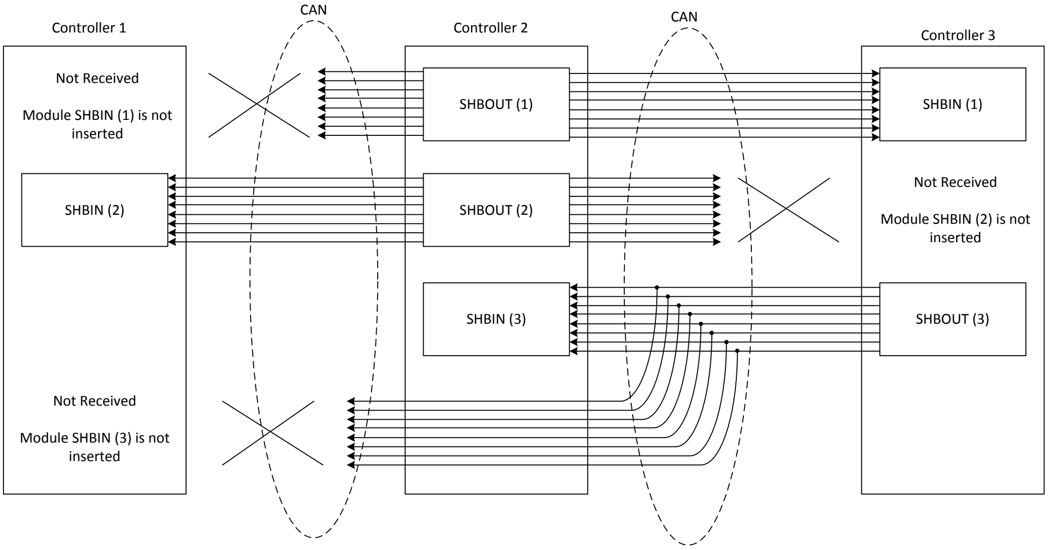


Figure: Principal Scheme (same for shared Binary I/O and shared Analogue I/O

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:

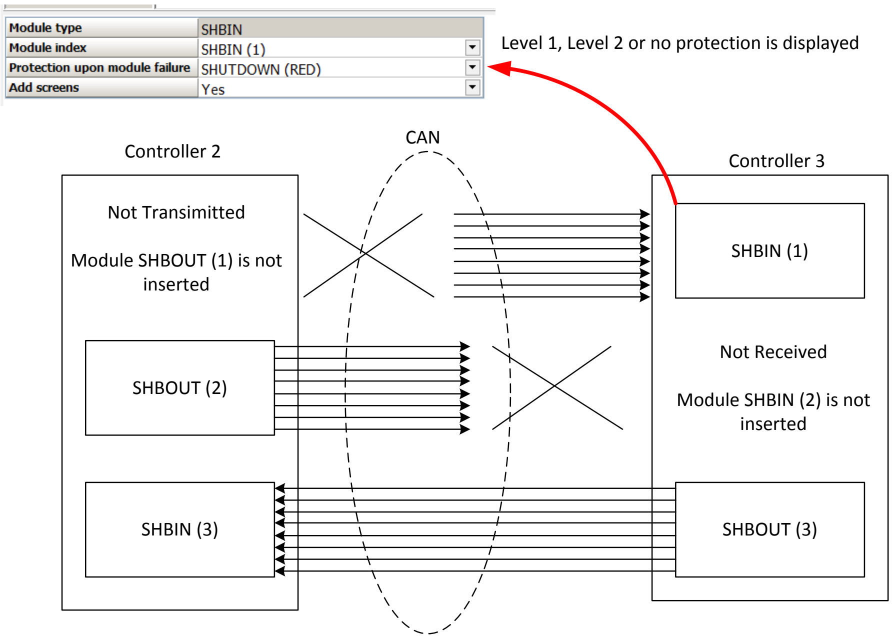
If SHUTDOWN (RED) protection is chosen, it is interpreted in InteliMains as Mains Protect with Reset type protection. For more information on Protection types and alarms please refet to the chapter Protection and Alarms management.

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.

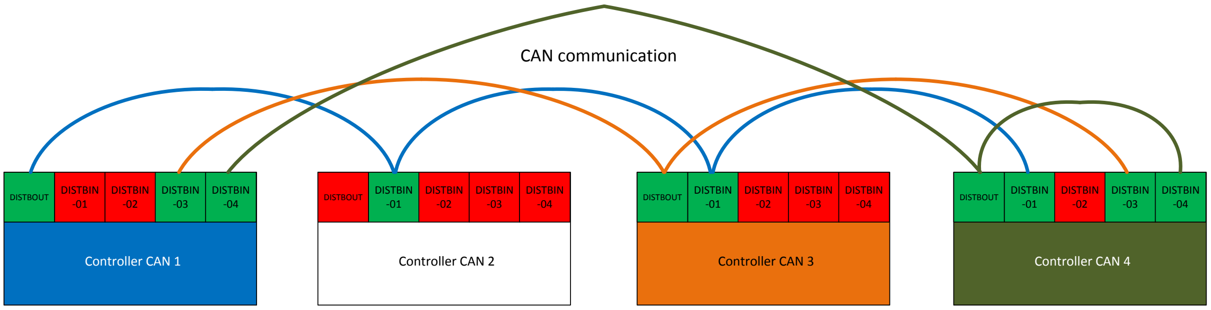


Module type	SHBIN
Module index	SHBIN (1)
Protection upon module failure	SHUTDOWN (RED)
Add screens	Yes

Level 1, Level 2 or no protection is displayed

Distributed Binary Inputs and Outputs

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.

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.

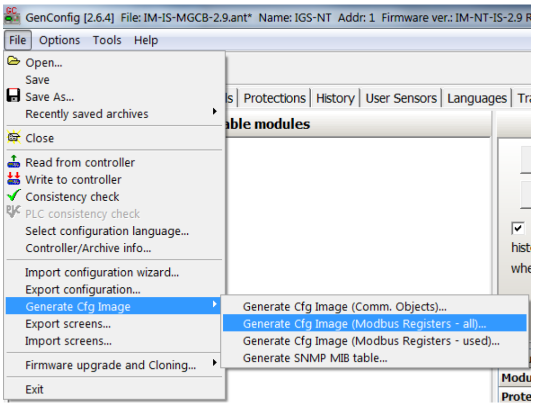
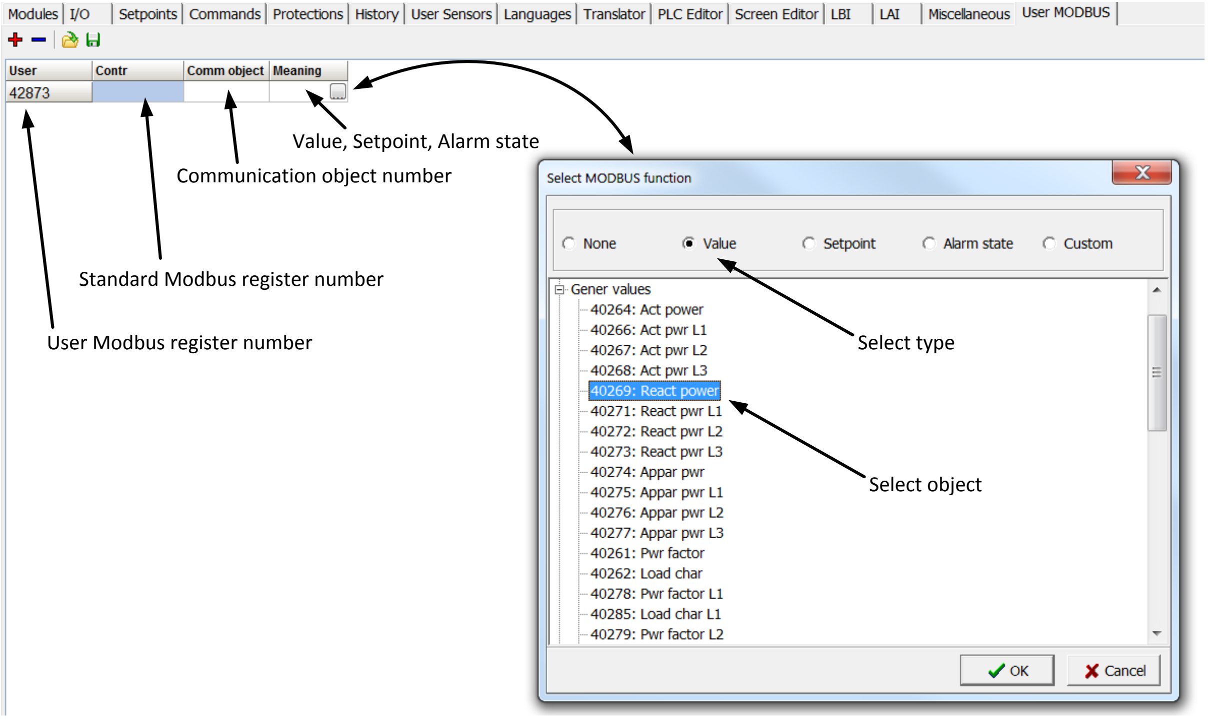


Figure: Exporting of Modbus registers

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.

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.



User	Contr	Comm object	Meaning
42873			

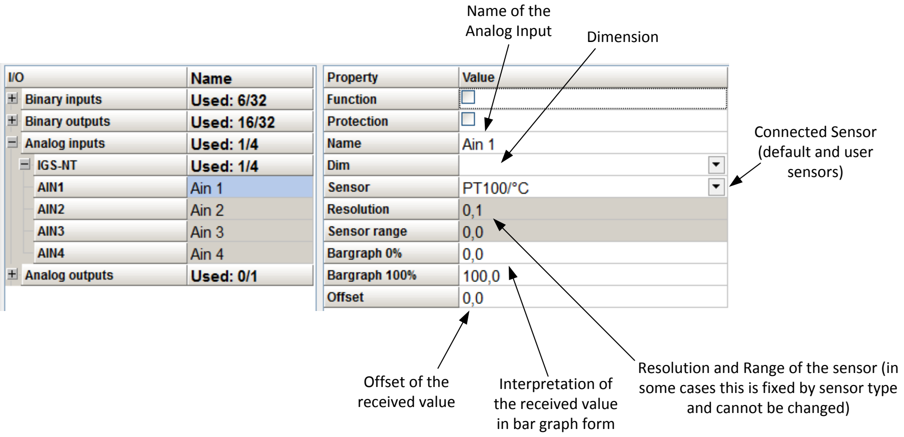
○ None ● Value ○ Setpoint ○ Alarm state ○ Custom

- Gener values
  - 40264: Act power
  - 40266: Act pwr L1
  - 40267: Act pwr L2
  - 40268: Act pwr L3
  - 40269: React power
  - 40271: React pwr L1
  - 40272: React pwr L2
  - 40273: React pwr L3
  - 40274: Appar pwr
  - 40275: Appar pwr L1
  - 40276: Appar pwr L2
  - 40277: Appar pwr L3
  - 40261: Pwr factor
  - 40262: Load char
  - 40278: Pwr factor L1
  - 40285: Load char L1
  - 40279: Pwr factor L2

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

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.



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

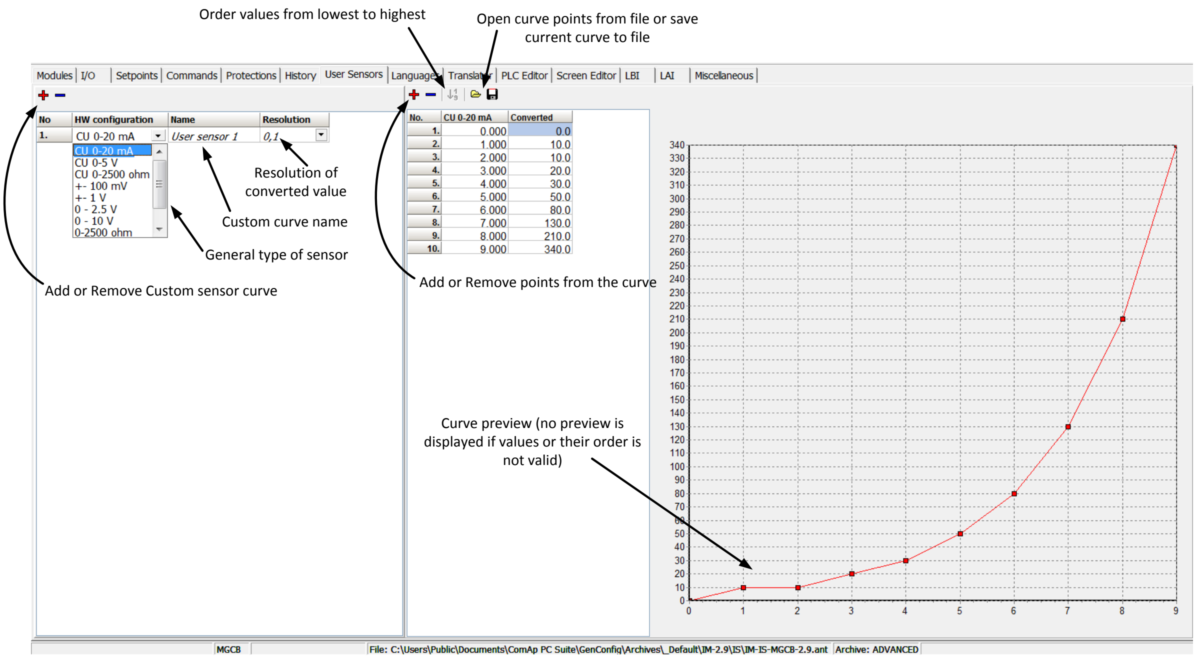
Property	Value
Function	☐
Protection	☐
Name	Ain 1
Dim	
Sensor	PT100/°C
Resolution	0,1
Sensor range	0,0
Bargraph 0%	0,0
Bargraph 100%	100,0
Offset	0,0

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*

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

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

Figure: User Sensor definition

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).

Power Formats

IGS-NT family 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

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.

System Start/Stop

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).

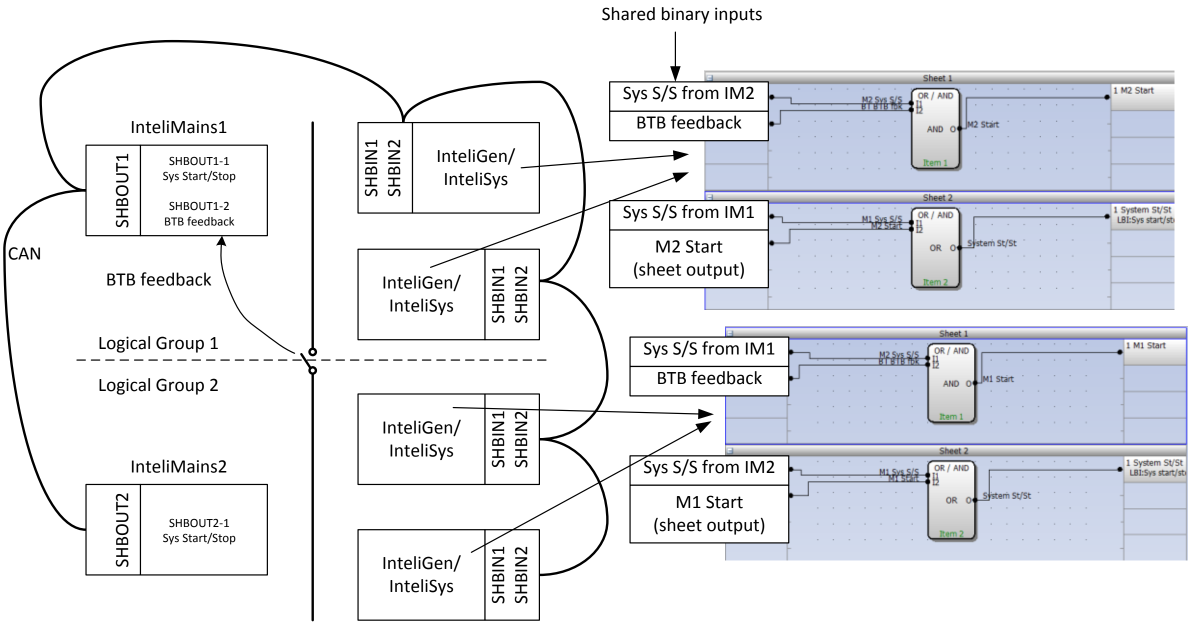
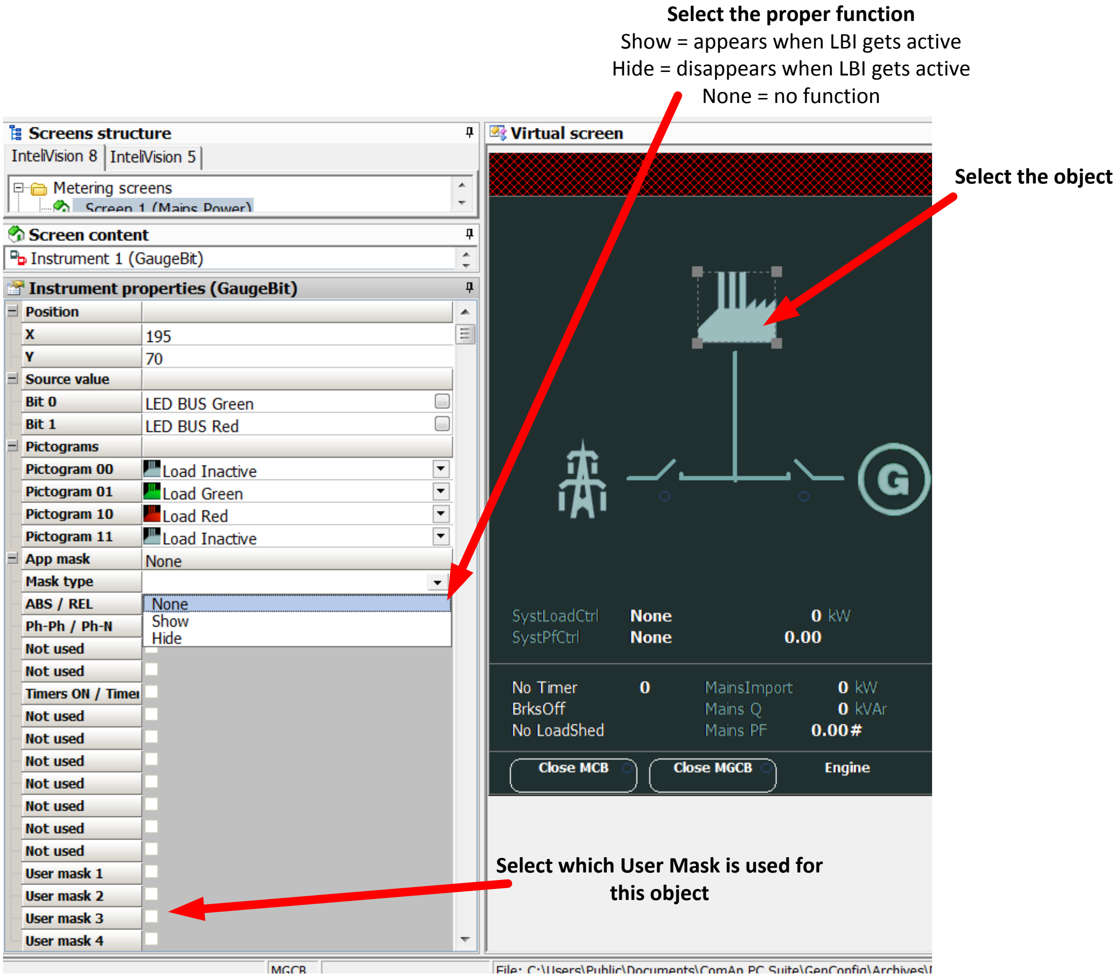


Figure: Preparation of correct system start/stop function for two logical groups

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

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
ABS / REL	
Ph-Ph / Ph-N	
Not used	☐
Not used	☐
Timers ON / Timer	☐
Not used	☐
Not used	☐
Not used	☐
Not used	☐
Not used	☐
Not used	☐
Not used	☐
User mask 1	☐
User mask 2	☐
User mask 3	☐
User mask 4	☐

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).

PLC functions

See description in IGS-NT-Application Guide 05-2013.pdf.

Multi language support

NT family controllers support up to five Languages that is possible to switch 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.

ECU interface customizing

The list of available ECU interfaces can be found in GenConfig / Modules / ECU list.

Binary selector

This function enables to change the following CAN values transmitted to ECU via J1939 or binary output only. The change can be provided by setpoint or via Binary input. There are four Bin selector channels available.

J1939 value	ECU command
Governor mode	Isochronous - Droop
Idle Speed select	Idle – Nominal
Frequency select	1500 – 1800
Preheat request	Yes – No
Protection override	Yes – No

Protections and Alarm management

ComAp gen-set controllers provide following range of generator protections.

For each protection adjustable limit and time delay are available.

ANSI CODE	PROTECTION	IG-NT, IG-NTC, IG-NT-BB, IG-NTC-BB	IS-NT-BB, IS-NTC-BB
59	Overvoltage	•	•
27	Undervoltage	•	•
47	Voltage Assymetry	•	•
81H	Overfrequency	•	•
81L	Underfrequency	•	•
78	Vectorshift	•	•
81R	Rate of Change of Frequency	•	•
50+51	Overcurrent	•	•
46	Current Unbalance	•	•
32	Overload	•	•
50N+64	Earth Fault Current	•	•
51N+64	Earth Fault Current, IDMT	•	•
32R	Reverse Power	•	•
25	Synchronism Check	•	•
47	Phase Rotation	•	•
37	Undercurrent	•$^{@}$	•$^{@}$
55	Power Factor	•$^{@}$	•$^{@}$
71	Gas (Fuel) Level	•	•
40	Excitation Loss	•	•

Note: – - excluded; • - included
$^{@}$ - can be created using universal protections

Protection groups

There are two groups of protections in the controller: fix and universal (configurable)

PROTECTION GROUP	CONFIGURABILITY	SETTINGS
Analogu protection	Configurable	Analog protect
Generator protection	Configurable	Gener protect
Mains protections	Configurable	Mains protect

Fix protections	Fix	Engine params, Gener protect, Mains protect, Analog protect

Alarm types

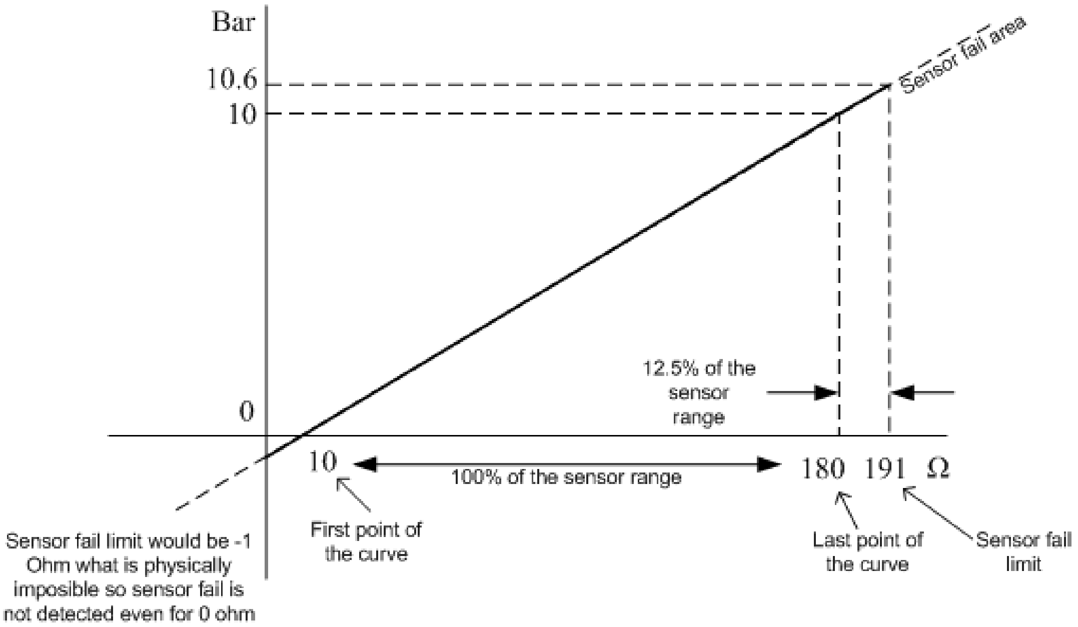
ALARM/EVENT KIND	LEVEL	DESCRIPTION
Warning	1	The alarm appears in the Alarmlist and is recorded into the history log. Activates the output Common Wrn as well as the standard alarm outputs.
Alarm Only	1	The alarm appears only in the Alarmlist. Activates the output Common Al as well as the standard alarm outputs.
HistRecOnly	1	The event is recorded into the history. Activates the output Common Hst for one second. Standard alarm outputs are not activated.
AL indication	1	The event is only indicated in the Alarmlist. It disappear for the alarmist automatically as soon as the cause disappears. Standard alarm outputs are not activated.
A+H indication	1	The event is only indicated in the Alarmlist and recorded into the history log. It disappear for the alarmist automatically as soon as the cause disappears. Standard alarm outputs are not activated.
Shutdown	2	The alarm appears in the Alarmlist and is recorded into the history log. It causes immediate stop of the gen-set without unloading and cooling phase. The gen-set can't be started again while there is a Shutdown alarm in the Alarmlist. Activates the output Common Sd as well as the standard alarm outputs.
Slow Stop	2	The alarm appears in the Alarmlist and is recorded into the history log. It causes stop of the gen-set by the standard stop sequence, i.e. including unloading and cooling phase. The gen-set can't be started again while there is a Slow stop alarm in the Alarmlist. Activates the output Common Stp as well as the standard alarm outputs.
Off Load	2	The event appears in the Alarmlist and is recorded into the history log. It does not require confirmation, diappears by itself. It causes immediate opening of the GCB. In AUT and SEM modes the gen-set remains running for 60 seconds and then it is stopped by the standard stop sequence. In MAN mode the gen-set remains running until the operator changes it's operational state manually. If the controller is in AUT or SEM mode and all previously active Off load alarms disappeared the gen-set is automatically started back and connected to the load if the condition for the gen-set to be running persists (e.g. Rem start/stop is active ..). This event is used to put the gen-set temporarily off the load for any reason. Activates the output Common OfL.

Low Power	2	The event appears in the Alarmlist and is recorded into the history log. It does not require confirmation, diappears by itself. It causes reduction of the required gen-set load to the Min Power PtM during parallel-to-mains operation or local baseload operation. If all previously active Low power alarms disappeared the gen-set is automatically ramped back to the original required load, which is given according to the currently active load control mode (Load ctrl PtM) in PtM operation. Activates the output Common LoP. This alarm type is not overriden by the input Sd Override. **Note:** Available in IS-NT only.
BrkOpen&CoolDn	2	The event appears in the Alarmlist and is recorded into the history log. It causes immediate opening of the GCB (without unloading) and then the standard stop sequence with cooling follows. The gen-set can't be started again while there is a BOC alarm in the Alarmlist. Activates the output Common BOC as well as the standard alarm outputs.
Mains Protect	2	The protection is only recorded into the history log. In applications which control the MCB this protection causes opening of the MCB. The gen-set can continue operation in island mode if required. The MCB can be closed back as soon as there isn't any mains protection active (including the built-in mains protections). In applications which do not control the MCB this protection causes opening of the GCB. The controller waits then for the MCB to open. After that the gen-set can continue operation in island mode if required. As soon as there isn't any mains protection active (including the built-in mains protections) the GCB is opened again and the controller waits for the MCB to close. After that the gen-set can continue operation in parallel-to-mains mode if required. Activates the output Common MP. This alarm type is not overriden by the input Sd Override.
Sd Override	2	The alarm appears in the Alarmlist and is recorded into the history log. It causes immediate stop of the gen-set without unloading and cooling phase. The gen-set can't be started again while there is a Sd override alarm in the Alarmlist. Activates the standard alarm outputs. This alarm type is not overriden by the input Sd Override.

HINT
The Standard alarm outputs are Alarm and Horn.

Sensor fail detection (FLS)

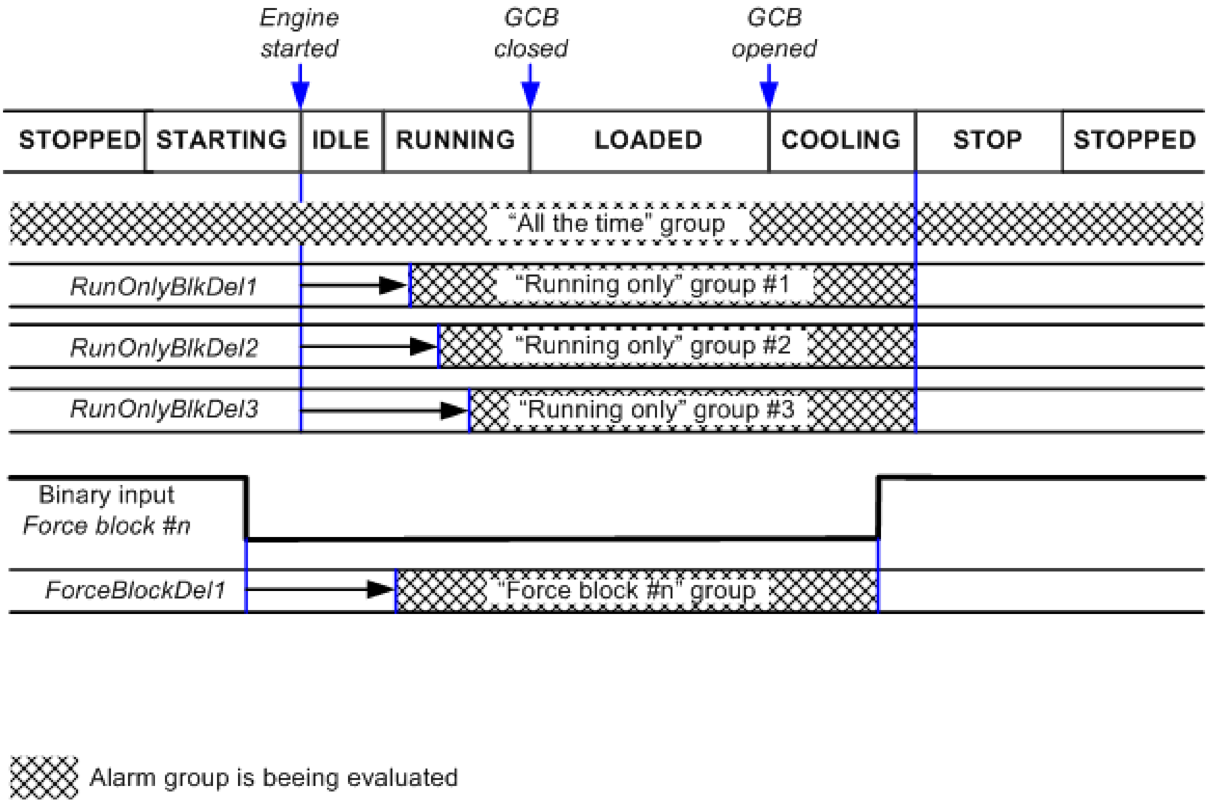
If the measured resistance, voltage or current on an analog input gets out of valid range, the sensor fail will be detected and a sensor fail message will appear in the alarmlist. The valid range is defined by the most-left (R_L) and most-right (R_H) points of the sensor characteristic ±12.5% from R_H-R_L.



HINT
The sensor fail alarm does not influence the gen-set operation

Blocking types

BLOCKING TYPE	DESCRIPTION
All the time	The alarms are beeing evaluated all the time the controller is switched on.
RunOnlyBlkDel1	The alarms are beeing evaluated only while the gen-set is running. The evaluation begins *RunOnlyBlkDel1* seconds after the engine has been started.
RunOnlyBlkDel2	The alarms are beeing evaluated only while the gen-set is running. The evaluation begins *RunOnlyBlkDel2* seconds after the engine has been started.
RunOnlyBlkDel3	The alarms are beeing evaluated only while the gen-set is running. The evaluation begins *RunOnlyBlkDel3* seconds after the engine has been started.
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.
El. prot	The alarms are beeing evaluated while the generator is expected to provide correct voltage and frequency. That means the alarms start to be evaluated after transition form *Idle* to *Running* phase when the period of *Max stab time* has already elapsed, remain beeing evaluated while the gen-set is running at nominal speed (regardless of GCB position) and stop to be evaluated by transition to the *Cooling* phase.



Default protections in Combi

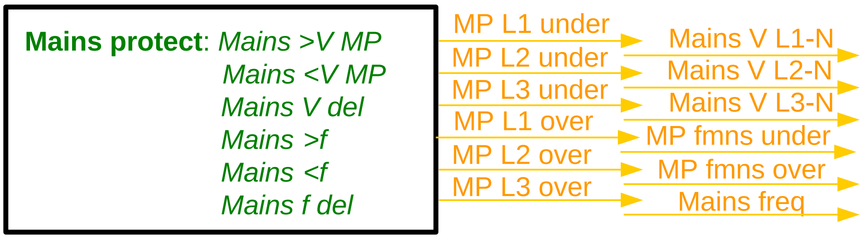
Fix – firmware based protections

ENGINE	PROTECTION TYPE	CORESPONDING SETPOINTS
Overspeed		**Engine protections:** *Overspeed*
Underspeed		**Engine params**: *Starting RPM*
GENERATOR	**PROTECTION TYPE**	**CORESPONDING SETPOINTS**
IDMT overcurrent	BOC	**Basic settings**: *Nomin current*; **Gener protect**: *2Inom del*
IDMT Active power	BOC	**Gener protect**: *OverldStrtEval; 2POvrldStrtEvDel*
IDMT EarthFault Current	BOC	**Gener protect:** *NomEthFltCurr, 2EthFltCurr del*
Shortcurrent	BOC	**Gener protect**: *Ishort; Ishort del*
Generator voltage: Ug1>, Ug1<, Ug2>, Ug2<, Ug3>, Ug3<	BOC	**Gener protect**: *Gen >V BOC; Gen <V BOC; Gen V del.*
Generator voltage: Ug1>>, Ug2>>, Ug3>>	Sd	**Gener protect**: *Gen >V Sd; Gen V del.*
Generator frequency: fg<, fg>	BOC	**Gener protect**: *Gen >f; Gen <f; Gen V del*
Excitation Loss	BOC	**Gener protect:** *ExcitationLoss, ExctLoss del*
MAINS	**PROTECTION TYPE**	**CORESPONDING SETPOINTS**

Vector shift	MP	**Mains protect**: *VectorS prot; VectorS CB sel; Vector S limit*
Mains voltage	MP	**Mains protect**: *Mains >V MP; Mains <V MP; Mains V del*
10 min moving average of mains voltage	MP	**Mains protect:** *Mains Avg >V MP*
Mains frequency	MP	**Mains protect**: *Mains >f; Mains <f; Mains f del*
Rate of Change of Frequency	MP	**Mains protect**: *ROCOF df/dt, ROCOF Win*
DEFAULT CONFIGURABLE	**PROTECTION TYPE**	**CORESPONDING SETPOINTS**
Reverse power (UnivState 1)	BOC	**Gener protect**: *Reverse power; ReversePwr del*
Batt <V, Batt >V (UnivState 2)	Wrn	**Analog protect**: *Batt >V; Batt <V; Batt V del*
Gen Current unbalance	BOC	**Gener protect**: *Gen I unbal; Gen I unb del*
Gen Voltage unbalance	BOC	**Gener protect**: *Gen V unbal;Gen V unb del*
Mains Voltage unbalance	BOC	**Mains protect:** *Mains V unbal; Mains Vunb del*

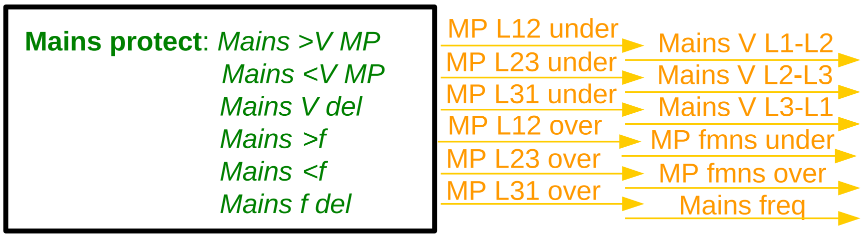
Mains voltage and frequency protections - limits and indications

Basic settings:
VoltProtselect = PHASE-NEUTRAL

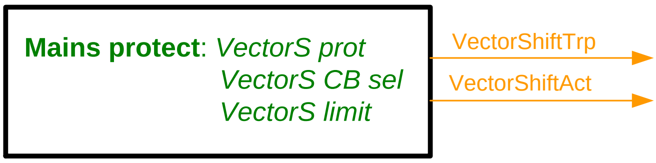


HINT
Mains protect is a setpoints group that contain setpoints related to mains protection evaluation. MP L1 under, Mains L1-N and etc. are alarms that occurs when mains protection is evaluated.
For more information about Mains protection see chapter *Setpoints / Mains protect* of this manual

Basic settings:
VoltProtselect = PHASE-PHASE



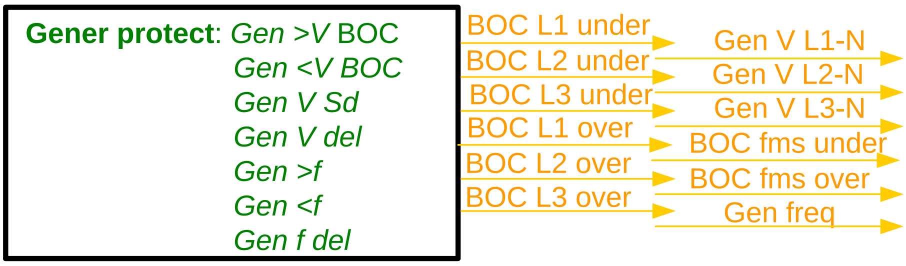
Vector shift protection - limits and indications



HINT
For more information about Vector Shift Protection see chapter *Setpoints / Mains protect* of this manual or chapter *Vector Shift Protection* of NPU User Guide 1.9.

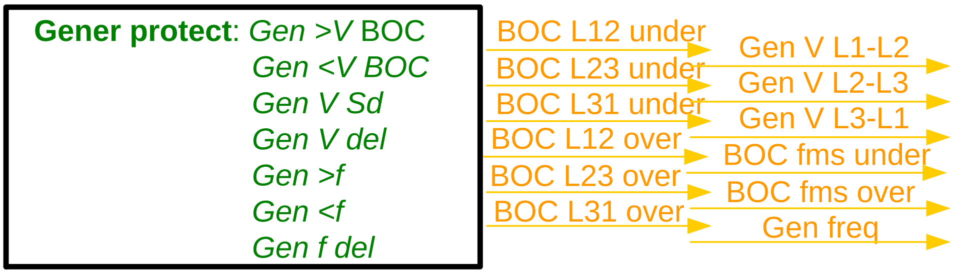
Generator voltage and frequency protections - limits and indications

Basic settings:
VoltProtSelect = PHASE-NEUTRAL



HINT
Gener protect is a setpoints group that contain setpoints related to mains protection evaluation. BOC L1 under, Gen V L1-N and etc are alarms that occurs when genset protection is evaluated.
For more information about Genset protection see chapter *Setpoints / Gener protect* of this manual.

Basic settings:
VoltProtSelect = PHASE-PHASE



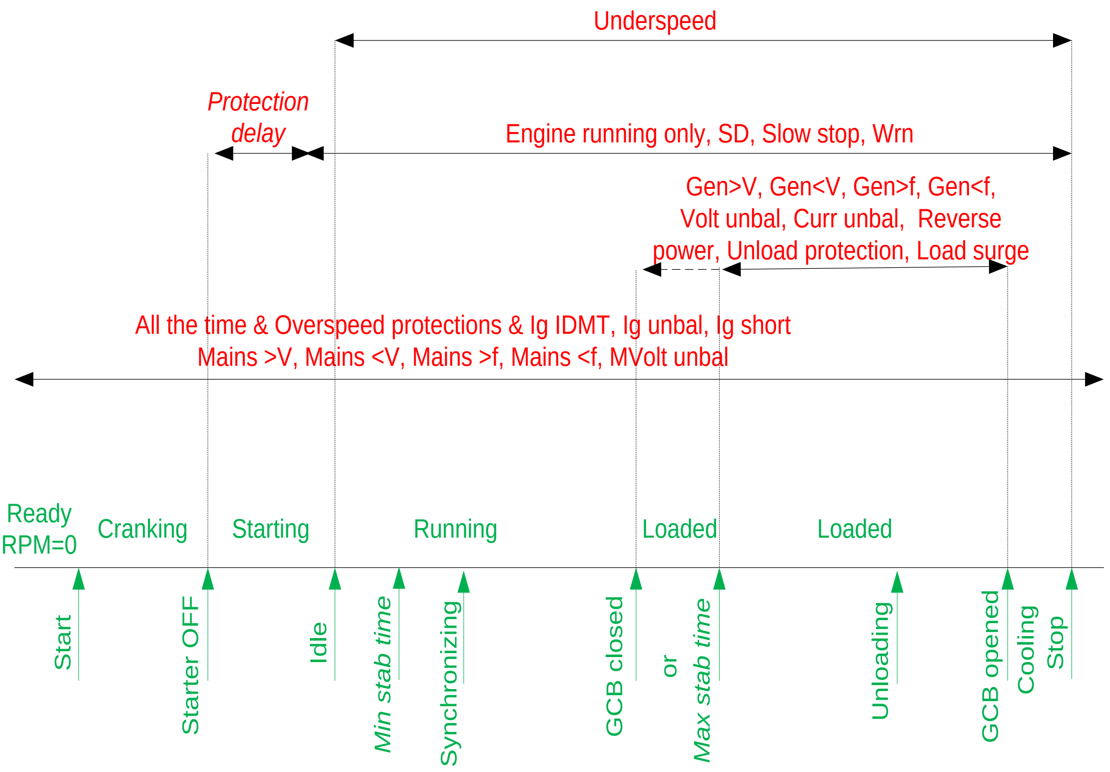
Shutdown override

If the Binary input shutdown override (Sd override) is closed, all 2nd level protections are disabled to allow engine run in an emergency situation, e.g. sprinkler devices power supply.
All protections are shown in Alarmlist and recorded into History, but the controller doesn't stop the engine because of them. If the input is deactivated and some protections are still active or not yet reset, the controller starts to take these protections into account and consequently stops the engine.

HINT
All 2nd level protections are locked out, except of these:

- Emergency stop
- Overspeed
- Underspeed (only if *Fuel solenoid* = GAS ENGINE)
- Binary and analog protections configured as *Sd override* type. In fact this protection type means "Unoverridable shutdown", i.e. it works the same way as standard shutdown protection, however it can not be overriden (blocked) by the *Sd override* input.

Alarm time chart



Gen-set operating states - depends on the actual gen-set conditions

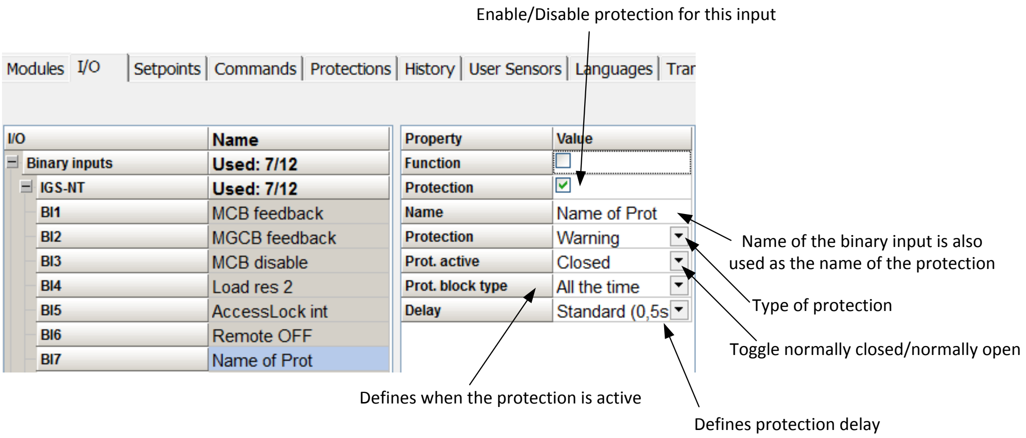
Protections - evaluation depends on the gen-set state

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.

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

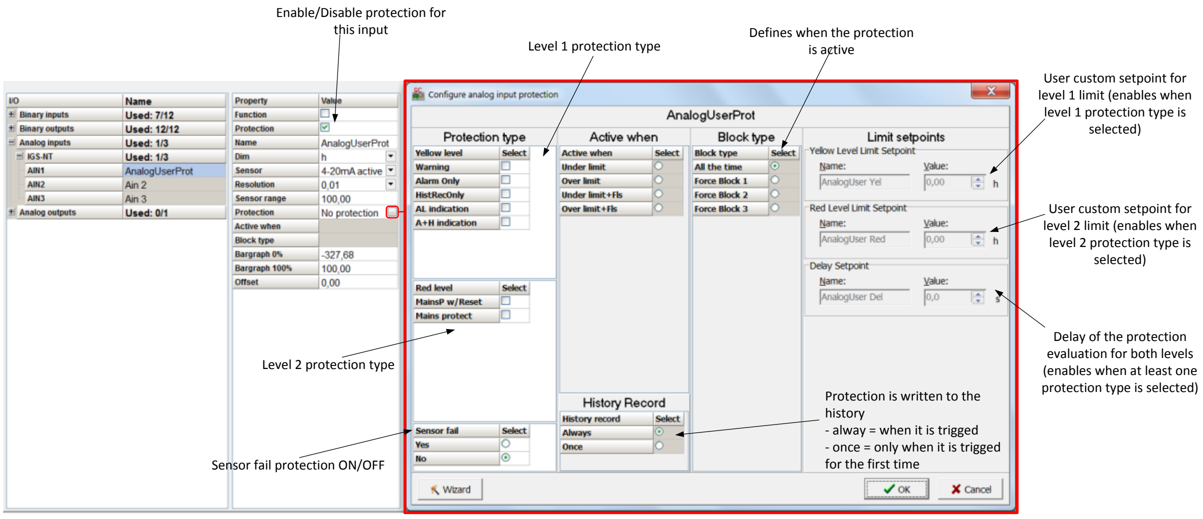
Toggle normally closed/normally open

Defines when the protection is active

Defines protection delay

Analog Input protection configuration

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

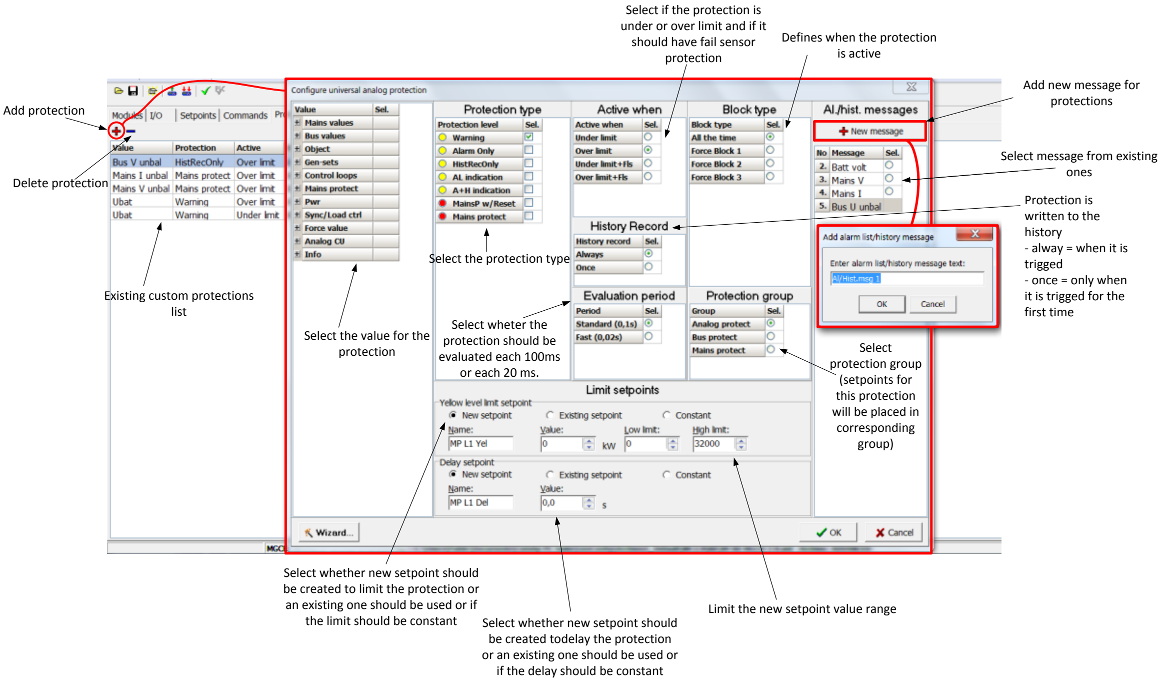


HINT

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.).

Custom configurable protection

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



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.

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.

Gen-set operation states

Gen-set can operate in following states

GEN-SET STATE	DESCRIPTION
Init	Controller is powerd up and configuration setting is initialized
Not ready	Gen-set is not ready to start or is not allowed to start
Ready	Gen-set is ready to run, all condition for start are fulfilled
Prestart	Prestart sequence in process. From closing of *Prestart* output to closing of *Starter* output
Cranking	Engine is cranking and the *starter* output is closed
Pause	Pause between start attempts is counting down
Starting	Starting RPM is reached
Running	Gen-set is running and waiting for GCB connection
Warming	Gen-set is running in parallel operation and gen-set load is reduced to *Warming load*
Soft load	Gen-set power is ramping up
Loaded	Gen-set is loaded
Soft unld	Gen-set power is ramping down
Cooling	State after GCB was opened and engine is not stopped
Stop	Engine is stopped
Shutdown	Shutdown alarm activated
Ventil	Gas engine – ventilation of unburned fuel when stop command comes during cranking with gas
SDVentil	Gas engine – ventilation of unburned fuel after unsuccessful start attempt
Off load	GCB is opened, gen-set keeps running on nominal RPM
Emerg man	Emergency manual state

GEN-SET OPERATION STATES

GEN-SET CONDITIONS	DESCRIPTION
IslOper	Island operation (MCB is opened, GCB is closed)
Brks Off	GCB, MCB opened
MainsOper	Mains is present (MCB is closed, GCB is opened)
Synchro	Gen-set is synchronizing (MCb is closed, GCB is opened)
ParalOper	Gen-set is in parallel with mains (MCB is closed, GCB is closed)
MainsOper/Brk Off	Engine is running idle

GEN-SET EXTERNAL CONDITIONS

Inputs and Outputs

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	IMPULSE	Note
IGS-NT controller	x	x	x	x		Number of I/O depends on type.
IGS-PTM	8	8	4	1	-	Standard I/O extension module.
IS-AIN8	-	-	8	-	-	Standard I/O extension module.
IS-AIN8TC	-	-	8	-	-	8 thermocouple inputs
IS-BIN16/8	16	8	-	-	-	Standard I/O extension module.
InteliAIN8	-	-	8	-	2	
InteliAIN8TC	-	-	8	-	-	
InteliIO8/8	8	8	-	2	-	
InteliIO16/0	16	0	-	2	-	
I-CB	x	x	x	x	-	Configurable communication bridge.
IGL-RA15	-	15	-	-	-	15 Green, Red, Yellow LED panel.
I-AOUT8	-	-	-	8	-	8 Analog outputs
VPIO	8	8	-	-	-	Virtual periphery I/O module.
SHBIN	8	-	-	-	-	SHared (virtual) Binary INput module
SHBOUT	-	8	-	-	-	SHared (virtual) Binary OUTput module
SHAIN	-	-	8	-	-	Shared (virtual) Analog INput module
SHAOUT	-	-	-	8	-	Shared (virtual) Analog OUTput module
PLC	x	x	x	x	-	Programmable (internal) logic module.

HINT
For more details about Virtual peripherals (Shared and Internal virtual I/O periphery and PLC) see IGS-NT-Application guide-2.4.pdf.

CAUTION!
Usage of any 3rd-party peripheral modules in cooperation with ComAp controller is not recommended. ComAp can’t guarantee the proper function of controller with none-ComAp peripheral modules.

Setpoints

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

Password protection

Any setpoint can be password protected - 7 levels of protection are available. There can be up to 8 users defined, each one with different access rights (levels of protection). Every user has it's own password. The password is a four-digit number. Only setpoints protected by the protection level that is covered by currently logged-in user's access rights can be modified.
If a user logs in from a particular terminal (e.g. the controller front panel), this does not unlock the other terminals for him, e.g. InteliMonitor connected directly or via modem.
Setpoints opened from front panel are automatically closed 15 minutes (return to measurement screens) after the last setpoint change or when wrong value of password is set.
System administrator (User 0 – always present in the system) can reset the password for any other user.
The controller programming (configuration) requires the highest - password 7 level, so only User 0 is able to modify the controller configuration or firmware.

Continuous internal evaluation of setpoints validity

In case of detection of Setpoints checksum (validity) evaluation error, the Shutdown alarm "Setpoint CS error" is issued to prevent the controller to run the engine with incorrect setting. The evaluation is provided at controller startup and continuously during the standard operation. I.e. in case of detection of such error, the engine is shut down immediatelly.

Setpoint synchronization

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

CAUTION!
Do not perform repeated writing of setpoints (e.g. power control from a PLC by repeated writing of baseload setpoint via Modbus) The setpoints are stored in EEPROM memory, which can be overwritten up to 10^5 times without risk of damage or data loss, however it may become damaged, when allowed number of writing cycles is exceeded!

List of possible events

The complete list is available in Troubleshooting guide.

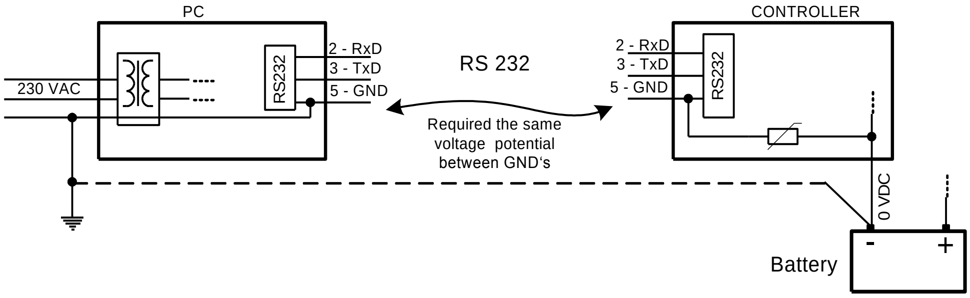
Controller configuration and monitoring

IGS-NT istallation pack contains separate PC software tools: GenConfig (GC) and InteliMonitor (IM).
GC and IM are based on Windows 95/98/NT/ME/2000/XP or higher platform and require approximately 30 Mbyte of hard disc free space.

Direct connection to the PC

IGS-NT controller can be connected directly with PC via RS232 or USB interface. Use the crossed RS232 or USB cable to connect PC with controller.

HINT
Make sure the grounding system on controller and PC – COM port (negative of the PC DC supply) are identical – before the first direct connection. There must not be any voltage between these two points otherwise the internal PTC protection activates and interrupts RS232 communication. In such case disconnect RS232 line wait a minute for PTC recovery and try again. The simple solution is to assure, that the PC supply 240/20V is ground free (GND terminal is not connected).



GenConfig functions

- Extension modules addressing
- All I/O function or protection configuration
- Setpoints adjusting
- Sensor characteristics modification
- History record modification
- Password level protection modification (password value must be changed in DriveMonitor)
- Controller firmware (mhx file) upgrade
- Controller application file Up/Down load
- Language translator enables
  - Create Dictionary between two languages (Dictionary can be used repeatedly)
  - Translate current text in Controller (in any language)
  - Add new language (up to five)

Configuration steps

Following configuration steps are available in GenConfig software:

- Select Extension modules when more inputs and outputs are required
- Configure J1939 interface when Electronic engine is connected
- Configure Binary inputs as Protection or Function
- Configure Binary outputs
- Configure Analog inputs as Protection or Function
- Define user sensors
- Configure History record
- Configure password protection
- Add/Translate the language

InteliMonitor

Functions

- On-line direct, Modem or Internet single or multiple engine monitoring
- Active Modem or Internet call from the controller to PC (activated by selected Alarm)
- On-line or Off-line History record listing
- Setpoints listing and adjusting (password protected)
- Statistics value (e.g. Running hours) Set/Reset
- Password and Access code change

Modbus protocol

Standard protocol enables receive/transmit any data or command from a Master system:

- Direct connection: RS232, RS422, RS485
- Modem connection
- 9600, 19200, 38400 or 57600 bps, 8 data bits, 1 stop bit, no parity
- Transfer mode RTU
- Function 3 (Read Multiply Registers)
- Function 6 (Write Single Register)
- Function 16 (Write Multiply Registers)
- The response to an incoming message depends on the communication speed. The delay is not shorter than the time needed to send/receive 3 and ½ characters.

The complete description of Modbus communication protocol can be found in *Modbus Protocol Reference Guide PI-MBUS-300* and *Open Modbus Specification Release 1.0*. Both documents are available from web site at http://www.modicon.com/openmbus/ .

HINT
Detail Modbus command description see in ComAp InteliCommunication guide.

Value and setpoint codes

HINT
It is possible to export actual values, setpoints and history file on-line from the controller or off-line from the archive using InteliMonitor – Monitor – Export data… function.

Technical data

HINT
Technical data of the controller and extension modules find in the IGS-NT-Installation guide-x.y.pdf.

Language support

IG-NT from display firmware version 1.4 supports following language code pages:

Code page	Language	Windows code
0	West European languages	Windows 1252
134	Chinese	GB 2312
162	Turkish	Windows 1254
129	Korean	Windows 1258
204	Russian	Windows 1251
238	East European languages	Windows 1250

IS-NT display from firmware version 1.5 supports following language code pages:

Code page	**Language**	**Windows code**
0	West European languages	Windows 1252
134	Chinese	GB 2312
162	Turkish	Windows 1254
129	Korean	Windows 1258
136	Thailand	GB 2312
204	Russian	Windows 1251
238	East European languages	Windows 1250

APPENDIX

Setpoint groups

CAUTION!
Do not perform repeated writing of setpoints (e.g. power control from a PLC by repeated writing of baseload setpoint via Modbus) The setpoints are stored in EEPROM memory, which can be overwritten more than 10^5 times without risk of damage or data loss, but it may become damaged, when allowed number of writing cycles is exceeded!

Setpoints - SMS/E-Mail

Setpoints - AMF Settings

1. EmergStart Del
2. MCB close del
3. MCB opens on
4. ReturnWithIntr
5. BreakerOverlap
6. RetFromIsland
7. ReturnTo mains
8. FwRet break
9. Mains ret del

Setpoints - Analog protect

1. Batt >V
2. Batt <V>
3. Batt volt del

Setpoints - Basic Settings

1. Nomin Power
2. Nomin current
3. CT ratio prim
4. CT ratio sec
5. Im3/ErFlCurCTp
6. Im3/ErFlCurCTs
7. VT ratio
8. Vg InpRangeSel
9. Vm VT ratio
10. Vm InpRangeSel
11. GenNomV
12. GenNomVph-ph
13. MainsNomV
14. MainsNomVph-ph
15. FixVoltProtSel
16. Nominal Freq
17. Nom frq offset
18. Gear Teeth
19. Nominal RPM
20. ControllerMode
21. FltRes GoToMAN
22. Local buttons
23. DispBaklightTO
24. DispBklStrtOff
25. FastHistPeriod
26. ConvCoefPulse1
27. ConvCoefPulse2 (for IS-NT only)
28. ConvCoefPulse3 (for IS-NT only)
29. ConvCoefPulse4 (for IS-NT only)

Setpoints - Comms settings

1. Gen-set name
2. Contr. address
3. RS232(1) mode
4. RS232(2) mode

Setpoints - Date/Time

Setpoints - Engine Params

Setpoints - Engine Protect

Setpoints - Force value

Setpoints - Gener Protect

Setpoints - Load shedding

Setpoints - Power Management

5. *Priority ctrl*
6. *#SysAMFstrtDel*
7. *#SysAMFstopDel*
8. *#LoadResStrt 1*
9. *#LoadResStop 1*
10. *#LoadResStrt 2*
11. *#LoadResStop 2*
12. *#LoadResStrt 3*
13. *#LoadResStop 3*
14. *#LoadResStrt 4*
15. *#LoadResStop 4*
16. *#%LdResStrt 1*
17. *#%LdResStop 1*
18. *#%LdResStrt 2*
19. *#%LdResStop 2*
20. *#%LdResStrt 3*
21. *#%LdResStop 3*
22. *#%LdResStrt 4*
23. *#%LdResStop 4*
24. *#NextStrt del*
25. *#OverldNextDel*
26. *#NextStopDel*
27. *#SlowStopDel*
28. *#MinRunPower 1*
29. *#MinRunPower 2*
30. *#MinRunPower 3*
31. *RunHoursBase*
32. *#RunHrsMaxDiff*
33. *#PwrBandContr1*
34. *#PwrBandContr2*
35. *#PwrBandContr3*
36. *#PwrBandContr4*
37. *#PwrBnChngDlUp*
38. *#PwrBnChngDlDn*
39. *Control group*
40. *GroupLinkLeft*
41. *GroupLinkRight*

Setpoints - Mains protect

1. *Mains >V MP*
2. *Mains <V MP*
3. *Mains V del*
4. *Mains Avg>V MP*
5. *Mains >f*
6. *Mains <f*
7. *Mains f del*
8. *VectorS prot*
9. *VS/ROCOF CBsel*
10. *VectorS limit*
11. *ROCOF prot*
12. *ROCOF Win*
13. *ROCOF df/dt*
14. *Mains V unbal*
15. *Mains Vunb del*

Setpoints - Process Control single

1. Base load
2. Base PF
3. Import load
4. Import PF
5. Load ctrl PtM
6. PF ctrl PtM
7. I/E-Pm meas
8. I/E-Qm meas
9. PeakLevelStart
10. PeakLevelStop
11. PeakAutS/S del
12. Peak kVA Start
13. Peak kVA Stop
14. PeakKVAS/S del
15. Export limit
16. Derating1 strt (IS-NT only)
17. Derating2 strt (IS-NT only)
18. Derating1 end (IS-NT only)
19. Derating2 end (IS-NT only)
20. Derated1 pwr (IS-NT only)
21. Derated2 pwr (IS-NT only)
22. TempByPwr Treq (IS-NT only)
23. TempByPwr gain (IS-NT only)
24. TempByPwr int (IS-NT only)
25. Overheat prot (IS-NT only)
26. Island enable
27. ParallelEnable
28. Synchro enable
29. MFStart enable
30. #Neutral cont.
31. Watched contr

Setpoints - Process Control Multi

1. #SysBaseLoad
2. LocalBaseload
3. #SysPwrFactor
4. #SysLdCtrl PtM
5. #SysPFCtrl PtM
6. SysBaseLdMode
7. SysBasePFMode
8. Derating1 strt(IS-NT only)
9. Derating2 strt(IS-NT only)
10. Derating1 end(IS-NT only)
11. Derating2 end(IS-NT only)
12. Derated1 pwr(IS-NT only)
13. Derated2 pwr(IS-NT only)
14. Synchro enable
15. #Neutral cont
16. Watched contr

Setpoints - Sync/load Ctrl

1. SpeedRegChar
2. Voltage window

3. *GtoM AngleReq*
4. *Dwell time*
5. *Freq gain*
6. *Freq int*
7. *Freq reg loop*
8. *Angle gain*
9. *Speed gov bias*
10. *SpdGovPWM rate*
11. *SpeedGovLowLim*
12. *SpeedGovHiLim*
13. *TauSpeedActuat*
14. *Load ramp*
15. *Load gain*
16. *Load int*
17. *RampStartLevel*
18. *GCB open level*
19. *GCB open del*
20. *Sync timeout*
21. *LS gain*
22. *LS int*

Setpoints - Timer settings

1. *TimerChannel 1*
2. *TimerChannel 2*
3. *TimerChannel 3*
4. *TimerChannel 4*
5. *TimerChannel 5*
6. *TimerChannel 6*
7. *TimerChannel 7*
8. *TimerChannel 8*
9. *TimerChannel 9*
10. *TimerChannel 10*
11. *TimerChannel 11*
12. *TimerChannel 12*
13. *TimerChannel 13*
14. *TimerChannel 14*
15. *TimerChannel 15*
16. *TimerChannel 16*

Setpoints - Volt/PF Control

1. *AVRRegChar*
2. *Voltage gain*
3. *Voltage int*
4. *PF gain*
5. *PF int*
6. *AVR DCout bias*
7. *VS gain*
8. *VS int*
9. *TauVoltActuat*

Value groups

1. Analog CU
2. Bin inputs CU
3. Bin outputs CU
4. Engine values
5. Force value
6. Gener values
7. Info
8. Log Bout
9. Load shedding
10. Mains/Bus val
11. Pwr Management
12. Statistics
13. Sync/Load ctrl
14. Volt/PF ctrl

Values group - Analog CU

1. *Ubat*
2. *CPU temp*
3. *D+*
4. *AIN CU-1*
5. *AIN CU-2*
6. *AIN CU-3*
7. *AIN CU-4*

Values group - Bin inputs CU

1. *BIN*

Values group - Bin outputs CU

1. *BOUT*

Values group - Engine values

1. *RPM*
2. *T Cyl aver*
3. *T Cyl max*
4. *T Cyl min*

Values group - Force value

1. *ExtValue1*
2. *ExtValue2*
3. *ExtValue3*
4. *ExtValue4*

Values group - Gener values

Values group - Info

22. *NextDate13-16*
23. *AirGate ID*
24. *AirGate status*

Values group - Log Bout

1. *LogBout 1*
2. *LogBout 2*
3. *LogBout 3*
4. *LogBout 4*
5. *LogBout 5*
6. *LogBout 6*
7. *LogBout 7*
8. *LogBout 8*
9. *RemoteControl*

Values group - Load shedding

1. *StatLdShed*

Values group - Mains/Bus val

1. *Mains freq*
2. *Mains V L1-N*
3. *Mains V L2-N*
4. *Mains V L3-N*
5. *Mains V*
6. *Mains V L1-L2*
7. *Mains V L2-L3*
8. *Mains V L3-L1*
9. *Mains V unbal*
10. *Im3/EarthFC*
11. *P mains*
12. *Q mains*
13. *Mains PF*
14. *Mains LChr*
15. *Object P*
16. *Object Q*
17. *Object PF*
18. *Object LChr*
19. *MaxVectorS*

Values group - Power management

1. *EnginePriority*
2. *Act Reserve*
3. *Reserve*
4. *Reserve Stp*
5. *ActRes rel*
6. *Res rel*
7. *ResStp rel*
8. *MinR PWR*

Values group - Statistics

1. kWhours
2. kVArhours
3. Run hours
4. Num starts
5. NumUnsc start
6. Service time 1
7. Service time 2
8. Service time 3
9. Service time 4
10. Total downtime
11. DnTimeReqToRun
12. PulseCounter 1
13. PulseCounter 2
14. PulseCounter 3
15. PulseCounter 4

Values group - Sync/Load ctrl

1. ActPwrReq
2. SpdRegOut
3. Speed request
4. SpeedReq RPM
5. ReqEngineSpeed
6. SystLoadCtrl
7. TotRunPact Q
8. TotRunPact P
9. netPgnomPh

Values group - Volt/PF ctrl

1. VoltRegOut
2. SystPfCtrl

Binary input functions

57. ECU StoppedEng
58. CtrlHBeat sens
59. Force value 1
60. Force value 2
61. Force value 3
62. Force value 4
63. Force value 5
64. Force value 6
65. Force value 7
66. Force value 8
67. Force value 9
68. Force value 10
69. Force value 11
70. Force value 12
71. Force value 13
72. Force value 14
73. Force value 15
74. Force value 16
75. CylDifEvalBlk (for IS-NT only)
76. ExtValue1 up (for IS-NT only)
77. ExtValue2 up (for IS-NT only)
78. ExtValue3 up (for IS-NT only)
79. ExtValue4 up (for IS-NT only)
80. ExtValue1 down (for IS-NT only)
81. ExtValue2 down (for IS-NT only)
82. ExtValue3 down (for IS-NT only)
83. ExtValue4 down (for IS-NT only)
84. ExtValue1reset
85. ExtValue2reset
86. ExtValue3reset
87. ExtValue4reset
88. PulseCounter 1 (for IS-NT only)
89. PulseCounter 2 (for IS-NT only)
90. PulseCounter 3 (for IS-NT only)
91. PulseCounter 4 (for IS-NT only)
92. Timer block 1
93. Timer block 2
94. Timer block 3
95. Timer block 4
96. Timer block 5
97. Timer block 6
98. Timer block 7
99. Timer block 8
100. Timer block 9
101. Timer block 10
102. Timer block 11
103. Timer block 12
104. Timer block 13
105. Timer block 14
106. Timer block 15
107. Timer block 16
108. Lang sel int A
109. Lang sel int B
110. Lang sel int C
111. Lang sel D#2 A
112. Lang sel D#2 B
113. Lang sel D#2 C
114. Lang sel D#3 A (for IS-NT only)
115. Lang sel D#3 B (for IS-NT only)
116. Lang sel D#3 C (for IS-NT only)

Analog input functions

Binary output functions

Common functions

Breaker control

Control loops

Power management

Status information

Fixed protections output

1. *Alarm*
2. *Alarm flashing*
3. *Horn*
4. *Horn flashing*
5. *Common Hst*
6. *Common MP*
7. *Common LoP (IS-NT only)*
8. *Common Al*
9. *Common Wrn*
10. *CommonActLev 1*
11. *CommonAlLev 1*
12. *Common OfL*
13. *Common BOC*
14. *Common Stp*
15. *Common Sd*
16. *CommonActLev 2*
17. *CommonAlLev 2*
18. *Common Fls*
19. *T cyl differ (IS-NT only)*
20. *Vgen <>*
21. *Vmains <>*
22. *VectorShiftTrp*
23. *VectorShiftAct*
24. *Overcurrent*
25. *ECU comm error*
26. *PeriphCommErr*
27. *CtrlHBeat FD*
28. *Not lubricated*
29. *CAN2 bus empty*
30. *Bus meas error*
31. *ECU*
32. *SHBinCfgErr*
33. *SHAinCfgErr*
34. *ECUDiagBlocked*
35. *WrongConfig*
36. *Dongle incomp*
37. *Emergency stop*
38. *WrnServiceT1+2*
39. *WrnServiceT3+4*
40. *Overspeed*
41. *Underspeed*
42. *Start fail*
43. *Sd Stop fail*
44. *ChrgAlternFail*
45. *Pickup fail*
46. *Sd ExtBattFlat*
47. *Stp GCB fail*
48. *Wrn MCB fail*
49. *BOC NCB fail*
50. *Stp Sync fail*
51. *WrnRSync fail*
52. *WrnSpdRegLim*
53. *WrnVoltRegLim*
54. *WrnTestOnLdFail*
55. *Sd Oil press B*
56. *OfL StartBlck*
57. *Start blocking*
58. *Fuel theft*

Configurable protection outputs

1. *PLC State 1*
2. *PLC State 2*
3. *PLC State 3*
4. *PLC State 4*
5. *UnivState 1*
6. *UnivState 2*
7. *UnivState 3*
8. *UnivState 4*
9. *UnivState 5*
10. *UnivState 6*
11. *UnivState 7*
12. *UnivState 8*
13. *UnivState 9*
14. *UnivState 10*
15. *UnivState 11*
16. *UnivState 12*
17. *UnivState 13*
18. *UnivState 14*
19. *UnivState 15*

Table of setpoints

Group: ProcCtrlMulti

Setpoint: #SysBaseLoad

Group	ProcCtrlMulti
Range [units]	0 .. 65000 [kW]
Related FW	2.0
Description	This setpoint is used to adjust the **requested load for the whole gen-set group** in *system baseload* mode (i.e. *#SysLdCtrl PtM* = BASELOAD). Each gen-set takes proprtionally equal part of this total required value. The number of running gen-sets is resolved by the power management function according to the requested total load, gen-sets nominal power and adjusted reserves.

Setpoint: LocalBaseload

Group	ProcCtrlMulti
Range [units]	OFF, 1 .. *Nomin power* [kW]
Related FW	2.0
Force value possible	YES
Description	This setpoint is used to adjust local baseload level. The gen-set maintains this load instead of performing proportional load sharing whenever the total load is high enough. Load variations are then equalized by the gen-sets with lower priority (higher number) or by gen-sets with local baseload switched off. If the setpoint is adjusted to 0 (OFF) the function is off. Description of the function is available in the chapter Local baseload.

Setpoint: #SysPwrFactor

Group	ProcCtrlMulti
Range [units]	0.60 .. 1.20 [-]
Related FW	2.0
Description	The setpoint is used for adjusting the requested gen-set power factor during the parallel-to-mains operation if *#SysPFCtrl PtM* = BASEPF and also during the local baseload operation. Values 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.

Setpoint: #SysLdCtrl PtM

Group	ProcCtrlMulti
Range [units]	BASELOAD, LDSHARING [-]
Related FW	2.0
Description	This setpoint is used to adjust the power control mode in parallel-to-mains operation. • BASELOAD: The gen-set is controlled by the load control loop (i.e. as in SPtM) to provide constant proportional part of the requested system baseload (see *SysBaseLdMode*). The proportional parts of all running gen-sets are equal relative to their nominal power. • LDSHARING: The gen-set load controlled by the load sharing loop as in island operation. This option is intended **only** for systems with InteliMains, where the InteliMains controls the power of the group via the load sharing line (e.g. in Import/Export mode).

Setpoint: #SysPFCtrl PtM

Group	ProcCtrlMulti
Range [units]	BASEPF, VSHARING [-]
Related FW	2.0
Description	This setpoint is used to adjust the power factor control mode in parallel-to-mains operation. • BASEPF: The gen-set power factor is controlled to a preadjusted level *#SysPwrFactor*. • VSHARING: The power factor is equalized with other gen-sets according to the actual reactive load. **NOTE:** If the power factor control mode is switched to VSHARING the *load control mode* must be switched to LDSHARING.

Setpoint: SysBaseLdMode

Group	ProcCtrlMulti

<table>
<tr><td>Range [units]</td><td>INTERNAL, EXTERNAL [-]</td></tr>
<tr><td>Related FW</td><td>2.0</td></tr>
<tr><td>Force value possible</td><td>YES</td></tr>
<tr><td>Description</td><td>This setpoint selects from where the System Base load value is taken if the load control mode in parallel-to-mains operation is switched to baseload (i.e. <i>#SysLdCtrl PtM</i> = BASELOAD).
<table>
<tr><td>INTERNAL</td><td>The baseload is adjusted by the setpoint <i>#SysBaseLoad</i>.</td></tr>
<tr><td>EXTERNAL</td><td>The baseload is adjusted by the logical (functional) analog input <i>MLC:AnExSysBld</i>.</td></tr>
</table>
NOTE:
If the external source is selected the logical analog input must be configured at each gen-set to the identical source. The <i>shared peripherial modules</i> can be used to distribute the value over the controllers via the CAN2 bus.

One controller measures the value physically on it's analog input and the function <i>MLC:AnExSysBld</i> is configured onto this physical input. But the value is also beeing transmitted from this controller to the CAN bus via one shared analog output (e.g. SHAOUT #1.1).
The other controllers reads the value from their shared analog inputs (e.g. SHAIN #1.1) and the function <i>MLC:AnExSysBld</i> is configured onto these shared inputs.
The transmitting controller must be always switched on!

</td></tr>
</table>

Setpoint: SysBasePFMode

<table>
<tr><td>Group</td><td>ProcCtrlMulti</td></tr>
<tr><td>Range [units]</td><td>INTERNAL, EXTERNAL [-]</td></tr>
<tr><td>Related FW</td><td>2.0</td></tr>
<tr><td>Force value possible</td><td>YES</td></tr>
<tr><td>Description</td><td>This setpoint selects from where the System Power Factor value is taken if the PF control mode in parallel-to-mains operation is switched to BasePF (i.e. <i>#SysPFCtrl PtM</i> = BASEPF).
<table>
<tr><td>INTERNAL</td><td>The required power factor is adjusted by the setpoint <i>#SysPwrFactor</i>.</td></tr>
<tr><td>EXTERNAL</td><td>The baseload is adjusted by the logical (functional) analog input <i>MPF:AnExSysBPF</i>.</td></tr>
</table>
NOTE:
If the external source is selected the logical analog input must be configured at each gen-set to the identical source. See the note at the setpoint <i>SysBaseLdMode</i>.
</td></tr>
</table>

Setpoint: RegkW/kVAr

Group	ProcCtrlMulti
Range [units]	STD, DROOP, EMERG DROOP [-]
Related FW	2.0
Force value possible	YES
Description	STD/DROOP/EMERG DROOP
STD	Standard isochronous Load Sharing and VAr Sharing are based on CAN intercontroller communication.
DROOP	Load Sharing and VAr Sharing regulations are based on droop. Requested power of each genset is calculated based on bus voltage and bus frequency.
EMERG DROOP	Load Sharing and VAr Sharing regulation are based on standard CAN intercontroller communication, but can be conditionally switched to droop. All controllers are continually checking the CAN16/CAN32 register to see witch addresses is it in cooperation (use the LBI EmergDroopEnab to confirm the supervised constalation of addresses on CAN) . In case of lost of any controller from CAN are the regulation automatically switched to droop (yellow alarm EmergDroopAct appears in alarm list, message EmergDROOPon is writen in history). Load Sharing and VAr Sharing regulation are switched back to the standard mode 60s after the constalation of addresses on can is set to the original state (message EmergDROOPoff is written in history, alarm EmergDroopAct has to be confirmed manually). The purpose of this function is protection against the cut off the CAN intercontroller line.

Group: ProcCtrlSingle

Setpoint: Base load

Group	ProcCtrlSingle
Range [units]	0 .. *Nomin power* [kW]
Related FW	2.0
Description	This setpoint is used for adjusting of the requested gen-set power in *Baseload* mode, i.e. if the setpoint *Load ctrl PtM* is set to BASELOAD. **NOTE:** The actual setpoint units and range depend on setting of the Power format in GenConfig. **NOTE:** If the this setpoint is adjusted to lower value than *Min Power PtM* the gen-set power is limited the *Min Power PtM* setpoint.

Setpoint: Base PF

Group	ProcCtrlSingle
Range [units]	0.60 .. 1.20 [-]
Related FW	2.0
Description	This setpoint is used for adjusting of the requested gen-set power factor value if

	the power factor control mode is set to BASEPF (setpoint *PF ctrl PtM*). Values over 1.00 mean capacitive load character, i.e. setting 0.95 means 0.95L and setting 1.05 means 0.95C.

Setpoint: Import load

Group	ProcCtrlSingle
Range [units]	-32000 .. 32000 [kW]
Related FW	2.0
Description	This setpoint is used for adjusting of the requested **mains import** if the gen-set load control mode is set to IMP/EXP (*Load 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.

Setpoint: Import PF

Group	ProcCtrlSingle
Range [units]	0.60 .. 1.20 [-]
Related FW	2.0
Description	The setpoint is used to adjust the requested power factor at the mains when *PF ctrl PtM* = PF-IM/EX. Values over 1.00 mean capacitive load character. **EXAMPLE:** Setting 0.95 means 0.95L and setting 1.05 means 0.95C.

Setpoint: Load ctrl PtM

Group	ProcCtrlSingle
Range [units]	BASELOAD, IM/EX, ANEXT BASELOAD, ANEXT IM/EX, T BY PWR [-]
Related FW	2.0
Force value possible	YES
Description	The setpoint is used for selection of the load control mode in parallel to mains operation. • BASELOAD: Gen-set load is maintained at constant level adjusted by the setpoint *Base load*. • IM/EX: Gen-set load is controlled so, that the mains import is maintained constant at the level adjusted by setpoint *Import load*. • ANEXT BASELOAD: Gen-set load is maintained at constant level given

by the analog input *LdCtrl:AnExBld*.

- ANEXT IM/EX: Gen-set load is controlled so, that the mains import is maintained constant at the level given by the analog input *LdCtrl:AnExI/E*. This option is available in IS-NT only.
- T BY PWR: Gen-set load is controlled so, that the analog input *LdCtrl:TByPwr* is maintained at constant level given by setpoint *TempByPwr Treq*. The regulation loop is adjusted by setpoints *TempByPwr gain* and *TempByPwr int*. This option is available in IS-NT only.

NOTE:
If the baseload value needs to be changed remotely via a communication interface select the ANEXT BASELOAD mode and then configure one of the objects *ExtValue1* .. *ExtValue4* as the source for the analog input *LdCtrl:AnExBld*. 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.

Setpoint: PF ctrl PtM

Group	ProcCtrlSingle
Range [units]	BASEPF, PF-IM/EX, ANEXT BASEPF, ANEXT PF-IM/EX [-]
Related FW	2.0
Force value possible	YES
Description	The setpoint is used for selection of the power factor control mode in parallel to mains operation. • BASEPF: Gen-set power factor is maintained at constant level adjusted by the setpoint *Base PF*. • PF-IM/EX: Gen-set power factor is controlled so, that the mains power factor is maintained constant at the level adjusted by setpoint *Import PF*. • ANEXT BASEPF: Gen-set power factor is maintained at constant level given by the analog input *PFCtrl:AnExBPF*. This option is available in IS-NT only. • ANEXT PF-IM/EX: Gen-set load is controlled so, that the mains power factor is maintained constant at the level given by the analog input *PFCtrl:AnExI/E*. This option is available in IS-NT only.

Setpoint: I/E-Pm meas

Group	ProcCtrlSingle
Range [units]	NONE, IM3 CT INPUT, ANALOG INPUT [-]
Related FW	2.0
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. • IM3 CT INPUT: Active power from the mains is calculated from the mains L3-N voltage and the current measured at the controller Im3 terminal and

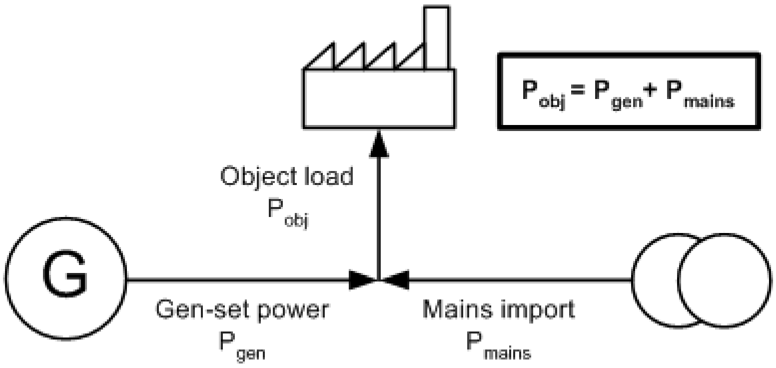
	then multiplied by 3. • ANALOG INPUT: Active power from the mains is measured by an external device and passed the controller via analog input *LdCtrl:I/E-Pm*. **NOTE:** If the mains import is not measured or measured externally, the Im3 terminal can be used for *Earth fault current protection* This protection is present in default archive and **should be removed** in GenConfig (Protections tab) if the Im3 input is used for mains import measurement.

Setpoint: I/E-Qm meas

Group	ProcCtrlSingle
Range [units]	NONE, IM3 CT INPUT, ANALOG INPUT [-]
Related FW	2.0
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 *Base PF* setpoint. However, this kind of operation may lead in certain conditions to bad power factor values at the mains. • IM3 CT INPUT: Reactive power from the mains is calculated from the mains L3-N voltage and the current measured at the controller Im3 terminal and then multiplied by 3. • ANALOG INPUT: Rective power from the mains is measured by an external device and passed the controller via analog input *PFCtrl: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 IM3 CT INPUT, the *I/E-Qm meas* should not be set to ANALOG INPUT and vice versa.

Setpoint: PeakLevelStart

Group	ProcCtrlSingle
Range [units]	*PeakLevelStop* .. 32000 [kW]
Related FW	2.0
Force value possible	YES
Description	If the object consumption (*Object P*) exceeds this setpoint for time longer than *PeakAutS/Sdel*, the gen-set starts automatically. Adjusting the *PeakAutS/Sdel* to 0 (OFF) disables the autostart. See also the setpoint *PeakLevelStop*.

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

Setpoint: PeakLevelStop

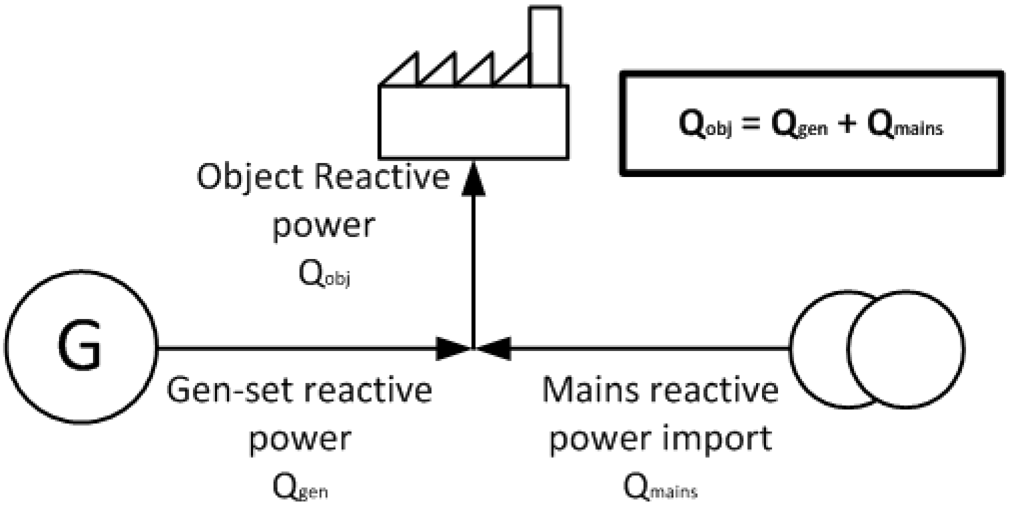
Group	ProcCtrlSingle
Range [units]	0 .. *PeakLevelStart* [kW]
Related FW	2.0
Force value possible	YES
Description	If the object consumption (*Object P*) drops below this setpoint for time longer than *PeakAutS/Sdel*, the gen-set stops automatically. See also the setpoint *PeakLevelStart*. **NOTE:** The actual setpoint units and range depend on setting of the Power format in GenConfig.

Setpoint: PeakAutS/S del

Group	ProcCtrlSingle
Range [units]	OFF, 1 .. 3200 [s]
Related FW	2.0
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*).

Setpoint: Peak kVA Start

Group	ProcCtrlSingle
Range [units]	*Peak kVA Stop* .. 32000 [kVA]

Related FW	2.0
Force value possible	YES
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.

Setpoint: Peak kVA Stop

Group	ProcCtrlSingle
Range [units]	0 .. *Peak kVA Start* [kW]
Related FW	2.0
Force value possible	YES
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.

Setpoint: PeakKVAS/S del

Group	ProcCtrlSingle
Range [units]	OFF, 1 .. 3200 [s]
Related FW	2.0
Force value possible	YES
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*).

Setpoint: VoltByPwr Vreq

Group	ProcCtrlSingle
Range [units]	80,0 .. 120,0 [%]
Related FW	2.0
Force value possible	NO
Description	This setpoint defines the line voltage that is considered as OK. Genset is not supposed to run on higher power than is given by setpoint **Gener protect:** *Min power PtM*. The value is relative to the setpoint **Basic settings:** *MainsNomV.*

Setpoint: VoltByPwr Vmin

Group	ProcCtrlSingle
Range [units]	80,0 .. 120,0 [%]
Related FW	2.0
Force value possible	NO
Description	This setpoint defines the line voltage on witch is the gen-set supposed to be running on maximum available power witch is given by setpoint **Basic settings:** *Nomin power.* The value is relative to the setpoint **Basic settings:** *MainsNomV.*

Setpoint: VoltByPwr Start

Group	ProcCtrlSingle
Range [units]	80,0 .. 120,0 [%]
Related FW	2.0
Force value possible	NO
Description	This setpoint defines the low limit of voltage when the gen-set is automatically

	started up (in AUT mode only). Gen-set is started when the mains voltage cross the limit with delay given by **ProcCtrlSingle:** *VoltByPwrSSdel* setpoint.The value is relative to the setpoint **Basic settings:** *MainsNomV.*

Setpoint: VoltByPwr Stop

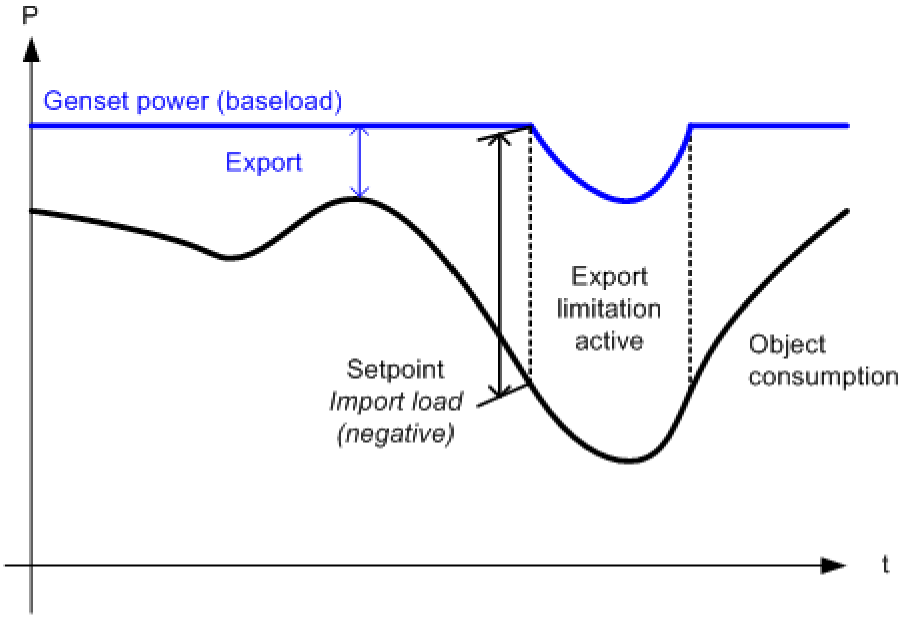
Group	ProcCtrlSingle
Range [units]	80,0 .. 120,0 [%]
Related FW	2.0
Force value possible	NO
Description	This setpoint defines the high limit of voltage when the gen-set is automatically stopped (in AUT mode only). Gen-set is stopped when the voltage cross the limit with delay given by setpoint **ProcCtrlSingle:** *VoltByPwrSSdel.* The value is relative to the setpoint **Basic settings:** *MainsNomV.*

Setpoint: VoltByPwrSSdel

Group	ProcCtrlSingle
Range [units]	OFF, 1 .. 3600 [s]
Related FW	2.0
Force value possible	YES
Description	This setpoint defines Start/Stop delay of V BY PWR function.

Setpoint: Export limit

Group	ProcCtrlSingle
Range [units]	DISABLED, ENABLED [-]
Related FW	2.0
Force value possible	YES
Description	The setpoint is used to enable and disable the *Export limit* function. If the function is enabled, the gen-set 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 BASELOAD, ANEXT BASELOAD 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.

Setpoint: Derating1 strt

Group	ProcCtrlSingle
Range [units]	-32000 .. +32000 [x]
Related FW	2.0
Force value possible	YES
Description	This setpoint is used for adjusting the starting point of the *Power derating 1* function, where the gen-set nominal power is still 100% of the setpoint *Nomin power*. See the chapter Power derating for details. **NOTE:** The setpoint actual physical dimension depends on configuration of the physical analog input to which the logical input *PowerDerating1* is assigned.

Setpoint: Derating1 end

Group	ProcCtrlSingle

Range [units]	-32000 .. +32000 [x]
Related FW	2.0
Force value possible	YES
Description	This setpoint is used for adjusting the end point of the *Power derating 1* function, where the gen-set nominal power is reduced to the value adjusted by setpoint *Derated1 pwr*. See the chapter Power derating for details. **NOTE:** The setpoint actual physical dimension depends on configuration of the physical analog input to which the logical input *PowerDerating1* is assigned.

Setpoint: Derated1 pwr

Group	ProcCtrlSingle
Range [units]	0 .. 100 [%]
Related FW	2.0
Force value possible	YES
Description	This setpoint is used for adjusting the final power level for the *Power derating 1* function. The nominal power is not reduced below this setpoint even if the respective analog input increases further. See the chapter Power derating for details.

Setpoint: Derating2 strt

Group	ProcCtrlSingle
Range [units]	-32000 .. +32000 [x]
Related FW	2.0
Force value possible	YES
Description	This setpoint is used for adjusting the starting point of the *Power derating 2* function, where the gen-set nominal power is still 100% of the setpoint *Nomin power*. See the chapter Power derating for details. **NOTE:** The setpoint actual physical dimension depends on configuration of the physical analog input to which the logical input *PowerDerating2* is assigned.

Setpoint: Derating2 end

Group	ProcCtrlSingle
Range [units]	-32000 .. +32000 [x]

Related FW	2.0
Force value possible	YES
Description	This setpoint is used for adjusting the end point of the *Power derating 2* function, where the gen-set nominal power is reduced to the value adjusted by setpoint *Derated2 pwr*. See the chapter Power derating for details. **NOTE:** The setpoint actual physical dimension depends on configuration of the physical analog input to which the logical input *PowerDerating1* is assigned.

Setpoint: Derated2 pwr

Group	ProcCtrlSingle
Range [units]	0 .. 100 [%]
Related FW	2.0
Force value possible	YES
Description	This setpoint is used for adjusting the final power level for the *Power derating 2* function. The nominal power is not reduced below this setpoint even if the respective analog input increases further. See the chapter Power derating for details.

Setpoint: TempByPwr Treq

Group	ProcCtrlSingle
Range [units]	-32000 .. +32000 [°C]
Related FW	2.0
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 *LdCtrl: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 gen-set power the regulated value (i.e. some temperature) must depend on the gen-set power. Typical usage of this function is regulation of the output temperature of the heating water at a CHP unit.

Setpoint: TempByPwr gain

Group	ProcCtrlSingle
Range [units]	0.00 .. 100.00 [%]
Related FW	2.0
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*.

Setpoint: TempByPwr int

Group	ProcCtrlSingle
Range [units]	0.00 .. 100.00 [%]
Related FW	2.0
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*.

Setpoint: Overheat prot

Group	ProcCtrlSingle
Range [units]	DISABLED, ENABLED
Related FW	2.0
Force value possible	YES
Description	The setpoint is used to enable/disable the *Overheat protection*, which is used for limitation of the gen-set power when there is not enough heat outlet from the gen-set to avoid shutdown due to oveheating. If the *Overheat protection* is enabled and the temperature at the logical analog input *LdCtrl: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*.

Setpoint: Island enable

Group	ProcCtrlSingle
Range [units]	NO, YES [-]
Related FW	2.0

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 generator breaker, cool-down the gen-set and stop it. While this situation persists the controller behavior is following: • The gen-set start in AUT mode is blocked, it can be started in MAN mode only. • The GCB can't be closed. • 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*.

Setpoint: ParallelEnable

Group	ProcCtrlSingle
Range [units]	NO, YES [-]
Related FW	2.0
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 generator breaker, cool-down the gen-set and stop it. While this situation persists the controller behavior is following: • The gen-set start in AUT mode is blocked, it can be started in MAN mode only. • The GCB can't be closed. • 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*.

Setpoint: Synchro enable

Group	ProcCtrlSingle
Range [units]	NONE, FORWARD, REVERSE, BOTH [-]
Related FW	2.0
Force value possible	YES
Description	The setpoint is used for enable/disable forward and reverse synchronization. • NONE: No synchronizing is enabled. • FORWARD: GCB synchronizing is enabled. • REVERSE: MCB synchronizing is enabled. • BOTH: GCB 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*.

Setpoint: MFStart enable

<table>
<tr><td>Group</td><td>ProcCtrlSingle</td></tr>
<tr><td>Range [units]</td><td>NO, YES [-]</td></tr>
<tr><td>Related FW</td><td>2.0</td></tr>
<tr><td>Force value possible</td><td>YES</td></tr>
<tr><td>Description</td><td>The setpoint is used to enable/disable automatic start of the gen-set when a mains failure occurs.
EXAMPLES OF SETTINGS:
<table>
<tr><th>DESCRIPTION OF THE BEHAVIOR</th><th>REQUIRED ADJUSTMENT</th></tr>
<tr><td rowspan="4">AMF gen-set, no synchronizing, no test-on-load function. This behavior is used if the both MCB and GCB too slow for synchronizing or if synchronizing is generally not allowed by the local electricity company.</td><td><i>Island enable</i> = YES</td></tr>
<tr><td><i>ParallelEnable</i> = NO</td></tr>
<tr><td><i>Synchro enable</i> = NONE</td></tr>
<tr><td><i>MFStart enable</i> = YES</td></tr>
<tr><td rowspan="4">AMF gen-set with test-on-load function and with synchronized return to the mains. No continuous parallel operation.</td><td><i>Island enable</i> = YES</td></tr>
<tr><td><i>ParallelEnable</i> = NO</td></tr>
<tr><td><i>Synchro enable</i> = BOTH</td></tr>
<tr><td><i>MFStart enable</i> = YES</td></tr>
</table></td></tr>
</table>

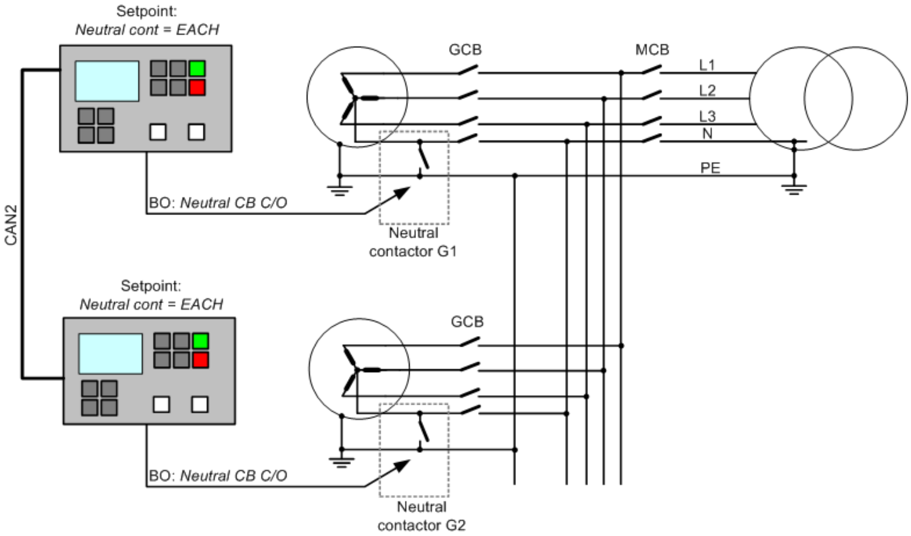
AMF gen-set without test-on-load function and with synchronized return to the mains. No continuous parallel operation.	*Island enable* = YES
	ParallelEnable = NO
	Synchro enable = REVERSE
	MFStart enable = YES
Gen-set operating parallel to mains with additional AMF functionality, synchronized return to the mains.	*Island enable* = YES
	ParallelEnable = YES
	Synchro enable = BOTH
	MFStart enable = YES
Gen-set operating parallel to mains with additional AMF functionality, switchover return to the mains (e.g. if the mains breaker is not suitable for synchronizing).	*Island enable* = YES
	ParallelEnable = YES
	Synchro enable = FORWARD
	MFStart enable = YES
Gen-set operating only in parallel to the mains. No island operation at all.	*Island enable* = NO
	ParallelEnable = YES
	Synchro enable = FORWARD
	MFStart enable = NO

Setpoint: #Neutral cont

Group	ProcCtrlSingle
Range [units]	EACH, COMMON [-]
Related FW	2.0
Description	The setpoint is used for adjusting the behavior of the *Neutral CB C/O* output according to actual site wiring. The neutral contactor is used to connect the neutral wire (N) with the protective wire (PE) in a TN-S system. This connection **must exist in one moment at one point** of the circuit only. The **EACH** option should be used if each gen-set has it's own neutral contactor. Four-pole GCB must be used for this case. • The output is always opened while the gen-set is not running. • The output is always opened while the MCB is closed. • While the gen-set is running and GCB is open, the output closes when generator voltage in at least one phase exceeds 85% of the nominal voltage. It opens when the generator voltage in all phases drops below 50% of the nominal voltage. • While the gen-set is running, MCB is open and GCB is closed, then the position of the output is given by an internal algorithm, which ensures, that always exactly one gen-set connected to the bus has the neutral

contactor closed.

NOTE:
Functional CAN2 communication between the controllers is required for this function.

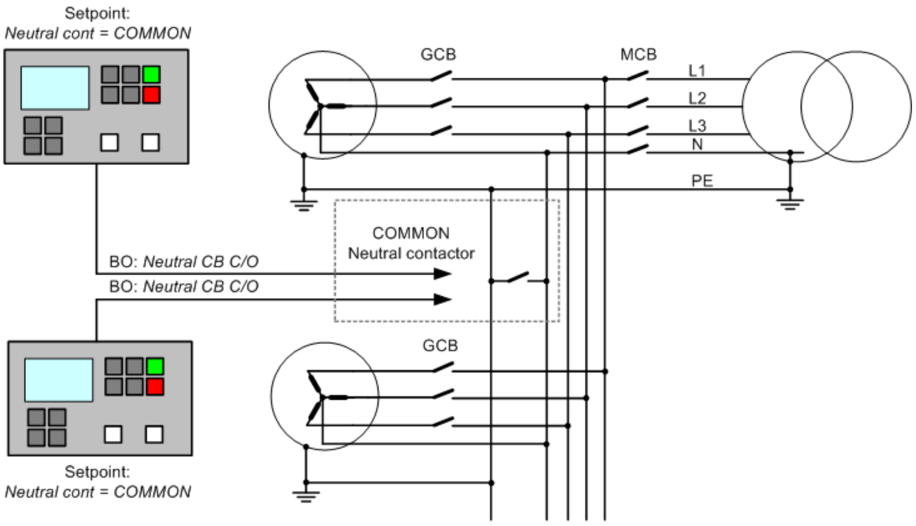


PRINCIPIAL SCHEME OF A SITE IF NEUTRAL CONT = EACH

The **COMMON** option should be used if there is one common neutral contactor for the whole site. The outputs *Neutral CB C/O* from all controllers are combined together and the combined signal is used to control the breaker. Three-pole GCB must be used for this case.

- The output is always opened while the gen-set is not running.
- The output is always opened while the MCB is closed.
- While the gen-set is running the output closes when generator voltage in at least one phase exceeds 85% of the nominal voltage. It opens when the generator voltage in all phases drops below 50% of the nominal voltage. That means if at least one gen-set in the site is running and having proper voltage, the neutral breaker is closed.

NOTE:
If there are more logical groups the "common" option is related to the group. That means one common neutral contactor is expected for each group.

	 PRINCIPIAL SCHEME OF A SITE IF NEUTRAL CONT = COMMON **NOTE:** As there is always a connection between the N and PE wires at the mains side the generator neutral contactors are always open when the mains breaker is closed.

Setpoint: WatchedContr

Group	ProcCtrlSingle
Range [units]	0 .. 16 [min]
Related FW	2.0
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.

Group: Basic settings

Setpoint: Nomin Power

Group	Basic Settings
Range [units]	1 .. 32000 [kW]
Related FW	2.0
Force value possible	YES
Description	This setpoint is used for adjusting the gen-set nominal (rated) power, i.e. the maximum allowed gen-set power level. IS-NT controllers provide two independent *power derating* functions, which can be used for derating of the gen-set according to an analog value (e.g. temperature). See the setpoints *Derating1 strt* and *Derating2 strt*. The nominal power or derated nominal power is used as the basis (100%) for gen-set power protections, as the upper limit of the requested power in the parallel-to-

	mains operation, for power management and other functions. **NOTE:** The actual setpoint units and range depend on setting of the Power format in GenConfig.

Setpoint: Nomin current

Group	Basic Settings
Range [units]	1 .. 10000 [A]
Related FW	2.0
Force value possible	YES
Description	This setpoint is used for adjusting the generator nominal current. The nominal current is used as the basis (100%) for generator thermal-overcurrent protection (*2Inom del*), and for short current protection (*Ishort*). **NOTE:** The setpoints *CT ratio prim* and *CT ratio sec* must be adjusted properly to obtain correct generator 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!

Setpoint: CT ratio prim

Group	Basic Settings
Range [units]	1 .. 15000 [A]
Related FW	2.0
Description	Nominal current of the **primary side** of the generator current transformers. The secondary side is adjusted by setpoint *CT ratio sec*.

Setpoint: CT ratio sec

Group	Basic settings
Range [units]	/5A, /1A [-]
Related FW	2.0
Description	Nominal current of the **secondary side** of the generator current transformers. The primary side is adjusted by setpoint *CT ratio prim*. **NOTE:** The CT secondary nominal current is adjustable only in IG-NTC and IS-NT. The IG-NT has the CT secondary nominal current adjusted fixedly to 5A regardless of this setpoint.

Setpoint: Im3/ErFlCurCTp

Group	Basic settings
Range [units]	1 .. 15000 [A]
Related FW	2.0
Description	Nominal current of the **primary side** of the current transformer connected to the controller terminals labeled *IN*. The secondary side is adjusted by setpoint *Im3/ErFlCurCTs*. **NOTE:** The *IN* terminals can be used either for measurement of earth current or mains current (mains import). See also the setpoint *I/E-Pm meas*.

Setpoint: Im3/ErFlCurCTs

Group	Basic settings
Range [units]	/5, /1 [A]
Related FW	2.0
Description	Nominal current of the **secondary side** of the current transformer connected to the controller terminals labeled *IN*. The primary side is adjusted by setpoint *Im3/ErFlCurCTp*. **NOTE:** The *IN* terminals can be used either for measurement of earth current or mains current (mains import). See also the setpoint *I/E-Pm meas*. **NOTE:** The CT secondary nominal current is adjustable only in IG-NTC and IS-NT. The IG-NT has the CT secondary nominal current adjusted fixedly to 5A regardless of this setpoint.

Setpoint: VT ratio

Group	Basic Settings
Range [units]	0.1 .. 500.0 [V/V]
Related FW	2.0
Description	The setpoint is used to adjust the generator voltage transformers ratio. **NOTE:** Adjust the setpoint to the value of **1.0** if the generator 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 **60.0**. **NOTE:** The range of the generator voltage inputs must be adjusted properly. See the setpoint *Vg InpRangeSel*.

Setpoint: Vg InpRangeSel

Group	Basic settings
Range [units]	277V, 120V [-]
Related FW	2.0
Description	This setpoint selects the range of the generator voltage terminals. The 120V range is available only in IG-NTC and IS-NT. The IG-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.

Setpoint: Vm VT ratio

Group	Basic Settings
Range [units]	0.1 .. 500.0 [V/V]
Related FW	2.0
Description	The setpoint is used to adjust the mains voltage transformers ratio. **NOTE:** Adjust the setpoint to the value of **1.0** 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 **60.0**. **NOTE:** The range of the mains voltage inputs must be adjusted properly. See the setpoint *Vm InpRangeSel*.

Setpoint: Vm InpRangeSel

Group	Basic settings
Range [units]	277V, 120V [-]
Related FW	2.0
Description	This setpoint selects the range of the mains voltage terminals. The 120V range is available only in IG-NTC and IS-NT. The IG-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.

Setpoint: Vb InpRangeSel

Group	Basic settings

Range [units]	277V, 120V [-]
Related FW	2.0
Description	This setpoint selects the range of the bus voltage terminals. The 120V range is available only in IG-NTC and IS-NT. The IG-NT has the range adjusted fixedly to 277V regardless of this setpoint. **NOTE:** See all notes mentioned above.

Setpoint: GenNomV

Group	Basic Settings
Range [units]	10 .. 34641 [V]
Related FW	2.0
Force value possible	YES
Description	This setpoint is used to adjust the nominal (rated) generator voltage (phase to neutral). If you do not know the phase-neutral nominal voltage, you can adjust the phase-phase nominal voltage *GenNomVph-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 gen-set and on Bus/Mains is required the following procedure is required: Both setpoints (*MainsNomV* and *GenNomV*) must be adjusted to the same values according to the value of actual generator nominal voltage. E.g. gen-set nominal is 231 V but Bus/Mains nominal is 240 V. In this case both setpoints need to be adjusted to 231 V and setpoints of corresponding protections for Bus/Mains need to be set assymetrically. For 240 V on Bus/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 *Mains >V MP* = 106% and *Mains <V MP* = 97 % (hence the desired values are reached).

Setpoint: GenNomVph-ph

Group	Basic Settings
Range [units]	17 .. 60000 [V]
Related FW	2.0
Description	This setpoint is used to adjust the nominal (rated) generator voltage (phase to phase). This setpoint is also recalculated automatically when the phase-neutral nominal voltage *GenNomV* 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 gen-set and on Bus/Mains is required the following procedure is required: Both setpoints (*GenNomVph-ph* and *MainsNomVph-ph*) must be adjusted to the same values according to the value of actual generator nominal voltage. E.g. gen-set nominal is 400 V but Bus/Mains nominal is 415 V. In this case both setpoints need to be adjusted to 400 V and setpoints of corresponding protections for Bus/Mains need to be set assymetrically. For 415 V on Bus/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 *Mains >V MP* = 106% and *Mains <V MP* = 97 % (hence the desired values are reached).

Setpoint: MainsNomV

Group	Basic Settings
Range [units]	10 .. 34641 [V]
Related FW	2.0
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 gen-set and on Bus/Mains is required the following procedure is required: Both setpoints (*MainsNomV* and *GenNomV*) must be adjusted to the same values according to the value of actual generator nominal voltage. E.g. gen-set nominal is 231 V but Bus/Mains nominal is 240 V. In this case both setpoints need to be adjusted to 231 V and setpoints of corresponding protections for Bus/Mains need to be set assymetrically. For 240 V on Bus/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 *Mains >V MP* = 106% and *Mains <V MP* = 97 % (hence the desired values are reached).

Setpoint: MainsNomVph-ph

Group	Basic settings
Range [units]	17 .. 60000 [V]
Related FW	2.0
Description	**In application SPtM and SPI.**

	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 gen-set and on Bus/Mains is required the following procedure is required: Both setpoints (GenNomVph-ph and MainsNomVph-ph) must be adjusted to the same values according to the value of actual generator nominal voltage. E.g. gen-set nominal is 400 V but Bus/Mains nominal is 415 V. In this case both setpoints need to be adjusted to 400 V and setpoints of corresponding protections for Bus/Mains need to be set assymetrically. For 415 V on Bus/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 *Mains >V MP* = 106% and *Mains <V MP* = 97 % (hence the desired values are reached).

Setpoint: FixVoltProtSel

Group	Basic settings
Range [units]	PHASE-NEUTRAL, PHASE-PHASE [-]
Related FW	2.0
Description	PHASE-NEUTRAL: The generator and mains/bus voltage protections are based on phase-neutral voltages and the phase-neutral nominal voltages are taken as 100%. PHASE-PHASE: The generator and mains/bus voltage protections are based on phase-phase voltages and the phase-phase nominal voltages are taken as 100%. **NOTE:** Both options require different settings of protection levels to achieve identical results. **EXAMPLE:** Phase-nominal voltage is 231V, actual voltages are L1N = 231V, L2N = 231V, L3N = 219.5V => the L3N voltage is at 95% of the nominal. The same situation evaluated from phase-phase voltages gives following results: nominal phase-phase voltage is 400V, measured voltages are L12 = 400V, L23 = 390V, L31 = 390V => the L23 and L31 are at 97.5% of the nominal. It is obvious that if the situation is evaluated from phase-neutral voltages the tripping level must be adjusted to 95%, whereas the same situation evaluated from phase-phase voltages require tripping level adjusted to 97.5%.

Setpoint: Nominal Freq

Group	Basic Settings
Range [units]	50 Hz, 60 Hz [-]

Related FW	2.0
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 generator and mains/bus frequency protections and as requested value for frequency regulation (except synchronizing) if the setpoint *Freq reg loop* is set to ALL THE TIME.

Setpoint: Nom frq offset

Group	Basic Settings
Range [units]	-2.00 .. 2.00 [Hz]
Related FW	2.0
Force value possible	YES
Description	The setpoint adjusts offset of nominal system frequency (*Nominal Freq*) 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 generator and mains/bus frequency protections and as requested value for frequency regulation (except synchronizing) if the setpoint *Freq reg loop* is set to ALL THE TIME.

Setpoint: Gear Teeth

Group	Basic Settings
Range [units]	1 .. 500 [-]
Related FW	2.0
Description	Number of teeth on the engine's flywheel for the pick-up sensor. Adjust the setpoint to Fgen->RPM (0), if the pick-up sensor is not used. Then the engine speed will be calculated from the generator frequency. **NOTE:** Generator voltage must be higher than 10V effective to measure the speed from the frequency correctly. If this condition is not fulfiled at low speeds (cranking) it is reccommended using additional running indication as e.g. D+ signal to prevent overcranking of the engine. See the binary output *Starter* for additional information. **CAUTION!** The starting procedure of gas engine may not work without the pickup. The pickup must me always used for gas engines.

Setpoint: Nominal RPM

Group	Basic Settings
Range [units]	100 .. 4000 [RPM]
Related FW	2.0
Force value possible	YES
Description	The setpoint adjusts the nominal gen-set speed. The nominal speed is used: • As 100% for the overspeed protection (setpoint *Overspeed*) • For current speed calculation if it is calculated from generator frequency. See the setpoint *Gear teeth*. **NOTE:** The setpoints *Nominal RPM* and system frequency (*Nominal Freq* + *Nom frq offset*) must correspond to each other, i.e. if the engine speed is at nominal value then the generator frequency must be at nominal value as well.

Setpoint: ControllerMode

Group	Basic Settings
Range [units]	OFF, MAN, SEM, AUT, TEST [-]
Related FW	2.0
Description	This setpoint can be used to select the controller mode. It is equivalent to selecting the mode by the buttons on the front panel. Currently active mode is displayed on the controller main screen. **NOTE:** If any of the mode forcing inputs *Remote OFF*, *Remote MAN*, *Remote AUT* or *Remote TEST* is active, then the currenly active mode can be different than the mode selected by the setpoint (resp. panel buttons).

OFF	The GCB is opened and the engine is immediately stopped in this mode without unloading and cooling. After that the controller is in *Not ready* state and can not be started any way. The MCB is closed permanently (*MCB Opens On* = GENRUN) or is open or closed according to the mains is present or not (*MCB Opens On* = MAINSFAIL).
MAN	The engine can be started and stopped manually using START and STOP buttons (or external buttons wired to appropiate binary inputs) in MAN mode. When the engine is running, GCB can be closed to a dead bus or synchronizing can be started by the GCB button. Also MCB can be closed and opened manually using the MCB button, regardless the mains is present or not. No autostart is performed. No reaction to the inputs *Sys Start/Stop* or *Rem Start/Stop*.
SEM	(IS-NT only) - The gen-set is started and stopped only manually using START and STOP buttons (or external buttons wired to

	appropiate binary inputs), however the the full start sequence up to the moment when the engine is loaded is automatic as well as unloading and stop sequence. The only case when the gen-set starts automatically in SEMI is the start/stop initiated by the AMF function.
AUT	This is fully automatic operation. The engine is started and stopped by: • Binary input *Rem Start/Stop* (SPtM, SPI, COMBI) • Mains import dependent autostart function (peak start/stop) (SPtM, SPI, Combi) • AMF function (SPtM, Combi) • Power management (MINT, Combi) Buttons MCB, GCB, START, STOP including the appropriate binary inputs for external buttons are not active. The full start sequence up to the moment when the engine is loaded is automatic as well as unloading and stop sequence. **WARNING!** If an red alarm is present and the gen-set is in AUT mode, it can start by self after all red alarms becomes inactive and are acknowledged!!! If you want to avoid this situation, adjust the setpoint *FltRes GoToMAN* to the ENABLED position.
TEST	(SPtM, Combi) - the gen-set is started when the controller is switched to TEST mode and remains running unloaded until the mode is changed. If a mains failure occurs, the gen-set takes over the load.

Setpoint: FltRes GoToMAN

<table>
<tr><td>Group</td><td>Basic Settings</td></tr>
<tr><td>Range [units]</td><td>DISABLED,ENABLED [-]</td></tr>
<tr><td>Related FW</td><td>2.0</td></tr>
<tr><td>Force value possible</td><td>YES</td></tr>
<tr><td>Description</td><td>This setpoint can be used to aviod possible unexpected automatic start of the gen-set in AUT mode after the gen-set was stopped by a protection and then fault reset was pressed.
<table>
<tr><td>ENABLED</td><td>The controller mode is automatically changed from any mode except OFF to MAN if any red-level protection is acknowledged by pressing of the fault reset.</td></tr>
<tr><td>DISABLED</td><td>The automatic change of the controller mode is disabled.</td></tr>
</table>
NOTE:
The function will not work if the current controller mode is forced by one of the inputs <i>Remote AUT</i> or <i>Remote TEST</i>.</td></tr>
</table>

Setpoint: Local buttons

<table>
<tr><td>Group</td><td>Basic settings</td></tr>
<tr><td>Range [units]</td><td>PANEL, EXTBUTTONS, BOTH [-]</td></tr>
<tr><td>Related FW</td><td>2.0</td></tr>
<tr><td>Description</td><td>
<p>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.</p>

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.

<p><u>NOTE:</u>
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).</p>
<p>IGS-NT (built-in monochrome display)</p>
<table>
<tr><td>PANEL</td><td>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.</td></tr>
<tr><td>EXTBUTTONS</td><td>The built-in buttons are disabled and the binary inputs for external buttons are enabled.</td></tr>
<tr><td>BOTH</td><td>Both built-in buttons and binary inputs for external buttons are enabled.</td></tr>
</table>
<p><u>NOTE:</u>
In case that additional IV display is connected to a controller it behaves in the way described below.</p>
<p><u>NOTE:</u>
The binary inputs for external buttons may be the following: GCBButton, MCBButton, FaultResButton, HornResButton, StartButton, StopButton etc.</p>
<p>IGS-NT-BB with IV-5 display</p>
<p>Situation is depicted in the following figure.</p>

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.

</td></tr>
</table>

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

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.

Setpoint: DispBaklightTO

<table>
<tr><td>Group</td><td>Basic settings</td></tr>
<tr><td>Range [units]</td><td>OFF, 1-240 min, NO TIMEOUT [min]</td></tr>
<tr><td>Related FW</td><td>2.0</td></tr>
<tr><td>Force value possible</td><td>YES</td></tr>
<tr><td>Force value possible</td><td>YES</td></tr>
<tr><td>Description</td><td>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".<table>
<tr><td>OFF</td><td>The backlight is off all the time</td></tr>
<tr><td>NO TIMEOUT</td><td>The backlight is on all the time</td></tr>
</table></td></tr>
</table>

Setpoint: DispBklStrtOff

Group	Basic settings

Range [units]	DISABLED, ENABLED [-]
Related FW	2.0
Force value possible	YES
Description	If this setpoint is in ENABLED position the display backlight is temporarily switched off during gen-set start.

Setpoint: FastHistPeriod

Group	Basic settings
Range [units]	100 ms, 300 ms, 500 ms, 1 s, 3 s [-]
Related FW	2.0
Description	This setpoint adjusts the period with which fast history records are written. Fast history is triggered if level 2 alarm (for more information on alarm levels please refer to this section) is issued and the engine is running (at least one condition from this list is fullfiled). For any setting of this setpoint Fast History contains 50 records.

Setpoint: ConvCoefPulse1

Group	Engine Params
Range [units]	1 .. 6500 [-]
Related FW	2.0
Description	This setpoint adjusts the rate of increasing of the PulseCounter #1 module. The module counts pulses at the input *PulseCounter 1* and if the input pulses counter reaches value given by this setpoint, the counter value *PulseCounter 1* (in the group Statistic) is increased by 1 and input pulses counter is reset to 0. Both counter value and input pulses counter are stored in the nonvolatile memory.

Setpoint: ConvCoefPulse2

Group	Basic settings
Range [units]	1 .. 6500 [-]
Related FW	2.0
Description	This setpoint adjusts the rate of increasing of the PulseCounter #2 module. The module counts pulses at the input *PulseCounter 2* and if the input pulses counter reaches value given by this setpoint, the counter value *PulseCounter 2* (in the group Statistic) is increased by 1 and input pulses counter is reset to 0. Both counter value and input pulses counter are stored in the nonvolatile memory.

Setpoint: ConvCoefPulse3

Group	Basic settings
Range [units]	1 .. 6500 [-]
Related FW	2.0

Description	This setpoint adjusts the rate of increasing of the PulseCounter #3 module. The module counts pulses at the input *PulseCounter 3* and if the input pulses counter reaches value given by this setpoint, the counter value *PulseCounter 3* (in the group Statistic) is increased by 1 and input pulses counter is reset to 0. Both counter value and input pulses counter are stored in the nonvolatile memory.

Setpoint: ConvCoefPulse4

Group	Basic settings
Range [units]	1 .. 6500 [-]
Related FW	2.0
Description	This setpoint adjusts the rate of increasing of the PulseCounter #4 module. The module counts pulses at the input *PulseCounter 4* and if the input pulses counter reaches value given by this setpoint, the counter value *PulseCounter 4* (in the group Statistic) is increased by 1 and input pulses counter is reset to 0. Both counter value and input pulses counter are stored in the nonvolatile memory.

Group: Comms settings

Setpoint: Gen-set name

Group	Comms settings
Range [units]	[-]
Related FW	2.0
Description	This setpoint is intended for a custom name of the gen-set, which is used for identification of the gen-set 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.

Setpoint: Contr. address

Group	Comms settings
Range [units]	1 .. 32 [-]
Related FW	2.0
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* (**COMBI application only**) is in AUT position, the address is assigned automatically. The setpoint *Contr. addr* 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 gen-set 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.

Setpoint: RS232(1) mode

Group	Comms settings
Range [units]	DIRECT, MODEM (HW), MODEM (SW), MODBUS-DIRECT, MODBUS-MDM(HW), ECU LINK [-]
Related FW	2.0
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.

Setpoint: RS232(2) mode

Group	Comms settings

Range [units]	DIRECT, MODEM (HW), MODEM (SW), MODBUS-DIRECT, MODBUS-MDM(HW), ECU LINK [-]
Related FW	2.0
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.

Setpoint: RS232(1)MBCSpd

Group	Comms settings
Range [units]	9600, 19200, 38400, 57600 [bps]

Related FW	2.0
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*.

Setpoint: RS232(2)MBCSpd

Group	Comms settings
Range [units]	9600, 19200, 38400, 57600 [bps]
Related FW	2.0
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*.

Setpoint: RS232(1)MdmIni

Group	Comms settings
Range [units]	[-]
Related FW	2.0
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.

Setpoint: RS485(1) conv.

Group	Comms settings
Range [units]	DISABLED, ENABLED [-]
Related FW	2.0
Description	This setpoint selects function of the built-in RS485(1) converter. **ENABLED**: 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. **DISABLED**: The communication port COM1 is present at the RS232(1) connector and the RS485(1) connector is used for the external display interface. **NOTE:** The redirection is applied only for DIRECT, MODBUS and ECU-LINK modes. See the setpoint *RS232(1) mode*. **NOTE:** 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.

Setpoint: RS232(2)MdmIni

Group	Comms settings
Range [units]	[-]
Related FW	2.0
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.

Setpoint: RS485(2) conv.

Group	Comms settings
Range [units]	DISABLED, ENABLED [-]
Related FW	2.0
Description	This setpoint selects function of the built-in RS485(2) converter. **ENABLED**: The communication port COM2 is redirected to the integrated RS485(2) converter. The RS232(2) connector has no function. **DISABLED**: The communication port COM2 is present at the RS232(2) connector. **NOTE:** The redirection is applied only for DIRECT, MODBUS and ECU-LINK modes. See the setpoint *RS232(2) mode*. **NOTE:** This setpoint has no function for IG-NT(C)-BB and IS-NTC-BB as this 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.

Setpoint: CAN bus mode

Group	Comms settings
Range [units]	32C,8C [-]
Related FW	2.0
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.

Setpoint: CAN2emptDetect

Group	Comms settings
Range [units]	DISABLED, ENABLED [-]
Related FW	2.0
Force value possible	YES
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.

Setpoint: LB/UART Log

Group	Comms settings
Range [units]	DISABLED, ENABLED
Related FW	2.0
Force value possible	YES
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.

Setpoint: CANAddrSwitch1

Group	Comms settings
Range [units]	[-]
Related FW	2.0

<table>
<tr><td>Description</td><td>The setpoint selects function of the terminal address 122 at the CAN2 line. See the latest communication guide for details about this topic.
<table><tr><td>MODEM</td><td>The address is used for modem connection via I-LB</td></tr><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>

Setpoint: CANAddrSwitch2

<table>
<tr><td>Group</td><td>Comms settings</td></tr>
<tr><td>Range [units]</td><td>[-]</td></tr>
<tr><td>Related FW</td><td>2.0</td></tr>
<tr><td>Description</td><td>The setpoint selects function of the terminal address 125 at the CAN2 line. See the latest communication guide for details about this topic.
<table><tr><td>MODEM</td><td>The address is used for modem connection via I-LB</td></tr><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>

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>2.0</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>

Setpoint: IP address

Group	Comms settings

Range [units]	[-]
Related FW	2.0
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).

Setpoint: IP Addr mode

<table>
<tr><td>Group</td><td>Comms settings</td></tr>
<tr><td>Range [units]</td><td>[-]</td></tr>
<tr><td>Related FW</td><td>2.0</td></tr>
<tr><td>Description</td><td>The setpoint is used to select the method how the ethernet connection is adjusted.
<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>

Setpoint: Net mask

Group	Comms settings
Range [units]	[-]
Related FW	2.0

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).

Setpoint: Gateway IP

Group	Comms settings
Range [units]	[-]
Related FW	2.0
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.

Setpoint: ComApProtoPort

Group	Comms settings
Range [units]	1 .. 255 [-]
Related FW	2.0
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.

Setpoint: AirGate

<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>2.0</td></tr>
<tr><td>Description</td><td>This setpoint selects the ethernet connection mode.
<table>
<tr><td>DISABLED</td><td>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</td></tr>
</table>
</td></tr>
</table>

	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*.

Setpoint: AirGate IP

Group	Comms settings
Range [units]	max. 32 characters [-]
Related FW	2.0
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.

Setpoint: SMTP authent

Group	Comms settings
Range [units]	DISABLED, ENABLED [-]
Related FW	2.0
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.

Setpoint: SMTP user name

Group	Comms settings
Range [units]	max. 32 characters [-]
Related FW	2.0
Description	Use this setpoint to enter the user name for the SMTP server if *SMTP authentification* is enabled.

Setpoint: SMTP password

Group	Comms settings
Range [units]	max. 32 characters [-]
Related FW	2.0
Description	Use this setpoint to enter the password for the SMTP server if *SMTP authentification* is enabled.

Setpoint: SMTP address

Group	Comms settings
Range [units]	max. 32 characters
Related FW	2.0
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.

Setpoint: Contr mailbox

Group	Comms settings
Range [units]	max. 32 characters [-]
Related FW	2.0
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.

Setpoint: Time zone

Group	Comms settings
Range [units]	- [-]
Related FW	2.0
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.

Setpoint: DNS IP

Group	Comms settings
Range [units]	[-]
Related FW	2.0
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).

Setpoint: ECU Diag

Group	Comms settings
Range [units]	DISABLED, ENABLED [-]
Related FW	2.0
Force value possible	YES
Description	This setpoint is used to disable reading of diagnostic codes from the ECU if an external diagnostic tool is connected to the engine. A message *ECU Diag disabled* is displayed in the alarm list while ECU diagnostics is disabled.

Setpoint: SHxOcol detect

Group	Comms settings
Range [units]	DISABLED, ENABLED [-]
Related FW	2.0
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.

Group: Engine params

Setpoint: Starting RPM

Group	Engine Params

Range [units]	0 .. 1000 [RPM]
Related FW	2.0
Force value possible	YES
Description	This setpoint adjusts "firing" speed level. When this level is reached during cranking, the engine is considered as started and the starter motor is disengaged, i.e. the output *Starter* is deactivated. **NOTE:** There are also other symptoms that causes disengagement of the starter. See the separate chapter Starting sequence. This setpoint is also used as the speed limit for the *Underspeed* protection, which is activated 5s after the starter was disengaged and the controller continued from *Starting* to *Idle* or *Running* phase.

Setpoint: Starting POil

Group	Engine Params
Range [units]	0.0 .. 10.00 [bar]
Related FW	2.0
Force value possible	YES
Description	Oil pressure can be used as one of the symptoms that are used for detection that the engine is running. This setpoint adjusts oil pressure limit above which the engine is considered as started. **NOTE:** Learn more in the separate chapter Starting sequence. **NOTE:** The logical analog input *Oil pressure* must be configured onto the apporpriate analog input where the oil pressure sensor is connected.

Setpoint: Prestart time

Group	Engine Params
Range [units]	0 .. 3600 [s]
Related FW	2.0
Force value possible	YES
Description	This setpoint adjust length of the prestart period before starter is engaged. The output *Prestart* is active during the prestart period. Adjust the setpoint to zero if you want to disable the prestart function.

Setpoint: Prelubr time

Group	Engine params

Range [units]	0 .. 3600 [s]
Related FW	2.0
Force value possible	YES
Description	This setpoint is used for adjusting duration of the prelubrication cycle. See the output *Prelubr pump* for details about prelubrication.

Setpoint: Prelubr pause

Group	Engine params
Range [units]	1 .. 3000 [min]
Related FW	2.0
Force value possible	YES
Description	YES This setpoint is used for adjusting the pause between two consequent prelubrication cycles. See the output *Prelubr pump* for details about prelubrication.

Setpoint: MaxCrank Time

Group	Engine Params
Range [units]	1 .. 240 [s]
Related FW	2.0
Force value possible	YES
Description	The setpoint adjusts the maximum duration the *starter motor* is energized within one cranking cycle. If there is none of *running engine symptoms* activated within this period the particular cranking attempt is finished and either a *cranking pause* follows or *start fail* alarm is issued. **NOTE:** At gas engines the last cranking cycle is extended about 25% and the engine is cranked with closed gas valve during this additional time to ventilate the remaining gas. **NOTE:** If magnetic pickup is used and the controller does not detect non-zero RPM within 2s (gas engine) or 5s (diesel engine) after energizing the starter motor then cranking pause follows immediately (as the pinion is probably not properly engaged). **NOTE:** Learn more in the separate chapter Starting sequence.

Setpoint: CrnkFail pause

Group	Engine Params
Range [units]	5 .. 60 [s]

Related FW	2.0
Force value possible	YES
Description	The setpoint adjusts the pause between two subsequent cranking cycles. **NOTE:** Learn more in the separate chapter Starting sequence.

Setpoint: Crank attempts

Group	Engine Params
Range [units]	1 .. 10 [-]
Related FW	2.0
Force value possible	YES
Description	The setpoint adjusts the maximum number of cranking cycles. The alarm *Start fail* is issued when the engine does not start within this number of cranking cycles. **NOTE:** An gas engines the last cranking cycle is extended about 25% and the engine is cranked with closed gas valve during this additional time to ventilate the remaining gas. **NOTE:** Learn more in the separate chapter Starting sequence.

Setpoint: Idle time

Group	Engine Params
Range [units]	1 .. 3600 [s]
Related FW	2.0
Force value possible	YES
Description	This setpoint adjusts duration of the idle period, which begins in the moment when the engine is started (e.g. the *starter motor* is disengaged). The output *Idle/Nominal* is not active to keep the engine at idle speed (if the governor supports idling) during idle period.

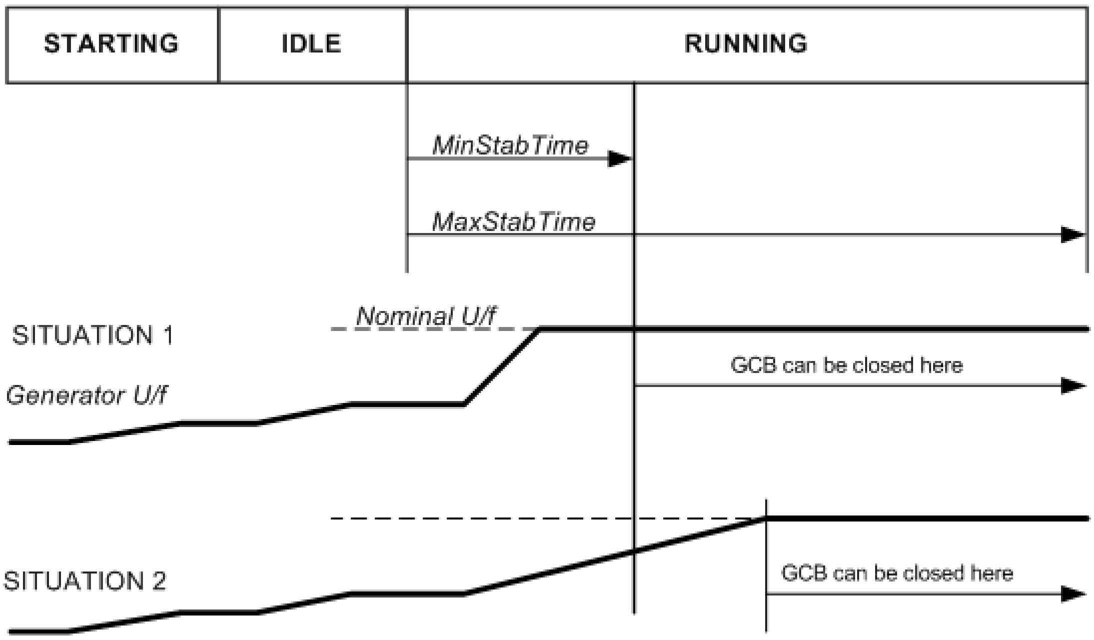
Setpoint: Min stab time

Group	Engine Params
Range [units]	1 .. *Max Stab Time* [s]
Related FW	2.0
Force value possible	YES
Description	This setpoint adjusts the minimum time between the end of the idle period and closing of the GCB. Closing of the GCB is blocked during this period even if

	generator voltage and frequency are in limits.

Setpoint: Max Stab Time

<table>
<tr><td>Group</td><td>Engine Params</td></tr>
<tr><td>Range [units]</td><td>Min Stab Time .. 3600 [s]</td></tr>
<tr><td>Related FW</td><td>2.0</td></tr>
<tr><td>Force value possible</td><td>YES</td></tr>
<tr><td>Description</td><td>This setpoint adjusts the maximum time between the end of the idle period and reaching proper generator voltage and frequency. If the proper generator voltage and frequency is not reached within this period generator voltage and/or frequency alarm is issued and the gen-set is stopped.


</td></tr>
</table>

Setpoint: Warming load

Group	Engine params
Range [units]	0 .. 100 [%]
Related FW	2.0
Force value possible	YES
Description	This setpoint is used to adjust the requested load level during *warming* period in % of the *Nomin power*. The warming period takes place after the gen-set has been synchronized to the mains if the temperature measured at the logical analog input *Warming Temp* is below the value of *Warming temp*. The gen-set load is maintained at *Warming load*, which should be adjusted to cca 20-30% of the nominal load to allow the

	engine reaching of it's operational temperature smoothly. The warming period is finished either when the temperature reaches the warming level or if duration of the warming period reaches *Max warm time*.

Setpoint: Warming temp

Group	Engine params
Range [units]	-32000 .. 32000 [°C]
Related FW	2.0
Force value possible	YES
Description	This setpoint adjusts the warming temperature. The warming phase is finished when either the water temperature at the logical analog input *Warming temp* reaches this level or the *Max warm time* elapses. **NOTE:** See also the setpoint *Warming load*.

Setpoint: Max warm time

Group	Gener Protect
Range [units]	0 .. 3600 [s]
Related FW	2.0
Force value possible	YES
Description	This setpoint adjusts the maximum duration of the warming phase after the genset was sychchronized to the mains. The warming phase is finished when either the water temperature at the logical analog input *Warming Temp* reaches this level or the *Max warm time* elapses.

Setpoint: Cooling speed

Group	Engine Params
Range [units]	IDLE, NOMINAL
Related FW	2.0
Force value possible	YES
Description	This setpoint is used to select whether the cooling phase is performed at idle or nominal speed, i.e. whether the output *Idle/Nominal* is open or closed during the idle phase. **NOMINAL**: Gen-set performs cooling at nominal speed, generator voltage and frequency protections remain active during cooling phase. **IDLE**: Gen-set performs cooling at idle speed, generator protections are not active in the cooling phase (except of *Gen >V Sd*).

Setpoint: Cooling time

Group	Engine Params
Range [units]	0 .. 3600 [s]
Related FW	2.0
Force value possible	YES
Description	This setpoint is used to adjust the length of the *Cooling* phase, which takes place after the gen-set has been unloaded (GCB opened) and before it is stopped. The cooling phase can be performed either at nominal or at idle speed. See the setpoint *Cooling speed*. If the cooling phase length optimalization is enabled, the actual length depend on the actual genset load in the moment the stop sequence was started. See the setpoint *Cooldown optim*.

Setpoint: CoolDnAfterBOC

<table>
<tr><td>Group</td><td>Engine Params</td></tr>
<tr><td>Range [units]</td><td>STOP, INFIN COOLING [-]</td></tr>
<tr><td>Related FW</td><td>2.0</td></tr>
<tr><td>Force value possible</td><td>YES</td></tr>
<tr><td>Description</td><td>The setpoint selects the controller behavior in cooling phase after a BOC alarm:
<table>
<tr><td>STOP</td><td>The controller behaves as usually, e.g. the cooling phase lasts for period adjusted by the setpoint <i>Cooling time</i> and then the gen-set is stopped.</td></tr>
<tr><td>INFIN COOLING</td><td>The cooling phase is not finished automatically when the <i>Cooling time</i> elapses. The gen-set remains in cooling until another event changes the it's state, e.g. it is manually stopped. If the gen-set is in AUT mode and the alarm is not active and has been reset the gen-set returns to loaded state automatically.</td></tr>
</table></td></tr>
</table>

Setpoint: Cooldown optim

<table>
<tr><td>Group</td><td>Engine params</td></tr>
<tr><td>Range [units]</td><td>DISABLED, ENABLED [-]</td></tr>
<tr><td>Related FW</td><td>2.0</td></tr>
<tr><td>Description</td><td>This setpoint enables optimalization of the cooling phase length based on the previous gen-set load.
<table>
<tr><td>DISABLED</td><td>The length of the cooling phase is given by the setpoint <i>Cooling time</i> regardless of the previous gen-set load.</td></tr>
<tr><td>ENABLED</td><td>The length of the cooling phase is linearly reduced according to the gen-set load in the moment the stop sequence started</td></tr>
</table></td></tr>
</table>

	(i.e. prior to the gen-set begun to ramp down or opened the GCB). If the load was 100% of the *nominal power* the length will be 100% of the setpoint *Cooling time*, if the load was 50% the length will be reduced to 50% etc...

Setpoint: AfterCool time

Group	Engine params
Range [units]	0 .. 3600 [s]
Related FW	2.0
Force value possible	YES
Description	The setpoint is used to adjust the length of the *aftercooling* period, i.e. how long the *cooling pump* remains running after the gen-set has been stopped.

Setpoint: Stop time

Group	Engine Params
Range [units]	0 .. 240 [s]
Related FW	2.0
Force value possible	YES
Description	This setpoint is used to adjust the time period the gen-set needs to stop completely. If the gen-set does not stop within this period the alarm *Stop fail* is issued. The setpoint also adjusts the minimal length of stop solenoid activation. See the output *Stop Solenoid* for more information.

Setpoint: SDVentil time

Group	Engine Params
Range [units]	0 .. 60 [s]
Related FW	2.0
Description	This setpoint is used to adjust the length of the preventilation phase at gas engines, i.e. if the setpoint *Fuel solenoid* is switched to GAS ENGINE. The preventilation phase is a period of cranking without opened gas valve which takes place prior to the first start attempt after a shutdown or after switching on the controller. The purpose of the preventilation phase is to clean the engine and exaust system from possible unburned gas.

Setpoint: Fuel Solenoid

Group	Engine Params
Range [units]	DIESEL ENGINE, GAS ENGINE [-]
Related FW	2.0

Description	This setpoint is used to select the type of starting sequence. The diagrams of both sequences are indicated in the separate chapter Starting sequence. The main difference in the behavior of the *fuel Solenoid* at diesel and gas engine is that at diesel engines the fuel solenoid is activated **prior to the starter motor**, whereas at gas engines it is **not activated until the gen-set reaches 30RPM**. **CAUTION!** It is strongly recommended to use pickup sensor for gas engines.

Setpoint: FuelSol offset

Group	Engine Params
Range [units]	-5.0 .. 5.0 [s]
Related FW	2.0
Description	This setpoint is used for fine adjustment of the moment when the *Fuel Solenoid* output is activated. The time is related to the activation of the *Starter* output, where negative values mean the fuel solenoid is activated in advance to the starter motor and positive values mean the fuel solenoid is delayed after the starter motor. **NOTE:** This setpoint is taken into accout at diesel engines only, i.e. if the setpoint *Fuel solenoid* is set to DIESEL ENGINE.

Setpoint: D+ Function

<table>
<tr><td>Group</td><td>Engine Params</td></tr>
<tr><td>Range [units]</td><td>ENABLED,CHRGFAIL,DISABLED [-]</td></tr>
<tr><td>Related FW</td><td>2.0</td></tr>
<tr><td>Description</td><td>This setpoint adjusts the function of the D+ terminal.
<table>
<tr><td>ENABLED</td><td>The D+ terminal is used for running engine detection as well as for charger failure alarm detection.</td></tr>
<tr><td>CHRGFAIL</td><td>The D+ terminal is used for charger failure alarm detection only.</td></tr>
<tr><td>DISABLED</td><td>The D+ terminal is not used.</td></tr>
</table>
NOTE:
Some alternators provide a terminal labelled as "L" instead of "D+". It is not possible to connect this "L" terminal to the "D+" terminal of the controller.</td></tr>
</table>

Setpoint: Bin selector 1

Group	Engine params
Range [units]	OFF, ON [-]
Related FW	2.0

Force value possible	YES
Description	The setpoint is used to switch on and off the output *Bin selector 1*.

Setpoint: Bin selector 2

Group	Engine params
Range [units]	OFF, ON [-]
Related FW	2.0
Force value possible	YES
Description	The setpoint is used to switch on and off the output *Bin selector 2*.

Setpoint: Bin selector 3

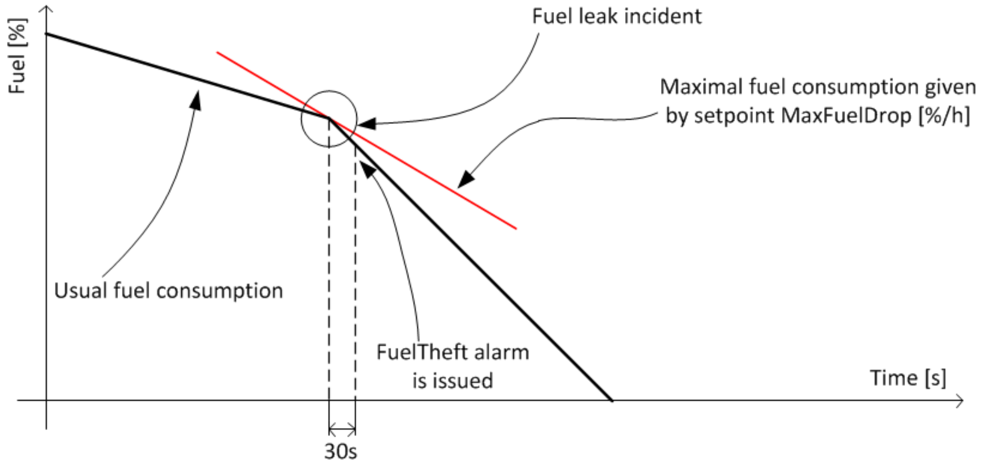
Group	Engine params
Range [units]	OFF, ON [-]
Related FW	2.0
Force value possible	YES
Description	The setpoint is used to switch on and off the output *Bin selector 3*.

Setpoint: Bin selector 4

Group	Engine params
Range [units]	OFF, ON [-]
Related FW	2.0
Force value possible	YES
Description	The setpoint is used to switch on and off the output *Bin selector 4*.

Setpoint: MaxFuelDrop

Group	Engine params
Range [units]	3 .. 50 [%/h]
Related FW	2.0
Description	This setpoint adjusts the maximal allowed drop of the fuel level within one hour. If measured drop is higher then *Fuel theft* alarm is issued. The setpoint should be adjusted according to the maximal hour fuel rate of the engine and capacity of the tank. **NOTE:** The logical analog input *Fuel level* must be configured onto the physical analog input where fuel level sensor is connected.

	EXAMPLE: A 100kW engine has specific fuel rate of 180g/kWh. Fuel tank capacity is 200l. The hour fuel rate at nominal power is then 100 * 180 = 18000g per hour, what is about 21 litres (density cca 830g/l => 18000/830 = 21). The maximal hour rate is then about 10% of the tank capacity, so optimal adjustment for this case will be 15% (with certain reserve). 

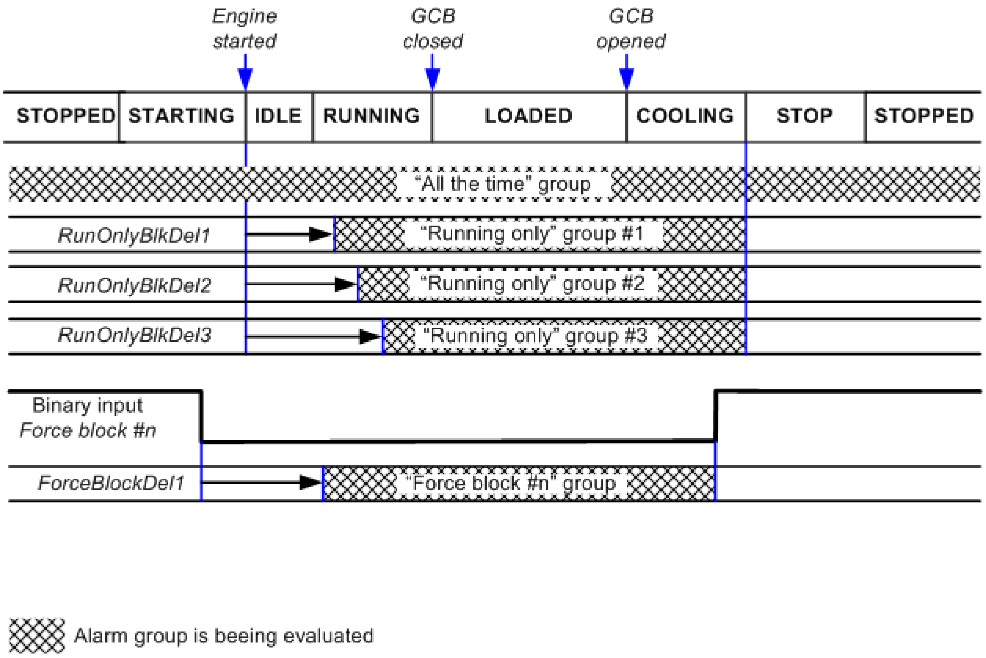
Group: Engine protect

Setpoint: Horn Timeout

Group	Engine Protect
Range [units]	OFF, 1s - 3600s, NO TIMEOUT [-]
Related FW	2.0
Force value possible	YES
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.

Setpoint: RunOnlyBlkDel1

Group	Engine protect
Range [units]	0.0 .. 3000.0 [s]
Related FW	2.0
Description	This setpoint adjusts the delay after engine start when the alarms configured as *RunOnlyBlkDel1* (i.e. "running only", group #1) are started to be evaluated. The "running only" alarms are not beeing evaluated while the engine is not running or then, after start, while the adjusted delay is running.

	 ALARM GROUPS ACCORDING TO BLOCKING TYPE

Setpoint: RunOnlyBlkDel2

Group	Engine protect
Range [units]	0.0 .. 3000.0 [s]
Related FW	2.0
Description	This setpoint adjusts the delay after engine start when the alarms configured as *RunOnlyBlkDel2* (i.e. "running only", group #2) are started to be evaluated. The "running only" alarms are not beeing evaluated while the engine is not running or then, after start, while the adjusted delay is running. See the setpoint *RunOnlyBlkDel1* for diagram of alarm groups and their blocking periods.

Setpoint: RunOnlyBlkDel3

Group	Engine protect
Range [units]	0.0 .. 3000.0 [s]
Related FW	2.0
Force value possible	YES
Description	This setpoint adjusts the delay after engine start when the alarms configured as *RunOnlyBlkDel3* (i.e. "running only", group #3) are started to be evaluated. The "running only" alarms are not beeing evaluated while the engine is not running or then, after start, while the adjusted delay is running. See the setpoint *RunOnlyBlkDel1* for diagram of alarm groups and their blocking periods.

Setpoint: BinInp delay 1

Group	Engine protect
Range [units]	0.0 .. 600.0 [s]
Related FW	2.0
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.

Setpoint: BinInp delay 2

Group	Engine protect
Range [units]	0.0 .. 600.0 [s]
Related FW	2.0
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.

Setpoint: BinInp delay 3

Group	Engine protect
Range [units]	0.0 .. 600.0 [s]
Related FW	2.0
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.

Setpoint: ForceBlockDel1

Group	Engine protect
Range [units]	0.0 .. 60.0 [s]
Related FW	2.0
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.

Setpoint: ForceBlockDel2

Group	Engine protect
Range [units]	0.0 .. 60.0 [s]
Related FW	2.0
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.

Setpoint: ForceBlockDel3

Group	Engine protect
Range [units]	0.0 .. 60.0 [s]
Related FW	2.0
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.

Setpoint: ResetActAlarms

Group	Engine protect
Range [units]	[-]
Related FW	2.0
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.

Setpoint: Overspeed

Group	Engine Protect
Range [units]	0 .. 200 [%]

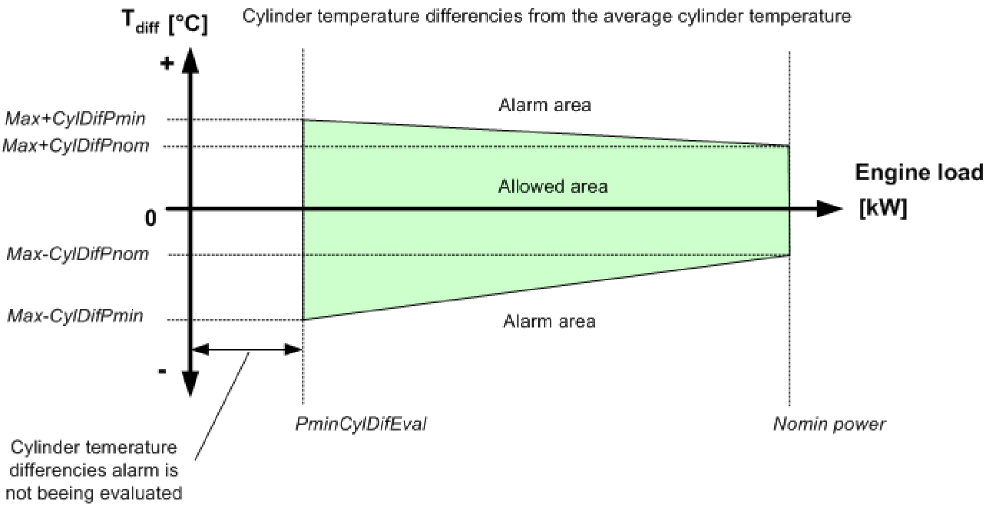
<table>
<tr><td>Related FW</td><td>2.0</td></tr>
<tr><td>Description</td><td>This setpoint adjusts the threshold level for overspeed protection.

NOTE:
The overspeed protection is evaluated all the time and without any delay.</td></tr>
</table>

Setpoint: Max+CylDifPmin

<table>
<tr><td>Group</td><td>Engine protect</td></tr>
<tr><td>Range [units]</td><td>-32000 .. +32000 [°C]</td></tr>
<tr><td>Related FW</td><td>2.0</td></tr>
<tr><td>Description</td><td>

This setpoint adjusts the maximum allowed **positive** difference between a particular cylinder temperature and average cylinder temperature **at minimum power** level adjusted by setpoint *PminCylDifEval*. This setpoint is one of four setpoints that define the allowed area of cylinder temperature differencies depending on gen-set power. See the picture below.



ALLOWED AREA OF CYLINDER TEMPERATURE DIFFERENCIES DEPENDING ON GENSET POWER

If the difference of actual cylinder temperature from the average temperature is out of the allowed range at one or more cylinders the alarm *Wrn CylTemp* is issued after the delay *CylDifEvalDel* elapses. The alarm is intended for detection that there is a problem with combustion at the particular cylinders.

NOTE:
Logical analog inputs *Cyl temp "n"* must be configured onto the appropriate physical analog inputs where the cylinder temperature sensors are connected. Use the "Cylinder temperature configuration wizard" in GenConfig - Analog inputs tab for easy configuration of cylinder temperature sensors.

NOTE:
The cylinder temperature difference protection is available in IS-NT only.

</td></tr>
</table>

Setpoint: Max-CylDifPmin

Group	Engine protect
Range [units]	-32000 .. +32000 [°C]

Related FW	2.0
Description	This setpoint adjusts the maximum allowed **negative** difference between a particular cylinder temperature and average cylinder temperature **at minimum power** level adjusted by setpoint *PminCylDifEval*. This setpoint is one of four setpoints that define the allowed area of cylinder temperature differencies depending on gen-set power. See the setpoint *Max+CylDifPmin* for more details.

Setpoint: Max+CylDifPnom

Group	Engine protect
Range [units]	-32000 .. +32000 [°C]
Related FW	2.0
Description	This setpoint adjusts the maximum allowed **positive** difference between a particular cylinder temperature and average cylinder temperature **at nominal power**. This setpoint is one of four setpoints that define the allowed area of cylinder temperature differencies depending on gen-set power. See the setpoint *Max+CylDifPmin* for more details.

Setpoint: Max-CylDifPnom

Group	Engine protect
Range [units]	-32000 .. +32000 [°C]
Related FW	2.0
Description	This setpoint adjusts the maximum allowed **negative** difference between a particular cylinder temperature and average cylinder temperature **at nominal power**. This setpoint is one of four setpoints that define the allowed area of cylinder temperature differencies depending on gen-set power. See the setpoint *Max+CylDifPmin* for more details.

Setpoint: PminCylDifEval

Group	Engine protect
Range [units]	0.0 .. *Nomin power* [kW]
Related FW	2.0
Description	This setpoint adjusts the gen-set power level below which the cylinder temperature difference protection is not evaluated. Learn more about this protection in the description of the setpoint *Max+CylDifPmin*.

Setpoint: CylDifEvalDel

Group	Engine protect
Range [units]	0 .. 600 [s]
Related FW	2.0
Description	This setpoint adjusts the evaluation delay of the cylinder temperature difference protection. Learn more about this protection in the description of the setpoint *Max+CylDifPmin*.

Setpoint: Service time 1

Group	Engine protect
Range [units]	0 .. 65535 [h]
Related FW	2.0
Description	This setpoint is used as maintenance interval counter #1. There are four independent maintenance interval counters, all of them work the same way - their values are decremented every hour while the gen-set is running and when the zero value is reached the related alarm is issued (i.e. *WrnServiceT1+2* or *WrnServiceT3+4*). The alarm remains active until the respective counter is readjusted back to nonzero value. Each of the maintenance intervals can be used for different type of regular maintenance works such as oil change, spark plug change etc. When the particular maintenance works have been performed, readjust the appropriate counter again to the period of next regular maintenance cycle. The counter will then count down again. The unused maintenance timers should be adjusted to maximal value, i.e. 65535.

Setpoint: Service time 2

Group	Engine protect
Range [units]	0 .. 65535 [h]
Related FW	2.0
Description	This setpoint is used as maintenance interval counter #2. There are four independent maintenance interval counters, all of them work the same way - their values are decremented every hour while the gen-set is running and when the zero value is reached the related alarm is issued (i.e. *WrnServiceT1+2* or *WrnServiceT3+4*). The alarm remains active until the respective counter is readjusted back to nonzero value. Each of the maintenance intervals can be used for different type of regular maintenance works such as oil change, spark plug change etc. When the particular maintenance works have been performed, readjust the appropriate counter again to the period of next regular maintenance cycle. The counter will then count down again. The unused maintenance timers should be adjusted to maximal value, i.e. 65535.

Setpoint: Service time 3

Group	Engine protect
Range [units]	0 .. 65535 [h]
Related FW	2.0
Description	This setpoint is used as maintenance interval counter #3. There are four independent maintenance interval counters, all of them work the same way - their values are decremented every hour while the gen-set is running and when the zero value is reached the related alarm is issued (i.e. *WrnServiceT1+2* or

	WrnServiceT3+4). The alarm remains active until the respective counter is readjusted back to nonzero value. Each of the maintenance intervals can be used for different type of regular maintenance works such as oil change, spark plug change etc. When the particular maintenance works have been performed, readjust the appropriate counter again to the period of next regular maintenance cycle. The counter will then count down again. The unused maintenance timers should be adjusted to maximal value, i.e. 65535.

Setpoint: Service time 4

Group	Engine protect
Range [units]	0 .. 65535 [h]
Related FW	2.0
Description	This setpoint is used as maintenance interval counter #4. There are four independent maintenance interval counters, all of them work the same way - their values are decremented every hour while the gen-set is running and when the zero value is reached the related alarm is issued (i.e. *WrnServiceT1+2* or *WrnServiceT3+4*). The alarm remains active until the respective counter is readjusted back to nonzero value. Each of the maintenance intervals can be used for different type of regular maintenance works such as oil change, spark plug change etc. When the particular maintenance works have been performed, readjust the appropriate counter again to the period of next regular maintenance cycle. The counter will then count down again. The unused maintenance timers should be adjusted to maximal value, i.e. 65535.

Group: Analog protect

Setpoint: Batt >V

Group	Analog protect
Range [units]	8.0 .. 40.0 [V]
Related FW	2.0
Description	This setpoint adjusts the warning level for battery overvoltage alarm.

Setpoint: Batt <V

Group	Analog protect
Range [units]	8.0 .. 40.0 [V]
Related FW	2.0
Description	This setpoint adjusts the warning level for battery undervoltage alarm.

Setpoint: Batt volt del

Group	Analog protect
Range [units]	0 .. 600 [s]
Related FW	2.0
Description	This setpoint adjusts the delay for battery *overvoltage* and *undervoltage* alarms.

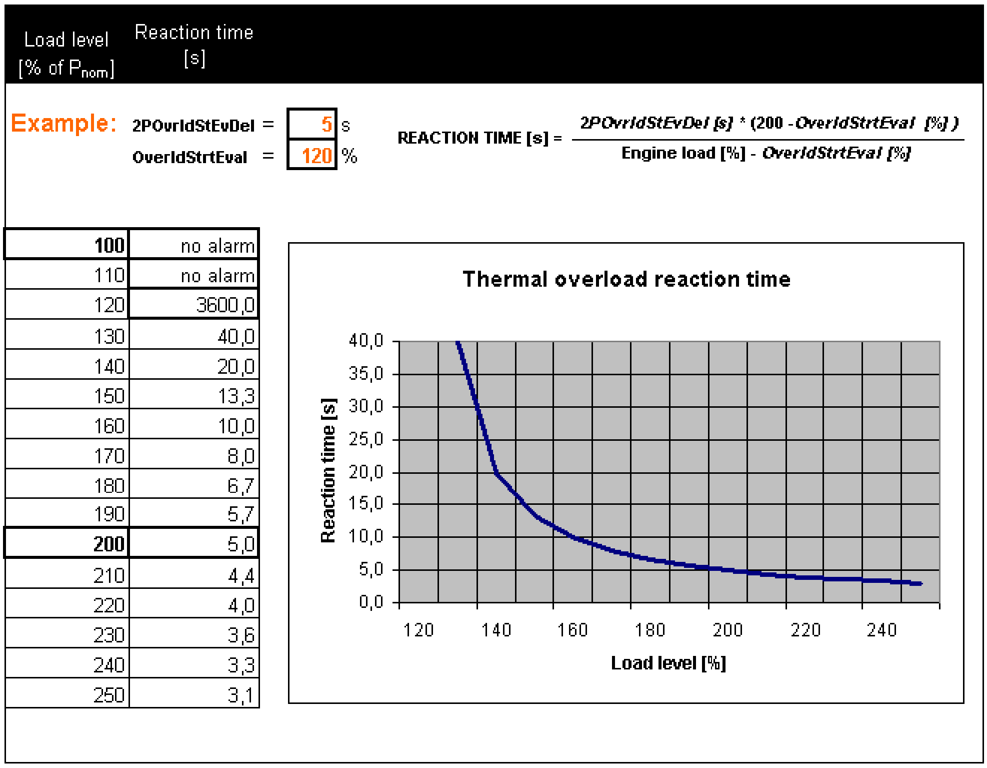
Group: Gener protect

Setpoint: OverldStrtEval

Group	Gener Protect
Range [units]	100 .. 200 [%]
Related FW	2.0
Force value possible	YES
Description	This setpoint specifies the power level relative to the *nominal power*, where the thermal overload protection starts to be evaluated. See the setpoint *2PovrldStEvDel* for more information about the thermal overload protection.

Setpoint: 2POvrldStEvDel

Group	Gener Protect
Range [units]	0.0 .. 600.0 [s]
Related FW	2.0
Description	This setpoint adjusts the reaction time of the thermal overload 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.



Example: 2POvrldStEvDel = 5 s

OverldStrtEval = 120 %

$$\text{REACTION TIME [s]} = \frac{\textit{2POvrldStEvDel [s]} * (200 - \textit{OverldStrtEval [\%]})}{\text{Engine load [\%]} - \textit{OverldStrtEval [\%]}}$$

Load level [% of P_{nom}]	Reaction time [s]
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:
The thermal overload protection is *Breaker open and cool down (BOC)* type.

Setpoint: Min Power PtM

Group	Gener protect
Range [units]	1 .. 100 [%]
Related FW	2.0
Force value possible	YES
Description	This setpoint is used for adjusting of the lower limit of the requested gen-set power in parallel to the mains operation. If the requested load (given by the active load control mode, e.g. Baseload, Import/Export etc.) is below this limit the requested load is limited to the level adjusted by this setpoint. The only situation, where the *Min Power PtM* is ignored, is the warming procedure after the gen-set is synchronized to the mains, i.e. the *Warming load* can be adjusted also below the sepoint *Min Power PtM*. This setpoint is also used as the requested load level if a protection of *Low power* type is active. **NOTE:** Note that if InteliMains is used and it is in active control mode (i.e. the *SysLdCtrl PtM* is set to LDSHARING) this setpoint is not considered and minimal power in parallel to Mains operation is given by **ProcessControl***MinPwr PtM* is used to determine minimal power of each gen-set in the group in percentage of its nominal power.

Setpoint: Ishort

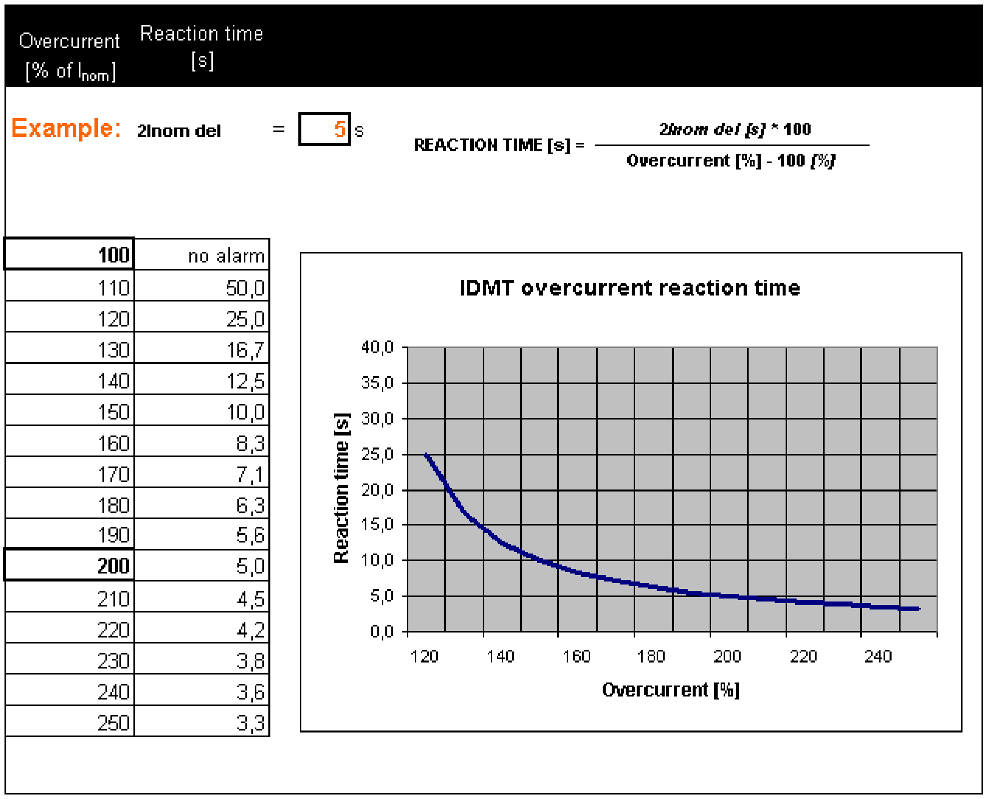
Group	Gener Protect
Range [units]	100 .. 500 [%]
Related FW	2.0
Description	This setpoint adjusts the threshold level (in % of the *nominal current*) for the generator fast overcurrent protection. The protection is activated (alarm *Ishort* is issued) when the generator current in at least one phase exceeds the threshold limit for time longer than *Ishort del*. **NOTE:** The protection type is *Breaker open and cool down* (BOC).

Setpoint: Ishort del

Group	Gener Protect
Range [units]	0.00 .. 10.00 [s]
Related FW	2.0
Description	This setpoint adjust the delay for generator fast overcurrent protection. The limit for the protection is adjusted by the setpoint *Ishort*. **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.

Setpoint: 2Inom del

Group	Gener Protect
Range [units]	1 .. 600.0 [s]
Related FW	2.0
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: 2Inom del = 5 s

$$\text{REACTION TIME [s]} = \frac{\text{2Inom del [s]} * 100}{\text{Overcurrent [\%]} - 100 \text{ [\%]}}$$

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

EXAMPLE OF IDMT OVERCURRENT PROTECTION CURVE

NOTE:
The IDMT overcurrent protection is *Breaker open and cool down (BOC)* type.

Setpoint: Gen >V BOC

Group	Gener Protect
Range [units]	*Gen <V BOC* .. 150 [%]
Related FW	2.0
Force value possible	YES
Description	This setpoint adjusts the threshold level for the generator overvoltage protection. The threshold is adjusted in % of the nominal generator voltage, which is either *GenNomV* or *GenNomVph-ph*, depending on the position of the setpoint *FixVoltProtSel*. The protection activates if the voltage in at least one phase gets over the threshold for time longer than *Gen V del*. **NOTE:** The associated protection to this setpoint is *Breaker open and cool down (BOC)* type. There is also *Shutdown* overvoltage protection, which is adjusted by setpoint *Gen >V Sd*. **NOTE:** The BOC protections are active after the *Max stab time* elapsed or after the GCB was closed, then while the GCB is closed and then also during cooling (if *Cooling speed* = NOMINAL).

Setpoint: Gen <V BOC

Group	Gener Protect
Range [units]	0 .. *Gen >V BOC* [%]
Related FW	2.0
Force value possible	YES
Description	This setpoint adjusts the threshold level for the generator undervoltage protection. The threshold is adjusted in % of the nominal generator voltage, which is either *GenNomV* or *GenNomVph-ph*, depending on the position of the setpoint *FixVoltProtSel*. The protection activates if the voltage in at least one phase drops below the threshold for time longer than *Gen V del*. **NOTE:** The generator undervoltage protection is *Breaker open and cool down (BOC)* type. **NOTE:** The BOC protections are active after the *Max stab time* elapsed or after the GCB was closed, then while the GCB is closed and then also during cooling (if *Cooling speed* = NOMINAL).

Setpoint: Gen >V Sd

Group	Gener protect
Range [units]	50 .. 150 [%]
Related FW	2.0
Force value possible	YES
Description	This setpoint adjusts the threshold level for the generator overvoltage **shutdown** protection. The threshold is adjusted in % of the nominal generator voltage, which is either *GenNomV* or *GenNomVph-ph*, depending on the position of the setpoint *FixVoltProtSel*. The protection activates if the voltage in at least one phase gets over the threshold for time longer than *Gen V del*. **NOTE:** The asociated protection to this setpoint is *Shutdown* type. There is also *Breaker open and cool down (BOC)* overvoltage protection, which is adjusted by setpoint *Gen >BOC*. **The BOC overvoltage protection is intended to be used as first level protection with lower threshold, whereas the shutdown one is intended as second level with higher threshold.**

Setpoint: Gen V del

Group	Gener protect
Range [units]	0.00 .. 600.00 [s]
Related FW	2.0

Description	The setpoint adjusts the delay for generator under- and overvoltage protections. The thresholds for these protections are adjusted by setpoints *Gen >V BOC*, *Gen <V BOC* and *Gen >V Sd*. **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.

Setpoint: Gen >f

Group	Gener Protect
Range [units]	*Gen <f* .. 150 [%]
Related FW	2.0
Force value possible	YES
Description	This setpoint adjusts the threshold level for the generator overfrequency protection. The threshold is adjusted in % of the system frequency (*Nominal Freq* + *Nom frq offset*). The protection activates if the frequency in phase L3 gets over the threshold for time longer than *Gen f del*. **NOTE:** The generator overfrequency protection is *Breaker open and cool down (BOC)* type. **NOTE:** The BOC protections are active after the *Max stab time* elapsed or after the GCB was closed, then while the GCB is closed and then also during cooling (if *Cooling speed* = NOMINAL).

Setpoint: Gen <f

Group	Gener Protect
Range [units]	0 .. *Gen >f* [%]
Related FW	2.0
Force value possible	YES
Description	This setpoint adjusts the threshold level for the generator underfrequency protection. The threshold is adjusted in % of the system frequency (*Nominal Freq* + *Nom frq offset*). The protection activates if the frequency in phase L3 drops below the threshold for time longer than *Gen f del*. **NOTE:** The generator underfrequency protection is *Breaker open and cool down (BOC)* type. **NOTE:**

	The BOC protections are active after the *Max stab time* elapsed or after the GCB was closed, then while the GCB is closed and then also during cooling (if *Cooling speed* = NOMINAL).

Setpoint: Gen f del

Group	Gener Protect
Range [units]	0.00 .. 600.00 [s]
Related FW	2.0
Description	The setpoint adjusts the delay for generator under and overfrequency protections. The thresholds for these protections are adjusted by setpoints *Gen >f* and *Gen <f*. **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.

Setpoint: BusMeasError

Group	Gener protect
Range [units]	DISABLED, ENABLED [-]
Related FW	2.0
Force value possible	YES
Description	This setpoint is used to enable and disable the *Bus meas error* alarm. If enabled, it is issued when the controller detects a mismatch between the expected and current voltage on the busbar. The mismatch means the measured voltage is out of limits, although the controller receives information that there is a breaker closed, through which the bus should be supplied. The alarm is issued when the mismatch lasts more than 20s. The breaker mentioned above may be MCB, GCB of the respective controller or GCB of any other controller in the group. If there is a mismatch of bus voltage then closing of the GCB is blocked even if the 20s delay hasn't elapsed yet.

Setpoint: Reverse power

Group	Gener Protect
Range [units]	0 .. 50 [%]
Related FW	2.0
Description	This setpoint adjusts the threshold level for the generator reverse (negative) power protection. The threshold is adjusted in % of the generator *nominal power*. The protection activates if the generator power drops below the threshold for time longer than *ReversePwr del*. **NOTE:**

	The generator reverse power protection is *Breaker open and cool down (BOC)* type.

Setpoint: ReversePwr del

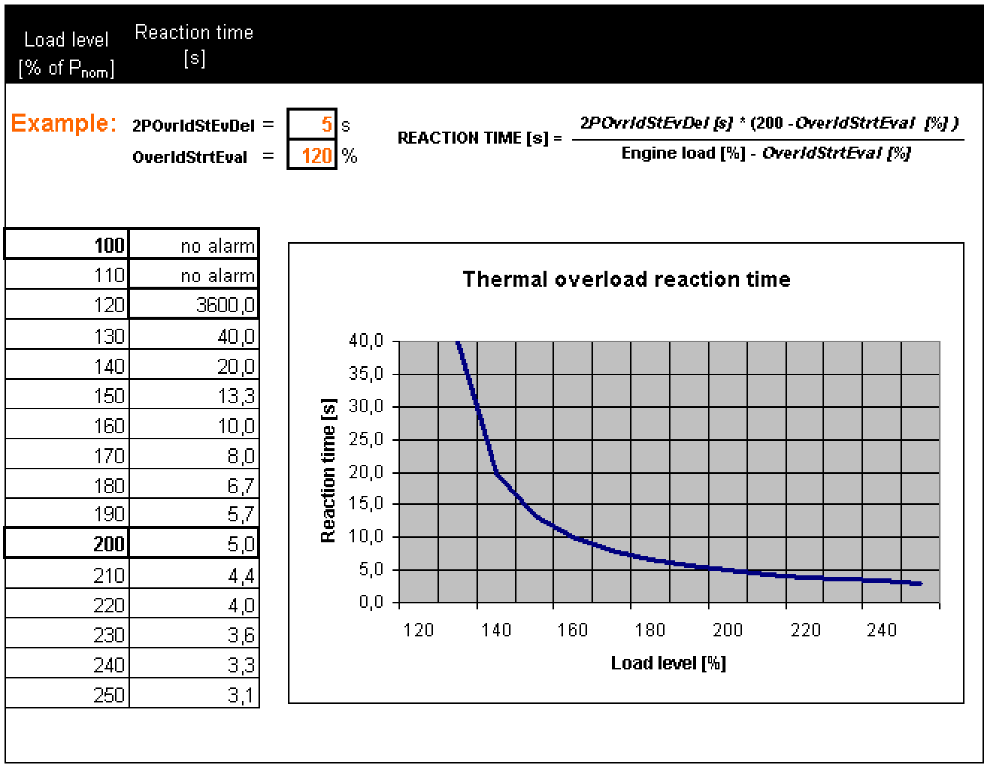
Group	Gener Protect
Range [units]	0 .. 600.0 [s]
Related FW	2.0
Description	The setpoint adjusts the delay for generator reverse power protection. The threshold for the protection is adjusted by setpoint *Reverse power*.

Setpoint: Nom EthFltCurr

Group	Gener protect
Range [units]	0 .. 10000 [A]
Related FW	2.0
Force value possible	YES
Description	This setpoint adjust the level of EarthFault Current when IDMT protection starts to get evaluated. Time of evaluation of this protection is given by the setpoint *2EthFltCur del*. When the EarthFault Current goes below the level given by *Nom EthFltCurr*, protection starts decreasing its thermal counter. For more information about this protection, refer to the setpoint *2EthFltCur del*.

Setpoint: 2EthFltCur del

Group	Gener protect
Range [units]	OFF, 0.1 .. 600.0 [s]
Related FW	2.0
Force value possible	YES
Description	This setpoint adjusts the reaction time of the IDMT EarthFault Current protection if the current is 200% of the base level given by the setpoint *Nom EthFltCurr*. The reaction time of the IDMT EarthFault Current protection is not fixed; it depends on how much is the current above the limit (base level). The higher is the current the shorter the reaction time will be.



Load level [% of P_{nom}]	Reaction time [s]
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: 2POvrldStEvDel = 5 s

OverldStrtEval = 120 %

$$\text{REACTION TIME [s]} = \frac{\text{2POvrldStEvDel [s]} * (200 - \text{OverldStrtEval [\%]})}{\text{Engine load [\%]} - \text{OverldStrtEval [\%]}}$$

EXAMPLE OF IDMT CURRENT PROTECTION CURVE

NOTE:
The IDMT EarthFault Current protection is *Breaker open and cool down (BOC)* type.

NOTE:
This protection's internal counter accumulates and it starts continuously decreasing when the EarthFault Current goes below *Nom EthFltCurr*. This function prevents the protection from completely reseting when the EarthFault Current goes below *Nom EthFltCurr* for only a short period of time. This behavior emulates circuit-breaker with thermal current protection.

Setpoint: ExcitationLoss

Group	Gener protect
Range [units]	0 .. 150 [%]
Related FW	2.0
Force value possible	YES
Description	This setpoint adjusts excitation loss protection level. Corresponding level in kVA is calculated from *nominal power* of gen-set as a negative percentage given by this setpoint (e.g. this setpoint is adjusted to 50% and nominal power of gen-set is 200 kW, therefore excitation loss protection level is set to -100 kVAr) Delay for this protection is given by the setpoint *ExctLoss del*. This protection is breaker off and cooldown type. For more information on protection types please refer to the section Alarm types.

Setpoint: ExctLoss del

Group	Gener protect
Range [units]	OFF, 0.1 .. 600.0 [s]
Related FW	2.0
Force value possible	YES
Description	This setpoint adjusts the delay for loss of excitation protection. Threshold of this protection is given by the setpoint *ExcitationLoss*.

Setpoint: Gen V unbal

Group	Gener protect
Range [units]	0 .. 200 [%]
Related FW	2.0
Description	This setpoint adjusts the threshold level for the generator voltage unbalance protection. The threshold is adjusted in % of the nominal generator voltage, which is either *GenNomV* or *GenNomVph-ph*, depending on the position of the setpoint *FixVoltProtSel*. The protection is *Breaker open and cool down* type and **is created in the default archive as universal analog protection** at the value *Gen V unbal*, which is calculated as maximum difference between two phase voltages. The protection activates if the voltage unbalance gets over the threshold for time longer than *Gen V unb del*. **NOTE:** The voltage unbalance protection is created in the default archive using the mechanism of *universal analog protections*. That means **this setpoint is one of general-purpose setpoints**, which may be used for different purpose if the protection is deleted from the configuration.

Setpoint: Gen V unb del

Group	Gener protect
Range [units]	0.0 .. 600.0 [s]
Related FW	2.0
Description	This setpoint adjusts the delay for the generator voltage unbalance protection. The threshold for the protection is adjusted by setpoint *Gen V unbal*. **NOTE:** The generator voltage unbalance protection is created in the default archive using the mechanism of *universal analog protections*. That means **this setpoint is one of general-purpose setpoints**, which may be used for different purpose if the protection is deleted from the configuration.

Setpoint: Gen I unbal

Group	Gener protect
Range [units]	0 .. 200 [%]

Related FW	2.0
Description	This setpoint adjusts the threshold level for the generator current unbalance protection. The threshold is adjusted in % of the generator *nominal current*. The protection is *Breaker open and cool down* type and **is created in the default archive as universal analog protection** at the value *Gen I unbal*, which is calculated as maximum difference between two phase currents. The protection activates if the current unbalance gets over the threshold for time longer than *Gen I unb del*. **NOTE:** The current unbalance protection is created in the default archive using the mechanism of *universal analog protections*. That means **this setpoint is one of general-purpose setpoints**, which may be used for different purpose if the protection is deleted from the configuration.

Setpoint: Gen I unb del

Group	Gener protect
Range [units]	0.0 .. 600.0 [s]
Related FW	2.0
Description	This setpoint adjusts the delay for the generator current unbalance protection. The threshold for the protection is adjusted by setpoint *Gen I unbal*. **NOTE:** The generator current unbalance protection is created in the default archive using the mechanism of *universal analog protections*. That means **this setpoint is one of general-purpose setpoints**, which may be used for different purpose if the protection is deleted from the configuration.

Setpoint: IslAdetFr+diff

Group	Gener protect
Range [units]	0,0 .. 5,0 [Hz]
Related FW	2.0
Force value possible	NO
Description	The plus difference of the mains frequency from the requested system frequency (**Basic setting**s: *Nominal freq + Nom frq offset*) used for detection of island operation.

Setpoint: IslAdetFr-diff

Group	Gener protect
Range [units]	0,0 .. 5,0 [Hz]
Related FW	2.0
Force value possible	NO
Description	The minus difference of the mains frequency from the requested system

	frequency (**Basic settings**: *Nominal freq* + *Nom frq offset*) used for detection of island operation.

Setpoint: IslAdetFr del

Group	Gener protect
Range [units]	0,0 .. 60,0 [s]
Related FW	2.0
Force value possible	NO
Description	Island operation is automatically detected with the delay *IslAdetFr del* after the frequency cross the limit *IslAdetFr+diff* or *IslAdetFr-diff*.

Group: Mains protect

Setpoint: Mains >V MP

Group	Mains protect
Range [units]	*Mains <V* .. 150 [%]
Related FW	2.0
Force value possible	YES
Description	This setpoint adjusts the threshold level for the mains overvoltage protection. The threshold is adjusted in % of the nominal mains voltage, which is either *MainsNomV* or *MainsNomVph-ph*, depending on the position of the setpoint *FixVoltProtSel*. The protection activates if the voltage in at least one phase gets over the threshold for time longer than *Mains V del*. **NOTE:** The asociated protection to this setpoint is *Mains protect* type. This type of protection is recorded into the history file, however it is not indicated in the Alarm list. When a protection of *Mains protect* type occurs the controller opens either MCB (in applications where the MCB is controlled) or GCB (in applications where the MCB is not controlled).

Setpoint: Mains <V MP

Group	Mains protect
Range [units]	50 .. *Mains >V* [%]
Related FW	2.0
Force value possible	YES
Description	This setpoint adjusts the threshold level for the mains undervoltage protection. The threshold is adjusted in % of the nominal mains voltage, which is either *MainsNomV* or *MainsNomVph-ph*, depending on the position of the setpoint *FixVoltProtSel*. The protection activates if the voltage in at least one phase drops under the

	threshold for time longer than *Mains V del*. **NOTE:** The asociated protection to this setpoint is *Mains protect* type. This type of protection is recorded into the history file, however it is not indicated in the Alarm list. When a protection of *Mains protect* type occurs the controller opens either MCB (in applications where the MCB is controlled) or GCB (in applications where the MCB is not controlled).

Setpoint: Mains V del

Group	Mains protect
Range [units]	0.00 .. 600.00 [s]
Related FW	2.0
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.

Setpoint: Mains Avg>V MP

Group	Mains protect
Range [units]	100.0 .. 150.0 [%]
Related FW	2.0
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.

Setpoint: Mains >f

Group	Mains protect
Range [units]	*Mains <f* .. 150.0 [%]
Related FW	2.0
Force value possible	YES
Description	This setpoint adjusts the threshold level for the mains overfrequency protection. The threshold is adjusted in % of the system frequency (*Nominal Freq* + *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 asociated protection to this setpoint is *Mains protect* type. This type of

	protection is recorded into the history file, however it is not indicated in the Alarm list. When a protection of *Mains protect* type occurs the controller opens either MCB (in applications where the MCB is controlled) or GCB (in applications where the MCB is not controlled).

Setpoint: Mains <f

Group	Mains protect
Range [units]	50.0 .. *Mains >f* [% of system frequency (*Nominal Freq* + *Nom frq offset*)]
Related FW	2.0
Force value possible	YES
Description	This setpoint adjusts the threshold level for the mains underfrequency protection. The threshold is adjusted in % of the system frequency (*Nominal Freq* + *Nom frq offset*). The protection activates if the frequency in phase L3 drops under the threshold for time longer than *Mains f del*. **NOTE:** The asociated protection to this setpoint is *Mains protect* type. This type of protection is recorded into the history file, however it is not indicated in the Alarm list. When a protection of *Mains protect* type occurs the controller opens either MCB (in applications where the MCB is controlled) or GCB (in applications where the MCB is not controlled).

Setpoint: Mains f del

Group	Mains protect
Range [units]	0.00 .. 600.00 [s]
Related FW	2.0
Description	The setpoint adjusts the delay for mains under- and overfrequency protections. The thresholds for these protections are adjusted by setpoints *Mains >f* and *Mains <f*. **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.

Setpoint: VectorS prot

Group	Mains protect
Range [units]	DISABLED, PARALLEL ONLY, ENABLED [-]
Related FW	2.0
Force value possible	YES

<table>
<tr><td>Description</td><td>This setpoint selects the function of the built-in vectorshift protection.
<table>
<tr><td>DISABLED</td><td>The vectorshift protection is disabled.</td></tr>
<tr><td>PARALLEL ONLY</td><td>The vectorshift protection is enabled only while the gen-set is running parallel to the mains, i.e. the both MCB and GCB are closed.</td></tr>
<tr><td>ENABLED</td><td>The vectorshift protection is active always while the MCB is closed, regardless of the GCB position.</td></tr>
</table>
<u>NOTE:</u>
The vectorshift protection is recorded into the history file, however it is not indicated in the Alarm list. When it occurs the controller opens either MCB or GCB depending on the setpoint <i>VS/ROCOF CB sel</i> (in SPI aplication GCB is always opened, <i>VS/ROCOF CB sel</i> setpoint is not available). If the MCB is not controlled in the particular application then GCB is opened.

<u>NOTE:</u>
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 <i><u>Mains ret del</u></i>, as the mains is evaluated as healthy.</td></tr>
</table>

Setpoint: VS/ROCOF CBsel

Group	Mains protect
Range [units]	MCB, GCB [-]
Related FW	2.0
Force value possible	YES
Description	This setpoint selects which breaker will be opened when the *vectorshift* or *ROCOF protection* is detected. **NOTE:** If the GCB is selected and a mains failure occurs the GCB 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. **NOTE:** In Combi-SPI application GCB is always opened regardless of this setpoint. In Combi-SPI application controller controls only GCB.

Setpoint: VectorS limit

Group	Mains protect
Range [units]	1 .. 45 [°]
Related FW	2.0
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 gen-set has been synchronized to the mains and after opening of GCB or MCB it is "frozen". In normal conditions the value should not be higher than 3º and the most common setting of the threshold is about 7º.

Setpoint: ROCOF prot

Group	Mains protect
Range [units]	DISABLED, PARALLEL ONLY, ENABLED [-]
Related FW	2.0
Force value possible	YES
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* (not available in SPI application).

Setpoint: ROCOF Win

Group	Mains protect
Range [units]	3 .. 30 [-]
Related FW	2.0
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.

Setpoint: ROCOF df/dt

Group	Mains protect
Range [units]	0.1 .. 10.0 [Hz/s]
Related FW	2.0
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:** To activate or deactivate ROCOF protection use *ROCOF prot*. Choose proper breaker which will be opened if ROCOF protection activates by adjusting setpoint *VS/ROCOF CB sel* (not available in SPI application).

Setpoint: Mains V unbal

Group	Mains protect
Range [units]	0 .. 200 [%]

Related FW	2.0
Description	This setpoint adjusts the threshold level for the mains voltage unbalance protection. The threshold is adjusted in % of the nominal generator voltage, which is either *MainsNomV* or *MainsNomVph-ph*, depending on the position of the setpoint *FixVoltProtSel*. The protection **is created in the default archive as universal analog protection** at the value *Mains V unbal*, which is calculated as maximum difference between two mains phase voltages. The protection activates if the voltage unbalance gets over the threshold for time longer than *MainsV unb del*. **NOTE:** The associated protection to this setpoint is *Mains protect* type. This type of protection is recorded into the history file, however it is not indicated in the Alarm list. When a protection of *Mains protect* type occurs the controller opens either MCB (in applications where the MCB is controlled) or GCB (in applications where the MCB is not controlled). **NOTE:** The voltage unbalance protection is created in the default archive using the mechanism of *universal analog protections*. That means **this setpoint is one of general-purpose setpoints**, which may be used for different purpose if the protection is deleted from the configuration.

Setpoint: MainsV unb del

Group	Mains protect
Range [units]	0.0 .. 600.0 [s]
Related FW	2.0
Description	This setpoint adjusts the delay for the mains voltage unbalance protection. The threshold for the protection is adjusted by setpoint *Mains V unbal*. **NOTE:** The mains voltage unbalance protection is created in the default archive using the mechanism of *universal analog protections*. That means **this setpoint is one of general-purpose setpoints**, which may be used for different purpose if the protection is deleted from the configuration.

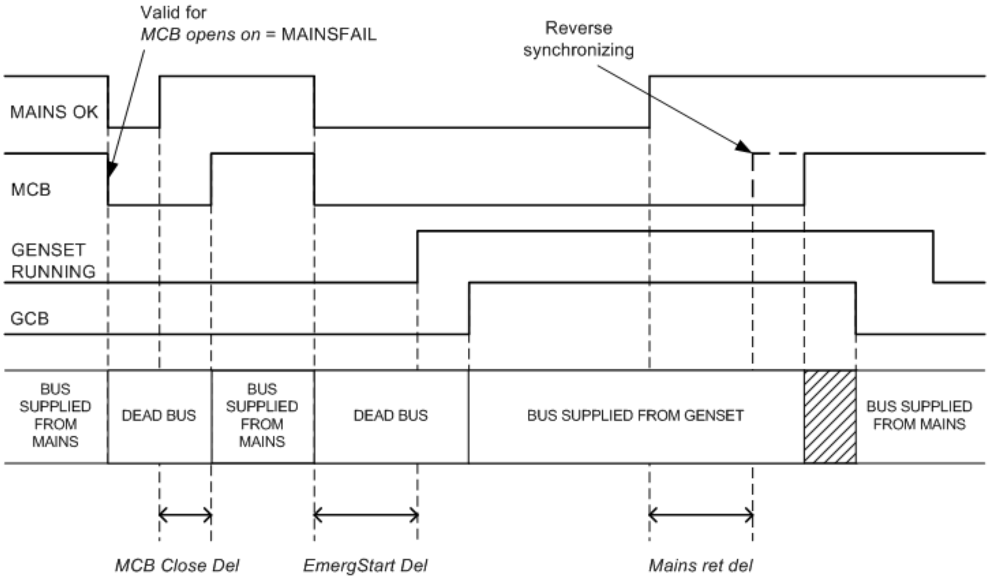
Group: AMF settings

Setpoint: EmergStart del

Group	AMF Settings
Range [units]	0 .. 600 [s]
Related FW	2.0
Force value possible	YES
Description	The setpoint adjusts the delay of automatic gen-set start in AUT mode after the mains failed. See the setpoint *MCB close del* for a time diagram of all AMF-related delays. **NOTE:**

	Use the setpoint *MFStart enable* to enable/disable automatic start of the gen-set due to mains failure.

Setpoint: MCB Close del

Group	AMF Settings
Range [units]	0.0 .. 60.0 [s]
Related FW	2.0
Force value possible	YES
Description	This setpoint adjusts the delay of automatic return from **dead bus** to **mains-powered bus** (i.e. closing of the MCB)after the mains restored. This delay applies if the mains failure duration is short and the gen-set has not been connected to the bus yet or if the gen-set is not running and supplying the bus from any other reason (failure, not in AUT etc.) **NOTE:** The delay of return from genset-powered bus to mains-powered bus (i.e. reverse synchronizing or changeover) is adjusted by setpoint *Mains ret del*.  AMF-RELATED DELAYS

Setpoint: MCB Opens on

Group	AMF Settings
Range [units]	MAINSFAIL, GEN RUN [-]
Related FW	2.0
Force value possible	YES
Description	This setpoint selects the in which moment the MCB is opened after the mains failed.

<table>
<tr><td></td><td>
<table>
<tr><td>MAINSFAIL</td><td>The MCB is opened immediately when the mains failure is detected. This option expects the breaker is able to be controlled even there is no AC voltage at the moment, as the mains is failed and the genset is not running yet. Use this option for contators, for breakers equipped with undervoltage release coil or for breakers controlled by 24VDC.</td></tr>
<tr><td>GEN RUN</td><td>The MCB open command is issued not until the gen-set is running and providing voltage (prior to GCB is closed!!). Use this option for AC controlled breakers. The wiring of the breaker control must be provided in such a way, that it automatically switches the AC control voltage either from the mains incomer (before MCB) or directly from the generator.</td></tr>
</table>
</td></tr>
</table>

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>2.0</td></tr>
<tr><td>Force value possible</td><td>YES</td></tr>
<tr><td>Description</td><td>The setpoint adjusts behavior of the controller if the reverse synchronizing to the restored mains was not successful.
<table>
<tr><td>ENABLED</td><td>If the reverse synchronization to the restored mains is not successful (i.e. <i>Sync fail</i> alarm is issued) the load is then transferred back to the mains by "changeover" sequence.</td></tr>
<tr><td>DISABLED</td><td>The load remains to be supplied from the genset if the reverse synchronization is not successful. After the <i>Sync fail</i> alarm is reset the controller performs next attempt of reverse synchronization.</td></tr>
</table>
</td></tr>
</table>

Setpoint: BreakerOverlap

<table>
<tr><td>Group</td><td>AMF Settings</td></tr>
<tr><td>Range [units]</td><td>0.0 .. 300.0 [s]</td></tr>
<tr><td>Related FW</td><td>2.0</td></tr>
<tr><td>Force value possible</td><td>YES</td></tr>
<tr><td>Description</td><td>This setpoint takes place in following situations:

In AUT mode after reverse synchronization if the gen-set will not continue in parallel operation. The setpoint adjusts the maximum time the both GCB and MCB breaker are closed together and the gen-set is beeing unloaded. The actual time can be shorter if the gen-set reaches the <i>GCB open level</i> earlier. The <i>GCB open del</i> does not take place.
During the <i>Test on load</i> procedure, after forward synchronization. The setpoint adjusts the minimum time the both GCB and MCB breakers are closed together and the load is beeing transferred from the mains to the gen-set. The actual time can be longer if the gen-set is not able to

</td></tr>
</table>

	take over the load and fully unload the mains.

Setpoint: RetFromIsland

Group	AMF Settings
Range [units]	MANUAL, AUTO [-]
Related FW	2.0
Force value possible	YES
Description	The setpoint selects the behavior of the controller in the moment the GCB is closed to a dead bus (i.e. transition to the island operation).

MANUAL	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). **NOTE:** This option is intended for applications where the moment of reverse transfer of the load to the restored mains is to be controlled manually. Setting to MANUAL might be important only for applications with break transfers (with synchronizing disabled). **CAUTION!** If the controller is in MAN mode the MCB is **not closed** automatically when the mains is restored even if e.g. the gen-set has been stopped due to a failure.
AUTO	The controller remains in AUT or TEST mode and the transfer of the load back to the mains is initiated automatically with delay adjusted by the setpoint *Mains ret del*.

Setpoint: ReturnTo mains

Group	AMF Settings
Range [units]	DISABLED, ENABLED [-]
Related FW	2.0
Force value possible	YES
Description	This setpoint selects the behavior of the controler in TEST mode if the load is currently supplied from the gen-set and the mains has restored.

DISABLED	The load remains to be supplied from the gen-set until the controller switched to different mode, e.g. to AUT mode., regardless of the fact that the mains is restored.
ENABLED	When the mains has restored the gen-set is reverse-synchronized to the mains, then the load is transferred to the

	mains, GCB is opened and the gen-set remains running unloaded in TEST mode.

Setpoint: FwRet break

Group	AMF Settings
Range [units]	0.0 .. 60.0 [s]
Related FW	2.0
Force value possible	YES
Description	The setpoint adjusts the delay between the GCB is opened and consequently MCB is closed and vice versa changeover is used instead of synchronizing (i.e. synchronizing is disabled). This delay is also applied between MCB opening and GCB closing in TEST mode when the gen-set is running without load and then mains fails.

Setpoint: Mains ret del

Group	AMF Settings
Range [units]	0 .. 3600 [s]
Related FW	2.0
Force value possible	YES
Description	This setpoint adjust the delay of start of the reverse synchronizing (SPtM, Combi) or forward synchronizing (SPI) after the mains has recovered. See the setpoint *MCB close del* for the time diagram of all AMF-related delays.

Group: Power management

Setpoint: Pwr Management

Group	Pwr Management
Range [units]	DISABLED, ENABLED [-]
Related FW	2.0
Force value possible	YES
Description	This setpoint is used to enable/disable the power management function in the particular controller. If the function is disabled the start and stop of the gen-set is performed only according to the position of the binary input *Sys start/stop*, i.e. if the input is active the gen-set is running and vice versa.

Setpoint: #Pwr mgmt mode

Group	Pwr management
Range [units]	ABS(kW), ABS(kVA), REL(%LOAD) [-]

<table>
<tr><td>Related FW</td><td>2.0</td></tr>
<tr><td>Description</td><td>This setpoint is used to select the power management mode:
<table>
<tr><td>ABS (KW)</td><td>The power management is based on actual <i>active power</i> and gen-set <i>nominal power</i>. The reserves are calculated and adjusted in kW.</td></tr>
<tr><td>ABS (KVA)</td><td>The power management is based on actual <i>apparent power</i> and gen-set "nominal apparent power" is calculated as 3 * <i>Nomin current</i> * <i>GenNomV</i>. The reserves are calculated and adjusted in kVA.
NOTE:
This mode is intended for systems supplying loads with low power factor. It prevents the gen-sets from operating at high currents.</td></tr>
<tr><td>REL (%)</td><td>The power management is based on the relative load, i.e. ratio active power to nominal power. The reserves are calculated and adjusted in %.</td></tr>
</table>
</td></tr>
</table>

Setpoint: Priority

Group	Pwr Management
Range [units]	1 .. 32 [-]
Related FW	2.0
Force value possible	YES
Description	This setpoint is used for adjusting of the gen-set priority. Value of 1 represents the the highest priority (lowest starting order), value of 32 is the lowest priority (highest starting order). To "push" the particular genset temporarily into the highest priority, value of 0 can be forced (see *Force value 1*) into this setpoint.

Setpoint: #PriorAutoSwap

<table>
<tr><td>Group</td><td>Pwr management</td></tr>
<tr><td>Range [units]</td><td>DISABLED, RUN HOURS EQU, LD DEMAND SWAP [-]</td></tr>
<tr><td>Related FW</td><td>2.0</td></tr>
<tr><td>Description</td><td>This setpoint selects the method of optimalization of priorities:
<table>
<tr><td>DISABLED</td><td>Optimalization is disabled. Priorities are given directly by the values adjusted into the setpoints <i>Priority</i>.</td></tr>
<tr><td>RUN HOURS EQU</td><td>The priority setpoints are automatically updated (swapped) to equalize running hours of the gen-sets or to keep constant difference of running hours.</td></tr>
<tr><td>LD DEMAND</td><td>This method changes the priorities (not the setpoints itself) of up to 3 gen-sets of different capacity to optimalize which gen-</td></tr>
</table>
</td></tr>
</table>

SWAP	sets are running according to their capacities and actual load demand (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).

NOTE:
See the chapter Optimalization of priorities for more details.

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 optimalization is enabled at least one gen-set in the group must be set as the master for the optimalization (*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.

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.

Setpoint: Priority ctrl

Group	Pwr management
Range [units]	SLAVE, MASTER [-]
Related FW	2.0
Force value possible	YES
Description	This setpoint is used to select the role of this particular controller in the optimalization of priorities.

SLAVE	The controller plays only passive role. Priority can be changed from other controller (active master).
MASTER	The controller can play both active or passive role. It plays active master role, i.e. changes priorities in slave controllers, if it has the lowest address from all the controllers beeing switched to MASTER position. Otherwise it plays the passive role as if switched to SLAVE position.

NOTE:
It is possible to have more than one master; always only the one with lowest CAN address will play the master role.

Setpoint: #SysAMFstrtDel

Group	Pwr management
Range [units]	0 .. 600 [s]
Related FW	2.0
Description	This setpoint adjusts the delay between closing of the input *Sys start/stop* and activation of the gen-set group into island operation (i.e. the *MCB feedback* is open). The delay of activation of the group into parallel-to-mains operation is fixed 1s. The setpoint is primarily intended for adjusting the "Mains failure autostart" delay in sites, where the input *Sys start/stop* is controlled directly by a mains decoupling relay.

Setpoint: ##SysAMFstopDel

Group	Pwr Management
Range [units]	0 .. 600 [s]
Related FW	2.0
Description	This setpoint adjusts the delay between opening of the input *Sys start/stop* and deactivation of the gen-set group if *MCB feedback* is open. If the MCB feedback is closed, the the delay is fixed 1s. The setpoint is primarily intended for adjusting the "Mains return" delay in sites, where the input *Sys start/stop* is controlled directly by a mains decoupling relay.

Setpoint: #LoadResStrt 1

Group	Pwr Management
Range [units]	-32000 .. *LoadResStop 1* [kX]
Related FW	2.0
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.

Setpoint: #LoadResStop 1

Group	Pwr Management
Range [units]	*LoadResStrt 1* .. 32000 [kX]
Related FW	2.0
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.

Setpoint: #LoadResStrt 2

Group	Pwr Management
Range [units]	-32000 .. *LoadResStop 2* [kX]
Related FW	2.0
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.

Setpoint: #LoadResStop 2

Group	Pwr Management
Range [units]	*LoadResStrt 2* .. 32000 [kX]
Related FW	2.0
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.

Setpoint: #LoadResStrt 3

Group	Pwr Management
Range [units]	-32000 .. LoadResStop 3 [kX]
Related FW	2.0
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.

Setpoint: #LoadResStop 3

Group	Pwr Management
Range [units]	LoadResStrt 3 .. 32000 [kX]
Related FW	2.0
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.

Setpoint: #LoadResStrt 4

Group	Pwr Management
Range [units]	-32000 .. *LoadResStop 4* [kX]
Related FW	2.0
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.

Setpoint: #LoadResStop 4

Group	Pwr Management
Range [units]	*LoadResStrt 4* .. 32000 [kX]
Related FW	2.0
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.

Setpoint: #%LdResStrt 1

Group	Pwr Management
Range [units]	0 .. *#%LdResStop 1* [%]
Related FW	2.0
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.

Setpoint: #%LdResStop 1

Group	Pwr Management
Range [units]	*#%LdResStrt 1* .. 110 [%]
Related FW	2.0
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.

Setpoint: #%LdResStrt 2

Group	Pwr Management
Range [units]	0 .. *#%LdResStop 2* [%]
Related FW	2.0
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.

Setpoint: #%LdResStop 2

Group	Pwr Management
Range [units]	*#%LdResStrt 2* .. 110 [%]
Related FW	2.0
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.

Setpoint: #%LdResStrt 3

Group	Pwr Management
Range [units]	0 .. *%LdResStop 3* [%]

Related FW	2.0
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.

Setpoint: #%LdResStop 3

Group	Pwr Management
Range [units]	*#%LdResStrt 3* .. 110 [%]
Related FW	2.0
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.

Setpoint: #%LdResStrt 4

Group	Pwr Management
Range [units]	0 .. *%LdResStop 4* [%]
Related FW	2.0
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.

Setpoint: #%LdResStop 4

Group	Pwr Management
Range [units]	*#%LdResStrt 4* .. 110 [%]
Related FW	2.0
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.

Setpoint: #NextStrt Del

Group	Pwr Management
Range [units]	0 .. 3600 [s]
Related FW	2.0
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.

Setpoint: ##OverldNextDel

Group	Pwr Management
Range [units]	0 .. 3600 [s]
Related FW	2.0
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 reaches 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.

Setpoint: #NextStopDel

Group	Pwr Management
Range [units]	0 .. 3600 [s]
Related FW	2.0
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.

Setpoint: #SlowStopDel

Group	Pwr Management
Range [units]	0 .. 600 [s]
Related FW	2.0
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.

Setpoint: #MinRunPower 1

Group	Power Management
Range [units]	0 .. 65000 [kW]
Related FW	2.0
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*. **NOTE:** If more than one binary input for MinRunPower activation is closed MinRunPower 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.

Setpoint: #MinRunPower 2

Group	Power Management
Range [units]	0 .. 65000 [kW]
Related FW	2.0
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*. **NOTE:** If more than one binary input for MinRunPower activation is closed MinRunPower 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.

Setpoint: #MinRunPower 3

Group	Power Management
Range [units]	0 .. 65000 [kW]
Related FW	2.0
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*.

	NOTE: If more than one binary input for MinRunPower activation is closed MinRunPower 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.

Setpoint: RunHoursBase

Group	Pwr management
Range [units]	0 .. 200000 [h]
Related FW	2.0
Force value possible	YES
Description	This setpoint is used for adjustment of the "initial point" of the running hours equalization function. It is used either for reflecting the difference of engine hours in the moment when the RHE function was activated or for keeping certain constant difference in the engine hours. See the examples in the chapter Running hours equalization.

Setpoint: #RunHrsMaxDiff

Group	Pwr management
Range [units]	0 .. 65000 [h]
Related FW	2.0
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.

Setpoint: #PwrBandContr 1

Group	Pwr management
Range [units]	1, 2, 1+2, 3, 1+3, 2+3, 1+2+3 [-]
Related FW	2.0
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.

Setpoint: #PwrBandContr 2

Group	Pwr management
Range [units]	1, 2, 1+2, 3, 1+3, 2+3, 1+2+3 [-]
Related FW	2.0

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.

Setpoint: #PwrBandContr 3

Group	Pwr management
Range [units]	1, 2, 1+2, 3, 1+3, 2+3, 1+2+3 [-]
Related FW	2.0
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.

Setpoint: #PwrBandContr 4

Group	Pwr management
Range [units]	1, 2, 1+2, 3, 1+3, 2+3, 1+2+3 [-]
Related FW	2.0
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.

Setpoint: #PwrBnChngDlUp

Group	Pwr management
Range [units]	0 .. 3600 [s]
Related FW	2.0
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.

Setpoint: #PwrBnChngDlDn

Group	Pwr management
Range [units]	0 .. 3600 [s]
Related FW	2.0

Description	This setpoint is used for adjusting the delay of changing the power band if the load demand dropped below the lower limit of the current power band. Learn more about this topis in the chapter Gen-set size optimalization.

Setpoint: Control group

Group	Pwr management
Range [units]	COMMON (=1), 2 .. 32 [-]
Related FW	2.0
Description	This setpoint selects the logical group to which the particular gen-set belongs. If there aren't logical groups at the site, adjust the setpoint to 1 (COMMON).

Setpoint: GroupLinkLeft

Group	Pwr management
Range [units]	COMMON (=1), 2 .. 32 [-]
Related FW	2.0
Description	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).

Setpoint: GroupLinkRight

Group	Pwr management
Range [units]	COMMON (=1), 2 .. 32 [-]
Related FW	2.0
Description	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).

Group: Sync/Load ctrl

Setpoint: SpeedRegChar

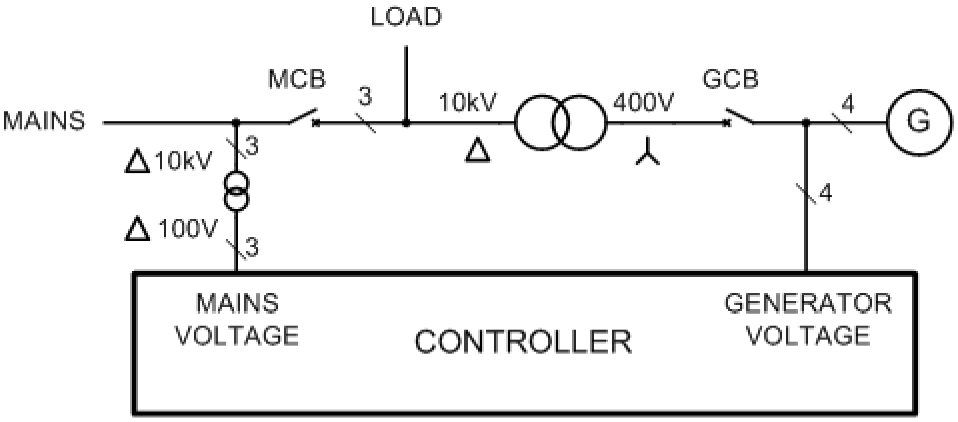
Group	Sync/Load Ctrl
Range [units]	POSITIVE, NEGATIVE [-]
Related FW	2.0
Description	This setpoint selects the characteristic of the speed governor output of the controller. Adjust it according to the behavior of the remote speed input of your speed governor:

<table>
<tr><td></td><td><table><tr><td>POSITIVE</td><td>Select this option if raising of the voltage on the governor remote speed input causes engine speed to raise.</td></tr><tr><td>NEGATIVE</td><td>Select this option if raising of the voltage on the governor remote speed input causes engine speed to lower.</td></tr></table></td></tr>
</table>

Setpoint: Voltage window

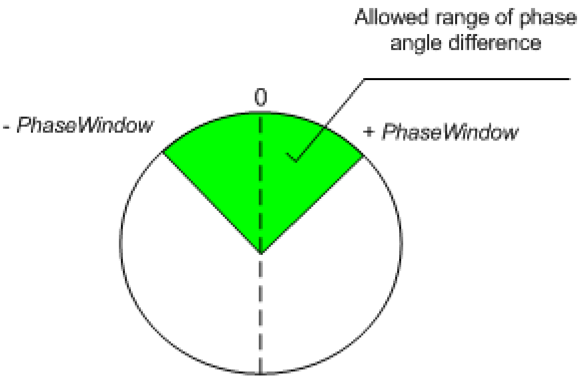
Group	Sync/Load Ctrl
Range [units]	0.0 .. 100.0 [%]
Related FW	2.0
Force value possible	YES
Description	This setpoint adjusts maximum difference between generator and mains/bus voltage in respective phases for voltage matching during synchronizing.

Setpoint: GtoM AngleReq

<table>
<tr><td>Group</td><td>Sync/Load ctrl</td></tr>
<tr><td>Range [units]</td><td>-45 .. 45 [°]</td></tr>
<tr><td>Related FW</td><td>2.0</td></tr>
<tr><td>Description</td><td>Requested angle between the phasors of the generator and mains voltage for synchronizing. This setpoint is intended for correction of the phase shift caused by a delta-triangle transformer located between the generator and mains voltage measuring points. In other situations the setpoint should be adjusted to 0.
The diagram below shows a situation where the 230V/10kV triangle-delta transformer causes 30° phase shift between the primary and secondary side. That means when there is 0° phase difference at the both sides of the GCB the phase difference measured by the controller is 30°. Correct setting for this kind of wiring is then <i>GtoM AngleReq</i> = 30.

</td></tr>
</table>

Setpoint: Phase window

Group	Sync/Load Ctrl
Range [units]	0 .. 90 [°]

Related FW	2.0
Force value possible	YES
Description	This setpoint adjusts maximum absolute value of difference between actual phase angle between the generator and mains/bus voltages for synchronizing. **NOTE:** To disable issuing the breaker close command (i.e. for test purpose) adjust this setpoint to 0. Synchronizing will continue until timeout occurs or the breaker is closed externally. 

Setpoint: Dwell time

Group	Sync/Load Ctrl
Range [units]	0.0 .. 25.0 [s]
Related FW	2.0
Force value possible	YES
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.

Setpoint: Freq gain

Group	Sync/Load Ctrl
Range [units]	0.0 .. 200.0 [%]
Related FW	2.0
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*. **NOTE:** See the chapter Regulation loops overview for general information about regulation loops and their adjustment.

Setpoint: Freq int

Group	Sync/Load Ctrl
Range [units]	0 .. 100 [%]
Related FW	2.0
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*.

Setpoint: Freq reg loop

<table>
<tr><td>Group</td><td>Sync/Load ctrl</td></tr>
<tr><td>Range [units]</td><td>ALL THE TIME, SYNC ONLY, GCB OPEN [-]</td></tr>
<tr><td>Related FW</td><td>2.0</td></tr>
<tr><td>Force value possible</td><td>YES</td></tr>
<tr><td>Description</td><td>This setpoint selects when is the frequency regulation loop active.
<table>
<tr><td>SYNC ONLY</td><td>The frequency regulation loop is active only during synchronizing to match the generator and mains frequencies together. It is assumed that in all other situations where the frequency is to be regulated the engine governor maintains it self.
NOTE:
This option is suitable for most governors.</td></tr>
<tr><td>ALL THE TIME</td><td>SPtM, SPI, Combi: This option activates the frequency regulation loop also while the gen-set is running without load and during the island operation. The controller maintains frequency at it's nominal value adjusted by setpoint system frequency (<i>Nominal Freq</i> + <i>Nom frq offset</i>).
NOTE:
This option can be used e.g. for elimination of the droop at governors that do not support isochronous mode.</td></tr>
<tr><td>GCB OPEN</td><td>MINT, COX: This option activates the frequency regulation loop also while the gen-set is running without load The controller maintains frequency at it's nominal value adjusted by the system frequency (<i>Nominal Freq</i> + <i>Nom frq offset</i>).</td></tr>
</table>
The P and I factors of the frequency regulation loop are adjusted by setpoints <i>Freq gain</i> and <i>Freq int</i>.</td></tr>
</table>

Setpoint: Angle Gain

Group	Sync/Load Ctrl
Range [units]	0.0 .. 200.0 [%]
Related FW	2.0
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 generator 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 generator voltages to the setpoint *GtoM AngleReq*. 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.

Setpoint: Speed gov bias

Group	Sync/Load Cont
Range [units]	*SpeedGovLowLim* .. *SpeedGovHiLim* [V]
Related FW	2.0
Force value possible	YES
Description	This setpoint adjusts the initial voltage level for the speed governor output, which is present on the output, if no speed or power regulation loop is active.

Setpoint: SpdGovPWM rate

Group	Sync/Load ctrl
Range [units]	500 .. 3000 [Hz]
Related FW	2.0
Description	This setpoint adjusts the frequency of the speed governor output in PWM mode. The PWM mode of the speed governor output is activated by the jumper located next to the speed governor output terminals. The PWM interface is used for several governor types as e.g. CAT or Cummins. Adjust the PWM frequency according to the governor specification. **Adjust the setpoint to 1200Hz if the PWM interface is not used.**

Setpoint: SpeedGovLowLim

Group	Sync/Load Ctrl
Range [units]	-10.00 .. *SpeedGovHiLim* [V]
Related FW	2.0
Description	Lower limit of the speed governor output. Use this setpoint to adapt the governor output range to the input range of your governor.

Setpoint: SpeedGovHiLim

Group	Sync/Load Ctrl
Range [units]	*SpeedGovLowLim* .. 10.00 [V]
Related FW	2.0
Description	Upper limit of the speed governor output. Use this setpoint to adapt the governor output range to the input range of your governor.

Setpoint: TauSpeedActuat

Group	Sync/Load Ctrl
Range [units]	1.0 .. 300.0 [s]
Related FW	2.0
Description	This setpoint is used to adjust the trasformation ratio of the speed governor output to the pulses at the binary outputs *Speed up* and *Speed dn*. Adjust the setpoint to the pulse duration which is needed for the speed control device to travel from minimal position to the maximal position.

Setpoint: Load Ramp

Group	Sync/Load Ctrl
Range [units]	0 .. *GCB open del* [s]
Related FW	2.0
Force value possible	YES
Description	All changes of requested gen-set load (except in loadsharing mode) are not made as one step, but are ramped - i.e. the requested load is changing slowly with the rate adjusted by this setpoint. The rate is adjusted in seconds for 100% load change (from 0 to 100% of nominal power). The ramp takes place in following situations: • The gen-set has been just synchronized and is ramping up to the target load level (e.g. baseload in parallel to mains operation or average gen-set load in multiple loadsharing operation). The starting point of the ramp for this case is adjustable by the setpoint *RampStartLevel*. • The gen-set is running parallel to the mains and baseload is changed. • The gen-set is beeing unloaded before opening the GCB and stop. In this case the end load level is adjusted by setpoint *GCB Open Level* and the timeout for unloading is adjusted by setpoint *GCB Open Del*.

Setpoint: Load gain

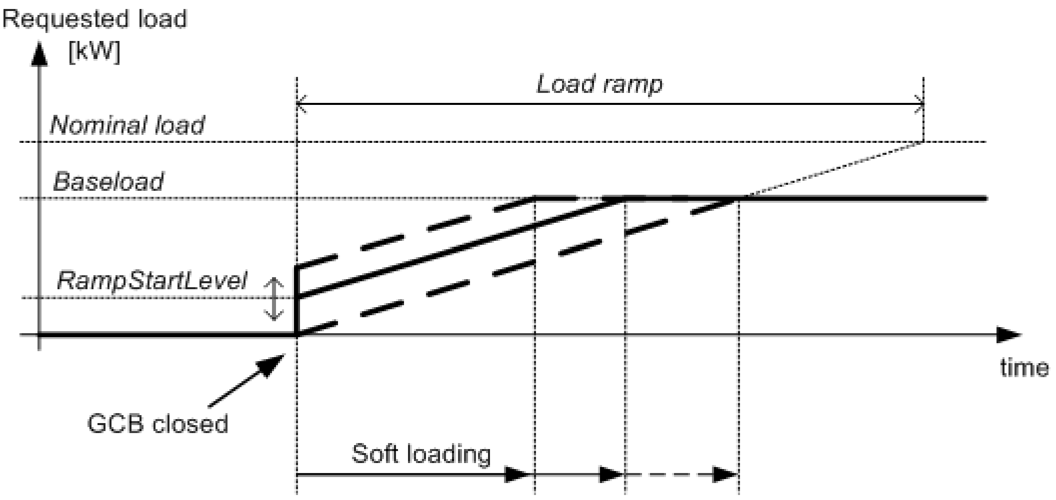
Group	Sync/Load Ctrl
Range [units]	0.0 .. 200.0 [%]
Related FW	2.0

Description	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 *Load int*. **NOTE:** See the chapter Regulation loops overview for general information about regulation loops and their adjustment.

Setpoint: Load int

Group	Sync/Load Ctrl
Range [units]	0 .. 100 [%]
Related FW	2.0
Description	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 *Load gain*.

Setpoint: RampStartLevel

Group	Sync/Load ctrl
Range [units]	0 .. 100 [%]
Related FW	2.0
Description	This setpoint adjusts the load level at which the *Load ramp* starts after the GCB has been closed. The intention of this setpoint is to give the gen-set certain "loading impulse" right after closing the GCB to avoid possible oscillations around 0kW or even reverse power if the ramp begun at 0kW. 

Setpoint: GCB open level

Group	Sync/Load Cont
Range [units]	0 .. 100 [%]
Related FW	2.0

Description	This setpoint adjusts the end point of the gen-set unloading ramp, i.e. power level at which the GCB is opened. If this level is not reached within time period adjusted by setpoint *GCB open del* the GCB is then opened regardless of the gen-set power. **NOTE:** The speed of the ramp is adjusted by the setpoint *Load ramp*.

Setpoint: GCB open del

Group	Sync/Load Ctrl
Range [units]	*Load ramp* .. 1800 [s]
Related FW	2.0
Force value possible	YES
Description	This setpoint adjusts the maximum duration of the gen-set unloading ramp. If the end point of the ramp (*GCB open level*) is not reached within time period adjusted by this setpoint the GCB is then opened regardless of the gen-set power. **NOTE:** The speed of the ramp is adjusted by the setpoint *Load ramp*.

Setpoint: Sync timeout

Group	Sync/Load Ctrl
Range [units]	1 .. 1800, NO TIMEOUT [s]
Related FW	2.0
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 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.

Setpoint: ManualFuseSync

Group	Sync/Load ctrl
Range [units]	DISABLED,ENABLED [-]
Related FW	2.0
Force value possible	YES
Description	Select controlling of MCB output when reverse synchronization is in process. ENABLED: External device controls connecting of MCB. The unlimited timeout of

	synchronization can be reached Sync/Load ctrl: *Sync timeout* = NO TIMEOUT. DISABLED: InteliGen controls MCB output.

Setpoint: LS gain

Group	Sync/Load ctrl
Range [units]	0.0 .. 200.0 [%]
Related FW	2.0
Description	This setpoint adjusts the gain factor (P-factor) of the load-sharing PI loop. The integration factor (I-factor) for the load-sharing loop is adjusted by the setpoint *LS int*. **NOTE:** See the chapter Regulation loops overview for general information about regulation loops and their adjustment.

Setpoint: LS int

Group	Sync/Load ctrl
Range [units]	0 .. 100 [%]
Related FW	2.0
Description	This setpoint adjusts the relative integration factor (I-factor) of the load-sharing PI loop. The gain factor (P-factor) for the load-sharing loop is adjusted by the setpoint *LS gain*.

Setpoint: Load droop

Group	Sync/Load ctrl
Range [units]	0 .. 20 [%]
Force value possible	YES
Related FW	2.0
Description	This setpoint defines the slope of the load droop correlation. The slope is set as a droop of frequency in percentages of the requested system frequency (**Basic settings**: *Nominal freq* + *Nom frq offset*) on the range of the requested power from 0 to 100% of **Basic settings:** *Nomin power.*

Setpoint: LdDroopOffset

Group	Sync/Load ctrl
Range [units]	0 .. 100 [%]
Force value possible	YES
Related FW	2.0
Description	This setpoint defines the value of requested power on the requested system frequency (**Basic settings**: *Nominal freq* + *Nom frq offset*). Allows to shift the

	droop correlation line up or down.

Group: Volt/PF ctrl

Setpoint: AVRRegChar

Group	Volt/PF Ctrl
Range [units]	POSITIVE, NEGATIVE [-]
Related FW	2.0
Description	This setpoint selects the characteristic of the AVRi output of the controller. Adjust it according to the behavior of the remote voltage adjustment input of your AVR: **POSITIVE** – Select this option if raising of the voltage on the remote voltage adjustment input causes the generator voltage to **raise**. **NEGATIVE** – Select this option if raising of the voltage on the remote voltage adjustment input causes the generator voltage to **lower**. **NOTE:** The characteristic can be also inverted by swapping the AVRi outputs that are connected to the AVR. However, it is recommended to use the *AVRRegChar* setpoint for selection of the characteristic instead of swapping the wires.

Setpoint: Voltage gain

Group	Volt/PF Ctrl
Range [units]	0.0 .. 200.0 [%]
Related FW	2.0
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:** See the chapter Regulation loops overview for general information about regulation loops and their adjustment.

Setpoint: Voltage Int

Group	Volt/PF Ctrl
Range [units]	0 .. 100 [%]
Related FW	2.0
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*.

Setpoint: PF gain

Group	Volt/PF Ctrl

Range [units]	0.0 .. 200.0 [%]
Related FW	2.0
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:** See the chapter Regulation loops overview for general information about regulation loops and their adjustment.

Setpoint: PF int

Group	Volt/PF Ctrl
Range [units]	0 .. 100 [%]
Related FW	2.0
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*.

Setpoint: AVR DCout bias

Group	Volt/PF Ctrl
Range [units]	0.0 .. 100.0 [%]
Related FW	2.0
Force value possible	YES
Description	This setpoint adjusts the initial level for the AVRi output. This level is present on the output if no regulation loop is active. **NOTE:** The resulting voltage at the input of the AVR also depends on position of the trimmer at the AVRi module.

Setpoint: VS gain

Group	Volt/PF ctrl
Range [units]	0.0 .. 200.0 [%]
Related FW	2.0
Description	This setpoint adjusts the gain factor (P-factor) of the VAr-sharing PI loop. The integration factor (I-factor) for the VAr-sharing loop is adjusted by the setpoint *VS int*. **NOTE:** See the chapter Regulation loops overview for general information about regulation loops and their adjustment.

Setpoint: VS int

Group	Volt/PF ctrl
Range [units]	0 .. 100 [%]
Related FW	2.0
Description	This setpoint adjusts the relative integration factor (I-factor) of the VAr-sharing PI loop. The gain factor (P-factor) for the VAr-sharing loop is adjusted by the setpoint *VS gain*.

Setpoint: TauVoltActuat

Group	Volt/PF ctrl
Range [units]	1.0 .. 300.0 [s]
Related FW	2.0
Description	This setpoint is used to adjust the trasformation ratio of the AVRi output to the pulses at the binary outputs *AVR up* and *AVR dn*. Adjust the setpoint to the pulse duration which is needed for the AVR to change the requested voltage from minimum to maximum.

Setpoint: VAr droop

Group	Sync/Load ctrl
Range [units]	0 .. 20 [%]
Force value possible	YES
Related FW	2.0
Description	This setpoint defines the slope of the VAr droop correlation. The slope is set as a droop of voltage in percentages of the generator nominal voltage (**Basic setting**s: *GenNomV*) on the range of the requested reactive power from 0 to 100% of nominal reactive power (value of nominal reactive power is not given by setpoint but it is calculated from setpoint *Nomin power* whilst the PF=0,8).

Setpoint: VArDroopOffset

Group	Sync/Load ctrl
Range [units]	0 .. 100 [%]
Force value possible	YES
Related FW	2.0
Description	This setpoint defines the value of requested reactive power on the nominal voltage (**Basic settings:** *GenNomV*). Allows to shift the droop correlation line up or down.

Group: Force value

Setpoint: Force value 1

Group	Force value

Range [units]	[-]
Related FW	2.0
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.

Setpoint: Force value 2

Group	Force value
Range [units]	[-]
Related FW	2.0
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.

Setpoint: Force value 3

Group	Force value
Range [units]	[-]
Related FW	2.0
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.

Setpoint: Force value 4

Group	Force value
Range [units]	[-]
Related FW	2.0
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.

Setpoint: Force value 5

Group	Force value
Range [units]	[-]
Related FW	2.0
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.

Setpoint: Force value 6

Group	Force value
Range [units]	[-]
Related FW	2.0
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.

Setpoint: Force value 7

Group	Force value
Range [units]	[-]
Related FW	2.0
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.

Setpoint: Force value 8

Group	Force value
Range [units]	[-]
Related FW	2.0
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.

Setpoint: Force value 9

Group	Force value
Range [units]	[-]
Related FW	2.0
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.

Setpoint: Force value 10

Group	Force value
Range [units]	[-]
Related FW	2.0
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.

Setpoint: Force value 11

Group	Force value
Range [units]	[-]
Related FW	2.0
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.

Setpoint: Force value 12

Group	Force value
Range [units]	[-]
Related FW	2.0
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.

Setpoint: Force value 13

Group	Force value

Range [units]	[-]
Related FW	2.0
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.

Setpoint: Force value 14

Group	Force value
Range [units]	[-]
Related FW	2.0
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.

Setpoint: Force value 15

Group	Force value
Range [units]	[-]
Related FW	2.0
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.

Setpoint: Force value 16

Group	Force value
Range [units]	[-]
Related FW	2.0
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.

Setpoint: ExtValue1deflt

Group	Force value
Range [units]	-32000 .. 32000 [x]
Related FW	2.0
Force value possible	YES
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*.

Setpoint: ExtValue1LoLim

Group	Force value
Range [units]	-32000 .. *ExtValue1HiLim* [X]

Related FW	2.0
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*. **NOTE:** For IS-NT only.

Setpoint: ExtValue1HiLim

Group	Force value
Range [units]	*ExtValue1LoLim* .. 32000 [X]
Related FW	2.0
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*. **NOTE:** For IS-NT only.

Setpoint: ExtValue1 rate

Group	Force value
Range [units]	1 .. 10000 [X/s]
Related FW	2.0
Force value possible	YES
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.

Setpoint: ExtValue2deflt

Group	Force value
Range [units]	-32000 .. 32000 [x]
Related FW	2.0
Force value possible	YES
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*.

Setpoint: ExtValue2LoLim

Group	Force value
Range [units]	-32000 .. *ExtValue2HiLim* [X]
Related FW	2.0
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*. **NOTE:** For IS-NT only.

Setpoint: ExtValue2HiLim

Group	Force value
Range [units]	*ExtValue2LoLim* .. 32000 [X]
Related FW	2.0
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*. **NOTE:** For IS-NT only.

Setpoint: ExtValue2 rate

Group	Force value
Range [units]	1 .. 10000 [X/s]
Related FW	2.0
Force value possible	YES
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.

Setpoint: ExtValue3deflt

Group	Force value
Range [units]	-32000 .. 32000 [x]
Related FW	2.0
Force value possible	YES
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*.

Setpoint: ExtValue3LoLim

Group	Force value
Range [units]	-32000 .. *ExtValue3HiLim* [X]
Related FW	2.0
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*. **NOTE:** For IS-NT only.

Setpoint: ExtValue3HiLim

Group	Force value
Range [units]	*ExtValue3LoLim* .. 32000 [X]
Related FW	2.0
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*. **NOTE:** For IS-NT only.

Setpoint: ExtValue3 rate

Group	Force value
Range [units]	1 .. 10000 [X/s]
Related FW	2.0
Force value possible	YES
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.

Setpoint: ExtValue4deflt

Group	Force value
Range [units]	-32000 .. 32000 [x]
Related FW	2.0
Force value possible	YES
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*.

Setpoint: ExtValue4LoLim

Group	Force value
Range [units]	-32000 .. *ExtValue4HiLim* [X]
Related FW	2.0
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*. **NOTE:** For IS-NT only.

Setpoint: ExtValue4HiLim

Group	Force value
Range [units]	*ExtValue4LoLim* .. 32000 [X]
Related FW	2.0
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*. **NOTE:** For IS-NT only.

Setpoint: ExtValue4 rate

Group	Force value
Range [units]	1 .. 10000 [X/s]
Related FW	2.0
Force value possible	YES
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.

Group: Load shedding

Setpoint: Ld shed active

Group	Load shedding
Range [units]	DISABLED, ISLAND ONLY, ISL+TRIP PARAL, ALL THE TIME [-]
Related FW	2.0
Force value possible	YES
Description	This setpoint is used for adjustment when the load shedding function will be active (see also IM-NT-MCB/MGCB help for more information on MCB/MGCB).

DISABLED	The Load shedding function is disabled. All the outputs are open.
ISLAND ONLY	In Island operation (e.g. MCB is open and MGCB is closed) Load shedding outputs (e.g. *LdShed stage 1*) are controlled by load shedding function.
ISL+TRIP PARAL	This setting adjusts the same behavior as ISLAND ONLY but in addition to it all load shedding outputs are closed when gen-set group goes to island operation. For more information see the chapter Load shedding.
ALL THE TIME	Outputs are controlled by the load shedding function regardless of breaker positions.

NOTE:

	Learn more about load shedding in the separate chapter Load shedding.

Setpoint: Ld shed level

Group	Load shedding
Range [units]	*Ld recon level* .. 200 [%]
Related FW	2.0
Force value possible	YES
Description	This setpoint is used to adjust the relative load level (in % of *nominal power* of gen-set) for load shedding. When the relative load level exceeds this level for more than *Ld shed delay* time the next load shedding output is closed. **NOTE:** Learn more about load shedding in the separate chapter Load shedding.

Setpoint: Ld shed delay

Group	Load shedding
Range [units]	0.0 .. 600.0 [s]
Related FW	2.0
Force value possible	YES
Description	This setpoint is used to adjust time period the relative load level 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.

Setpoint: Ld recon level

Group	Load shedding
Range [units]	0 .. *Ld shed level* [%]
Related FW	2.0
Force value possible	YES
Description	This setpoint is used to adjust the relative load level (in % of *nominal power* of gen-set) for load reconnection. When the relative load level drops below this level for more than *Ld recon delay* 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.

Setpoint: Ld recon del

Group	Load shedding
Range [units]	0 .. 600 [s]
Related FW	2.0
Force value possible	YES
Description	This setpoint is used to adjust time period the relative load level must be below the *Ld recon level* limit to allow reconnection of next load group. **NOTE:** Learn more about load shedding in the separate chapter Load shedding.

Setpoint: AutoLd recon

Group	Engine Protect
Range [units]	DISABLED, ENABLED [-]
Related FW	2.0
Force value possible	YES
Description	This setpoint selects whether the reconnection of the load occurs automatically when the relative load level 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.

Group: Timer settings

Setpoint: Timer channel 1

Group	Timer settings
Range [units]	[-]
Related FW	2.0
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.

Setpoint: Timer channel 2

Group	Timer settings
Range [units]	[-]
Related FW	2.0
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.

Setpoint: Timer channel 3

Group	Timer settings
Range [units]	[-]
Related FW	2.0
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.

Setpoint: Timer channel 4

Group	Timer settings
Range [units]	[-]
Related FW	2.0
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.

Setpoint: Timer channel 5

Group	Timer settings
Range [units]	[-]
Related FW	2.0
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.

Setpoint: Timer channel 6

Group	Timer settings
Range [units]	[-]
Related FW	2.0
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.

Setpoint: Timer channel 7

Group	Timer settings
Range [units]	[-]
Related FW	2.0
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.

Setpoint: Timer channel 8

Group	Timer settings
Range [units]	[-]
Related FW	2.0
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.

Setpoint: Timer channel 9

Group	Timer settings
Range [units]	[-]
Related FW	2.0
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.

Setpoint: Timer channel 10

Group	Timer settings
Range [units]	[-]
Related FW	2.0
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.

Setpoint: Timer channel 11

Group	Timer settings
Range [units]	[-]
Related FW	2.0
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.

Setpoint: Timer channel 12

Group	Timer settings
Range [units]	[-]
Related FW	2.0
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.

Setpoint: Timer channel 13

Group	Timer settings
Range [units]	[-]
Related FW	2.0
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.

Setpoint: Timer channel 14

Group	Timer settings
Range [units]	[-]
Related FW	2.0
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.

Setpoint: Timer channel 15

Group	Timer settings
Range [units]	[-]

Related FW	2.0
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.

Setpoint: Timer channel 16

Group	Timer settings
Range [units]	[-]
Related FW	2.0
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.

Group: Act. calls/SMS

Setpoint: History record

Group	Act. calls/SMS
Range [units]	DISABLED, ENABLED [-]
Related FW	2.0
Force value possible	YES
Force value possible	YES
Description	This setpoint is used to enable sending SMS and/or e-mail alerts when a "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.

Setpoint: Alarm only

Group	Act. calls/SMS
Range [units]	DISABLED, ENABLED [-]
Related FW	2.0
Force value possible	YES
Force value possible	YES
Description	This setpoint is used to enable sending SMS and/or e-mail alerts when a

	"protection" configured as *Alarm only* occurs. See the chapter Alarm management for more information about protection types.

Setpoint: Warning

Group	Act. calls/SMS
Range [units]	DISABLED, ENABLED [-]
Related FW	2.0
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.

Setpoint: Off load

Group	Act. calls/SMS
Range [units]	DISABLED, ENABLED [-]
Related FW	2.0
Force value possible	YES
Description	This setpoint is used to enable sending SMS and/or e-mail alerts when a "protection" configured as *Off load* occurs. See the chapter Alarm management for more information about protection types. **NOTE:** As the *Off load* protection does not appear in the alarmlist, the SMS or e-mail may contain empty alarmlist.

Setpoint: BrkOpen&CoolDn

Group	Act. calls/SMS
Range [units]	DISABLED, ENABLED [-]
Related FW	2.0
Force value possible	YES
Description	This setpoint is used to enable sending SMS and/or e-mail alerts when a *BrkOpen&CoolDn*-type alarm occurs. See the chapter Alarm management for more information about protection types.

Setpoint: Mains protect

Group	Act. calls/SMS
Range [units]	DISABLED, ENABLED [-]

Related FW	2.0
Force value possible	YES
Force value possible	YES
Description	This setpoint is used to enable sending SMS and/or e-mail alerts when a "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.

Setpoint: Slow stop

Group	Act. calls/SMS
Range [units]	DISABLED, ENABLED [-]
Related FW	2.0
Force value possible	YES
Description	This setpoint is used to enable sending SMS and/or e-mail alerts when a *Slow stop*-type alarm occurs. See the chapter Alarm management for more information about protection types.

Setpoint: Shutdown

Group	Act. calls/SMS
Range [units]	DISABLED, ENABLED [-]
Related FW	2.0
Force value possible	YES
Description	This setpoint is used to enable sending SMS and/or e-mail alerts when a *Shutdown*-type alarm occurs. See the chapter Alarm management for more information about protection types.

Setpoint: ShutdownOvr

Group	Act. calls/SMS
Range [units]	DISABLED, ENABLED [-]
Related FW	2.0
Force value possible	YES
Description	This setpoint is used to enable sending SMS and/or e-mail alerts when a *Sd Override*-type alarm occurs. See the chapter Alarm management for more information about protection types.

Setpoint: AcallCH1-Type

Group	Act. calls/SMS
Range [units]	[-]
Related FW	2.0
Description	The setpoint is used to specify the alert type of the active calls - channel 1. See the chapter Alarm messaging for more details.

Setpoint: AcallCH1-Addr

Group	Act. calls/SMS
Range [units]	[-]
Related FW	2.0
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.

Setpoint: AcallCH2-Type

Group	Act. calls/SMS
Range [units]	[-]
Related FW	2.0
Description	The setpoint is used to specify the alert type of the active calls - channel 2. See the chapter Alarm messaging for more details.

Setpoint: AcallCH2-Addr

Group	Act. calls/SMS
Range [units]	[-]
Related FW	2.0
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.

Setpoint: AcallCH3-Type

Group	Act. calls/SMS
Range [units]	[-]
Related FW	2.0
Description	The setpoint is used to specify the alert type of the active calls - channel 3. See the chapter Alarm messaging for more details.

Setpoint: AcallCH3-Addr

Group	Act. calls/SMS
Range [units]	[-]
Related FW	2.0
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.

Setpoint: AcallCH4-Type

Group	Act. calls/SMS
Range [units]	[-]
Related FW	2.0
Description	The setpoint is used to specify the alert type of the active calls - channel 4. See the chapter Alarm messaging for more details.

Setpoint: AcallCH4-Addr

Group	Act. calls/SMS
Range [units]	[-]
Related FW	2.0
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.

Setpoint: AcallCH5-Type

Group	Act. calls/SMS
Range [units]	[-]
Related FW	2.0
Description	The setpoint is used to specify the alert type of the active calls - channel 5. See the chapter Alarm messaging for more details.

Setpoint: AcallCH5-Addr

Group	Act. calls/SMS
Range [units]	[-]
Related FW	2.0
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.

Setpoint: NumberRings AA

Group	Act. calls/SMS
Range [units]	1 .. 30 [-]
Related FW	2.0
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.

Setpoint: ActCallAttempt

Group	Act. calls/SMS
Range [units]	1 .. 250 [-]
Related FW	2.0
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.

Setpoint: Acall+SMS lang

Group	Act. calls/SMS
Range [units]	1 .. 7 [-]
Related FW	2.0
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.

Group: Date/Time

Setpoint: Time stamp act

<table>
<tr><td>Group</td><td>Date/Time</td></tr>
<tr><td>Range [units]</td><td>DISABLED, ENGINE RUNNING, ALWAYS [-]</td></tr>
<tr><td>Related FW</td><td>2.0</td></tr>
<tr><td>Description</td><td>The setpoint selects the <i>Time stamp</i> function mode.
<table>
<tr><td>DISABLED</td><td>The function is disabled.</td></tr>
<tr><td>ENGINE RUNNING</td><td>While the engine is running the <i>Time stamps</i> records are recorded into the history log with period adjusted by setpoint</td></tr>
</table>
</td></tr>
</table>

<table>
<tr><td></td><td>
<table>
<tr><td></td><td><i>Time Stamp Per</i>.</td></tr>
<tr><td>ALWAYS</td><td>The <i>Time stamps</i> records are recorded into the history log with period adjusted by setpoint <i>Time Stamp Per</i> all the time while the controler is switched on.</td></tr>
</table>
</td></tr>
</table>

Setpoint: Time Stamp Per

Group	Date/Time
Range [units]	1 .. 240 [min]
Related FW	2.0
Description	The setpoint adjusts the time interval for *Time stamp* records. See also the setpoint *Time stamp act*.

Setpoint: #SummerTimeMod

<table>
<tr><td>Group</td><td>Date/Time</td></tr>
<tr><td>Range [units]</td><td>DISABLED, WINTER, SUMMER, WINTER-S, SUMMER-S [-]</td></tr>
<tr><td>Related FW</td><td>2.0</td></tr>
<tr><td>Description</td><td>The setpoint is used to select the mode of automatic daylight saving time change.
<table>
<tr><td>DISABLED</td><td>The automatic change to daylight saving time and back is disabled.</td></tr>
<tr><td>WINTER</td><td>The automatic change is enabled, the current season is winter and the controller is located in the northern hemisphere.</td></tr>
<tr><td>SUMMER</td><td>The automatic change is enabled, the current season is summer and the controller is located in the northern hemisphere.</td></tr>
<tr><td>WINTER-S</td><td>The automatic change is enabled, the current season is winter and the controller is located in the southern hemisphere.</td></tr>
<tr><td>SUMMER-S</td><td>The automatic change is enabled, the current season is summer and the controller is located in the southern hemisphere.</td></tr>
</table>
</td></tr>
</table>

Setpoint: #Time

Group	Date/Time
Range [units]	[HH:MM:SS]
Related FW	2.0
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: Setpoint with the symbol # are synchronized between controllers.

Setpoint: #Date

Group	Date/Time
Range [units]	[dd.mm.yyyy]
Related FW	2.0
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:** Setpoint with the symbol # are synchronized between controllers.

Table of values

Group: Engine values

Value: RPM

Group	Engine values
Units	1/min
Related FW	2.0
Description	Current engine speed. See the chapter Engine speed measurement for details about speed measurement methods.

Value: T Cyl aver

Group	Engine values
Units	°C
Related FW	2.0
Description	The value contains average cylinder temperature, i.e. average of all configured logical analog inputs *Cyl temp 1* ... *Cyl temp 32* **NOTE:** Available in IS-NT only.

Value: T Cyl max

Group	Engine values
Units	°C

Related FW	2.0
Description	The value contains the maximum of all cylinder temperatures, i.e. maximum of all configured logical analog inputs *Cyl temp 1* ... *Cyl temp 32* **NOTE:** The value is intended for creating the "high cylinder temperature" alarm using an universal analog protection. There is a special wizard at the I/O tab in GenConfig which makes the configuration of cylinder temperatures easy. **NOTE:** Available in IS-NT only.

Value: T Cyl min

Group	Engine values
Units	°C
Related FW	2.0
Description	The value contains the minimus of all cylinder temperatures, i.e. maximum of all configured logical analog inputs *Cyl temp 1* ... *Cyl temp 32* **NOTE:** The value is intended for creating the "misfiring cylinder" alarm using an universal analog protection. **NOTE:** Available in IS-NT only.

Group: Gener values

Value: Act power

Group	Generator
Units	kW
Related FW	2.0
Description	Generator total active power.

Value: Act pwr L1

Group	Gener values
Units	kW
Related FW	2.0
Description	Generator active power in phase L1.

Value: Act pwr L2

Group	Gener values
Units	kW
Related FW	2.0
Description	Generator active power in phase L2.

Value: Act pwr L3

Group	Gener values
Units	kW
Related FW	2.0
Description	Generator active power in phase L3.

Value: React power

Group	Gener values
Units	kVAr
Related FW	2.0
Description	Generator total reactive power.

Value: React pwr L1

Group	Gener values
Units	kVAr
Related FW	2.0
Description	Generator reactive power in phase L1.

Value: React pwr L2

Group	Gener values
Units	kVAr
Related FW	2.0
Description	Generator reactive power in phase L2.

Value: React pwr L3

Group	Gener values
Units	kVAr
Related FW	2.0
Description	Generator reactive power in phase L3.

Value: Appar pwr

Group	Gener values
Units	kVA
Related FW	2.0
Description	Generator total apparent power.

Value: Appar pwr L1

Group	Gener values
Units	kVA

Related FW	2.0
Description	Generator apparent power in phase L1.

Value: Appar pwr L2

Group	Gener values
Units	kVA
Related FW	2.0
Description	Generator apparent power in phase L2.

Value: Appar pwr L3

Group	Gener values
Units	kVA
Related FW	2.0
Description	Generator apparent power in phase L3.

Value: Pwr factor

Group	Gener values
Units	-
Related FW	2.0
Description	Generator 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.

Value: Load char

Group	Gener values
Units	-
Related FW	2.0
Description	Character of the generator load. "L" means inductive load, "C" is capacitive and "R" is resistive load (power factor = 1).

Value: Pwr factor L1

Group	Gener values
Units	-
Related FW	2.0
Description	Generator power factor in phase L1.

Value: Load char L1

Group	Gener values
Units	-
Related FW	2.0
Description	Character of the generator load in the L1 phase. "L" means inductive load, "C" is capacitive and "R" is resistive load (power factor = 1).

Value: Pwr factor L2

Group	Gener values
Units	-
Related FW	2.0
Description	Generator power factor in phase L2.

Value: Load char L2

Group	Gener values
Units	-
Related FW	2.0
Description	Character of the generator load in the L2 phase. "L" means inductive load, "C" is capacitive and "R" is resistive load (power factor = 1).

Value: Pwr factor L3

Group	Gener values
Units	-
Related FW	2.0
Description	Generator power factor in phase L3.

Value: Load char L3

Group	Gener values
Units	-
Related FW	2.0
Description	Character of the generator load in the L3 phase. "L" means inductive load, "C" is capacitive and "R" is resistive load (power factor = 1).

Value: Gen freq

Group	Gener values
Units	Hz
Related FW	2.0
Description	Generator frequency. The frequency is measured in the phase L3.

Value: Gen V L1-N

Group	Gener values

Units	V
Related FW	2.0
Description	Generator voltage in phase L1. **NOTE:** The ratio between the voltage measured at the input terminals and the displayed voltage is adjusted by the setpoint *VT ratio*.

Value: Gen V L2-N

Group	Gener values
Units	V
Related FW	2.0
Description	Generator voltage in phase L2. **NOTE:** The ratio between the voltage measured at the input terminals and the displayed voltage is adjusted by the setpoint *VT ratio*.

Value: Gen V L3-N

Group	Gener values
Units	V
Related FW	2.0
Description	Generator voltage in phase L3. **NOTE:** The ratio between the voltage measured at the input terminals and the displayed voltage is adjusted by the setpoint *VT ratio*.

Value: Gen V

Group	Gener values
Units	V
Related FW	2.0
Description	Generator 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 *VT ratio*.

Value: Gen V L1-L2

Group	Gener values
Units	V
Related FW	2.0
Description	Generator voltage between phases L1 and L2. **NOTE:** The ratio between the voltage measured at the input terminals and the displayed voltage is adjusted by the setpoint *VT ratio*.

Value: Gen V L2-L3

Group	Gener values
Units	V
Related FW	2.0
Description	Generator voltage between phases L2 and L3. **NOTE:** The ratio between the voltage measured at the input terminals and the displayed voltage is adjusted by the setpoint *VT ratio*.

Value: Gen V L3-L1

Group	Gener values
Units	V
Related FW	2.0
Description	Generator voltage between phases L3 and L1. **NOTE:** The ratio between the voltage measured at the input terminals and the displayed voltage is adjusted by the setpoint *VT ratio*.

Value: Gen curr L1

Group	Gener values
Units	A
Related FW	2.0
Description	Generator current in phase L1. **NOTE:** The ratio between the current measured at the input terminals and the displayed current is adjusted by the setpoints *CT ratio prim* and *CT ratio sec*.

Value: Gen curr L2

Group	Gener values
Units	A
Related FW	2.0
Description	Generator current in phase L2. **NOTE:** The ratio between the current measured at the input terminals and the displayed current is adjusted by the setpoints *CT ratio prim* and *CT ratio sec*.

Value: Gen curr L3

Group	Gener values
Units	A
Related FW	2.0

Description	Generator current in phase L3. **NOTE:** The ratio between the current measured at the input terminals and the displayed current is adjusted by the setpoints *CT ratio prim* and *CT ratio sec*.

Value: Gen V unbal

Group	Gener values
Units	%
Related FW	2.0
Description	Generator 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 generator voltage unbalance protection using the "universal analog protections".

Value: Gen I unbal

Group	Gener values
Units	V
Related FW	2.0
Description	Generator 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 generator current unbalance protection using the "universal analog protections".

Value: Slip freq

Group	Gener values
Units	Hz
Related FW	2.0
Description	Differential frequency between the generator and the mains/bus.

Value: Angle

Group	Gener values
Units	°
Related FW	2.0
Description	The angle between the phasors of the generator and mains/bus voltage.

Group: Mains/Bus values

Value: Mains freq

Group	Mains values
Units	Hz

Related FW	2.0
Description	Mains frequency. The frequency is measured in the phase L3.

Value: Bus freq

Group	Bus values
Units	Hz
Related FW	2.0
Description	Bus frequency. The frequency is measured in the phase L3.

Value: Mains V L1-N

Group	Mains values
Units	V
Related FW	2.0
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*.

Value: Bus V L1-N

Group	Bus values
Units	V
Related FW	2.0
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 *Vb VT ratio*.

Value: Mains V L2-N

Group	Mains values
Units	V
Related FW	2.0
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*.

Value: Bus V L2-N

Group	Bus values
Units	V
Related FW	2.0
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 *Vb VT ratio*.

Value: Mains V L3-N

Group	Mains values
Units	V
Related FW	2.0
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*.

Value: Bus V L3-N

Group	Bus values
Units	V
Related FW	2.0
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 *Vb VT ratio*.

Value: Mains V

Group	Mains values
Units	V
Related FW	2.0
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*.

Value: Bus V

Group	Bus values
Units	V
Related FW	2.0
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 *Vb VT ratio*.

Value: Mains V L1-L2

Group	Mains values
Units	V
Related FW	2.0
Description	Mains voltage phase L1 to L2.

Value: Bus V L1-L2

Group	Bus values
Units	V
Related FW	2.0
Description	Bus voltage phase L1 to L2.

Value: Mains V L2-L3

Group	Mains values
Units	V
Related FW	2.0
Description	Mains voltage phase L2 to L3.

Value: Bus V L2-L3

Group	Bus values
Units	V
Related FW	2.0
Description	Bus voltage phase L2 to L3.

Value: Mains V L3-L1

Group	Mains values
Units	V
Related FW	2.0
Description	Mains voltage phase L3 to L1.

Value: Bus V L3-L1

Group	Bus values
Units	V
Related FW	2.0
Description	Bus voltage phase L3 to L1.

Value: Mains V unbal

Group	Mains values
Units	V
Related FW	2.0
Description	Mains voltage unbalance. The value is calculated as maximal difference of two phase voltages at one moment and expressed in % of the mains nominal voltage.

Value: Im3/EarthFC

Group	Mains values
Units	A
Related FW	2.0
Description	This value contains the current measured at the current input labeled "IN". This

	input is used either for measurement of the mains current in phase L3 or for earth fault current. The function depends on the setpoint *I/E-Pm meas*. **NOTE:** The ratio between the current measured at the input terminals and the displayed current is adjusted by the setpoints *Im3/ErFlCurCTp* and *Im3/ErFlCurCTs*.

Value: EarthFC

Group	Bus values
Units	A
Related FW	2.0
Description	This value contains the current measured at the current input labeled "IN". This input is used for measurement of the earth fault current. **NOTE:** The ratio between the current measured at the input terminals and the displayed current is adjusted by the setpoints *Im3/ErFlCurCTp* and *Im3/ErFlCurCTs*.

Value: P mains

Group	Mains values
Units	kW
Related FW	2.0
Description	Actual active power imported from the mains. Method of the mains import measurement is adjusted by the setpoint *I/E-Pm meas*.

Value: Q mains

Group	Mains values
Units	kVAr
Related FW	2.0
Description	Actual reactive power imported from the mains. Method of the mains import measurement is adjusted by the setpoint *I/E-Qm meas*.

Value: Mains PF

Group	Mains values
Units	-
Related FW	2.0
Description	Cos-phi factor at the mains inlet.

Value: Mains LChr

Group	Mains values
Units	-

Related FW	2.0
Description	Character of the load as it is seen from the mains side at the mains inlet. "L" means inductive load, "C" is capacitive and "R" is resistive load.

Value: Object P

Group	Mains values
Units	kW
Related FW	2.0
Description	Actual active power consumed by the object. This value is calculated as sum of the *genset active power* and the *active power imported from the mains*.

Value: Object Q

Group	Mains values
Units	kVAr
Related FW	2.0
Description	Actual reactive power consumed by the object. This value is calculated as sum of the *genset reactive power* and the *reactive power imported from the mains*.

Value: Object PF

Group	Mains values
Units	-
Related FW	2.0
Description	Cos-phi factor at the load. This value is computed indirectly from the values *Object P* and *Object Q*.

Value: Object LChr

Group	Mains values
Units	-
Related FW	2.0
Description	Character of the object load. This value is computed indirectly from the values *Object P* and *Object Q*.

Value: MaxVectorS

Group	Mains values
Units	°
Related FW	2.0
Description	This is maximal measured value of vector shift of the generator voltage. The value is reset to 0 automatically in the moment of closing the GCB.

Value: Mains Avg V1

Group	Mains values
Units	V
Related FW	2.0
Description	This value shows average Mains voltage in phase L1.

Value: Bus Avg V1

Group	Bus values
Units	V
Related FW	2.0
Description	This value shows average Bus voltage in phase L1.

Value: Mains Avg V2

Group	Mains values
Units	V
Related FW	2.0
Description	This value shows average Mains voltage in phase L2.

Value: Bus Avg V2

Group	Bus values
Units	V
Related FW	2.0
Description	This value shows average Bus voltage in phase L2.

Value: Mains Avg V3

Group	Mains values
Units	V
Related FW	2.0
Description	This value shows average Mains voltage in phase L3.

Value: Bus Avg V3

Group	Bus values
Units	V
Related FW	2.0
Description	This value shows average Bus voltage in phase L3.

Value: ROCOF

Group	Mains values / Bus values
Units	Hz/s
Related FW	2.0
Description	This value shows actual measured value of ROCOF.

Value: Max ROCOF

Group	Mains values / Bus values
Units	Hz/s
Related FW	2.0
Description	This value shows maximal measured value of ROCOF.

Group: Power management

Value: EnginePriority

Group	Pwr management
Units	-
Related FW	2.0
Description	This value shows current priority number. It corresponds to the setpoint *Priority* except following situations: • If at least one of binary inputs *Priority SW "X"* is configured on some source and is active then the actual gen-set priority is given by the combination of these inputs. • If a *force value function* is configured at the *Priority* setpoint and the forcing binary input is active, the actual gen-set priority is given by the alternative setting from the force value function. • If the Gen-set size optimalization is active then the actual priority is given by the optimalization function.

Value: Act Reserve

Group	Pwr management
Units	-
Related FW	2.0
Description	Actual absolute reserve.

Value: Reserve

Group	Pwr management
Units	-
Related FW	2.0
Description	Actual absolute reserve for start. This value contains a copy of the setpoint *#LoadResStrt* from the currently selected reserve set.

Value: Reserve Stp

Group	Pwr management
Units	kX
Related FW	2.0
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.

Value: ActRes rel

Group	Power management
Units	%
Related FW	2.0
Description	Actual relative reserve.

Value: Res rel

Group	Power management
Units	%
Related FW	2.0
Description	Actual relative reserve for start. This value contains a copy of the setpoint *#%LdResStrt* from the currently selected reserve set.

Value: ResStp rel

Group	Power management
Units	%
Related FW	2.0
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: *[Nominal power of gen-set which is next to be stopped + ((%LdResStp/100) * Sum of nominal powers of gen-sets loaded in power management except the one which is next to be stopped)]/(Sum of nominal powers of gen-sets loaded in power management)*. #%LdResStop is used from the currently selected reserve set.

Value: MinR PWR

Group	Power management
Units	kW
Related FW	2.0
Description	Currently active Minimal Running Power level. If the value contains 0 the minimal running power function is disabled.

Group: Sync/Load ctrl

Value: ActPwrReq

Group	Sync/Load ctrl
Units	kW
Related FW	2.0
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.

Value: SpdRegOut

Group	Sync/Load ctrl
Units	V
Related FW	2.0
Description	This is the actual voltage on the speed governor output of the controller. In case the output is switched to PWM mode, the relation is 10V ~ 100% PWM.

Value: Speed request

Group	Sync/Load ctrl
Units	%
Related FW	2.0
Description	This value contains the speed control signal expressed in %. This value is used for digital interfacing (via a communication bus) with ECUs that require the requested speed in %. The relation between *Speed request* and *SpdRegOut* is following: • 0% is sent for SpeedRegOut = -10V • 100% is sent for SpeedRegOut = 10V **NOTE:** Most of ECU units use the J1939 TSC1 frame for speed control, where the requested speed is expressed directly in RPM. Use the value *SpeedReq RPM* for this purpose.

Value: SpeedReq RPM

Group	Sync/Load ctrl
Units	RPM
Related FW	2.0
Description	This value contains the speed which is currently requested by the controller from the attached ECU. This value is used for digital interfacing (via a communication bus) with ECUs that require the requested speed directly in RPM. The relation between *SpeedReq RPM* and *Speed request* is following: • 0.9 * Nominal RPM is sent for 0% • 1.1 * Nominal RPM is sent for 100%

Value: RegEngineSpeed

Group	Sync/Load ctrl
Units	RPM
Related FW	2.0
Description	This value contains an exact copy of the required speed which is beeing sent to the ECU (e.g. in the TSC1 frame). It is intended for checking if the speed regulation chain is configured properly.

Value: SystLoadCtrl

Group	Sync/Load ctrl
Units	-
Related FW	2.0
Description	Code of the current load control mode. The description how to obtain the text representation of each code can be found at the value *Engine state*.

Value: TotRunPact Q

Group	Pwr management
Units	kVAr
Related FW	2.0
Description	Sum of **reactive** power of all gen-sets within the group that are connected to the bus.

Value: TotRunPact P

Group	Pwr management
Units	kW
Related FW	2.0
Description	Sum of **active** power of all gen-sets within the group that are connected to the bus.

Value: netPgnomPh

Group	Pwr management
Units	kW
Related FW	2.0
Description	Sum of **nominal** power of all gen-sets within the group that are connected to the bus.

Group: Volt/PF ctrl

Value: VoltRegOut

Group	Volt/PF ctrl
Units	%
Related FW	2.0

Description	This is the actual PWM percentage on the AVRi output of the controller.

Value: SystPfCtrl

Group	Volt/PF ctrl
Units	-
Related FW	2.0
Description	Code of the current power factor control mode. The description how to obtain the text representation of each code can be found at the value *Engine state*.

Group: Force value

Value: ExtValue1

Group	Force value
Units	-
Related FW	2.0
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 is required to be running in parallel-to-mains mode at constant load level (baseload), however the 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 *LdCtrl:AnExBld* 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 *Load ctrl PtM* to ANEXT BASELOAD. 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).

Value: ExtValue2

Group	Force value
Units	-

Related FW	2.0
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. See an example at the object *ExtValue1*.

Value: ExtValue3

Group	Force value
Units	-
Related FW	2.0
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. See an example at the object *ExtValue1*.

Value: ExtValue4

Group	Force value
Units	X
Related FW	2.0
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. See an example at the object *ExtValue1*.

Group: Load shedding

Value: StatLdShed

Group	Load shedding
Units	-
Related FW	2.0
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.

Group: Analog CU

Value: UBat

Group	Analog CU
Units	V
Related FW	2.0
Description	Voltage at the controller power supply terminals.

Value: CPU Temp

Group	Analog CU
Units	ºC
Related FW	2.0
Description	Temperature inside the controller (on the CPU).

Value: D+

Group	Analog CU
Units	V
Related FW	2.0
Description	Voltage measured at the D+ terminal. If this voltage is > 80% of the *Ubat* the D+ terminal is evaluated as active and the engine is evaluated as running. See also the chapter Start sequence.

Value: AIN CU-1

Group	Analog CU
Units	configurable
Related FW	2.0
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.

Value: AIN CU-2

Group	Analog CU
Units	configurable
Related FW	2.0
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.

Value: AIN CU-3

Group	Analog CU
Units	configurable
Related FW	2.0
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.

Value: AIN CU-4

Group	Analog CU
Units	configurable
Related FW	2.0
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.

Group: Bin inputs CU

Value: BIN

Group	Bin inputs CU
Units	-
Related FW	2.0
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.

Group: Bin outputs CU

Value: BOUT

Group	Bin outputs CU
Units	-
Related FW	2.0
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.

Group: Log Bout

Value: LogBout 1

Group	Log bout
Units	-
Related FW	2.0
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.

Value: LogBout 2

Group	Log bout
Units	-
Related FW	2.0
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.

Value: LogBout 3

Group	Log bout
Units	-
Related FW	2.0
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.

Value: LogBout 4

Group	Log bout
Units	-
Related FW	2.0
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.

Value: LogBout 5

Group	Log bout
Units	-
Related FW	2.0
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.

Value: LogBout 6

Group	Log bout
Units	-
Related FW	2.0
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.

Value: LogBout 7

Group	Log bout
Units	-
Related FW	2.0
Description	This is a bit array containing status of logical binary outputs 97-112 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.

Value: LogBout 8

Group	Log bout
Units	-
Related FW	2.0
Description	This is a bit array containing status of logical binary outputs 113-128 of the controller. Bit0 represents LBO113, bit1 represents LBO114 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.

Value: LogBout 9

Group	Log bout
Units	-
Related FW	2.0
Description	This is a bit array containing status of logical binary outputs 128-143 of the controller. Bit0 represents LBO128, bit1 represents LBO129 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.

Value: RemoteControl

Group	Log bout
Units	-
Related FW	2.0
Description	This is a bit array containing status of the binary outputs *Remote control1* ... *Remote control8*.

Group: Info

Value: Controller mode

Group	Info
Units	-
Related FW	2.0
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*.

Value: SW Version

Group	Info
Units	-
Related FW	2.0
Description	Major and minor firmware version number. E.g. value "2,4" means version 2.4. Release version number is not included.

Value: Application

Group	Info
Units	-
Related FW	2.0
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.

Value: SW Branch

Group	Info
Units	-
Related FW	2.0
Description	Firmware branch code. Contains 1 in case of standard branches.

Value: PasswordDecode

Group	Info
Units	-
Related FW	2.0
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.

Value: CAN16

Group	Info
Units	-
Related FW	2.0

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".

Value: CAN32

Group	Info
Units	-
Related FW	2.0
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".

Value: Reg16

Group	Info
Units	-
Related FW	2.0
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.

Value: Reg32

Group	Info
Units	-
Related FW	2.0
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.

Value: GL16

Group	Info
Units	-
Related FW	2.0
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.

Value: GL32

Group	Info

Units	-
Related FW	2.0
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.

Value: Combi select

Group	Info
Units	-
Related FW	2.0
Description	This value indicates which application is currently selected in Combi application.

Value: Engine state

Group	Info
Units	-
Related FW	2.0
Description	Code of the current state of the engine control. The text representation of each code can be obtained following way: 1. Open the archive in GenConfig and use the function File -> Generate Cfg Image -> Comm. objects to create a list of all communication objects. 2. Open the file, find the row containing this value and look for the column "Type". The column "Type" contains reference to a list of codes and their representations located in the bottom part of the file.

Value: Breaker state

Group	Info
Units	-
Related FW	2.0
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 *Engine state*.

Value: Timer text

Group	Info
Units	-
Related FW	2.0
Description	Code of the currently running system process timer. The text representation of each code can be obtained by the procedure described at the value *Engine state*. Remaining time of the timer is available in the value *Timer val*.

Value: Timer val

Group	Info

Units	-
Related FW	2.0
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*.

Value: ECU DiagSource

Group	Info
Units	-
Related FW	2.0
Description	This value indicates from which source the ECU diagnostic messages are beeing received. The source depends on ECU type.

Value: NextTime1-4

Group	Info
Units	-
Related FW	2.0
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.

Value: NextDate1-4

Group	Info
Units	-
Related FW	2.0
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.

Value: NextTime5-8

Group	Info
Units	-
Related FW	2.0
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.

Value: NextDate5-8

Group	Info
Units	-
Related FW	2.0
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.

Value: NextTime9-12

Group	Info
Units	-
Related FW	2.0
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.

Value: NextDate9-12

Group	Info
Units	-
Related FW	2.0
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.

Value: NextTime13-16

Group	Info
Units	-
Related FW	2.0
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.

Value: NextDate13-16

Group	Info
Units	-

Related FW	2.0
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.

Value: AirGate ID

Group	Info
Units	-
Related FW	2.0
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.

Value: AirGate status

Group	Info
Units	-
Related FW	2.0
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.

Value: Latitude

Group	Info
Units	-
Related FW	2.0
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.

Value: Longitude

Group	Info
Units	-

Related FW	2.0
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.

Group: Statistics

Value: kWhours

Group	Statistics
Units	kWh
Related FW	2.0
Description	Active energy counter. **NOTE:** The counter can be readjusted/reset from InteliMonitor menu Monitor -> Set statistics.

Value: kVArhours

Group	Statistics
Units	kVAh
Related FW	2.0
Description	Reactive energy counter. **NOTE:** The counter can be readjusted/reset from InteliMonitor menu Monitor -> Set statistics.

Value: Run Hours

Group	Statistics
Units	h
Related FW	2.0
Description	Engine operation hours counter. If an ECU is configured and it provides engine hours value, the value is taken from ECU. If the value is not available from the ECU or ECU is not configured, the engine hours are incremented in the controller while the engine is running. **NOTE:** The counter can be readjusted/reset from InteliMonitor menu Monitor -> Set statistics.

Value: Num starts

Group	Statistics
Units	-
Related FW	2.0

Description	Engine start commands counter. The counter is increased by 1 even if the particular start command will take more than one attempt. **NOTE:** The counter can be readjusted/reset from InteliMonitor menu Monitor -> Set statistics.

Value: NumUnsc start

Group	Statistics
Units	-
Related FW	2.0
Description	Unsuccessful starts counter. The counter is incremented always when *Start fail* alarm is issued. **NOTE:** The counter can be readjusted/reset from InteliMonitor menu Monitor -> Set statistics.

Value: Service time 1

Group	Statistics
Units	h
Related FW	2.0
Description	This is maintenance countdown timer #1. The timer is located in setpoints (group Engine protect) as well as in values (group Statistics). Adjust the timer to the requested maintenance interval. It will be then decremented while the gen-set is running. The alarm *WrnServiceTime* is issued as soon as the timer counts down to zero.

Value: Service time 2

Group	Statistics
Units	h
Related FW	2.0
Description	This is maintenance countdown timer #2. The timer is located in setpoints (group Engine protect) as well as in values (group Statistics). Adjust the timer to the requested maintenance interval. It will be then decremented while the gen-set is running. The alarm *WrnServiceTime* is issued as soon as the timer counts down to zero.

Value: Service time 3

Group	Statistics
Units	h
Related FW	2.0
Description	This is maintenance countdown timer #3. The timer is located in setpoints (group Engine protect) as well as in values (group Statistics). Adjust the timer to the requested maintenance interval. It will be then decremented while the gen-set is

	running. The alarm *WrnServiceTime* is issued as soon as the timer counts down to zero.

Value: Service time 4

Group	Statistics
Units	h
Related FW	2.0
Description	This is maintenance countdown timer #4. The timer is located in setpoints (group Engine protect) as well as in values (group Statistics). Adjust the timer to the requested maintenance interval. It will be then decremented while the gen-set is running. The alarm *WrnServiceTime* is issued as soon as the timer counts down to zero.

Value: TotalDownTime

Group	Statistics
Units	h
Related FW	2.0
Description	This counter counts while the controller is in "not ready" state, i.e. it can not be started. The reason of the "not ready" state may be either some 2nd level alarm or the controller switched in OFF mode. **NOTE:** The counter can be readjusted/reset from InteliMonitor menu Monitor -> Set statistics.

Value: DnTimeReqToRun

Group	Statistics
Units	h
Related FW	2.0
Description	This counter counts while the controller is in "not ready" state (see the value *Total downtime*) and there is a request for the gen-set to run. **NOTE:** The counter can be readjusted/reset from InteliMonitor menu Monitor -> Set statistics.

Value: PulseCounter 1

Group	Statistics
Units	-
Related FW	2.0
Description	This is the value of *PulseCounter #1* module. See the binary input *PulseCounter 1*.

Value: PulseCounter 2

Group	Statistics
Units	-
Related FW	2.0
Description	This is the value of *PulseCounter #2* module. See the binary input *PulseCounter 2*. **NOTE:** Available in IS-NT only.

Value: PulseCounter 3

Group	Statistics
Units	-
Related FW	2.0
Description	This is the value of *PulseCounter #3* module. See the binary input *PulseCounter 3*. **NOTE:** Available in IS-NT only.

Value: PulseCounter 4

Group	Statistics
Units	-
Related FW	2.0
Description	This is the value of *PulseCounter #4* module. See the binary input *PulseCounter 4*. **NOTE:** Available in IS-NT only.

Table of binary input functions

Binary input: GCB feedback

Related FW	2.0
Description	This input is used for connection of the normally open feedback contact from the generator circuit breaker or contactor. If the input is active, the controller will consider the GCB as closed and vice versa. • If the feedback does not respond to a change of the control output *GCB close/open* within 2s, the alarm *GCB Fail* will be issued. • If the feedback changes it's position unexpectedly without any command given by the control output, the alarm *GCB Fail* will be issued immediately.

	NOTE: This input is obligatory.

Binary input: MCB feedback

Related FW	2.0
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).

Binary input: Rem Start/Stop

Related FW	2.0
Description	Use this input to turn the gen-set on and off in AUT mode. The gen-set will perform the complete start-up procedure up to taking the load automatically when the input is activated and then the complete stop procedure when the input is deativated. **NOTE:** The gen-set may stay running even if the input is deactivated. This will occur if there is another condition for the gen-set to be running like AMF condition etc.

Binary input: Sys start/stop

Related FW	2.0
Description	This input is used to activate and dectivate the praticular gen-set within the group. Reaction of the controller to a change of this input is delayed by setpoints *#SysAMFstrtDel* and *#SysAMFstopDel*. • If the input is active, the gen-set in AUT mode takes active part in the power management of the group, i.e. starts and stops automaticaly according to the load. **NOTE:** If the power management is disabled by the *Pwr Management* setpoint, the gen-set excluded from the power management and starts and stops only according to position of this input. • If the input is not active, the gen-set is always stopped in AUT mode.

	NOTE: This input is usually wired parallel into all controllers within the group to activate and deactivate all the gen-sets in the group by one switch (signal). If you want to deactivate one particular genset, switch it out from AUT mode.

Binary input: Emergency Stop

Related FW	2.0
Description	If the input is activated, engine shutdown is immediately performed. However, the controller behavior is slightly different compared to other shutdown alarms: • Outputs *Ignition*, *Ventilation*, *Cooling pump* and *Prelubr pump* are deactivated as well. • This input cannot be overridden with the input *Sd override*. **NOTE:** Because of safety reasons it is recommended to configure this input as *Normally closed* and use a NC switch. **CAUTION!** This is a software function only. It can be extended by a "hard-wired" emergency stop function, which means disconnecting power supply from the controller outputs.

Binary input: Test on load

Related FW	2.0
Description	This input is used to force the genset to take over the load in TEST mode. **NOTE:** This logical input can be configured together with the input *Remote TEST* onto one controller terminal and then the "test with load" function can be activated by one signal. That means e.g. if a mains supply interruption is expected, the controller can be forced to start, take the load over and disconnect the mains prior to the interruption occurs. Then, after the mains has been restored, the signal is removed and the controller transfers the load back to the mains.

Binary input: SPI enable

Related FW	2.0
Description	This binary input, together with the input *MultipleEnable* are used to select the application mode. APPLICATION MODE SELECTION TABLE

	SPI ENABLE	***MULTIPLEENABLE***
SPTM	Open	Open
SPI	Closed	Open
MINT	x	Closed

	NOTE: A change of the application mode is accepted when **the controller is powered-on** or while it is in **emergency manual** mode. If you need to change the application mode without switching the controller off switch the controller to *Emerg. manual*, then change the application and finally switch the emergency manual off.

Binary input: MultipleEnable

Related FW	2.0
Description	This binary input, together with the input *SPI Enable* are used to select the application mode. APPLICATION MODE SELECTION TABLE (see table below) **NOTE:** A change of the application mode is accepted when **the controller is powered-on** or while it is in **emergency manual** mode. If you need to change the application mode without switching the controller off switch the controller to *Emerg. manual*, then change the application and finally switch the emergency manual off.

APPLICATION MODE SELECTION TABLE

	SPI ENABLE	*MULTIPLEENABLE*
SPTM	Open	Open
SPI	Closed	Open
MINT	x	Closed

Binary input: REMOTE: Remote off

Related FW	2.0
Description	The controller is forced into OFF mode while this input is active and the genset is not running. The controller will return into the previous mode after the input is deactivated. If the genset is running, the mode does not change until it is stopped. Use this input if you need to disable the genset temporarily from any reason (maintenance, control from a higher-level automation system etc..).

Binary input: REMOTE: Remote MAN

Related FW	2.0
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.

Binary input: REMOTE: Remote AUT/Remote SEM

Related FW	2.0
Description	SEM mode is available in IS-NT only!

	The controller is forced into AUT or SEM 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.

Binary input: REMOTE: Remote TEST

Related FW	2.0
Description	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.)

Binary input: REMOTE: Remote off

Related FW	2.0
Description	The controller is forced into OFF mode while this input is active and the genset is not running. The controller will return into the previous mode after the input is deactivated. If the genset is running, the mode does not change until it is stopped. Use this input if you need to disable the genset temporarily from any reason (maintenance, control from a higher-level automation system etc..).

Binary input: REMOTE: Remote MAN

Related FW	2.0
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.

Binary input: REMOTE: Remote AUT/Remote SEM

Related FW	2.0
Description	SEM mode is available in IS-NT only! The controller is forced into AUT or SEM 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.

Binary input: REMOTE: Remote TEST

Related FW	2.0
Description	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.)

Binary input: REMOTE: Remote off

Related FW	2.0
Description	The controller is forced into OFF mode while this input is active and the genset is not running. The controller will return into the previous mode after the input is deactivated. If the genset is running, the mode does not change until it is stopped. Use this input if you need to disable the genset temporarily from any reason (maintenance, control from a higher-level automation system etc..).

Binary input: REMOTE: Remote MAN

Related FW	2.0
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.

Binary input: REMOTE: Remote AUT/Remote SEM

Related FW	2.0
Description	SEM mode is available in IS-NT only! The controller is forced into AUT or SEM 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.

Binary input: REMOTE: Remote TEST

Related FW	2.0
Description	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.)

Binary input: REMOTE: Remote off

Related FW	2.0
Description	The controller is forced into OFF mode while this input is active and the genset is

	not running. The controller will return into the previous mode after the input is deactivated. If the genset is running, the mode does not change until it is stopped. Use this input if you need to disable the genset temporarily from any reason (maintenance, control from a higher-level automation system etc..).

Binary input: REMOTE: Remote MAN

Related FW	2.0
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.

Binary input: REMOTE: Remote AUT/Remote SEM

Related FW	2.0
Description	SEM mode is available in IS-NT only! The controller is forced into AUT or SEM 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.

Binary input: REMOTE: Remote TEST

Related FW	2.0
Description	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.)

Binary input: REMOTE: Remote off

Related FW	2.0
Description	The controller is forced into OFF mode while this input is active and the genset is not running. The controller will return into the previous mode after the input is deactivated. If the genset is running, the mode does not change until it is stopped. Use this input if you need to disable the genset temporarily from any reason (maintenance, control from a higher-level automation system etc..).

Binary input: REMOTE: Remote MAN

Related FW	2.0
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.

Binary input: REMOTE: Remote AUT/Remote SEM

Related FW	2.0
Description	SEM mode is available in IS-NT only! The controller is forced into AUT or SEM 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.

Binary input: REMOTE: Remote TEST

Related FW	2.0
Description	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.)

Binary input: Oil press

Related FW	2.0
Description	This input is to be configured to the physical binary input where engine oil pressure binary sensor is connected. It provides following alarms: • The input **must not** be active at stopped engine. If it is active, the controller issues *Sd Oil press B* alarm. • The input **must** be active at running engine at latest in the moment when the alarm blocking delay *RunOnlyBlkDel1* has elapsed. If it is not active, the controller issues *Sd Oil press B* alarm. **NOTE:** If you use this logical binary input you do not need to configure any other protection onto the respective physical binary input.

Binary input: AccessLock int

Related FW	2.0
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.

Binary input: AccessLock ext

Related FW	2.0
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.

Binary input: PrestartBypass

Related FW	2.0
Description	Use this input to bypass the prestart phase of the start-up procedure and activate the *Starter* output immediately after start command has been issued. This input is typically used to skip preglowing of the engine when the engine is already warm. A built-in PLC module *Comparator with hysteresis* attached to the engine temperature value can be used to provide the "engine warm" binary signal, which is then internally configured onto this logical binary input.

Binary input: Startblocking

Related FW	2.0
Description	Engine start is disabled while this input is active. *NotReady* state is displayed on the controller main screen and the message *Start blocking* is displayed in the Alarmlist. Use this input to disable temporarily the genset to be started e.g. from an higher-level automation device such as PLC. **NOTE:** The genset will not be stopped if the input is activated while the genset is running.

Binary input: Sd override

Related FW	2.0
Description	If the input is closed, all 2nd level protections are overriden to allow engine run in an emergency situation, e.g. when the gen-set works as a power supply for fire extinguishing equipment.

	All protections are displayed in Alarmlist and recorded into history, however the controller leaves the gen-set in operation. If there are any protections still active or not reset in the moment when the input is deactivated, the controller will react to them in a standard way. Following protections are **not** overriden by this input: • Emergency stop • Overspeed • Underspeed (only if *Fuel solenoid* = GAS ENGINE) • Binary and analog protections configured as *Sd override* type. In fact this protection type means "Unoverridable shutdown", i.e. it works the same way as standard shutdown protection, however it can not be overriden (blocked) by the *Sd override* input.

Binary input: GCB disable

Related FW	2.0
Description	The input is used to disable issuing the GCB closing command. • If the input is active during synchronizing, the controller will keep the genset synchronized without issuing the GCB closing command until the input is deactivated or *Sync timeout* is elapsed. • If the input is active and the GCB button is pressed in MAN mode to close the GCB to dead bus, the GCB will not be closed until the input is deactivated and the GCB button pressed again. • If the input is active and the GCB is to be closed to dead bus automatically, the GCB will not be closed until the input is deactivated.

Binary input: MCB disable

Related FW	2.0
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 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.

Binary input: GCB fdb neg

Related FW	2.0
Description	This input is used for connection of the **normally closed** feedback contact from the 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 *GCB feedback*. Maximal allowed time the both inputs are in the same position is 500ms, after this time the alarm *GCB Fail* is issued.

Binary input: MCB fdb neg

Related FW	2.0
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.

Binary input: Emerg. manual

Related FW	2.0
Description	This input is designed to allow the gen-set to be controlled externally, not by the controller. This feature is especially designed for marine gen-sets, which are supposed to be started manually as the controller has no power supply before the gen-set is started. It may be also useful in case of testing the gen-set or in case of a failure, which does not allow the gen-set to be controlled by the controller, but the gen-set itself is stays operational. This function is also used in case of redundancy to disable redundant controller. The controller behaves following way: • Shows the text *EmergMan* in the engine status on the main screen. • Stops all functions regarding the gen-set control, deactivates all outputs related to it. The complete list of effected logical binary outputs is at the bottom. • *Stop Fail* alarm is not beeing evaluated and stop solenoid is not activated if nonzero speed is detected. • Voltage, current, power and other electric measurements are active. • When the input is deactivated, the controller takes control over the gen-set according to the situation in which the gen-set was in the moment of deactivation. I.e. the gen-set remains running loaded if it was running and GCB was closed in the moment the input was deactivated. **NOTE:** For successful recovery from a running state when the input is deactivated it is recommended to use pulse-type control outputs instead of continous-type. E.g. *Stop Solenoid* for fuel supply control and *GCB ON coil*, *GCB OFF coil* for breaker control. Logical Binary Outputs that are deactivated (directly or indirectly) when *Emerg. manual* is active: Starter Fuel solenoid Prestart Cooling pump CB close/open (GCB and MCB) CB ON coil (GCB and MCB) CB OFF coil (GCB and MCB) CB UV coil (GCB and MCB) Stop solenoid Stop pulse Speed up

	Speed dn AVR up AVR dn Ignition Ventilation Idle/Nominal Prelubr pump In synchronism ECU PwrRelay Ready for load Stand-by ready Operational Ready Not Ready CranckProcedure Starting Idle run Running ForwardSynchro ReverseSynchro Warming Soft load Loaded Soft unld Cooling Stopping Crancking PeakShaveAct

Binary input: ManualLdRecon

Related FW	2.0
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.

Binary input: FaultResButton

Related FW	2.0
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.

Binary input: HornResButton

Related FW	2.0
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.

Binary input: StopButton

Related FW	2.0
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.

Binary input: StartButton

Related FW	2.0
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.

Binary input: GCBButton

Related FW	2.0
Description	This input is used for an external GCB button mounted on the switchboard. The function of the input is identical as function of the GCB button on the controller front panel. The input is enabled only if the setpoint *Local Button* is set to position EXTBUTTONS or BOTH.

Binary input: MCBButton

Related FW	2.0
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.

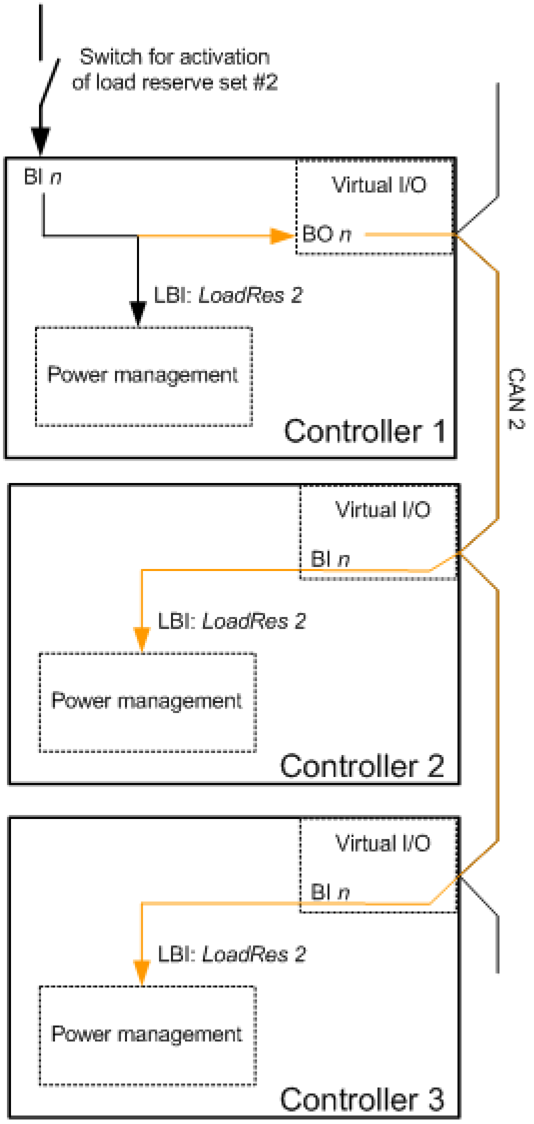
Binary input: Load res 2

Related FW	2.0
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

Binary input: Load res 3

Related FW	2.0
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*.

Binary input: Load res 4

Related FW	2.0
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*.

Binary input: MinRun power 1

Related FW	2.0
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*.

Binary input: MinRun power 2

Related FW	2.0
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*.

Binary input: MinRun power 3

Related FW	2.0
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*.

Binary input: Priority sw A

Related FW	2.0
Description	This is one of four inputs *Priority sw A*, *Priority sw B*, *Priority sw C* and *Priority sw D* that can be used for selection of the power management priority externally. These inputs are optional and if not configured, the priority is then adjusted by the

	setpoint *Priority*. ENCODING TABLE

PRIORITY	INPUT A	INPUT B	INPUT C	INPUT D
Default	0	0	0	0
1	1	0	0	0
2	0	1	0	0
3	1	1	0	0
4	0	0	1	0
5	1	0	1	0
6	0	1	1	0
7	1	1	1	0
8	0	0	0	1
9	1	0	0	1
10	0	1	0	1
11	1	1	0	1
12	0	0	1	1
13	1	0	1	1
14	0	1	1	1
15	1	1	1	1

NOTE:
"0" in the table means the input is not active or not configured.

NOTE:
"Default" is the priority adjusted by the setpoint *Priority*.

Binary input: Priority sw B

Related FW	2.0
Description	This is one of four inputs *Priority sw A*, *Priority sw B*, *Priority sw C* and *Priority sw D* that can be used for selection of the power management priority externally. These inputs are optional and if not configured, the priority is then adjusted by the setpoint *Priority*. **NOTE:** See encoding table in the description of the input *Priority sw A*.

Binary input: Priority sw C

Related FW	2.0
Description	This is one of four inputs *Priority sw A*, *Priority sw B*, *Priority sw C* and *Priority sw D* that can be used for selection of the power management priority externally. These inputs are optional and if not configured, the priority is then adjusted by the

	setpoint *Priority*. **NOTE:** See encoding table in the description of the input *Priority sw A*.

Binary input: Priority sw D

Related FW	2.0
Description	This is one of four inputs *Priority sw A*, *Priority sw B*, *Priority sw C* and *Priority sw D* that can be used for selection of the power management priority externally. These inputs are optional and if not configured, the priority is then adjusted by the setpoint *Priority*. **NOTE:** See encoding table in the description of the input *Priority sw A*.

Binary input: ECUComFailBlck

Related FW	2.0
Description	The input disables issuing of the ECU communication failure alarm and all other alarms related to values that are beeing read from the ECU.

Binary input: GroupLink

Related FW	2.0
Description	This input is used for logical connection and disconnection of the two gen-set groups selected by setpoints *GroupLinkLeft* and *GroupLinkRight*. If the input is active, then the two selected groups will perform power management, kW-sharing and kVAr-sharing together as one large group. For linking of one couple of groups use this input only at one controller, e.g. the nearest to the bus tie breaker which physically disconnects the groups, and connect the input to the BTB feedback contact. **NOTE:** This function is independent on the group which the particular controller belongs to, i.e. the controller can provide linking function e.g. for groups 3,4 although it self belongs to group 2.

Binary input: PulseCounter 1

Related FW	2.0
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.

Binary input: PulseCounter 2

Related FW	2.0
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. **NOTE:** Available in IS-NT only.

Binary input: PulseCounter 3

Related FW	2.0
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. **NOTE:** Available in IS-NT only.

Binary input: PulseCounter 4

Related FW	2.0
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. **NOTE:** Available in IS-NT only.

Binary input: Timer block 1

Related FW	2.0
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.

Binary input: Timer block 2

Related FW	2.0
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.

Binary input: Timer block 3

Related FW	2.0
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.

Binary input: Timer block 4

Related FW	2.0

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.

Binary input: Timer block 5

Related FW	2.0
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.

Binary input: Timer block 6

Related FW	2.0
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.

Binary input: Timer block 7

Related FW	2.0
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.

Binary input: Timer block 8

Related FW	2.0
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.

Binary input: Timer block 9

Related FW	2.0
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.

Binary input: Timer block 10

Related FW	2.0
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.

Binary input: Timer block 11

Related FW	2.0
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.

Binary input: Timer block 12

Related FW	2.0
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.

Binary input: Timer block 13

Related FW	2.0
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.

Binary input: Timer block 14

Related FW	2.0
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.

Binary input: Timer block 15

Related FW	2.0
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.

Binary input: Timer block 16

Related FW	2.0
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.

Binary input: ExtValue1 up

Related FW	2.0
Description	For IS-NT only. 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*.

Binary input: ExtValue1 down

Related FW	2.0
Description	IS-NT specific function 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*.

Binary input: ExtValue2 up

Related FW	2.0
Description	For IS-NT only. 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*.

Binary input: ExtValue2 down

Related FW	2.0
Description	IS-NT specific function 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*.

Binary input: ExtValue3 up

Related FW	2.0
Description	For IS-NT only. 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*.

Binary input: ExtValue3 down

Related FW	2.0
Description	IS-NT specific function 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*.

Binary input: ExtValue4 up

Related FW	2.0
Description	For IS-NT only. 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*.

Binary input: ExtValue4 down

Related FW	2.0
Description	IS-NT specific function 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*.

Binary input: ExtValue1reset

Related FW	2.0
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.

Binary input: ExtValue2reset

Related FW	2.0
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.

Binary input: ExtValue3reset

Related FW	2.0
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.

Binary input: ExtValue4reset

Related FW	2.0
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.

Binary input: RunIndication 1

Related FW	2.0
Description	This input is one of three inputs used for indication, that the engine is running, and has following functions: - If the input is active when the engine is expected to be stopped, then the *Stop fail* alarm is issued and start is blocked.

	• If the input becomes active while cranking, the engine is considered as started and the start-up procedure continues to the next phase (idle). **NOTE:** Learn more in the separate chapter Starting sequence.

Binary input: RunIndication 2

Related FW	2.0
Description	This input is one of three inputs used for indication, that the engine is running, and has following functions: • If the input is active when the engine is expected to be stopped, then the *Stop fail* alarm is issued and start is blocked. • If the input becomes active while cranking, the engine is considered as started and the start-up procedure continues to the next phase (idle). **NOTE:** Learn more in the separate chapter Starting sequence.

Binary input: RunIndication 3

Related FW	2.0
Description	This input is one of three inputs used for indication, that the engine is running, and has following functions: • If the input is active when the engine is expected to be stopped, then the *Stop fail* alarm is issued and start is blocked. • If the input becomes active while cranking, the engine is considered as started and the start-up procedure continues to the next phase (idle). **NOTE:** Learn more in the separate chapter Starting sequence.

Binary input: IssueActCallC1

Related FW	2.0
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*.

Binary input: IssueActCallC2

Related FW	2.0
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*.

Binary input: IssueActCallC3

Related FW	2.0
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*.

Binary input: IssueActCallC4

Related FW	2.0
Description	This input forces the controller to issue an active call/e-mail/SMS via the channel #4. Type of the channel is to be adjusted by the setpoint *AcallCH4-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 *IssueActCallC4*.

Binary input: IssueActCallC5

Related FW	2.0
Description	This input forces the controller to issue an active call/e-mail/SMS via the channel #5. Type of the channel is to be adjusted by the setpoint *AcallCH4-Addr*. 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 *IssueActCallC5*.

Binary input: AccessLock D#2

Related FW	2.0
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.

Binary input: AccessLock D#3

Related FW	2.0
Description	**NOTE:** For IS-NT and IS-NT-BB only. This input forces the external **local** terminal or IntelliVision (display) #3 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.

Binary input: NeutralCB fdb

Related FW	2.0
Description	This input is used for connection of the normally open feedback contact from the Neutral contactor. If the input is active, the controller will consider the neutral contactor as closed and vice versa. See also description of the setpoint *#Neutral cont.*.

Binary input: CylDifEvalBlk

Related FW	2.0
Description	This input is used to disable temporarily evaluation of the alarms caused by cylinder temperatures deviations. **NOTE:** For IS-NT only.

Binary input: ECU StoppedEng

Related FW	2.0
Description	When this input is activated, the genset will be stopped immdiately without unloading and cooling phase, however no alarm will be issued. This input is intended for situations, where the genset is controller by an ECU or other device which also includes engine protections and can stop the engine itself. In such case the controller would issue an *Underspeed* alarm. Connecting this input to an appropriate ECU output, which provides information, that the engine has been stopped by the ECU, prevents the controller from issuing the underspeed alarm.

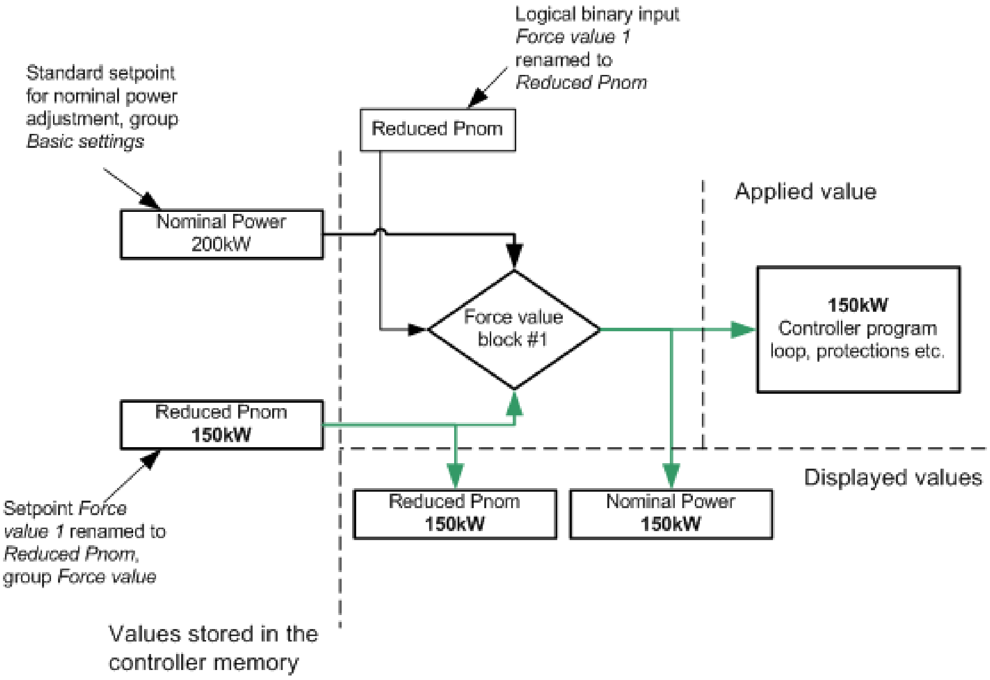
Binary input: CtrlHBeat sens

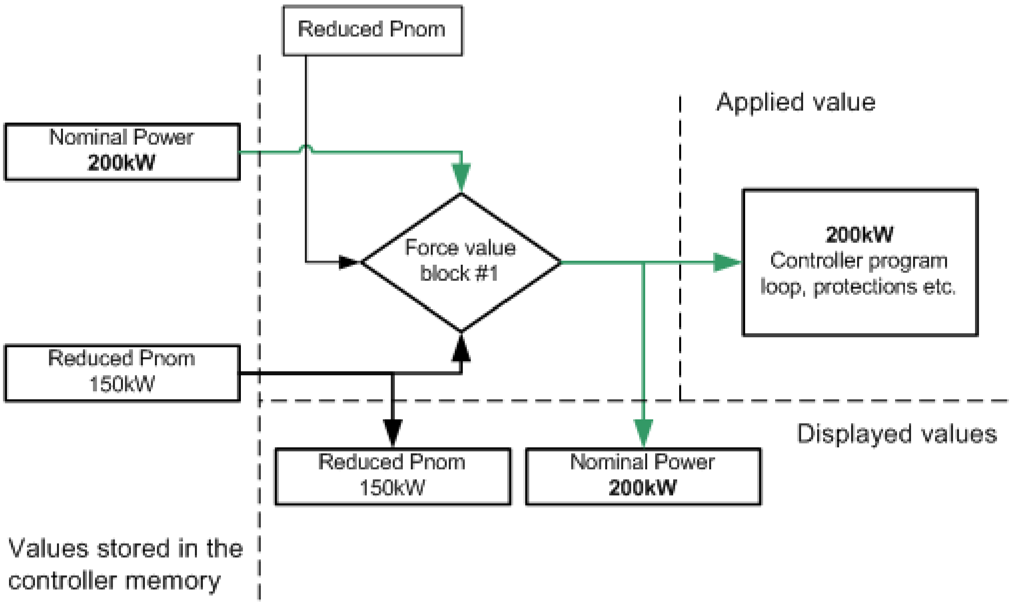
Related FW	2.0
Description	This input is used at a redundant controller to sense the "heart beat" from the main controller. The input is to be connected to the output *CtrlHeartBeat* of the main controller. If the redundant controller does not sense the heart beat from the main one, it will activate the binary output *CtrlHBeat FD*, which has to be wired such a way, that it disconnects the dead main controller from the genset, connects the redundant controller instead and activates it. **NOTE:** Learn more about redundancy in separate chapter Redundant controllers.

Binary input: Nominal speed

Related FW	2.0
Description	Use this input to bypass the idle phase of the start-up procedure. **NOTE:** The input is especially designed for shortening of the start-up procedure when the gen-set is starting to an AMF operation.

Binary input: ForceValueIn 1

Related FW	2.0
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

Binary input: ForceValueIn 2

Related FW	2.0
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*.

Binary input: ForceValueIn 3

Related FW	2.0
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*.

Binary input: ForceValueIn 4

Related FW	2.0
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*.

Binary input: ForceValueIn 5

Related FW	2.0
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*.

Binary input: ForceValueIn 6

Related FW	2.0
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*.

Binary input: ForceValueIn 7

Related FW	2.0
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*.

Binary input: ForceValueIn 8

Related FW	2.0
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*.

Binary input: ForceValueIn 9

Related FW	2.0
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*.

Binary input: ForceValueIn10

Related FW	2.0
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*.

Binary input: ForceValueIn11

Related FW	2.0
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*.

Binary input: ForceValueIn12

Related FW	2.0
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*.

Binary input: ForceValueIn13

Related FW	2.0
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*.

Binary input: ForceValueIn14

Related FW	2.0
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*.

Binary input: ForceValueIn15

Related FW	2.0
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*.

Binary input: ForceValueIn16

Related FW	2.0
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*.

Binary input: Force block 1

Related FW	2.0
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).

Binary input: Force block 2

Related FW	2.0
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).

Binary input: Force block 3

Related FW	2.0
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).

Binary input: Lang sel int A

<table>
<tr><td>Related FW</td><td>2.0</td></tr>
<tr><td>Description</td><td>
<p>This is one of three binary inputs <i>Lang sel int A</i>, <i>Lang sel int B</i>, <i>Lang sel int C</i>, 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.</p>
<p>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.</p>
<p>ENCODING TABLE</p>
<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>
<p>NOTE:
"0" in the table means the input is not active or not configured.</p>
<p>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.</p>
<p>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).</p>
<p>CAUTION!
Each language change causes the reinitialization of the display. Function of the</p>
</td></tr>
</table>

	controller is not influenced.

Binary input: Lang sel int B

Related FW	2.0
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 (see 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). **CAUTION!** Each language change causes the reinitialization of the display. Function of the controller is not influenced.

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

Binary input: Lang sel int C

Related FW	2.0
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.

Binary input: Lang sel D#2 A

Related FW	2.0
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.

Binary input: Lang sel D#2 B

Related FW	2.0

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.

Binary input: Lang sel D#2 C

Related FW	2.0
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.

Binary input: Lang sel D#3 A

Related FW	2.0
Description	This is one of three binary inputs *Lang sel D#3 A*, *Lang sel D#3 B*, *Lang sel D#3 C*, used for selecting language of the **external** local terminal #3. The terminal #3 is available in IS-NT only.

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.

Binary input: Lang sel D#3 B

Related FW	2.0
Description	This is one of three binary inputs *Lang sel D#3 A*, *Lang sel D#3 B*, *Lang sel D#3 C*, used for selecting language of the **external** local terminal #3. The terminal #3 is available in IS-NT only.

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.

Binary input: Lang sel D#3 C

Related FW	2.0
Description	This is one of three binary inputs *Lang sel D#3 A*, *Lang sel D#3 B*, *Lang sel D#3 C*, used for selecting language of the **external** local terminal #3. The terminal #3 is available in IS-NT only.

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).

<table>
<tr><td></td><td>CAUTION!
Each language change causes the reinitialization of the display. Function of the controller is not influenced.</td></tr>
</table>

Binary input: User mask 1

<table>
<tr><td>Related FW</td><td>2.0</td></tr>
<tr><td>Description</td><td>This input allows user to activate chosen function in ScreenEditor (tool for GenConfig) for particular screen instrument. User may choose from the following functions:
<table>
<tr><th>NONE</th><th>SHOW</th><th>HIDE</th></tr>
<tr><td>No action regarding this screen instrument is taken.</td><td>By default the screen instrument is hidden. If any of mask inputs (<i>User mask 1</i>, <i>User mask 2</i>, <i>User mask 3</i>, <i>User mask 4</i> or other switches) connected to this particular screen instrument is activated, this screen instrument is shown.</td><td>By default the screen instrument is shown. If any of mask inputs (<i>User mask 1</i>, <i>User mask 2</i>, <i>User mask 3</i>, <i>User mask 4</i> or other switches) connected to this particular screen instrument is activated, this screen instrument is hidden.</td></tr>
</table>
E.g. this function can be used to "swap" between two different screen instruments when certain conditions are fulfilled. Logical binary inputs Mask 1..4 can be used to define any custom condition for this "swapping" function.</td></tr>
</table>

Binary input: User mask 2

<table>
<tr><td>Related FW</td><td>2.0</td></tr>
<tr><td>Description</td><td>This input allows user to activate chosen function in ScreenEditor (tool for GenConfig) for particular screen instrument. User may choose from the following functions:
<table>
<tr><th>NONE</th><th>SHOW</th><th>HIDE</th></tr>
<tr><td>No action regarding this screen instrument is taken.</td><td>By default the screen instrument is hidden. If any of mask inputs (<i>User mask 1</i>, <i>User mask 2</i>, <i>User mask 3</i>, <i>User mask 4</i> or other switches) connected to this particular screen instrument is activated, this screen instrument is shown.</td><td>By default the screen instrument is shown. If any of mask inputs (<i>User mask 1</i>, <i>User mask 2</i>, <i>User mask 3</i>, <i>User mask 4</i> or other switches) connected to this particular screen instrument is activated, this screen instrument is hidden.</td></tr>
</table>
E.g. this function can be used to "swap" between two different screen instruments when certain conditions are fulfilled. Logical binary inputs Mask 1..4 can be used to define any custom condition for this "swapping" function.</td></tr>
</table>

Binary input: User mask 3

Related FW	2.0
Description	This input allows user to activate chosen function in ScreenEditor (tool for GenConfig) for particular screen instrument. User may choose from the following functions:

NONE	SHOW	HIDE
No action regarding this screen instrument is taken.	By default the screen instrument is hidden. If any of mask inputs (*User mask 1*, *User mask 2*, *User mask 3*, *User mask 4* or other switches) connected to this particular screen instrument is activated, this screen instrument is shown.	By default the screen instrument is shown. If any of mask inputs (*User mask 1*, *User mask 2*, *User mask 3*, *User mask 4* or other switches) connected to this particular screen instrument is activated, this screen instrument is hidden.

E.g. this function can be used to "swap" between two different screen instruments when certain conditions are fulfilled. Logical binary inputs Mask 1..4 can be used to define any custom condition for this "swapping" function.

Binary input: User mask 4

Related FW	2.0
Description	This input allows user to activate chosen function in ScreenEditor (tool for GenConfig) for particular screen instrument. User may choose from the following functions:

NONE	SHOW	HIDE
No action regarding this screen instrument is taken.	By default the screen instrument is hidden. If any of mask inputs (*User mask 1*, *User mask 2*, *User mask 3*, *User mask 4* or other switches) connected to this particular screen instrument is activated, this screen instrument is shown.	By default the screen instrument is shown. If any of mask inputs (*User mask 1*, *User mask 2*, *User mask 3*, *User mask 4* or other switches) connected to this particular screen instrument is activated, this screen instrument is hidden.

E.g. this function can be used to "swap" between two different screen instruments when certain conditions are fulfilled. Logical binary inputs Mask 1..4 can be used to define any custom condition for this "swapping" function.

Binary input: Cleaning

Related FW	2.0
Description	**In Combi application only.** This binary input is intended for activation of cleaning mode of generator (cleaning and drying). During the cleaning (when the *Cleaning* is active)

	• Informative message is shown: "Cleaning" (this is not an alarm and it cannot be fault reset, it will disappear automatically once *Cleaning* gets inactive) • Generator excitation is deactivated. • Under and overfrequency and under and overvoltage protections are inactive. (Gener protect: *Gen >V BOC*, *Gen <V BOC*, *Gen >f*, *Gen <f*) • Voltage and frequency regulation is inactive. **WARNING!** Be aware that activation LBI Cleaning ensures only that the under voltage and under frequency protection is not active and allows gen-set to run with frequency and voltage out of limits of protections. Activating of this input does not ensures that the voltage excitation is realy switched off. The excitation of the generator has to be unconditionally switch off directly on the AVR of generator while the cleaning function is in use!

Binary input: EmergDroopEnab

Related FW	2.0
Description	Closing of this output confirms that the actual constalation of addresses witch the controller can see on CAN2 is correct and enables the changeover of regulation to emergency droop mode in case that anyone of the controllers on CAN2 is lost. Deactivation of this LBI when emergency droop is active causes that the regulation are switched over back to the standard Load Sharing and VAr Sharing mode.

Binary input: DroopUnld dis

Related FW	2.0
Description	Activation of this logical binary input avoids the soft unload function of the genset if it is running in droop. GCB is opened immediately after the stop request or pressing of GCB button. If this input is not active the loadramp is given by settings in the setpoint group Sync/Load ctrl. This function is used when there is no other genset to take over the load of the genset which is beeing unloaded.

Binary input: kVArDroopAct

Related FW	2.0
Description	This logical binary output is used for independent activation of VAr sharing droop while the setpoint <setp href="13212"/> is set to STD or EMERG DROOP. The Load (kW) regulations remains running based on standard isochronous mode.

Binary input: IslAdetectEnab

Related FW	2.0
Description	This LBI Enables/Disables the automatic detection of Island operation in SPtM mode.

Table of analog input functions

Analog input: LdCtrl:AnExBld

Related FW	2.0
Description	This functional input is used for requesting the **gen-set baseload** externally by an analog input. The setpoint *Load ctrl PtM* must be set to ANEXT BASELOAD position.

Analog input: LdCtrl:AnExI/E

Related FW	2.0
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.

Analog input: PFCtrl:AnExBPF

<table>
<tr><td>Related FW</td><td>2.0</td></tr>
<tr><td>Description</td><td>This functional input is used for requesting the gen-set cos phi factor externally by an analog input. The setpoint <i>PF ctrl PtM</i> must be set to ANEXT BASEPF 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></td></tr>
</table>

Analog input: PFCtrl:AnExI/E

<table>
<tr><td>Related FW</td><td>2.0</td></tr>
<tr><td>Description</td><td>This functional input is used for requesting the mains cos phi factor externally by an analog input. The setpoint <i>PF ctrl PtM</i> 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></td></tr>
</table>

Analog input: LdCtrl:I/E-Pm

Related FW	2.0
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.

Analog input: PFCtrl:I/E-Qm

Related FW	2.0
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.

Analog input: LCD brightness

Related FW	2.0
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.

Analog input: RPM pick-up

Related FW	2.0
Description	This functional input is used for reading of the gen-set speed from other source than pickup or generator frequency. This source is typically an ECU unit, which provides the speed at the communication bus. **NOTE:** See also the chapter Engine speed measurement.

Analog input: Oil press

Related FW	2.0
Description	This functional input is used as an additional information whether the engine is running or not. If you want to use this additional feature configure this input onto the physical analog input where the oil pressure sensor is connected and adjust the setpoint *Starting POil* to cca 50% of typical engine oil pressure at idle speed. **NOTE:** See also the chapter Running engine detection.

Analog input: Warming temp

Related FW	2.0
Description	This functional input is used for *engine warming*. See also the setpoint *Warming load*.

Analog input: Fuel level

Related FW	2.0
Description	This logical analog input is used for evaluation of the *Fuel theft* alarm. Learn more

	in the description of the setpoint *MaxLevelDrop*.

Analog input: PowerDerating1

Related FW	2.0
Description	This is the input into the *Power derating* block #1. See details about the function in the chapter Power derating.

Analog input: PowerDerating2

Related FW	2.0
Description	This is the input into the *Power derating* block #2. See details about the function in the chapter Power derating.

Analog input: LdCtrl:TByPwr

Related FW	2.0
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*.

Analog input: MLC:AnExSysBld

Related FW	2.0
Description	This functional input is used for requesting the **system baseload** externally by an analog input. The setpoint *SysBaseLdMode* must be set to EXTERNAL to read the system baseload from this input. **NOTE:** This logical analog input must be configured at each gen-set to the identical source. The *shared peripherial modules* can be used to distribute the value over the controllers via the CAN2 bus. See the note in the description of the setpoint *SysBaseLdMode*.

Analog input: MPF:AnExSysBPF

Related FW	2.0
Description	This functional input is used for requesting the **system power factor** externally by an analog input. The setpoint *SysBasePFMode* must be set to EXTERNAL to read the requested system power factor from this input. **NOTE:** This logical analog input must be configured at each gen-set to the identical source. The *shared peripherial modules* can be used to distribute the value over the controllers via the CAN2 bus. See the note in the description of the setpoint *SysBaseLdMode*.

Analog input: Cyl temp 1

Related FW	2.0

Description	Logical analog input for cylinder temperature #1. Used for computing of values *T Cyl aver*, *T Cyl max*, *T Cyl min*. **NOTE:** Available in IS-NT only.

Analog input: Cyl temp 2

Related FW	2.0
Description	Logical analog input for cylinder temperature #2. Used for computing of values *T Cyl aver*, *T Cyl max*, *T Cyl min*. **NOTE:** Available in IS-NT only.

Analog input: Cyl temp 3

Related FW	2.0
Description	Logical analog input for cylinder temperature #3. Used for computing of values *T Cyl aver*, *T Cyl max*, *T Cyl min*. **NOTE:** Available in IS-NT only.

Analog input: Cyl temp 4

Related FW	2.0
Description	Logical analog input for cylinder temperature #4. Used for computing of values *T Cyl aver*, *T Cyl max*, *T Cyl min*. **NOTE:** Available in IS-NT only.

Analog input: Cyl temp 5

Related FW	2.0
Description	Logical analog input for cylinder temperature #5. Used for computing of values *T Cyl aver*, *T Cyl max*, *T Cyl min*. **NOTE:** Available in IS-NT only.

Analog input: Cyl temp 6

Related FW	2.0
Description	Logical analog input for cylinder temperature #6. Used for computing of values *T Cyl aver*, *T Cyl max*, *T Cyl min*. **NOTE:** Available in IS-NT only.

Analog input: Cyl temp 7

Related FW	2.0
Description	Logical analog input for cylinder temperature #7. Used for computing of values *T Cyl aver*, *T Cyl max*, *T Cyl min*. **NOTE:** Available in IS-NT only.

Analog input: Cyl temp 8

Related FW	2.0
Description	Logical analog input for cylinder temperature #8. Used for computing of values *T Cyl aver*, *T Cyl max*, *T Cyl min*. **NOTE:** Available in IS-NT only.

Analog input: Cyl temp 9

Related FW	2.0
Description	Logical analog input for cylinder temperature #9. Used for computing of values *T Cyl aver*, *T Cyl max*, *T Cyl min*. **NOTE:** Available in IS-NT only.

Analog input: Cyl temp 10

Related FW	2.0
Description	Logical analog input for cylinder temperature #10. Used for computing of values *T Cyl aver*, *T Cyl max*, *T Cyl min*. **NOTE:** Available in IS-NT only.

Analog input: Cyl temp 11

Related FW	2.0
Description	Logical analog input for cylinder temperature #11. Used for computing of values *T Cyl aver*, *T Cyl max*, *T Cyl min*. **NOTE:** Available in IS-NT only.

Analog input: Cyl temp 12

Related FW	2.0
Description	Logical analog input for cylinder temperature #12. Used for computing of values *T Cyl aver*, *T Cyl max*, *T Cyl min*. **NOTE:**

	Available in IS-NT only.

Analog input: Cyl temp 13

Related FW	2.0
Description	Logical analog input for cylinder temperature #13. Used for computing of values *T Cyl aver*, *T Cyl max*, *T Cyl min*. **NOTE:** Available in IS-NT only.

Analog input: Cyl temp 14

Related FW	2.0
Description	Logical analog input for cylinder temperature #14. Used for computing of values *T Cyl aver*, *T Cyl max*, *T Cyl min*. **NOTE:** Available in IS-NT only.

Analog input: Cyl temp 15

Related FW	2.0
Description	Logical analog input for cylinder temperature #15. Used for computing of values *T Cyl aver*, *T Cyl max*, *T Cyl min*. **NOTE:** Available in IS-NT only.

Analog input: Cyl temp 16

Related FW	2.0
Description	Logical analog input for cylinder temperature #16. Used for computing of values *T Cyl aver*, *T Cyl max*, *T Cyl min*. **NOTE:** Available in IS-NT only.

Analog input: Cyl temp 17

Related FW	2.0
Description	Logical analog input for cylinder temperature #17. Used for computing of values *T Cyl aver*, *T Cyl max*, *T Cyl min*. **NOTE:** Available in IS-NT only.

Analog input: Cyl temp 18

Related FW	2.0

Description	Logical analog input for cylinder temperature #18. Used for computing of values *T Cyl aver*, *T Cyl max*, *T Cyl min*. **NOTE:** Available in IS-NT only.

Analog input: Cyl temp 19

Related FW	2.0
Description	Logical analog input for cylinder temperature #19. Used for computing of values *T Cyl aver*, *T Cyl max*, *T Cyl min*. **NOTE:** Available in IS-NT only.

Analog input: Cyl temp 20

Related FW	2.0
Description	Logical analog input for cylinder temperature #20. Used for computing of values *T Cyl aver*, *T Cyl max*, *T Cyl min*. **NOTE:** Available in IS-NT only.

Analog input: Cyl temp 21

Related FW	2.0
Description	Logical analog input for cylinder temperature #21. Used for computing of values *T Cyl aver*, *T Cyl max*, *T Cyl min*. **NOTE:** Available in IS-NT only.

Analog input: Cyl temp 22

Related FW	2.0
Description	Logical analog input for cylinder temperature #22. Used for computing of values *T Cyl aver*, *T Cyl max*, *T Cyl min*. **NOTE:** Available in IS-NT only.

Analog input: Cyl temp 23

Related FW	2.0
Description	Logical analog input for cylinder temperature #23. Used for computing of values *T Cyl aver*, *T Cyl max*, *T Cyl min*. **NOTE:** Available in IS-NT only.

Analog input: Cyl temp 24

Related FW	2.0
Description	Logical analog input for cylinder temperature #24. Used for computing of values *T Cyl aver*, *T Cyl max*, *T Cyl min*. **NOTE:** Available in IS-NT only.

Analog input: Cyl temp 25

Related FW	2.0
Description	Logical analog input for cylinder temperature #25. Used for computing of values *T Cyl aver*, *T Cyl max*, *T Cyl min*. **NOTE:** Available in IS-NT only.

Analog input: Cyl temp 26

Related FW	2.0
Description	Logical analog input for cylinder temperature #26. Used for computing of values *T Cyl aver*, *T Cyl max*, *T Cyl min*. **NOTE:** Available in IS-NT only.

Analog input: Cyl temp 27

Related FW	2.0
Description	Logical analog input for cylinder temperature #27. Used for computing of values *T Cyl aver*, *T Cyl max*, *T Cyl min*. **NOTE:** Available in IS-NT only.

Analog input: Cyl temp 28

Related FW	2.0
Description	Logical analog input for cylinder temperature #28. Used for computing of values *T Cyl aver*, *T Cyl max*, *T Cyl min*. **NOTE:** Available in IS-NT only.

Analog input: Cyl temp 29

Related FW	2.0
Description	Logical analog input for cylinder temperature #29. Used for computing of values *T Cyl aver*, *T Cyl max*, *T Cyl min*. **NOTE:**

	Available in IS-NT only.

Analog input: Cyl temp 30

Related FW	2.0
Description	Logical analog input for cylinder temperature #30. Used for computing of values *T Cyl aver*, *T Cyl max*, *T Cyl min*. **NOTE:** Available in IS-NT only.

Analog input: Cyl temp 31

Related FW	2.0
Description	Logical analog input for cylinder temperature #31. Used for computing of values *T Cyl aver*, *T Cyl max*, *T Cyl min*. **NOTE:** Available in IS-NT only.

Analog input: Cyl temp 32

Related FW	2.0
Description	Logical analog input for cylinder temperature #32. Used for computing of values *T Cyl aver*, *T Cyl max*, *T Cyl min*. **NOTE:** Available in IS-NT only.

Analog input: Cold temp 1

Related FW	2.0
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 #1. **NOTE:** Thermocouples without internal compensation "Thermo(nc)..." must be used for this case.

Analog input: Cold temp 2

Related FW	2.0
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 #2. **NOTE:** Thermocouples without internal compensation "Thermo(nc)..." must be used for this case.

Analog input: Cold temp 3

Related FW	2.0
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 #3. **NOTE:** Thermocouples without internal compensation "Thermo(nc)..." must be used for this case.

Analog input: Cold temp 4

Related FW	2.0
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.

Table of binary output functions

Binary output: Starter

Related FW	2.0
Description	The output is used to energize the starter motor. The output closes at the begining of start sequence after prestart has been completed and opens when the engine is started. **NOTE:** Learn more in the separate chapter Starting sequence.

Binary output: Fuel Solenoid

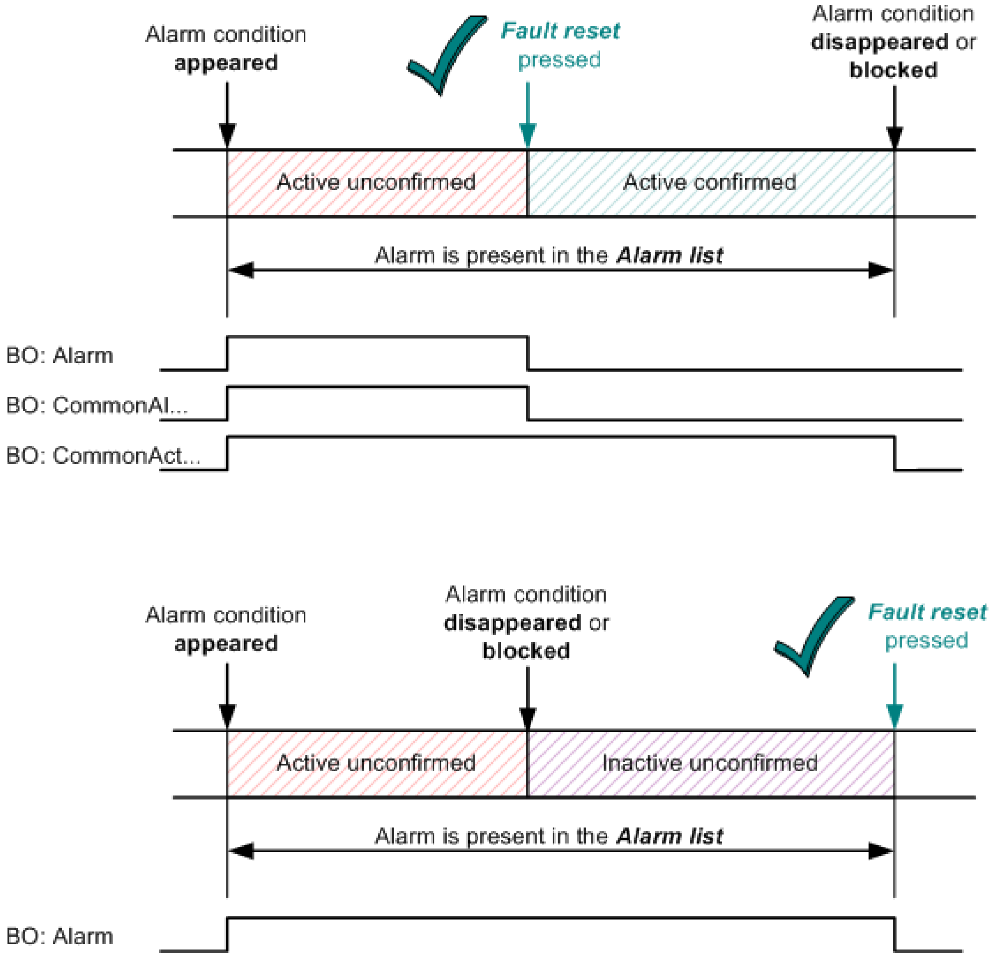
Related FW	2.0
Description	This output is used for control of the engine fuel valve. The fuel valve can be either a fuel solenoid of diesel engine or a gas valve of gas engine. The behavior of this output is to be selected by the setpoint *Fuel solenoid*. **NOTE:** Learn more in the separate chapter Starting sequence.

Binary output: Prestart

Related FW	2.0
Description	This output can be used for control of any device, which has to be activated just before start, i.e. glow plugs. The output is closed for time period of *Prestart time* prior to activating of the starter motor and remains closed during cranking and also during pause between cranking attempts. **NOTE:** Learn more in the separate chapter Starting sequence.

Binary output: Alarm

Related FW	2.0
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

Binary output: Horn

Related FW	2.0
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.

Binary output: CommonAlLev 1

Related FW	2.0
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.

Binary output: CommonAlLev 2

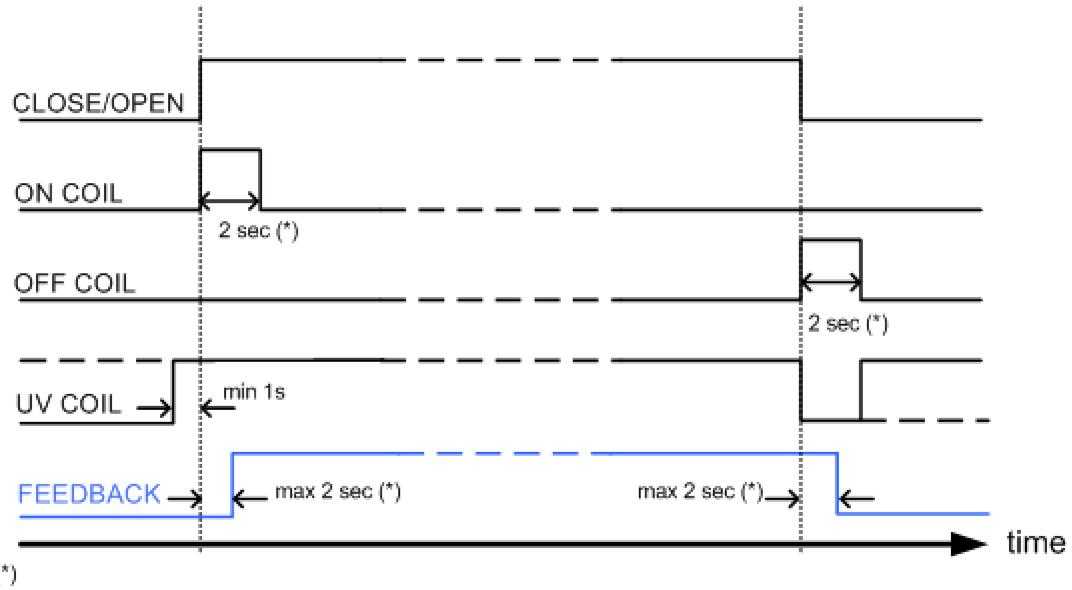
Related FW	2.0
Description	This output is active if there is at least one **unconfirmed** 2nd-level (red) alarm present in the alarm list. See the chapter Alarm management for more

	information.

Binary output: Cooling Pump

Related FW	2.0
Description	This output is used for control of an external electric motor-driven cooling pump. The output closes when the gen-set is started (i.e. at the end of the *Starting* period) and opens at the end of the *Aftercooling* period, which takes place after the engine has been fully stopped. Duration of the aftercooling period is adjusted by the setpoint *AfterCool time*. The output opens immediately when *Emergency stop* is activated or if the controller is switched to OFF mode.

Binary output: GCB Close/Open

Related FW	2.0
Description	This output is intended for control of the GCB if a **contactor** is used as GCB. The output provides continuous signal while the GCB has to be closed. There are also other outputs availabe for GCB control: • *GCB ON coil* • *GCB OFF coil* • *GCB UV coil*  (*) 5 sec if synchronizing with the particular breaker is disabled. TIMING OF BREAKER CONTROL OUTPUTS

Binary output: GCB ON Coil

Related FW	2.0

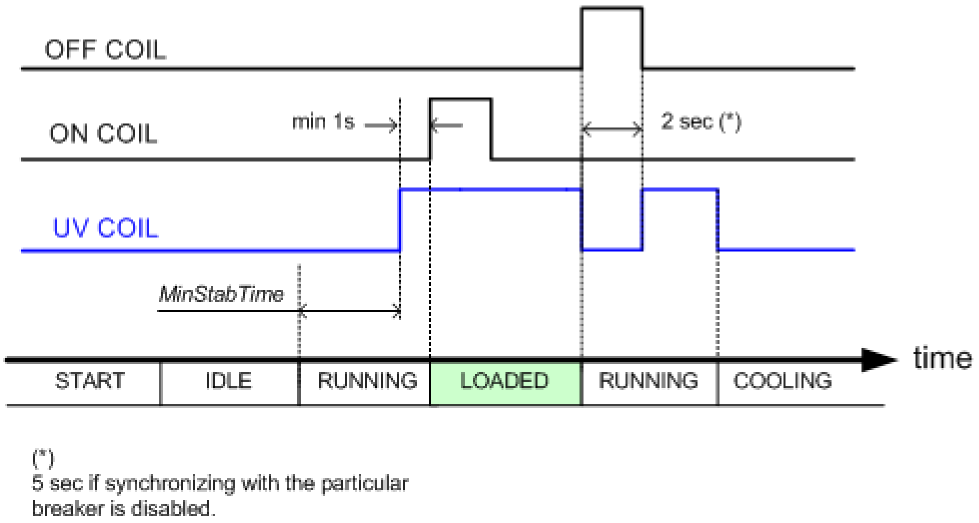
Description	This output is intended for closing of the GCB using ON coil if a **circuit breaker** is used as GCB. The output provides 2 sec pulse when the GCB has to close. If synchronizing is disabled with the particular breaker, the pulse length is extended to 5sec. See timing diagram of all available breaker control outputs in the description of the *GCB close/open* output. There are also other outputs availabe for GCB control: • *GCB close/open* • *GCB OFF coil* • *GCB UV coil*

Binary output: GCB OFF Coil

Related FW	2.0
Description	This output is intended for opening of the GCB using OFF coil if a **circuit breaker** is used as GCB. The output provides 2 sec pulse when the GCB 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 *GCB close/open* output. There are also other outputs availabe for GCB control: • *GCB close/open* • *GCB ON coil* • *GCB UV coil*

Binary output: GCB UV Coil

Related FW	2.0
Description	This output is intended for opening of the GCB using an undervoltage coil if a **circuit breaker** is used as GCB. • The output is closed after the gen-set has been started, *Min stab time* has elapsed and the generator voltage and frequency has got into limits. GCB 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 GCB has to open. If synchronizing is disabled with the particular breaker, the length of the inverse pulse is extended to 5sec. • The output is closed again and remains closed while the generator voltage and frequency are in limits, if the *Running* phase follows after opening of the GCB (e.g. in MAN). • The output remains opened if the *Cooling* phase follows after opening of the GCB.

	 GCB UV COIL OUTPUT TIMING There are also other outputs availabe for GCB control: • *GCB close/open* • *GCB ON coil* • *GCB OFF coil*

Binary output: MCB Close/Open

Related FW	2.0
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 in the description of the *GCB 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 MCB has to be open. There are also other outputs availabe for MCB control: • *MCB ON coil* • *MCB OFF coil* • *MCB UV coil*

Binary output: MCB ON Coil

Related FW	2.0
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

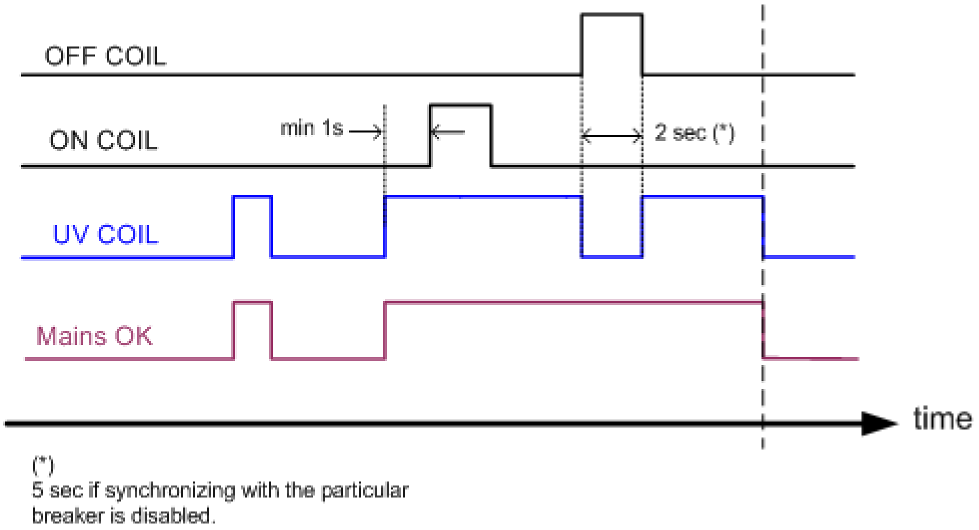
	description of the *GCB close/open* output. There are also other outputs availabe for MCB control: - *MCB close/open* - *MCB OFF coil* - *MCB UV coil*

Binary output: MCB OFF Coil

Related FW	2.0
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 *GCB close/open* output. There are also other outputs availabe for MCB control: - *MCB close/open* - *MCB ON coil* - *MCB UV coil*

Binary output: MCB UV Coil

Related FW	2.0
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*

Binary output: Stop Solenoid

Related FW	2.0
Description	This output is used at diesel engines equipped with fuel valve, which **must be energized to stop the engine**. The output is closed when the engine has to stop, remains closed while the engine is stopping and is opened back if the engine has successfuly stopped and stop time elapsed. For other stopping sequences please refer to Stop sequence chapter. The total time this output is continuously active is never shorter than *Stop time*, i.e. if the gen-set stops quickly, the output may remain closed eventhough all symptoms indicate the engine is stopped. This output is also closed if the engine begins to rotate unexpectedly, i.e. if it is started manually directly on the engine. To allow the engine to be operated manually without intervention from the controller, switch the controller to the *emergency manual* mode using the input *Emerg. manual*. **NOTE:** Learn more about this topic in the separate chapter Stop sequence.

Binary output: Stop Pulse

Related FW	2.0
Description	One second pulse is issued at this output when the engine is required to stop (i.e. this pulse does not commence stopping sequence but it is rather an actual command to engine physical stopping). The output is especially intended to be

	used as stop command for ECU-controlled engines, which support stop command via the communication bus (e.g. J1939).

Binary output: Syst res OK

Related FW	2.0
Description	The output is closed while the actual reserve is above the selected reserve for start.

Binary output: Syst res 1 OK

Related FW	2.0
Description	The output is closed while the actual reserve is above the reserve for start from the reserve set #1.

Binary output: Syst res 2 OK

Related FW	2.0
Description	The output is closed while the actual reserve is above the reserve for start from the reserve set #2.

Binary output: Syst res 3 OK

Related FW	2.0
Description	The output is closed while the actual reserve is above the reserve for start from the reserve set #3.

Binary output: Syst res 4 OK

Related FW	2.0
Description	The output is closed while the actual reserve is above the reserve for start from the reserve set #4.

Binary output: AllAvailGS run

Related FW	2.0
Description	The output is closed while all gen-sets in the group, which participate in the power management, are running and loaded.

Binary output: Speed up

Related FW	2.0
Description	This output together with the complementary output *Speed dn* are designed for speed and power control at gen-sets where the speed governor does not support analogue control. **NOTE:** The governor is recommended to be configured for droop function when these outputs are used for power control.

	NOTE: The alarm *Wrn SpdRegLim* is disabled when this output is used (configured onto any controller terminal or virtual output).

Binary output: Speed dn

Related FW	2.0
Description	This output together with the complementary output *Speed up* are designed for speed and power control at gen-sets where the speed governor does not support analogue control. **NOTE:** The governor is recommended to be configured for droop function when these outputs are used for power control. **NOTE:** The alarm *Wrn SpdRegLim* is disabled when this output is used (configured onto any controller terminal or virtual output).

Binary output: AVR up

Related FW	2.0
Description	This output together with the complementary output *AVR dn* are designed for voltage and power factor control at gen-sets where the AVR does not support analogue control. **NOTE:** The AVR is recommended to be configured for droop function when these outputs are used for power factor control. **NOTE:** The alarm *Wrn VoltRegLim* is disabled when this output is used (configured onto any controller terminal or virtual output).

Binary output: AVR dn

Related FW	2.0
Description	This output together with the complementary output *AVR up* are designed for voltage and power factor control at gen-sets where the AVR does not support analogue control. **NOTE:** The AVR is recommended to be configured for droop function when these outputs are used for power factor control. **NOTE:** The alarm *Wrn VoltRegLim* is disabled when this output is used (configured onto any controller terminal or virtual output).

Binary output: SPI mode

Related FW	2.0

Description	This output is closed while the application is currently running in SPI mode. See the chapter Description of Combi application for information how to switch the application mode.

Binary output: SPtM mode

Related FW	2.0
Description	This output is closed while the application is currently running in SPtM mode. See the chapter Description of Combi application for information how to switch the application mode.

Binary output: MINT mode

Related FW	2.0
Description	This output is closed while the application is currently running in MINT mode. See the chapter Description of Combi application for information how to switch the application mode.

Binary output: Vgen <>

Related FW	2.0
Description	The output is closed while the *generator over/under voltage* alarm is present in the alarm list.

Binary output: Vmains <>

Related FW	2.0
Description	The output is closed while the *mains over/under voltage* alarm is present in the alarm list.

Binary output: Overcurrent

Related FW	2.0
Description	The output is closed while there is either the *Generator IDMT Overcurrent* or *Generator Short current* alarms present in the alarm list.

Binary output: VectorShiftTrp

Related FW	2.0
Description	The output closes if the *Vector shift* protection gets active and the controller trips the selected breaker. The output stays closed for 3s, then opens again. **NOTE:** See also the output *VectorShiftAct*.

Binary output: VectorShiftAct

Related FW	2.0
Description	The output closes if the Vector shift protection gets active. It stays closed for 3s,

	then opens again. This output is activated even if the selected breaker is actually not tripped because of the input *Sd override* is active. **NOTE:** See also the output *VectorShiftTrp*.

Binary output: Common Wrn

Related FW	2.0
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.

Binary output: Common Sd

Related FW	2.0
Description	The output is closed while there is at least one alarm of the *Shutdown* 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.

Binary output: Common SdOvr

Related FW	2.0
Description	Common output that closes with 2s delay if any Shutdown override-type protection becomes active. If it is already active and another protection of that type becomes active, the output is deactivated for 2 seconds and then reactivated again to inform on this new alarm.

Binary output: Common Stp

Related FW	2.0
Description	The output is closed while there is at least one alarm of the *Slow stop* 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.

Binary output: Common Fls

Related FW	2.0
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.

Binary output: Common LoP

Related FW	2.0

Description	This IS-NT specific function! The output is closed while there is at least one alarm of the *Low power* type present in the alarm list. See the chapter Alarm management for more information.

Binary output: Common OfL

Related FW	2.0
Description	The output is closed while there is at least one alarm of the *Off load* type present in the alarm list. See the chapter Alarm management for more information.

Binary output: Common BOC

Related FW	2.0
Description	The output is closed while there is at least one alarm of the *Breaker open&Cool-down* 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.

Binary output: Common MP

Related FW	2.0
Description	The output is closed while there is at least one alarm of the *Mains protection* type present in the alarm list. See the chapter Alarm management for more information.

Binary output: Common Al

Related FW	2.0
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.

Binary output: Common Hst

Related FW	2.0
Description	The output is closed for 1s when any alarm of *History record* type appears. See the chapter Alarm management for more information.

Binary output: CommonActLev 1

Related FW	2.0
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.

Binary output: CommonActLev 2

Related FW	2.0
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.

Binary output: Alarm flashing

Related FW	2.0
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.

Binary output: Horn flashing

Related FW	2.0
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.

Binary output: T cyl differ

Related FW	2.0
Description	IS-NT specific function! The output is closed while the alarm *cylinder temperature difference* alarm is active.

Binary output: Ignition

Related FW	2.0
Description	The output is used for control of an ignition module on gas engines. The output is closed when the engine speed exceeds 30 RPM and opens when the engine is fully stopped regardless of the reason of the stop, i.e. whether it is an operational stop or shutdown stop. The only exception is activation of the input *Emergency stop*, when the ignition output is opened immediately after the input is activated. **NOTE:** Learn more in the separate chapter Starting sequence.

Binary output: Ventilation

Related FW	2.0
Description	The output is intended for control of an engine room ventilation fan or engine container ventilation fan. Intended for the engine ventilator control. The output is closed at the beginning of the start procedure together with *Prestart* output and opens together with *Stop Solenoid* after the engine is fully stopped. The output opens immediately when *Emergency stop* is activated or if the controller is switched to OFF mode.

Binary output: Idle/Nominal

Related FW	2.0
Description	This output is intended for switching of the speed governor reference from idle to nominal speed and vice versa. The output is opened when the engine is required to run at idle speed and it is closed when the engine is required to run at nominal speed. • The output is opened while the engine is not running and also during start. • The output is closed after the engine has been started when the timer *Idle time* elapses. • The output remains closed while the engine is running. • The output is opened while stopping either at the beginning or at the end of the cooling phase. This is selectable by the setpoint *Cooling speed*. **NOTE:** Some governors do not support speed reference switching.

Binary output: Prelubr pump

Related FW	2.0
Description	This output can be used for periodic lubrication of the engine while the engine is not running. The output is periodically closed for *Prelubr time* and then opened for *Prelubr pause*. The output opens immediately when *Emergency stop* is activated or if the controller is switched to OFF mode. **NOTE:** The engine must be equipped with an external electric motor-driven oil pump to allow this function.

Binary output: FltResButnEcho

Related FW	2.0
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.

Binary output: HrnResButnEcho

Related FW	2.0
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.

Binary output: StartButnEcho

Related FW	2.0
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.

Binary output: StopButnEcho

Related FW	2.0
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.

Binary output: MCBButnEcho

Related FW	2.0
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.

Binary output: GCBButnEcho

Related FW	2.0
Description	This output provides 1s pulse when: • *GCB* button is pressed on the controller front panel or • *GCB* button is pressed on any of external local/remote terminals or • *GCB close/open* command is received via communication line or • the input *GCBButton* is activated.

Binary output: GCB status

Related FW	2.0
Description	This output indicates the GCB position, how it is internally considered in the controller. The position is based on *GCB feedback* input and optionally also on the *GCB 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 GCB 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 GCB position.

Binary output: MCB status

Related FW	2.0
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.

Binary output: Gen params OK

Related FW	2.0
Description	This output indicates that the generator actually provides proper voltage and frequency. The output is closed while the gen-set is running (regardless of whether GCB is closed or not) and **all generator electrical parameters** are in limits. **NOTE:** This output combined with a PLC block *Delay* can be used for switching on/off of some auxiliary devices (e.g. cooling pump), that are supplied directly from generator (before GCB). The delay is reccommended to allow the generator getting stable and avoid unnecessary switching the auxiliary device on and off just after start.

Binary output: MainsParams OK

Related FW	2.0
Description	This output indicates that the mains is healthy. The output is closed while **all mains electrical parameters** are in limits.

Binary output: Bus Params OK

Related FW	2.0
Description	This output indicates that the bus is healthy. The output is closed while **all bus electrical parameters** are in limits.

Binary output: kWh pulse

Related FW	2.0
Description	This output generates 100ms pulse always when the internal kWh counter incremented.

Binary output: In synchronism

Related FW	2.0
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: • Phase shift between generator and mains (bus) voltage must be within range of ±*Phase window* for period longer than *Dwell time*. • Voltage difference between generator and mains (bus) 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 GCB **must be disabled** for this case. Use the input *GCB disable*.

Binary output: InMainsParal

Related FW	2.0
Description	This LBO indicates that controller (or logical group, which the controller is member of) is connected to the mains. It means that there exists a way across MCB (IM-NT-MCB application) or MCB+MGCB (IM-NT-MGCB application) to the controller. It is possible to configure this signal as MCB feedback of the controller, what can be useful for complicated applications with higher amount of mains. **NOTE:**

	This signal works correctly only if IM-NT is used as the MCB/MGCB control device.

Binary output: Derating 1 act

Related FW	2.0
Description	IS-NT specific funtion! This output is closed when level 1 derating is active. For more information on power derating see chapter Power derating.

Binary output: Derating 2 act

Related FW	2.0
Description	IS-NT specific funtion! This output is closed when level 2 derating is active. For more information on power derating see chapter Power derating.

Binary output: Engines swapped

Related FW	2.0
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.

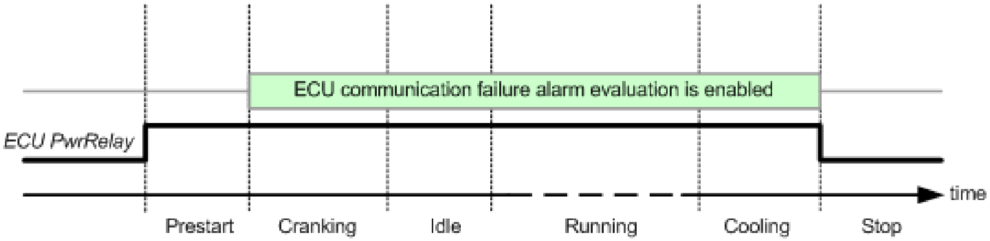
Binary output: Neutral CB C/O

Related FW	2.0
Description	This output is intended for control of the neutral contactor. The output provides continuous signal while the neutral contactor has to be closed. Use the input *NeutralCB fdb* for the neutral contactor feedback. Response time of the contactor must be **less than 400ms**. If the contactor does not respond to an open or close command within this time, the alarm *Wrn NCB fail* is issued. **NOTE:** Learn more about neutral contactor in the description of the setpoint *#Neutral cont.*.

Binary output: ECU PwrRelay

Related FW	2.0
Description	This output is used for control of the "Keyswitch" ECU input. The output is closed at the beginning of the prestart phase, remains closed while the engine is running, and is opened when the engine has to be stopped. The keyswitch input may be also labeled as "15" according to cable numbering convention used in vehicles. • If this input is used (configured), the evaluation of ECU communication fault alarm and other ECU-related alarms is enabled only while the engine is beeing started or is running. The reason is that most of ECUs go to

sleep mode and do not communicate while the keyswitch input is deactivated.



ECU ALARMS EVALUATION PERIOD WHEN THE ECU PWRRELAY IS USED

NOTE:
It is recommended to adjust the *Prestart time* to at least 3 sec to allow the ECU to wake-up and begin the communication prior to the ECU communication fault alarm is enabled.

- If this input is not configured the evaluation of ECU-related alarms is enabled all the time.

NOTE:
If your ECU does not have the keyswitch input, however you want the ECU-related alarms to be disabled while the engine is not running, configure the output onto a virtual IO module (VPIO).

CAUTION!
This output should not be used for disconnecting of main power supply from the ECU. Disconnecting of the main power supply while the engine is running might cause the ECU will not be able to record eventual trouble codes into it's nonvolatile memory.

Binary output: ECU Comm Error

Related FW	2.0
Description	The output is closed while there is an error in the communication with ECU, i.e. while there is the alarm *ECU comm error* present in the alarm list.

Binary output: PeriphCommErr

Related FW	2.0
Description	The output is closed while there is an error in the communication with any peripheral unit (e.g. IS-AIN8, IGS-PTM, ...).

Binary output: CtrlHeartBeat

Related FW	2.0
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.

Binary output: CtrlHBeat FD

Related FW	2.0
Description	This output is used at a redundant controller to disconnect the main controller from the gen-set, 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.

Binary output: LdShed stage 1

Related FW	2.0
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.

Binary output: LdShed stage 2

Related FW	2.0
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.

Binary output: LdShed stage 3

Related FW	2.0
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.

Binary output: TimerAct 1-4

Related FW	2.0
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.

Binary output: TimerAct 5-8

Related FW	2.0
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.

Binary output: TimerAct 9-12

Related FW	2.0
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.

Binary output: TimerAct 13-16

Related FW	2.0
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.

Binary output: TimerActiveCom

Related FW	2.0
Description	This is combined output from all timer channels. The output is active if at least one timer channel is active.

Binary output: MODES: Off mode

Related FW	2.0
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*).

Binary output: MODES: Man mode

Related FW	2.0
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*).

Binary output: MODES: Sem mode

Related FW	2.0
Description	IS-NT specific function! The output is closed while the controller is currently in SEM mode. This output is available in IS-NT controllers only.

Binary output: MODES: Aut mode

Related FW	2.0
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*).

Binary output: MODES: Test mode

Related FW	2.0
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*).

Binary output: MODES: Off mode

Related FW	2.0
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*).

Binary output: MODES: Man mode

Related FW	2.0
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*).

Binary output: MODES: Sem mode

Related FW	2.0
Description	IS-NT specific function! The output is closed while the controller is currently in SEM mode. This output is available in IS-NT controllers only.

Binary output: MODES: Aut mode

Related FW	2.0
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*).

Binary output: MODES: Test mode

Related FW	2.0
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*).

Binary output: MODES: Off mode

Related FW	2.0
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*).

Binary output: MODES: Man mode

Related FW	2.0
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*).

Binary output: MODES: Sem mode

Related FW	2.0
Description	IS-NT specific function! The output is closed while the controller is currently in SEM mode. This output is available in IS-NT controllers only.

Binary output: MODES: Aut mode

Related FW	2.0
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*).

Binary output: MODES: Test mode

Related FW	2.0
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*).

Binary output: MODES: Off mode

Related FW	2.0
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*).

Binary output: MODES: Man mode

Related FW	2.0

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*).

Binary output: MODES: Sem mode

Related FW	2.0
Description	IS-NT specific function! The output is closed while the controller is currently in SEM mode. This output is available in IS-NT controllers only.

Binary output: MODES: Aut mode

Related FW	2.0
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*).

Binary output: MODES: Test mode

Related FW	2.0
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*).

Binary output: MODES: Off mode

Related FW	2.0
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*).

Binary output: MODES: Man mode

Related FW	2.0
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*).

Binary output: MODES: Sem mode

Related FW	2.0
Description	IS-NT specific function! The output is closed while the controller is currently in SEM mode. This output is available in IS-NT controllers only.

Binary output: MODES: Aut mode

Related FW	2.0
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*).

Binary output: MODES: Test mode

Related FW	2.0
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*).

Binary output: SystReady

Related FW	2.0
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.

Binary output: Ready for Load

Related FW	2.0
Description	This output is closed while the gen-set is running, it's voltage and frequency are in limits and the GCB is able to be closed or is already closed.

Binary output: Stand-by ready

Related FW	2.0
Description	This output is intended for indication, that the gen-set is ready for standby operation, i.e. for automatic start and taking over the load. The output is closed while: • the genset is not running **and** • the controller is in AUT or SEM mode **and** • there isn't any alarm blocking start of the gen-set **and** • AMF function and island operation are enabled (*Island enable*, *MFStart enable*).

Binary output: Gen-set active

Related FW	2.0
Description	The output closes at the beginning of the prestart phase and opens after the gen-set has been fully stopped. If the gen-set fails to start the output opens after the last cranking attempt. **NOTE:** The output also closes if the engine begins to rotate spontaneously.

Binary output: Operational

Related FW	2.0
Description	The output is closed when the gen-set is ready for operation or is currently in

	operation.

Binary output: Ready

Related FW	2.0
Description	The output is closed while the gen-set is not in operation at the moment, however it is ready to be put into operation. The output is closed while: • the genset is not running **and** • the controller is not in OFF mode **and** • there isn't any alarm blocking start of the gen-set

Binary output: Not ready

Related FW	2.0
Description	The output is closed while the gen-set is not in operation, however it is not ready to be put into operation. The output is closed while: • the genset is not running **and** • the controller is in OFF mode **or** • there is an alarm blocking start of the gen-set.

Binary output: CrankProcedure

Related FW	2.0
Description	The output is closed while the engine is cranking and during pauses between crank attemps. The output is opened either when the gen-set is started or failed to start. See the diagram in the descrition of the output *Cranking* for differencies between outputs *CrankProcedure*, *Cranking* and *Starter*.

Binary output: Starting

Related FW	2.0
Description	The output is closed at the beginning of the prestart phase and remains closed during prestart, cranking and starting phases. The output is opened either when the gen-set goes to running phase or when it failed to start. See the diagram in the descrition of the output *Cranking* for details.

Binary output: Idle run

Related FW	2.0
Description	This output is closed while the timer *Idle time* is counting down. This timer begins to count down when the engine is considered as started and the starter motor is deenergized. See also description of the output *Starter*.

Binary output: Running

Related FW	2.0
Description	This output is closed at the end of the *Idle* phase when the output *Idle/Nominal* is closed to switch the gen-set to nominal speed. The output is opened when the gen-set goes to cooling phase or performs a shutdown.

Binary output: ForwardSynchro

Related FW	2.0
Description	The output is closed during forward synchronizing and opens when the output *GCB status* is activated (= GCB was closed). **NOTE:** The output can be used for control of an external synchronizing module.

Binary output: ReverseSynchro

Related FW	2.0
Description	The output is closed during reverse synchronizing (synchronizing of loaded gen-set 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.

Binary output: Warming

Related FW	2.0
Description	The output is closed during warming period. Learn more about warmin in the description of the setpoint *Warming load*.

Binary output: Soft load

Related FW	2.0
Description	The output is closed during gen-set soft loading period – i.e. it is closed when the gen-set has been synchronized to the mains/bus and GCB has been closed and opened again when the ramp of the gen-set power reached the required level. **NOTE:** The output is not closed during the warming period.

Binary output: Loaded

Related FW	2.0
Description	The output is closed while the gen-set is loaded and the load is beeing regulated according to selected mode (baseload, import/export, power management etc.) or is not beeing regulated in single island operation.

Binary output: Soft unld

Related FW	2.0
Description	The output is closed while the gen-set is beeing unloaded before opening GCB.

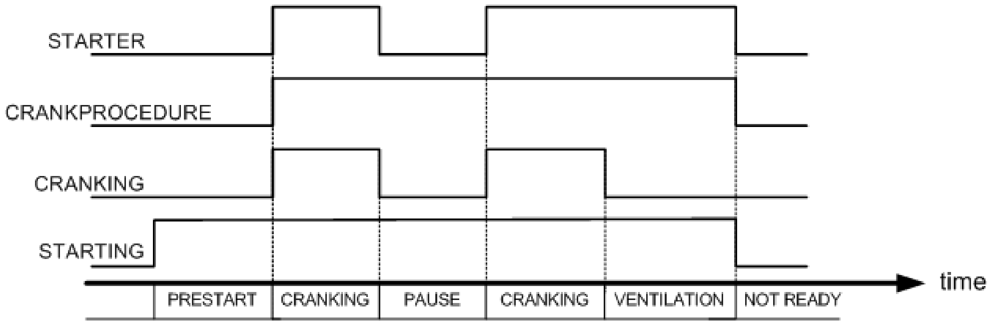
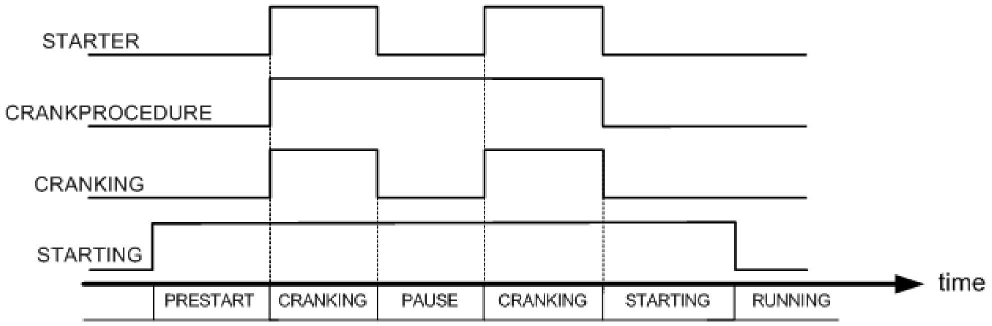
Binary output: Cooling

Related FW	2.0
Description	The output is closed during the *Cooling* phase, which takes place after GCB has been opened before the engine is stopped.

Binary output: Stopping

Related FW	2.0
Description	The output closes when the command to stop the engine has been issued, i.e. the output *Fuel Solenoid* has been deactivated. It opens when the engine is fully stopped. The output also closes if the engine begins to rotate spontaneously. This output is closed for the whole time of the stopping sequence (regardless of the repeated opening of the *Stop solenoid*). It is deactivated immediately when the engine is considered stopped.

Binary output: Cranking

Related FW	2.0
Description	The output is closed while the engine is cranking. See the following diagrams for differencies between outputs *CrankProcedure*, *Cranking* and *Starter*. The diagrams show situation for gas engine and two crank attempts.  CRANKING OUTPUTS BEHAVIOR - SUCCESSFUL START  CRANKING OUTPUTS BEHAVIOR - UNSUCCESSFUL START

Binary output: Logical 0

Related FW	2.0
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.

Binary output: Logical 1

Related FW	2.0
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.

Binary output: Bin selector 1

Related FW	2.0
Description	Output is closed or opened according to the setpoint *Bin selector 1*. **NOTE:** The output is intended for ECU-controlled engines to switch on/off some particular ECU function by a controller setpoint if the function can be controlled by a binary value over the J1939 bus.

Binary output: Bin selector 2

Related FW	2.0
Description	Output is closed or opened according to the setpoint *Bin selector 2*. **NOTE:** The output is intended for ECU-controlled engines to switch on/off some particular ECU function by a controller setpoint if the function can be controlled by a binary value over the J1939 bus.

Binary output: Bin selector 3

Related FW	2.0
Description	Output is closed or opened according to the setpoint *Bin selector 3*. **NOTE:** The output is intended for ECU-controlled engines to switch on/off some particular ECU function by a controller setpoint if the function can be controlled by a binary value over the J1939 bus.

Binary output: Bin selector 4

Related FW	2.0
Description	Output is closed or opened according to the setpoint *Bin selector 4*. **NOTE:** The output is intended for ECU-controlled engines to switch on/off some particular ECU function by a controller setpoint if the function can be controlled by a binary value over the J1939 bus.

Binary output: WrongPhSeq

Related FW	2.0
Description	Binary output WrongPhSeq is active when at least one of the following conditions is fulfilled: Generator/Mains/Bus phase is inverted or wrong generator/mains/bus phase sequence or opposed generator/mains/bus phase sequence is detected.

Binary output: PeakShaveAct

Related FW	2.0
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).

Binary output: User Button 1

<table>
<tr><td>Related FW</td><td>2.0</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 one second.
NOTE:
Repeated pressing of button during the closed period (one second) causes issuing another puls of length of one second to be generated from the moment of button pushing.</td></tr>
</table>
</td></tr>
</table>

Binary output: User Button 2

Related FW	2.0
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 one second.
NOTE:
Repeated pressing of button during the closed period (one second) causes issuing another puls of length of one second to be generated from the moment of button pushing.</td></tr>
</table>
</td></tr>
</table>

Binary output: User Button 3

<table>
<tr><td>Related FW</td><td>2.0</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 one second.
NOTE:
Repeated pressing of button during the closed period (one second) causes issuing another puls of length of one second to be generated from the moment of button pushing.</td></tr>
</table>
</td></tr>
</table>

Binary output: User Button 4

Related FW	2.0
Description	This output can be specified for example on buttons on IV-5/8 or in SCADA

<table>
<tr><td></td><td>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 one second.
<u>NOTE:</u>
Repeated pressing of button during the closed period (one second) causes issuing another puls of length of one second to be generated from the moment of button pushing.</td></tr>
</table></td></tr>
</table>

Binary output: User Button 5

<table>
<tr><td>Related FW</td><td>2.0</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>
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<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 one second.
<u>NOTE:</u>
Repeated pressing of button during the closed period (one second) causes issuing another puls of length of one second to be generated from the moment of button pushing.</td></tr>
</table></td></tr>
</table>

Binary output: User Button 6

<table>
<tr><td>Related FW</td><td>2.0</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.
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<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>
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NOTE:
Repeated pressing of button during the closed period (one second) causes issuing another puls of length of one second to be generated from the moment of button pushing.</td></tr>
</table>
</td></tr>
</table>

Binary output: User button 7

<table>
<tr><td>Related FW</td><td>2.0</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.
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<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>
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<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>
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NOTE:
Repeated pressing of button during the closed period (one second) causes issuing another puls of length of one second to</td></tr>
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</td></tr>
</table>

<table>
<tr><td></td><td><table><tr><td></td><td>be generated from the moment of button pushing.</td></tr></table></td></tr>
</table>

Binary output: User Button 8

<table>
<tr><td>Related FW</td><td>2.0</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>
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<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>
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<u>NOTE:</u>
Repeated pressing of button during the closed period (one second) causes issuing another puls of length of one second to be generated from the moment of button pushing.</td></tr>
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</table>

Binary output: User Button 9

<table>
<tr><td>Related FW</td><td>2.0</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.

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<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>
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<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</td><td>Pressing the button issues log. binary output User Button X to</td></tr>
</table></td></tr>
</table>

	<table><tr><td>**ON**</td><td>close for one second. **NOTE:** Repeated pressing of button during the closed period (one second) causes issuing another puls of length of one second to be generated from the moment of button pushing.</td></tr></table>

Binary output: User Button 10

Related FW	2.0
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 one second. **NOTE:** Repeated pressing of button during the closed period (one second) causes issuing another puls of length of one second to be generated from the moment of button pushing.</td></tr></table>

Binary output: User Button 11

Related FW	2.0
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></table>

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<tr><td></td><td>
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<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 one second.
NOTE:
Repeated pressing of button during the closed period (one second) causes issuing another puls of length of one second to be generated from the moment of button pushing.</td></tr>
</table>
</td></tr>
</table>

Binary output: User Button 12

<table>
<tr><td>Related FW</td><td>2.0</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.
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<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>
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<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 one second.
NOTE:
Repeated pressing of button during the closed period (one second) causes issuing another puls of length of one second to be generated from the moment of button pushing.</td></tr>
</table>
</td></tr>
</table>

Binary output: User Button 13

<table>
<tr><td>Related FW</td><td>2.0</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>
</table>
</td></tr>
</table>

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 one second. **NOTE:** Repeated pressing of button during the closed period (one second) causes issuing another puls of length of one second to be generated from the moment of button pushing.

Binary output: User Button 14

Related FW	2.0
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 one second. **NOTE:** Repeated pressing of button during the closed period (one second) causes issuing another puls of length of one second to be generated from the moment of button pushing.

Binary output: User Button 15

Related FW	2.0
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></td><td>
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<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 one second.
<u>NOTE:</u>
Repeated pressing of button during the closed period (one second) causes issuing another puls of length of one second to be generated from the moment of button pushing.</td></tr>
</table>
</td></tr>
</table>

Binary output: User Button 16

<table>
<tr><td>Related FW</td><td>2.0</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 one second.
<u>NOTE:</u>
Repeated pressing of button during the closed period (one second) causes issuing another puls of length of one second to be generated from the moment of button pushing.</td></tr>
</table>
</td></tr>
</table>

Binary output: Droop active

Related FW	2.0
Description	This LBO detects that regulation of load sharing and VARr sharing are running based on droop (setpoint Reg kW/kVAr is set to DROOP or to EMERG DROOP and emergency droop is active or the LBI kVArDroopAct).

Binary output:IslandOperAdet

Related FW	2.0
Description	This LBO gets active in case that the function of automatic detection of island operation is active and island operation was detected.

Binary output: ROCOF Act

Related FW	2.0
Description	The output closes if the Vector shift protection gets active. It stays closed for 3s, then opens again. This output is activated even if the selected breaker is actually not tripped because of the input *Sd override* is active. **NOTE:** See also the output *ROCOF Trp*.

Binary output: ROCOF Trp

Related FW	2.0
Description	The output closes if the ROCOF protection gets active and the controller trips the selected breaker. The output stays closed for 3s, then opens again. **NOTE:** See also the output *ROCOF Act*.

Binary output: RemoteControl1

Related FW	2.0
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.

Binary output: RemoteControl2

Related FW	2.0
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.

Binary output: RemoteControl3

Related FW	2.0

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.

Binary output: RemoteControl4

Related FW	2.0
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.

Binary output: RemoteControl5

Related FW	2.0
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.

Binary output: RemoteControl6

Related FW	2.0
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.

Binary output: RemoteControl7

Related FW	2.0
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.

Binary output: RemoteControl8

Related FW	2.0
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.

Alarm output: Not lubricated

Related FW	2.0
Description	The output is closed while there is the message *Not lubricated* present in the alarm list, i.e. while the first lubrication cycle haven't been completed yet. The first cycle occurs when the controller is switched on, when it is switched from OFF mode to another mode or when the input *Emergency stop* is released and confirmed. **NOTE:** If the setpoint *Prelubr time* is set to 0 (OFF), the prelubrication function is switched off.

Alarm output: CAN2 bus empty

Related FW	2.0
Description	The output is closed while there is the alarm *CAN2 bus empty* present in the alarm list, i.e. if the controller doesn’t detect any other controller on the CAN2 bus. This alarm can be disabled by the setpoint *CAN2emptDetect*.

Alarm output: ECU

Related FW	2.0
Description	The output is closed while there is the *ECU* alarm present in the alarm list, i.e. if an ECU unit is configured and it does not communicate with the controller althought it is required to communicate.

Alarm output: SHBinCfgErr

Related FW	2.0
Description	The output is closed while there is the *SHBinCfgErr* alarm present in the alarm list, i.e. if there is **more than one controller** on the CAN2 bus, which has configured the SHBOUT peripherial module **with the same index**.

Alarm output: SHAinCfgErr

Related FW	2.0
Description	The output is closed while there is the *SHAinCfgErr* alarm present in the alarm list, i.e. if there is **more than one controller** on the CAN2 bus, which has configured the SHAIN peripherial module **with the same index**.

Alarm output: ECUDiagBlocked

Related FW	2.0
Description	The output is active when receiving of diagnostic messages from the ECU is disabled (*ECU diag* = DISABLED).

Alarm output: WrongConfig

Related FW	2.0
Description	This output is closed while there is the *WrongConfig* alarm present in the alarm list. The wrong configuration is indicated if the controller configuration contains a PLC program, which exceeds limits of the current controller hardware. Typically this situation can occur when a miniCHP archive is used in a controller without mCHP dongle inserted.

Alarm output: Dongle incomp

Related FW	2.0
Description	This output is closed while there is the *Dongle incomp* alarm present in the alarm list. The incompatible dongle is indicated when a function is switched on, which requires dongle, however the dongle is not inserted or does not contain the appropriate feature. Typical situations are: • Power management is enabled and there is not any dongle with "PMS" feature inserted in the controller. • The controller is in situation, when the load sharing should beeing performed, however there is not any dongle with "LS" feature inserted in the controller.

Alarm output: Emergency stop

Related FW	2.0
Description	This output is closed while the *Emergency stop* alarm is present in the alarm list. The emergency stop alarm is activated by the input *Emergency stop*.

Alarm output: WrnServiceT1+2

Related FW	2.0
Description	This output is closed while the *WrnServiceT1+2* alarm is present in the alarm list. This alarm occurs when the counter *Service time 1* or *Service time 2* has reached

	zero value. Both timers must be reset to a nonzero value to get rid of this alarm.

Alarm output: WrnServiceT3+4

Related FW	2.0
Description	This output is closed while the *WrnServiceT3+4* alarm is present in the alarm list. This alarm occurs when the counter *Service time 3* or *Service time 4* has reached zero value. Both timers must be reset to a nonzero value to get rid of this alarm.

Alarm output: Overspeed

Related FW	2.0
Description	This output is closed while the *Overspeed* alarm is present in the alarm list.

Alarm output: Underspeed

Related FW	2.0
Description	This output is closed while the *Underspeed* alarm is present in the alarm list.

Alarm output: Start fail

Related FW	2.0
Description	This output is closed while the *Start fail* alarm is present in the alarm list. See the diagram in the description of the *Starter* output for information when the start fail alarm is indicated.

Alarm output: Sd Stop fail

Related FW	2.0
Description	This output is closed while the *Sd Stop fail* alarm is present in the alarm list. This alarm appears when the gen-set indicates that it is rotating although it has to be stopped. This situation can occur: • when the gen-set starts to rotate spontaneously (from the controller point of view) or • when the gen-set does not stop after the stop command has been issued. See the timing diagram in the description of the output *Stop Solenoid*.

Alarm output: ChrgAlternFail

Related FW	2.0
Description	This output is closed while the *ChrgAlternFail* alarm is present in the alarm list. This alarm appears when the voltage at the controller D+ terminal drops below 90% of the controller supply voltage for more than 2s. **NOTE:** Function of the D+ terminal is selected by the setpoint *D+ Function*.

Alarm output: Pickup fail

Related FW	2.0
Description	This output is closed while the *ChrgAlternFail* alarm is present in the alarm list. This alarm appears when the engine is running (there is at least one "running symptom" active), however zero speed is detected. **NOTE:** Pickup fail can be indicated even if the speed is actually measured from the generator frequency. The "running symptoms" are listed in the description of the output *Starter*.

Alarm output: Sd ExtBattFlat

Related FW	2.0
Description	This output is closed while the *Sd Battery flat* alarm is present in the alarm list. This alarm appears when reset of the controller occurs while the gen-set is actually cranking. Such a situation is considered as a reset caused by a drop of the supply voltage due to starter motor current when the gen-set starting battery is in bad condition.

Alarm output: Stp GCB fail

Related FW	2.0
Description	This output is closed while the *GCB fail* alarm is present in the alarm list.

Alarm output: Wrn MCB fail

Related FW	2.0
Description	This output is closed while the *MCB fail* alarm is present in the alarm list.

Alarm output: BOC NCB fail

Related FW	2.0
Description	This output is closed while the *NCB fail* alarm (neutral circuit breaker) is present in the alarm list.

Alarm output: Stp Sync fail

Related FW	2.0
Description	This output is closed while the *Stp Sync fail* alarm is present in the alarm list, i.e. if the last synchronization process was not successful and ended by timeout.

Alarm output: WrnRSync fail

Related FW	2.0
Description	This output is closed while the *WrnRSync fail* alarm is present in the alarm list, i.e.

	if the last reverse synchronization process was not successful and ended by timeout.

Alarm output: WrnSpdRegLim

Related FW	2.0
Description	This output is closed while the *WrnSpdRegLimit* alarm is present in the alarm list, i.e. while the analog output for speed governor is near minimum or maximum position (out of the range *SpeedGovLowLim* + 0.2V to *SpeedGovHiLim* - 0.2V for more than 2s). **NOTE:** This alarm is disabled when speed governing via binary outputs *Speed up* and *Speed dn* is used (i.e. at least one of these outputs is configured onto a physical or virtual output terminal).

Alarm output: WrnVoltRegLim

Related FW	2.0
Description	This output is closed while the *WrnVoltRegLim* alarm is present in the alarm list, i.e. while the analog output for AVR is near minimum or maximum position (out of the range 2% to 98% for more than 2s). **NOTE:** This alarm is disabled when AVR control via binary outputs *AVR up* and *AVR dn* is used (i.e. at least one of these outputs is configured onto a physical or virtual output terminal).

Alarm output: WrnTestOnLdFail

Related FW	2.0
Description	This output is closed while the *WrnTestOnLdFail* alarm is present in the alarm list. This alarm indicates that the *Test on load* function has failed, i.e. the controller is in TEST mode, the input *Test on load* is closed, however, when the gen-set has been synchronized to the mains and load ramp has been finished there is still nonzero import from the mains, because the load is higher than the gen-set capacity.

Alarm output: Sd Oil press B

Related FW	2.0
Description	This output is closed while the *Sd Oil press B* alarm is present in the alarm list, i.e. while there is a mismatch between gen-set state (running/stopped) and position of the input *Oil press*.

Alarm output: OfL StartBlck

Related FW	2.0
Description	This output is closed while message *OfL StartBlck* is present in the alarm list. The message indicates that the setpoints *Island enable*, *ParallelEnable* and *Synchro enable* are adjusted in such a way, that the genset is not allowed to operate in current conditions, for example if mains breaker is opened and however island

	operation is disabled.

Alarm output: Start blocking

Related FW	2.0
Description	The output is closed while there is the message *Start blocking* in the alarm list, i.e. while the input Startblocking is closed.

Alarm output: Fuel theft

Related FW	2.0
Description	This output is closed while the *Fuel theft* alarm is present in the alarm list. This alarm occurs when the fuel level value measured at the analog input Fuel level drops faster than is the limit adjusted by setpoint MaxFuelDrop.

Alarm output: PLC State 1

Related FW	2.0
Description	The output is closed while the alarm generated by the PLC block *Force prot 1* is present in the alarm list. **NOTE:** The actual text, which appears in the alarm list, can be changed in GenConfig.

Alarm output: PLC State 2

Related FW	2.0
Description	The output is closed while the alarm generated by the PLC block *Force prot 2* is present in the alarm list. **NOTE:** The actual text, which appears in the alarm list, can be changed in GenConfig.

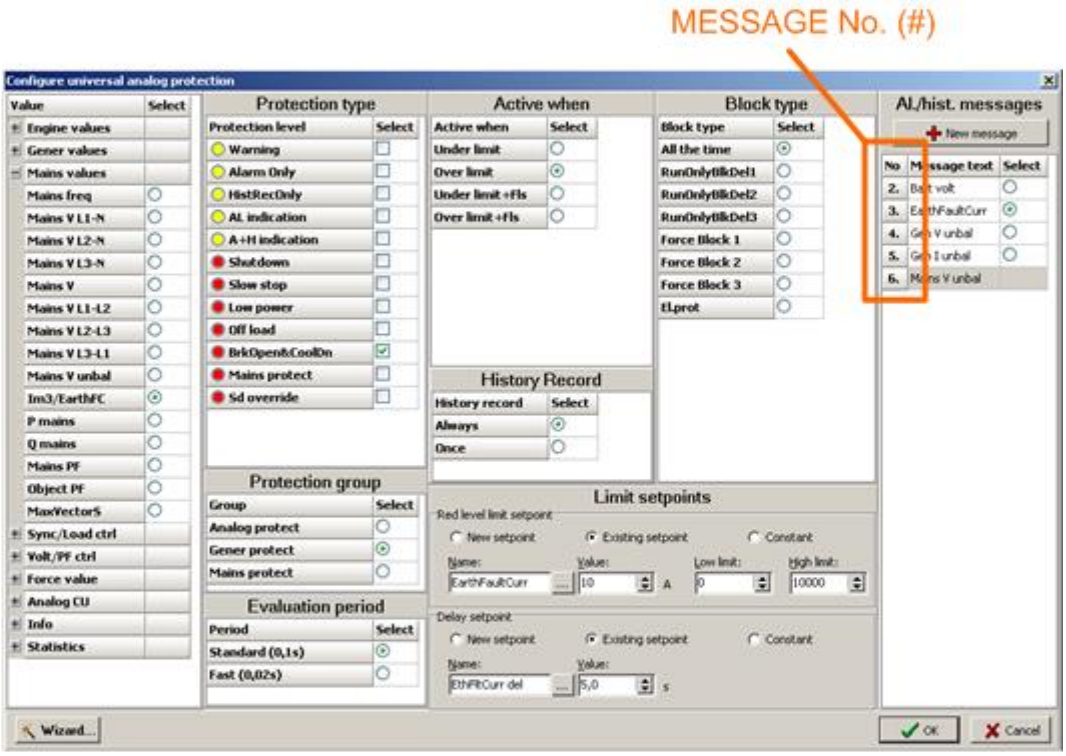
Alarm output: PLC State 3

Related FW	2.0
Description	The output is closed while the alarm generated by the PLC block *Force prot 3* is present in the alarm list. **NOTE:** The actual text, which appears in the alarm list, can be changed in GenConfig.

Alarm output: PLC State 4

Related FW	2.0
Description	The output is closed while the alarm generated by the PLC block *Force prot 4* is present in the alarm list. **NOTE:** The actual text, which appears in the alarm list, can be changed in GenConfig.

Alarm output: UnivState 1

Related FW	2.0
Description	The output is closed while the alarm generated by the *Universal analog protection*, where the **Message #1** is used, is present in the alarm list. **NOTE:** The actual text of the message depends on configuration.  HOW TO FIND OUT THE MESSAGE NUMBER

Value	Select
+ Engine values	
+ Gener values	
− Mains values	
Mains freq	○
Mains V L1-N	○
Mains V L2-N	○
Mains V L3-N	○
Mains V	○
Mains V L1-L2	○
Mains V L2-L3	○
Mains V L3-L1	○
Mains V unbal	○
Im3/EarthFC	●
P mains	○
Q mains	○
Mains PF	○
Object PF	○
MaxVectorS	○
+ Sync/Load ctrl	
+ Volt/PF ctrl	
+ Force value	
+ Analog CU	
+ Info	
+ Statistics	

Protection level	Select
Warning	☐
Alarm Only	☐
HistRecOnly	☐
AL indication	☐
A+H indication	☐
Shutdown	☐
Slow stop	☐
Low power	☐
Off load	☐
BrkOpen&CoolDn	☑
Mains protect	☐
Sd override	☐

Group	Select
Analog protect	○
Gener protect	●
Mains protect	○

Period	Select
Standard (0,1s)	●
Fast (0,02s)	○

Active when	Select
Under limit	○
Over limit	●
Under limit +Fls	○
Over limit +Fls	○

History record	Select
Always	●
Once	○

Block type	Select
All the time	●
RunOnlyBlkDel1	○
RunOnlyBlkDel2	○
RunOnlyBlkDel3	○
Force Block 1	○
Force Block 2	○
Force Block 3	○
ELprot	○

No	Message text	Select
2.	Batt volt	○
3.	EarthFaultCurr	●
4.	Gen V unbal	○
5.	Gen I unbal	○
6.	Mains V unbal	

Red level limit setpoint
○ New setpoint ● Existing setpoint ○ Constant
Name: EarthFaultCurr Value: 10 A Low limit: 0 High limit: 10000

Delay setpoint
○ New setpoint ● Existing setpoint ○ Constant
Name: EthFltCurr del Value: 5,0 s

Alarm output: UnivState 2

Related FW	2.0
Description	The output is closed while the alarm generated by the *Universal analog protection*, where the **Message #2** is used, is present in the alarm list. See the *UnivState 1* for picture how to find the message number.

Alarm output: UnivState 3

Related FW	2.0
Description	The output is closed while the alarm generated by the *Universal analog protection*, where the **Message #3** is used, is present in the alarm list. See the *UnivState 1* for picture how to find the message number.

Alarm output: UnivState 4

Related FW	2.0

Description	The output is closed while the alarm generated by the *Universal analog protection*, where the **Message #4** is used, is present in the alarm list. See the *UnivState 1* for picture how to find the message number.

Alarm output: UnivState 5

Related FW	2.0
Description	The output is closed while the alarm generated by the *Universal analog protection*, where the **Message #5** is used, is present in the alarm list. See the *UnivState 1* for picture how to find the message number.

Alarm output: UnivState 6

Related FW	2.0
Description	The output is closed while the alarm generated by the *Universal analog protection*, where the **Message #6** is used, is present in the alarm list. See the *UnivState 1* for picture how to find the message number.

Alarm output: UnivState 7

Related FW	2.0
Description	The output is closed while the alarm generated by the *Universal analog protection*, where the **Message #7** is used, is present in the alarm list. See the *UnivState 1* for picture how to find the message number.

Alarm output: UnivState 8

Related FW	2.0
Description	The output is closed while the alarm generated by the *Universal analog protection*, where the **Message #8** is used, is present in the alarm list. See the *UnivState 1* for picture how to find the message number.

Alarm output: UnivState 9

Related FW	2.0
Description	The output is closed while the alarm generated by the *Universal analog protection*, where the **Message #9** is used, is present in the alarm list. See the *UnivState 1* for picture how to find the message number.

Alarm output: UnivState 10

Related FW	2.0
Description	The output is closed while the alarm generated by the *Universal analog protection*, where the **Message #10** is used, is present in the alarm list. See the *UnivState 1* for picture how to find the message number.

Alarm output: UnivState 11

Related FW	2.0

Description	The output is closed while the alarm generated by the *Universal analog protection*, where the **Message #11** is used, is present in the alarm list. See the *UnivState 1* for picture how to find the message number.

Alarm output: UnivState 12

Related FW	2.0
Description	The output is closed while the alarm generated by the *Universal analog protection*, where the **Message #12** is used, is present in the alarm list. See the *UnivState 1* for picture how to find the message number.

Alarm output: UnivState 13

Related FW	2.0
Description	The output is closed while the alarm generated by the *Universal analog protection*, where the **Message #13** is used, is present in the alarm list. See the *UnivState 1* for picture how to find the message number.

Alarm output: UnivState 14

Related FW	2.0
Description	The output is closed while the alarm generated by the *Universal analog protection*, where the **Message #14** is used, is present in the alarm list. See the *UnivState 1* for picture how to find the message number.

Alarm output: UnivState 15

Related FW	2.0
Description	The output is closed while the alarm generated by the *Universal analog protection*, where the **Message #15** is used, is present in the alarm list. See the *UnivState 1* for picture how to find the message number.

Alarm output: Bus meas error

Related FW	2.0
Description	The output closes when bus measurement protection is activated according to description of Gener protect:*BusMeasError* setpoint.