DEIF

-power in control

CE

DESIGNER'S REFERENCE HANDBOOK

Compact Genset Controller, CGC 400

- General product information
- Functional description
- Additional functions
- Protections

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1. General information

1.1 Warnings, legal information and safety

1.1.1 Warnings and notes

Throughout this document, a number of warnings and notes with helpful user information will be presented. To ensure that these are noticed, they will be highlighted as follows in order to separate them from the general text.

Warnings

Warnings indicate a potentially dangerous situation, which could result in death, personal injury or damaged equipment, if certain guidelines are not followed.

Notes

Notes provide general information, which will be helpful for the reader to bear in mind.

1.1.2 Legal information and disclaimer

DEIF takes no responsibility for installation or operation of the generator set. If there is any doubt about how to install or operate the engine/generator controlled by the unit, the company responsible for the installation or the operation of the set must be contacted.

The unit is not to be opened by unauthorised personnel. If opened anyway, the warranty will be lost.

Disclaimer

DEIF A/S reserves the right to change any of the contents of this document without prior notice.

1.1.3 Safety issues

Installing and operating the unit may imply work with dangerous currents and voltages. Therefore, the installation should only be carried out by authorised personnel who understand the risks involved in working with live electrical equipment.

Be aware of the hazardous live currents and voltages. Do not touch any AC measurement inputs as this could lead to injury or death.

DEIF do not recommend to use the USB as the primary power supply for the unit.

1.1.4 Electrostatic discharge awareness

Sufficient care must be taken to protect the terminal against static discharges during the installation. Once the unit is installed and connected, these precautions are no longer necessary.

1.1.5 Factory settings

The unit is delivered from factory with certain factory settings. These are based on average values and are not necessarily the correct settings for matching the engine/generator set in question. Precautions must be taken to check the settings before running the engine/generator set.

1.2 About the designer's reference handbook

1.2.1 General purpose

This Designer's Reference Handbook mainly includes functional descriptions, presentation of display unit and menu structure, the procedure for parameter setup and reference to parameter lists.

The general purpose of this document is to provide useful overall information about the functionality of the controlelr and its applications. This document also offers the user the information he needs in order to successfully set up the parameters needed in his specific application.

Please make sure to read this document before starting to work with the controller and the genset to be controlled. Failure to do this could result in human injury or damage to the equipment.

1.2.2 Intended users

This Designer's Reference Handbook is mainly intended for the panel builder designer in charge. On the basis of this document, the panel builder designer will give the electrician the information he needs in order to install the unit, e.g. detailed electrical drawings. In some cases, the electrician may use these installation instructions himself.

1.2.3 Contents and overall structure

This document is divided into chapters, and in order to make the structure simple and easy to use, each chapter will begin from the top of a new page.

2. General product information

2.1 Introduction

2.1.1 Introduction

This chapter will deal with the unit in general and its place in the DEIF product range.
The CGC, short for Compact Genset Controller, is part of the DEIF Compact Genset Controller range, based on standard advanced software of Multi-line 2. The concept of the CGC is to offer a cost-effective solution to genset builders, who need a flexible generator protection and control unit for small single to medium and large genset applications.

2.2 Type of product

The compact genset controller is a micro-processor based control unit containing all necessary functions for protection and control of a genset.

It contains all necessary 3-phase measuring circuits, and all values and alarms are presented on the LCD display.

The CGC 400 will come in two different variants: CGC 412 and CGC 413.
The CGC 412 is the unit that is able to perform auto start, and the CGC 413 is able to make the automatic mains failure (AMF) sequences. The hardware for the two products is different, therefore some of the sequences described in this document are only relevant to one of the variants. You will find a detailed description of the available functions in each product in the chapter "Standard Functions".

For detailed specifications of the hardware, please refer to the datasheet.

2.3 Options

2.3.1 Options

When ordering the CGC 400, it comes with a number of features, which were options in the other DEIF products.

The customer cannot add or remove any of these features/options.

The included features are A1, C2, H2, H5.

2.4 PC utility software warning

2.4.1 PC USW warning

It is possible to remote-control the genset from the PC utility software or AGI. To avoid personal injury, make sure that it is safe to remote-control the genset.

DEIF do not recommend to use the USB as the primary power supply for the unit.

3. Passwords

3.1 Passwords and parameter access

3.1.1 Password

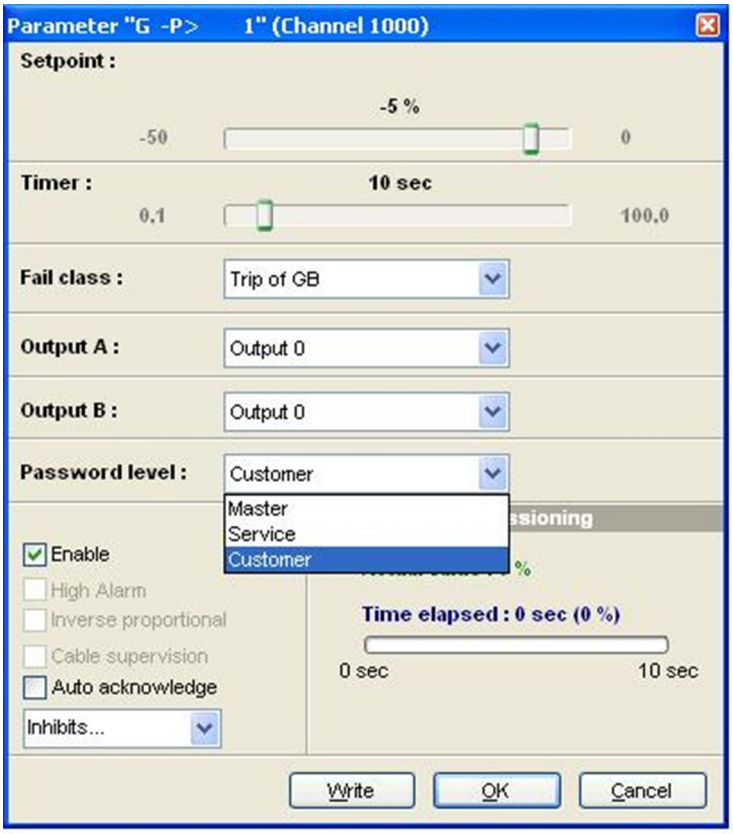
The unit includes three password levels. All levels can be adjusted in the PC software.

Available password levels:

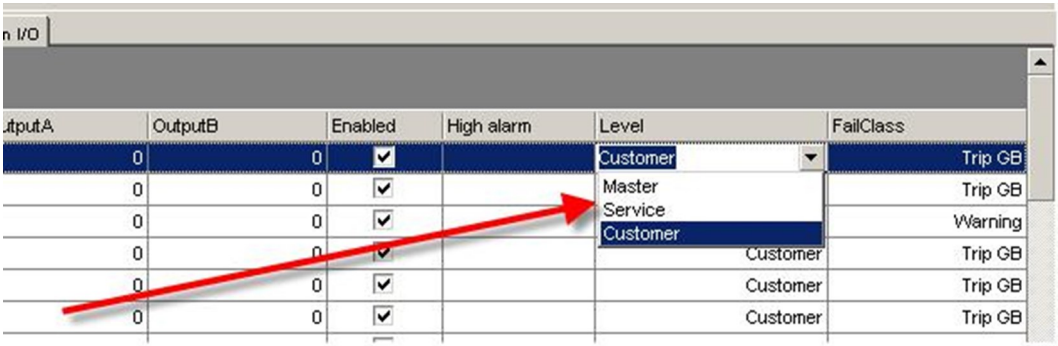
Password level	Factory setting	Access		
		Customer	Service	Master
Customer	2000	X		
Service	2001	X	X	
Master	2002	X	X	X

A parameter cannot be entered with a password that is ranking too low. But the settings can be displayed without password entry.

Each parameter can be protected by a specific password level. To do so, the PC utility software must be used. Enter the parameter to be configured and select the correct password level.



The password level can also be changed from the parameter view in the column "Level".



3.1.2 Parameter access

To gain access to adjust the parameters, the password level must be entered:

If the password level is not entered, it is not possible to enter the parameters.

The customer password can be changed in jump menu 9116. The service password can be changed in jump menu 9117. The master password can be changed in jump menu 9118.

The factory passwords must be changed if the operator of the genset is not allowed to change the parameters.

It is not possible to change the password at a higher level than the password entered.

4. Functional descriptions

4.1 Standard functions

4.1.1 Standard functions

This section includes functional descriptions of standard functions as well as illustrations of the relevant application types. Flowcharts and single-line diagrams will be used in order to simplify the information.

The standard functions are listed in the following paragraphs.

The table below describes the genset modes that are available, depending on the variant of the CGC to be used.

Application	Comment
Automatic Mains Failure (AMF) (no back sync.)	CGC 413
Island operation	CGC 412/CGC 413
Load takeover	CGC 413

On the hardware point of view, the CGC 412 has a lighter specification than the CGC 413.

The table below describes which points differ from each other.

Feature (terminal numbers)	Available on CGC 412	Available on CGC 413
Mains measurement (term. 28 to 32)	No	Yes
Extra multi-inputs (term. 58 and 59)	No	Yes
Extra binary inputs (term. 56 and 57)	No	Yes

4.1.2 Operation modes

- Automatic Mains Failure
- Island operation
- Load takeover

4.1.3 Engine control

- Start/stop sequences
- Run and stop coil

4.1.4 Generator protection (ANSI)

- 2 x reverse power (32)
- 5 x overload (32)
- 4 x overcurrent (50/51)
- 2 x overvoltage (59)
- 3 x undervoltage (27)
- 3 x over-/underfrequency (81)
- Multi-inputs (digital, 4-20 mA, Pt100, Pt1000 or RMI)
- Digital inputs

The overcurrent level is limited to 200% of the nominal current. Therefore, it cannot be considered as a short-circuit protection.

4.1.5 Busbar protection (ANSI)

- 2 x over-voltage (59)
- 2 x under-voltage (27)
- 2 x over-frequency (81)
- 2 x under-frequency (81)

4.1.6 Display

- Push-buttons for start and stop
- Push-buttons for breaker operations
- Status texts

4.1.7 M-Logic

- Simple logic configuration tool
- Selectable input events
- Selectable output commands

4.2 Terminal strip overview

4.2.1 Reference to Installation Instructions

Please see the Installation Instructions for terminal strip overview and rear side controller view.

4.3 Measurement systems

The CGC 400 is designed for measurement of voltages between 100 and 480V AC. For further reference, the AC wiring diagrams are shown in the Installation Instructions. In menu 9130, the measurement principle can be changed between three-phase, single phase and split phase.

Configure the CGC 400 to match the correct measuring system. When in doubt, contact the switchboard manufacturer for information about the required adjustment.

4.3.1 Single phase system

The single phase system consists of one phase and the neutral.

The following adjustments must be made to make the system ready for the single phase measuring (example 230V AC):

Setting	Adjustment	Description	Adjust to value
6004	G nom. voltage	Phase-neutral voltage of the generator	230V AC
6041	G transformer	Primary voltage of the G voltage transformer (if installed)	U_{NOM} x √3
6042	G transformer	Secondary voltage of the G voltage transformer (if installed)	U_{NOM} x √3
6051	BB transformer	Primary voltage of the BB voltage transformer (if installed)	U_{NOM} x √3
6052	BB transformer	Secondary voltage of the BB voltage transformer (if installed)	U_{NOM} x √3
6053	BB nom. voltage	Phase-phase voltage of the busbar	U_{NOM} x √3

The voltage alarms refer to U_{NOM} (230V AC).

The controller has two sets of BB transformer settings, which can be enabled individually in this measurement system.

4.3.2 Split phase system

This is a special application where two phases and neutral are connected to the controller. The controller shows phases L1 and L3 in the display. The phase angle between L1 and L3 is 180 degrees. Split phase is possible between L1-L2 or L1-L3.

The following adjustments must be made to make the system ready for the split phase measuring (example 240/120V AC):

Setting	Adjustment	Description	Adjust to value
6004	G nom. voltage	Phase-phase voltage of the generator	120V AC
6041	G transformer	Primary voltage of the G voltage transformer (if installed)	U_{NOM}
6042	G transformer	Secondary voltage of the G voltage transformer (if installed)	U_{NOM}
6051	BB transformer	Primary voltage of the BB voltage transformer (if installed)	U_{NOM}
6052	BB transformer	Secondary voltage of the BB voltage transformer (if installed)	U_{NOM}
6053	BB nom. voltage	Phase-phase voltage of the busbar	U_{NOM}

The measurement U_{L3L1} shows 240V AC. The voltage alarm setpoints refer to the nominal voltage 120V AC, and U_{L3L1} does not activate any alarm.

The controller has two sets of BB transformer settings, which can be enabled individually in this measurement system.

4.3.3 Three-phase system

When the controller is delivered from the factory, the three-phase system is selected. When this principle is used, all three phases must be connected to the controller.

The following adjustments must be made to make the system ready for the three-phase measuring (example 400/230V AC):

Setting	Adjustment	Description	Adjust to value
6004	G nom. voltage	Phase-phase voltage of the generator	400V AC
6041	G transformer	Primary voltage of the G voltage transformer (if installed)	U_{NOM}
6042	G transformer	Secondary voltage of the G voltage transformer (if installed)	U_{NOM}
6051	BB transformer	Primary voltage of the BB voltage transformer (if installed)	U_{NOM}
6052	BB transformer	Secondary voltage of the BB voltage transformer (if installed)	U_{NOM}
6053	BB nom. voltage	Phase-phase voltage of the busbar	U_{NOM}

The controller has two sets of BB transformer settings, which can be enabled individually in this measurement system.

4.4 Applications

4.4.1 Applications and genset modes

This section about applications is to be used for reference using the particular genset mode as starting point. It is not suitable for reading from beginning to end.

The unit can be used for the applications listed in the table below.

Application	Comment
Automatic Mains Failure (no back sync.)	CGC 413
Island operation	CGC 412/CGC 413
Load takeover	CGC 413

Genset mode	Running mode			
	Auto	Test	Man	Block
Automatic Mains Failure (no back sync.)	X	X	X	X
Island operation	X	X	X	X
Load takeover	X	X	X	X

For a general description of the available running modes, please refer to the chapter "Running mode description".

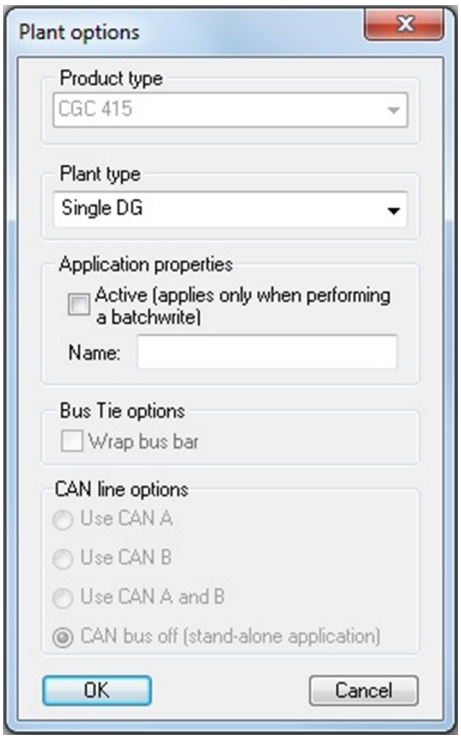
4.4.2 Application design

The application is designed through the utility software. Please select configuration.

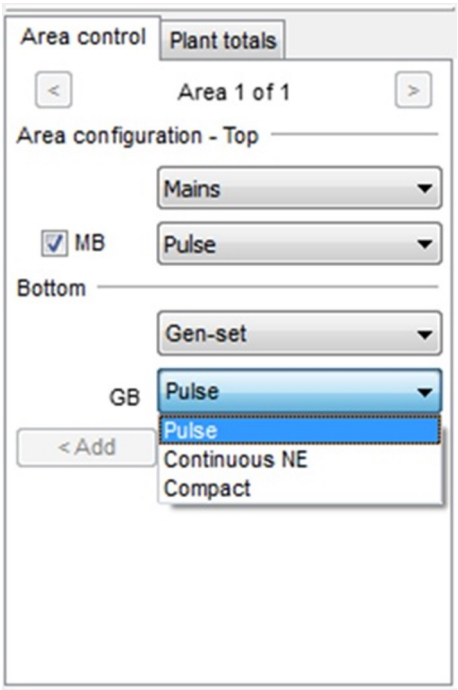
Select a new application and adjust the settings in this dialogue box.
The product will be automatically selected if you are currently connected to the unit when doing this configuration.

When using the CGC 400, the plant type will be stuck to "Single DG". This means no CAN communication can be established with other units.
The active choice we can make here is the name of the application.

Using the CGC 400, only one application will be available.



Now the application can be designed using the section control panel.



For each area, it is defined whether a generator and a mains are present, and the number and type of breakers.

If a CGC 412 is currently connected, it will not be possible to draw an application with a mains or a mains breaker.

This application configuration setup is here to give the user the choice of which breaker type is in use.

It will be possible to choose between "Pulse", "Continuous NE" or "Compact" for the generator breaker.
For the mains breaker, in case a CGC 413 is connected, the choice will be between "Pulse", "Continuous NE", "Continuous ND" or "Compact".

4.4.3 AMF (no back synchronisation)

Auto mode description
The unit automatically starts the genset and switches to generator supply at a mains failure after an adjustable delay time. It is possible to adjust the unit to change to genset operation in two different ways:

1. The mains breaker will be opened at genset start-up.
2. The mains breaker will remain closed until the genset is running, and the genset voltage and frequency is OK.

In both cases, the generator breaker will be closed when the generator voltage and frequency is OK, and the mains breaker is open.

When the mains returns, the unit will switch back to mains supply and cool down and stop the genset. The switching back to mains supply is done when the adjusted "Mains OK delay" has expired.

For a general description of the available running modes, please refer to the chapter "Running mode description".

4.4.4 Island operation

Auto mode description

The unit automatically starts the genset and closes the generator breaker at a digital start command. When the stop command is given, the generator breaker is tripped, and the genset will be stopped after a cooling down period. The start and stop commands are used by activating and deactivating a digital input or with the time-dependent start/stop commands. If the *time-dependent start/stop* commands are to be used, the auto mode must also be used.

For a general description of the available running modes, please refer to the chapter "Running mode description".

4.4.5 Load takeover

Auto mode description

The purpose of the load takeover mode is to transfer the load imported from the mains to the genset for operation on generator supply

The unit automatically starts the genset and closes the generator breaker at a digital start command. When the stop command is given, the generator breaker is tripped, and the genset will be stopped after a cooling-down period. The start and stop commands are used by activating and deactivating a digital input or with the time-dependent start/stop commands. If the time-dependent start/stop commands are to be used, then the auto mode must also be used.

4.5 Running mode description

4.5.1 Manual mode

The unit can be operated in manual mode (MAN). Manual means that the unit will not initiate any sequences automatically, as is the case with the auto mode. It will only initiate sequences, if external signals are given.

An external signal may be given in three ways:

1. Display push-buttons
2. Digital inputs
3. Modbus command at service port or RS485

The standard CGC 400 is only equipped with a limited number of digital inputs, please refer to "Digital inputs" in this document and the data sheet for additional information about availability.

The following sequences can be activated in manual mode:

Command	Description	Comment
Start	The start sequence is initiated and continues until the genset starts or the maximum number of start attempts has been reached. If Hz/V OK the GB is ready to close.	
Stop	The genset will be stopped. After disappearance of the running signal, the stop sequence will continue to be active in the ‘"extended stop time" period. The genset is stopped with cooling down time.	The cooling down time is cancelled if the stop button is activated twice.
Close GB	The unit will close the generator breaker if the mains breaker is open	
Open GB	The unit will open the generator breaker instantly	
Close MB	The unit will close the mains breaker if the generator breaker is open	
Open MB	The unit opens the mains breaker instantly.	

4.5.2 Test mode

The test mode function is activated by activating a digital input, Modbus RS485, USW or the TEST push-button on the display.

The settings for the test function are set up in menu

7040 Test

- Timer: Period starts when U/f is ok. Engine stops when time runs out.
- Return: When the test is completed, the unit will return to the selected mode (manual or auto).
- Type: Selection of one of the two types of tests: simple or full.

If the timer in parameter 7042 is set to 0.0 min., the test sequence will be infinite. The test will be cancelled by pushing TEST again.

The test will be interrupted if the mode is changed to either manual or auto.

4.5.3 Simple test

The controller will go through the start sequence and run the engine for the time set in parameter 7042 without any breaker operation. This sequence is initiated by a digital input or the TEST push-button on the front. The test will run until the timer expires. When the timer runs out, the stop sequence including cooling down will be carried out.

4.5.4 Full test

The full test will start the genset, open the mains breaker, if pressent, and close the generator breaker. When the test timer expires or the test is cancelled by mode change, the generator breaker is opened, the mains breaker closed, if pressent, and the generator is stopped after the cooldown time.

It is possible to open and close the generator breaker and the mains breaker in manual mode.

4.5.5 Block mode

Block mode can be enabled by pressing the MAN button twice, with M-Logic or a digital input. When block mode is selected, the controller will be locked for certain actions. This means that it cannot start the genset or perform any breaker operations from the buttons.
The purpose of the block mode is to make sure that the genset does not start for instance during maintenance work.

It is important to know that the digital input configured to block mode is a constant signal. So, when it is ON, the unit is in a blocked state, and when it is OFF, it returns to the mode it was in before block mode was selected.

When controller goes into block mode, it will:

- Open GB, shut down the engine, show "BLOCK" in the display and flash the MAN LED
- GB ON, GB OFF, MB ON, MB OFF and START buttons are locked

If block mode is selected using the display, the block mode can only be deactivated from the display. If block mode is selected using the digital input, the block mode can only be deactivated by setting the digital input to OFF.

Before the running mode is changed, it is important to check that persons are clear of the genset and that the genset is ready for operation.

Alarms are not influenced by block mode selection.

The genset can be started from the local engine control panel, if such is installed. Therefore, DEIF recommends avoiding local cranking and starting of the genset.

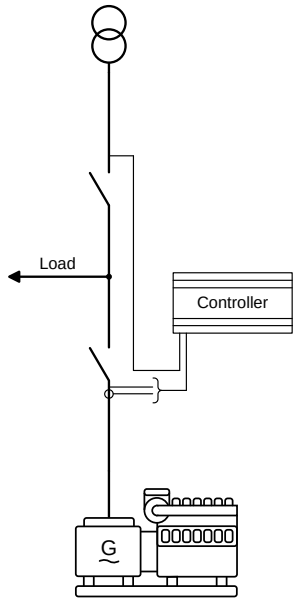
The genset will shut down if block mode is selected while the genset is running.

4.6 Single-line diagrams

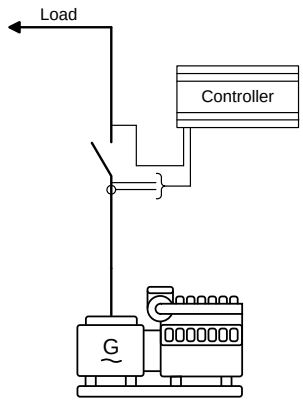
4.6.1 Application illustration

In the following, the various applications are illustrated in single-line diagrams.

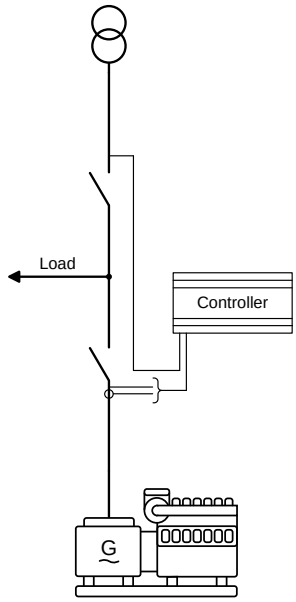
4.6.2 Automatic Mains Failure



4.6.3 Island operation



4.6.4 Load takeover



4.7 Flowcharts

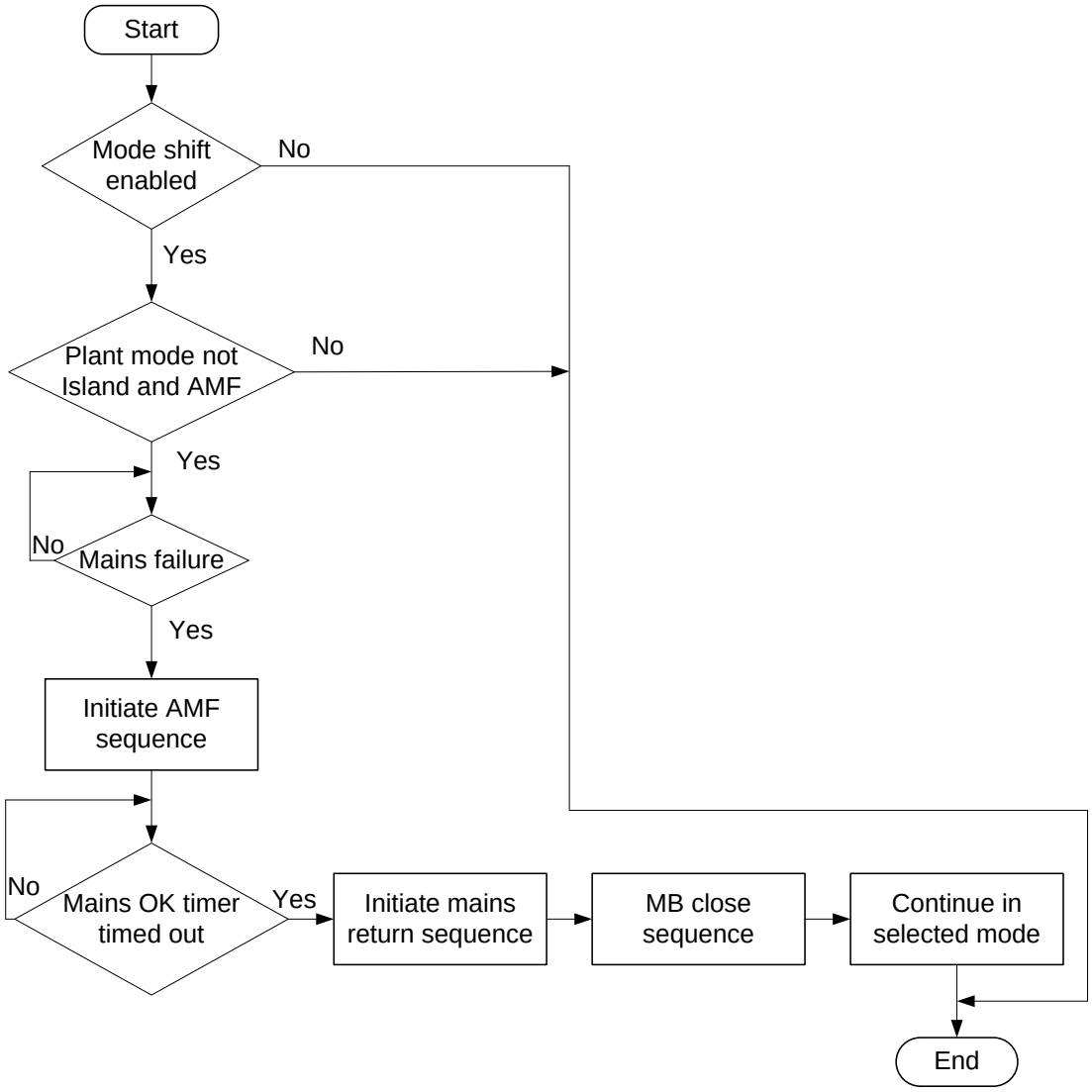
4.7.1 Flowcharts

Using flowcharts, the principles of the most important functions will be illustrated in the next sections. The functions included are:

- Mode shift
- MB open sequence
- GB open sequence
- Stop sequence
- Start sequence
- MB close sequence
- GB close sequence
- Load takeover
- Island operation
- Automatic Mains Failure
- Test sequence

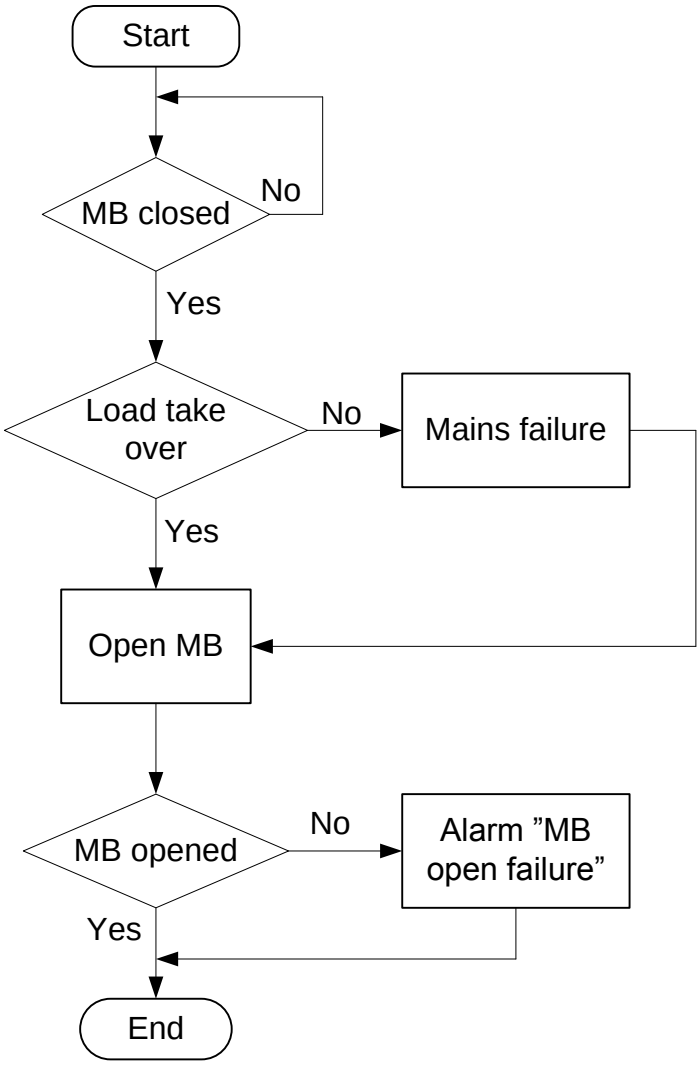
The flowcharts on the following pages are for guidance only. For illustrative purposes, the flowcharts are simplified in some extent.

4.7.2 Mode shift

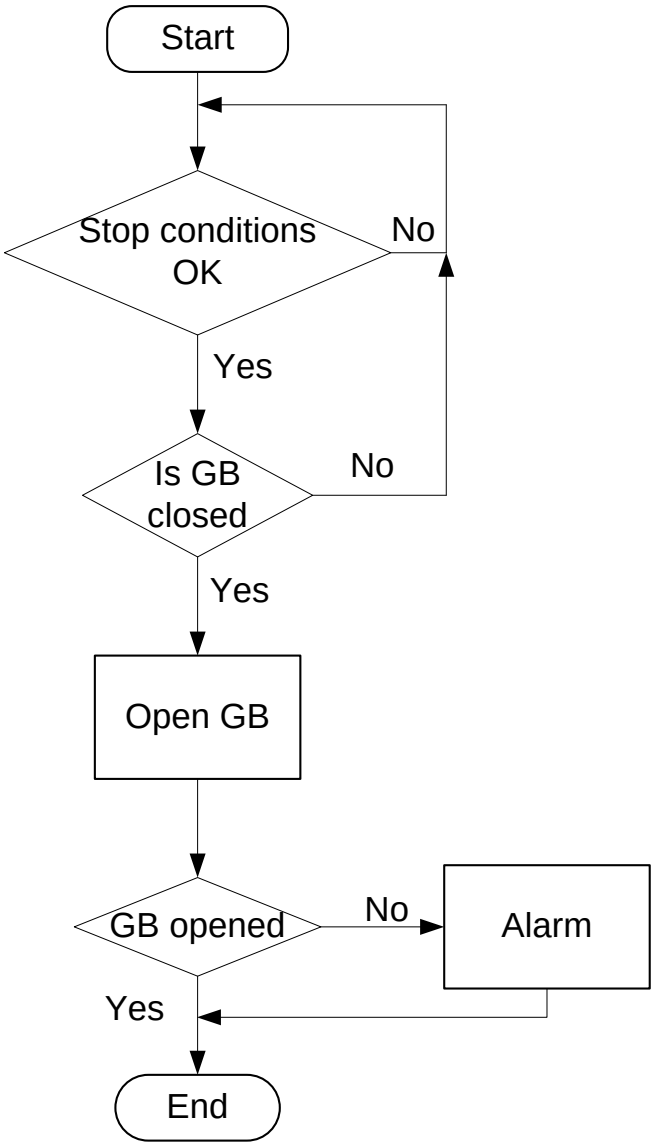


To enable mode shift, a digital input has to be set up.

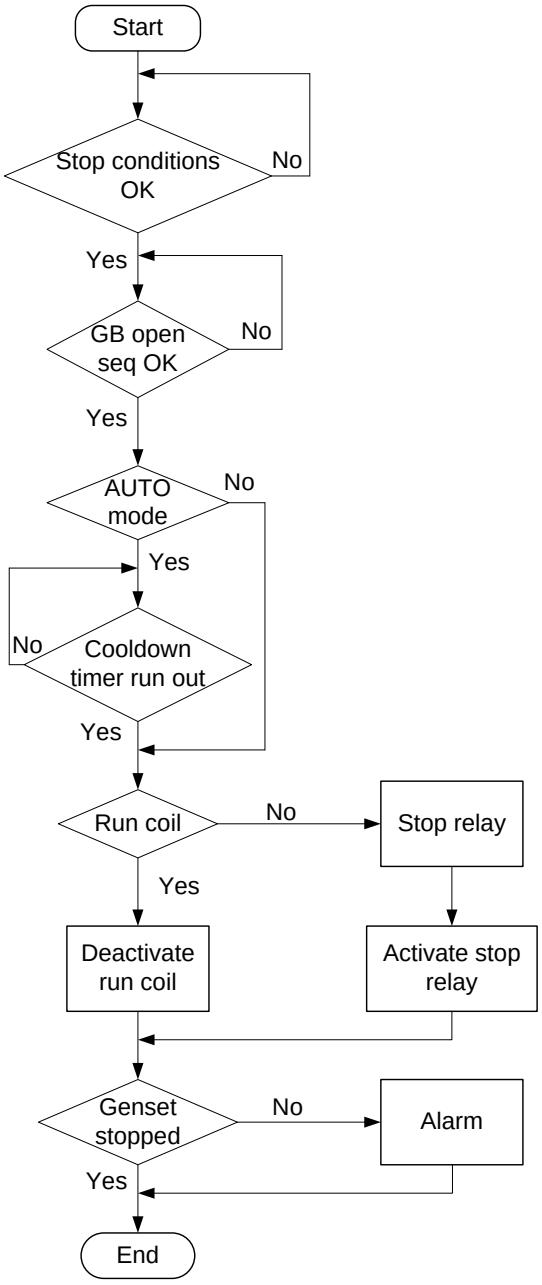
4.7.3 MB open sequence



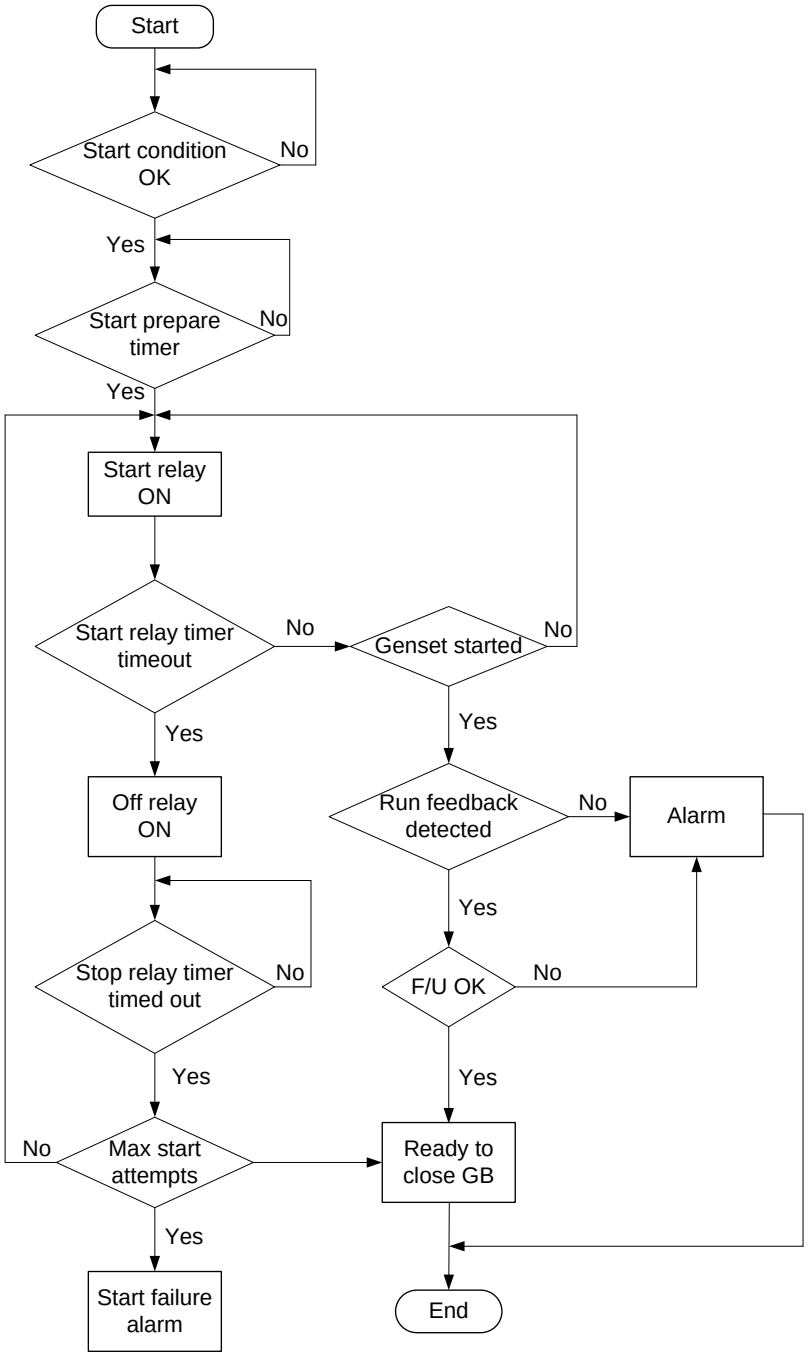
4.7.4 GB open sequence



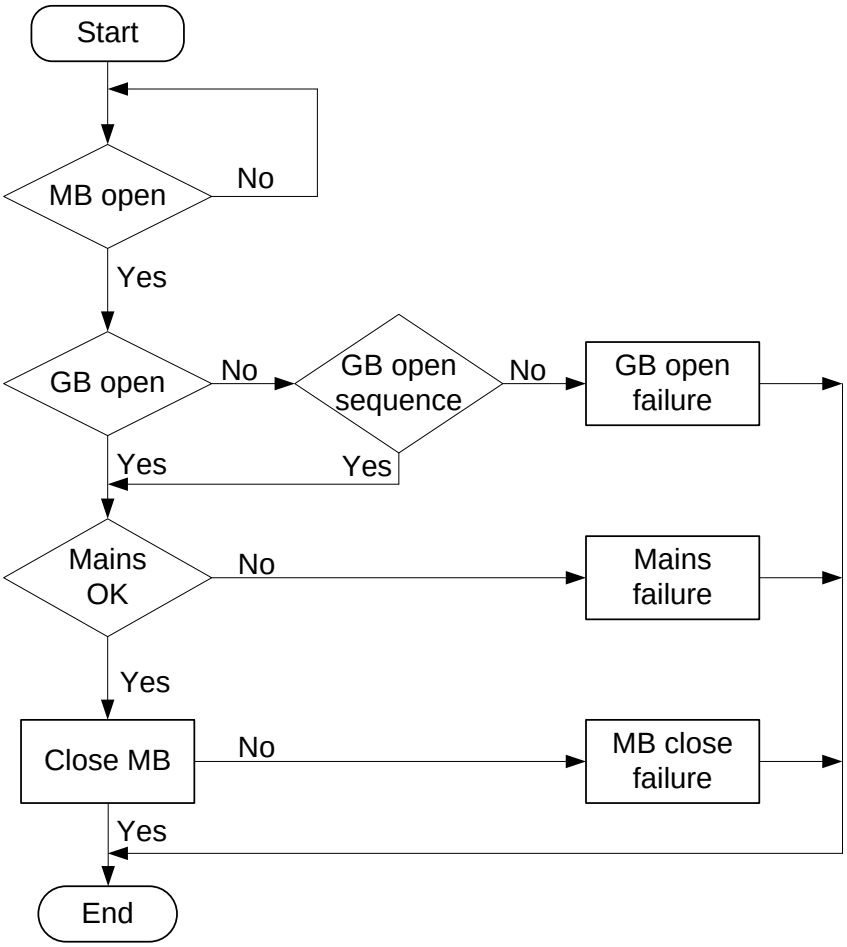
4.7.5 Stop sequence



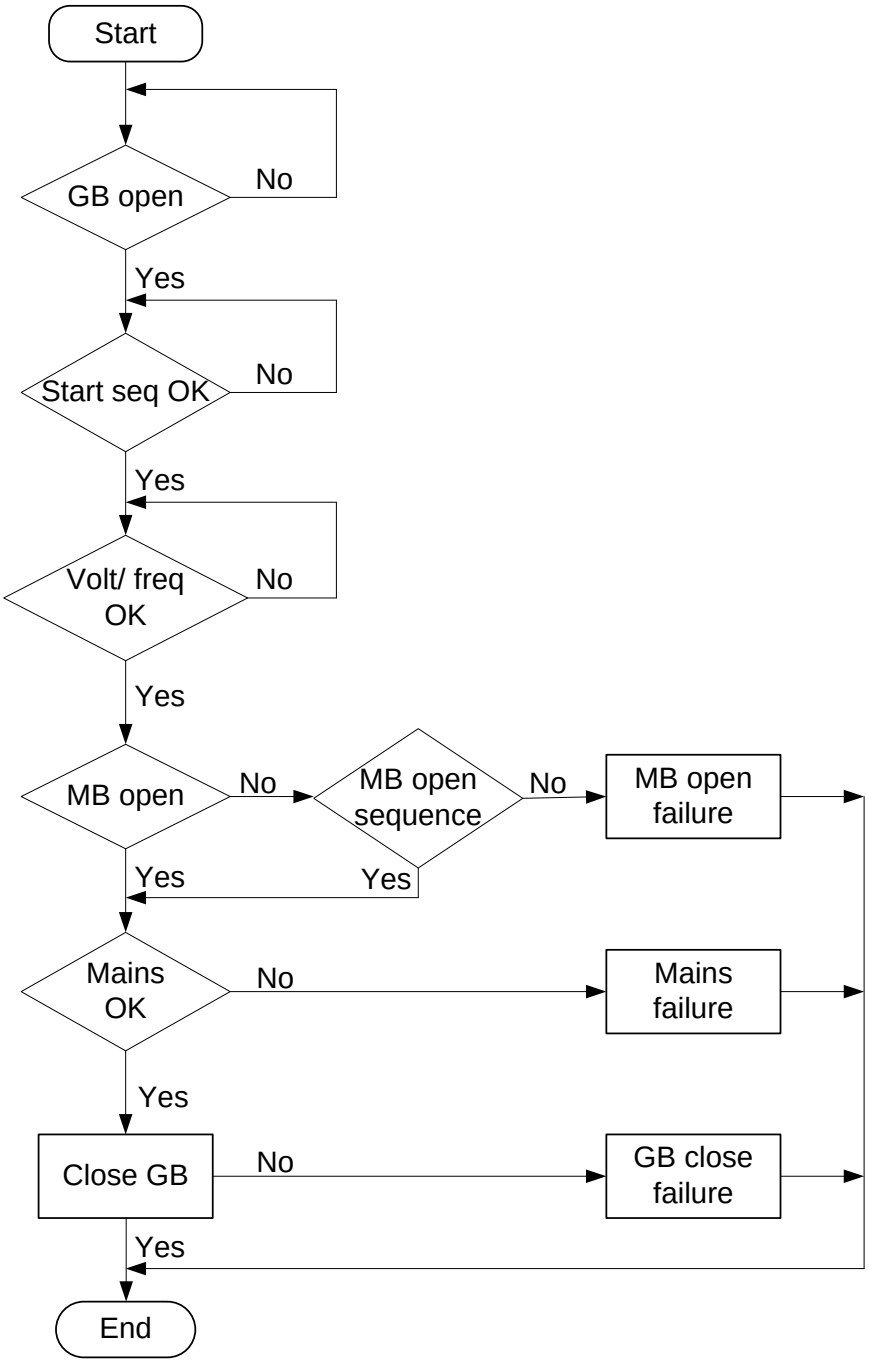
4.7.6 Start sequence



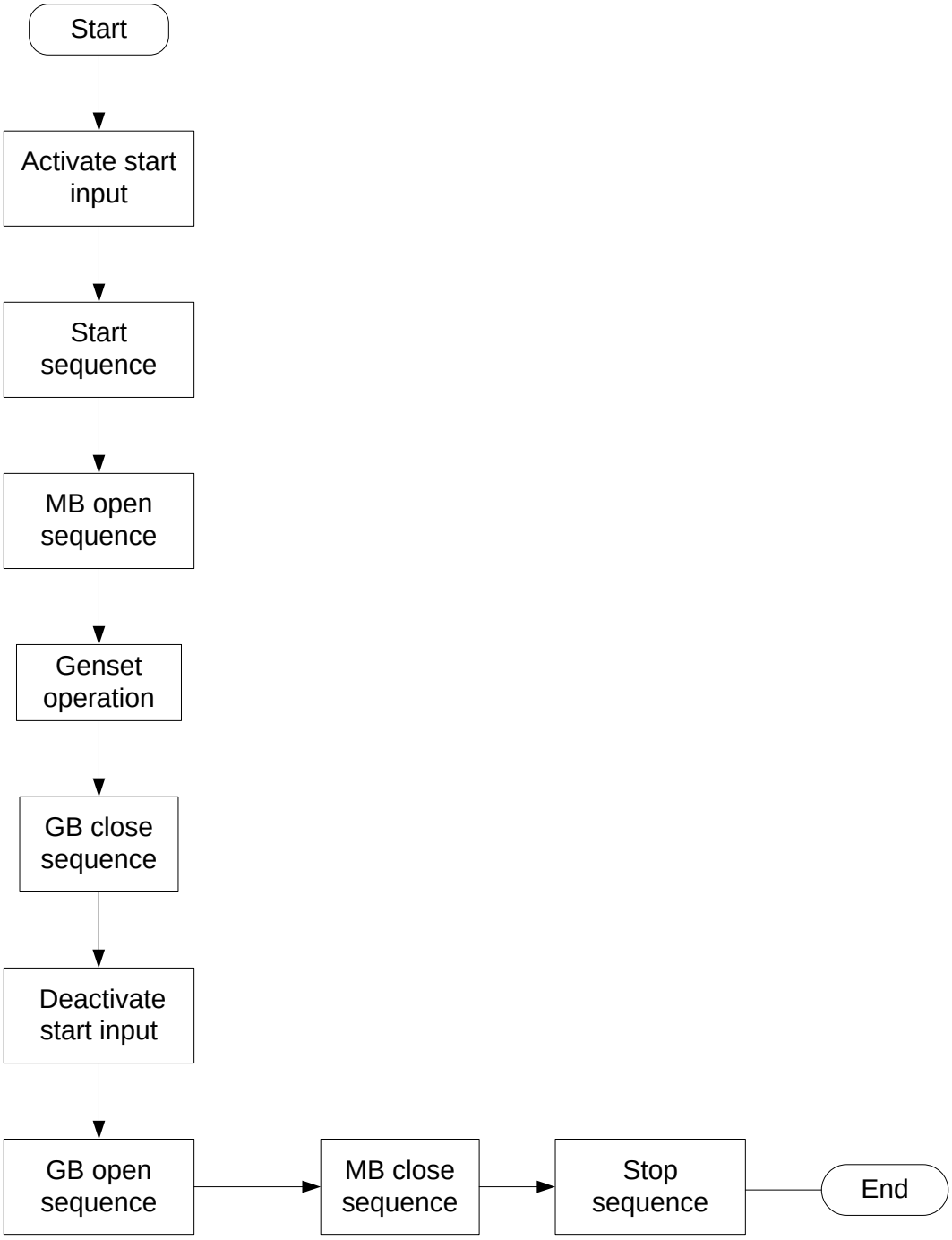
4.7.7 MB close sequence



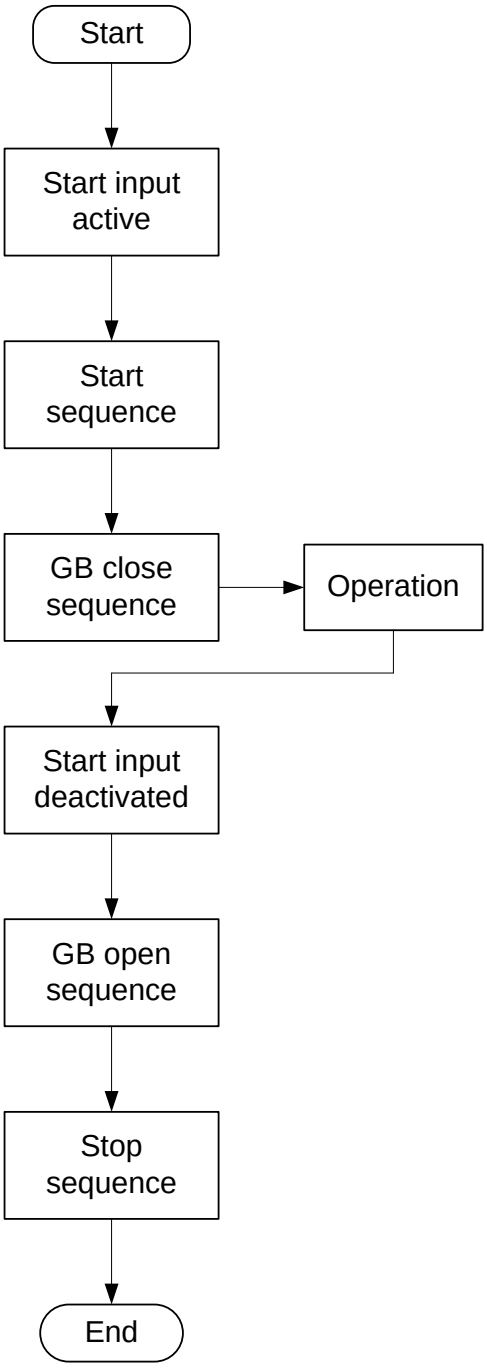
4.7.8 GB close sequence



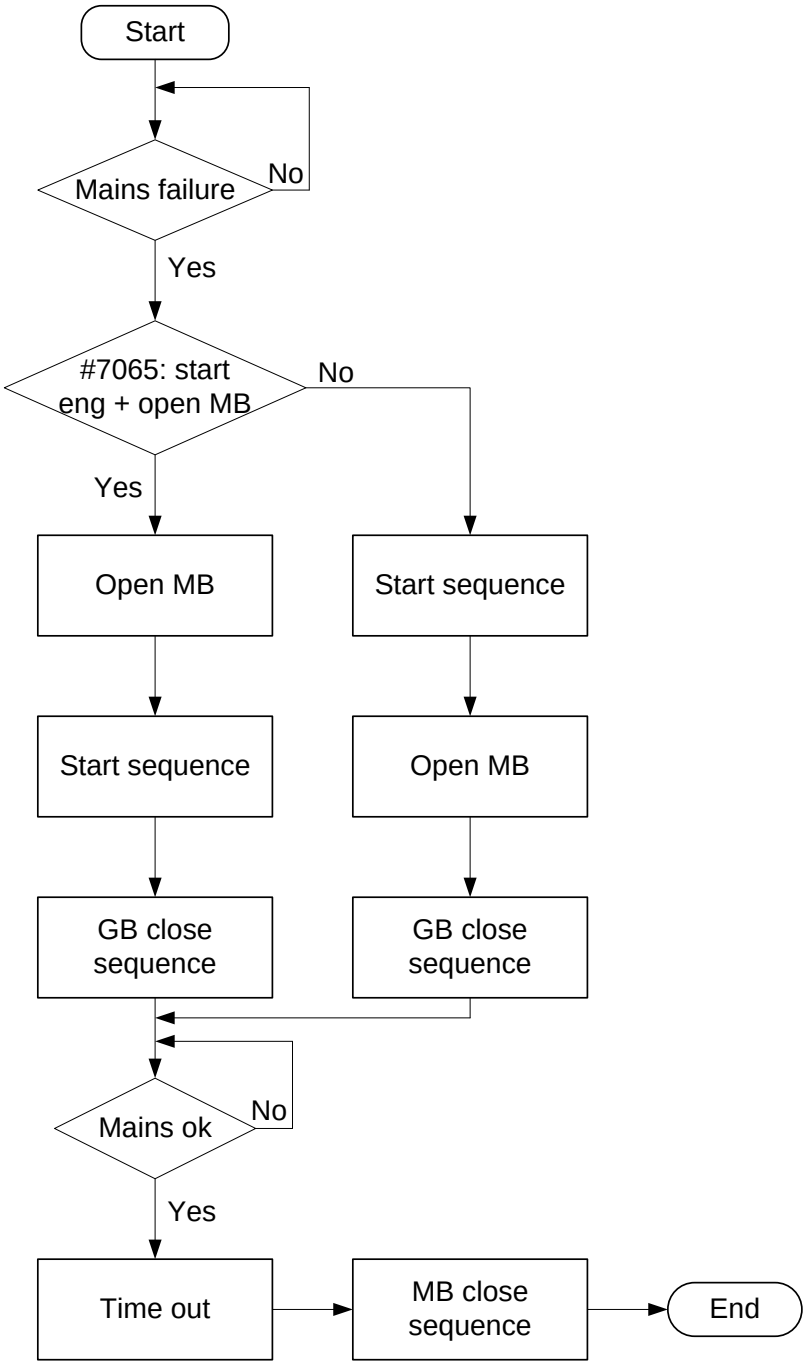
4.7.9 Load takeover



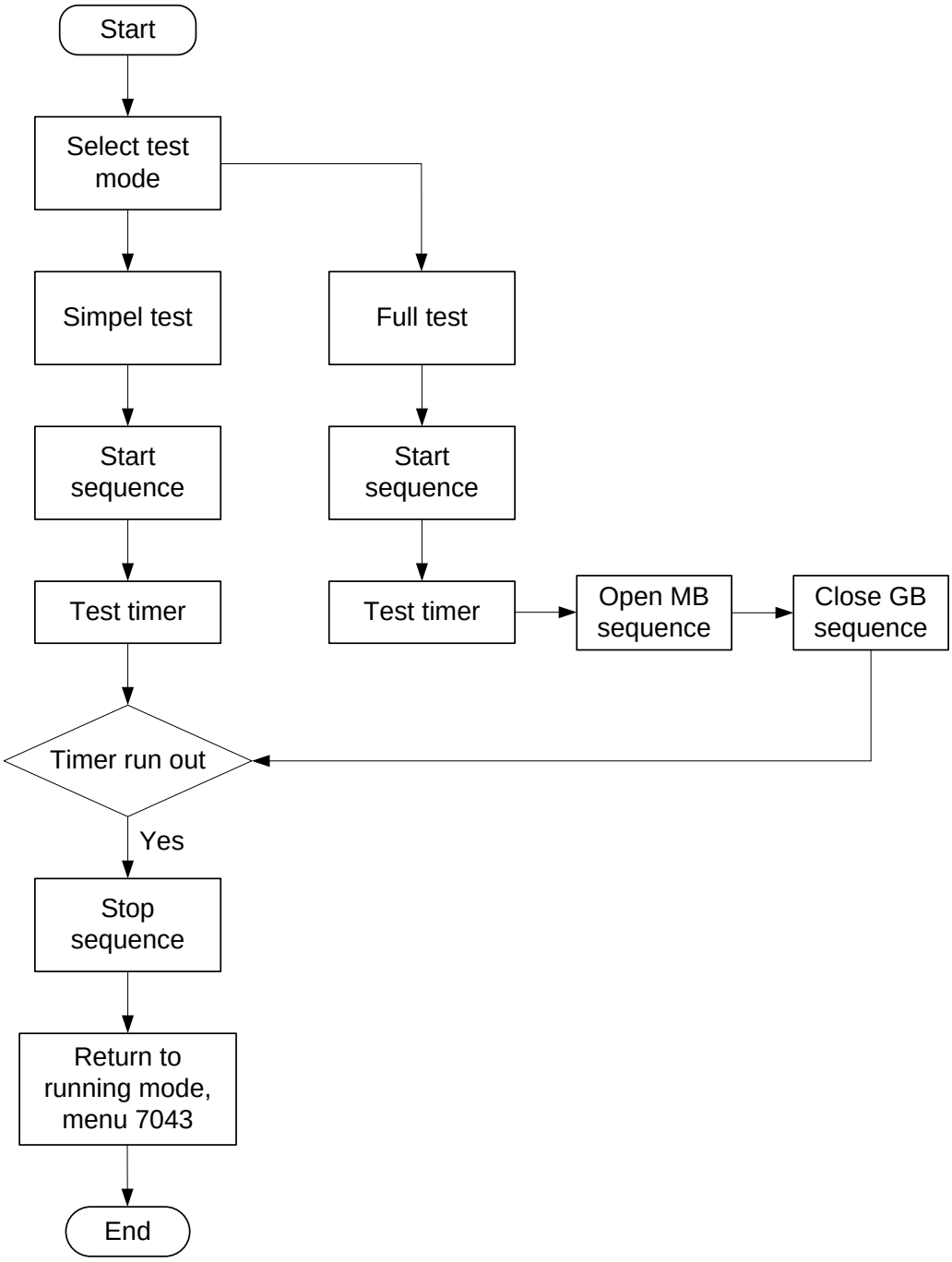
4.7.10 Island operation



4.7.11 Automatic Mains Failure, AMF



4.7.12 Test sequence



4.8 Sequences

4.8.1 Sequences

The following contains information about the sequences of the engine, the generator breaker, and the mains breaker. These sequences are automatically initiated if the auto mode is selected.

In the manual mode, the selected sequence is the only sequence initiated (e.g. press the START push-button: the engine will start, but not close the breaker).

The following sequences will be illustrated below:

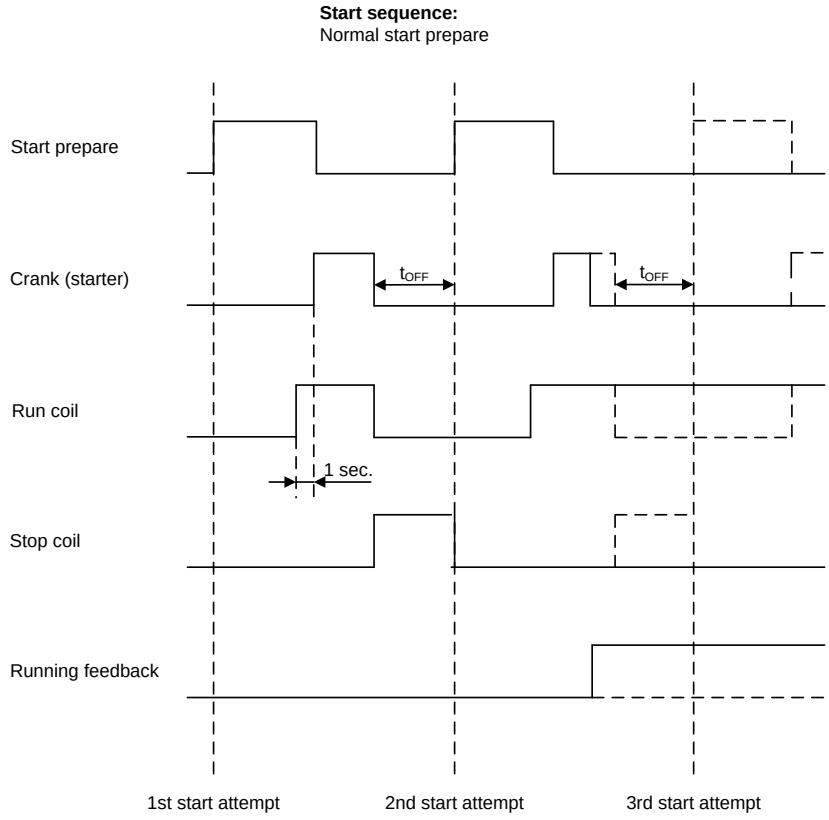
- START sequence
- STOP sequence
- Breaker sequences

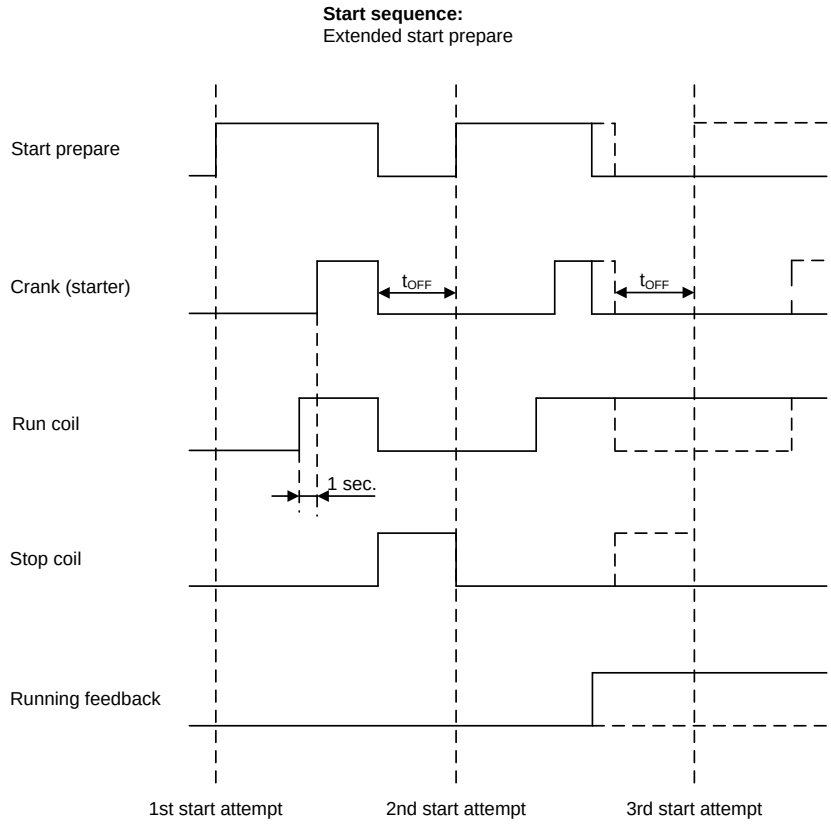
The stop coil function can only be used in relays 24,26, 45 and 47.We recomment that a resistor is mounted across the relay coil to prevent undesirable closing of the relay.

4.8.2 Start sequence

The following drawings illustrate the start sequences of the genset with normal start prepare and extended start prepare.

No matter the choice of start prepare function, the run coil is activated before the start relay (starter). The time between the run coil and the start relay is setup in parameter 6151. In the following drawings this time is set to 1 sec.





4.8.3 Start sequence conditions

The start sequence initiation can be controlled by the following conditions:

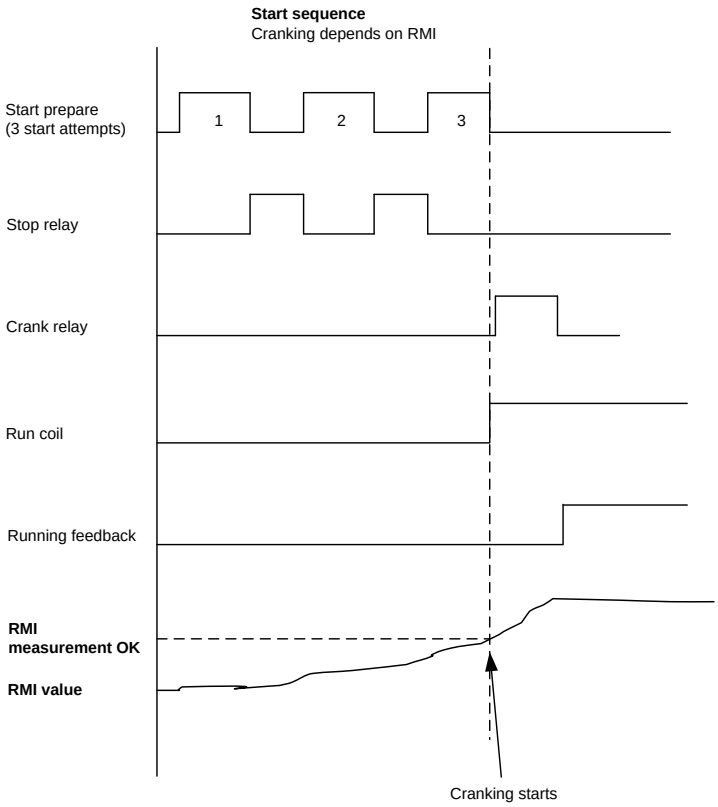
- RMI 6 (oil pressure)
- RMI 7 (water temperature)
- RMI 8 (fuel level)

This means that if e.g. the oil pressure is not primed to the sufficient value, then the crank relay will not engage the starter motor.

The selection is made in setting 6185. For each of the RMI settings, the rule is that the value (oil pressure, fuel level or water temperature) must exceed the setpoint of setting 6186 before starting is initiated.

If the value in 6186 is set to 0.0, the start sequence is initiated as soon as it is requested.

The diagram below shows an example where the RMI signal builds up slowly, and starting is initiated at the end of the third start attempt.



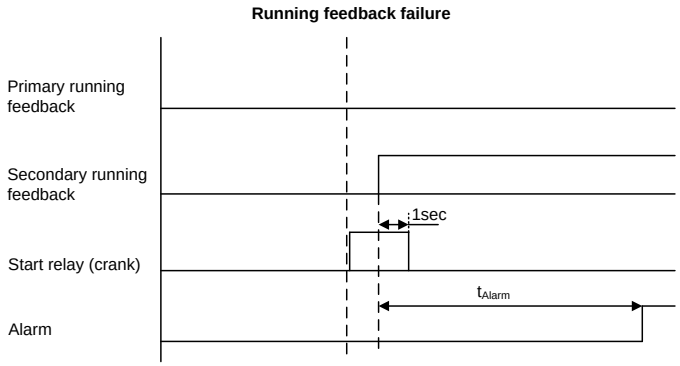
4.8.4 Running feedback

Different types of running feedback can be used to detect if the motor is running. Refer to menu 6170 for selection of the running feedback type.

The running detection is made with a built-in safety routine. The running feedback selected is the primary feedback. At all times, all the types of running feedback is used for running detection. If, for some reason, the primary choice is not detecting any running feedback, the starter relay will stay activated for 1 additional second. If a running feedback is detected based on one of the secondary choices, the genset will start. This way, the genset will still be functional even though a tacho sensor is damaged or dirty.

As soon as the genset is running, no matter if the genset is started based on the primary or secondary feedback, the running detection will be made, based on all available types.

The sequence is shown in the diagram below.



Interruption of start sequence
The start sequence is interrupted in the following situations:

Event	Comment
Stop signal	
Start failure	
Remove starter feedback	Tacho setpoint.
Running feedback	Digital input.
Running feedback	Tacho setpoint.
Running feedback	W terminal
Running feedback	Frequency measurement above 18 Hz. The frequency measurement requires a voltage measurement of 30% of U_{NOM}. The running detection based on the frequency measurement can replace the running feedback based on tacho or digital input or engine communication.
Running feedback	Oil pressure setpoint (menu 6175).
Running feedback	EIC (engine communication).
Emergency stop	
Alarm	Alarms with shutdown" or "trip and stop" fail class.
Stop push-button on display	Manual mode.
Modbus stop command	Manual mode.
Binary stop input	Manual mode.
Deactivate the "auto start/stop"	Auto mode in the following genset modes: Island operation or load takeover mode.

If the MPU input is to be used to remove the starter, it has to be set up in menu 6174.

Setpoints related to the start sequence
- Crank failure alarm **(4530 Crank failure)**

If MPU is chosen as the primary running feedback, this alarm will be raised if the specified rpm is not reached before the delay has expired.

- Run feedback failure **(4540 Run feedb. fail)**
If running is detected on the frequency (secondary), but the primary running feedback, e.g. digital input, has not detected running, this alarm will be raised. The delay to be set is the time from the secondary running detection and until the alarm is raised.

- Hz/V failure **(4560 Hz/V failure)**
If the frequency and voltage are not within the limits set in menu 2110 after the running feedback is received, this alarm is raised when the delay has expired.

- Start failure alarm **(4570 Start failure)**
The start failure alarm occurs, if the genset has not started after the number of start attempts set in menu 6190.

- Start prepare **(6180 Starter)**
Normal prepare: the start prepare timer can be used for start preparation purposes, e.g. prelubrication or preglowing. The start prepare relay is activated when the start sequence is initiated and deactivated when the start relay is activated. If the timer is set to 0.0 s, the start prepare function is deactivated.

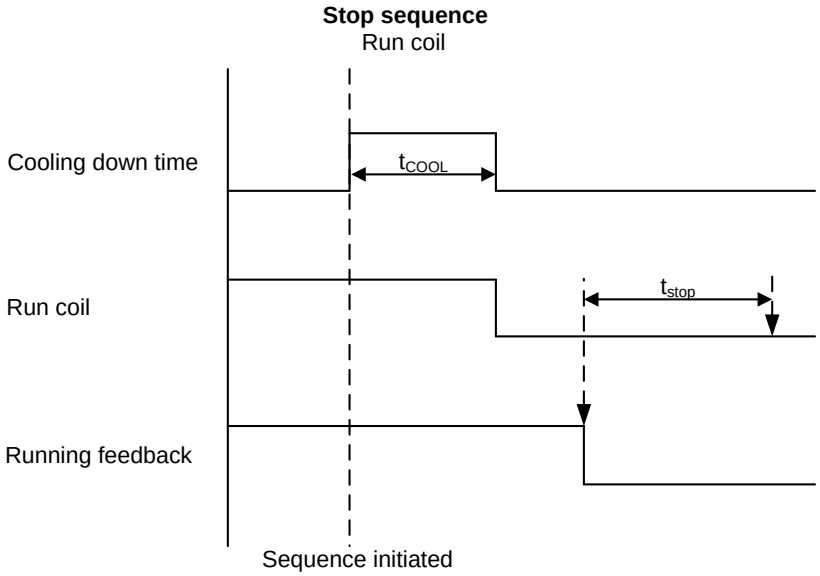
Extended prepare: the extended prepare will activate the start prepare relay when the start sequence is initiated and keep it activated when the start relay activates until the specified time has expired. If the ext. prepare time exceeds the start ON time, the start prepare relay is deactivated when the start relay deactivates. If the timer is set to 0.0 s, the extended prepare function is deactivated.

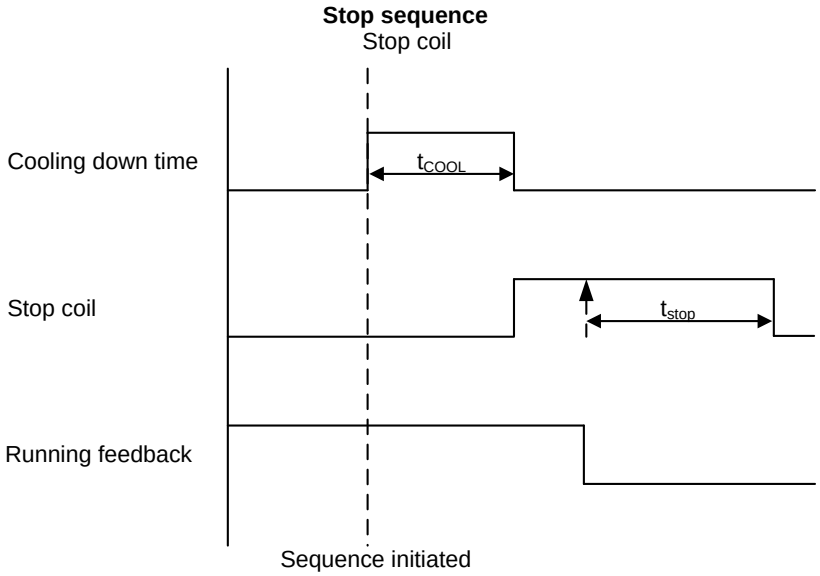
Start ON time: the starter will be activated for this period when cranking.

Start OFF time: the pause between two start attempts.

4.8.5 Stop sequence

The drawings illustrate the stop sequence.





The stop sequence will be activated if a stop command is given. The stop sequence includes the cooling down time if the stop is a normal or controlled stop.

Description	Cooling down	Stop	Comment
Auto mode stop	X	X	
Trip and stop alarm	X	X	
Stop button on display	(X)	X	Manual. Cooling down is interrupted if the stop button is activated twice.
Remove "auto start/stop"	X	X	Auto mode: island operation and load takeover.
Emergency stop		X	Engine shuts down and GB opens.

The stop sequence can only be interrupted during the cooling down period. Interruptions can occur in these situations:

Event	Comment
Mains failure	AMF mode selected (or mode shift selected ON) and auto mode selected.
Start button is pressed	Auto mode: engine will run in idle speed.
Binary start input	Auto mode: island operation and load takeover.
GB close button is pressed	Manual mode.

Setpoints related to the stop sequence

- Stop failure **(4580 Stop failure)**
A stop failure alarm will appear if the primary running feedback or the generator voltage and frequency are still present after the delay in this menu has expired.

- Stop **(6210 Stop)**
Cooling-down:
The length of the cooling-down period.

Extended stop:
The delay after the running feedback has disappeared until a new start sequence is allowed. The extended stop sequence is activated any time the stop button is pressed.

Cool down controlled by engine temperature:
The engine temperature-controlled cool-down is to ensure that the engine is cooled down below the setpoint in menu 6214 "Cool down temperature" before the engine is stopped. This is particularly beneficial if the engine has been running for a short period of time and therefore not reached normal cooling water temperature, as the cool-down period will be very short or none at all. If the engine has been running for a long period, it will have reached normal running temperature, and the cool-down period will be the exact time it takes to get the temperature below the temperature setpoint in menu 6214.

If, for some reason, the engine cannot get the temperature below the temperature setpoint in 6214 within the time limit in parameter 6211, the engine will be shut down by this timer. The reason for this could be high ambient temperature.

If the cooling-down timer is set to 0.0 s, the cooling-down sequence will be infinite.

If the cooling-down temperature is set to 0 deg., the cooling-down sequence will be entirely controlled by the timer.

4.8.6 Breaker sequences

The breaker sequences will be activated depending on the selected mode:

Mode	Genset mode	Breaker control
Auto	All	Controlled by the unit
Manual	All	Push-button, M-Logic, Modbus, Digital input
Block	All	Controlled by the unit

Before closing the breakers, it must be checked that the voltage and frequency are OK.

Setpoints related to MB control

7080 MB control

Mode shift: When enabled, the controller will perform the AMF sequence in case of a mains failure in load takeover or TEST mode

MB close delay: The time from GB OFF to MB ON

Load time: After opening of the breaker, the MB ON sequence will not be initiated before this delay has expired. Please refer to the description of "Breaker spring load time".

If no MB is represented, the relays and inputs normally used for MB control become configurable.

The GB can only be closed if the mains breaker is open. The MB can only be closed if the generator breaker is open.

- AMF MB opening **(7060 U mains failure)**

It is possible to select the functionality of the mains breaker closing function. This is necessary if the unit operates in Automatic Mains Failure (AMF).

The possibilities are:

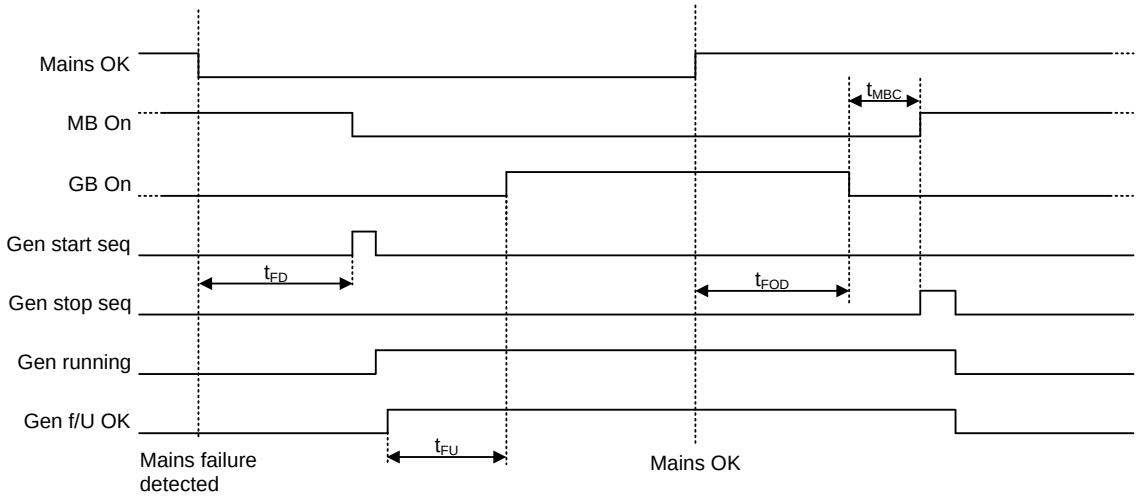
Selection	Description
Start engine and open mains breaker	When a mains failure occurs, the mains breaker opens, and the engine starts at the same time.
Start engine	When a mains failure occurs, the engine starts. When the generator is running and the frequency and voltage are OK, the MB opens and the GB closes.

4.8.7 AMF timers

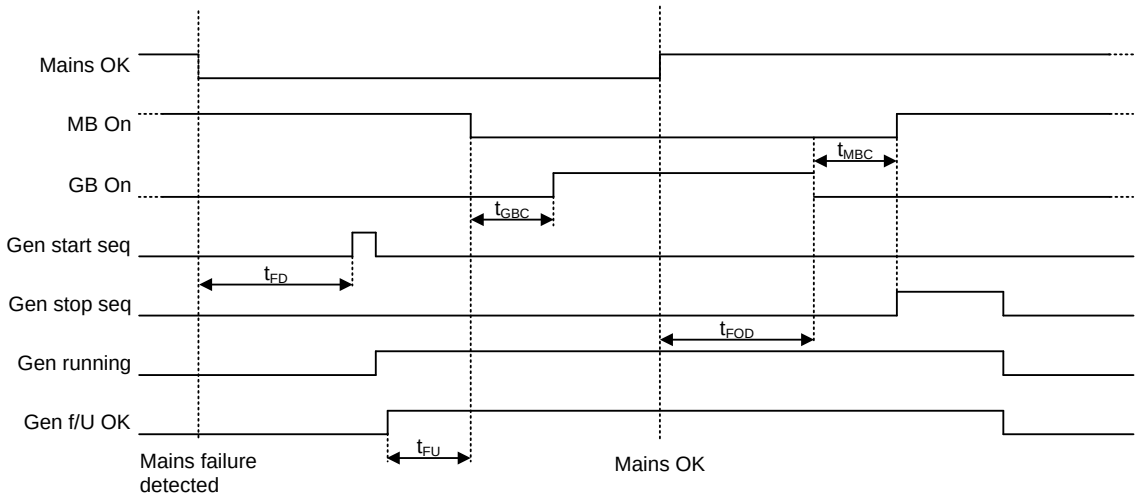
The time charts describe the functionality at a mains failure and at mains return. The timers used by the AMF function are indicated in the table below:

Timer	Description	Menu number
t_{FD}	Mains failure delay	**7070 f mains failure** **7060 U mains failure**
t_{FU}	Frequency/voltage OK	**6220 Hz/V OK**
t_{FOD}	Mains failure OK delay	**7070 f mains failure** **7060 U mains failure**
t_{GBC}	GB ON delay	**6230 GB control**
t_{MBC}	MB ON delay	**7080 MB control**

Example 1:
7065 Mains fail control: Start engine and open MB



Example 2:
7065 Mains fail control: Start engine



Conditions for breaker operations
The breaker sequences react depending on the breaker positions and the frequency/voltage measurements.

The conditions for the ON and OFF sequences are described in the table below:

Conditions for breaker operations	
Sequence	**Condition**
GB ON, direct closing	Running feedback Generator frequency/voltage OK MB open
MB ON, direct closing	Mains frequency/voltage OK GB open
GB OFF, direct opening	MB open
MB OFF, direct opening	Alarms with fail classes: Shut down or Trip MB alarms

5. Display and menu structure

5.1 Reference to operator's manual

Information about display and menu structure can be found in the "Operator's manual", which is located on DEIF's homepage under documentation for CGC 400.

6. Engine communication

6.1 Reference to H5 manual

6.1.1 Engine communication

Information about engine communication can be found in the "Option H5 and H7" manual, which is located on DEIF's homepage under documentation for CGC 400.

7. Additional functions

7.1 Start functions

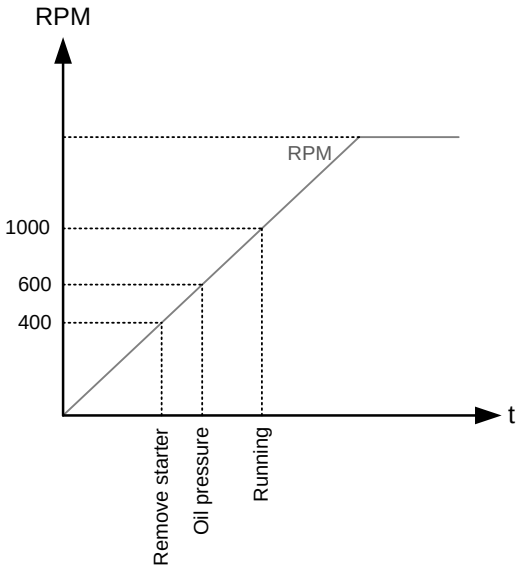
7.1.1 Start functions

The controller will start the genset when the start command is given. The start sequence is deactivated when the remove starter event occurs or when the running feedback is present.

The reason for having two possibilities to deactivate the start relay is to be able to delay the alarms with run status.

If it is not possible to activate the run status alarms at low revolutions, the remove starter function must be used.

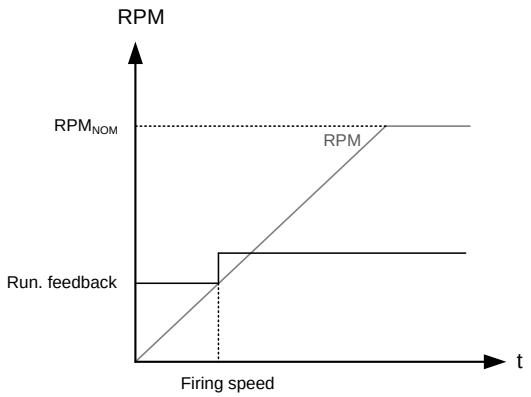
An example of a critical alarm is the oil pressure alarm. Normally, it is configured according to the shutdown fail class. But if the starter motor has to disengage at 400 RPM, and the oil pressure does not reach a level above the shutdown setpoint before 600 RPM, then the genset would shut down if the specific alarm was activated at the preset 400 RPM. In that case, the running feedback must be activated at a higher number of revolutions than 600 RPM.



7.1.2 Digital feedbacks

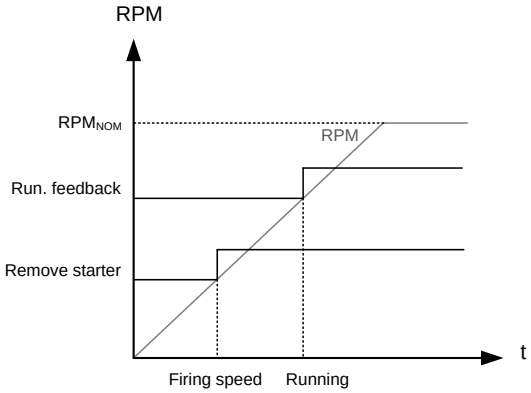
If an external running relay is installed, the digital control inputs for running detection or remove starter can be used.

Running feedback
When the digital running feedback is active, the start relay is deactivated, and the starter motor will be disengaged.



The diagram illustrates how the digital running feedback is activated when the engine has reached its firing speed.

Remove starter
When the digital remove starter input is present, the start relay is deactivated, and the starter motor will be disengaged.



The diagram illustrates how the remove starter input is activated when the engine has reached its firing speed. At the running speed, the digital running feedback is activated.

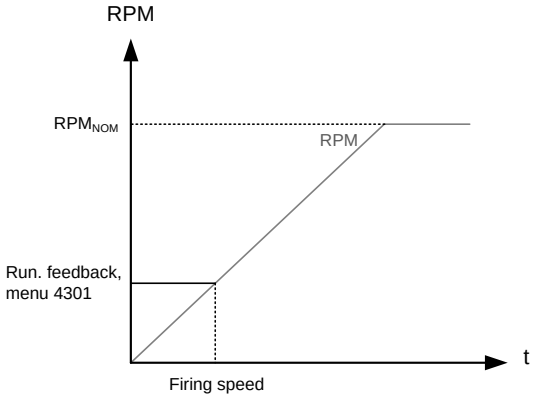
The remove starter input must be configured from a number of available digital inputs.

The running feedback is detected by either the digital input (see diagram above), frequency measurement above 18 Hz, RPM measured by magnetic pick-up or EIC (engine communication).

7.1.3 Analogue tacho feedback

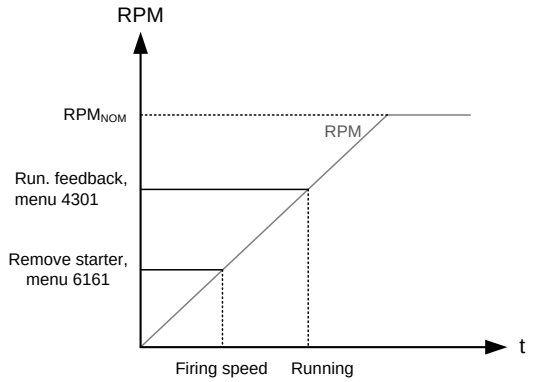
When a magnetic pick-up (MPU) is being used, the specific level of revolutions for deactivation of the start relay can be adjusted.

Running feedback
The diagram below shows how the running feedback is detected at the firing speed level. The factory setting is 1000 RPM **(6170 Running detect.).**



Notice that the factory setting of 1000 RPM is higher than the RPM level of starter motors of typical design. Adjust this value to a lower value to avoid damage of the starter motor.

Remove starter input
The drawing below shows how the setpoint of the remove starter is detected at the firing speed level. The factory setting is 400 RPM **(6170 Running detect.).**



The number of teeth on the flywheel must be adjusted in menu 6170 when the MPU input is used.

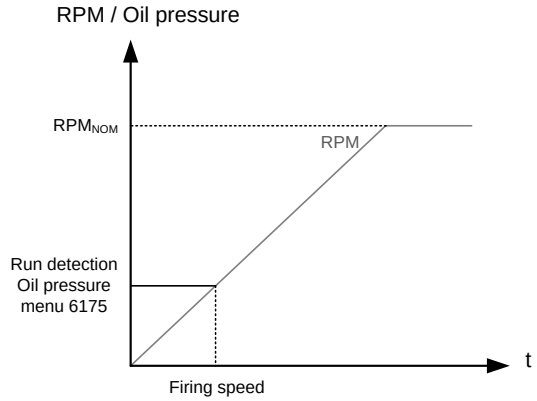
7.1.4 Oil pressure

The multi-inputs on terminals 6, 7 and 8 can be used for the detection of running feedback. The terminal in question must be configured as a RMI input for oil pressure measurement.

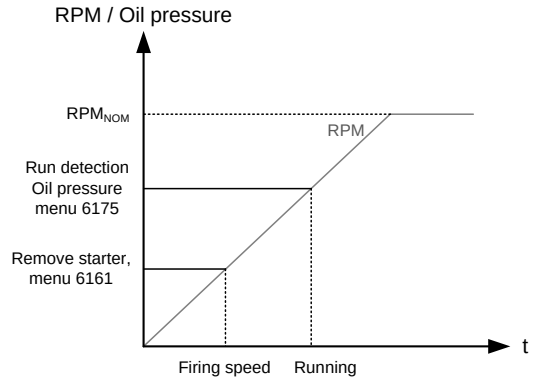
Multi-input 58 and 59 cannot be used for this purpose.

When the oil pressure increases above the adjusted value **(6175 Pressure level),** the running feedback is detected, and the start sequence is ended.

Running feedback



Remove starter input
The drawing below shows how the setpoint of the "remove starter input" is detected at the firing speed level. The factory setting is 400 RPM **(6170 Running detect.).**



The remove starter function can use the MPU or a digital input.

7.2 Phase sequence error

7.2.1 Description of phase sequence error

Prior to closing a breaker, the unit checks that the phase sequence is correct, depending on the chosen phase direction in parameter 2154: "phase rotation". If it is incorrect (reversed), an alarm will be issued, and the breaker in question will not be closed.

7.3 Breaker types

7.3.1 Breaker types

There are five possible selections for the setting of breaker type for both mains breaker and generator breaker. The breaker type is selected in the application configuration.

Continuous NE and Continuous ND

This type of signal is most often used combined with a contactor. When using this type of signal, the controller will only use the close breaker(e.g. GB On) relays. The relay will be closed for closing of the contactor and will be opened for opening of the contactor. Continuous NE is a normally energised signal, and continuous ND is a normally deenergised signal.

Pulse

This type of signal is most often used combined with circuit breaker. With the setting pulse, the controller will use the close command(e.g. GB On) and the open command relay (e.g. GB Off). The close breaker relay will close for a short time for closing of the circuit breaker. The open breaker relay will close for a short time for opening of the breaker.

Compact

This type of signal will most often be used combined with a compact breaker, a direct controlled motor-driven breaker. With the setting compact, the controller will need to use both a close command(e.g. GB On) and a open command relay(e.g. GB Off). The close breaker relay will close for a short time for the compact breaker to close. The breaker off relay will close for the compact breaker to open and hold it closed long enough for the motor in the breaker to recharge the breaker. If the compact breaker is tripped externally, it is recharged automatically before next closing.

If compact breaker is selected, the length of breaker open signal can be adjusted. This can be done in menu 2160/2200 (GB open fail and MB open fail).

7.4 Breaker spring load time

To avoid breaker close failures in situations where breaker ON command is given before the breaker spring has been loaded, the spring load time can be adjusted for GB/TB and MB.

The following describes a situation where you risk getting a close failure:

1. The genset is in auto mode, the auto start/stop input is active, the genset is running and the GB is closed.
2. The auto start/stop input is deactivated, the stop sequence is executed and the GB is opened.
3. If the auto start/stop input is activated again before the stop sequence is finished, the GB will give a GB close failure as the GB needs time to load the spring before it is ready to close.

Different breaker types are used, and therefore there are two available solutions:

1. Timer-controlled

A load time setpoint for the GB/TB and MB control for breakers with no feedback indicating that the spring is loaded. After the breaker has been opened, it will not be allowed to close again before the delay has expired. The setpoints are found in menus 6230, 7080 and 8190.

2. Digital input
Two configurable inputs to be used for feedbacks from the breakers: One for GB/TB spring loaded and one for MB spring loaded. After the breaker has been opened, it will not be allowed to close again before the configured inputs are active. The inputs are configured in the PC utility software. When the timers are counting, the remaining time is shown in the display.

If the two solutions are used together, both requirements are to be met before closing of the breaker is allowed.

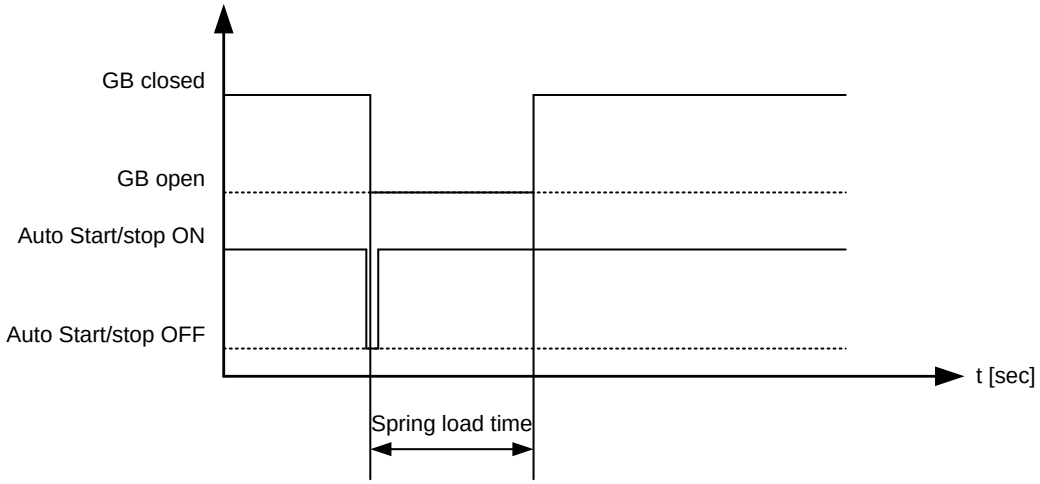
Breaker LED indication
To alert the user that the breaker close sequence has been initiated but is waiting for permission to give the close command, the LED indication for the breaker will be flashing yellow in this case.

If the breaker needs time to reload the spring after it has opened, then the CGC can take this delay into account. This can be controlled through timers in the CGC or through digital feedbacks from the breaker, depending on the breaker type.

7.4.1 Principle

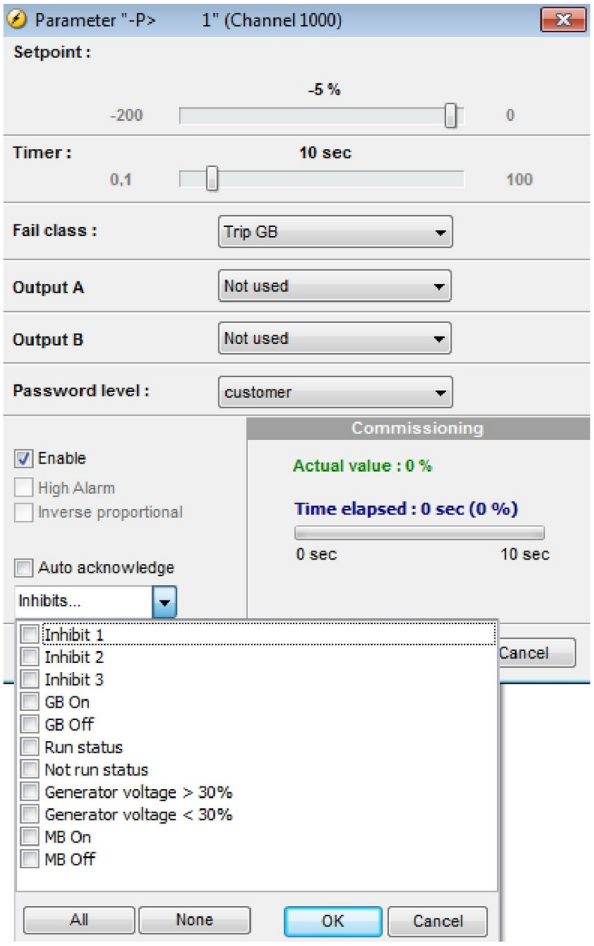
The diagram shows an example where a single CGC in island mode is controlled by the AUTO start/stop input.

This is what happens: When the AUTO start/stop input deactivates, the GB opens. The AUTO start/stop is reactivated immediately after the GB has opened, e.g. by the operator through a switch in the switchboard. However, the CGC waits a while before it issues the close signal again, because the spring load time must expire (or the digital input must be activated - not shown in this example). Then the CGC issues the close signal.



7.5 Alarm inhibit

In order to select when the alarms are to be active, a configurable inhibit setting for each alarm has been made. The inhibit functionality is a way to make an alarm inactive when the events, chosen in the menu below, are active. The inhibit functionality is only available via the PC utility software. For each alarm, there is a drop-down window where it is possible to select which signals have to be present in order to inhibit the alarm.



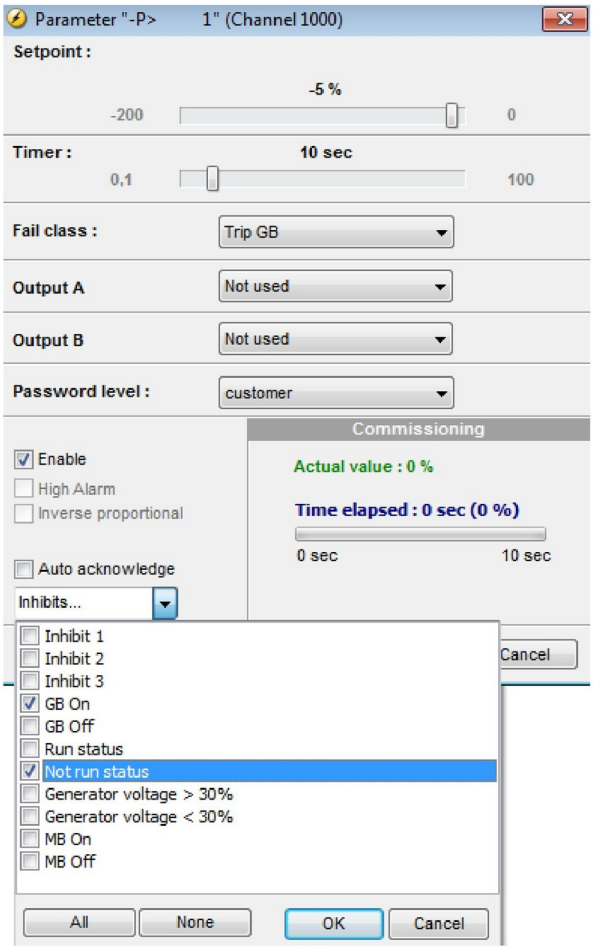
Selections for alarm inhibit:

Function	Description
Inhibit 1	M-Logic outputs: Conditions are programmed in M-Logic
Inhibit 2	
Inhibit 3	
GB ON (TB ON)	The generator breaker is closed
GB OFF (TB ON)	The generator breaker is open
Run status	Running detected and the timer in menu 6160 expired
Not run status	Running not detected or the timer in menu 6160 not expired
Generator voltage > 30%	Generator voltage is above 30% of nominal
Generator voltage < 30%	Generator voltage is below 30% of nominal
MB ON	The mains breaker is closed
MB OFF	The mains breaker is open

The timer in 6160 is not used if binary running feedback is used.

Inhibit of the alarm is active as long as one of the selected inhibit functions is active.

Example:

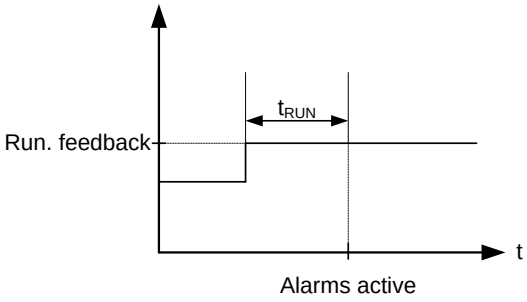


In this example, inhibit is set to *Not run status* and *GB ON*. Here, the alarm will only be active when the generator is running and disabled again when the GB is closed.

7.5.1 Run status (6160)

Alarms can be adjusted to activate only when the running feedback is active and a specific time delay has expired.

The diagram below illustrates that after activation of the running feedback, a run status delay will expire. When the delay expires, alarms with *Run status* will be activated.



The timer is ignored if digital running feedback is used.

7.6 Access lock

The purpose of access lock is to deny the operator the possibility to configure the unit parameters and change the running modes from the display and digital inputs. When activated the display will say "Access lock" when pushing the display buttons affected by the access lock, please see the table below.

The input to be used for the access lock function is defined in the PC utility software (USW).

Access lock will typically be activated from a key switch installed behind the door of the switchboard cabinet.

Display Button	Button icon	Button status	Comment
START		Not active	
STOP		Not active	
GB ON		Not active	
GB OFF		Not active	
MB ON		Not active	
MB OFF		Not active	
TEST		Not active	
AUTO		Not active	
MANUAL		Not active	
LED TEST		Active	
HORN		Active	
UP		Active	
SELECT		Active	If the access lock is activated when the view menu system is displayed, it is not possible to access the setup menu. If the access lock is activated when the setup menu system is displayed, this button is not active.
DOWN		Active	
ESC		Active	

After three minutes, the display returns to the view menu system. The setup menu system can only be entered again if the access lock is deactivated.

The following digital input functions are affected when access lock is activated:

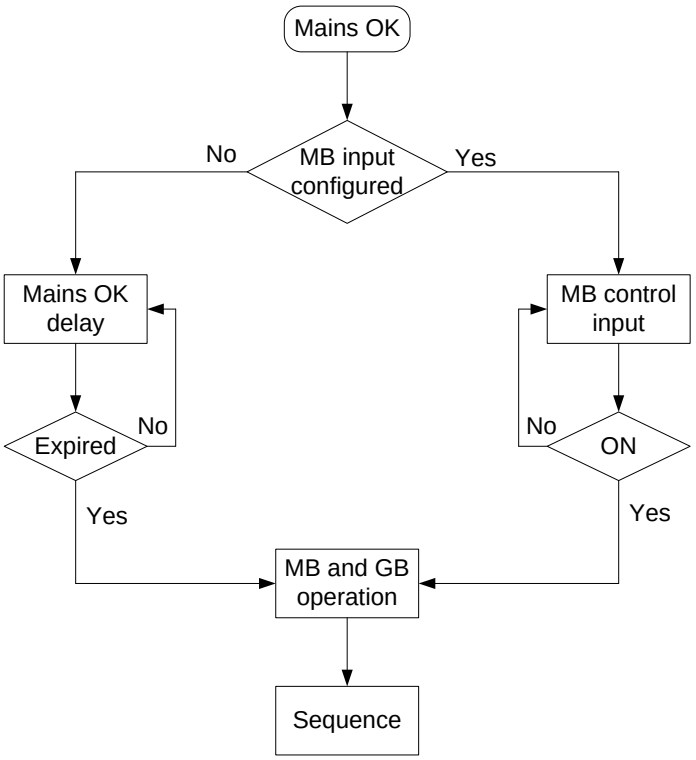
Digital input name	Input status	Comment
Remote Start	Not active	
Remote Stop	Not active	
Remote GB ON	Not active	
Remote GB OFF	Not active	
Remote MB ON	Not active	
Remote MB OFF	Not active	
Test mode	Not active	
Auto mode	Not active	
Manual mode	Not active	
Block	Not active	

7.7 Digital mains breaker control

The unit will normally execute the automatic mains failure sequence based on the settings adjusted in the system setup. Besides these settings it is possible to configure a digital input that can be used to control the mains return sequence. This input is the "Mains Okay" input. The purpose of this function is to let an external device or an operator control the mains return sequence. The external device can e.g. be a PLC.

The flowchart below shows that if the input is configured, it needs to be activated (by a pulse) in order to initiate the mains return sequence. The load will continue on generator supply if the input is not activated.

The mains OK delay is not used at all when the "Mains Okay" input is configured.



7.8 Command timers

The purpose of the command timers is to be able to e.g. start and stop the genset automatically at specific times each weekday or certain weekdays. If auto mode is activated, this function is available in island operation and load takeover operation. Up to four command timers can be used for e.g. start and stop. The command timers are available in M-Logic and can be used for other purposes than starting and stopping the genset automatically. The settings can either be set up through the PC utility software or the display. Each command timer can be set for the following time periods:

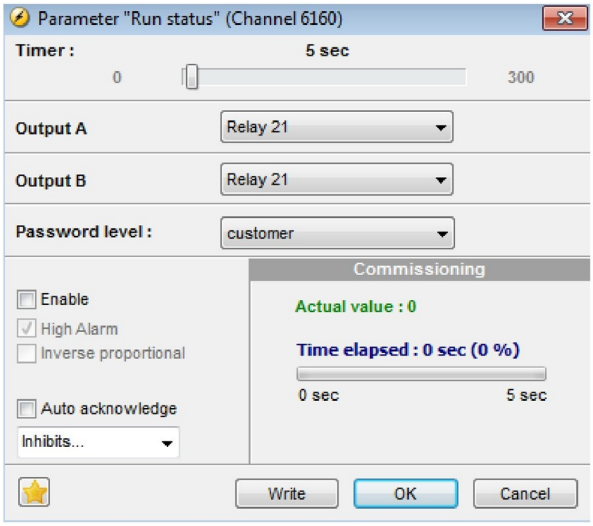
- Individual days (MO, TU, WE, TH, FR, SA, SU)
- MO, TU, WE, TH
- MO, TU, WE, TH, FR
- MO, TU, WE, TH, FR, SA, SU
- SA, SU

To start in AUTO mode, the "Auto start/stop" command can be programmed in M-Logic or in the input settings.

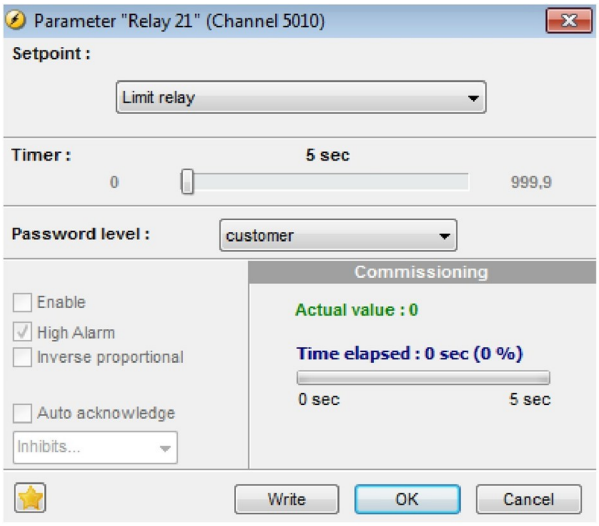
The time-dependent commands are flags that are raised when the command timer is in the active period.

7.9 Running output

6160 Run status can be adjusted to give a digital output when the genset is running.



Select the correct relay number in output A and output B and enable the function. Change the relay function to limit in the I/O menu. Then the relay will activate, but no alarm will appear.



If the relay function is not changed to "limit" function, an alarm will appear at every running situation.

7.10 Idle running

7.10.1 Idle running

The purpose of the idle run function is to change the start and stop sequences to allow the genset to operate under low temperature conditions.

It is possible to use the idle run function with or without timers. Two timers are available. One timer is used in the start sequence, and one timer is used in the stop sequence.

The main purpose of the function is to prevent the genset from stopping. The timers are available to make the function flexible.

The speed governor must be prepared for the idle run function if this function is to be used.

The function is typically used in installations where the genset is exposed to low temperatures which could generate starting problems or damage the genset.

7.10.2 Description

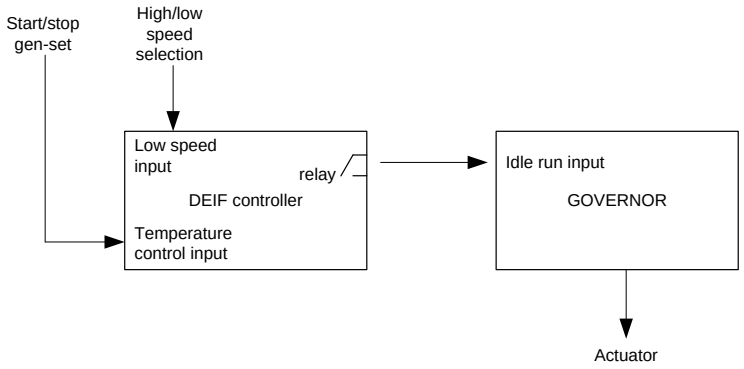
The function is enabled and configured in 6290 Idle running. It has to be noted that the governor itself must handle the idle speed based on a digital signal from the unit (see the principle diagram below).

When the function is enabled, two digital inputs are used for control purposes. These inputs must be configured through the Utility software:

No.	Input	Description
1	Low speed input	This input is used to change between idle speed and nominal speed. This input does not prevent the genset from stopping - it is only a selection between idle and nominal speed.
2	Temperature control input	When this input is activated, the genset will start. It will not be able to stop as long as this input is activated. To use temperature control it is necessary to enable idle speed in parameter 6295.

If the idle run function is selected by means of the timer, the low speed input is overruled.

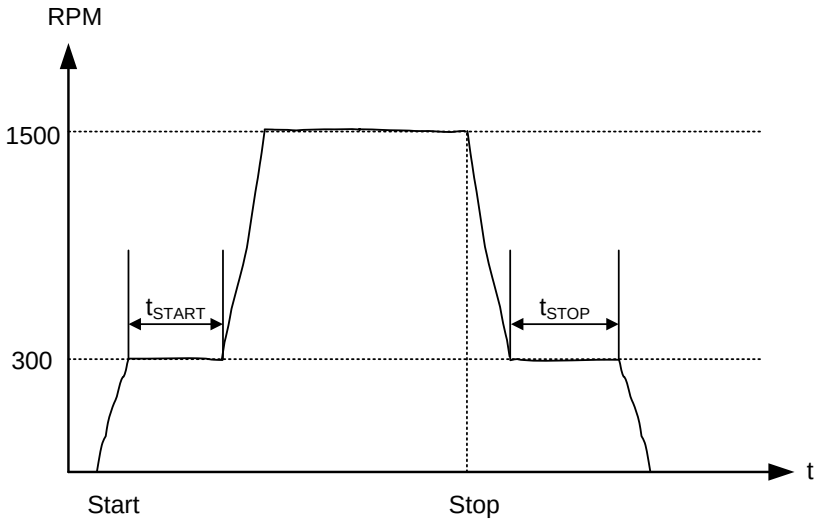
Turbo chargers not originally prepared for operating in the low speed area can be damaged if the genset is running in "idle run" for too long.



7.10.3 Examples

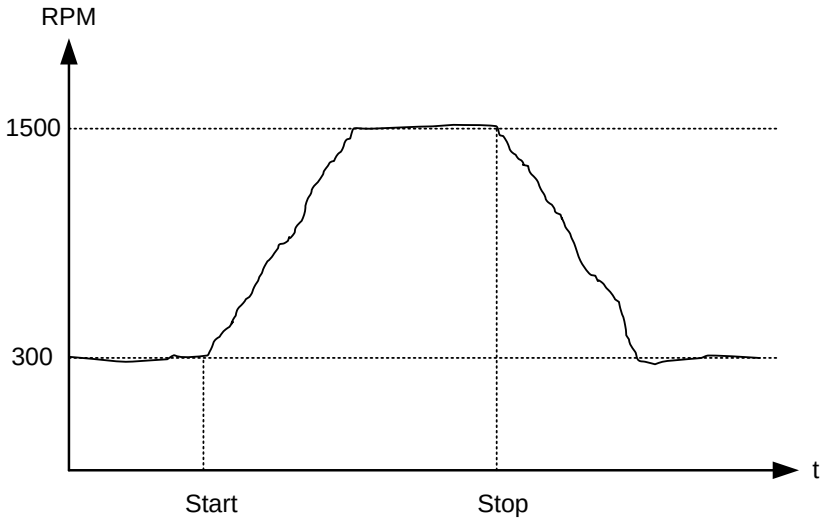
Idle speed during starting and stopping
In this example both the start and the stop timers are activated.

The start and stop sequences are changed in order to let the genset stay at the idle level before speeding up. It also decreases the speed to the idle level for a specified delay time before stopping.



Idle speed, no stopping
In this example both timers are deactivated.

If the genset is to be prevented from stopping, then the digital input "temp control" must be left ON at all times. In that case the characteristic looks like this:



The oil pressure alarm (RMI oil) will be enabled during idle run if set to "ON".

7.10.4 Inhibit

The alarms that are deactivated by the inhibit function are inhibited in the usual manner, except for the oil pressure alarms; RMI oil 6,7 and 8 which are active during "idle run" as well.

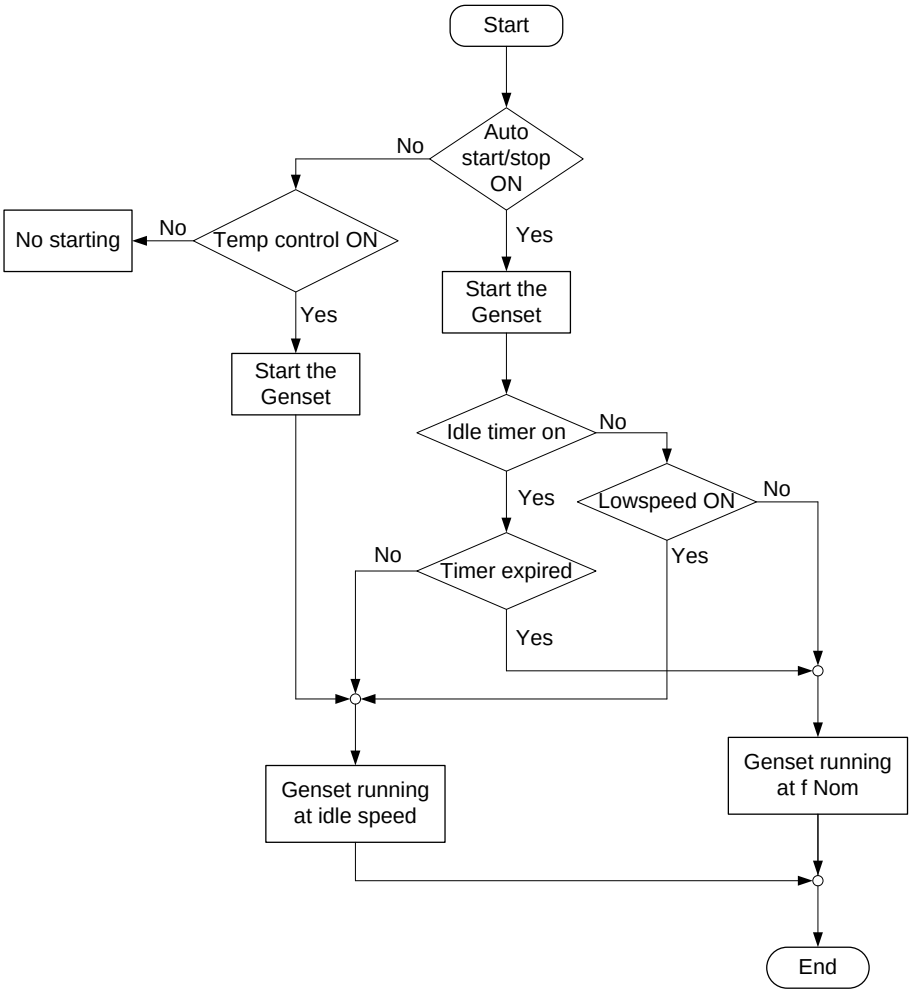
7.10.5 Running signal

The running feedback must be activated when the genset is running in idle mode.

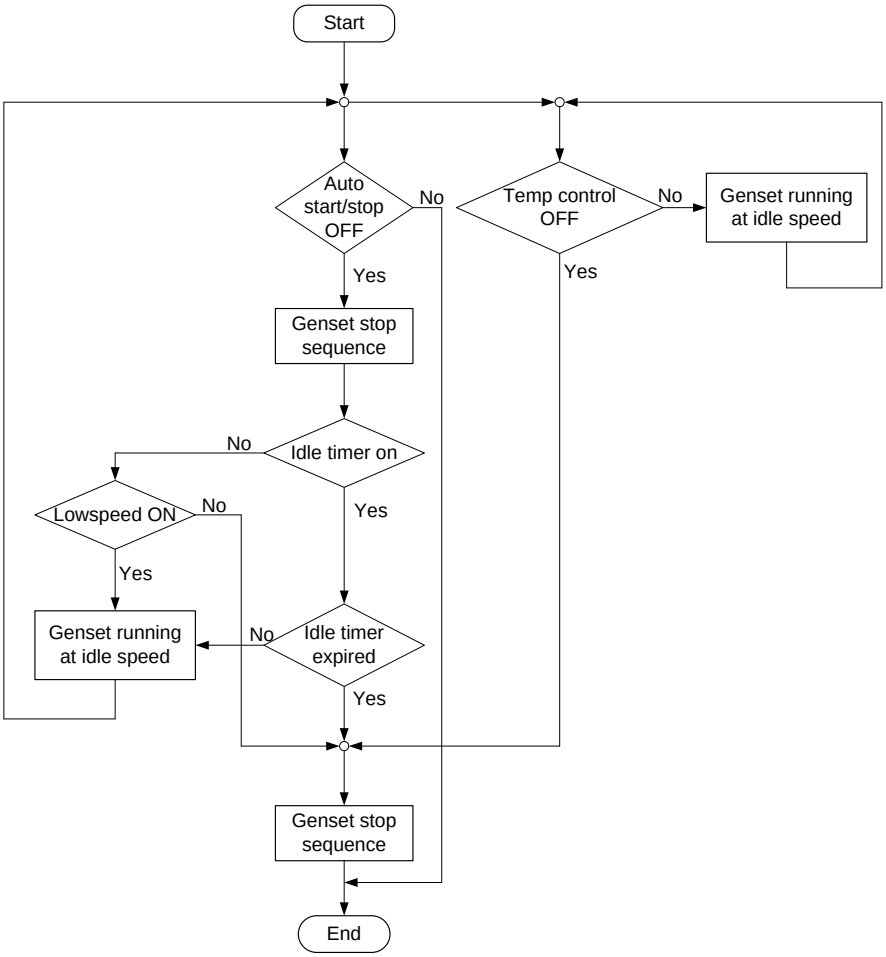
7.10.6 Idle speed flowcharts

The flowcharts illustrate the starting and stopping of the genset by use of the inputs "temp control" and "low speed".

7.10.7 Start


Start
Auto start/stop ON
No
Yes
Temp control ON
No
No starting
Yes
Start the Genset
Start the Genset
Idle timer on
No
Yes
Lowspeed ON
No
Yes
Timer expired
No
Yes
Genset running at idle speed
Genset running at f Nom
End

7.10.8 Stop



7.11 Engine heater

This function is used to control the temperature of the engine. A sensor measuring the cooling water temperature is used to activate an external heating system to keep the engine at a minimum temperature.

The setpoints adjusted in menu 6320 are:

Setpoint: This setpoint +/- the hysteresis is the start and stop points for the engine heater.

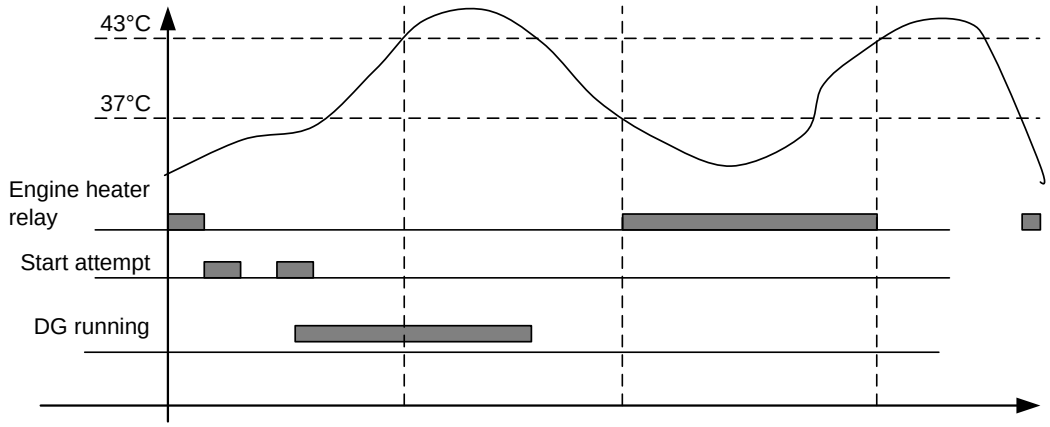
Output A: The relay output for the engine heater.

Input type: Multi-input to be used for temperature measurement.

Hysteresis: This decides how big a deviation from the setpoint is needed to activate/deactivate the engine heater.

Enable: Enables the engine heater function.

Principle diagram:



The engine heater function is only active when the engine is stopped.

7.11.1 Engine heater alarm

If the temperature keeps dropping after the start setpoint has been exceeded, an alarm will be raised if configured in menu 6330.

7.12 Ventilation

This function can be used to control the cooling of the engine. The purpose is to use a multi-input for measuring the cooling water temperature and that way activate an external ventilation system to keep the engine below a maximum temperature. The functionality is shown in the below diagram.

Setpoints available **(6460 Max ventilation):**

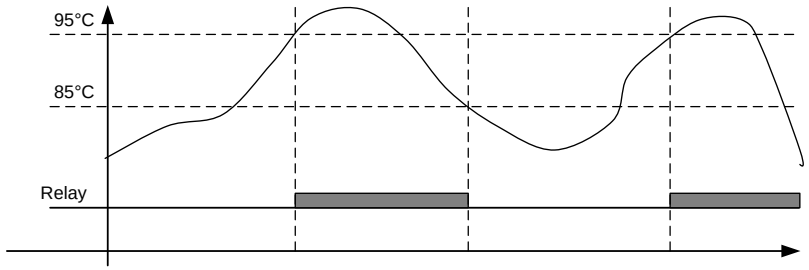
Setpoint: The limit for activation of the relay set in OA.

Output A (OA): The relay activated when the setpoint is exceeded.

Hysteresis: The number of degrees the temperature has to be below the setpoint in order to deactivate the relay set in OA.

Enable: Enable/disable the ventilation function.

The type of input to use for the temperature measurement is selected in menu 6323 Engine heater.



7.12.1 Max. ventilation alarm

Two alarms can be set up in menu 6470 and menu 6480 to activate if the temperature keeps rising after the start setpoint has been reached.

7.13 Not in auto

This function can be used for indication or to raise an alarm in case the system is not in Auto. The function is set up in menu 6540.

7.14 Fuel pump logic

The fuel pump logic is used to start and stop the fuel supply pump to maintain the fuel level in the service tank at predefined levels. The start and stop limits are detected from one of the three multi-inputs.

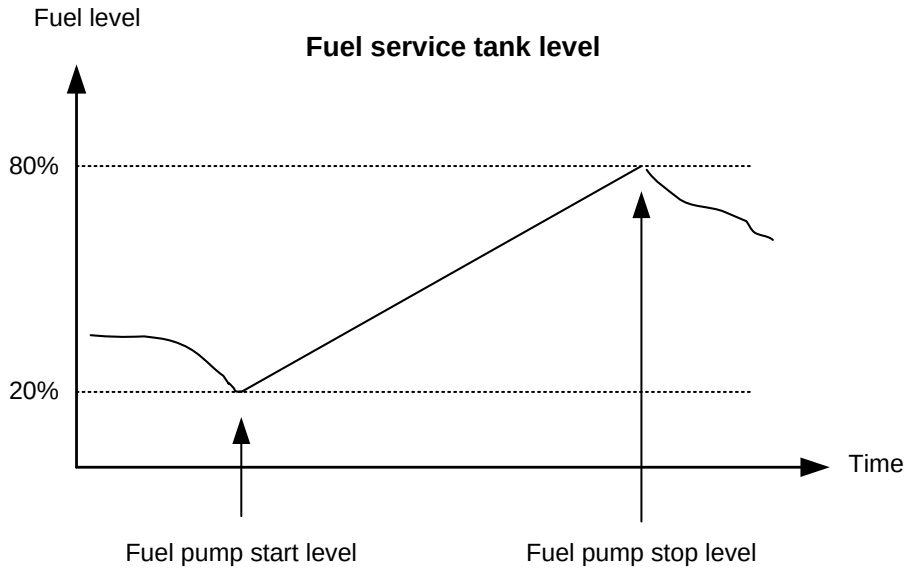
Parame-ter	Name	Function
6551	Fuel pump log. start	Fuel transfer pump start point in percentage.
6552	Fuel pump log. stop	Fuel transfer pump stopping point in percentage.
6553	Fuel fill check	Delay timer before activating fuel fill check alarm.
6554	Output A	The output relay to be used for control of the fuel pump. The selected relay activates below the start limit and deactivates above the stop level.
6555	Type	The multi-input or external analogue input to be used for the fuel level sensor. **Choose multi-input if 4-20 mA is used.** **Choose "auto detection" if an RMI is used.**
6556	Fail class	The fail class of the fuel fill alarm.

Setpoints available in menu 6550:

The fuel pump relay can be activated via M-Logic.

The output relay should be configured as a limit relay. Otherwise, an alarm will be raised whenever the output is activated.

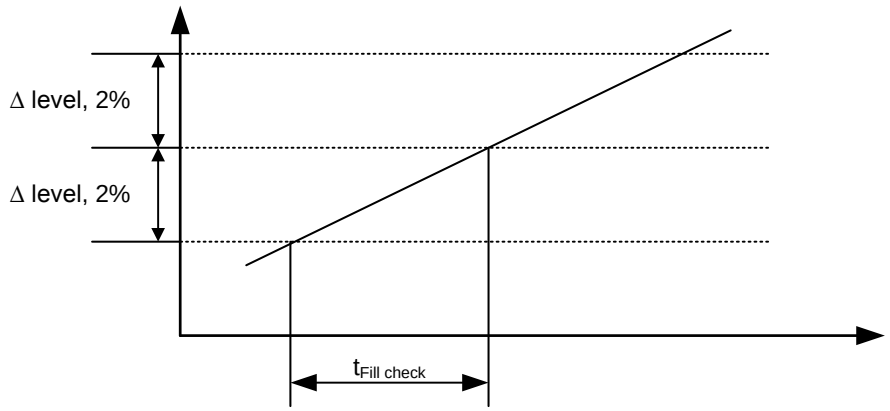
The below drawing shows how the fuel pump is activated when the level reaches 20% and stopped again when the level has reached 80%.



7.14.1 Fuel fill check

The fuel pump logic includes a **Fuel fill check** function.

When the fuel pump is running, the fuel level must increase by 2% within the **fuel fill check** timer set in menu 6553. If the fuel level does not increase by 2% within the adjusted delay time, then the fuel pump relay deactivates and a **Fuel fill alarm** occurs.



The level of increase is fixed at 2% and cannot be changed.

7.15 Fail class

7.15.1 Fail class

All activated alarms must be configured with a fail class. The fail classes define the category of the alarms and the subsequent alarm action.

Seven different fail classes can be used. The tables below illustrate the action of each fail class when the engine is running or stopped.

7.15.2 Engine running

Fail class	Action	Alarm horn relay	Alarm display	Trip of gen. breaker	Trip of mains breaker	Cooling-down genset	Stop genset
1 Block		X	X				
2 Warning		X	X				
3 Trip GB		X	X	X			
4 Trip + stop		X	X	X		X	X
5 Shutdown		X	X	X			X
6 Trip MB		X	X		X		
7 Trip MB/GB		X	X	(X)	X		

The table illustrates the action of the fail classes. If, for instance, an alarm has been configured with the "shutdown" fail class, the following actions occur.

- The alarm horn relay will activate
- The alarm will be displayed in the alarm info screen
- The generator breaker will open instantly
- The genset is stopped instantly
- The genset cannot be started from the unit (see next table)

The fail class "Trip MB/GB" will only trip the generator breaker if there is no mains breaker present.

7.15.3 Engine stopped

Fail class	Action	Block engine start	Block MB sequence	Block GB sequence
1 Block		X		
2 Warning				
3 Trip GB		X		X
4 Trip + stop		X		X
5 Shutdown		X		X
6 Trip MB			X	
7 Trip MB/GB		(X)	X	(X)

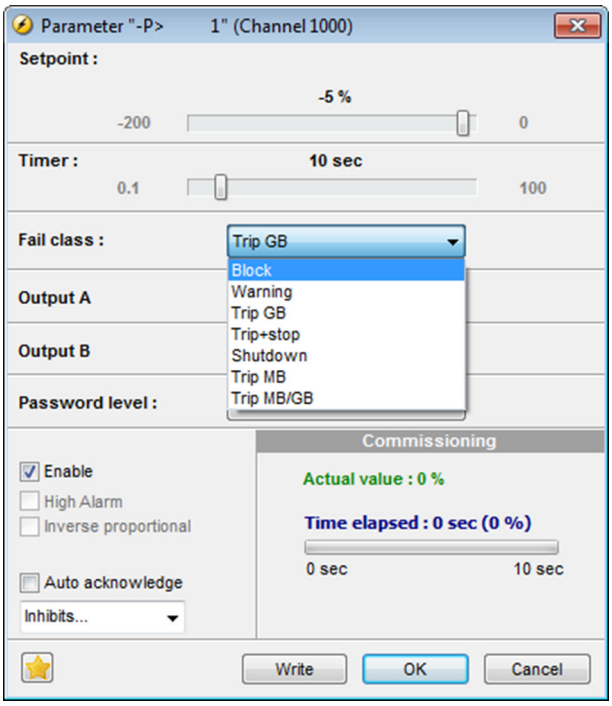
In addition to the actions defined by the fail classes, it is possible to activate one or two relay outputs if additional relays are available in the unit.

The fail class "Trip MB/GB" will only block engine start and GB sequence if no mains breaker is present.

7.15.4 Fail class configuration

The fail class can be selected for each alarm function either via the display or the PC software.

To change the fail class via the PC software, the alarm function to be configured must be selected. Select the desired fail class in the fail class roll-down panel.



7.16 Service timers

The unit is able to monitor the maintenance intervals. Two service timers are available to cover different intervals. The service timers are set up in menus 6110 and 6120.

The function is based on running hours. When the adjusted time expires, the unit will display an alarm. The running hours is counting when the running feedback is present.

Setpoints available in menus 6110 and 6120:

Enable: Enable/disable the alarm function.

Running hours: The number of running hours to activate the alarm. The service timer alarm will be activated as soon as the running hours have been reached.

Day: The number of days to activate the alarm – if the running hours are not reached before this number of days, the alarm will still be activated. The service timer alarm will be activated at 8:00 AM on the day the alarm expires.

Fail class: The fail class of the alarm.

Output A: Relay to be activated when the alarm is activated.

Reset: Enabling this will reset the service timer to zero. This must be done when the alarm is activated.

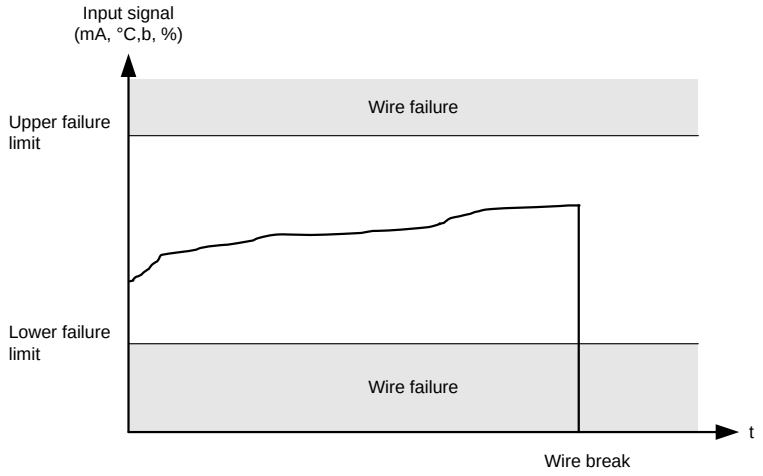
7.17 Wire fail detection

If it is necessary to supervise the sensors/wires connected to the multi-inputs and analogue inputs, then it is possible to enable the wire break function for each input. If the measured value on the input is outside the normal dynamic area of the input, it will be detected as if the wire has made a short-circuit or a break. An alarm with a configurable fail class will be activated.

Input	Wire failure area	Normal range	Wire failure area
4-20 mA	< 3 mA	4-20 mA	> 21 mA
Pt100	< 82.3 ohm	-	> 194.1 ohm
Pt1000	< 823 ohm	-	> 1941 ohm
RMI Oil, type 1	< 1.0 ohm	-	> 195.0 ohm
RMI Oil, type 2	< 1.0 ohm	-	> 195.0 ohm
RMI Temp, type 1	< 4.0 ohm	-	> 488.0 ohm
RMI Temp, type 2	< 4.0 ohm	-	> 488.0 ohm
RMI Temp, type 3	< 0.6 ohm	-	> 97.0 ohm
RMI Fuel, type 1	< 0.6 ohm	-	> 97.0 ohm
RMI Fuel, type 2	< 1.0 ohm	-	> 195.0 ohm
RMI configurable	< lowest resistance	-	> highest resistance
Level switch	Only active if the switch is open		

Principle

The illustration below shows that when the wire of the input breaks, the measured value will drop to zero. Then the alarm will occur.



7.18 Digital inputs

The unit has a number of binary inputs, some of which are configurable and some are not.

	Input function	Auto	Test	Man	Block	Configurable	Input type
1	Shutdown override	X	X	X	X	Configurable	Constant
2	Access lock	X	X	X	X	Configurable	Constant
3	Binary running detection	X	X	X	X	Configurable	Constant
4	Remote start			X		Configurable	Pulse
5	Remote stop			X		Configurable	Pulse
6	Test	X		X	X	Configurable	Pulse
7	Auto		X	X	X	Configurable	Pulse
8	Manual		X		X	Configurable	Pulse
9	Block	X	X	X		Configurable	Constant
10	Remote GB ON			X		Configurable	Pulse
11	Remote GB OFF			X		Configurable	Pulse
12	Remote MB ON			X		Configurable	Pulse
13	Remote MB OFF			X		Configurable	Pulse
14	Remote alarm acknowledge	X	X	X	X	Configurable	Constant
15	Auto start/stop	X				Configurable	Constant
16	Remove starter	X	X	X		Configurable	Constant
17	GB position ON	X	X	X	X	Configurable	Constant
18	GB position OFF	X	X	X	X	Configurable	Constant
19	MB position ON	X	X	X	X	Configurable	Constant
20	MB position OFF	X	X	X	X	Configurable	Constant
21	Emergency stop	X	X	X	X	Not configurable	Constant
22	Low speed	X	X			Configurable	Constant
23	Temperature control	X	X			Configurable	Constant
24	Battery test	X				Configurable	Pulse
25	Mains Okay	X	X	X	X	Configurable	Pulse
26	GB close inhibit	X		X	X	Configurable	Constant
27	MB close inhibit	X	X	X	X	Configurable	Constant
28	Enable mode shift	X	X	X	X	Configurable	Constant
29	Start enable	X	X	X		Configurable	Constant
30	Alternative start	X	X	X	X	Configurable	Constant
31	Switchboard error	X	X	X	X	Configurable	Constant
32	Total test	X	X	X	X	Configurable	Constant
33	GB spring loaded	X	X	X	X	Configurable	Constant
34	MB spring loaded	X	X	X	X	Configurable	Constant

	Input function	Auto	Test	Man	Block	Configurable	Input type
35	Inhibit Engine alarms	X	X	X	X	Configurable	Constant

7.18.1 Functional description

1. Shutdown override
This input deactivates all protections except the overspeed protection and the emergency stop input. The number of start attempts is seven by default, but it can be configured in parameter 6201. Also a special cool down timer, parameter 6202, is used in the stop sequence after an activation of this input.

2. Access lock
Activating the access lock input deactivates the control display push-buttons. It will only be possible to view measurements, alarms and the log.

3. Binary running detection
The input is used as a running indication of the engine. When the input is activated, the start relay is deactivated.

4. Remote start
This input initiates the start sequence of the genset when manual mode is selected.

5. Remote stop
This input initiates the stop sequence of the genset when manual mode is selected.

6. Test
Changes the present running mode to test.

7. Auto
Changes the present running mode to auto.

8. Manual
Changes the present running mode to manual.

9. Block
Changes the present running mode to block.

When block mode is selected, the running mode cannot be changed by activating the digital inputs.

10. Remote GB ON
The generator breaker ON sequence will be initiated and the breaker will close if the MB is opened when manual mode is selected..

11. Remote GB OFF
The generator breaker OFF sequence will be initiated when manual mode is selected..

12. Remote MB ON
The mains breaker ON sequence will be initiatedand the breaker will close if the GB is opened when manual mode is selected..

13. Remote MB OFF
The mains breaker OFF sequence will be initiated when manual mode is selected..

14. Remote alarm acknowledge
Acknowledges all present alarms, and the alarm LED on the display stops flashing.

15. Auto start/stop
The genset will start when this input is activated. The genset will be stopped if the input is deactivated. The input can be used when the unit is in island operation, load takeover and the AUTO running mode is selected.

16. Remove starter
The start sequence is deactivated. This means the start relay deactivates, and the starter motor will disengage.

17. Generator breaker closed feedback (GB position ON)
The input function is used as an indication of the generator breaker position. The unit requires this feedback when the breaker is closed or a position failure alarm occurs.

18. Generator breaker open feedback (GB position OFF)
Th input function is used as an indication of the generator breaker position. The unit requires this feedback when the breaker is opened or a position failure alarm occurs.

19. Mains breaker closed feedback (MB position ON)
The input function is used as an indication of the mains breaker position. The unit requires this feedback when the breaker is closed or a position failure alarm occurs.

20. Mains breaker open feedback (MB position OFF)
The input function is used as an indication of the mains breaker position. The unit requires this feedback when the breaker is opened or a position failure alarm occurs.

21. Emergency stop
The input shuts down the engine immediately. At the same time it opens the generator breaker.

The shutdown fail class must be selected.

22. Low speed
Disables the regulators and keeps the genset running at a low RPM.

The governor must be prepared for this function.

23. Temperature control
This input is part of the idle mode function. When the input is high, then the genset starts. It starts at high or low speed, depending on the activation of the low speed input. When the input is deactivated, then the genset goes to idle mode (low speed = ON), or it stops (low speed = OFF).

24. Mains Okay
Disables the "mains OK delay" timer. The MB close sequence will begin when the input is activated.

25. GB close inhibit
When this input is activated, then the generator breaker cannot close. Inhibit used for GB, where ext. PLC or other equipment controls when load is on gen-set.

26. MB close inhibit
When this input is activated, then the mains breaker cannot close.

27 Enable mode shift
The input activates the mode shift function, and the controller will perform the AMF sequence in case of a mains failure. When the input is configured, the setting in menu 7081 (mode shift ON/OFF) is disregarded.

28. Start enable
The input must be activated to be able to start the engine.

When the genset is started, the input can be removed.

29. Alternative start
This input is used to simulate an AMF failure and this way run a full AMF sequence without a mains failure actually being present.

30. Switchboard error
The input combined with Parrallel ON, parameter 6502, will block the genset from start. Parameter 6500 enables the alarm. It is also possible to have the genset act on the input under running conditions with Stop swbd error, parameter 6510. Parrallel ON needs to be on to get Stop swbd error active.

31. Total test
This input will be logged in the event log to indicate that a planned mains failure has been made.

32. GB spring loaded
The controller will not send a close signal before this feedback is present.

33. MB spring loaded
The controller will not send a close signal before this feedback is present.

34. Inhibit EI alarms
When this input is active, it will inhibit all engine interface alarms.

The input functions are set up with the PC utility software, please refer to "Help" in this.

7.19 Outputs

The unit has a number of output functions which can be configured to any available relay.

	Output function	Auto	Test	Man	Block	Configurable	Output type
1	Status OK	X	X	X	X	Configurable	Constant
2	Run coil	X	X	X	X	Configurable	Constant
3	Stop coil	X	X	X	X	Configurable	Constant
4	Prepare	X	X	X	X	Configurable	Constant
5	Starter (Crank)	X	X	X	X	Configurable	Constant
6	Horn	X	X	X	X	Configurable	Constant
7	GB on	X	X	X	X	Configurable	Continuous
8	GB off	X	X	X	X	Configurable	Continuous
9	MB on (CGC 413 only)	X	X	X	X	Configurable	Continuous
10	MB off (CGC 413 only)	X	X	X	X	Configurable	Continuous

7.19.1 Functional description

1. Status OK

2. Run Coil
The relay configured to Run coil will be closed the entire time the engine is supposed to run.

3. Stop Coil
This relay will close to stop the engine, and when no running feedback is present, it will stay closed in the ext. stop time (parameter 6212).

4. Prepare
This function will close the relay as the first thing in the start sequence. The relay will be closed for the time programmed in parameter 6181. This function is used for preheating the engine or for prelubrication.

5. Starter (Crank)
The relay configured to starter will be closed for the time selected in parameter 6184 in the start sequence.

6. Horn
The horn relay is a common alarm output. This means that every time an alarm state appears, the horn relay will close for the time configured in the parameter 6130 Alarm horn regardless of fail class. If 6130 is set to 0 seconds, it will be on until the reset horn push-button is activated or the alarm(s) has (have) been acknowledged.

7. GB on
The function will close the generator breaker

8. GB off
This function will open the generator breaker

9. MB on (CGC 413 only)
This function will close the mains breaker

10. MB off (CGC 413 only)
This function vil open the mains breaker

7.20 Multi-inputs

7.20.1 Multi-inputs

The CGC 412 unit has three multi-inputs which can be configured to be used as the following input types:

1. 4-20 mA
2. Pt100
3. Pt1000
4. RMI oil
5. RMI water
6. RMI fuel
7. Binary

The CGC 413 has two extra multi-inputs. These two extras cannot be used in the sequences like during the startup of the engine (Oil P, etc....).
The multi-inputs 58 and 59 can be configured in a way to give two alarm leves per input.

The configuration of the function of each for multi-inputs is done in the USW tab in the PC tool. The channel numbers used are following the below table.

Input number	Channel
Multi-input 6	10980
Multi-input 7	10990
Multi-input 8	11000
Multi-input 58	11300
Multi-input 59	11310

The function of the multi-inputs can only be configured in the PC utility software.

For each input, two alarm levels are available, the menu numbers of the alarm settings for each multi-input is controlled by the configured input type as seen in the following table.

Input type	Multi-input 6	Multi-input 7	Multi-input 8	Multi-input 58	Multi-input 59
4-20 mA	4120/4130	4250/4260	4380/4390	4740/4750	4770/4780
Pt100	4160/4170	4290/4300	4420/4430	4740/4750	4770/4780
Pt1000	4160/4170	4290/4300	4420/4430	4740/4750	4770/4780
RMI oil	4180/4190	4310/4320	4440/4450	4740/4750	4770/4780
RMI water	4200/4210	4330/4340	4460/4470	4740/4750	4770/4780
RMI fuel	4220/4230	4350/4360	4480/4490	4740/4750	4770/4780
Binary	3400	3410	3420	4740	4770

Only one alarm level is available for the digital input type.

When the multi-inputs 58 and 59 are configured as binary inputs, and the wirebreak alarm occurs, it will use channels under main menu 4000 (normally reserved for analogue).

7.20.2 4-20 mA

If one of the multi-inputs has been configured as 4-20 mA, the unit range of the measured value corresponding to 4-20 mA can be changed in the PC utility software in order to get the correct reading in the display.

The CGC 400 handles an overcurrent protection for the multi-inputs. If configured as 4-20 mA, and the current flow is above 24 mA, the input will automatically switch to resistive mode, in order to protect the HW.

If the current seen from the unit reaches this level, an alarm will be displayed. The text will be "Multi input HW limit", but no channel will be used. The alarm is raised when any of the multi-input have raised the level of destruction for current.

7.20.3 Pt100/Pt1000

This input type can be used for heat sensor, e.g. cooling water temperature. The unit of the measured value can be changed from Celsius to Fahrenheit in the PC utility software in order to get the desired reading in the display.

Offset parameter is used for compensation of wire resistance in a 2 wire setup.

7.20.4 RMI inputs

The unit can contain up to 5 RMI(resistance measurement input). The inputs have different functions, as the hardware design allows for several RMI types.
RMI is a resistance measurement input which can be used together with a resistance dependant sensor.
These various types of RMI are available for all multi-inputs:

RMI oil:	Oil pressure
RMI water:	Cooling water temperature
RMI fuel:	Fuel level sensor

For each type of RMI, it is possible to select between different characteristics including a configurable one.

The multi-inputs 58 and 59 cannot be used as configurable curves.

7.20.5 RMI oil

This RMI input is used for measuring the lubricating oil pressure.

		RMI sensor type		
Pressure		**Type 1**	**Type 2**	**Type 3**
Bar	**psi**	**Ω**	**Ω**	**Ω**
0	0	10.0	10.0	
0.5	7	27.2		
1.0	15	44.9	31.3	
1.5	22	62.9		
2.0	29	81.0	51.5	
2.5	36	99.2		
3.0	44	117.1	71.0	
3.5	51	134.7		
4.0	58	151.9	89.6	
4.5	65	168.3		
5.0	73	184.0	107.3	
6.0	87		124.3	
7.0	102		140.4	
8.0	116		155.7	
9.0	131		170.2	
10.0	145		184.0	

The configurable type is configurable with eight points in the range 0-2500 Ω. The resistance as well as the pressure can be adjusted.

7.20.6 RMI water

This RMI input is used for measuring the cooling water temperature.

		RMI sensor type			
Temperature		**Type 1**	**Type 2**	**Type 3**	**Type 4**
°C	**°F**	**Ω**	**Ω**	**Ω**	**Ω**
40	104	291.5	480.7	69.3	
50	122	197.3	323.6		
60	140	134.0	222.5	36.0	
70	158	97.1	157.1		
80	176	70.1	113.2	19.8	
90	194	51.2	83.2		
100	212	38.5	62.4	11.7	
110	230	29.1	47.6		
120	248	22.4	36.8	7.4	
130	266		28.9		
140	284		22.8		
150	302		18.2		

The configurable type is configurable with eight points in the range 0-2500 Ω. The temperature as well as the resistance can be adjusted.

7.20.7 RMI fuel

This RMI input is used for the fuel level sensor.

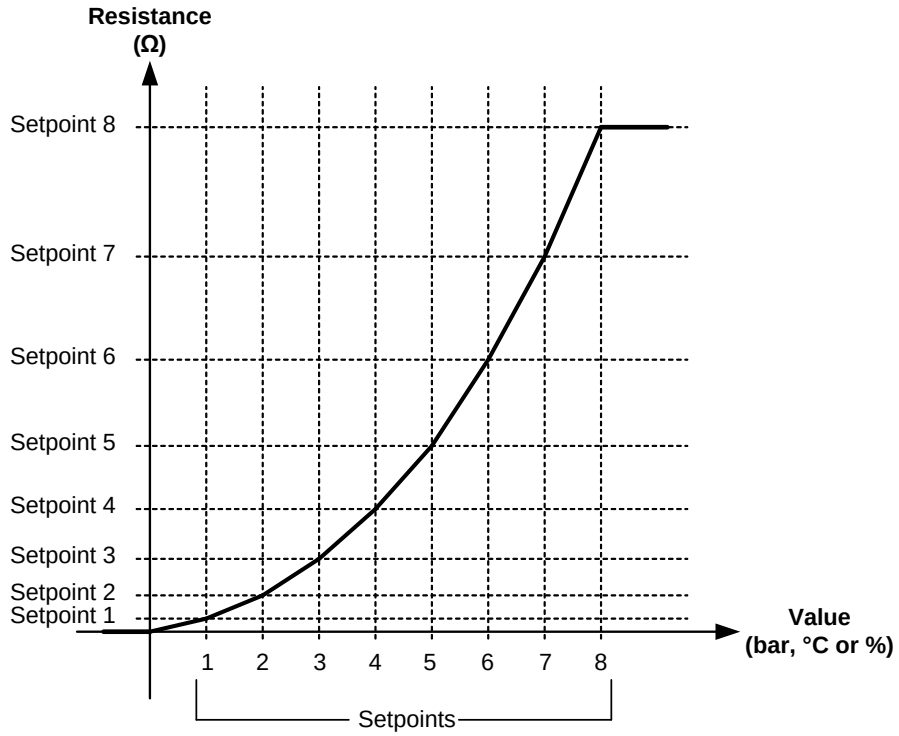
	RMI sensor type
	Type 1
Value	**Resistance**
0%	78.8 Ω
100%	1.6 Ω

	RMI sensor type
	Type 2
Value	**Resistance**
0%	3 Ω
100%	180 Ω

	RMI sensor type
Value	**Type configurable**
%	**Resistance**
0	
10	
20	
30	
40	
50	
60	
70	
80	
90	
100	

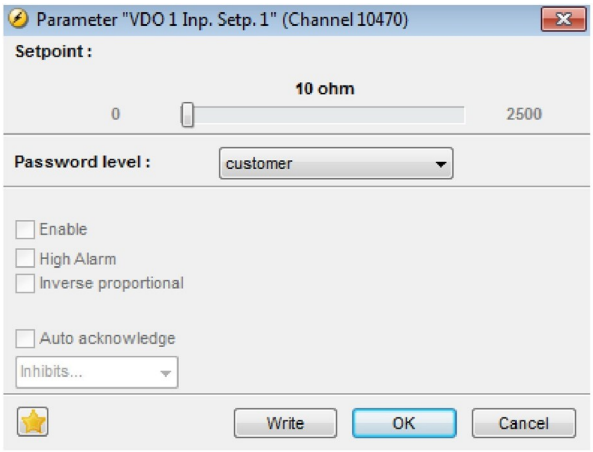
The configurable type is configurable with eight points in the range 0-2500 Ω. The value as well as the resistance can be adjusted.

7.20.8 Illustration of configurable inputs



7.20.9 Configuration

The eight curve settings for the configurable RMI inputs cannot be changed in the display, but **only** in the PC utility software. In the PC utility software the configurable inputs are adjusted in this dialogue box:



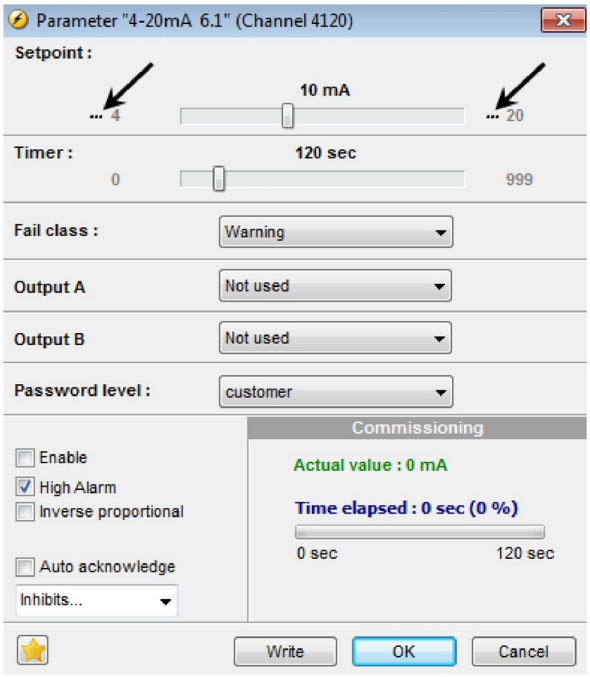
Adjust the resistance of the RMI sensor at the specific measuring value. In the example above the adjustment is 10 Ω at 0.0 bar.

7.20.10 Scaling of 4-20 mA inputs

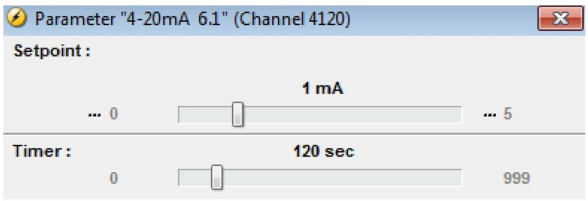
The scaling of the analogue inputs is made to ensure that the readout of the inputs is made with a resolution that fits the connected sensor. It is recommended to follow the guide below when changing the scaling of the analogue inputs.

Scaling example:

1. Use the utility software to configure a multi-input to be 4-20 mA, in this example multi-input 6 (parameter 10980)
2. Read the parameters from the device
3. After reading the parameters, the 4-20 mA alarm appears under the analogue fane in the USW. The example below shows how to adjust the analogue input alarm.
   The three dots to the left of the figures, marked with arrows, are buttons. Adjust the input as required, e.g. 0-5 bar:

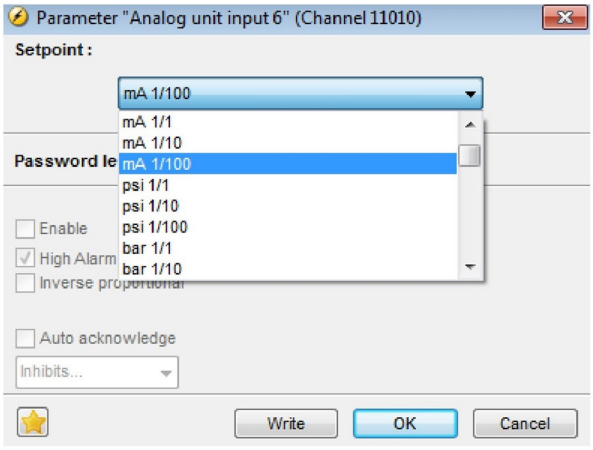


4. Adjust the input as required, e.g. 0-5 bar:

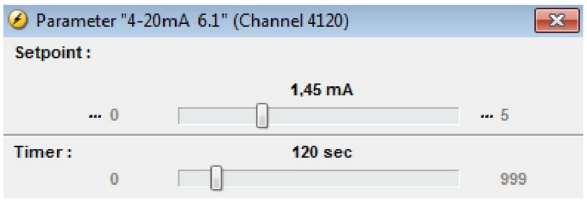


The display will then show 0 at 4 mA.

5. If needed, it is possible to scale the input to fit the sensor (Parameter 11010).



6. It is necessary to read the parameters from the device to the computer after changing the scale (1/1, 1/10 or 1/100) settings. This is in order to refresh the parameter list so the alarm settings present the correct value.
7. After reading the parameters, the alarm has been scaled so it needs to be adjusted (0-5 in this example), and this is also a scaling of the value on the display.



The display will now show the scaled value of multi-input 6.
In the example shown above, the value can be adjusted with two decimals. If the parameters were not refreshed, it would still only be possible to adjust the setpoint without decimals.

Save the parameter file:
After having set up the 4-20 mA inputs (HW as well as alarms), the parameter file should be uploaded from the device to the PC and then saved. In this way, the settings will not be modified again if the parameters are reloaded to the device.

7.20.11 Binary

If the multi-inputs are configured to "Binary", they become available as binary inputs.

7.21 Input function selection

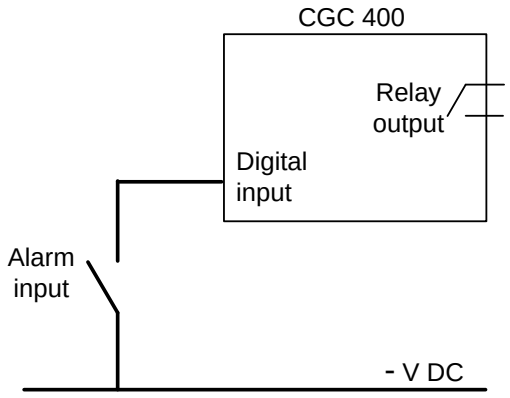
Digital input alarms can be configured with a possibility to select when the alarms are to be activated. The possible selections of the input function are normally open or normally closed.

The drawing below illustrates a digital input used as an alarm input.

1. Digital input alarm configured to NC, normally closed
   This will initiate an alarm when the signal on the digital input disappears.
2. Digital input alarm configured to NO, normally open

This will initiate an alarm when the signal on the digital input appears.

The relay output function can be selected to be ND (Normally Deenergised), NE (Normally Energised), Limit or Horn.



7.22 Language selection

7.22.1 Language selection

The unit has the possibility to display different languages. It is delivered with one master language which is English. This is the default language, and it cannot be changed. In addition to the master language, three different languages can be configured. This is done via the PC utility software.

The languages are selected in the system setup menu 6080. The language can be changed when connected to the PC utility software. It is not possible to make language configuration from the display, but the already configured languages can be selected.

7.23 Text in status line

This table explains the different messages in the status line text.

7.23.1 Standard texts

Condition	Comment	
BLOCK	Block mode is activated	
SIMPLE TEST	Test mode is activated	
FULL TEST		
SIMPLE TEST ###.#min	Test mode activated and test timer counting down	
FULL TEST ###.#min		
ISLAND MAN	Genset stopped or running and no other action taking place	
READY ISLAND AUTO	Genset stopped in Auto	
ISLAND ACTIVE	Genset running in Auto	
AMF MAN	Genset stopped or running and no other action taking place	
READY AMF AUTO	Genset stopped in Auto	
AMF ACTIVE	Genset running in Auto	
LOAD TAKEOVER MAN	Genset stopped or running and no other action taking place	
READY LTO AUTO	Genset stopped in Auto	
LTO ACTIVE	Genset running in Auto	
DG BLOCKED FOR START	Generator stopped and active alarm(s) on the generator	
GB ON BLOCKED	Generator running, GB open and an active "Trip GB" alarm	
SHUTDOWN OVERRIDE	The configurable input is active	
ACCESS LOCK	The configurable input is activated, and the operator tries to activate one of the blocked keys	
GB TRIP EXTERNALLY	Some external equipment has tripped the breaker	An external trip is logged in the event log
MB TRIP EXTERNALLY	Some external equipment has tripped the breaker	An external trip is logged in the event log
IDLE RUN	The "Idle run" function is active. The genset will not stop until a timer has expired	
IDLE RUN ###.#min	The timer in the "Idle run"' function is active	
START PREPARE	The start prepare relay is activated	
START RELAY ON	The start relay is activated	
START RELAY OFF	The start relay is deactivated during the start sequence	
MAINS FAILURE	Mains failure and mains failure timer expired	

Condition	Comment	
MAINS FAILURE IN ###s	Frequency or voltage measurement is outside the limits	The timer shown is the Mains failure delay.Text in mains units
MAINS U OK DEL ####s	Mains voltage is OK after a mains failure	The timer shown is the Mains OK delay
MAINS f OK DEL ####s	Mains frequency is OK after a mains failure	The timer shown is the Mains OK delay
Hz/V OK IN ###s	The voltage and frequency on the genset is OK	When the timer runs out it is allowed to operate the generator breaker
COOLING DOWN ###s	Cooling-down period is activated	
COOLING DOWN	Cooling-down period is activated and infinite	Cooling down timer is set to 0.0 s
GENSET STOPPING	This info is shown when cooling down has finished	
EXT. STOP TIME ###s		
EXT. START ORDER	A planned AMF sequence is activated	There is no failure on the mains during this sequence

7.24 Counters

Counters for various values are included, and some of these can be adjusted if necessary, for instance if the unit is installed on an existing genset or a new circuit breaker has been installed.

The table shows the adjustable values and their function in menu 6100:

Description	Function	Comment
6101 Running time	Offset adjustment of the total running hours counter.	Counting when the running feedback is present.
6102 Running time	Offset adjustment of the total running thousand hours counter.	Counting when the running feedback is present.
6103 GB operations	Offset adjustment of the number of generator breaker operations.	Counting at each GB close command.
6104 MB operations	Offset adjustment of the number of mains breaker operations.	Counting at each MB close command.
6105 kWh reset	Resets the kWh counter.	Automatically resets to OFF after the reset. The reset function cannot be left active.
6106 Start attempts	Offset adjustment of the number of start attempts.	Counting at each start attempt.

Additional counters for "Running hours" and "Energy" can be read out from the PC utility software.

7.25 M-Logic

The M-Logic functionality is included in the unit and is not an option-dependent function.

M-Logic is used to execute different commands at predefined conditions. M-Logic is not a PLC but substitutes one, if only very simple commands are needed.

M-Logic is a simple tool based on logic events. One or more input conditions are defined, and at the activation of those inputs, the defined output will occur. A great variety of inputs can be selected, such as digital inputs, alarm conditions and running conditions. A variety of the outputs can also be selected, such as relay outputs, change of genset modes and change of running modes.

The M-Logic is part of the PC utility software, and as such, it can only be configured in the PC utility software and not via the display. Please see the M-Logic manual which is available at .

The main purpose of M-Logic is to give the operator/designer more flexible possibilities of operating the generator control system.

Please refer to the "Help" function in the PC utility software for a full description of this configuration tool.

7.26 Buzzer

7.26.1 Buzzer

The CGC 400 has a built-in buzzer. The buzzer is configured in M-Logic. This means that if the buzzer is going to be used as a horn annunciator, the input must be set to "Horn" and the output must be set to "Buzzer". The buzzer will act concurrently to the horn output timer. If the delay timer in M-Logic is used, the buzzer will be active after this time delay.

7.27 USW communication

7.27.1 USW communication

It is possible to communicate with the unit via the PC utility software. The purpose is to be able to remote-monitor and control the genset application.

If setting 9020 is set to 1, the PC utility software cannot communicate with the unit when it is connected directly to the PC and a modem is not used.

Application settings

Please refer to the PC utility software help file.

Safety

If communication fails, the unit will operate according to the received data. If e.g. only half of the parameter file has been downloaded when the communication is interrupted, the unit will use this actual data.

7.28 Nominal settings

7.28.1 How to change the nominal settings

The nominal settings can be changed to match different voltages and frequencies. The controller has four sets of nominal values for the generator, and they are adjusted in menus 6000 to 6030 (Nominal settings 1 to 4). There are also two sets of nominal settings for the busbar, they can be adjusted in menus 6050 to 6060.

If no busbar voltage transformer is present, the primary and secondary side values are set to generator nominal value.

The possibility to switch between the four sets of nominal setpoints is typically used on rental gensets, where switching between 50 and 60 Hz is required.

Activation

The switching between the nominal setpoints can be done in two ways; digital input or menu 6006.

Digital input

M-Logic is used when a digital input is needed for switching between the four sets of nominal settings. Select the required input among the input events, and select the nominal settings in the outputs.

Example:

Event A		Event B		Event C	Output
Dig. input no. 10	or	Not used	or	Not used	Set nom. parameter settings 1
Not Dig. input no. 10	or	Not used	or	Not used	Set nom. parameter settings 2

Example:

Event A		Event B		Event C	Output
Button07	or	Not used	or	Not used	Set nom. parameter settings 1
Button08	or	Not used	or	Not used	Set nom. parameter settings 2

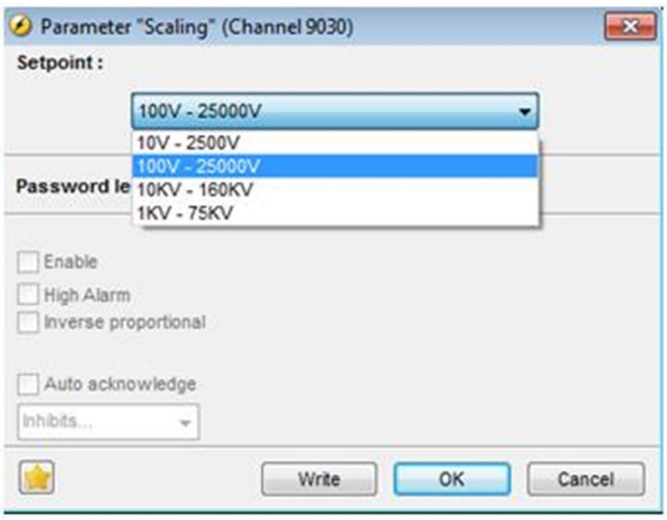
Menu settings

In menu 6006 the switching is made between settings 1 to 4 simply by choosing the desired nominal setting.

7.29 Scaling

Default voltage scaling is set to range 100 V-25000 V (menu 9030). To be able to handle applications above 25000 V and below 100 V, it is necessary to adjust the input range so it matches the actual value of the primary voltage transformer. This makes it possible to support a wide range of voltage and power values.

Setup of the scaling can be done in menu 9030 from the display.



Changing the voltage scaling will also influence the nominal power scaling:

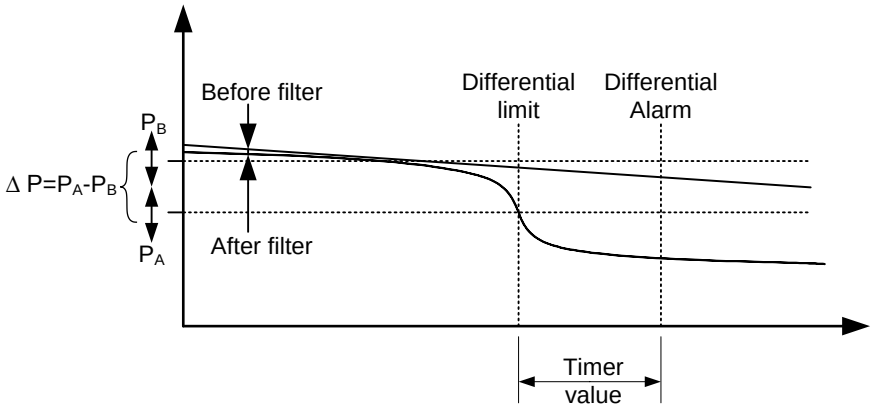
Scaling parameter 9030	Nom. settings 1 to 4 (power) will change according to parameter 9030	Nom. settings 1 to 4 (voltage) will change according to parameter 9030	Transformer ratio settings parameter 6041, 6051 and 6053
10 V-2500 V	1.0-900.0 kW	10.0 V-2500.0 V	10.0 V-2500.0 V
100 V-25000 V	10-20000 kW	100 V-25000 V	100 V-25000 V
1 kV-75 kV	0.10-90.00 MW	1.00 kV-75.00 kV	1.00 kV-75.00 kV
10 kV-160 kV	1.0-900.0 MW	10.0 kV-160.0 kV	10.0 kV-160.0 kV

All nominal values and the primary VT settings must be corrected after the scaling has been changed in menu 9030.

7.30 Differential measurement

7.30.1 Differential measurement

With the differential measurement function it is possible to compare two analogue inputs and trigger on the difference between the two values.
If the differential function is for example air filter check, the timer will be activated if the setpoint between PA (analogue A) and PB (analogue B) is exceeded. If the differential value drops below the setpoint value before the timer runs out, then the timer will be stopped and reset.



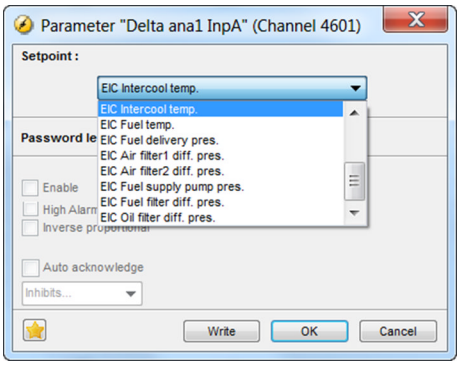
Three different differential measurements between two analogue input values can be configured.

Differential measurements between two sensors can be configured in menus 4600-4606. As an example the figure below shows the two parameters for input selection for differential measurement 1.

Ain	4601	Delta ana1 InpA	1482	4	
Ain	4602	Delta ana1 InpB	1483	4	

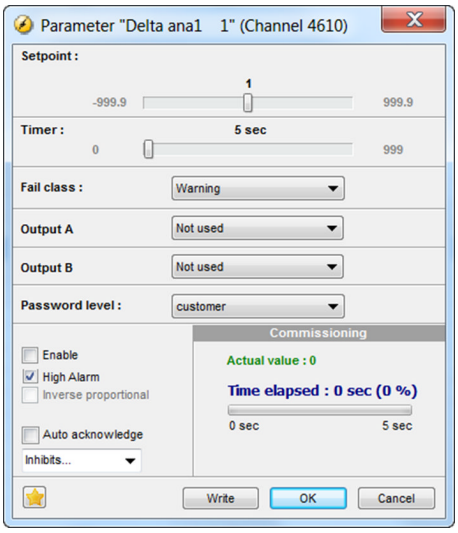
Inputs are selected from the input list as shown below, avaible inputs are:

- Multi inputs
- EIC measurements



The relevant alarm setpoint is chosen in parameters 4610-4660. Each alarm can be configured in two alarm levels for each differential measurement between analog input A and input B. Below figure shows the two parameters to configure alarm level 1 and 2, for differential measurement 1.

Ain	4610	Delta ana1 1	1488	1	
Ain	4620	Delta ana1 2	1489	1	



7.31 Filename extension

7.31.1 Filename extension

The filename extension for CGC 400 is .4cx

It will be possible to update the firmware using the DEIF utility software and use the normal procedure.
For more information, please refer to online documentation.

7.32 Modbus parameters

7.32.1 Modbus parameters

This is related to RS485 only.

The CGC 400 includes as native a Modbus port.
This port can be configured as ASCII or RTU. However, parameters differ depending on if it is set to ASCII or RTU.

RTU mode	ASCII mode
Speed 9600 bps	Speed 9600 bps
8 data bits	7 data bits
Parity none	Parity even
1 stop bit	1 stop bit

7.33 Battery low voltage alarm timer

7.33.1 Battery low voltage alarm timer

The CGC 400 handles a big capacitor to be able to handle battery drop down during the cranking phase.

In order to prevent some battery low voltage alarm to occur during the voltage decrease curve, when unplugging the unit, the range of timer for this alarm will be changed.
It will not be possible to set a timer below 10 seconds for alarm.

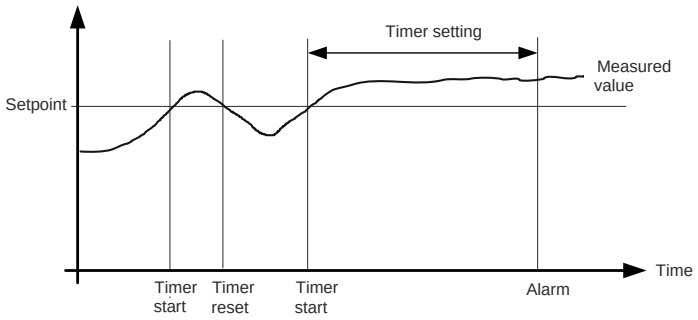
8. Protections

8.1 General

8.1.1 General

The protections are all of the definite time type, i.e. a setpoint and time is selected.

If the function is e.g. overvoltage, the timer will be activated if the setpoint is exceeded. If the voltage value falls below the setpoint value before the timer runs out, then the timer will be stopped and reset.



When the timer runs out, the output is activated. The total delay will be the delay setting + the reaction time.

When parameterising the DEIF controller, the measuring class of the controller and an adequate "safety" margin has to be taken into consideration.

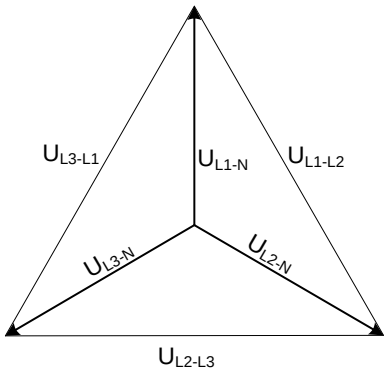
An example:
A power generation system must not reconnect to a network when the voltage is 85% of Un +/-0% ≤ U ≤ 110% +/-0%. In order to ensure reconnection within this interval, a control unit's tolerance/accuracy (Class 1 of the measuring range) has to be taken into consideration. It is recommended to set a control unit's setting range 1-2% higher/lower than the actual setpoint if the tolerance of the interval is +/-0% to ensure that the power system does not reconnect outside the interval.

Phase-phase voltage trip

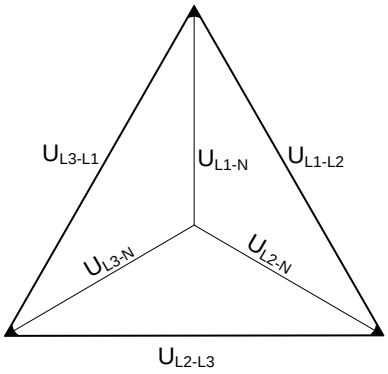
The voltage alarms are working based on phase-phase measurements. It is not possible to select phase-neutral measurements.

The overcurrent level is limited to 200% of the nominal current. Therefore it cannot be considered as a short-circuit protection.

Phase-neutral



Phase-phase



As indicated in the vector diagram, there is a difference in voltage values at an error situation for the phase-neutral voltage and the phase-phase voltage.

The table shows the actual measurements at a 10% undervoltage situation in a 400/230 volt system.

	Phase-neutral	**Phase-phase**
Nominal voltage	**400/230**	**400/230**
Voltage, 10% error	380/**207**	**360**/185

The alarm will occur at two different voltage levels, even though the alarm setpoint is 10% in both cases.

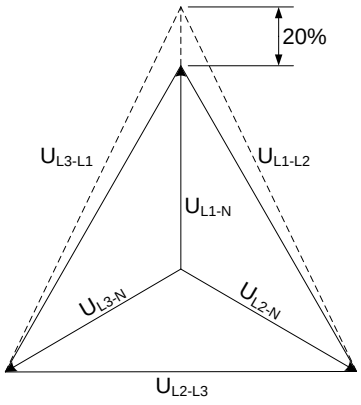
Example
The below 400V AC system shows that the phase-neutral voltage must change 20%, when the phase-phase voltage changes 40 volts (10%).

Example:
U_{NOM} = 400/230V AC

Error situation:
U_{L1L2} = 360V AC
U_{L3L1} = 360V AC

U_{L1-N} = 185V AC

ΔU_{PH-N} = 20%



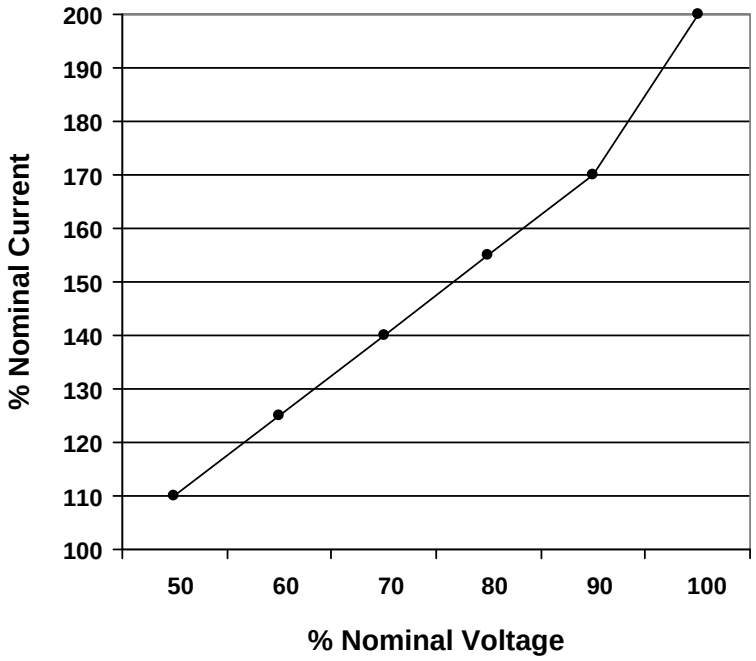
Both the generator protections and the busbar/mains protections use phase-phase voltage.

8.2 Voltage-dependent (restraint) overcurrent

This protection is used when the generator must be tripped due to a fault situation that creates a reduced generator voltage, e.g. a voltage collapse. During the voltage collapse, the generator can only produce part of its usual rating. A short-circuit current during a voltage collapse can even be lower than the nominal current rating.

The protection will be activated based on the overcurrent setpoint as a function of the measured voltage on the generator voltage terminals.

The result can be expressed as a curve function where the voltage setpoints are fixed values and the current setpoints can be adjusted (menu 1100). This means that if the voltage drops, the overcurrent setpoint will also drop.



The voltage values for the six points on the curve are fixed; the current values can be adjusted in the range 50-200%.

Voltage and current % values refer to the nominal settings.

Timer value can be adjusted in the range 0.1- 60.0 sec.

9. Parameter list

9.1 Related parameters

9.1.1 Related parameters

The Designer's Reference Handbook relates to the parameters 1000-1990, 2010-2790, 3000-3610, 4120-4970, 5000-5070, 6000-6990, 7000-7680, 9000-9150.

For further information, please see the separate parameter list, document number 4189340789.