DEIF A/S

Designer's Reference Handbook

Automatic Gen-set Controller/GS Multi-line 2

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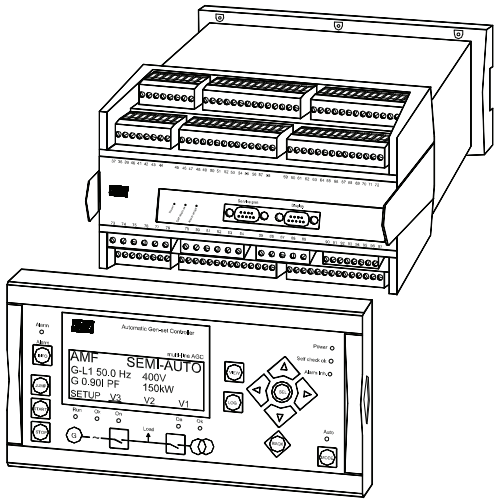

- *Functional descriptions*
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- *PI-controller*
- *Procedure for parameter setup*
- *Parameter list*

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1. About this document

This chapter includes general user information about this handbook concerning the general purpose, the intended users and the overall contents and structure.

General purpose

This document is the Designer's Reference Handbook for DEIF's Automatic Gen-set Controller, the AGC. The document mainly includes functional descriptions, presentation of display unit and menu structure, information about the PI-controller, the procedure for parameter setup and complete standard parameter lists.

The general purpose of the Designer's Reference Handbook is to provide useful overall information about the functionality of the unit and its applications. This handbook 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 handbook before working with the Multi-line 2 controller and the gen-set to be controlled. Failure to do this could result in human injury or damage to the equipment.

Intended users

The handbook is mainly intended for the person responsible for the unit parameter setup. In most cases, this would be a panel builder designer. Naturally, other users might also find useful information in the handbook.

Contents/overall structure

The Designer's Reference Handbook is divided into chapters and in order to make the structure of the document simple and easy to use, each chapter will begin from the top of a new page. The following will outline the contents of each of the chapters.

About this document

This first chapter includes general information about this handbook as a document. It deals with the general purpose and the intended users of the Designer's Reference Handbook. Furthermore, it outlines the overall contents and structure of the document.

Warnings and legal information

The second chapter includes information about general legal issues and safety precautions relevant in the handling of DEIF products. Furthermore, this chapter will introduce note and warning symbols, which will be used throughout the handbook.

General product information

The third chapter will deal with the unit in general and its place in the DEIF product range.

Functional descriptions

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

Display unit and menu structure

This chapter deals with the display unit including the push-button and LED functions. In addition, the unit menu structure will be presented. Furthermore, the selection of unit mode and password will be illustrated.

Additional functions

This chapter describes the additional functions of the unit.

PI-controller

This chapter offers information about the PI-controller in the form of principle drawings and descriptions.

Synchronising

This chapter has detailed information about the unit's dynamic and static synchronisation.

Procedure for parameter setup

This chapter deals with the procedure to be followed, when the parameters are set up or changed. By use of various illustrations this chapter will guide the user through the procedure for parameter setup step by step.

Parameter list

This chapter includes a complete standard parameter list for setup. Therefore, this chapter is to be used for reference, when information about specific parameters is needed.

2. Warnings and legal information

This chapter includes important information about general legal issues relevant in the handling of DEIF products. Furthermore, some overall safety precautions will be introduced and recommended. Finally, the highlighted notes and warnings, which will be used throughout this handbook, are presented.

Legal information and responsibility

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

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

Electrostatic discharge awareness

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

Safety issues

Installing the unit implies 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.

Definitions

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

Notes

The notes provide general information which will be helpful for the reader to bear in mind.

Warnings

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

3. General product information

This chapter will deal with the unit in general and its place in the DEIF product range.

Introduction

The AGC is part of the DEIF Multi-line 2 product family. Multi-line 2 is a complete range of multi-function generator protection and control products integrating all the functions you need into one compact and attractive solution.

The concept of the AGC is to offer a cost-effective solution to gen-set builders, who need a flexible generator protection and control unit for medium to large gen-set applications. Being part of the Multi-line product family the standard functions can be supplemented with a variety of optional functions.

Type of product

The Automatic Gen-set Controller is a micro-processor based control unit containing all necessary functions for protection and control of a gen-set.

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

Options

The Multi-line 2 product range consists of different basic versions which can be supplemented with the flexible options needed to provide the optimum solution. The options cover e.g. various protections for generator, busbar and mains, voltage/VAr/PF control, various outputs, power management, serial communication, additional operator display, etc.

A full options list is included in the data sheet, document no. 4921240257.

PC utility software warning

It is possible to remote control the gen-set from the PC utility software M-Vision or the Graphical Display Unit (GDU) by use of a modem. To avoid personal injury make sure that it is safe to remote control the gen-set.

4. Functional descriptions

This chapter 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.

Standard functions

In the following paragraphs the standard functions are listed.

Operation modes

- Automatic Mains Failure
- Island operation
- Fixed power/base load
- Peak shaving
- Load take over
- Mains power export

Engine control

- Start/stop sequences
- Fuel solenoid selection
- Relay outputs for governor control

Protections (ANSI)

- Overcurrent, 2 levels (51)
- Reverse power (32)
- 4-20mA inputs
- PT100 or VDO inputs
- Digital inputs

Display

- Prepared for remote mounting
- Push-buttons for start and stop
- Push-buttons for breaker operations
- Status texts

M-logic

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

GSM-communication

- SMS messages at all alarms
- Dial up from PC utility software to control unit

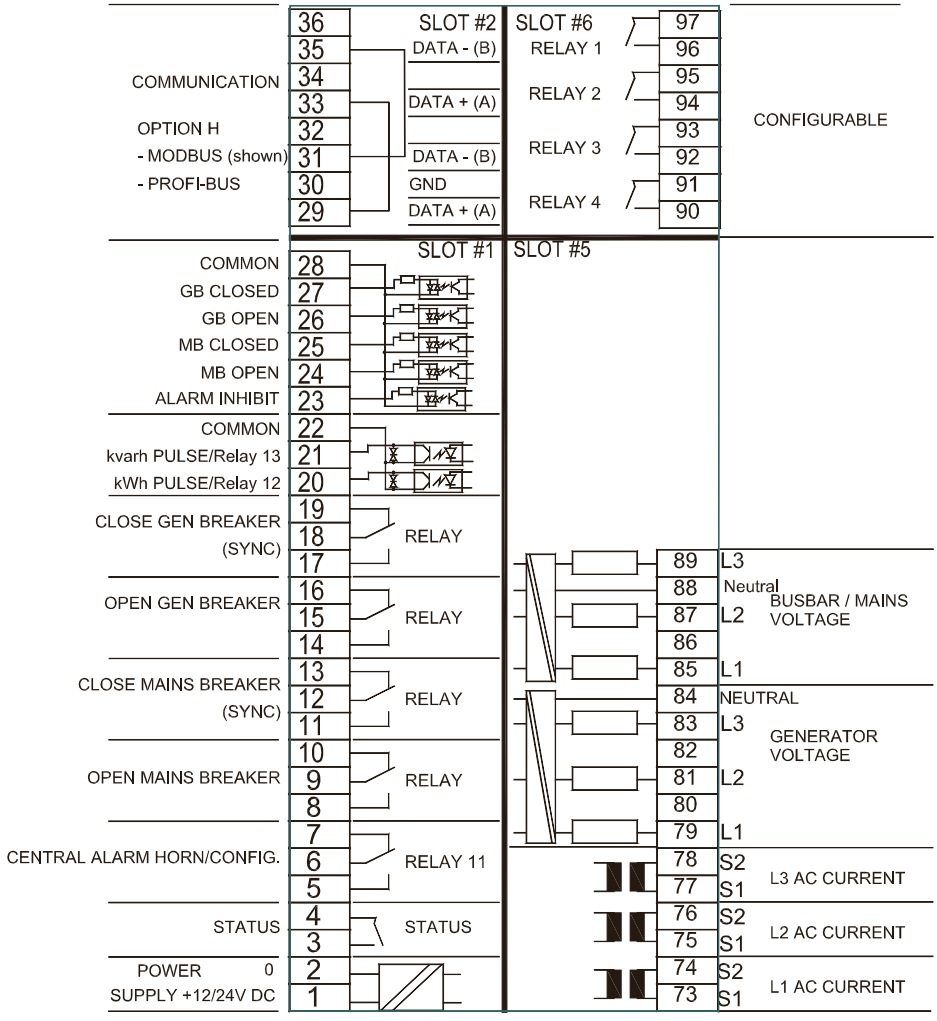
Terminal strip overview

The terminal strip overview shows I/Os for selectable standard and optional hardware.

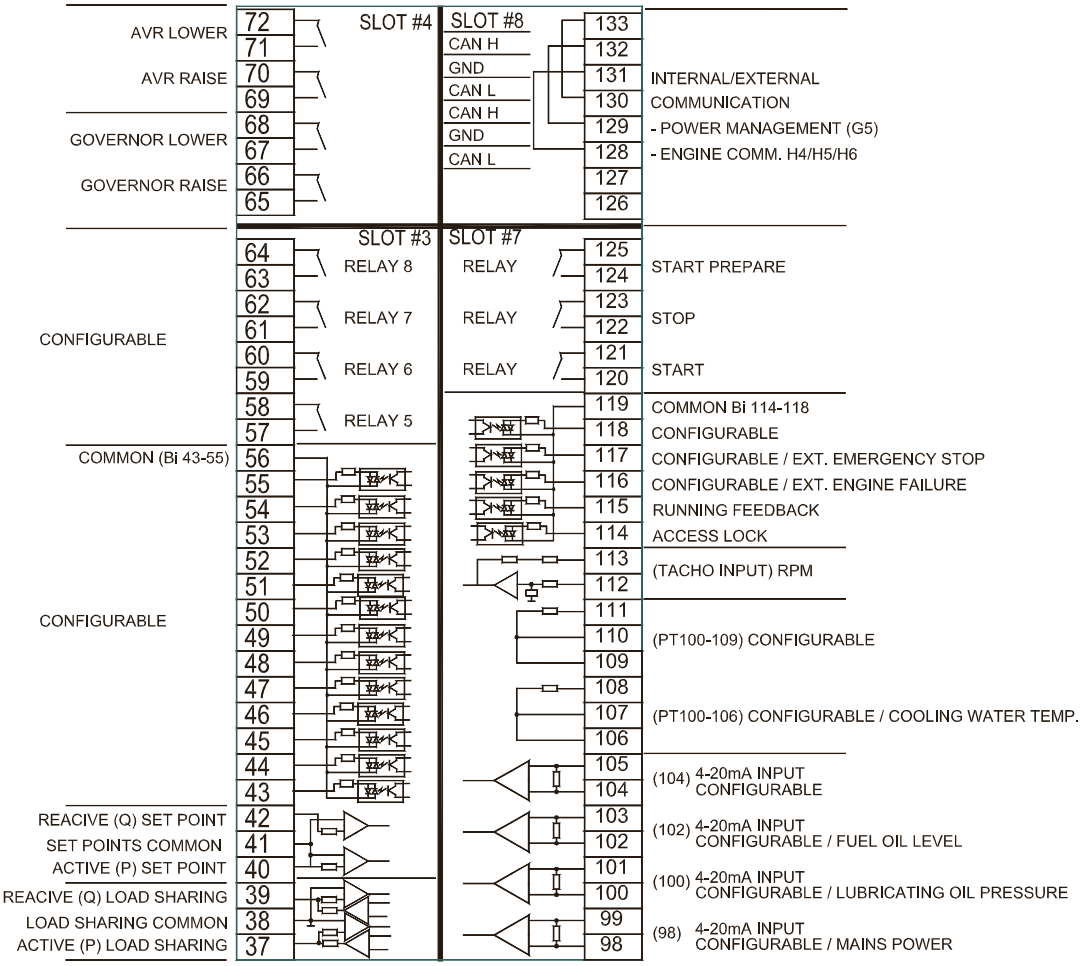
Refer to the data sheet for accurate information about possible configurations of the AGC.

Refer to the input/output lists in the installation instructions for detailed information about the I/Os of the specific options.

Slots #1, #2, #5 and #6



Slots #3, #4, #7 and #8



Applications

This section about applications is to be used for reference using the particular gen-set 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.)	Standard
Automatic Mains Failure (with back sync.)	Standard
Island operation	Standard
Fixed power/base load	Standard
Peak shaving	Standard
Load take over	Standard
Mains power export (fixed power to mains)	Standard
Multiple gen-sets, load sharing	Requires option G3
Multiple gen-sets, power management	Requires option G5

Gen-set mode	Running mode				
	Auto	Semi	Test	Man	Block
Automatic Mains Failure (no back sync.)	X	X	X	X	X
Automatic Mains Failure (with back sync.)	X	X	X	X	X
Island operation	X	X		X	X
Fixed power/base load	X	X	X	X	X
Peak shaving	X	X	X	X	X
Load take over	X	X	X	X	X
Mains power export	X	X	X	X	X
Multiple gen-sets, load sharing	X	X		X	X
Multiple gen-sets, power management	X	X	X	X	X

See mode overview in chapter 6 on page 61 for short description.

The flowcharts below illustrate the full functionality of the mentioned gen-set modes.

AMF (no back synchronisation)

Auto mode description

The unit automatically starts the gen-set and switches to generator supply at a mains failure after an adjustable delay time. It is possible to adjust the unit to change to gen-set operation in two different ways.

1. The mains breaker will be opened at gen-set start-up.
2. The mains breaker will remain closed, until the gen-set is running, and the gen-set 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 gen-set. The switching back to mains supply is done without back synchronisation, when the adjusted 'mains OK delay' has expired.

Semi-auto mode description

When the generator breaker is closed, the unit will use the nominal frequency as the setpoint for the speed governor. If AVR control (option D1) is selected, then the nominal voltage is used as setpoint.

See general semi-auto mode description on page 19.

Test mode description

See general test mode description valid for all gen-set modes on page 20.

Manual mode description

See general manual mode description valid for all gen-set modes on page 21.

Block mode description

See general block mode description valid for all gen-set modes on page 21.

AMF (with back synchronisation)

Auto mode description

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

1. The mains breaker will be opened at gen-set start-up.
2. The mains breaker will remain closed until the gen-set is running and the gen-set 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 synchronise the mains breaker to the busbar, when the 'mains OK delay' has expired. Then the gen-set cools down and stops.

The automatic mains failure mode can be combined with the short time parallel function. In that case, the generator breaker and the mains breaker will never be closed at the same time for a longer period than the adjusted 'short time parallel' time.

Semi-auto description

When the generator breaker is closed and the mains breaker is opened, the unit will use the nominal frequency as the setpoint for the speed governor. If AVR control (option D1) is selected, the nominal voltage is used as the setpoint.

When the generator is paralleled to the mains, the governor regulation will be active afterwards. It will use the setting 'generator minimum load as the setpoint' (menu 6523). If AVR control (option D1) is selected, then the setpoint will be the adjusted power factor (6550 Fixed power setpoint).

See general semi-auto mode description on page 19.

Test mode description

See general test mode description valid for all gen-set modes on page 20.

Manual mode description

See general manual mode description valid for all gen-set modes on page 21.

Block mode description

See general block mode description valid for all gen-set modes on page 21.

Island operation

Auto mode description

The unit automatically starts the gen-set and closes the generator breaker at a digital start command. When the stop command is given, the generator breaker is tripped, and the gen-set will be stopped after a cooling-down period. The start and stop commands are used by activating and deactivating a digital input. If the *time dependent start/stop* commands are to be used, then the auto mode must also be used. In this case, the digital input 'auto start/stop' *cannot* be used.

Semi-auto mode description

When the generator breaker is closed, the unit will use the nominal frequency as setpoint for the speed governor. If AVR control (option D1) is selected, the nominal voltage is used as setpoint.

See general semi-auto mode description on page 19.

Test mode description

See general test mode description valid for all gen-set modes on page 20.

Manual mode description

See general manual mode description valid for all gen-set modes on page 21.

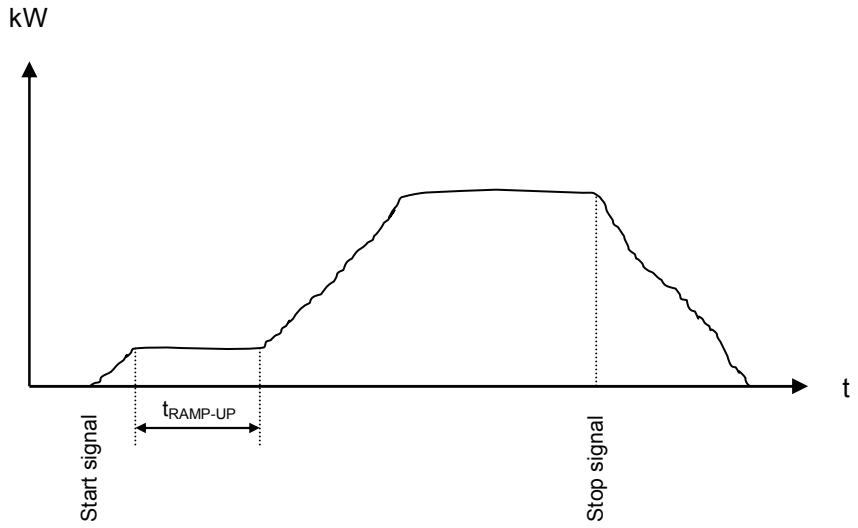
Block mode description

See general block mode description valid for all gen-set modes on page 21.

Fixed power/base load

Auto mode description

The unit automatically starts the gen-set and synchronises to the mains, when the digital input 'auto start/stop' is activated. After the generator breaker closure, the unit ramps up the load to the setpoint level. When the stop command is given, the gen-set is deloaded and stopped after the cooling-down period. The start and stop commands are used by activating and deactivating a digital input. If the *time dependent start/stop* commands are to be used, then the auto mode must also be used. In this case, the digital input 'auto start/stop' *cannot* be used.



Diagram, fixed power - principle

Semi-auto mode description

When the generator breaker is closed and the mains breaker is opened, the unit will use the nominal frequency as the setpoint for the speed governor. If AVR control (option D1) is selected, the nominal voltage is used as setpoint.

When the generator is paralleled to the mains, the generator power will be increased to the fixed power setpoint (6550 Fixed power setpoint). If AVR control (option D1) is selected, then the setpoint will be the adjusted power factor (6550 Fixed power setpoint).

See general semi-auto mode description on page 19.

Test mode description

See general test mode description valid for all gen-set modes on page 20.

Manual mode description

See general manual mode description valid for all gen-set modes on page 21.

Block mode description

See general block mode description valid for all gen-set modes on page 21.

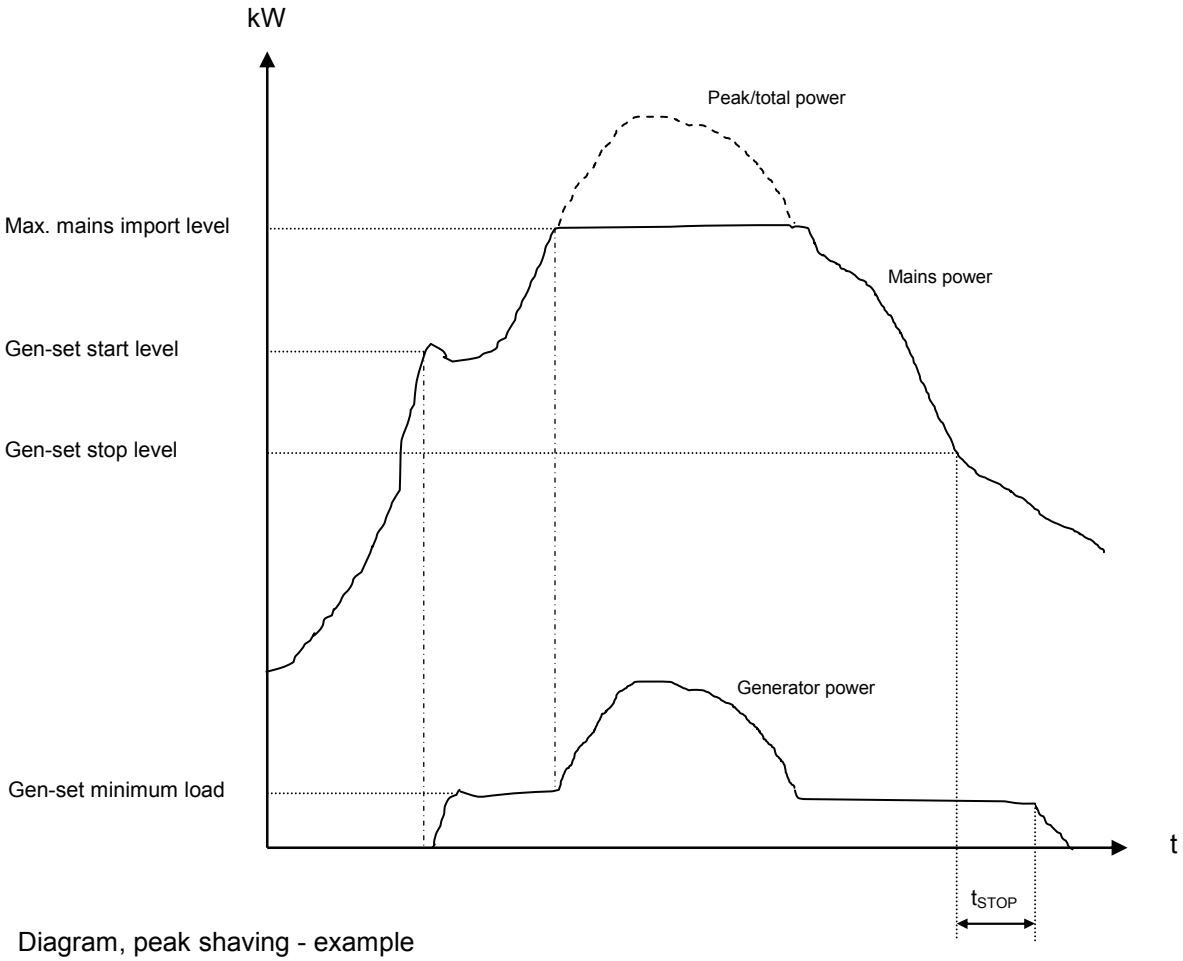
Peak shaving

Auto mode description

The gen-set will start at a predefined mains import level and run at a fixed minimum load, e.g. 10%. When the mains import increases above the maximum mains import setpoint, the gen-set will supply the extra load in order to maintain the mains import at the maximum import level.

When the load drops below the max. mains import setpoint, the gen-set will run at min. load again. When the mains import decreases below the stop setpoint, the gen-set will cool down and stop.

A 4-20mA transducer is used for indication of the power imported from the mains.



Diagram, peak shaving - example

Semi-auto mode description

When the generator breaker is closed and the mains breaker is opened, the unit will use the nominal frequency as setpoint for the speed governor. If AVR control (option D1) is selected, the nominal voltage is used as setpoint.

When the generator is paralleled to the mains, the generator will be controlled according to the peak shaving setpoint. So the maximum mains import will not be exceeded in spite of the semi-auto mode. If AVR control (option D1) is selected, the setpoint is the adjusted power factor (6550 Fixed power setpoint).

See general semi-auto mode description on page 19.

Test mode description

See general test mode description valid for all gen-set modes on page 20.

Manual mode description

See general manual mode description valid for all gen-set modes on page 21.

Block mode description

See general block mode description valid for all gen-set modes on page 21.

Load take over

Auto mode description

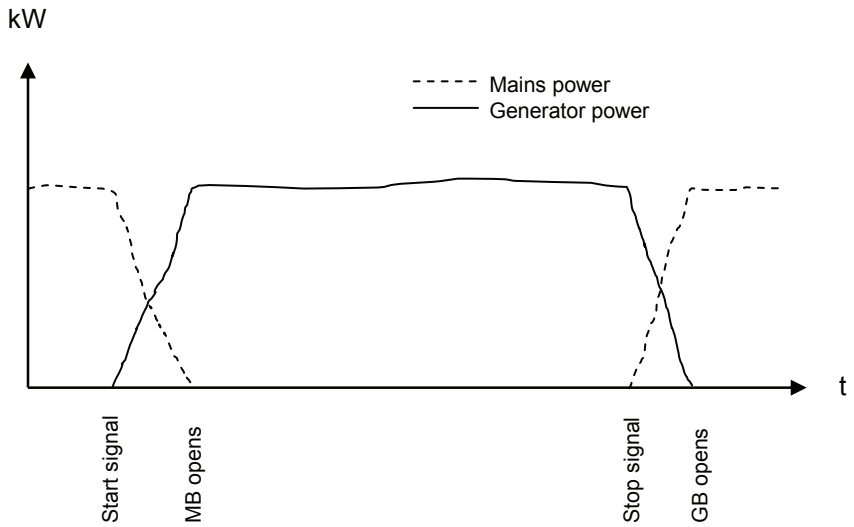
Back synchronising ON

The purpose of the load take over mode is to transfer the load imported from the mains to the gen-set for operation on generator supply only.

When the start command is given, the gen-set will start and synchronise the generator breaker to the busbar that is being supplied by the mains. When the generator breaker is closed, the imported load is decreased (the power is being transferred to the gen-set), until the load is at the open breaker point. Then the mains breaker opens.

When the stop command is given, the mains breaker is synchronised to the busbar and after closure the gen-set is deloaded, cooled down and stopped.

A 4-20mA transducer is used for indication of the power imported from the mains.



Diagram, load take over - example

The load take over mode can be combined with the short time parallel. In that case, the generator and the mains breakers will never be closed at the same time for a longer period than the adjusted 'short time parallel' time.

If the imported load is higher than the nominal gen-set power, an alarm appears and the load take over sequence is paused.

Back synchronising OFF

When the start command is given, the gen-set will start. When the frequency and voltage is OK, the mains breaker is opened and the generator breaker is closed. Now the generator supplies the load, until the stop command is given. Then the generator breaker opens and the mains breaker closes. The gen-set cools down and stops.

A 4-20mA transducer is used for indication of the power imported from the mains.

If the imported load is higher than the nominal gen-set an alarm appears, and the load take over sequence is paused.

Semi-auto mode

When the generator breaker is closed, and the mains breaker is opened, the unit will use the nominal frequency as setpoint for the speed governor. If AVR control (option D1) is selected, the nominal voltage is used as setpoint.

When the generator is paralleled to the mains, it will be controlled, so the imported power from the mains will be kept at 0 kW. If AVR control (option D1) is selected, the setpoint is the adjusted power factor (6550 Fixed power setpoint).

See general semi-auto mode description on page 19.

Test mode description

See general test mode description valid for all gen-set modes on page 20.

Manual mode description

See general manual mode description valid for all gen-set modes on page 21.

Block mode description

See general block mode description valid for all gen-set modes on page 21.

Mains power export (fixed power to mains)

Auto mode description

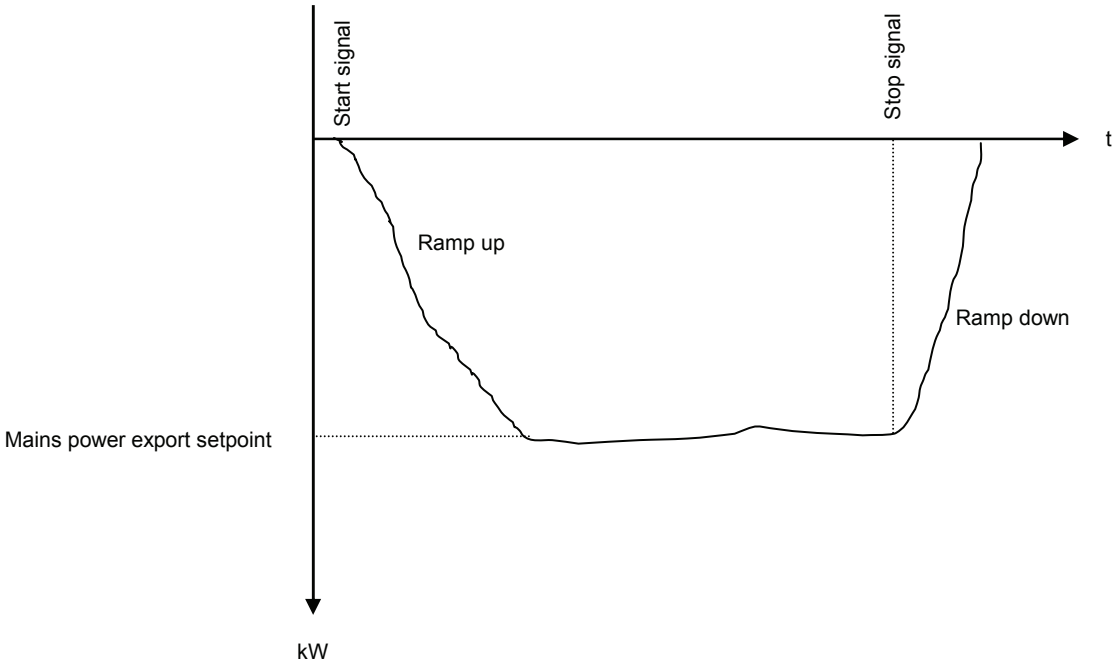
The mains power export mode can be used to maintain a constant level of power through the mains breaker. The power can be exported to the mains or imported from the mains, but always at a constant level.

If a fixed level of imported power must be used, it is still the mains power export mode that must be selected! This mode covers import as well as export.

The gen-set starts as a result of a digital start command. It synchronises to the mains and will start to export power to the mains. The amount of power exported or imported will be kept at a fixed level regardless of the load on the busbar (the factory).

The stop command will cause the gen-set to deload and trip the generator breaker. Afterwards, it will cool down and stop.

A 4-20mA transducer is used for indication of the power exported from the mains. The example below shows a situation where the setpoint is adjusted to exporting power to the mains.



Diagram, mains power export - example

Please notice that the set point of the mains power export can be adjusted to 0 kW. This means that the gen-set will be parallel to the mains but no power import or export.

Semi-auto description

When the generator breaker is closed and the mains breaker is opened, the unit will use the nominal frequency as setpoint for the speed governor. If AVR control (option D1) is selected the nominal voltage is used as setpoint.

When the generator is paralleled to the mains, it will be controlled according to the mains power export setpoint. If AVR control (option D1) is selected, the setpoint is the adjusted power factor (6550 Fixed power setpoint).

See general semi-auto mode description on page 19.

Test mode description

See general test mode description valid for all gen-set modes on page 20.

Manual mode description

See general manual mode description valid for all gen-set modes on page 21.

Block mode description

See general block mode description valid for all gen-set modes on page 21.

General semi-auto mode description

The unit can be operated in semi-automatic mode. Semi-auto 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. Push-buttons on the display are used
2. Digital inputs are used
3. Modbus command.

The standard AGC is only equipped with a limited number of digital inputs, please refer to page 95 in this document and the data sheet for additional information about availability.

When the gen-set is running in semi-auto mode, the unit will control the speed governor and the AVR, if option D1 is selected.

It is possible to manually increase and decrease the speed/voltage when semi-auto is selected. When the digital up/down input is activated, then the regulator is deactivated as long as the manual up/down inputs are activated.

Manual voltage control is option dependent (option D1).

The following sequences can be activated in semi-auto:

Command	Description	Comment
Start	The start sequence is initiated and continues until the gen-set starts or the maximum number of start attempts has been reached. The frequency (and voltage) will be regulated to make the GB ready to close.	
Stop	The gen-set will be stopped. After disappearance of the running signal, the stop sequence will continue to be active in the 'extended stop time' period. The gen-set is stopped without cooling-down time.	
Close GB	The unit will close the generator breaker, if the mains breaker is open, synchronise and close the generator breaker, if the mains breaker is closed.	When AMF mode is selected, the unit will not regulate after breaker closure.
Open GB	The unit will ramp down and open the generator breaker at the breaker open point, if the mains breaker is closed. The unit will open the generator breaker instantly, if the mains breaker is open or the gen-set mode is island mode.	
Close MB	The unit will close the mains breaker, if the generator breaker is open, synchronise and close the mains breaker, if the generator breaker is closed.	
Open MB	The unit opens the mains breaker instantly.	
Manual GOV UP	The regulator is deactivated and the governor output is activated as long as the GOV input is ON.	
Manual GOV DOWN	The regulator is deactivated and the governor output is activated as long as the GOV input is ON.	
Manual AVR UP	The regulator is deactivated and the governor output is activated as long as the AVR input is ON.	Option D1 is required.
Manual AVR DOWN	The regulator is deactivated and the governor output is activated as long as the AVR input is ON.	Option D1 is required.

General test mode description

The test mode function is activated by selecting test with the MODE push-button on the display or by activating a digital input, if one of them is configured to 'test'. The test mode will only test synchronising, if the 'Sync. to mains' function is enabled. If this is the case, the gen-set will start, and the unit will synchronise and close the generator breaker to let the gen-set run in parallel, until the test time expires. If the 'Sync. to mains' function is not activated, then the gen-set will start and run at the nominal frequency with the generator breaker open.

The settings for the test function are set up in menu **6540 Test running**

.

- Setpoint: Load setpoint when paralleling to mains.
- Timer: Engine run time during the test period
- Return: When the test is completed, the unit will return to the selected mode (semi-auto or auto).

Short time parallel is ignored in test mode.

Test mode cannot be used, if the gen-set is in island operation (gen-set mode selected to island mode).

General manual mode description

When manual mode is selected, the gen-set can be controlled with digital inputs. The following commands are possible:

Command	Comment
Start	Gen-set starts.
Stop	Gen-set opens GB and stops without cooling-down.
Manual increase speed	Unit gives increase signal to speed governor.
Manual decrease speed	Unit gives decrease signal to speed governor.
Manual increase voltage	Unit gives increase signal to the AVR. (Option D1).
Manual decrease voltage	Unit gives decrease signal to the AVR. (Option D1).

It is necessary to configure the digital inputs through the PC utility software to use the manual commands. The number of configurable digital inputs is option dependent.

It is not possible to open and close the generator breaker or the mains breaker in manual mode.

MAN mode cannot be selected, when AUTO mode is selected. To go from AUTO to MAN it is necessary to go to SEMI-AUTO to make MAN available.

General block mode description

When the block mode is selected, the unit is locked for certain actions. This means that it cannot start the gen-set or perform any breaker operations.

To change the running mode from the display, the user will be asked for a password, before the change can be made. It is not possible to select 'block mode', when running feedback is present.

The purpose of the block mode is to make sure that the gen-set does not start for instance during maintenance work.

If the digital inputs are used to change the mode, then it is important to know that the 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.

If block mode is selected using the display after the digital block input is activated, the AGC will stay in block mode after the block input is deactivated. The block mode must now be changed using the display. The block mode can only be changed locally by display or digital input.

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

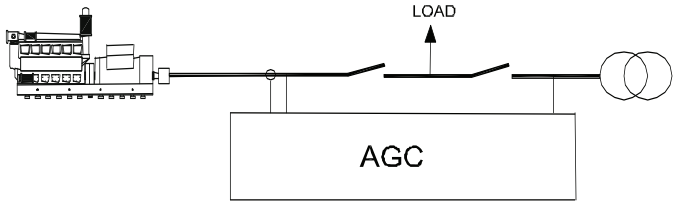
Alarms are not influenced by block mode selection.

The gen-set can be started from the local engine control panel, if such is installed. Therefore, DEIF recommends to avoid local cranking and starting of the gen-set.

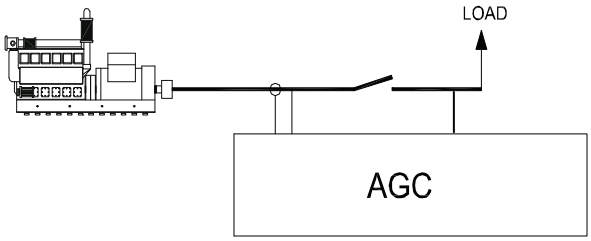
Single-line diagrams

In the following, single-line diagrams illustrating the various applications are presented.

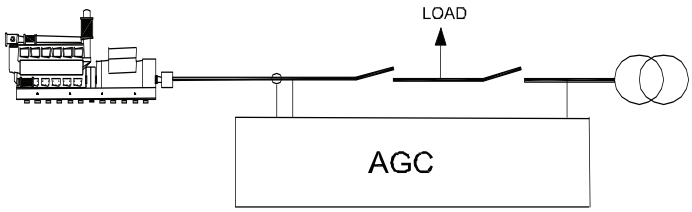
Automatic Mains Failure



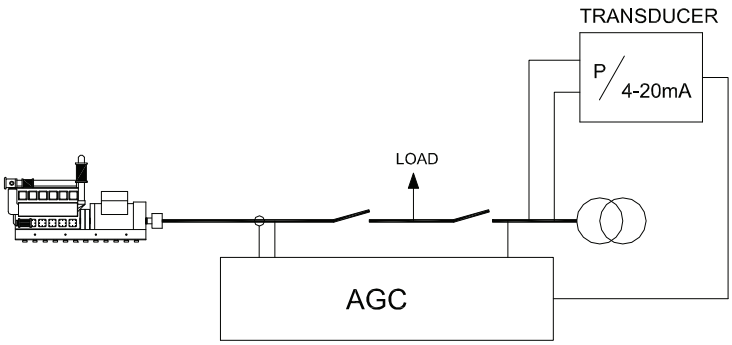
Island operation



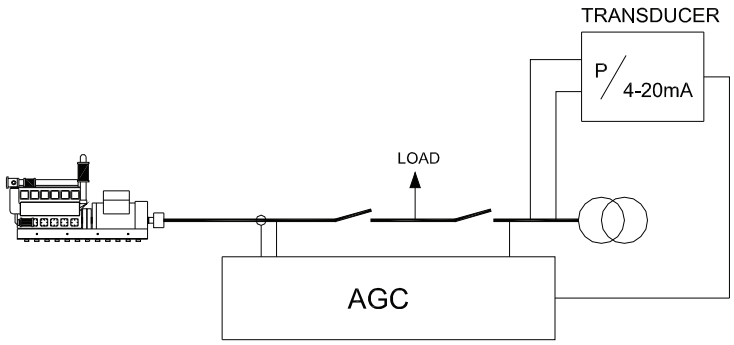
Fixed power/base load



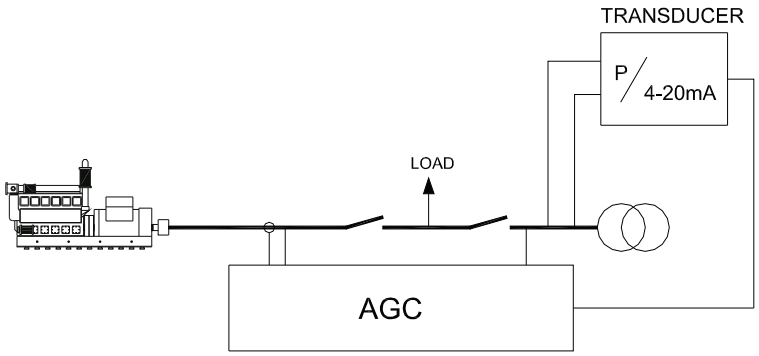
Peak shaving



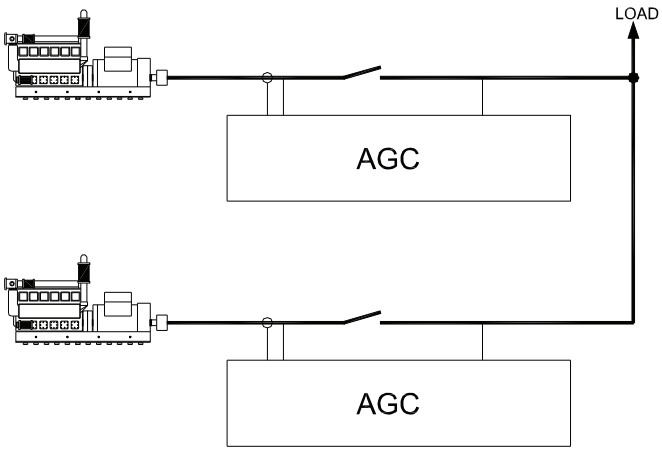
Load take over



Mains power export

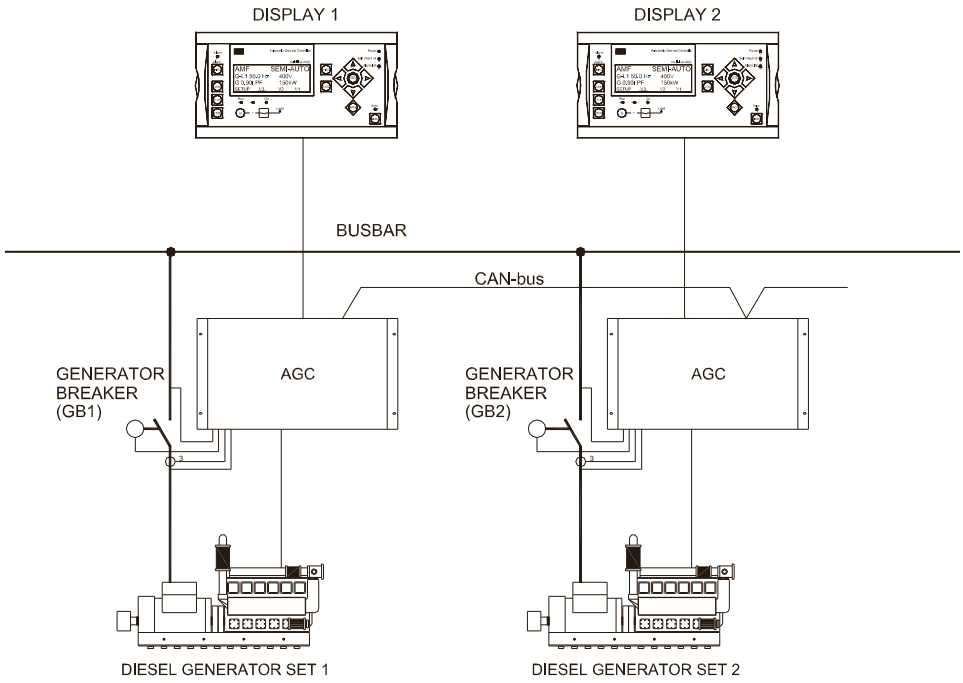


Multiple gen-sets, load sharing

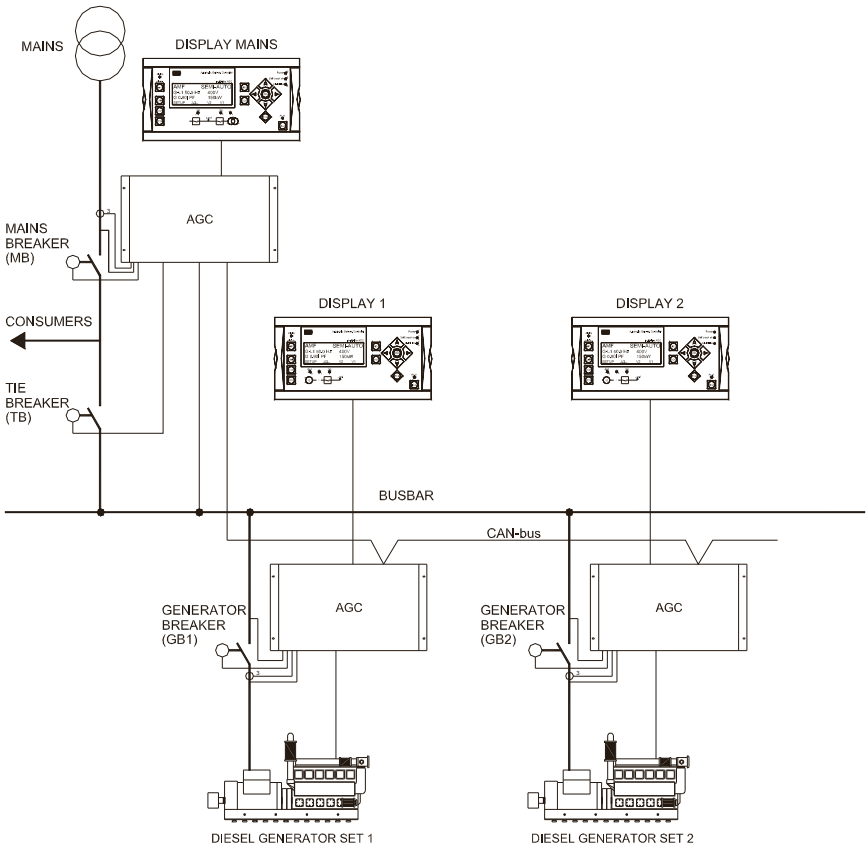


Multiple gen-sets, power management

Island mode application



Parallel to mains application



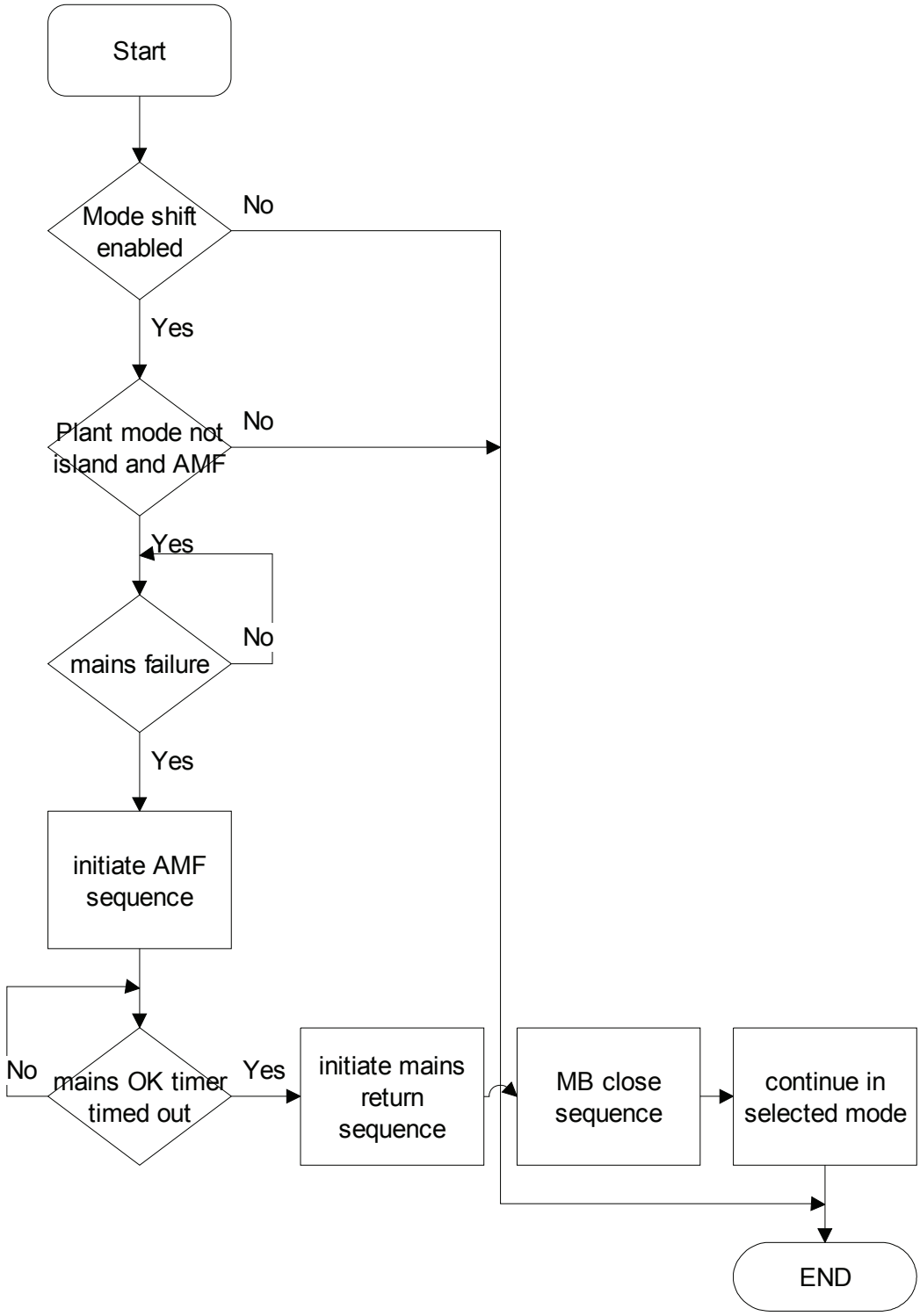
Flowcharts

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

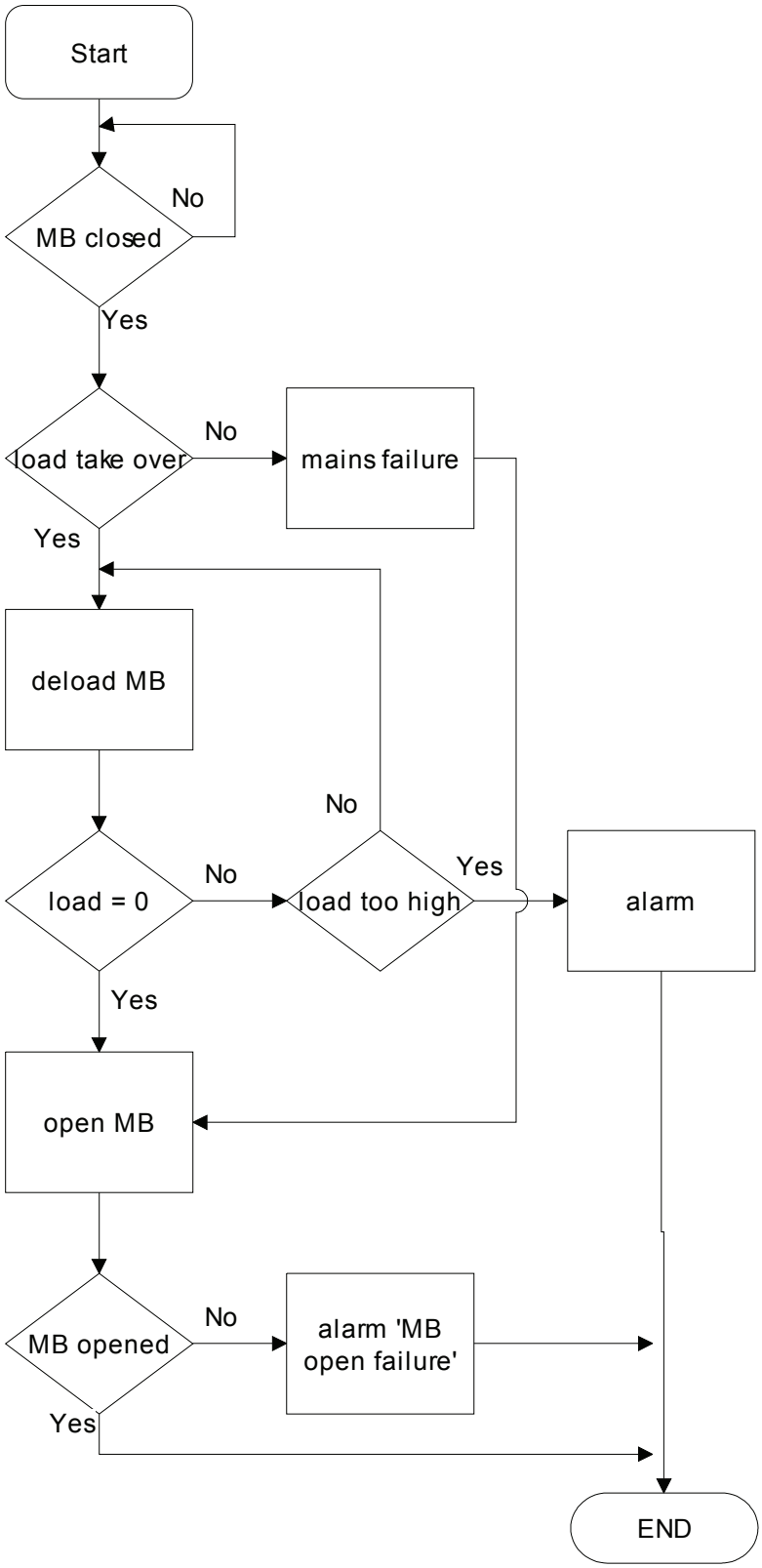
- Mode shift
- MB open sequence
- GB open sequence
- Stop sequence
- Start sequence
- MB close sequence
- GB close sequence
- Fixed power
- Load take over
- Island operation
- Peak shaving
- Mains power export
- Automatic Mains Failure
- Test sequence

The flowcharts below are for guidance only. For illustrative purposes the flowcharts are simplified in some extent.

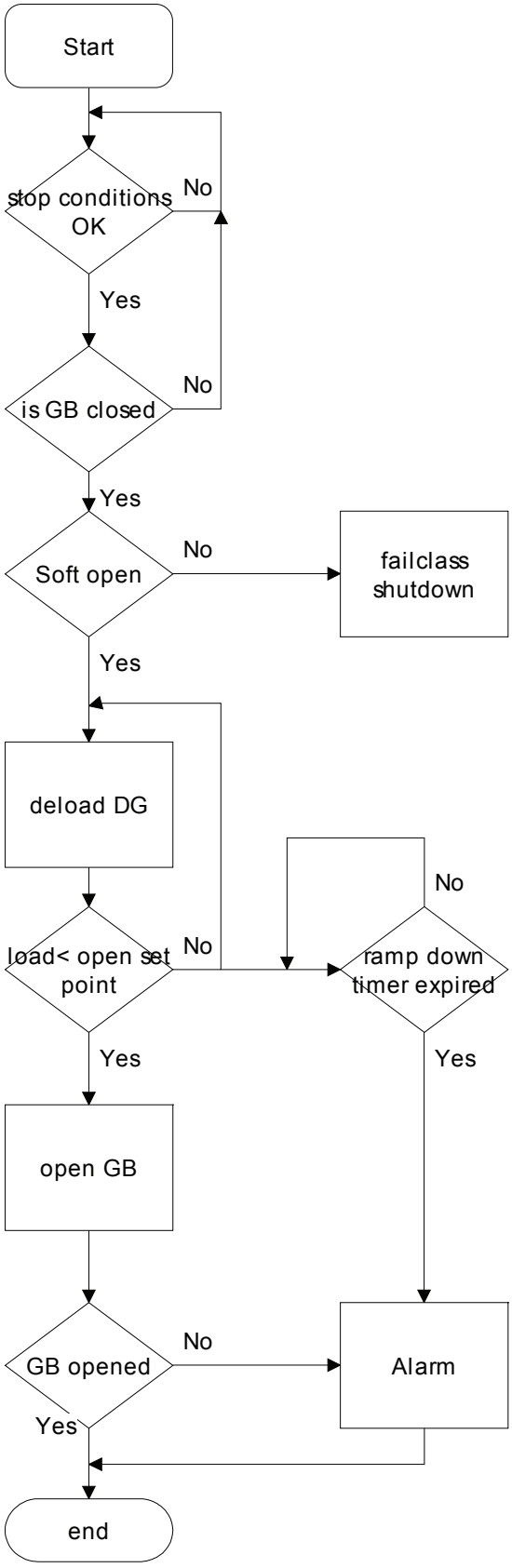
Mode shift


Start
Mode shift enabled
No
Yes
Plant mode not island and AMF
No
Yes
mains failure
No
Yes
initiate AMF sequence
No
mains OK timer timed out
Yes
initiate mains return sequence
MB close sequence
continue in selected mode
END

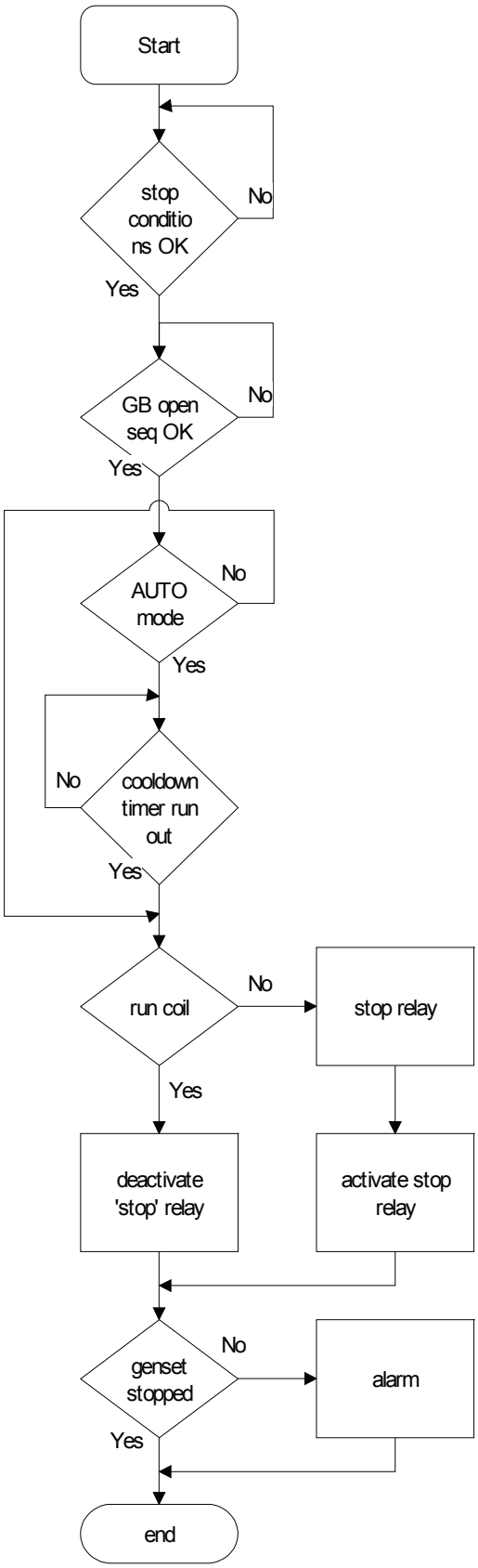
MB open sequence



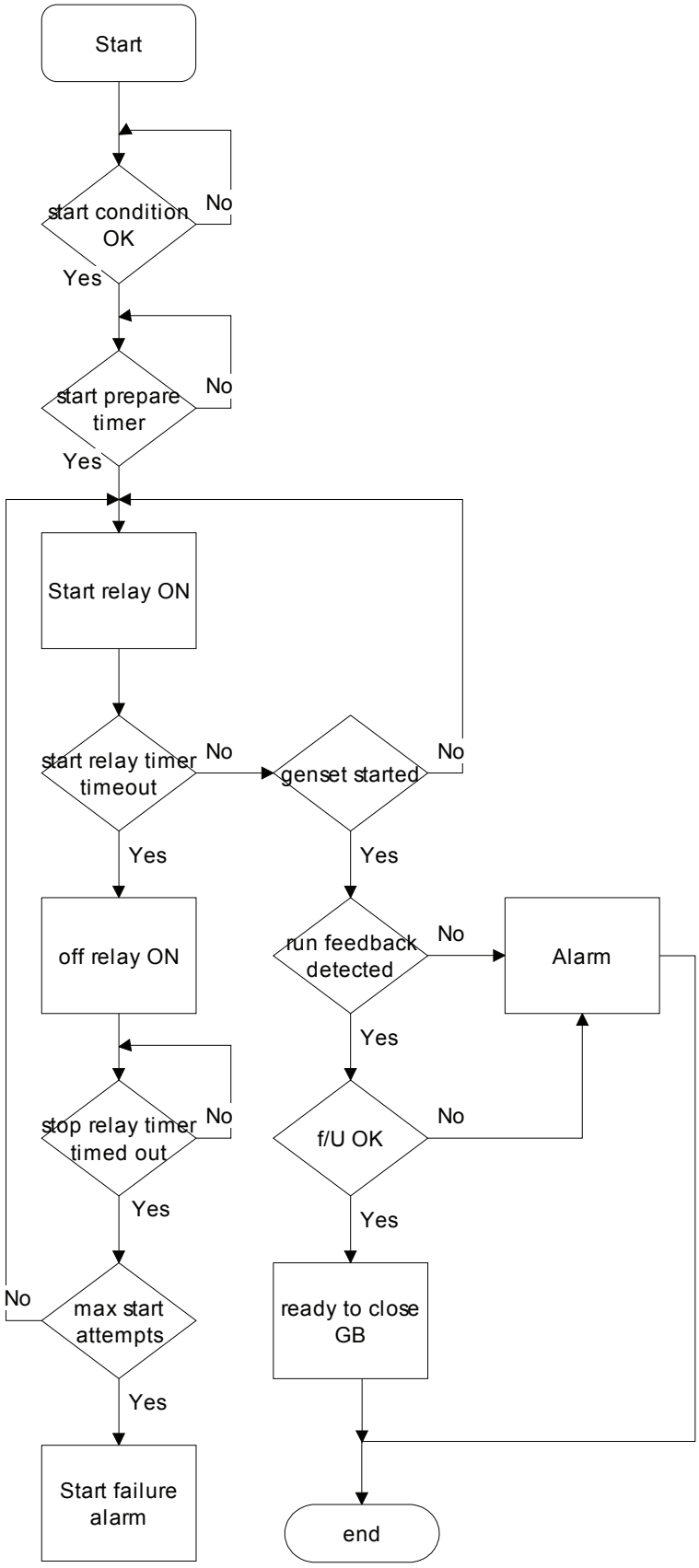
GB open sequence



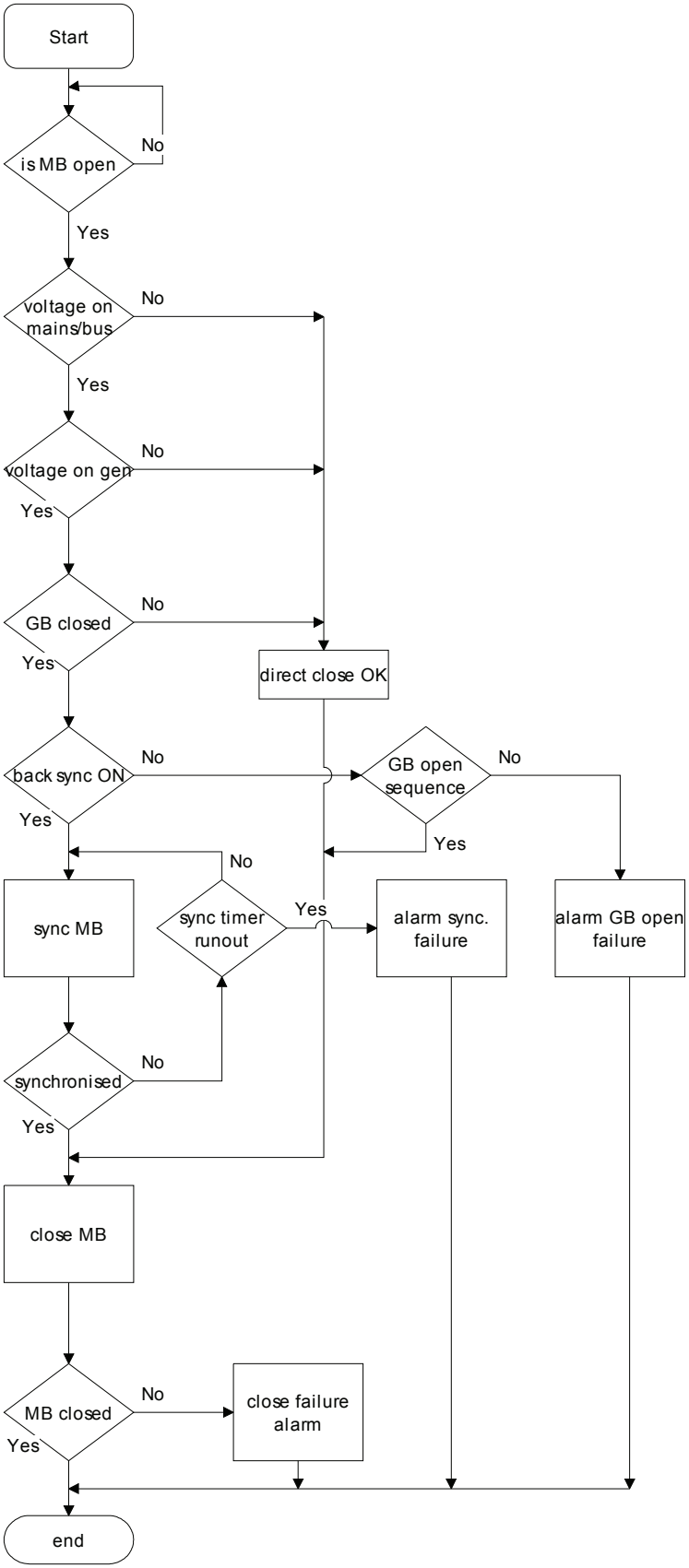
Stop sequence



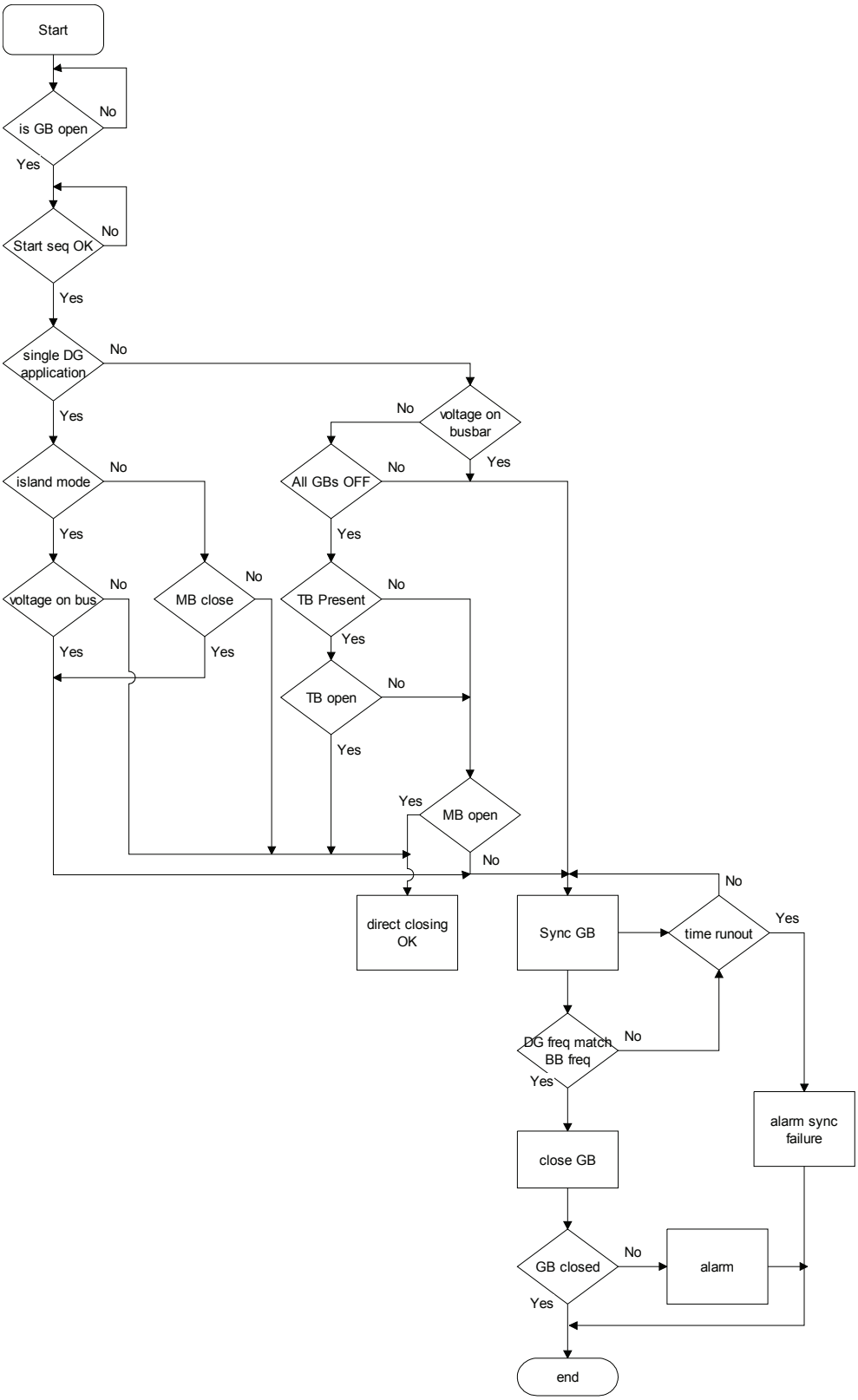
Start sequence



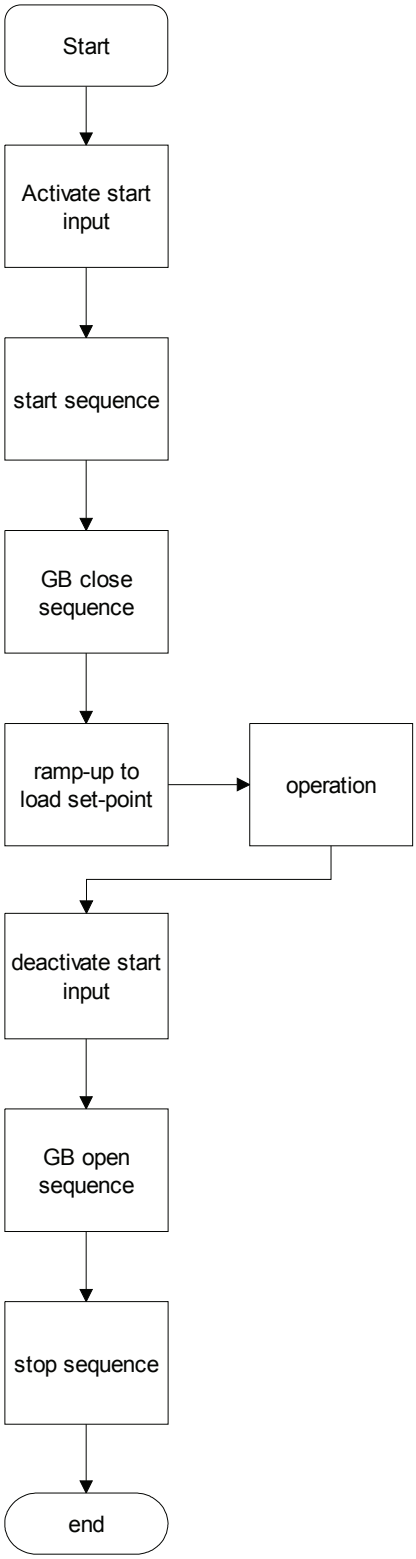
MB close sequence



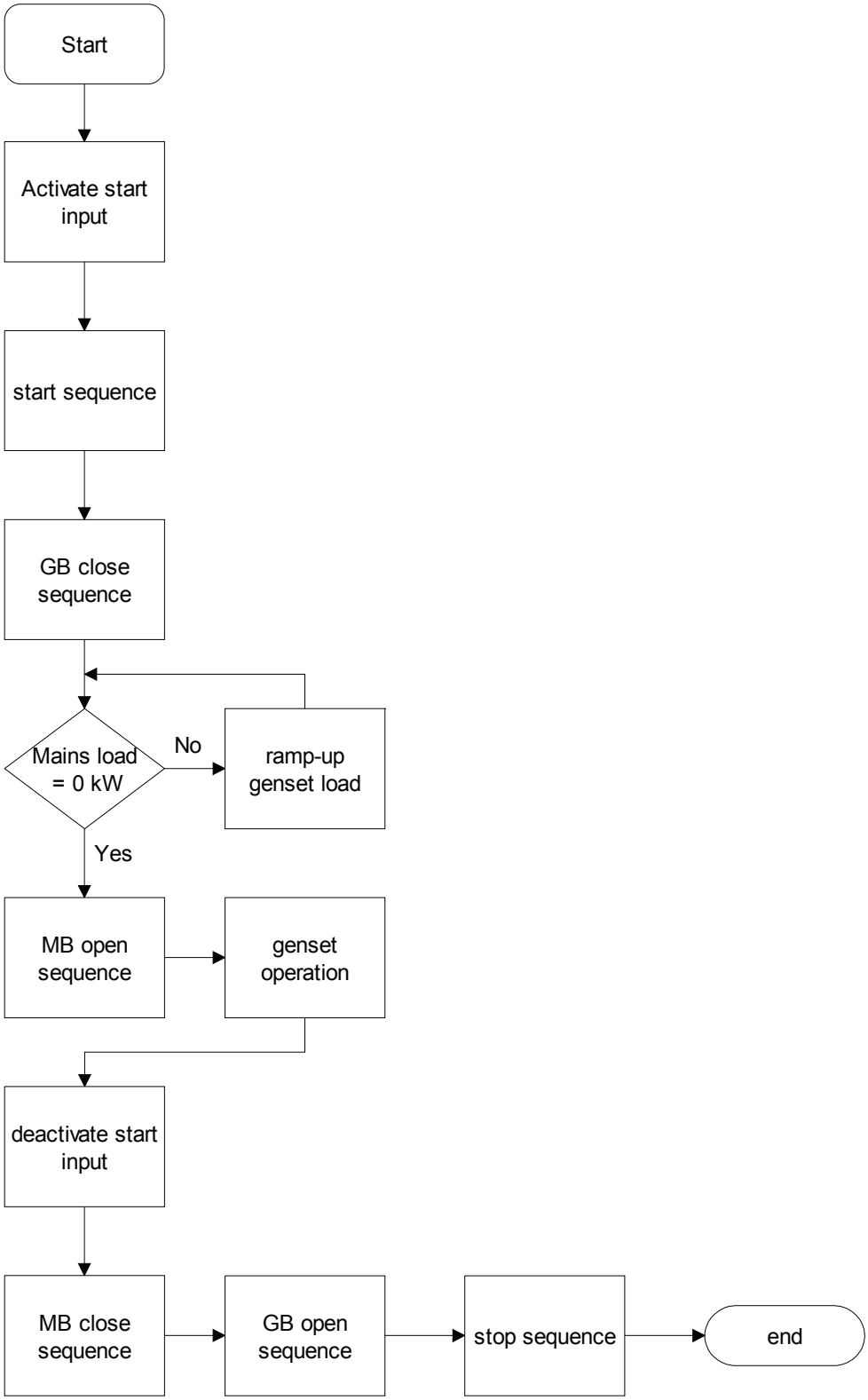
GB close sequence



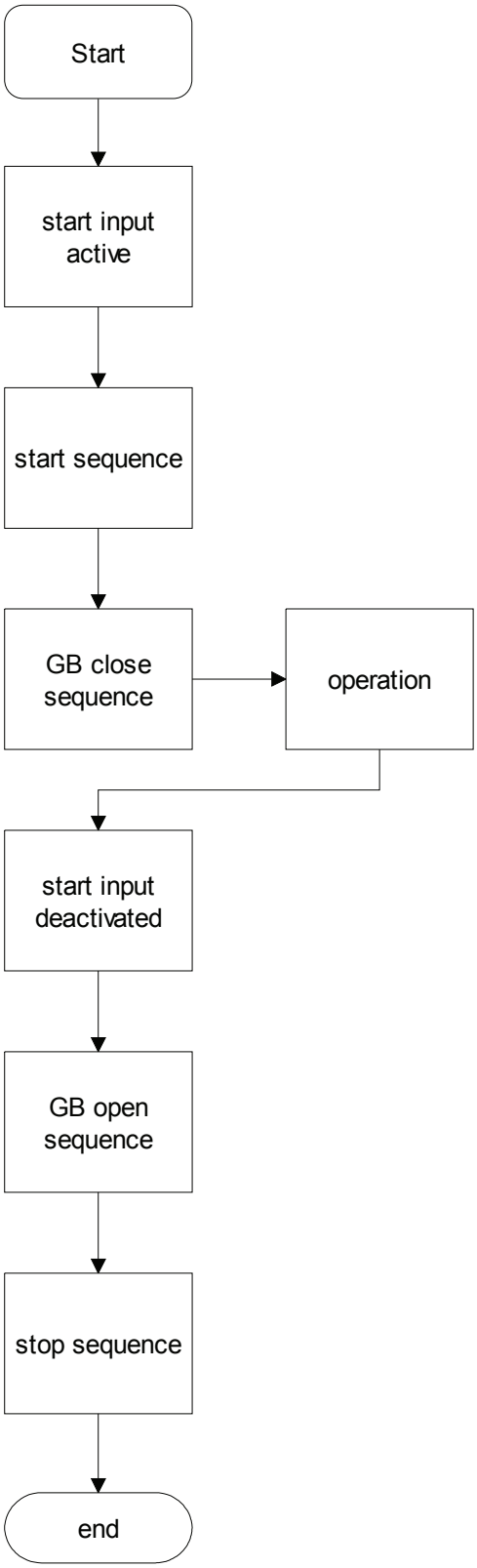
Fixed power


Start
Activate start input
start sequence
GB close sequence
ramp-up to load set-point
operation
deactivate start input
GB open sequence
stop sequence
end

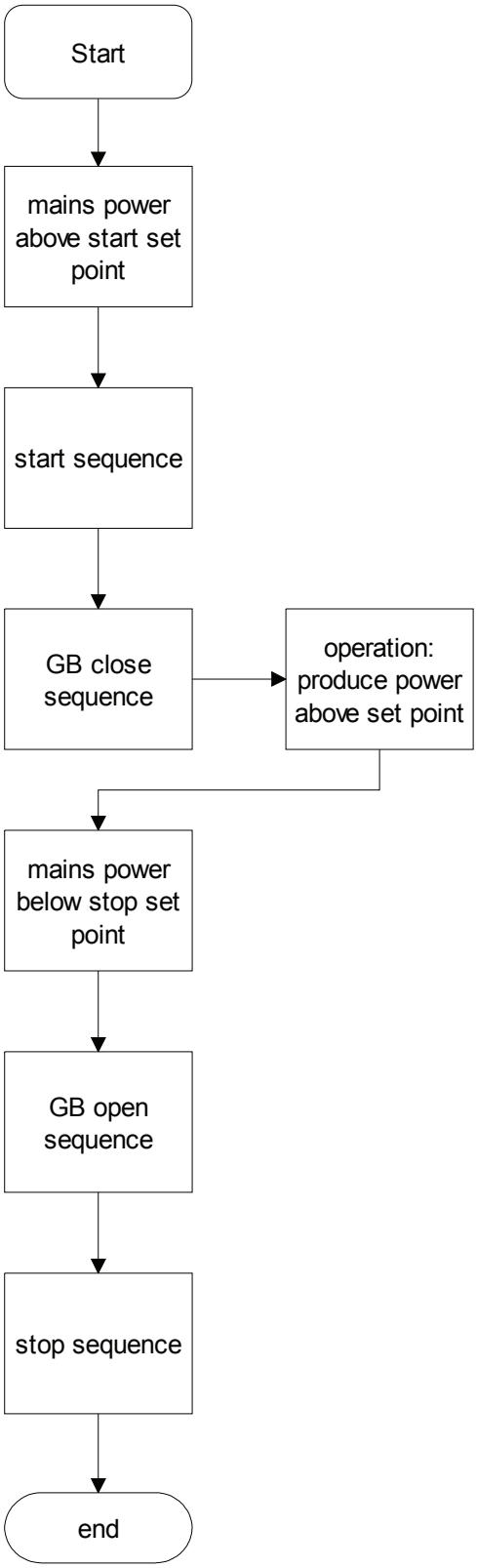
Load take over



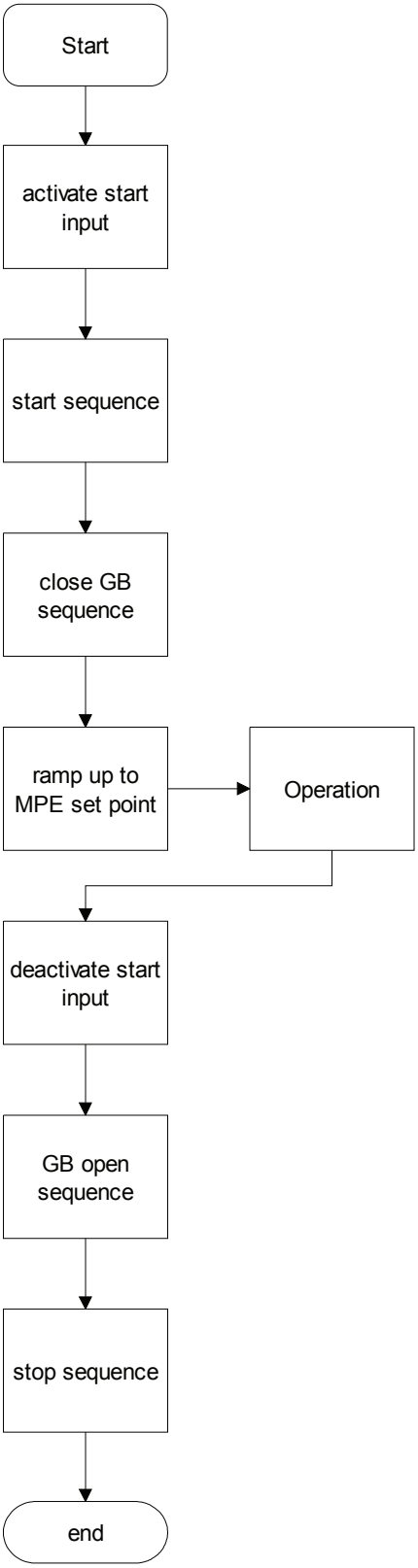
Island operation



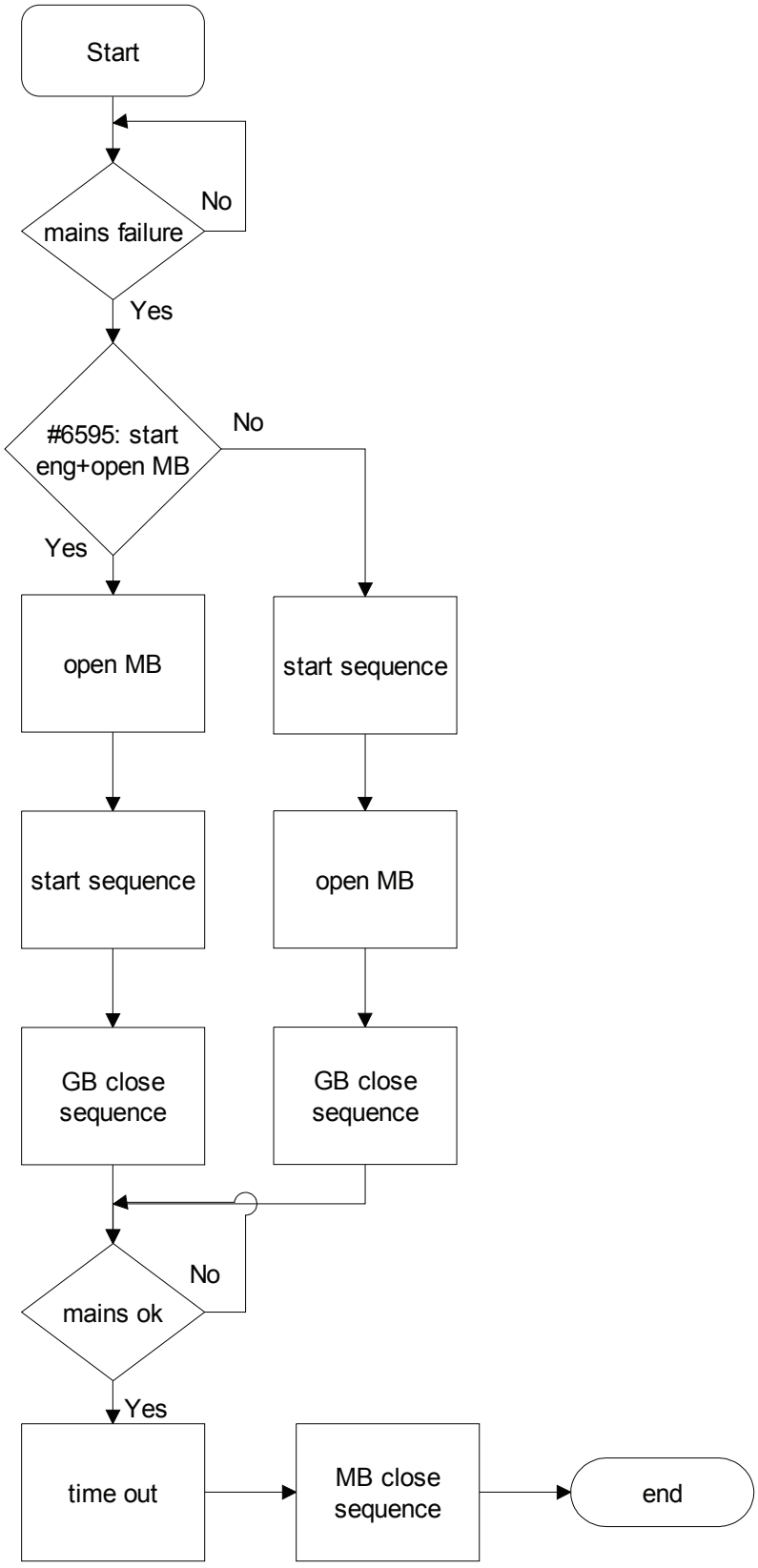
Peak shaving



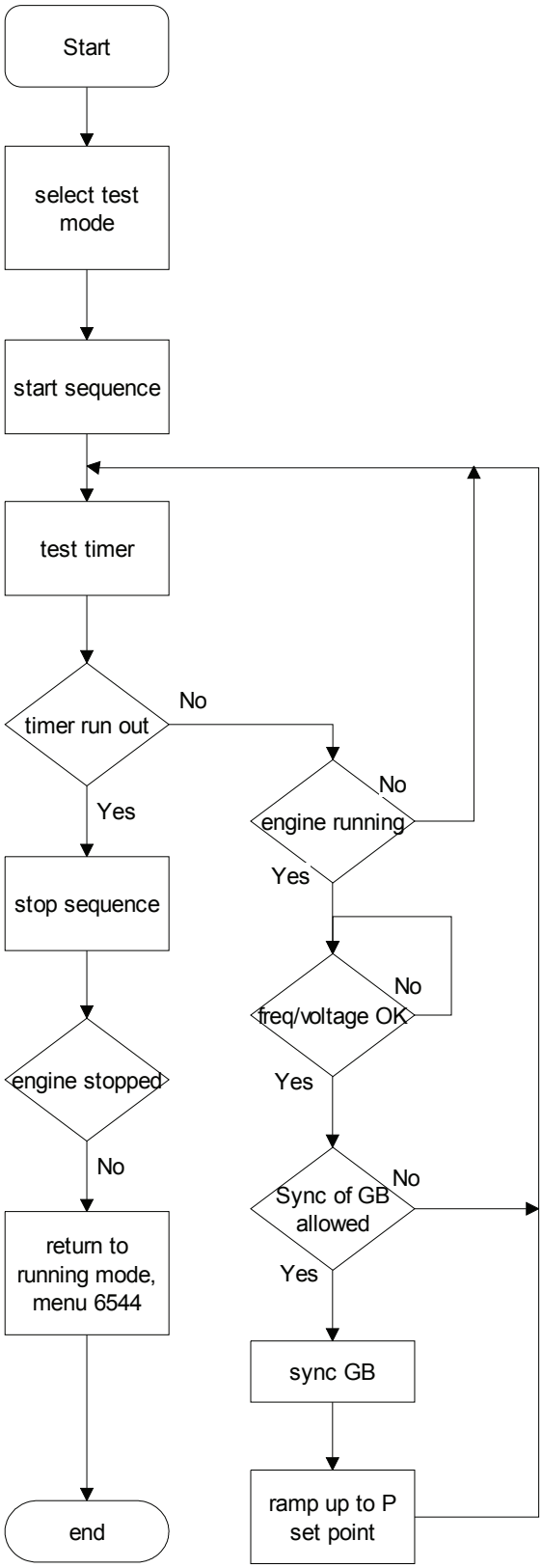
Mains power export



Automatic Mains Failure



Test sequence



Sequences

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

In the semi-auto mode the selected sequence is the only sequence initiated (e.g. press the START push-button: The engine will start, but no subsequent synchronising is initiated).

The following sequences will be illustrated below:

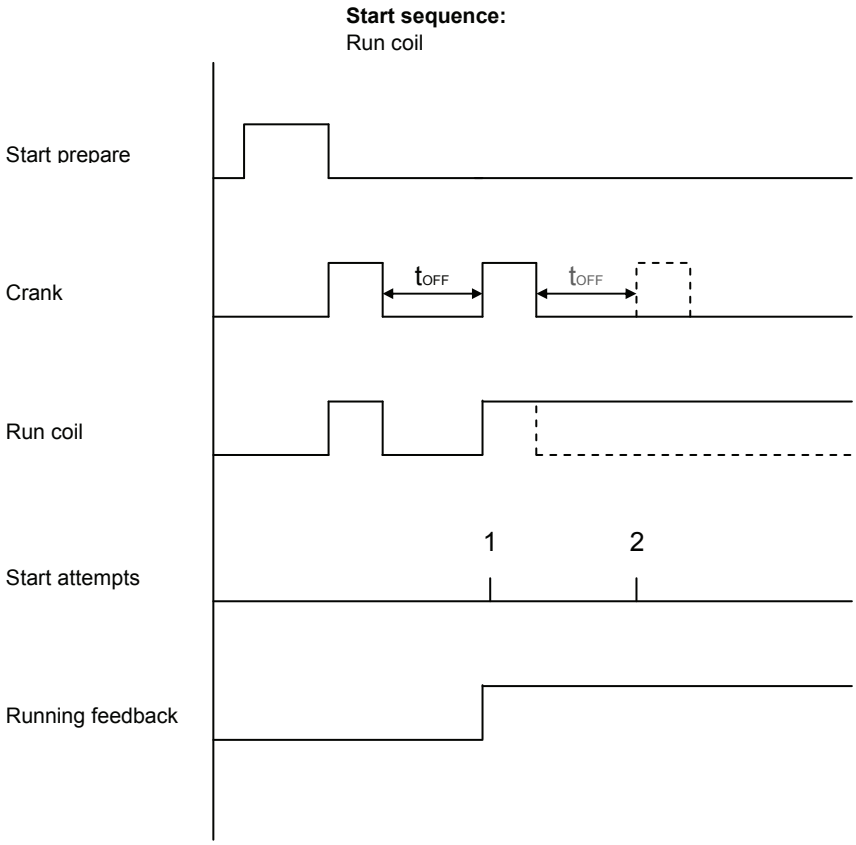
- START sequence
- STOP sequence
- Breaker sequences

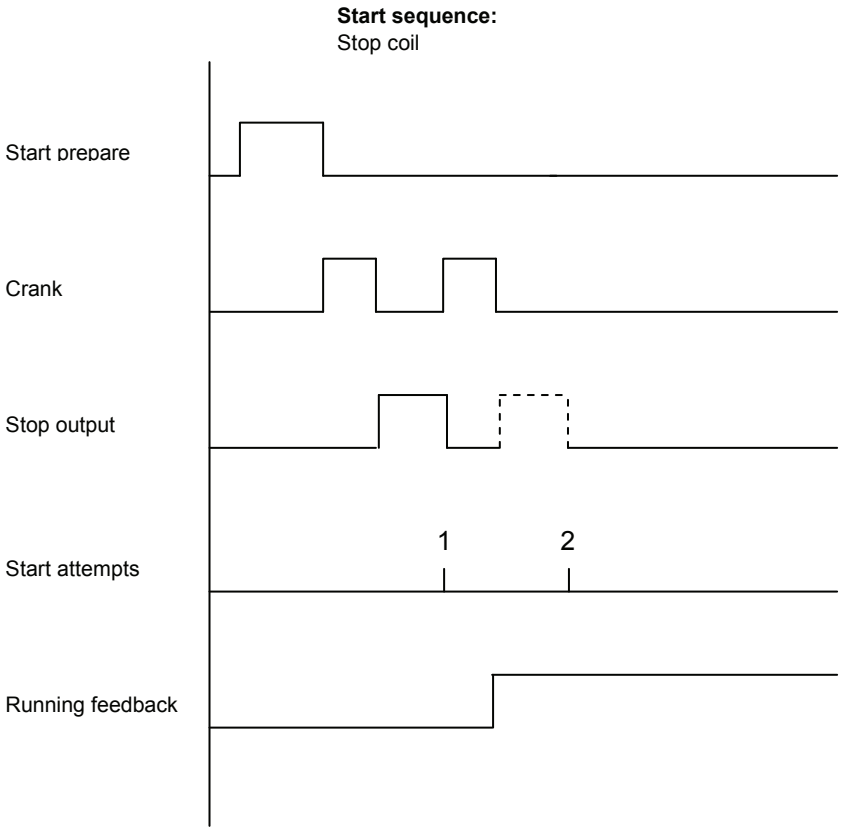
If island operation is selected, the digital input 'MB closed' must NOT be activated with a 12/24 volt input signal. A 'mains breaker failure' will occur, if the wiring of the mains breaker feedback inputs is wrong.

Refer to our 'Application Notes' for information about the required breaker wiring.

START sequence

The drawings illustrate the start sequences of the gen-set.





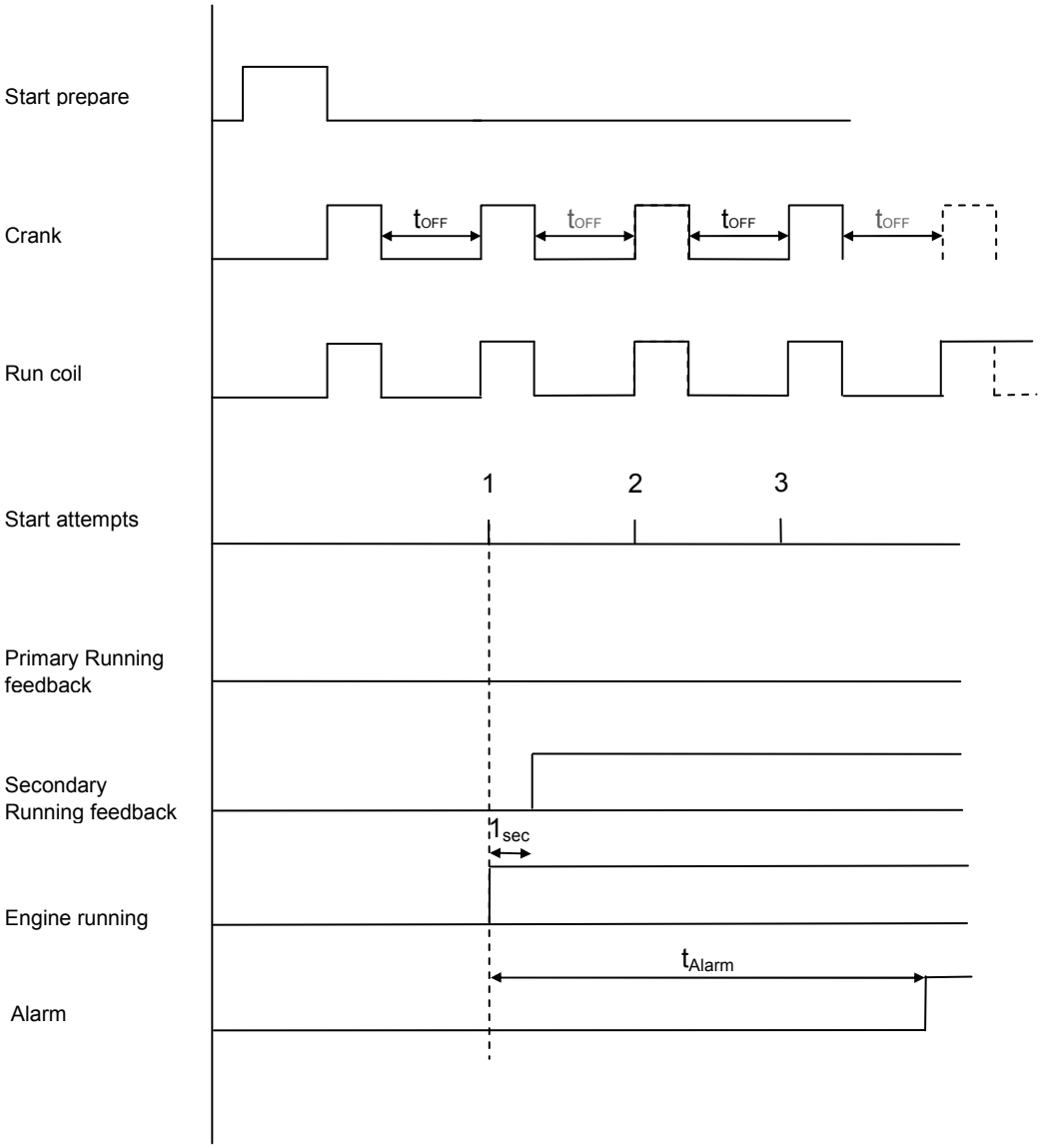
4 different types of running feedback can be used to detect if the motor is running. Refer to menu 4300 for selection of the running feedback type.

The running detection is made with a built-in safety routine. The running feedback selected in menu 4300 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 additionally 1 second. If a running feedback is detected based on one of the secondary choices, the gen-set will start. This way the gen-set will still be functional even though a tacho sensor is damaged or dirty.

As soon as the gen-set is running, no matter if the gen-set is started based on the primary or secondary feedback, the running detection will be made based on all 4 types.

The sequence is shown in the diagram below.

Running feedback error:
Run coil



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	Frequency measurement above 32Hz. The frequency measurement requires a voltage measurement of 30% * U_{NOM}. The running detection based on the frequency measurement can replace the running feedback based on tacho or digital input or engine communication.
Emergency stop	
Alarm	Alarms with 'shutdown' or 'trip and stop' fail class.
Stop push-button on display	Only in semi-auto or manual mode.
Modbus stop command	Semi-auto or manual mode.
Binary stop input	Semi-auto or manual mode.
Deactivate the 'auto start/stop'	Auto mode in the following gen-set modes: Island operation, fixed power, load take over or mains power export mode.
Running mode	It is not possible to change the running mode to 'block' as long as the gen-set is running.

If the tacho input is to be used to remove the starter, it has to be set up in menu 6161. If the digital input is to be used as running feedback, then terminal 115 has to be used.

The only protections that can stop the gen-set/interrupt the start sequence when the 'fire pump' input is activated, are the digital input 'emergency stop' and the tacho alarm 'overspeed 2'. Both of these must have the fail class 'shut down'.

Start failure alarm **(6180 Start attempts)**

The start failure alarm occurs, if the gen-set has not started after the last start attempt. Output A (OA) and output B (OB) in this menu indicate the relay output(s) which will be activated at a start failure alarm.

Start prepare (

6170 Starter

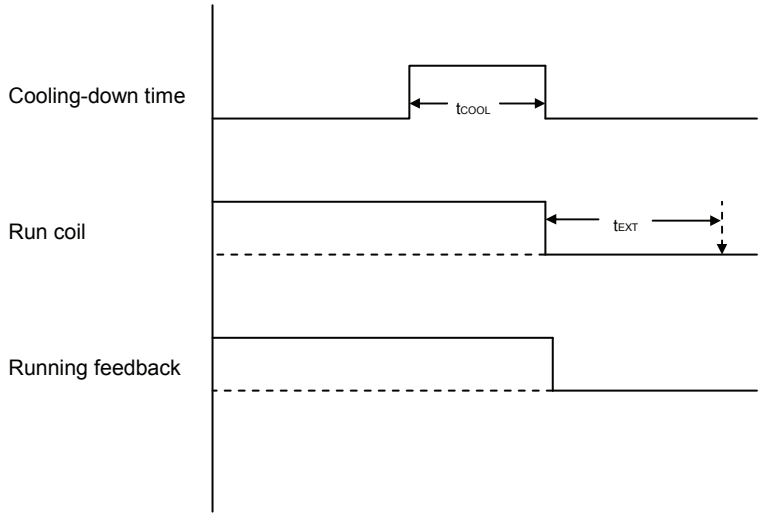
)

The start prepare timer can be used for start preparation purposes, e.g. pre-lubrication or pre-glowing.

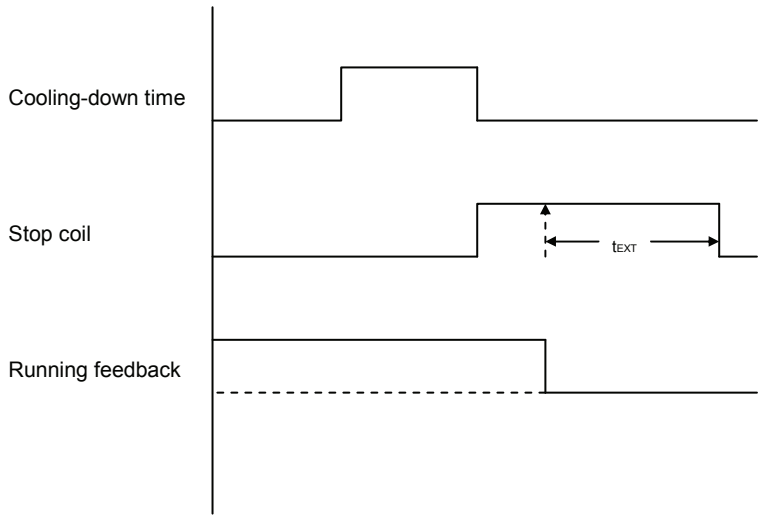
Stop sequence

The drawings illustrate the stop sequence.

Stop sequence/RUN coil



Stop sequence/STOP coil



Stop sequence, description

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	Semi-auto or manual.
Remove 'auto start/stop'	X	X	Auto mode: Island operation, fixed power, load take over, mains power export.
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	Semi-auto mode: Engine will run in idle speed.
Binary start input	Auto mode: Island operation and fixed power, load take over or mains power export.
Exceeding setpoint	Auto mode: Peak shaving.
GB close button is pressed	Semi-auto mode only.

The stop sequence can only be interrupted during the cooling-down period.

When the engine is stopped, then the speed governor output is reset to the offset value if option E1 or EF2 is selected, or the initial value if option EF3/EF5 is selected and the PWM output is used. Please refer to the descriptions of the mentioned options.

Stop failure alarm

A stop failure alarm will occur, if the running feedback or the generator voltage and frequency are still active. The stop failure timer is adjusted in **6220 Stop failure**

. Output A (OA) and output B (OB) in this menu indicate the relay output(s) that will be activated at a stop failure alarm.

Breaker sequences

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

Mode	Gen-set mode	Breaker control
Auto	All	Controlled by the unit
Semi-auto	All	Push-button
Manual	All	None
Block	All	None

Before closing the breakers it must be checked that the voltage and frequency are OK. The limits are adjusted in **2040 Sync. blackout**

AGC without back synchronisation:
The GB can only be closed, if the mains breaker is open.
The MB can only be closed, if the generator breaker is open.

AGC with back synchronisation:
If the GB or MB push-button is activated the AGC will start synchronising, if the generator or mains voltage is present.
The GB can close directly, if the MB is open.
The MB can close directly, if the GB is open.

AMF MB opening function **(6590 Mains failure voltage**

)
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.

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

Timer	Description	Menu number
t_{FD}	Mains failure delay	**6600 Mains failure frequency** **6590 Mains failure voltage**
t_{FU}	Frequency/voltage OK	**6190 f/U OK**
t_{FOD}	Mains failure OK delay	**6600 Mains failure frequency** **6590 Mains failure voltage**
t_{GBC}	GB ON delay	**6250 GB control**
t_{MBC}	MB ON delay	**6610 Mains breaker control**

The timer t_{MBC} is only active, if back synchronisation is deactivated (6610 Mains breaker

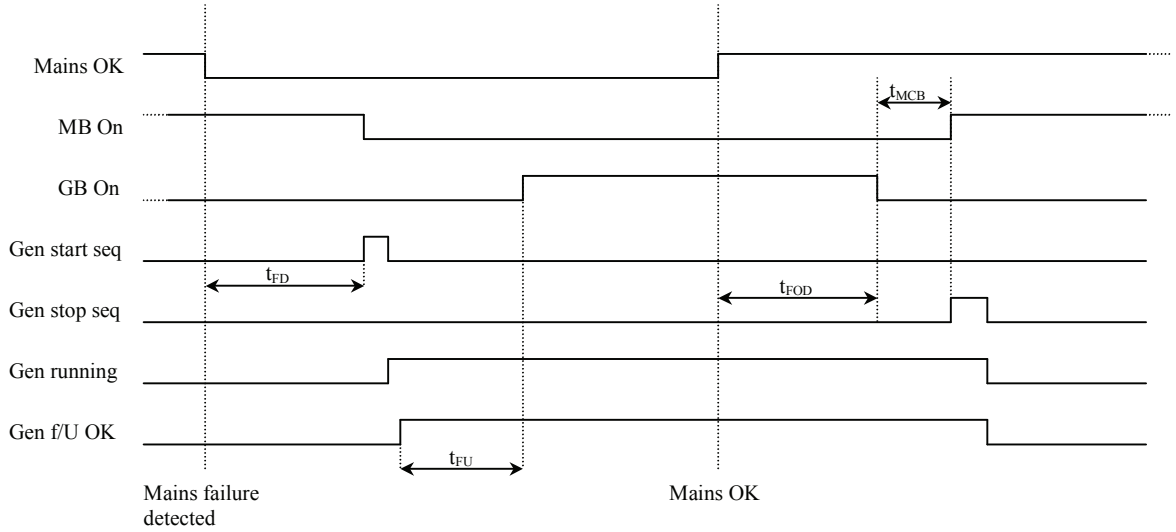
control

).

Example 1 (6590 Mains failure voltage

)

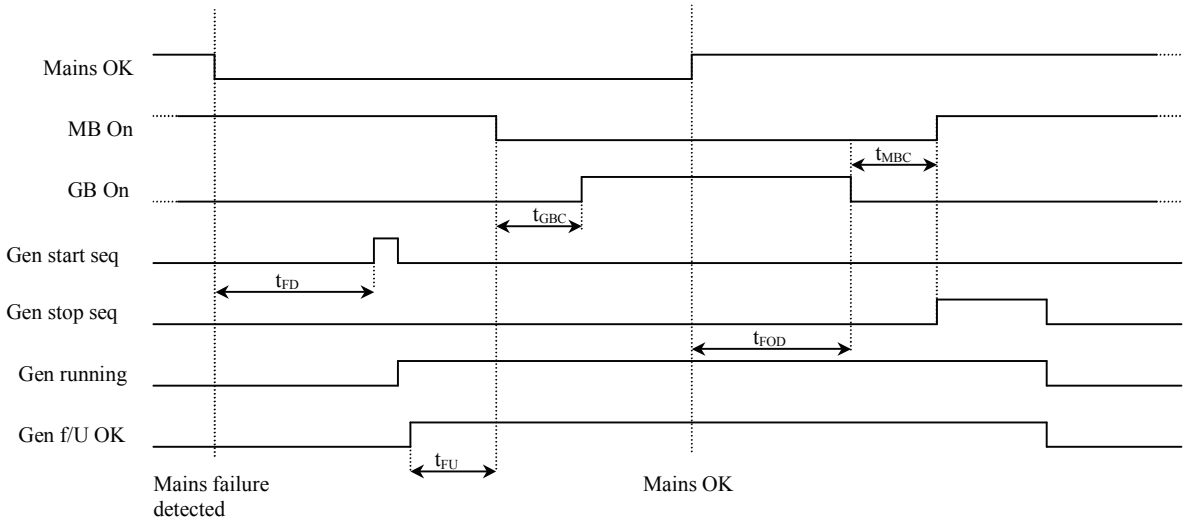
Start engine and open MB:



Example 2 (6590 Mains failure voltage

)

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 ON, synchronising	Running feedback Generator frequency/voltage OK MB closed No generator failure alarms
MB ON, synchronising	Mains frequency/voltage OK GB closed No generator failure alarms
GB OFF, direct opening	MB open
MB OFF, direct opening	Alarms with fail classes: Shut down Trip GB alarms
GB OFF, deloading	MB closed
MB OFF, deloading	Alarms with fail classes: Trip and stop

When the breakers open and they need to reclose immediately, then the adjustable timer 6252 GB load time or 6615 MB load time must expire before closing is possible. This is the time the breaker uses to reload the spring.

If the digital inputs 'MB spring loaded' and 'GB spring loaded' are configured, then they must be activated before the breakers can close.

5. Display unit and menu structure

This chapter deals with the display unit including the push-button and LED functions. In addition, the unit menu structure will be presented.

Display unit

The display has 4 different lines, each with 20 characters, and holds a number of push-button functions.

Display dimensions are H x W = 115 x 220 mm (4.528" x 9.055").

Push-button functions

The display unit holds a number of push-button functions which are presented below.

INFO: Shifts the display 3 lower lines to show the alarm list.

JUMP: Enters a specific menu number selection. All settings have a specific number attached to them. The JUMP button enables the user to select and display any setting without having to navigate through the menus (see later).

VIEW: Shifts the first line displaying in the setup menus.

LOG: Shifts the display 3 lower lines to show the event and alarm list. The list holds 150 events. The events are not deleted when the auxiliary supply is switched off.

 : Moves the cursor left for manoeuvring in the menus.

 : Increases the value of the selected setpoint (in the setup menu). In the daily use display, this button function is used for scrolling the second line displaying of generator values.

SEL: Is used to select the underscored entry in the fourth line of the display.

 : Decreases the value of the selected setpoint (in the setup menu). In the daily use display, this button function is used for scrolling the second line displaying of generator values.

 : Moves the cursor right for manoeuvring in the menus.

BACK: Jumps one step backwards in the menu (to previous display or to the entry window).

START: Start of the gen-set *if 'SEMI-AUTO' or 'MANUAL' is selected*.

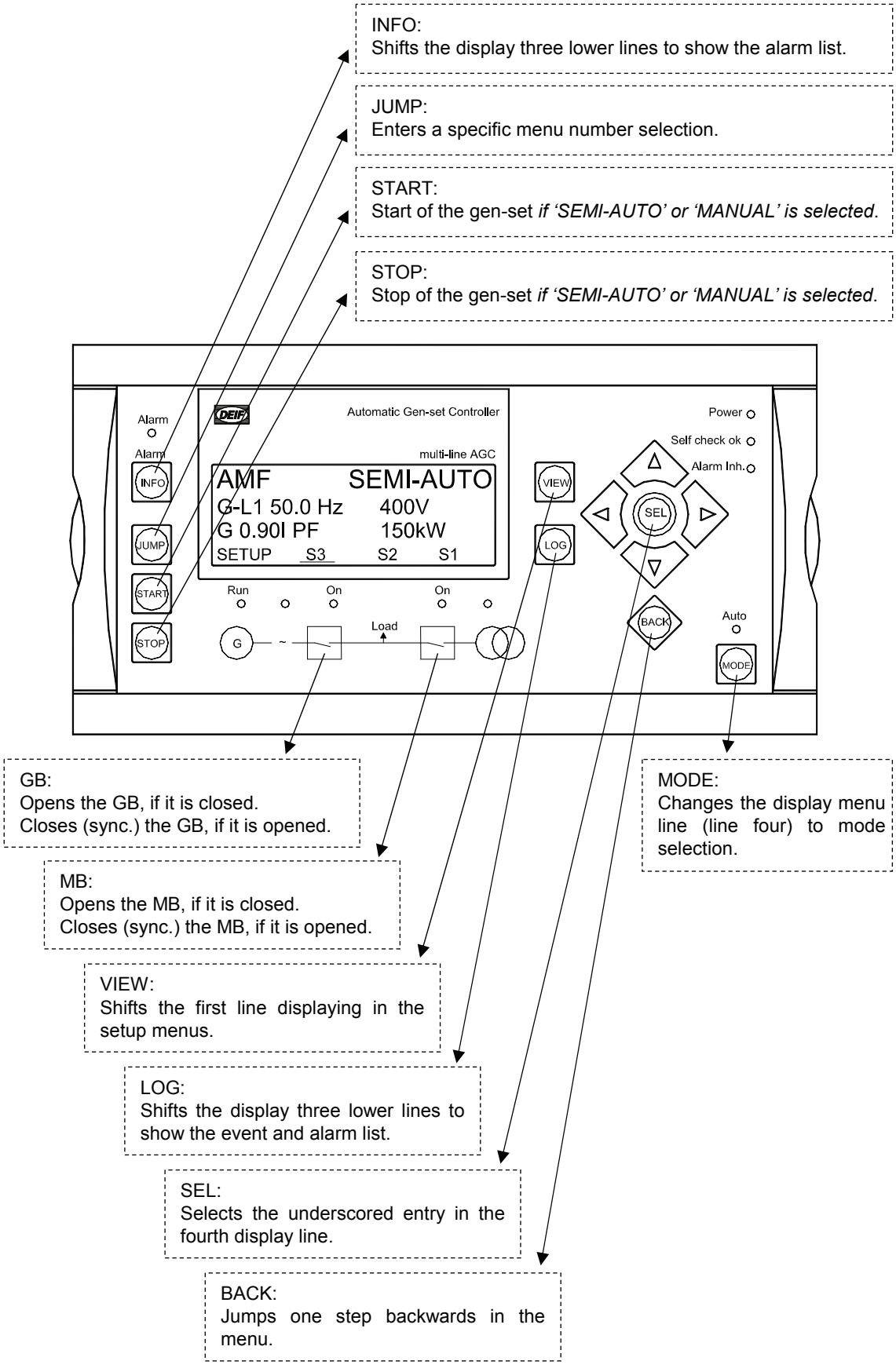
STOP: Stop of the gen-set *if 'SEMI-AUTO' or 'MANUAL' is selected*.

(GB) ON: Manual activation of close breaker and open breaker sequence *if 'SEMI-AUTO' is selected*.

(MB) ON: Manual activation of close breaker and open breaker sequence *if 'SEMI-AUTO' is selected*.

MODE: Changes the menu line (line 4) in the display to mode selection.

The push-buttons are placed as follows:



LED functions

The display unit holds 10 LED functions. The colour is green or red or a combination in different situations.

Alarm: LED flashing indicates that unacknowledged alarms are present.
LED fixed light indicates that ALL alarms are acknowledged.

Power: LED indicates that the auxiliary supply is switched on.

Self check OK: LED indicates that the self check is OK.

Alarm inh: Gen-set is stopped:
LED fixed light indicates that the unit does not receive a running signal. The inhibit lamp will be switched off when the run status timer times out **(6150 Running status)**.

Gen-set is running:
LED fixed light indicates that the digital input is activated.

Run: LED indicates that the generator is running.

(Gen.) OK: LED green light indicates that the voltage/frequency is present and OK.

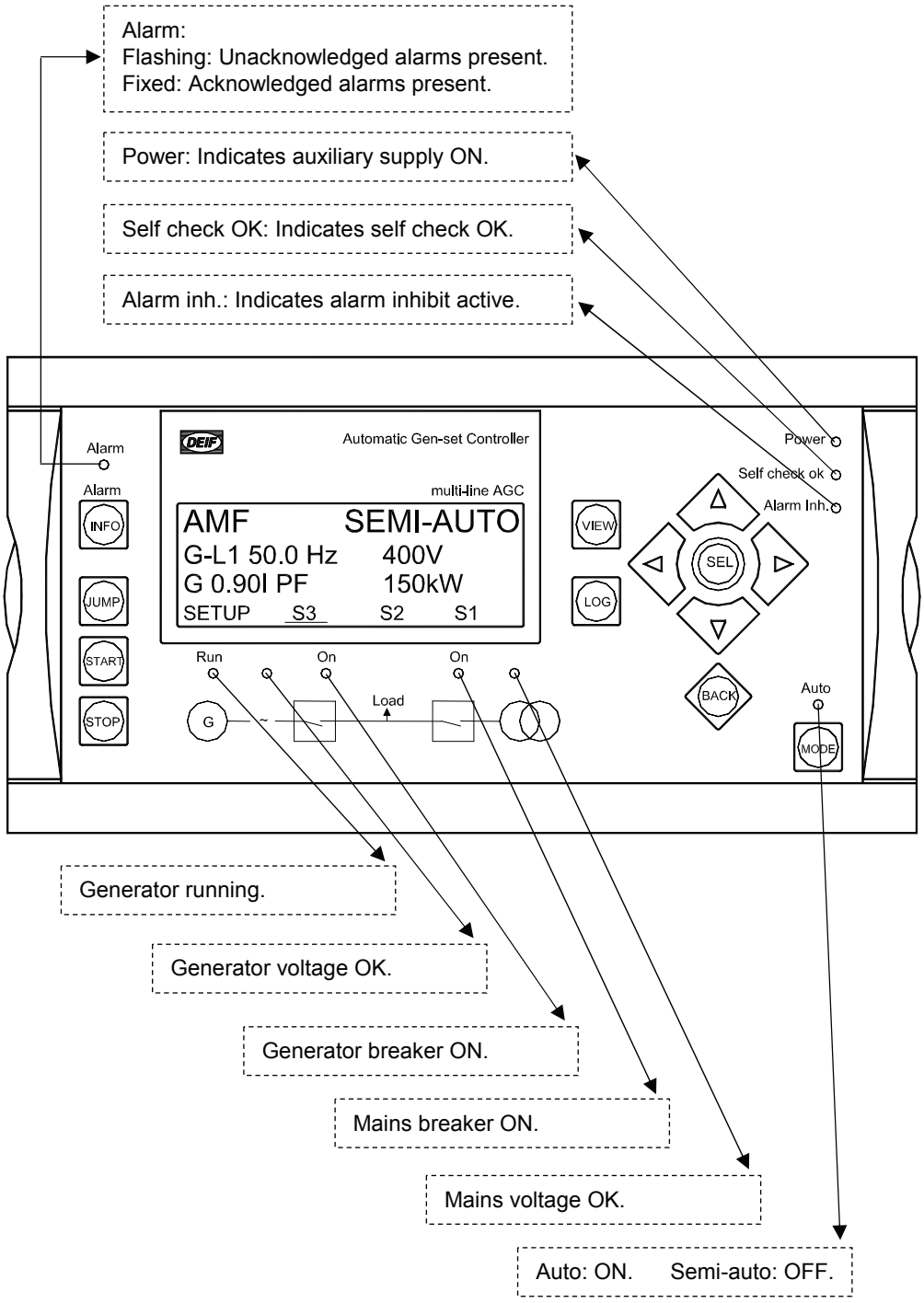
(GB) ON: LED green light indicates that the generator breaker is closed.
LED yellow light indicates that the generator breaker has received a command to close on a black BUS, but the breaker is not yet closed due to interlocking of the GB.

(MB) ON: LED indicates that the mains breaker is closed.

(Mains) OK: LED is green, if the mains is present and OK.
LED is red at a measured mains failure.
LED is flashing green when the mains returns during the 'mains OK delay' time.

Auto: LED indicates that auto mode is selected.

The display LEDs are indicating as follows:



Menu structure

The display includes two menu systems which can be used without password entry:

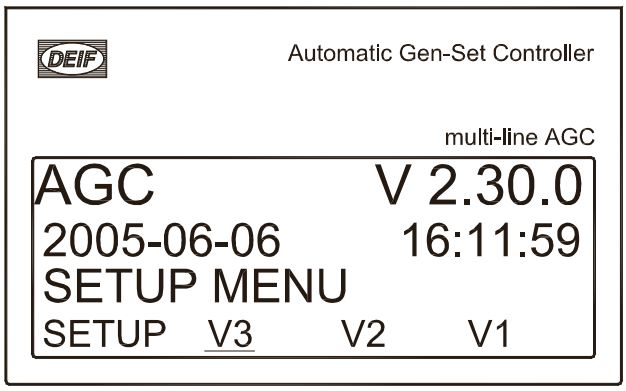
View menu system
This is the commonly used menu system. 15 windows are configurable and can be entered by using the arrow push-buttons.

Setup menu system
This menu system is used for setting up the unit, and if the user needs detailed information that is not available in the view menu system.
Changing of parameter settings is password protected.

Entry window

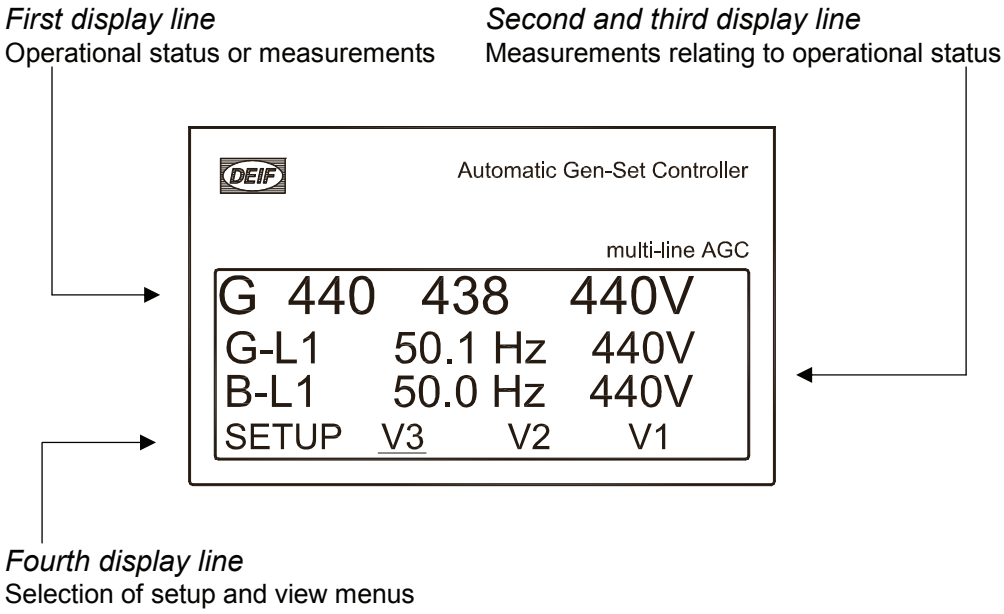
When the unit is powered up, an entry window appears. The entry window is the turning point in the menu structure and as such the gateway to the other menus. It can always be reached by pressing the BACK push-button 3 times.

The event and alarm list will appear at power up, if an alarm is present.



View menu

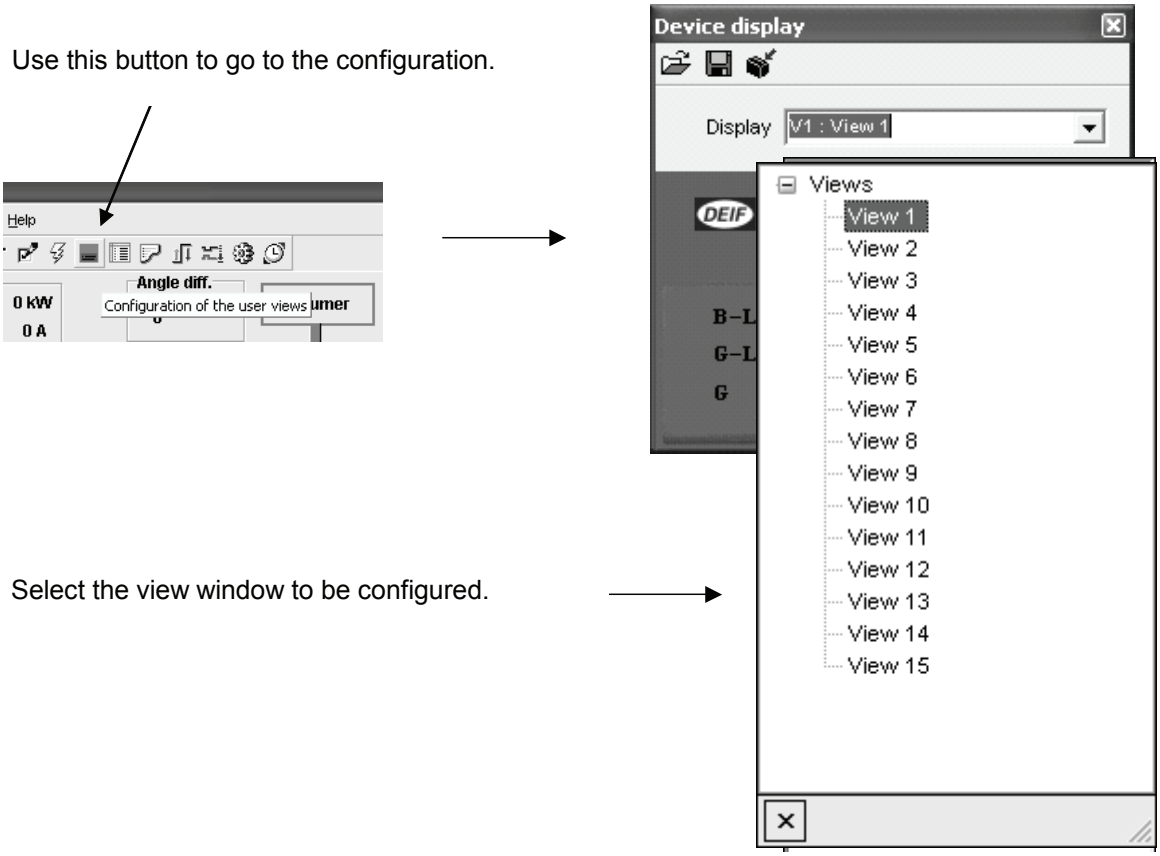
The view menus (V1, V2 and V3) are the most commonly used menus of the unit.



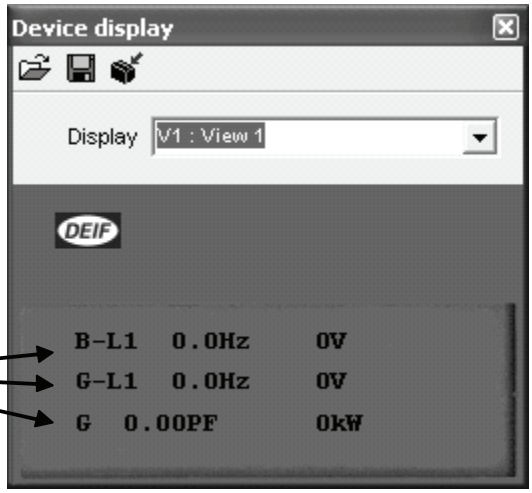
In the view menus various measured values are on display.

View window configuration

The individual view windows need to be configured through the PC software in the dialog box illustrated below.



Click here to change the configuration.



It is only possible to configure the view windows via the PC software – configuration via the display unit is not possible.

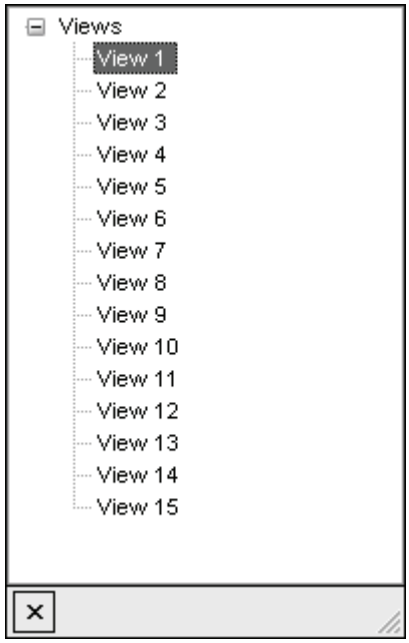
The selectable values and measurements are presented in the table on page 59 in this handbook.

If the text 'no text' is selected in all 3 lines in a window, it will not be displayed. This is to get a continuous displaying, if a window is not to be used.

There is a maximum of 15 configurable view windows in V1.

View window overview

Windows	V1
View 1	Manual selection with key UP or key DOWN push-buttons
View 2	
View 3	
View 4	
View 5	
View 6	
View 7	
View 8	
View 9	
View 10	
View 11	
View 12	
View 13	
View 14	
View 15	

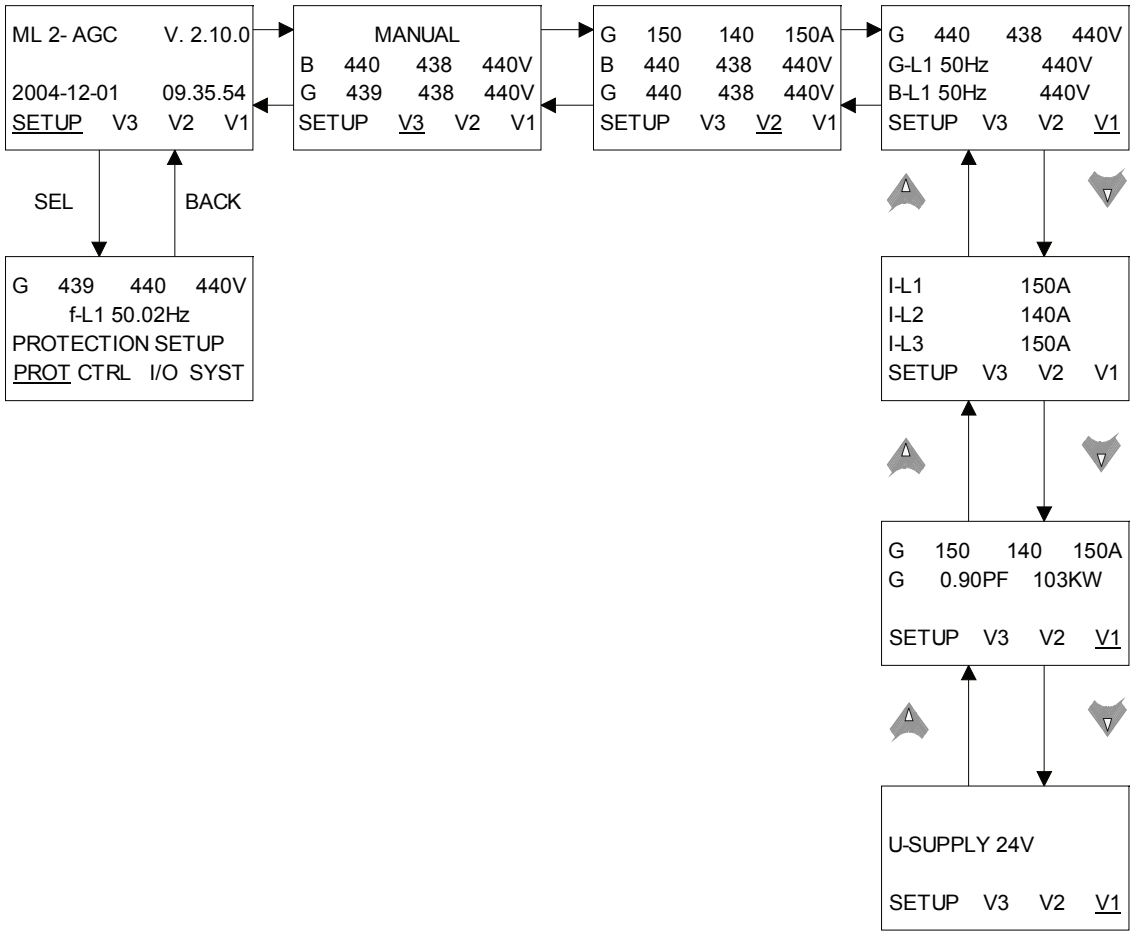


Windows	V 2	V 3
View 1	Changes automatically between the 5 first views: 1. View 1 (Start prepare) 2. View 2 (Sync.) 3. View 3 (Ramp up/down) 4. View 4 5. View 5 (Default*) No manual selection. All three lines show measuring values.	Changes automatically between the 5 first views: 1. View 1 (Start prepare) 2. View 2 (Sync.) 3. View 3 (Ramp up/down) 4. View 4 5. View 5 (Default*) No manual selection. Line 1 shows the text 1…5 (above). Line 2 and line 3 show measurements.
View 2		
View 3		
View 4		
View 5		

** The default window is automatically selected after the generator breaker closure when the gen-set is in normal operation, e.g. fixed power mode after the ramping up.*

View menu example

The following is an example of a configured view menu system. In this example 4 of 15 windows have been configured in view 1.



...Etc. (max. 15)

The menu navigating starts from the fourth display line in the entry window and is carried out using the , , and push-buttons.

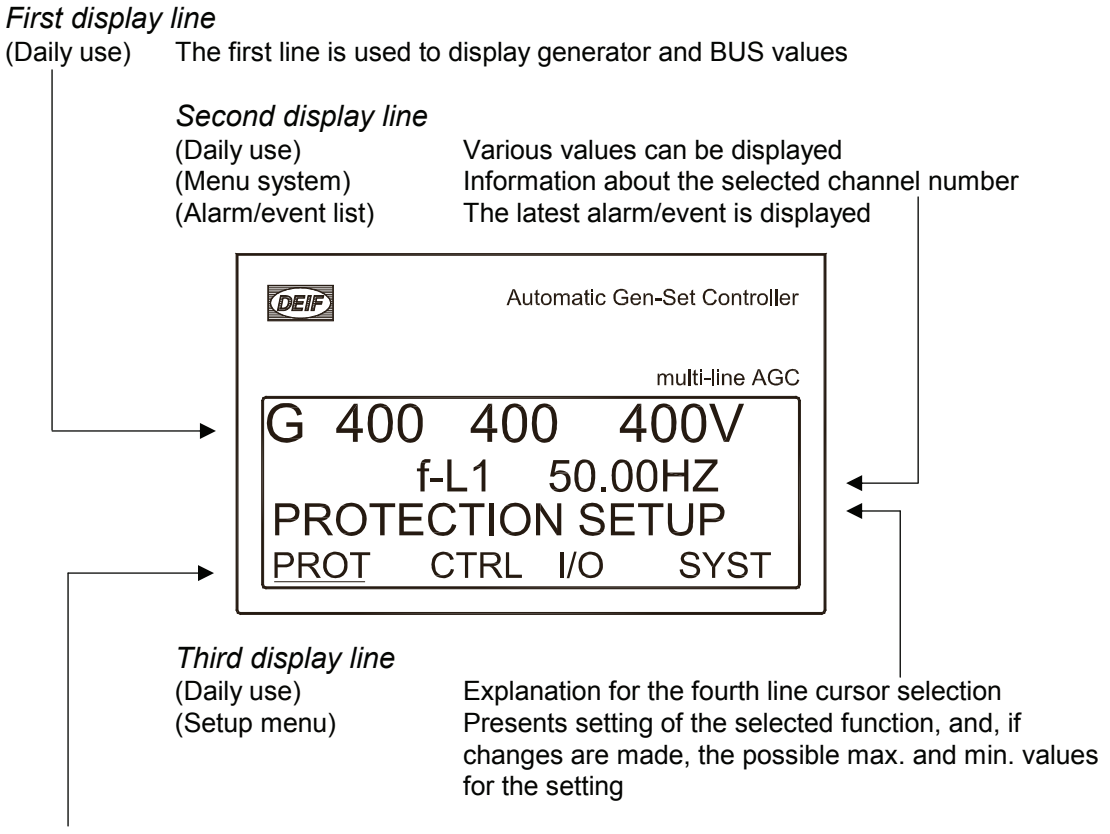
The entry window displays view 3, (in the illustration above the window where 'manual' is displayed).

Moving the cursor left or right offers the following possibilities.

- Setup menu – access to the following sub-menus:
  - Protection setup
  - Control setup
  - I/O setup
  - System setup
- View 3 – window displays operational status and selectable measurements
- View 2 – window displays selectable measurements
- View 1 – access to up to 15 selectable windows displaying selectable measurements

Setup menu

The setup menu system is used for parameter setup of the unit, and if the user needs detailed information that is not available in the view menu system. So, this menu can be used for both daily use and setup purposes. The menu is entered from the entry window by selecting the entry SETUP in the fourth display line.

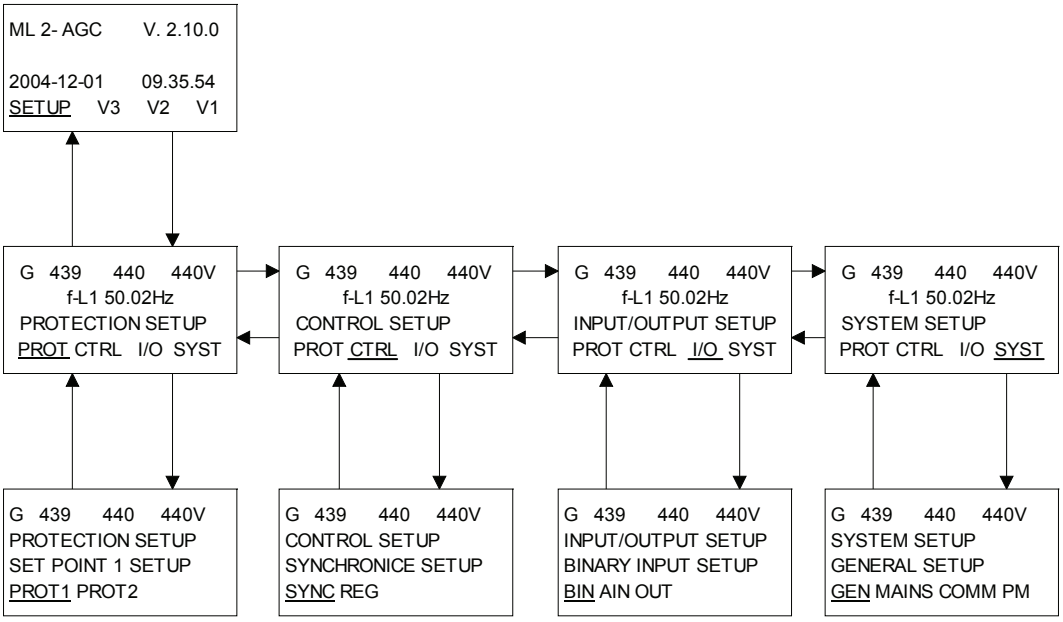


Possible values in second display line

View line/second display line configuration			
For generator	**For bus/mains**	**For analogue input**	**Communication/ other**
Voltage L1 L2 L3 (V AC)	Voltage L1 L2 L3 (V AC)	Analogue 98	PID Value #1.1
Voltage L1-N (V AC)	Voltage L1-N (V AC)	Analogue 100 (oil press.)	PID Value #1.2
Voltage L2-N (V AC)	Voltage L2-N (V AC)		PID value #1.3
Voltage L3-N (V AC)	Voltage L3-N (V AC)	Analogue 102 (fuel level)	PID value #1.4
Voltage L1-L2 (V AC)	Voltage L1-L2 (V AC)	Analogue 104	PID value #1.5
Voltage L2-L3 (V AC)	Voltage L2-L3 (V AC)	Analogue 91	PID value #1.6
Voltage L3-L1 (V AC)	Voltage L3-L1 (V AC)	Analogue 93	PID value #1.7
Voltage max. (V AC)	Voltage max. (V AC)	Analogue 95	PID value #1.8
Voltage min. (V AC)	Voltage min. (V AC)	Analogue 97	PID value #2.1
Current L1 L2 L3 (A)	Frequency (Hz)	PT100 no. 106	PID value #2.2
Current L1 (A)	Frequency/voltage L1 (Hz/	PT100 no. 109	PID value #2.3

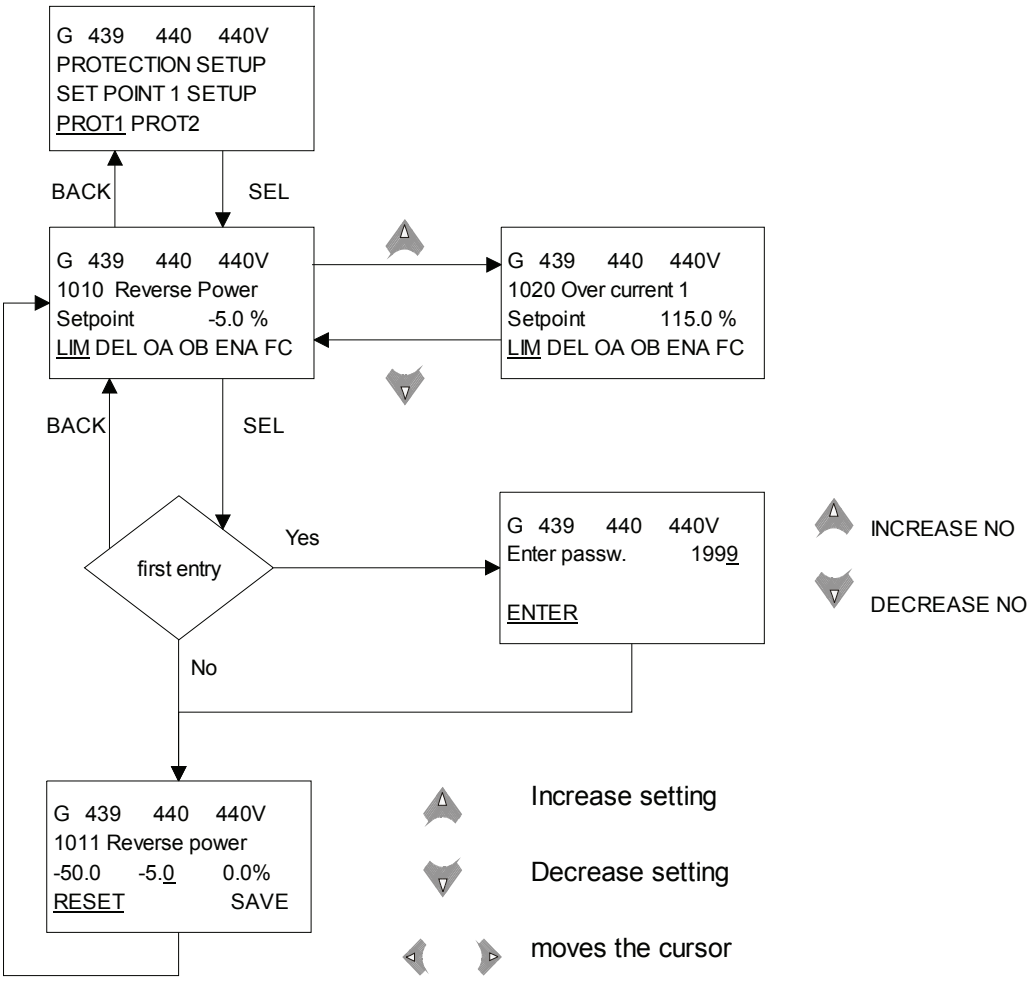
View line/second display line configuration			
For generator	**For bus/mains**	**For analogue input**	**Communication/ other**
	V AC)		
Current L2 (A)		Tacho	PID value #2.4
Current L3 (A)	Voltage angle between L1-L2 (deg.)	VDO 104 (pressure)	PID value #2.5
Frequency/voltage L1 (Hz/V AC)		VDO 105 (temperature)	PID value #2.6
Frequency L1 (Hz)	Voltage angle between generator voltage and bus voltage (deg.)	VDO 106 (fuel level)	PID value #2.7
Frequency L2 (Hz)			PID value #2.8
Frequency L3 (Hz)			Status line
Power factor/active power (PF/kW)	Power supply voltage (V DC)		Synchroscope
Active power (kW)	Mains power (kW)		Date and time
Reactive power/apparent power	Negative voltage		
(kVAr)/(kVA)	Negative current		
Reactive power (kVAr)	Zero voltage		
Apparent power (kVA)	Zero current		
Energy counter (kWh)			
Power factor			
Voltage angle between L1-L2 (deg.)			
Voltage angle between L2-L3 (deg.)			
Voltage angle between L3-L1 (deg.)			
Absolute run time (h)			
Relative run time (h)			
Next priority shift (h and min.)			
Fire run			
Number of GB operations			
Number of MB operations			
Next service			

Setup structure



Setup example

The following example illustrates how a specific setting is changed in the setup menu. In this case **Reverse power** is the selected parameter.



Mode overview

The unit has four different running modes and one block mode. For detailed information see page 11.

Auto

In auto mode the unit will operate automatically, and the operator cannot initiate any sequences manually.

Semi-auto

In semi-auto mode the operator has to initiate all sequences. This can be done via the push-button functions, Modbus commands or digital inputs. When started in semi-automatic mode, the gen-set will run at nominal values.

Test

The test sequence will start when the test mode is selected.

Manual

When manual mode is selected, the binary increase/decrease inputs can be used (if they have been configured) as well as the start and stop push-buttons. When starting in manual mode, the gen-set will start without any subsequent regulation.

Block

When the block mode is selected, the unit is not able to initiate any sequences, e.g. the start sequence.

Block mode must be selected, when maintenance work is carried out on the gen-set.

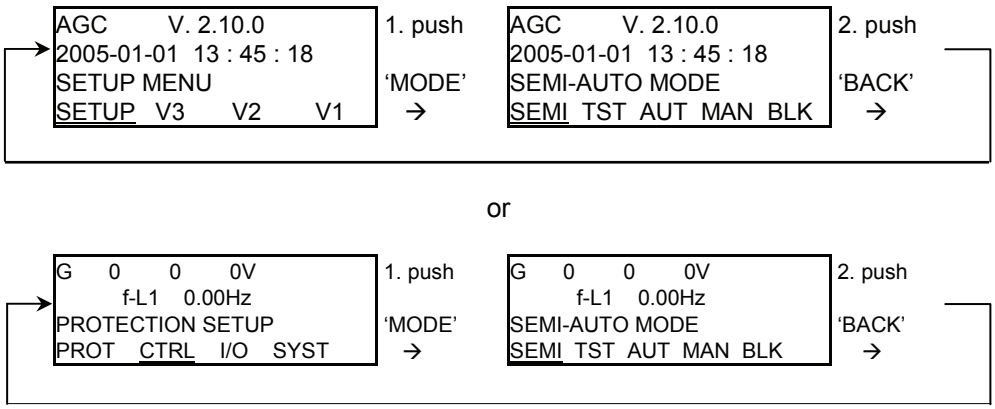
Mode selection

The following drawings illustrate how the mode selection is carried out.

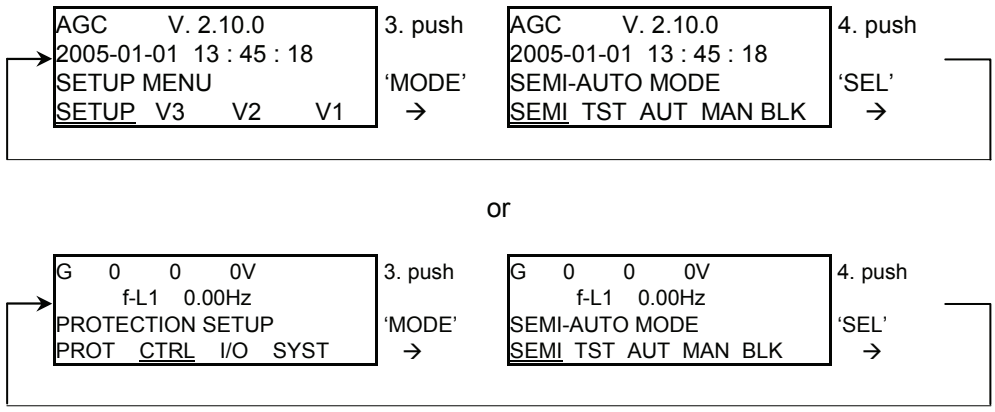
Pushing the MODE push-button will change the displayed text. After pushing 'MODE', the fourth display line indicates the selectable modes. In the third display line, the underscored (fourth line) selection will be displayed.

Two possibilities are now available:

If 'BACK' is pushed, the display returns to the original text without changing the mode.



If 'SEL' is pushed, the underlined mode is selected, and the display returns to the original text. In this example the SEMI-AUTO mode is selected.



Password

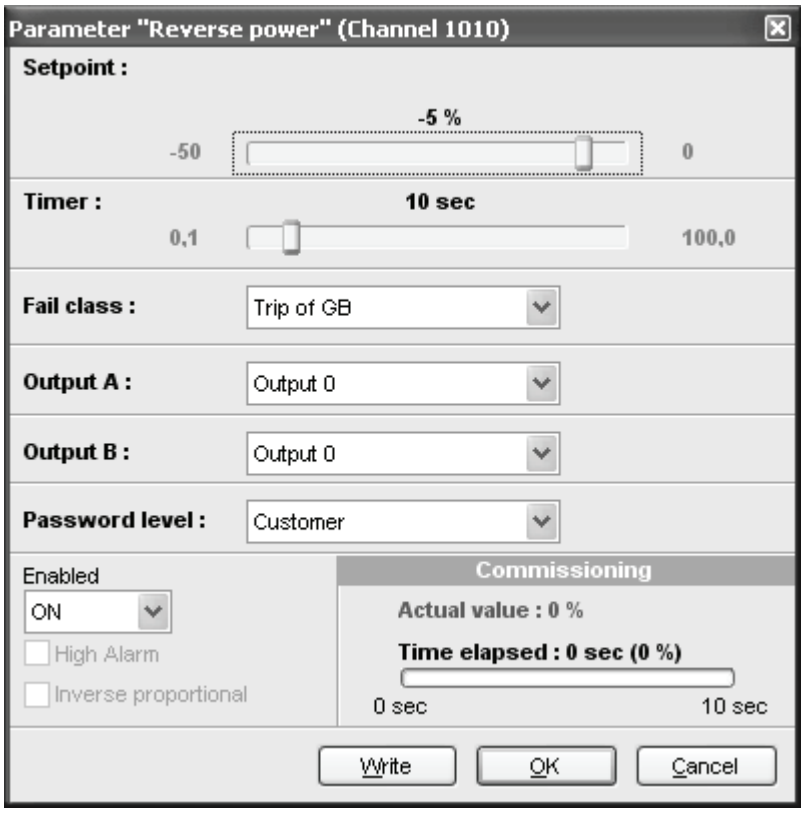
The unit includes three password levels. All levels can be adjusted in the PC software.

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 too low ranking password. But the settings can be displayed without password entry.

Each parameter can be protected at 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.



Parameter access

To get 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 menu 9116 page 167.
The service password can be changed in menu 9117 page 167.
The master password can be changed in menu 9118 page 167.

The factory passwords must be changed, if the operator of the gen-set is not allowed to change the parameters.

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

6. Additional functions

This chapter describes the additional functions.

Start functions

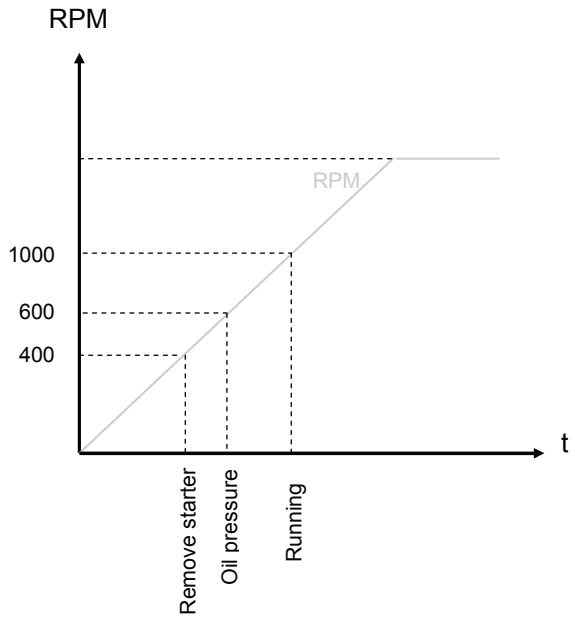
The unit will start the gen-set when the start command is given. The start sequence is deactivated when the remove starter event occurs or when the running feedback is present.

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

See page 41 for detailed information about start sequence.

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, obviously, the gen-set 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.

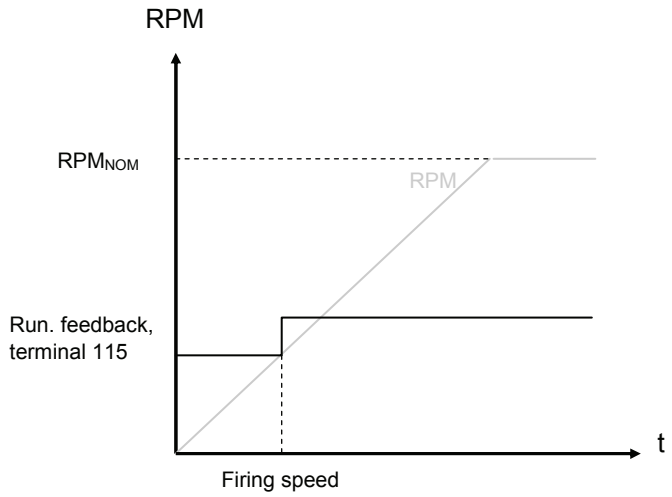


Digital feedbacks

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

Running feedback

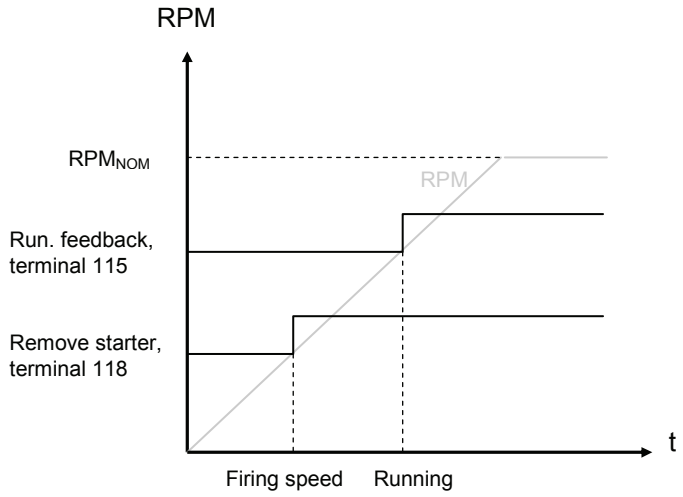
When the digital running feedback is active, the start relay is deactivated and the starter motor will be disengaged.



The diagram illustrates how the digital running feedback (terminal 115) 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 (terminal 118) 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. In the example above terminal 118 is used.

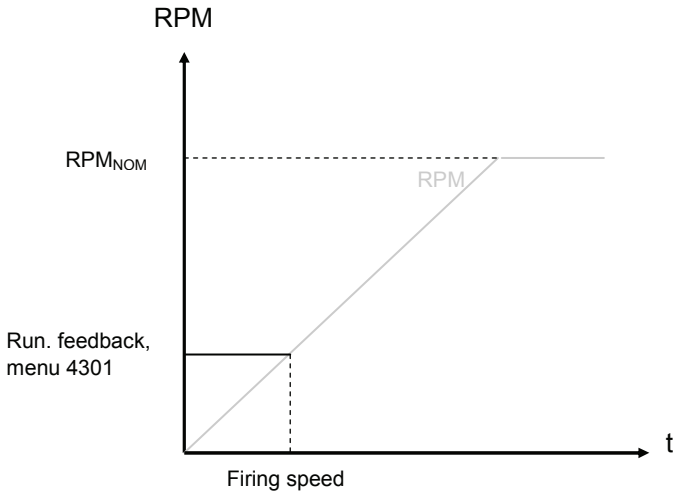
The running feedback is detected by the digital input (see diagram above). Frequency measurement above 32Hz or RPM is measured by magnetic pick-up.

Analogue tacho feedback

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

Running feedback.

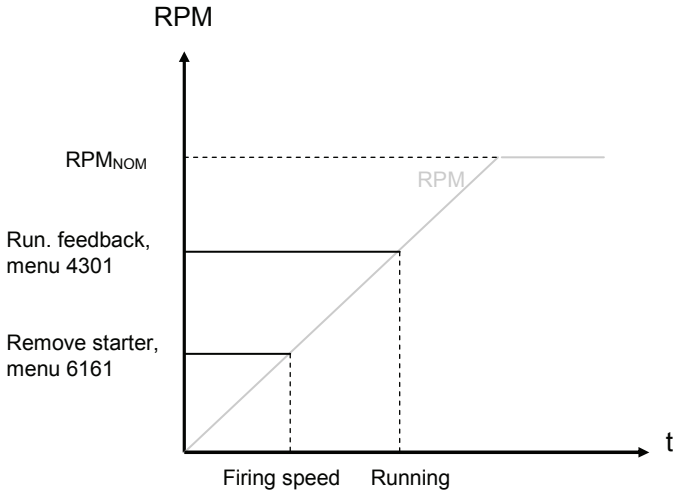
The diagram below shows how the running feedback is detected at the firing speed level. The factory setting is 1000 RPM **(4300 Running detection)**.



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 **(6160 Remove starter)**.



The number of teeth on the flywheel must be adjusted when the tacho input is used (6160 Remove starter).

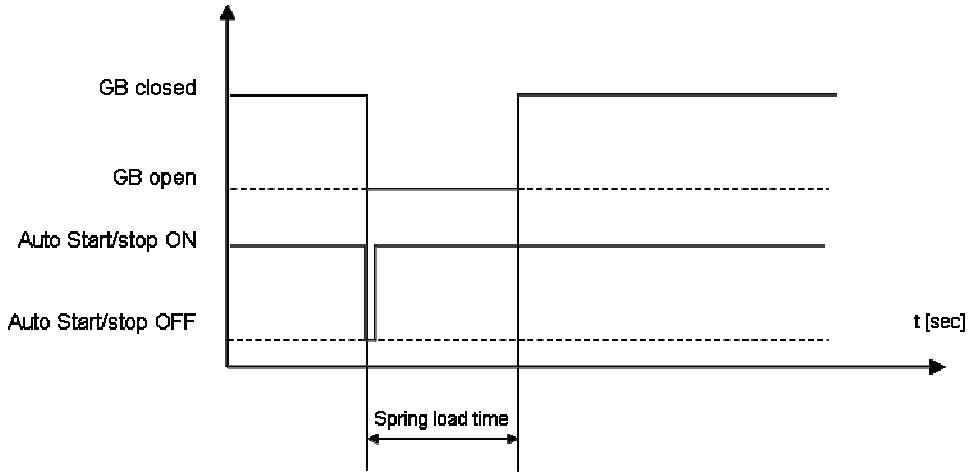
Breaker spring load time

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

Principle

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

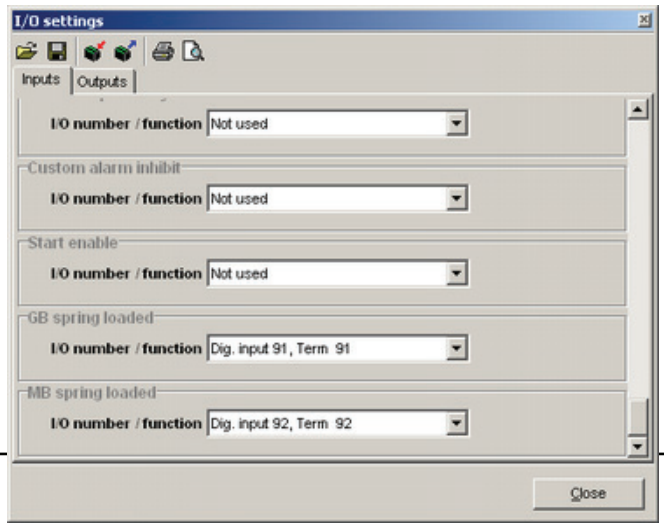
This is what happens: When the AUTO start/stop input deactivates, the GB opens. The AUTO start/stop is reactivated immediately after the GB has opened, e.g. by the operator through a switch in the switchboard. However, the AGC waits a while before it issues the close signal again, because the spring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



Digital input

This can be used e.g. when the breaker is able to send a feedback to the AGC when its spring is reloaded.

There is one input for the generator breaker and one for the mains breaker. The input configuration is done through the PC utility software. The names of the inputs are 'GB spring loaded' and 'MB spring loaded'. In the example below they are configured to terminal 91 and 92.



When the feedback is not activated, the breaker cannot close. The LED above the breaker symbol will be flashing (yellow), and the AGC will not attempt to issue a close signal before the spring load feedback is on.

On the AGC mains unit (option G5) the spring load feedback from the tie breaker can be connected instead of the GB spring load feedback.

Timer-controlled

On breakers where no feedback can be issued when the spring is in loaded position, timer settings can be used instead. There are timers for all breakers that can be controlled by the AGC, i.e. the generator breaker (menu 6252), the mains breaker (menu 6615) and the tie breaker (option G5, menu 7632).

When the timers are counting, then the remaining time is shown in the display, the LED above the breaker symbol will be flashing (yellow) and the AGC will not attempt to issue a close signal before the timer has expired.

Alarm inhibit

The purpose of the alarm inhibit function is to avoid nuisance alarms when the gen-set is in a controlled operational state (stop). For example it is not necessary to have the low lubricating oil pressure alarm displayed when the gen-set stops.

Four possibilities exist for the alarm inhibit functionality:

1. Digital input 23 can be used.
2. The alarms can be given *RUN* status.
3. Selectable alarms can be given *Parallel* status.
4. Selectable alarms can be 'custom inhibit' by using a configurable input in the utility SW.

The inhibit LED on the unit and on the display will activate when the voltage is below 30% of the nominal voltage.

Digital input 23

The functionality of the alarm inhibit input is indicated in the table below:

Standard PCBs

Alarm/input	M1	M2	Alarm inhibit input 23		
	Terminal number		Input ON	Input OFF	Comment
Generator low f			-	Active	Option dependent
Generator low U			-	Active	Option dependent
Generator high f			Active	Active	Option dependent
Generator high U			Active	Active	Option dependent
Busbar low f			-	Active	Option dependent
Busbar low U			-	Active	Option dependent
Busbar high f			Active	Active	Option dependent
Busbar high U			Active	Active	Option dependent
4…20mA input	98	98	-	Active	
4…20mA input	100	100	-	Active	
4…20mA input	102	102	-	Active	
4…20mA input	104		-	Active	
VDOinput		104	-	Active	
VDO input		105	-	Active	
VDO input		106	-	Active	
PT100	106		-	Active	
PT100	109		-	Active	
Tacho input	112	108	Active	Active	
Binary input		110	-	Active	Configurable input
Binary input		111	-	Active	Configurable input
Binary input		112	-	Active	Configurable input
Binary input		113	-	Active	Configurable input
Binary input	114	114	Active	Active	Access lock
Binary input	115	115	Active	Active	Running feedback
Binary input	116	116	Active	Active	External engine fail.
Binary input	117	117	Active	Active	Emergency stop
Binary input	118	118	-	Active	Configurable input
Positive sequence U			-	Active	Option dependent

Optional PCBs

Input	Alarm inhibit input 23		
	Input ON	**Input OFF**	**Comment**
Option M12	-	Active	Digital inputs
Option M13	-	Active	Digital inputs
Option M15	-	Active	4-20mA inputs

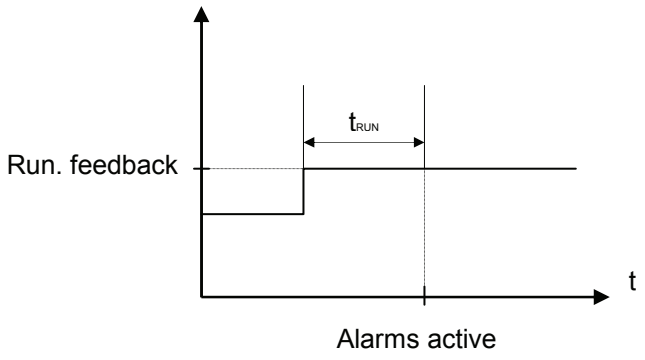
Function inputs such as running feedback, remote start or access lock are never inhibited. Only alarm inputs can be inhibited.

If an alarm is configured to activate a limit relay the relay will activate despite that the inhibit input is ON.

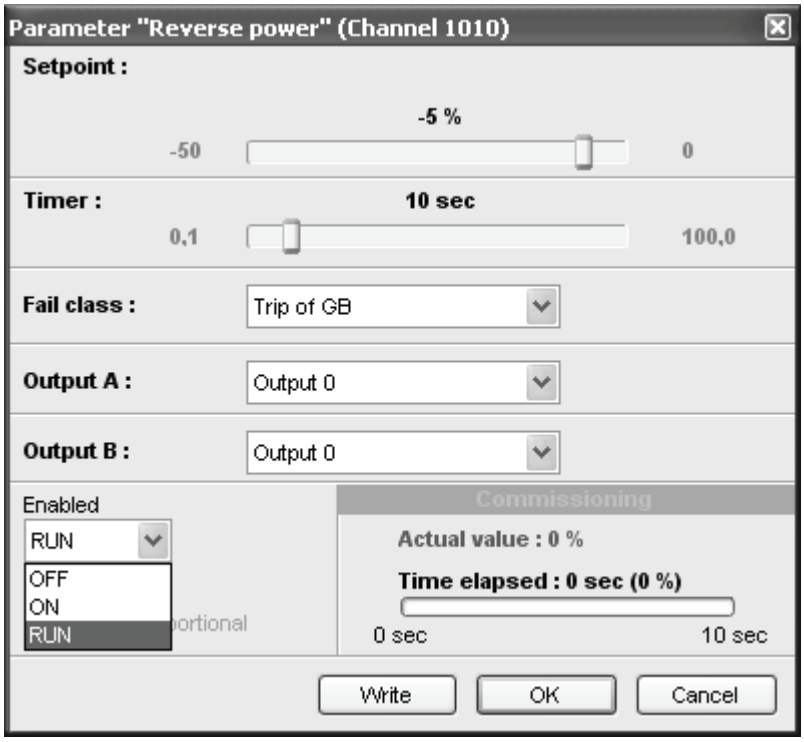
Automatic RUN status

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.

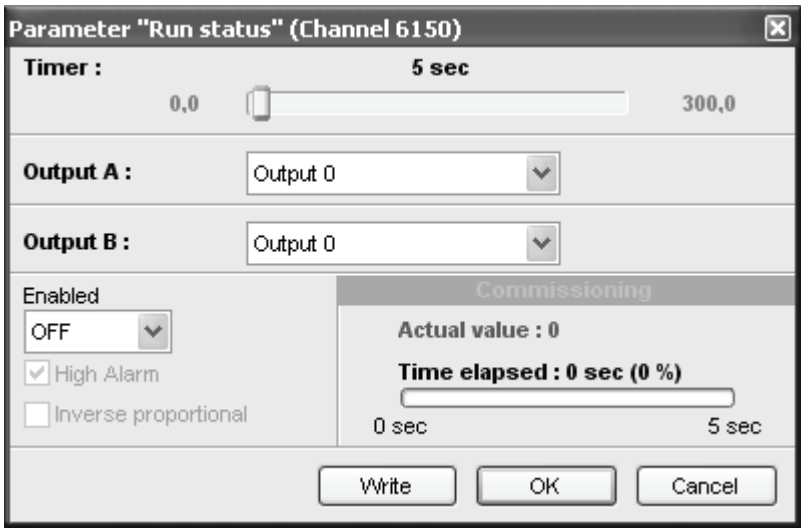


The alarms are set up from the display or the PC utility software. In the PC utility software it looks like this:



The adjustment is made in the drop down menu in the lower left corner.

The timer is adjusted in the following dialog box:



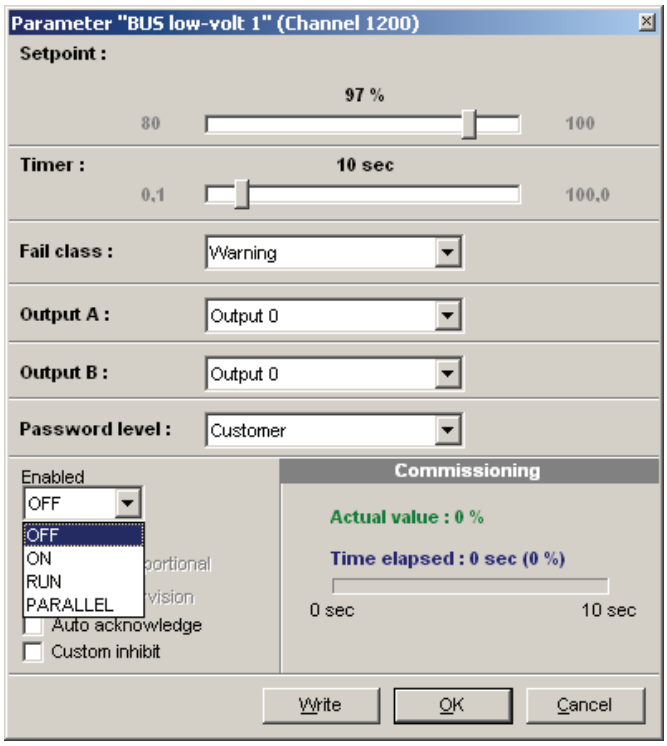
Only the timer needs adjustment to achieve this function. The additional roll down panels are used, if a digital running status output is needed. Refer to page 81.

Parallel status

If an alarm is to be activated only when both the GB and the MB is closed, then the alarm can be adjusted to 'parallel'. This is possible for the following alarms:

Menu	Description	Comment
1180	BUS high voltage 1	1 second delay after breaker closure
1190	BUS high voltage 2	1 second delay after breaker closure
1200	BUS low voltage 1	1 second delay after breaker closure
1210	BUS low voltage 2	1 second delay after breaker closure
1220	BUS high frequency 1	1 second delay after breaker closure
1230	BUS high frequency 2	1 second delay after breaker closure
1240	BUS low frequency 1	1 second delay after breaker closure
1250	BUS low frequency 2	1 second delay after breaker closure
1350	df/dt (ROCOF)	1 second delay after breaker closure
1360	Vector jump	1 second delay after breaker closure
1390	Positive sequence U	1 second delay after breaker closure

For detailed information please refer to the separate manual for option A1-A4.

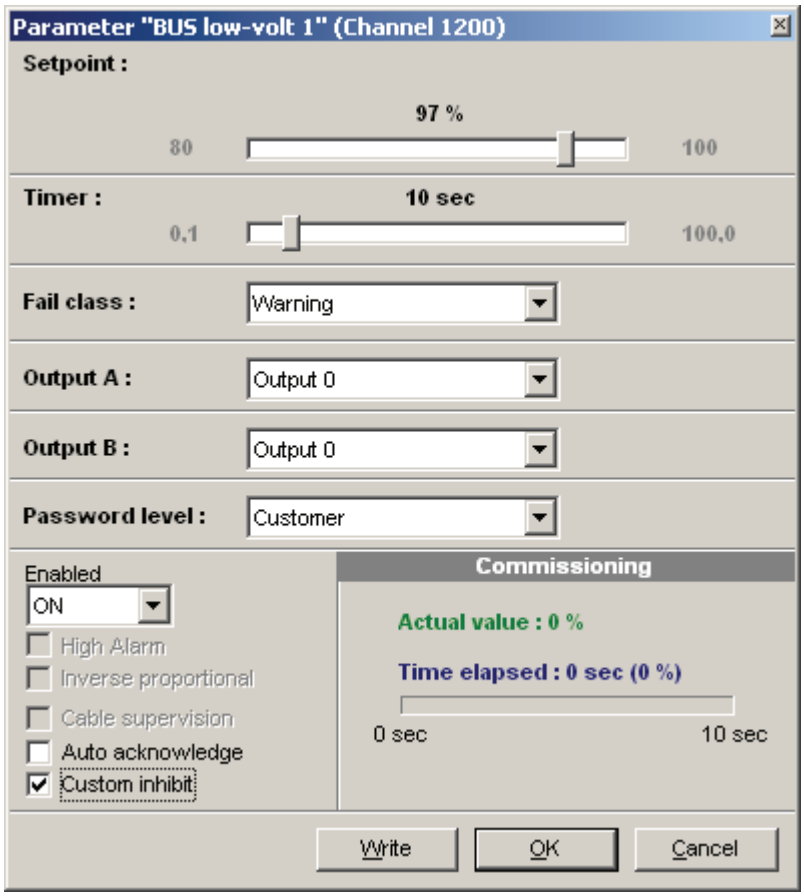


Custom inhibit input

The custom inhibit function is made to give the user a possibility to decide which protections should be inhibited when an input is activated.

To activate the custom inhibit function two things are needed:

1. Configure an input in the input settings in the utility SW.
2. Enable the function as shown in the dialog box below.


Parameter "BUS low-volt 1" (Channel 1200)
Setpoint :
97 %
80
100
Timer :
10 sec
0.1
100.0
Fail class :
Warning
Output A :
Output 0
Output B :
Output 0
Password level :
Customer
Enabled
ON
High Alarm
Inverse proportional
Cable supervision
Auto acknowledge
Custom inhibit
Commissioning
Actual value : 0 %
Time elapsed : 0 sec (0 %)
0 sec
10 sec
Write
OK
Cancel

The functionality of the custom inhibit input is indicated in the table below:

Standard PCBs

Alarm/input	M1	M2	Custom inhibit input configured		
	Terminal number		Input ON and custom inhibit enabled	Input OFF	Comment
Generator low f			-	Active	Option dependent
Generator low U			-	Active	Option dependent
Generator high f			Active	Active	Option dependent
Generator high U			Active	Active	Option dependent
Busbar low f			-	Active	Option dependent
Busbar low U			-	Active	Option dependent
Busbar high f			Active	Active	Option dependent
Busbar high U			Active	Active	Option dependent
4…20mA input	98	98	-	Active	
4…20mA input	100	100	-	Active	
4…20mA input	102	102	-	Active	
4…20mA input	104		-	Active	
VDO input		104	-	Active	
VDO input		105	-	Active	
VDO input		106	-	Active	
PT100	106		-	Active	
PT100	109		-	Active	
Tacho input	112	108	Active	Active	
Binary input		110	-	Active	Configurable input
Binary input		111	-	Active	Configurable input
Binary input		112	-	Active	Configurable input
Binary input		113	-	Active	Configurable input
Binary input	114	114	Active	Active	Access lock
Binary input	115	115	Active	Active	Running feedback
Binary input	116	116	Active	Active	External engine fail.
Binary input	117	117	Active	Active	Emergency stop
Binary input	118	118	-	Active	Configurable input
Positive sequence U			-	Active	Option dependent

Optional PCBs

Input	Custom inhibit input configured		
	Input ON and custom inhibit enabled	Input OFF	Comment
Option M12	-	Active	Digital inputs
Option M13	-	Active	Digital inputs
Option M15	-	Active	4-20mA inputs

Optional protections

Input	Custom inhibit input configured		
	Alarm limit exceeded and custom inhibit enabled	**Input OFF**	**Comment**
Option A1	-	Active	
Option A2	-	Active	
Option A3	-	Active	
Option A4	-	Active	
Option B1	-	Active	
Option C1	-	Active	
Option C2	-	Active	

Function inputs such as running feedback, remote start or access lock are never inhibited. Only alarm inputs can be inhibited.

If an alarm is configured to activate a limit relay, the relay will activate in spite of the fact that the inhibit input is ON.

If the protection is configured to 'RUN' or 'PARALLEL' the custom inhibit will overrule these functions, if the input is active after the conditions for 'RUN' or 'PARALLEL' have been removed.

Access lock

The digital input number 114 is preconfigured to the function 'access lock'. The purpose of access lock is to deny the operator the possibility to configure the unit parameters and change the running modes.

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

Button	Button status	Comment
INFO	Active	It is possible to read all alarms, but it is not possible to acknowledge any of them.
JUMP	Not active	
START	Not active	
STOP	Not active	
GB ON	Not active	
MB ON	Not active	
VIEW	Active	
LOG	Active	
LEFT	Active	
UP	Active	
SELECT	Not active	If the access lock is activated when the view menu system is displayed, then the button is not active.
SELECT	Active	If the access lock is activated when the setup menu system is displayed, then the button is active.
DOWN	Active	
BACK	Active	
RIGHT	Active	
MODE	Active	If the access lock is activated when the view menu system is displayed, the button is not active.
MODE	Active	If the access lock is activated when the setup menu system is displayed, then the button is 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 stop push-button is not active in semi-auto mode when the access lock is activated. For safety reasons it is recommended to install an emergency stop switch.

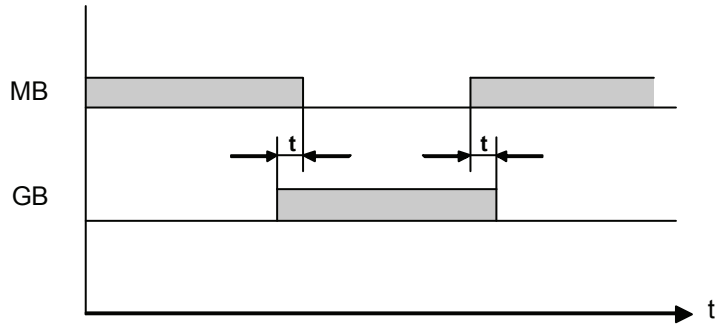
Input name	Input status	Comment
Fire pump	Active	
Access lock		
Running feedback	Active	
Remote start	Not active	
Remote stop	Not active	
Semi-auto	Not active	
Test	Not active	
Auto	Not active	
Manual	Not active	
Block	Not active	
Remote GB ON	Not active	
Remote GB OFF	Not active	
Remote MB ON	Not active	
Remote MB OFF	Not active	
Remote TB ON	Not active	
Remote TB OFF	Not active	
Remote alarm acknowledge	Active	
Gen-set start sequence	Active	
Remove starter	Active	
Reset analogue governor output	Active	
Manual GOV up	Active	
Manual GOV down	Active	
Manual AVR up	Active	
Manual AVR down	Active	
Alarm inhibit	Active	
GB position ON	Active	
GB position OFF	Active	
MB position ON	Active	
MB position OFF	Active	
Emergency stop	Active	
External engine failure	Active	
AOP buttons	Active	

Short-time parallel

The purpose of the *short time parallel* function is to be able to define a maximum paralleling time between the generator and the mains supply.

The function is typically used, if there are local requirements to maximum allowed paralleling time.

The short time paralleling function is only available in the automatic mains failure and load take over gen-set modes.



The diagram shows that when the generator breaker is synchronised, the mains breaker will be opened automatically after a time delay (t). Later the mains breaker is synchronised, and the generator breaker is opened after the time delay (t).

The time delay is measured in seconds and can be adjusted from 0.10 to 99.90 seconds.

The same time delay is used for both generator and mains breaker synchronisation.

If the function is used in a Power Management (option G5) application, then the short time paralleling will occur between the mains breaker and the tie breaker on the AGC mains.

The time delay typed in the set point is a maximum time. This means that if 0.10 seconds are used, the two breakers will never be closed at the same time for a longer delay than the set point.

The short time parallel function is set up in **2700 Short time paralleling**

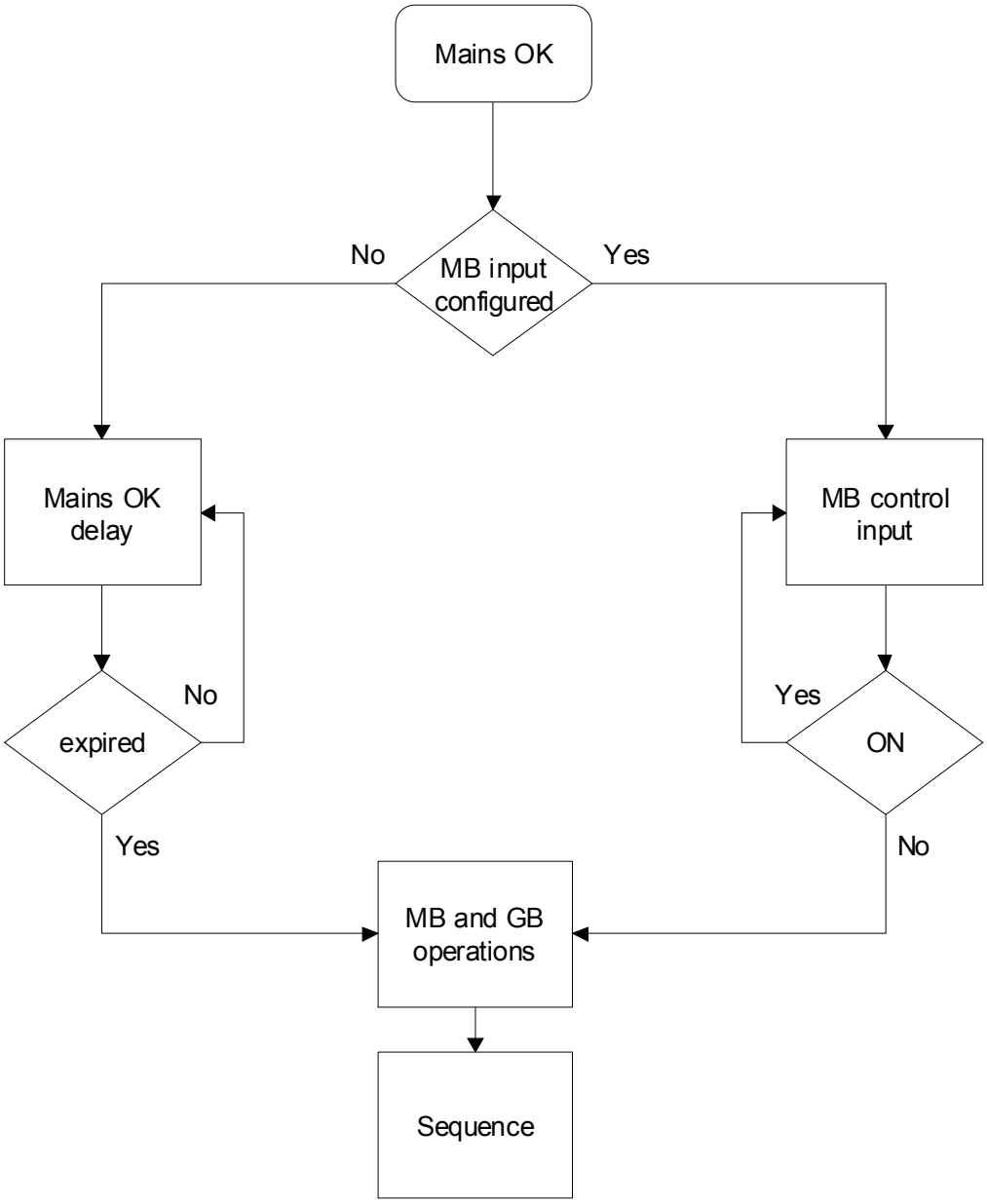
.

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 OK' 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 *deactivated* in order to initiate the mains return sequence. The load will continue on generator supply, if the input is still activated.

The mains OK delay is not used at all when the 'mains OK' input is configured.



Time dependent start/stop

The purpose of the time dependent start/stop function is to be able to start and stop the gen-set automatically at specific times each weekday or certain weekdays. If auto mode is activated, this function is available in island operation, load take over, mains power export and fixed power operation. Up to 8 commands can be used for either start or stop. The settings are set up through the PC utility software. Each command 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

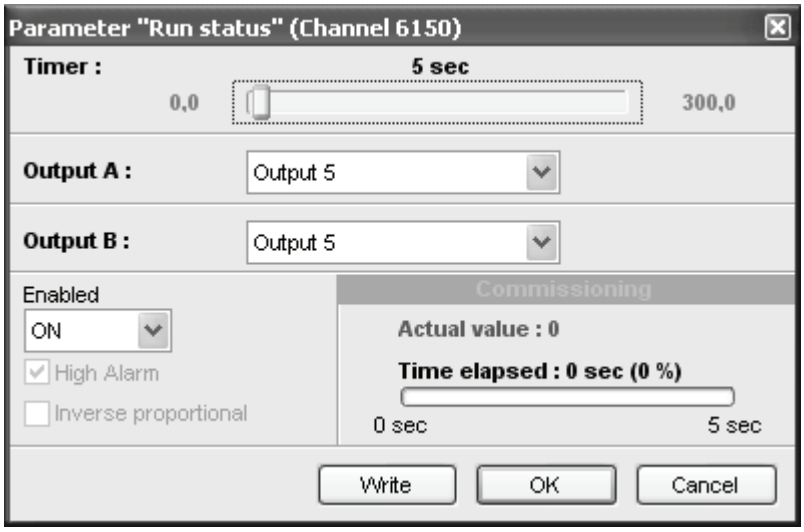
The digital input 'auto start/stop' cannot be used, when this function is enabled.

It is necessary to use the PC utility software when setting up the time dependent start/stop function.

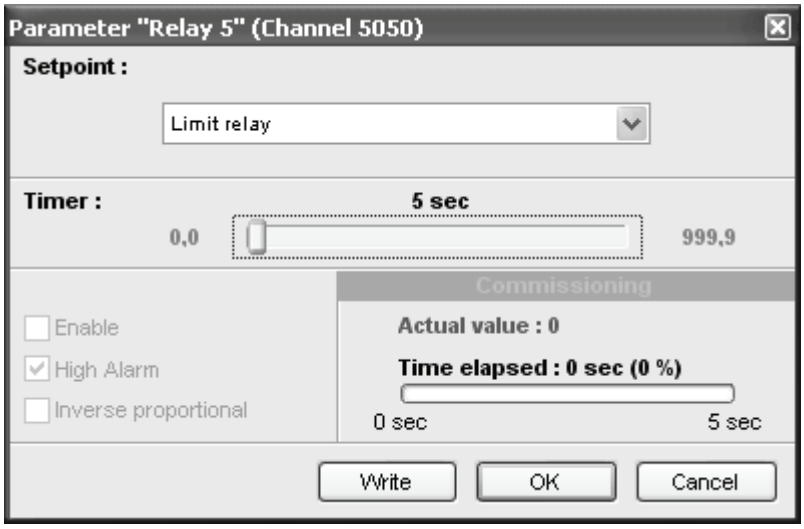
Running output

6150 Running status

can be adjusted to give a digital output when the gen-set 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.

Derate gen-set

The purpose of the derate function is to be able to reduce the maximum output power of the gen-set, if specific conditions require this. An example of such a condition is the ambient

temperature. If the ambient temperature increases to a level where the cooling water coolers decrease in cooling capacity, it will be necessary to reduce the power of the gen-set.
If the gen-set is not derated, alarms and shutdown events will very likely occur.

The derate function is typically used when cooling problems are expected.

Input selection
The derate function can be configured to one of the following inputs:

Input	Engine interface selection	
	M1	M2
Analogue input 100	X	X
PT100 input 106	X	
PT100 input 109	X	
VDO input 105		X
VDO input 106		X

Select the needed input in

6260 P_{nom} derate

.

Refer to the type label for information about engine interface selection.

Derate parameters
The parameters that define the derate characteristics are the following:

Start derate point (

6260 P_{nom} derate

):

This is the setting where the derating must start. The setting can be in mA (max. 20mA) or in centigrades ºC (max 200ºC).

Slope (

6260 P_{nom} derate

):

Adjust the derating speed. The adjustment is in percent per unit, i.e. if the 4…20mA input is used (analogue 100), then the derating will be in %/mA, and if the PT100/VDO input is used, then the derating will be in %/C.

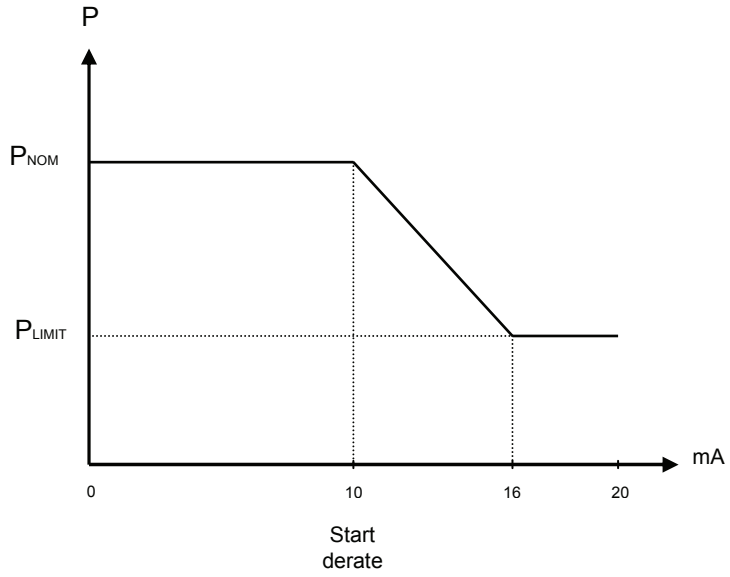
Be aware that the 4…20mA input can be configured with different minimum and maximum settings. In this case the settings 'start derate point' and 'slope' use these new settings.

Derate limit (

6260 P_{nom} derate

):

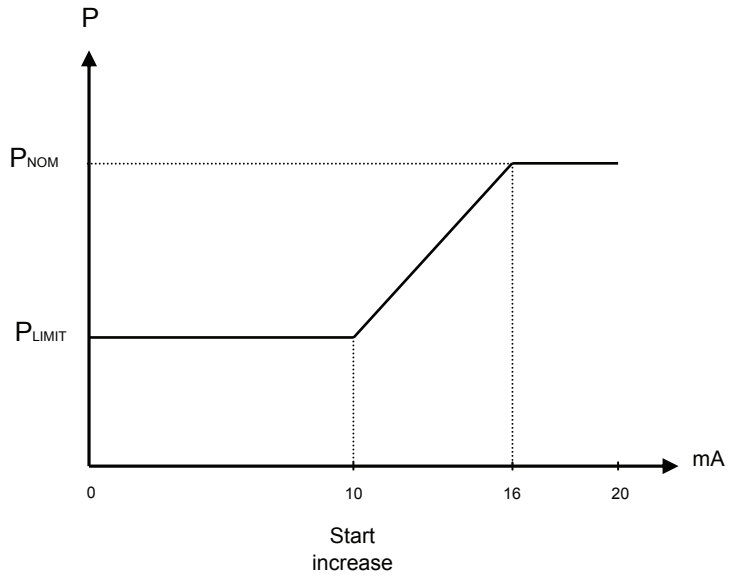
This is the lowest derate level.



Derate characteristic

It can be selected whether the characteristic of the derating should be proportional or inverse proportional. The drawing above shows the inverse characteristic.

The proportional characteristic is illustrated below.



The gen-set is derated when the control value is lower than the setpoint (in the example above the control value is an mA signal).

The derate characteristic is selected in

6260 Pnom derate
.

Setting OFF: Inverse characteristic
Setting ON: Proportional characteristic

Idle running

The purpose of the idle run function is to change the start and stop sequences to allow the gen-set 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 gen-set 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 gen-set is exposed to low temperatures which could generate starting problems or damage the gen-set.

Description

The function is enabled and configured in **6310 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).

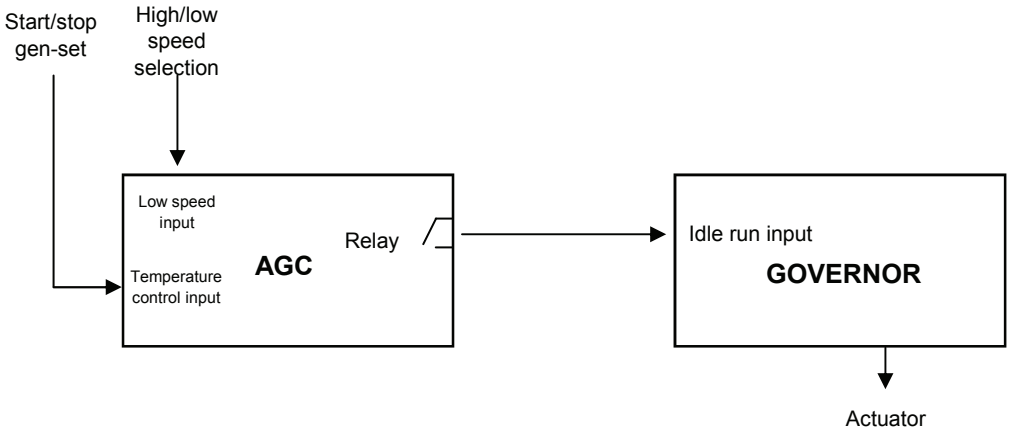
When the function is enabled, two digital inputs are used for control purposes:

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 gen-set from stopping - it is only a selection between idle and nominal speed.
2	Temperature control input	When this input is activated, the gen-set will start. It will not be able to stop as long as this input is activated.

The input must be configured through the PC software at commissioning.

One extra relay output must be available on the unit. Notice that this is option dependent.

Turbo chargers not originally prepared for operating in the low speed area can be damaged, if the gen-set is running in 'idle run' for too long.

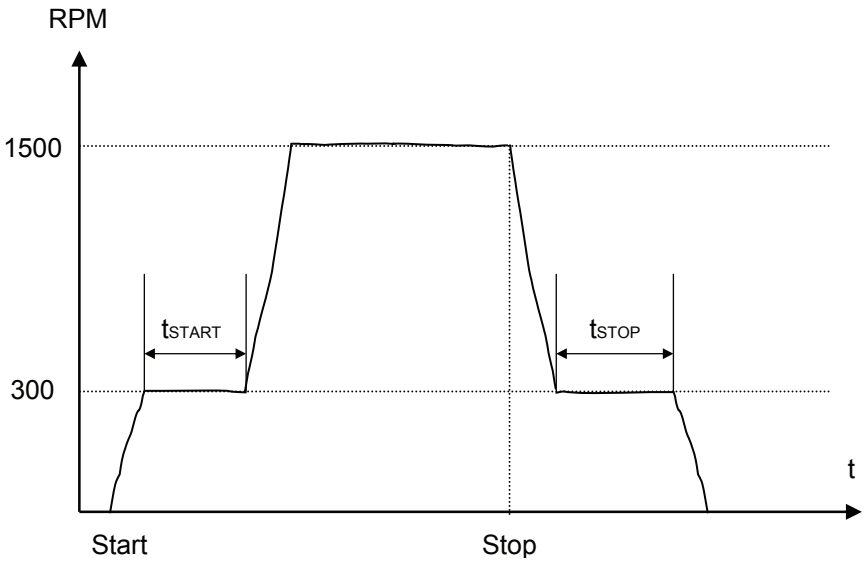


Examples

Idle speed during starting and stopping

In this example both the start and the stop timers are activated.

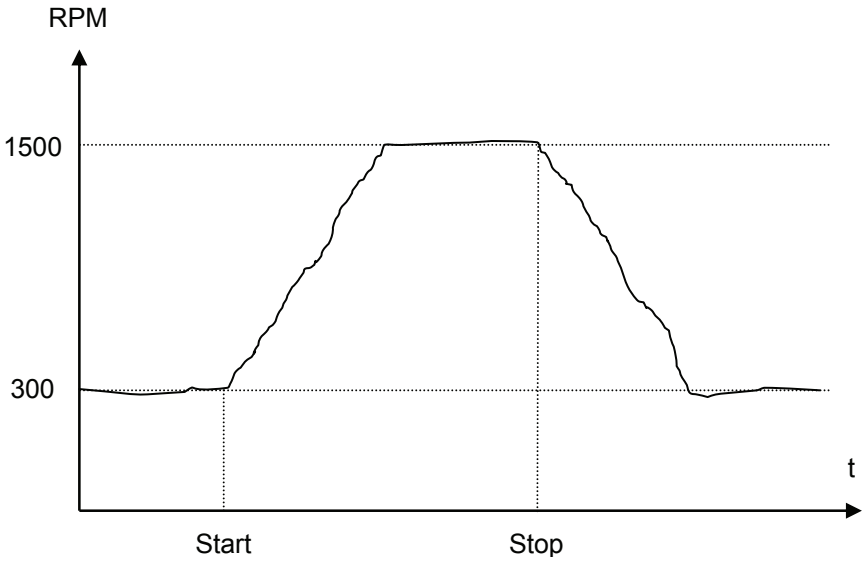
The start and stop sequences are changed in order to let the gen-set stay at the idle level before speeding up. It also decreases the speed to the idle level for a specified delay time before stopping.



Idle speed, no stopping

In this example both timers are deactivated.

If the gen-set 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:

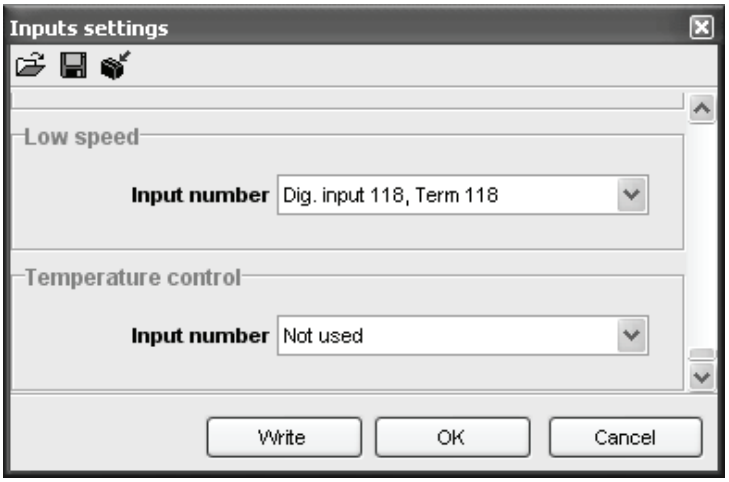


The run status is deactivated, when idle run is active. This means that all protections set to 'RUN' will be inhibited.

The oil pressure alarm will be enabled at all times, no matter if it is set to 'RUN' or 'ON'.

Configuration of digital input

The digital input is configured via the PC software.



Inhibit

The alarms that are deactivated by the inhibit function or the alarms with run status are inhibited like usual except for the oil pressure alarms, i.e. VDO 104 if option M2 is selected, and 4…20mA input 100 if option M1 is selected.

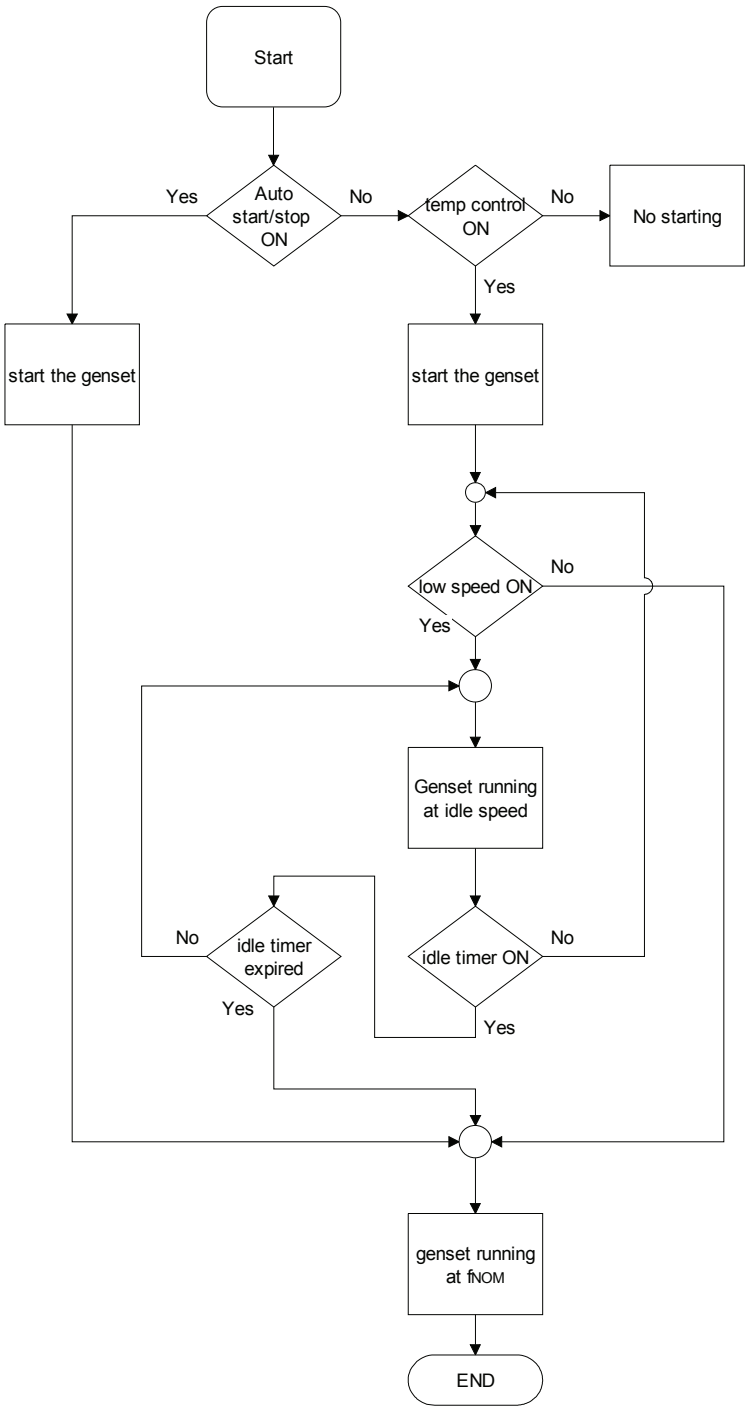
Running signal

The running feedback must be activated when the gen-set is running in idle mode.

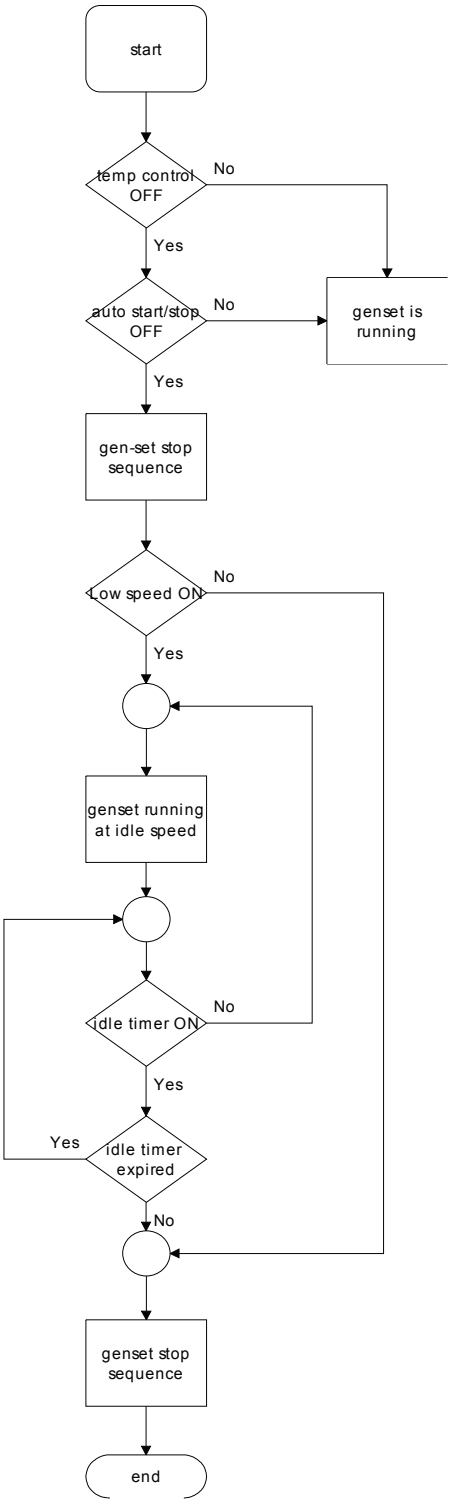
Idle speed flowcharts

The flowcharts illustrate the starting and stopping of the gen-set by use of the inputs 'temp control' and 'low speed'.

Start



Stop


start
temp control OFF
No
Yes
auto start/stop OFF
No
genset is running
Yes
gen-set stop sequence
Low speed ON
No
Yes
genset running at idle speed
idle timer ON
No
Yes
Yes
idle timer expired
No
genset stop sequence
end

Master clock

The purpose of the master clock is to control the frequency of the gen-set in order to obtain the correct number of periods.

This function can only be used, if island operation is selected.

In a 50Hz system one period lasts 20 ms. If this changes, e.g. due to the dead band setting of the frequency controller, a difference will exist between the actual number of periods and the theoretical number of periods.

Equipment that works based on the zero crossings will be affected by the surplus or missing zero crossings. The most common example of such equipment is alarm clocks.

The unit's internal clock is a timekeeper which is included in the battery backed memory circuit. The timekeeper function works based on an oscillating crystal instead of zero crossings of the AC measurements. Due to the accuracy of the timekeeper, it is recommended to synchronise the clock on a regular basis, e.g. once every month.

Setting	Description	Comment
6401 Start	Start time.	The compensation period starts at the adjusted time.
6402 Stop	Stop time.	The compensation period stops at the adjusted time.
6403 Difference	The setpoint in seconds that initiates the compensation.	
6404 Compensation	Frequency difference when the compensation is initiated.	+/- value.
6405 Enable	Enables the function.	

If the power management option is selected (option G5), then the adjustment is made in the command unit.

The compensation frequency must be adjusted to a value higher than the dead band setting.

Compensation time

The time for the compensation can easily be calculated at a given adjustment of 6403 and 6404 (example):

- 6403 = 30 seconds
- 6404 = +/- 0.1Hz

$$t_{TOTAL} = t_{SET} / (1 - f_{NOM} / f_{DIFF})$$

$$t_{TOTAL} = 30s / (1 - 50Hz / 50{,}1Hz)$$

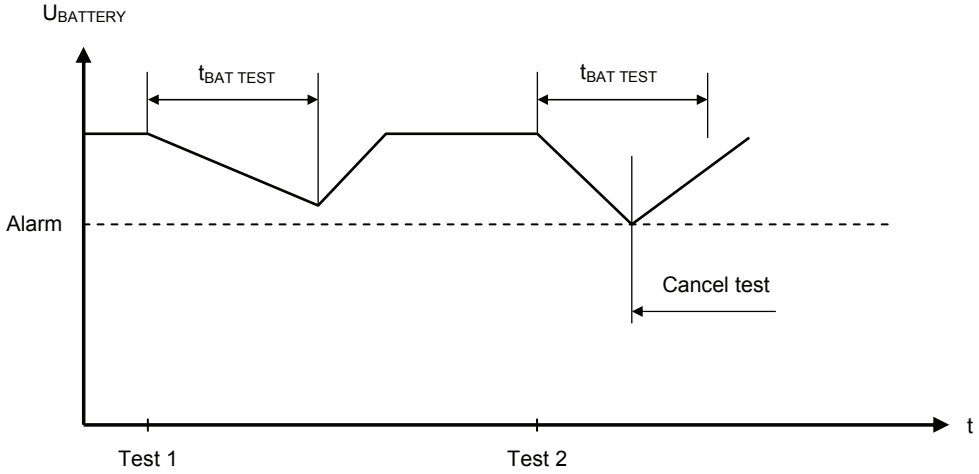
$$t_{TOTAL} = 15030s \sim 4{,}1hours$$

Battery test

This function gives the possibility to test the condition of the battery. The battery test initiates with a digital input and is available when the gen-set is in semi-auto mode.

If a mains failure occurs during the battery test sequence, the test will automatically be interrupted, and the automatic mains failure start up sequence will be activated.

During the test the battery voltage will decrease, and an alarm will occur if it drops to the setpoint.



The drawing shows that test #1 is carried out without a large voltage drop of the battery voltage, whereas test #2 reaches the alarm setpoint.

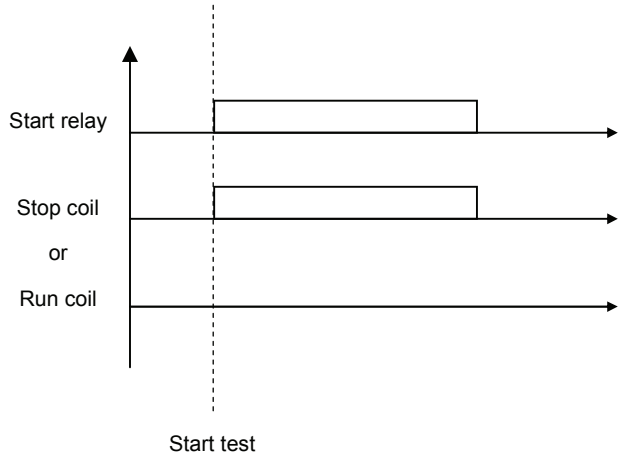
As there is no reason to wear the battery down even more, the test stops when the battery test alarm occurs.

The test is typically used at periodical intervals, e.g. once every week. The engine must be at a standstill when the test is started. Otherwise, the test command will be ignored.

The stop relay will act depending on the coil type selection in **6210 Stop**
:

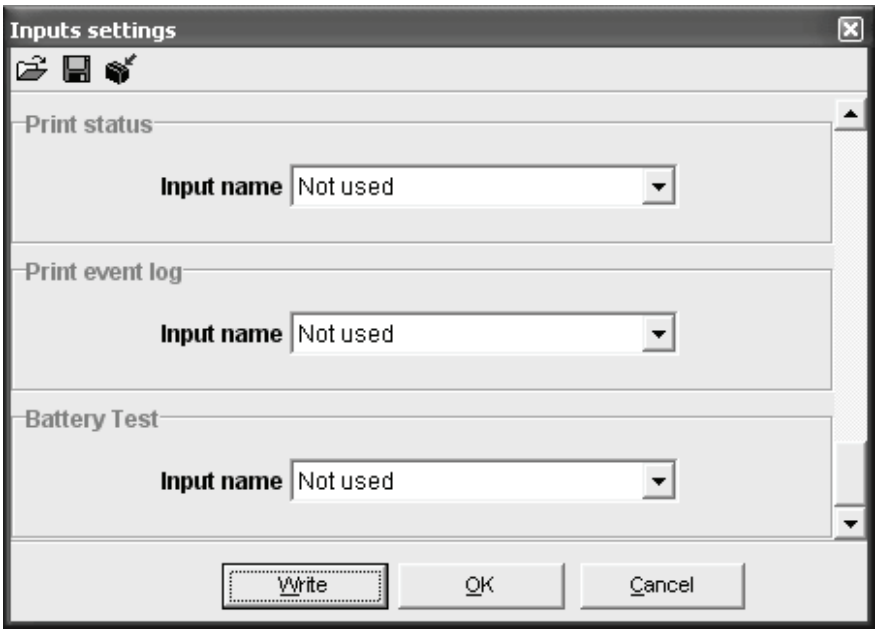
Stop coil: *The stop relay activates during the test.*
Run coil: *The stop relay stays deactivated during the test.*

The drawing below shows that when the test is started, the start relay activates making the engine turn.



Input configuration

If this function is to be used, it is necessary to configure a digital input that initiates the function. This is done in the dialog box below.



If AUTO mode is selected, the mains failure sequence will be initiated, if a mains failure occurs during the battery test.

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.

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

Engine running

Action / Fail class	Alarm horn relay	Alarm display	Deload	Trip of gen. breaker	Trip of mains breaker	Cooling-down gen-set	Stop gen-set
1 Alarm	X	X					
2 Warning	X	X					
3 Trip of GB	X	X		X			
4 Trip and stop	X	X	(X)	X		X	X
5 Shutdown	X	X		X			X
6 Trip of MB	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 gen-set is stopped instantly
- The gen-set cannot be started from the unit (see next table)

The fail class 'trip and stop' will only deload the gen-set before opening the breaker, if option G5 (power management) is included.

Engine stopped

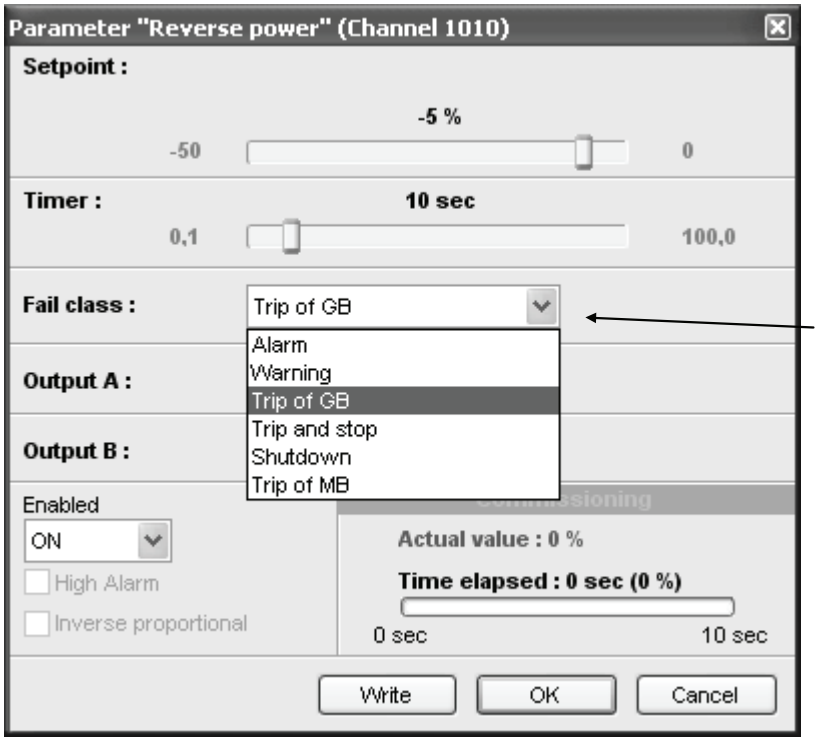
Action / Fail class	Block engine start	Block MB sequence	Block GB sequence
1 Alarm	X		
2 Warning			
3 Trip of GB	X		X
4 Trip and stop	X		X
5 Shutdown	X		X
6 Trip of MB		X	

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.

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.



The fail class drop down panel is activated, and the user wants to select the 'trip of GB' fail class.

Service timers

The unit is able to monitor the maintenance intervals. The menu is available in the system setup.

6090 Service timer

The function is based on running hours. When the adjusted time expires, the unit will display an alarm. The 'alarm acknowledge' function resets this alarm.

When acknowledging the alarm, the timer will be reset and a new service timer alarm will only reoccur after the adjusted time has elapsed. The running hours is counting, when the running feedback is present.

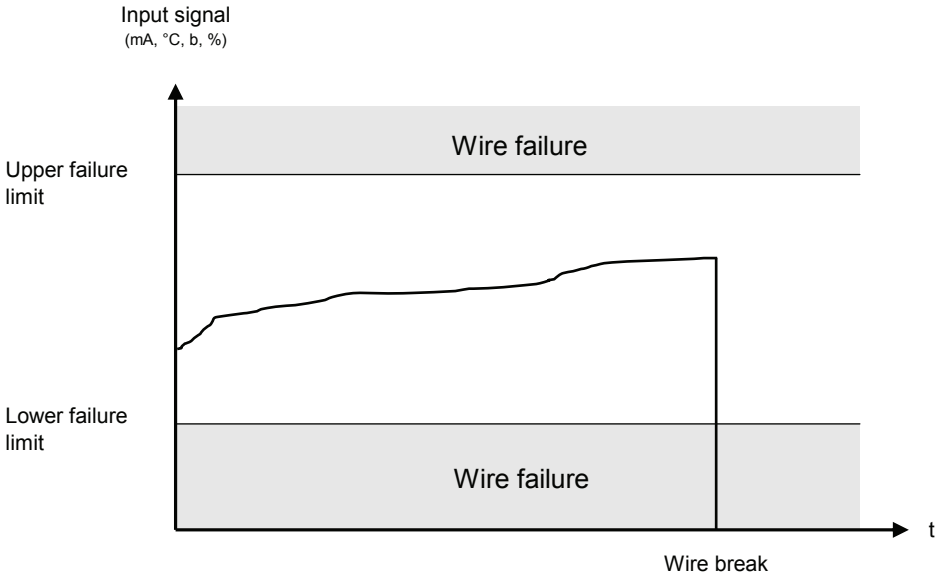
Wire break detection

If it is necessary to supervise the sensors/wires connected to the analogue inputs (4-20mA, VDO and PT100), then it is possible to use the menus 4370-4430 depending on the HW options available in the unit. 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.

	Wire failure area	Normal range	Wire failure area
4-20mA	Below 4mA	4-20mA	Above 20mA
VDO 104	0…40%	-	60…100%
VDO 105	0…40%	-	60…100%
VDO 106	0…40%	-	60…100%
PT100 – 106	0…40%	-	60…100%
PT100 – 109	0…40%	-	60…100%

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.



PT100 settings

The alarm setpoint of the PT100 inputs can be calculated in percent like this:

$$deviation_{\%} = (t + 40) / 2{,}9$$

Example:
Required setpoint is 200 °C. The adjustment must be:

$$deviation_{\%} = (200 + 40) / 2{,}9$$
$$deviation_{\%} = 83\%$$

VDO settings

The alarm setpoint of the VDO inputs can be calculated in percent like this:

VDO 104, oil pressure: $deviation_{\%} = setting / 240 * 100$

VDO 105, cooling temp.: $deviation_{\%} = setting / 530 * 100$

VDO 106, fuel level: $deviation_{\%} = setting / 240 * 100$

The deviation is the alarm value entered in percent, and the setting is the required alarm setting *in ohms.*

Example:
Required setpoint of VDO104 is 180Ω. The adjustment must be:

$$deviation_{\%} = 180 / 240 * 100$$
$$deviation_{\%} = 75\%$$

Digital inputs

The unit has a number of binary inputs some of which are configurable and some are not. The number of digital inputs on the standard unit depends on the selected engine interface card.

Engine interface card	Available digital inputs – not configurable	Available digital inputs – configurable
M1 (standard)	2	3
M2 (option)	2	7

	Input function	Auto	Semi	Test	Man	Block	Configurable	Input type
1	Fire pump	X	X	X	X		Configurable	Constant
2	Access lock	X	X	X	X	X	Not configurable	Constant
3	Running feedback	X	X	X	X		Not configurable	Constant
4	Remote start		X		X		Configurable	Pulse
5	Remote stop		X		X		Configurable	Pulse
6	Semi-auto	X		X	X	X	Configurable	Pulse
7	Test	X	X		X	X	Configurable	Pulse
8	Auto		X	X	X	X	Configurable	Pulse
9	Manual		X	X		X	Configurable	Pulse
10	Block	X	X	X	X		Configurable	Constant
11	Remote GB ON		X				Configurable	Pulse
12	Remote GB OFF		X				Configurable	Pulse
13	Remote MB ON		X				Configurable	Pulse
14	Remote MB OFF		X				Configurable	Pulse
15	Remote alarm acknowledge	X	X	X	X	X	Configurable	Constant
16	Auto start/stop	X					Configurable	Constant
17	Remove starter	X	X	X	X		Configurable	Constant
18	Reset analogue GOV/AVR outputs	X	X		X	X	Configurable	Pulse
19	Manual GOV up				X		Configurable	Constant
20	Manual GOV down				X		Configurable	Constant
21	Manual AVR up				X		Configurable	Constant
22	Manual AVR down				X		Configurable	Constant
23	Alarm inhibit	X	X	X	X	X	Not configurable	Constant
24	GB position ON	X	X	X	X	X	Not configurable	Constant
25	GB position OFF	X	X	X	X	X	Not configurable	Constant
26	MB position ON	X	X	X	X	X	Not configurable	Constant
27	MB position OFF	X	X	X	X	X	Not configurable	Constant
28	Emergency stop	X	X	X	X	X	Text configurable	Constant
29	External engine failure	X	X	X	X	X	Text configurable	Constant
30	Low speed	X	X	X			Configurable	Constant
31	Temperature control	X	X	X			Configurable	Constant
32	Battery test		X				Configurable	Pulse
33	Mains OK	X	X	X	X	X	Configurable	Constant
34	External f control	X	X	X			Configurable	Constant
35	External P control	X	X	X			Configurable	Constant
36	External PF control	X	X	X			Configurable	Constant
37	External U control	X	X	X			Configurable	Constant

	Input function	Auto	Semi	Test	Man	Block	Configurable	Input type
38	External Q power	X	X	X			Configurable	Constant
39	Print status	X	X	X			Configurable	Pulse
40	Print event log	X	X	X			Configurable	Pulse
41	MB close inhibit	X	X	X	X	X	Configurable	Constant
42	Engine comm. inhibit	X	X	X	X	X	Configurable	Constant
43	Enable mode shift	X					Configurable	Constant
44	Enable GB black close	X	X	X	X	X	Configurable	Constant
45	Enable sep. sync.	X	X	X	X	X	Configurable	Constant
46	Custom alarm inhibit	X	X	X	X	X	Configurable	Constant
47	Start enable	X	X	X	X	NA	Configurable	Constant
48	GB spring loaded	X	X	X			Configurable	Constant
49	MB spring loaded	X	X	X			Configurable	Constant

Functional description

1. Fire pump

This input deactivates all protections except the overspeed protection and the emergency stop input. The number of start attempts is 7 by default, but it can be configured in **6180 Start attempts**. Also a special cool down timer 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. Running feedback

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 gen-set when semi-auto or manual mode is selected.

5. Remote stop

This input initiates the stop sequence of the gen-set when semi-auto or manual mode is selected. The gen-set will stop without cooling-down.

6. Semi-auto

Changes the present running mode to semi-auto.

7. Test

Changes the present running mode to test.

8. Auto

Changes the present running mode to auto.

9. Manual

Changes the present running mode to manual.

10. Block

Changes the present running mode to block.

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

11. Remote GB ON

The generator breaker ON sequence will be initiated and the breaker will synchronise, if the mains breaker is closed, or close without synchronising if the mains breaker is opened.

12. Remote GB OFF

The generator breaker OFF sequence will be initiated. If the mains breaker is opened, then the generator breaker will open instantly. If the mains breaker is closed, the generator load will be deloaded to the breaker open limit followed by a breaker opening.

13. Remote MB ON

The mains breaker ON sequence will be initiated and the breaker will synchronise, if the generator breaker is closed, or close without synchronising if the generator breaker is opened.

14. Remote MB OFF

The mains breaker OFF sequence will be initiated, and the breaker will open instantly.

15. Remote alarm acknowledge

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

16. Auto start/stop

The gen-set will start when this input is activated. The gen-set will be stopped, if the input is deactivated. The input can be used when the unit is in island operation, fixed power, load take over or mains power export and the AUTO running mode is selected.

17. Remove starter

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

18. Reset analogue GOV/AVR outputs

The analogue +/-20mA controller outputs will be reset to 0mA.

All analogue controller outputs are reset. That is the governor output and the AVR output, if option D1 is selected.

If an offset has been adjusted in the control setup, then the reset position will be the specific adjustment.

19. Manual GOV up

If manual mode is selected, then the governor output will be increased.

20. Manual GOV down

If manual mode is selected, then the governor output will be decreased.

21. Manual AVR up

If manual mode is selected, then the AVR output will be increased.

22. Manual AVR down

If manual mode is selected, then the AVR output will be decreased.

The manual governor and AVR increase and decrease inputs can only be used in manual mode.

23. Alarm inhibit

Specific alarms are inhibited to prevent the alarms from occurring. Refer to page 69.

Essential protections might also be inhibited, if this input is used.

24. 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.

25. Generator breaker open feedback (GB position OFF)

The 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.

26. 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.

27. 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.

28. Emergency stop

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

The shut-down fail class must be selected.

29. External engine failure

This input is an alarm input that can be given one of all the selectable fail classes.

30. Low speed

Disables the regulators and keeps the gen-set running at a low RPM. All alarms set to 'RUN' will be inhibited as long as the function is active.

The governor must be prepared for this function.

31. Temperature control

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

32. Battery test

Activates the starter motor without starting the gen-set. If the battery is weak, the test will cause the battery voltage to drop more than acceptable, and an alarm will occur.

33. Mains OK

Disables the 'mains OK delay' timer. The synchronisation of the mains breaker will happen when the input is activated.

34. External frequency control

The nominal frequency setpoint will be controlled from the analogue inputs terminal 40/41. The internal setpoint will not be used.

35. External power control

The power setpoint in fixed power will be controlled from the analogue inputs terminal 40/41. The internal setpoint will not be used.

36. External power factor control

The power factor setpoint will be controlled from the analogue inputs terminal 41/42. The internal setpoint will not be used.

37. External voltage control

The nominal voltage setpoint will be controlled from the analogue inputs terminal 41/42. The internal setpoint will not be used.

38. External reactive power

The reactive power setpoint will be controlled from the analogue inputs terminal 41/42. The internal setpoint will not be used.

39. Print status

When this input is activated, the current running status of the system will be printed.

Please refer to the description of option P1.

40. Print event log

When this input is activated, the latest events will be printed. The number of events and possible additional data can be selected in the system setup.

Please refer to the description of option P1.

41. MB close inhibit

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

42. Engine communication inhibit

When this input is activated, then the engine communication alarms are inhibited if option H5 or H6 is used.

43. Enable mode shift

The input activates the mode shift function, and the AGC will perform the AMF sequence. When the input is configured, then the setting in the menu 6611 (mode shift ON/OFF) is disregarded.

44. Enable GB black close

When the input is activated, then the AGC can close the generator on a black busbar.

45. Enable separate sync.

Activating this input will split the breaker close and breaker synchronisation functions into two

different relays. The breaker close function will remain on the relays dedicated for breaker control. The synchronisation function will be moved to a configurable relay dependent on the options configuration. Please refer to the description on page 140.

This function is option dependent. Option M12 or M14 is required.

46. Custom alarm inhibit

The protections with the custom inhibit function enabled through the utility SW will be inhibited when the input is activated.

47. Start enable

The input must be activated to be able to start the engine.

When the gen-set is started, the input can be removed.

48. GB spring loaded

The input is used when there is a delay from the breaker opens and until it is ready to close. When the breaker is ready, then the input must be activated. This is e.g. a feedback from the breaker.

49. MB spring loaded

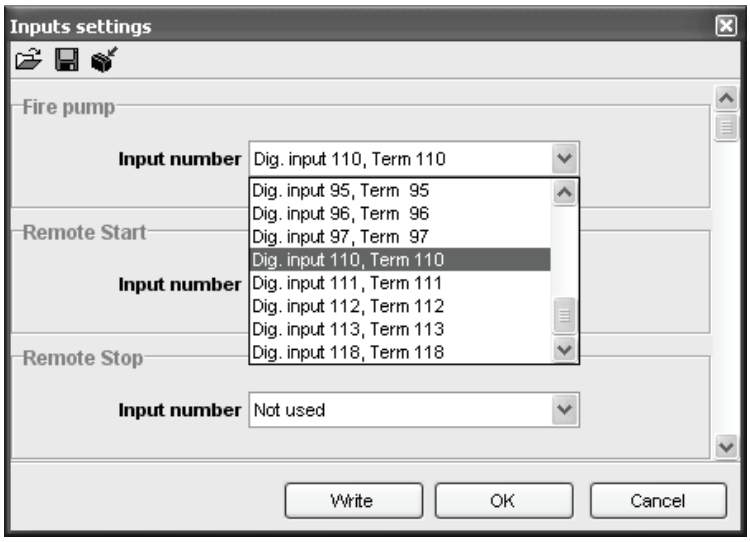
The input is used when there is a delay from the breaker opens and until it is ready to close. When the breaker is ready, then the input must be activated. This is e.g. a feedback from the breaker.

Configuration

The digital inputs are configured via the PC software.

Select the input icon in the horizontal toolbar.

The desired input number can now be selected for the individual input function via the roll-down panel.



VDO inputs

There are three VDO inputs in the unit. The inputs have different functions, as the hardware design allows for several VDO types.

VDO input 104: Oil pressure
VDO input 105: Cooling water temperature
VDO input 106: Fuel level sensor

VDO input 104

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

	VDO sensor type		
Pressure	**Type 1**	**Type 2**	**Type configurable**
Bar	**Ω**	**Ω**	**Ω**
0	10.0	10.0	Point 1
0.5	27.2		
1.0	44.9	31.3	
1.5	62.9		
2.0	81.0	51.5	
2.5	99.2		Point 2
3.0	117.1	71.0	
3.5	134.7		
4.0	151.9	89.6	
4.5	168.3		
5.0	184.0	107.3	Point 3
6.0		124.3	Point 4
7.0		140.4	Point 5
8.0		155.7	Point 6
9.0		170.2	Point 7
10.0		184.0	Point 8

The configurable type is configurable with 8 points.

Level switch type

	VDO sensor type
	Type level switch
Resistance	**Function**
>200Ω	Normal situation, no alarm
<200Ω	Alarm situation

If the VDO input is used as a level switch, then be aware that no voltage must be connected to the input. If any voltage is applied to the VDO inputs, then it will be damaged. Refer to the Application Notes for further wiring information.

VDO input 105

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

	VDO sensor type			
Temperature	**Type 1**	**Type 2**	**Type 3**	**Type 4**
°C	**Ω**	**Ω**	**Ω**	**Ω**
40	291.5	480.7	69.3	Point 1
50	197.3	323.6		Point 2
60	134.0	222.5	36.0	Point 3
70	97.1	157.1		Point 4
80	70.1	113.2	19.8	Point 5
90	51.2	83.2		Point 6
100	38.5	62.4	11.7	Point 7
110	29.1	47.6		Point 8
120	22.4	36.8	7.4	
130		28.9		
140		22.8		
150		18.2		

The configurable type is configurable with 8 points.

Level switch type

	VDO sensor type
	Type 3
Resistance	**Function**
<1.7kΩ	Normal situation, no alarm
>1.7kΩ	Alarm situation

If the VDO input is used as a level switch, then be aware that no voltage must be connected to the input. If any voltage is applied to the VDO inputs, then it will be damaged. Refer to the Application Notes for further wiring information.

VDO input 106

This VDO input is used for the fuel level sensor.

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

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

If the VDO input is used as a level switch, then be aware that no voltage must be connected to the input. If any voltage is applied to the VDO inputs, then it will be damaged. Refer to the Application Notes for further wiring information.

	VDO sensor type
Value	**Type configurable**
%	**Resistance**
0	Point 1
10	
20	
30	
40	Point 2
50	Point 3
60	Point 4
70	Point 5
80	Point 6
90	Point 7
100	Point 8

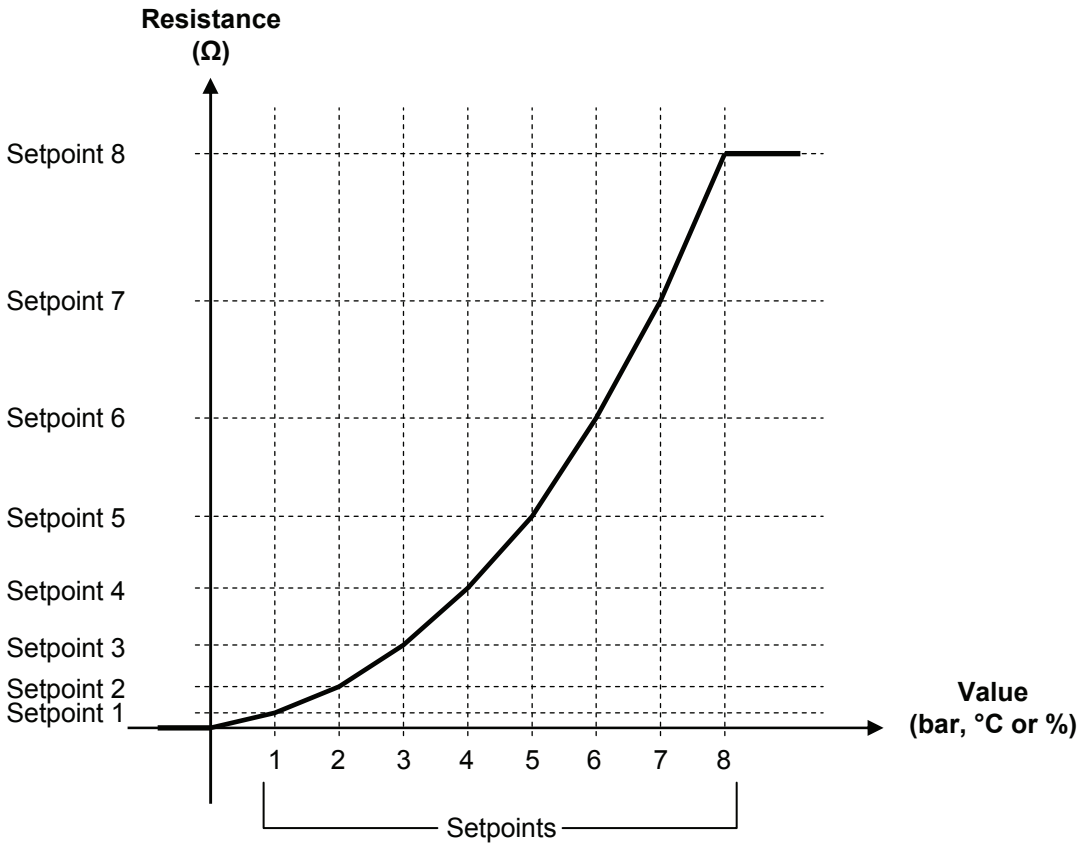
The configurable type is configurable with 8 points.

VDO usage

The VDO inputs are used as alarm inputs and can be configured in the following menus:

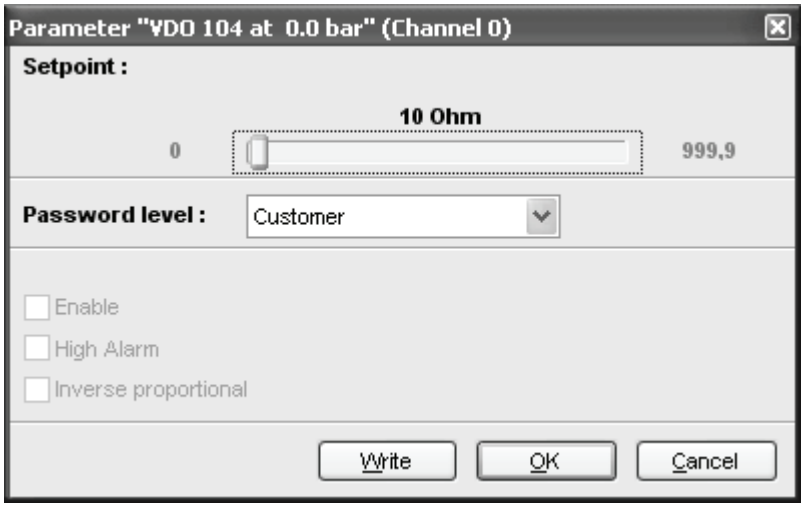
VDO input 104: Lubricating oil pressure – alarm settings in menus 4170/4180.
VDO input 105: Cooling water temperature – alarm settings in menus 4190/4200.
VDO input 106: Fuel level switch – alarm settings in menus 4210/4220.

Illustration of configurable inputs



Configuration

The 8 curve settings for the configurable VDO inputs cannot be changed in the display, but **only** in the PC utility software. The alarm settings can be changed both in the display and in the PC utility software. In the PC utility software the configurable inputs are adjusted in this dialog box:



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

Manual governor control

The governor can be given increase and decrease signals with digital inputs. The inputs can be used in manual mode and in semi-auto mode.

Manual mode

In manual mode the regulation is switched off. The output of the regulator will therefore not change depending on the load or frequency. The output will only change, if the manual up or manual down input is activated.

Semi-auto mode

In semi-auto mode the regulator is active, and the frequency or power is controlled according to the actual setpoint. If semi-auto is selected, the regulation is switched off when either the manual increase or decrease input is activated. Now an offset can be given to the frequency or power depending on the operation.

The regulation is activated as soon as the manual increase or manual decrease input is deactivated. This can be used during commissioning of the gen-set.

This function does not change the set point of the controller. It only gives an offset to the controller when the manual input is ON.

If option D1 is selected, then the AVR can also be controlled similar to the governor control.

Manual governor control from an AOP

It is possible to make a pulse control of the governor when the AOP is connected. Commands for increase and decrease can be configured for any of the eight push-buttons on the AOP.

When the button for either increase or decrease is pushed, then the AGC will perform the command for 5 seconds. When the button is pushed within the 5 seconds period, then the command is reset, and the manual increase or decrease will stop.

Manual mode

In manual mode the regulation is switched off. The output of the regulator will therefore not change depending on the load or frequency. The output will only change, if the manual up or manual down button on the AOP is activated.

Semi-auto mode

In semi-auto mode the regulator is active, and the frequency or power will be controlled according to the actual setpoint. If semi-auto is selected, the regulation is switched off when either the manual increase or decrease button on the AOP is activated. Now an offset can be given to the frequency or power depending on the operation.

The regulation is activated after 5 seconds or when the increase/decrease button is pushed again within 5 seconds.

See the M-logic Manual for details.

If option D1 is selected, then the AVR can also be controlled from the AOP similar to the governor control.

Input function selection

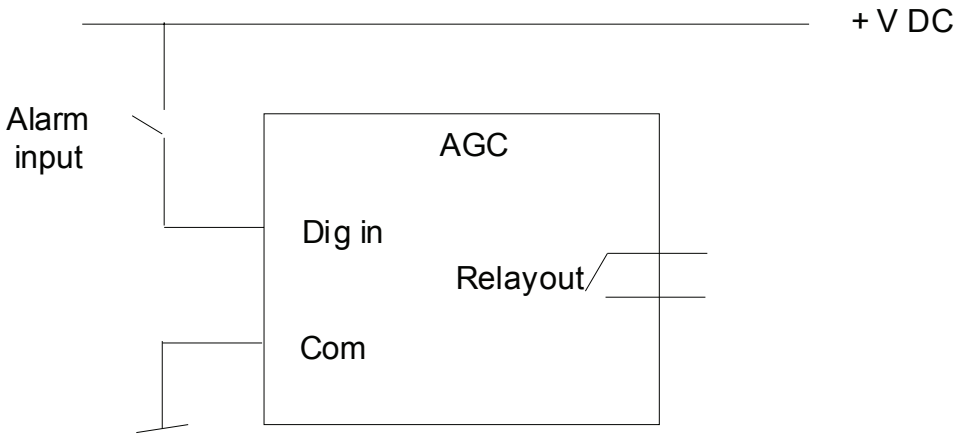
Digital input alarms can be configured with a possibility to select when the alarms are to be activated. The possible selections of the input function are normally open or normally closed.

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 cannot be changed. This will always be a NO relay and will close when the alarm occurs, alarm = CC (closed contact).



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 11 different languages can be configured. This is done via the PC utility software.

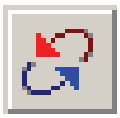
The languages are selected in the system setup **(**
The alarm is for the auxiliary power supply measured on terminals 1 and 2.
6130 Language

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.

Buttons used in the PC utility software

Retrieve languages from the device:
Activating this button will retrieve the configured languages from the device.

Send languages to the device:
Activating this button will send the content of the 11 language frames to the device.



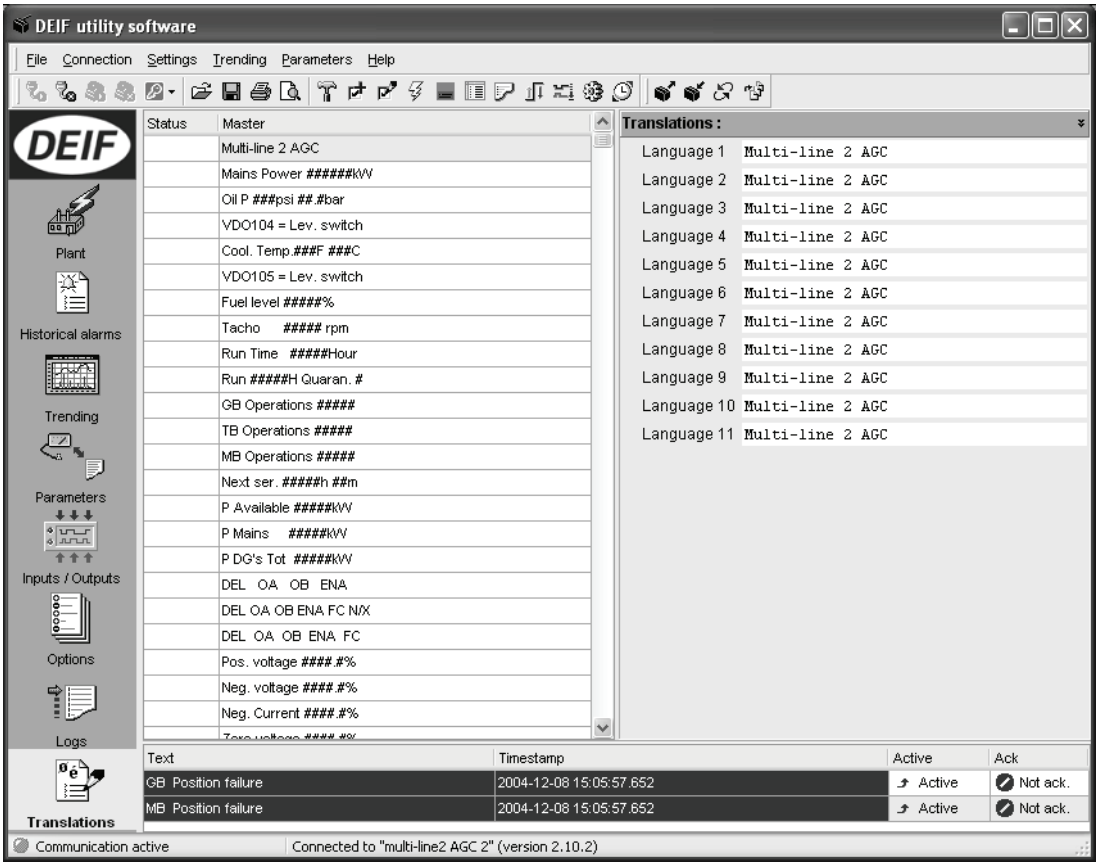
Synchronise a language file with the device:
Activating this button will synchronise a language file from a previous version of the software with a newer version. New functions that are not translated will be marked.

Copy master language to other languages:
Activating this button will send the master language to the 11 language frames (except for the already configured texts).

Language configuration

Besides the master language 11 empty language shells are available. These empty shells can be filled in via the PC utility software.

In the PC utility software the language is configured in the *Translations* menu. Activate the menu by pressing the *Translations* icon (see below):



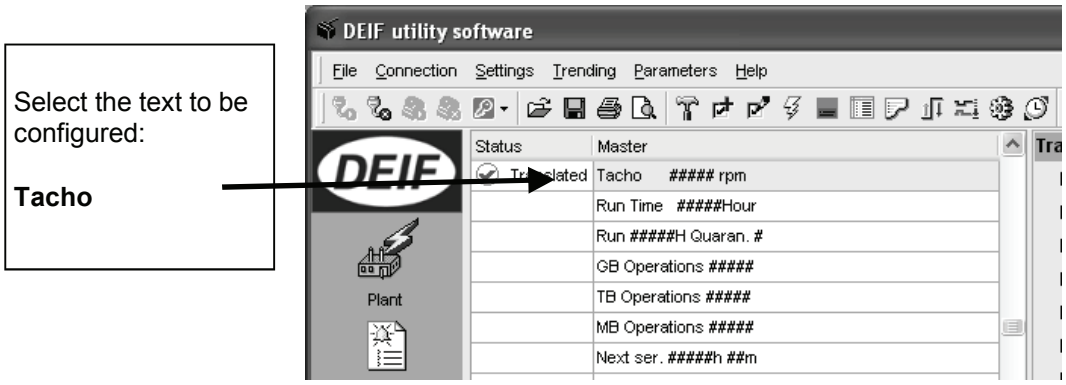
All configurable entries are indicated in the left side column. The list can be scrolled with page DOWN/UP.

Example:

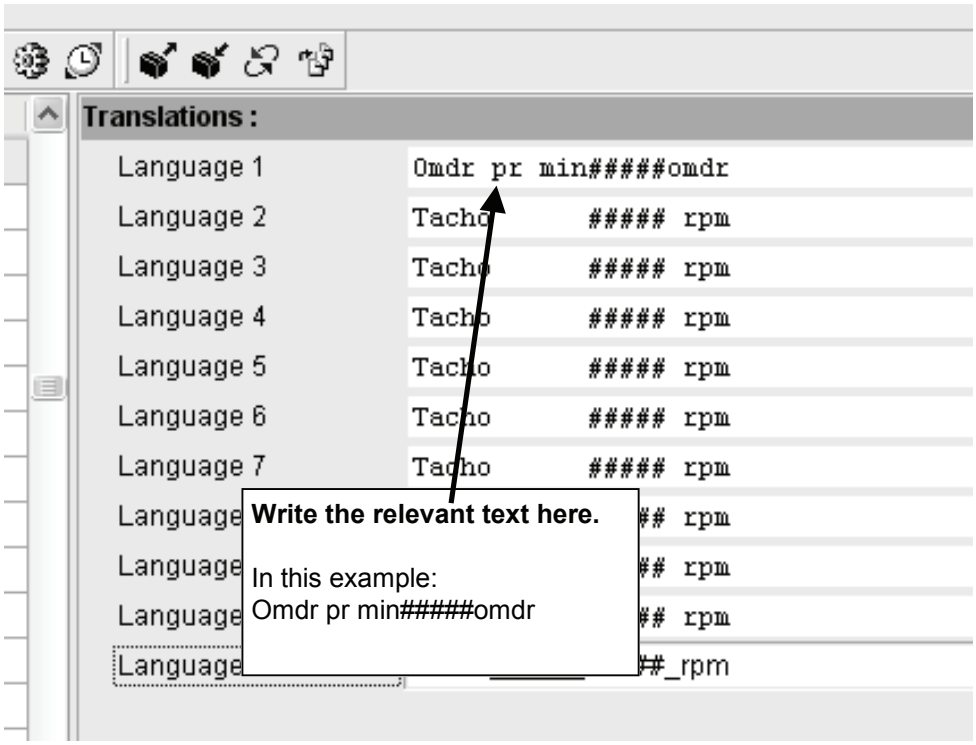
Language 1 = Danish.
Tacho name is changed in this example:

- 'Tacho' is changed to 'Omdr pr min'
- 'RPM' is changed to 'Omdr'

Select the line which needs to be edited.



Select language 1 and write the relevant text.



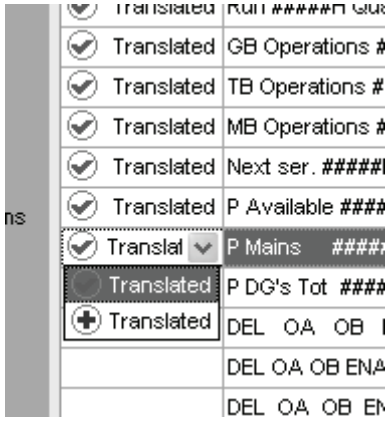
When the relevant texts have been configured, they can be downloaded to the unit.

The symbol '#####' indicates the measured value (in this case the actual RPM).

There is a maximum of 20 characters/text. The symbol ##### is included and will in this case use up 5 characters. It is not possible to change the number of characters in the measurement symbol (#####).

Translation status

To give an overview of the translated menus, a status indication can be given for each parameter. The check mark is green, and the cross is red.



Symbols

The following symbols can be used for this function:

	!	"	#	$	%	&	´	(	)	*	+	,	-	.	/
0	1	2	3	4	5	6	7	8	9	:	;	<	=	>	?
@	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O
P	Q	R	S	T	U	V	W	X	Y	Z	[	\	]	^	_
`	a	b	c	d	e	f	g	h	i	j	k	l	m	n	o
p	q	r	s	t	u	v	w	x	y	z	{	|	}	~	

Texts in status line

The status texts must be self-explaining. If the operator does something wrong, then the status line must indicate it. The table below indicates the texts in the status line.

Status text	Condition	Comment
BLOCK		
Simple TEST	The TEST is activated. The gen-set will be started, but it is not allowed to close the generator breaker.	
Load TEST	The TEST is activated. The gen-set will be started, and the generator breaker will be synchronised/closed.	The test will be parallel to mains.
ISLAND MANUAL	If the gen-set is stopped, or if it is running and no other action takes place.	
ISLAND SEMI-AUTO		
ISLAND AUTO		
AMF MANUAL		
AMF SEMI-AUTO		
AMF AUTO		
FIXED MANUAL		
FIXED SEMI-AUTO		
FIXED AUTO		

Status text	Condition	Comment
Peak shave MANUAL		
Peak shave SEMI-AUTO		
Peak shave AUTO		
LTO MANUAL		
LTO SEMI-AUTO		
LTO AUTO		
MPE MANUAL		
MPE SEMI-AUTO		
MPE AUTO		
PM MANUAL		
PM SEMI-AUTO		
PM AUTO		
Fire pump	If the configurable input is active.	
Display locked	If the 'Access lock' input is activated, and the operator tries to activate one of the blocked keys.	
GB tripped externally	This info. will be shown, if some external equipment has tripped the breaker.	An external trip is logged in the event log.
MB tripped externally	This info. will be shown, if some external equipment has tripped the breaker.	An external trip is logged in the event log.
TB tripped externally	This info. will be shown, if some external equipment has tripped the breaker.	An external trip is logged in the event log.
Power derate	If the 'power derate' function is activated and the nominal power setpoint has been decreased, this info. will appear.	
Idle run	If the 'Idle run' function is active, this info. will appear to inform the user that the gen-set will not stop, until a timer has expired.	
Idle run ###.#min.	If the timers in the 'Idle run' function are active, this info. will appear to inform the user that the gen-set will not start/stop, until a timer has expired.	
Compensation freq.	Compensation is active.	To inform the user that there is a reason why the frequency is not at the nominal setting.
Aux. test ###V ####s	This info. is shown during a battery test.	
Deload	This info. is shown when decreasing the load of the gen-set.	
Starting DG(s) ###s	When the start gen-set setpoint is exceeded, this info. is shown with the countdown of the timer.	

Status text	Condition	Comment
Stopping DG(s) ###s	When the stop gen-set setpoint is exceeded, this info. is shown with the countdown of the timer.	
Start prepare	This info. is shown during the time the start prepare relay is activated.	
Start ON	This info. is shown during the time the start relay is activated during the start sequence.	
Start OFF	This info. is shown during the time the start prepare relay is deactivated.	
Mains failure	This text appears as soon as a frequency or voltage measurement is outside the limits.	
Mains failure in ###s	This text appears as soon as a frequency or voltage measurement is outside the limits. The timer shown is the mains failure delay.	
Mains U OK del ####s	When the mains voltage is OK after a mains failure, this info. is shown with the countdown of the timer.	
Mains f OK del ####s	When the mains frequency is OK after a mains failure, this info. is shown with the countdown of the timer.	
Volt./freq. OK in ###s	As soon as the voltage and frequency on the gen-set are OK, this text is shown until it is allowed to operate the generator breaker.	
Cooling down ###s	When the cooling down period is started, this info. is shown with the countdown of the timer.	
Gen-set stopping	This info. is shown when cool down has finished.	
Ext. stop t. ###s		
Blackout enable	This info. is shown, if a CAN failure is present in a power management application.	Option G5 must be available.
Programming language	This info. is shown, if the language file is downloaded from the PC utility software.	

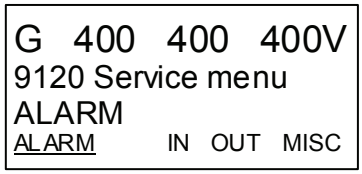
Service menu

The purpose of the service menu is to give information about the present operating condition of the gen-set. The service menu is entered using the 'JUMP' push-button **(9120 Service menu)**.

Use the service menu for easy trouble shooting in connection with the event log (see page 50).

Entry window

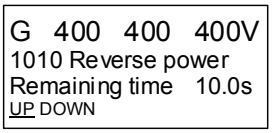
The entry shows the possible selections in the service menu.



Available selections:

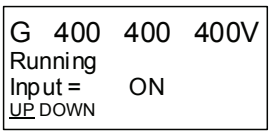
Alarm

Shows the alarm timer and the remaining time. The indicated remaining time is minimum remaining time. The timer will count downwards when the setpoint has been exceeded.



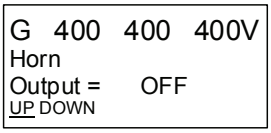
IN (digital input)

Shows the status of the digital inputs.



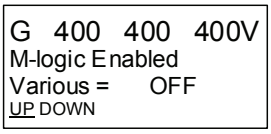
OUT (digital output)

Shows the status of the digital outputs.



MISC (miscellaneous)

Shows miscellaneous messages.

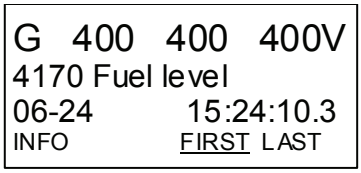


Event log

The event log holds up to 150 events, and they can be viewed in the display or in the PC utility software. When more than 150 events have occurred, each new event will overwrite the oldest event following the 'first in – first out' principle.

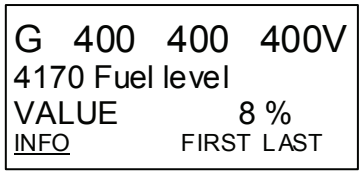
Display

In the display it looks like this when the 'LOG' push-button is pressed (example):



The specific alarm or event is shown in the second line. In the example above the fuel level alarm has occurred. The third line shows the time stamp.

If the cursor is moved to 'INFO', the actual value can be read when pressing 'SEL':



The first event in the list will be displayed, if the cursor is placed below 'FIRST' and 'SEL' is pressed.

The last event in the list will be displayed, if the cursor is placed below 'LAST' and 'SEL' is pressed.

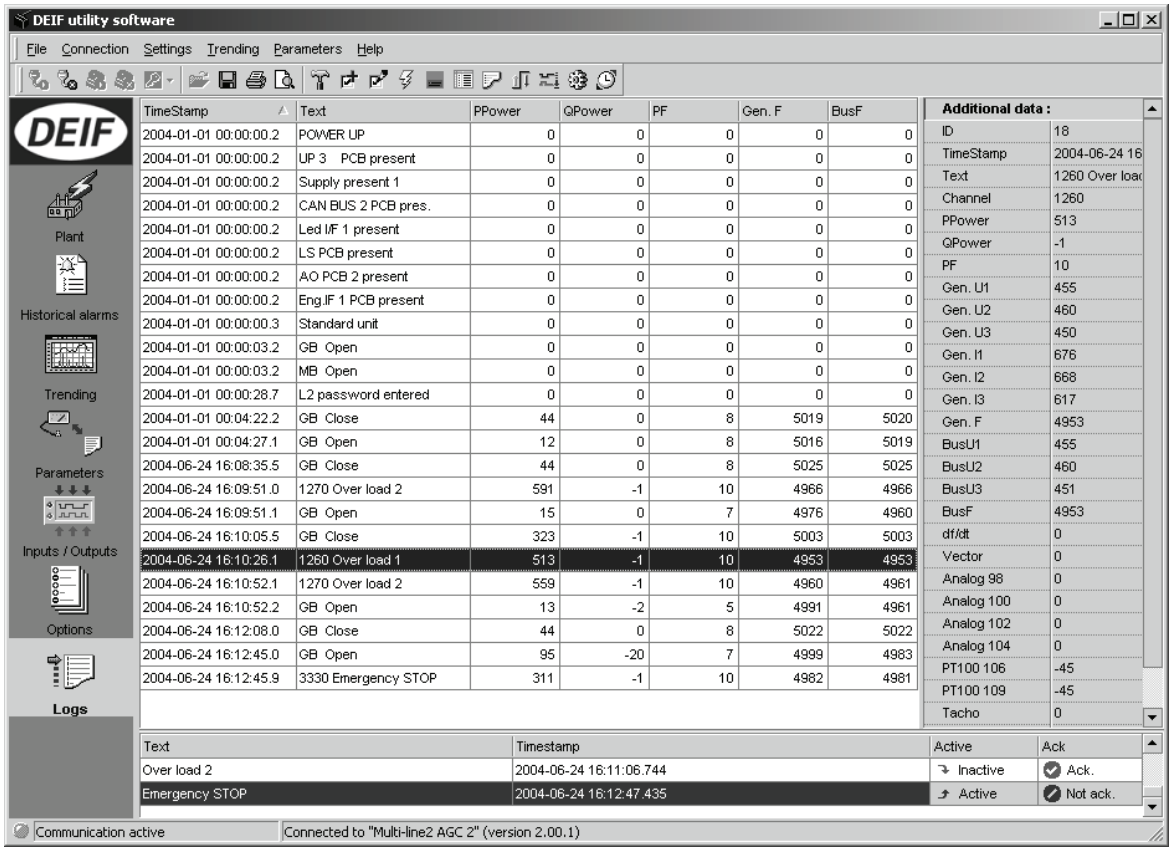
The keyUP and keyDOWN push-buttons are used for navigating in the list.

PC utility software

Using the PC utility software the entire log stack of the last 150 events can be retrieved by activating the log button on the horizontal toolbar.

The alarms and events are displayed as indicated below. The actual alarms are displayed in the text column together with selected measurements.

In the right side column additional data is indicated. This is specific data for the most important measurements. The data is logged for each specific event and is used for troubleshooting after each alarm.



The entire log can be saved in Excel format and in that particular programme.

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 gen-set or a new circuit breaker has been installed.

The table shows the adjustable values and their function:

Description	Function	Comment
6081 Running time	Offset adjustment of the total running hours counter.	Counting when the running feedback is present.
6082 GB operations	Offset adjustment of the number of generator breaker operations.	Counting at each GB close command.
6083 MB operations	Offset adjustment of the number of mains breaker operations.	Counting at each MB close command.
6084 kWh reset	Resets the kWh counter.	Automatically resets to OFF after the reset. The reset function cannot be left active.
6085 Attempts	Offset adjustment of the number of start attempts.	Counting at each start attempt.
6086 Running time FP	The running hour counter for the fire pump operation can be reset in this menu.	The running hour counter is shown in the display.

M-logic

M-logic functionality is included in units with software versions 1.51 and forward. It is not an option dependent function, but selecting additional options, such as option M12 which offers additional digital inputs and outputs, can increase the functionality.

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 gen-set modes and change of running modes.

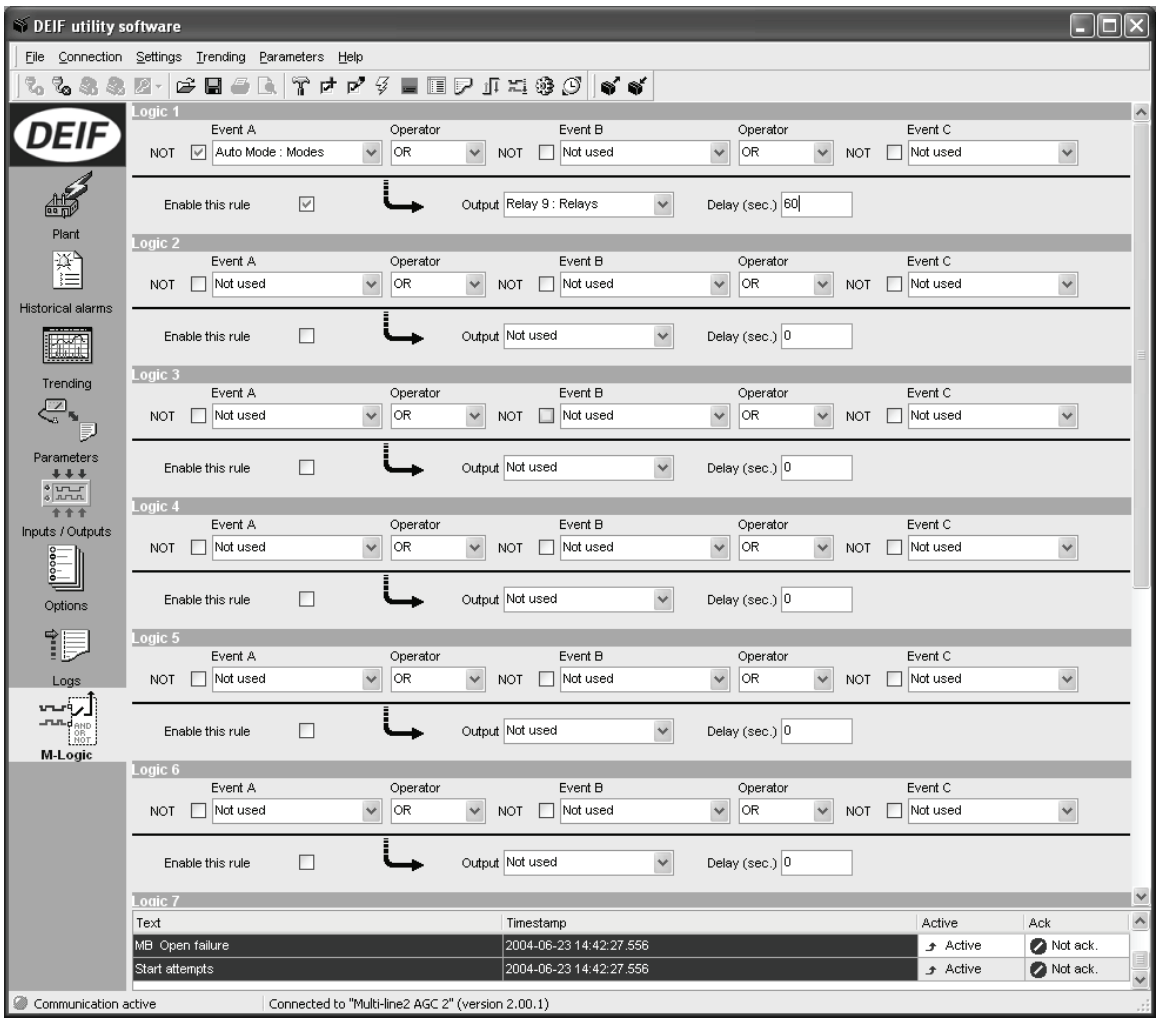
The M-logic is part of the PC utility software, and as such it can only be configured in the PC utility software and not via the display.

The M-logic icon is not active as default – 'Alt + F1' activates M-logic.

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

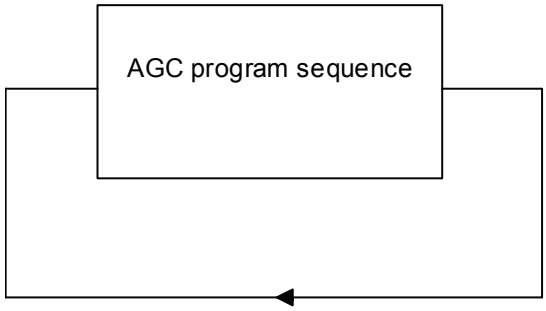
Programming

The programming interface in the PC utility software looks like this:

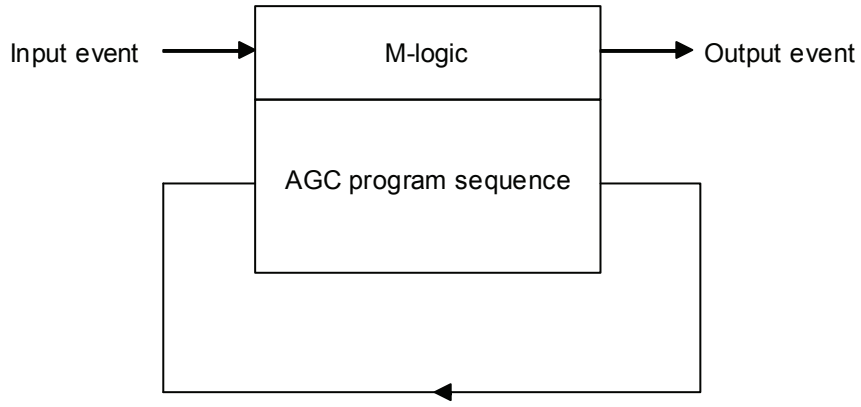


Description overview

This diagram illustrates the programme sequence without the M-logic function enabled:



This diagram illustrates the programme sequence with the M-logic enabled - M-logic is part of the programme sequence.

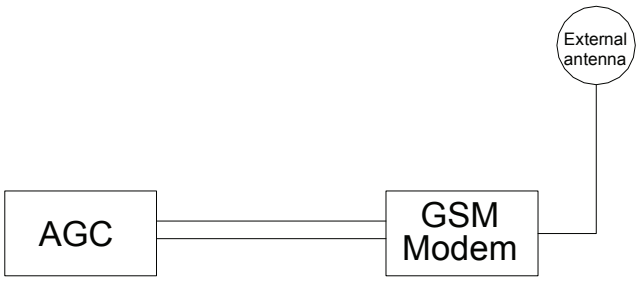


Please refer to the 'M-logic Handbook' for a full description of this configuration tool.

GSM communication

The GSM modem communication is used to send a GSM message to up to 5 cellular telephones when an alarm appears on the display.

System single-line diagram



DEIF recommends using a MOXA OnCell G2150I, Wavecom WMOD2 or Westermo GDW-11 terminal, as the application has been tested with these terminals.

Serial connection
The serial connection to the GSM modem is done via a straight cable (option J3) (male/female).

Basic parameter settings

Setting no.	Name	Function	Set to
GSM	GSM PIN code	Set PIN code for GSM modem	None
GSM	12345678901	Set phone no. for SMS to cellular phone 1	None
GSM	12345678901	Set phone no. for SMS to cellular phone 2	None
GSM	12345678901	Set phone no. for SMS to cellular phone 3	None
GSM	12345678901	Set phone no. for SMS to cellular phone 4	None
GSM	12345678901	Set phone no. for SMS to cellular phone 5	None

For calling a foreign number type '+ country code' instead of '00', for example dial +45 99999999 for a Danish number.

The phone number can only be dialed using the PC utility software.

The SIM card used in the cellular telephone must support data transfer.

PIN code configuration
After each auxiliary supply power up, the unit will send the required PIN code to the modem, if this is necessary. The PIN code is adjusted in the PC utility software.

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 gen-set application.

It is possible to remote control the gen-set from the PC utility software, if a modem is used. Take precautions that it is safe to remote operate the gen-set to avoid personal injury or death.

Serial connection
The serial connection to the GSM modem is via the null-modem cable (option J3).

Setup
The Modbus protocol type can be changed from RTU to ASCII **(9020 Service port)**. This menu can only be reached using the JUMP push-button. When set to 1, the ASCII protocol type is used, and the unit will allow for the slower modem communication.

9020 Service port

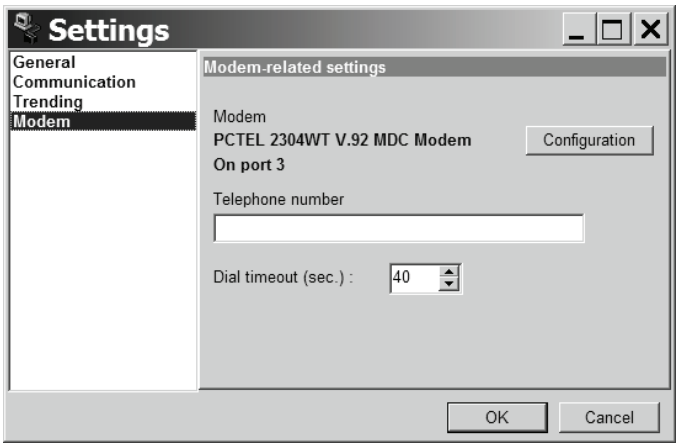
No.	Setting		Min. setting	Max. setting	Factory setting
9021	Service port	Setpoint	0 (normal USW)	1 (modem USW)	0 (normal USW)

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 push-button

Enter the desired telephone number using the application settings tool.

Settings dialog box:



The telephone number to be entered in this dialog box is the number of the modem connected to the unit.

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.

Nominal settings

The nominal settings can be changed to match different voltages and frequencies. The AGC has two sets of nominal values, and they are adjusted in menus 6010 (Nominal settings 1) and 6020 (Nominal settings 2).

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

Activation

The switching between the nominal setpoints can be done in three ways, namely digital input, AOP or menu 6025.

Digital input

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

Event A		Event B		Event C	Output
Dig. input no. 118	or	Not used	or	Not used	Set nom. parameter settings 1
Not Dig. input no. 118	or	Not used	or	Not used	Set nom. parameter settings 2

See the M-logic Manual for details.

AOP

M-logic is used when the AOP is used for switching between the two sets of nominal settings. Select the required AOP push-button among the input events, and select the nominal settings in the outputs.

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

See the M-logic Manual for details.

Menu settings

In menu 6025 the switching is made between settings 1 and 2 as described in the table:

Nominal value / Menu setting	Nominal settings 1	Nominal settings 2	Available overspeed protections
OFF	X	-	4310/4320
1	X	-	4310
2	-	X	4320

Both setting 'OFF' and setting '1' will activate the nominal settings 1. The difference will be the number of available overspeed settings.

The selection OFF (where two overspeed alarms are active) can only be performed from the display.

Overspeed protection

When fire pump mode is selected with a digital input, then the overspeed alarm menu 4320 (Overspeed 2) is activated. The overspeed alarm menu 4310 is not active!

If the fire pump mode is used with the selection of nominal settings adjusted to 'OFF', then the overspeed alarm 2 (4320) must be used to protect the engine from overspeeding. Overspeed 1 (4310) is not active.

7. PI controller

The unit controller is a PI controller. It consists of a proportional regulator and an integral regulator. The PI controller is able to eliminate the regulation deviation and can easily be tuned in.

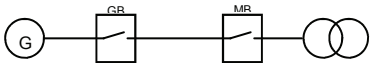
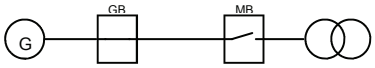
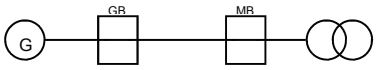
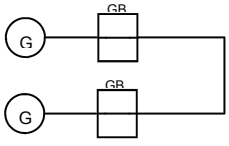
See 'General Guidelines for Commissioning'.

Controllers

There are two controllers for the governor control and, if option D1 is selected, also two controllers for the AVR control.

Controller	GOV	AVR	Comment
Frequency	X		Controls the frequency
Power	X		Controls the power
Voltage (option D1)		X	Controls the voltage
VAr (option D1)		X	Controls the power factor

The table below indicates when each of the controllers is active. This means that the controllers can be tuned in when the shown running situations are present.

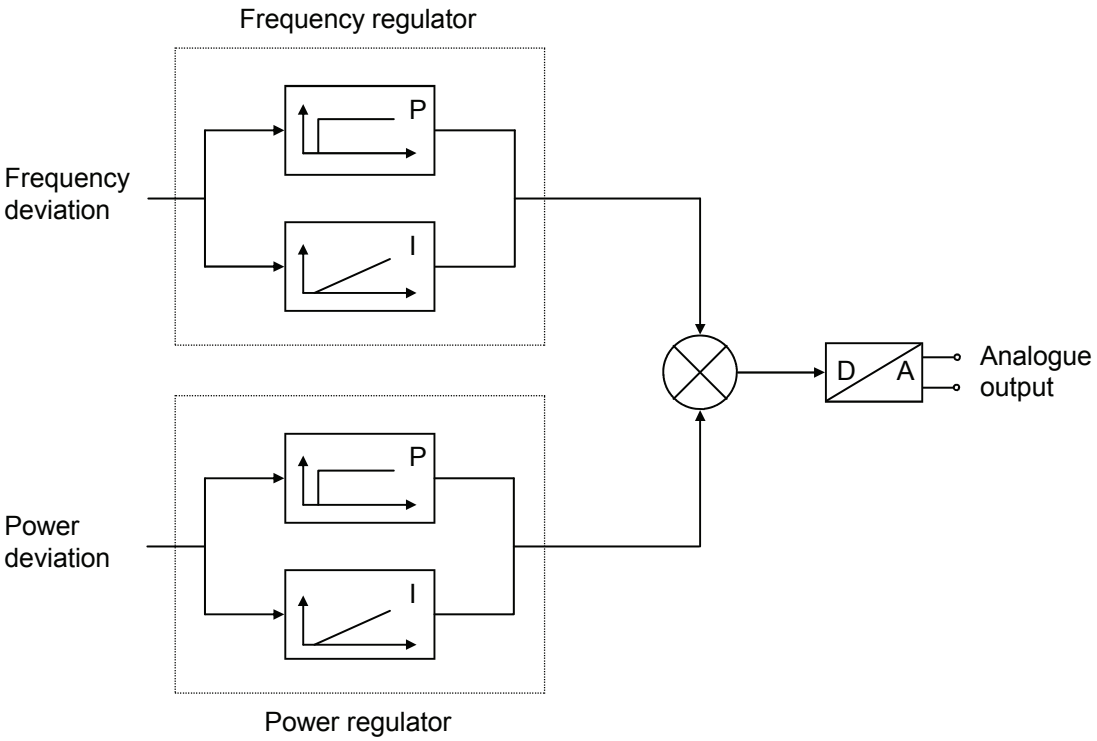
Governor		AVR (option dependent)		Schematic
Frequency	**Power**	**Voltage**	**VAr**	
X		X		
X		X		
	X		X	
X	X	X	X	

The frequency (and voltage) controller is activated when the gen-set is running in island operation, stand-alone or load sharing mode. The power (and VAr) controller is activated when the gen-set is running parallel to the mains or in load sharing mode.

Load sharing mode is option dependent (option G3).

Principle drawing

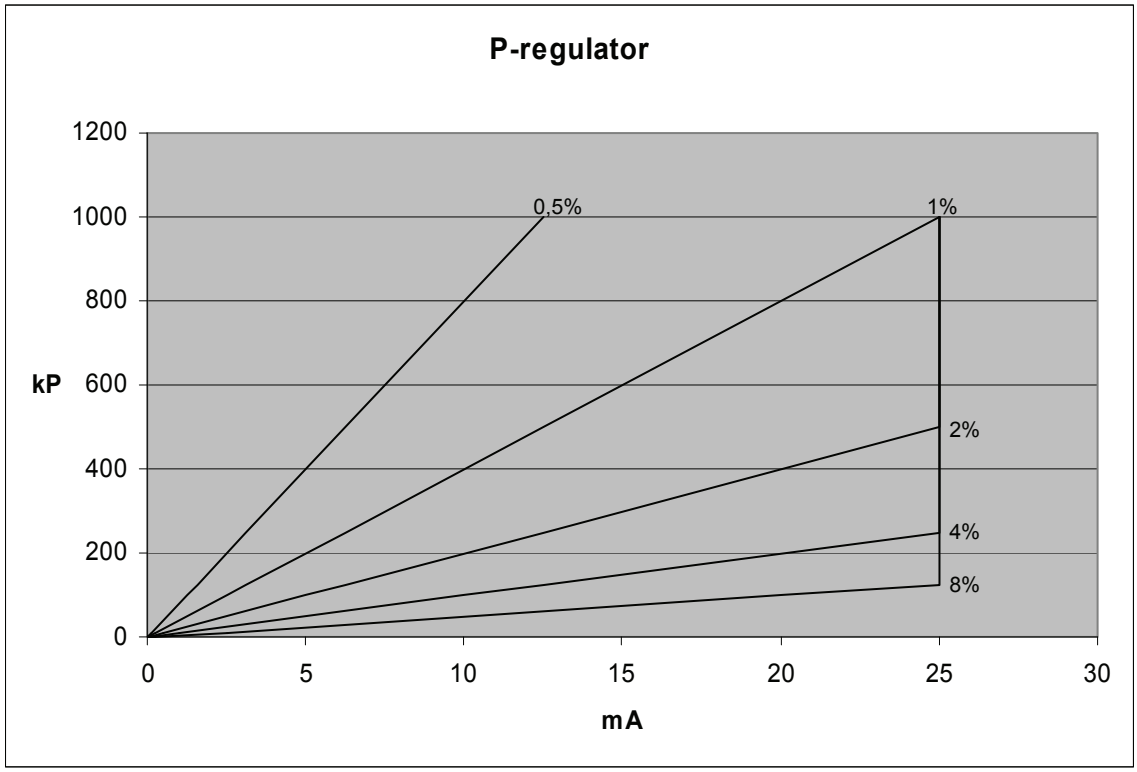
The drawing below shows one PI regulator for the frequency control and one PI regulator for the power control. The output from each regulator is added and converted to the output stage which, in this case, is the analogue output. PWM or relay outputs can also be used.



Proportional regulator

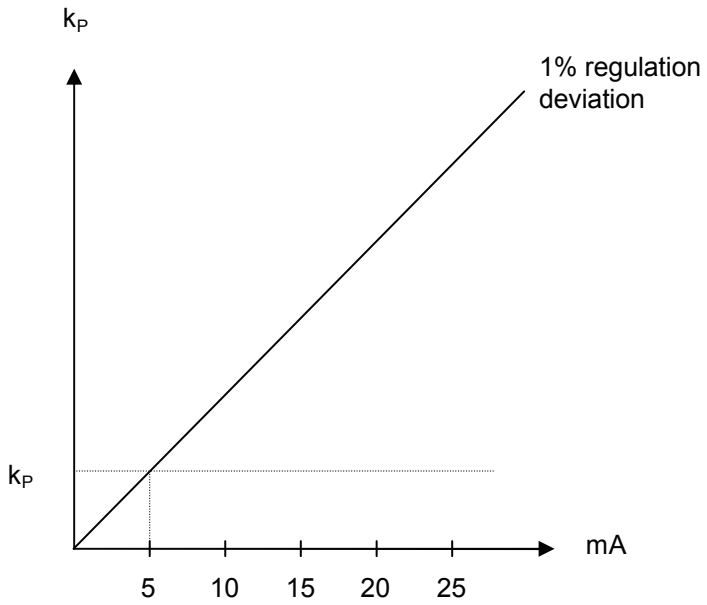
When the regulation deviation occurs, the proportional part will cause an immediate change of the output. The size of the change depends on the proportional action coefficient, KP.

The diagram shows how the output of the P regulator depends on the KP setting. The change of the output at a given KP setting will be doubled, if the regulation deviation doubles.



Speed range

Because of the characteristic above it is recommended to use the full range of the output to avoid an unstable regulation. If the output range used is too small, a small regulation deviation will cause a rather big output change. This is shown in the drawing below.

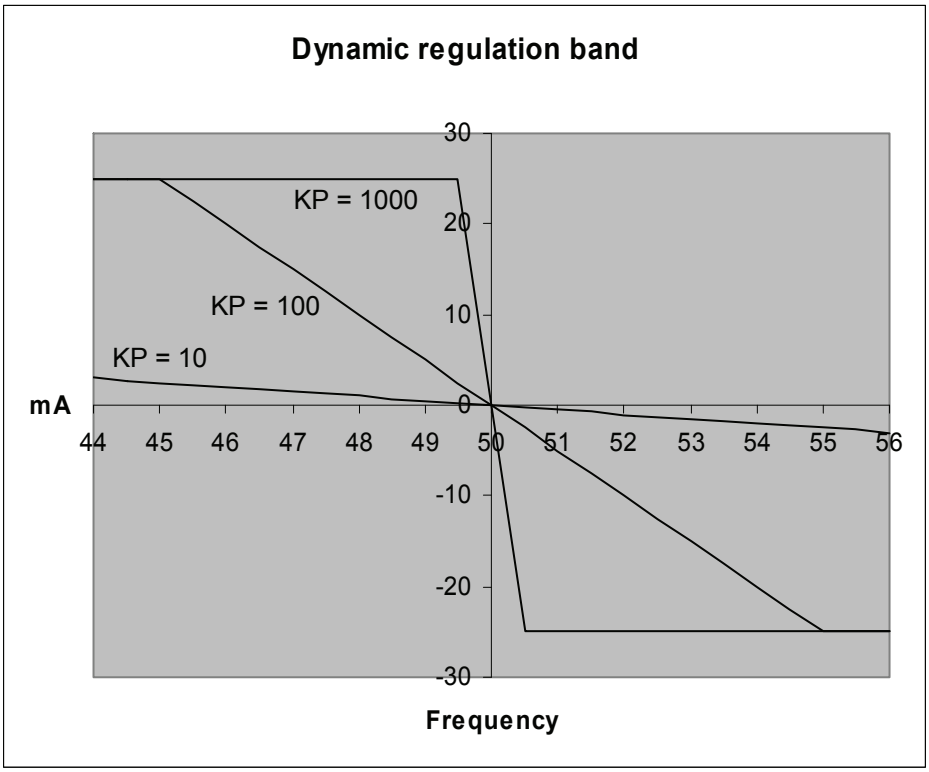


A 1% regulation deviation occurs. With the KP setting adjusted, the deviation causes the output to change 5mA. The table shows that the output of the AGC changes relatively much, if the maximum speed range is low.

Max. speed range	Output change		Output change in % of max. speed range
10mA	5mA	5/10*100%	50
20mA	5mA	5/20*100%	25

Dynamic regulation area

The drawing below shows the dynamic regulation area at given values of KP. The dynamic area gets smaller, if the KP is adjusted to a higher value.

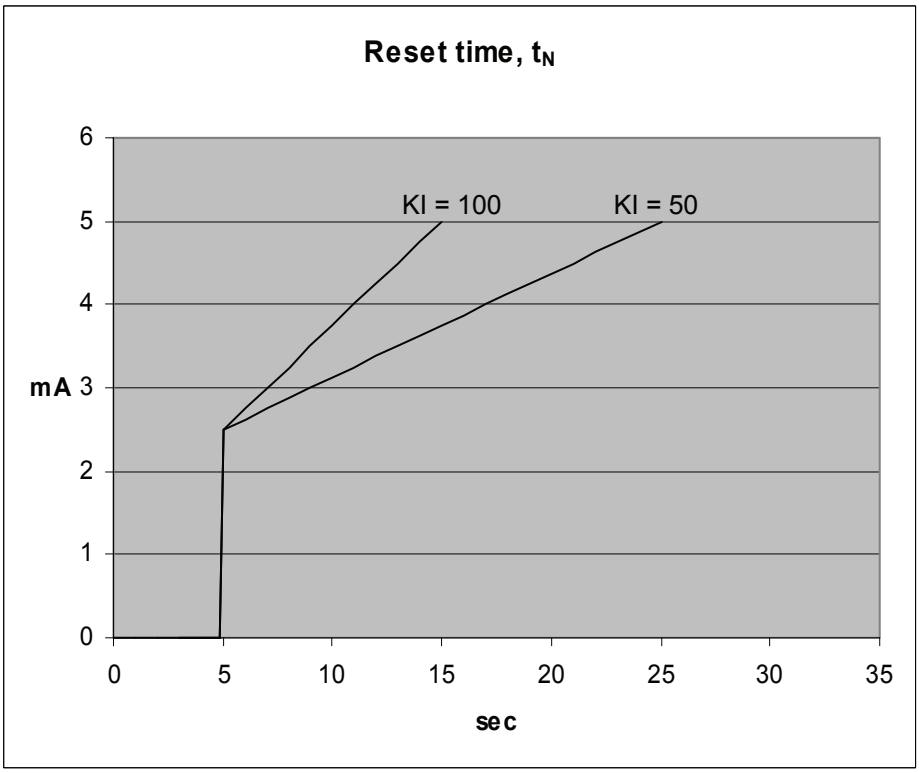


Integral regulator

To illustrate the integral action coefficient, the KI reset time can be used. The reset time is defined as the time the integral regulator uses to replicate the momentary change of the output caused by the proportional regulator.

In the drawing below the proportional regulator causes an immediate change of 2.5mA. The reset time is then measured when the output reaches 2 x 2.5mA = 5mA.

The drawing shows that when the KI setting is changed to half the value, then the reset time is doubled. The reset time is 10 seconds with a KI setting of 100. With the KI setting adjusted to 50 the reset time will be 20 seconds. The KP setting is 100 in this example.



The reset time of the unit can be calculated at all values of KP and KI with the formula:

$$t_N = k_P * 10 / k_I$$

The table shows theoretical reset times in seconds:

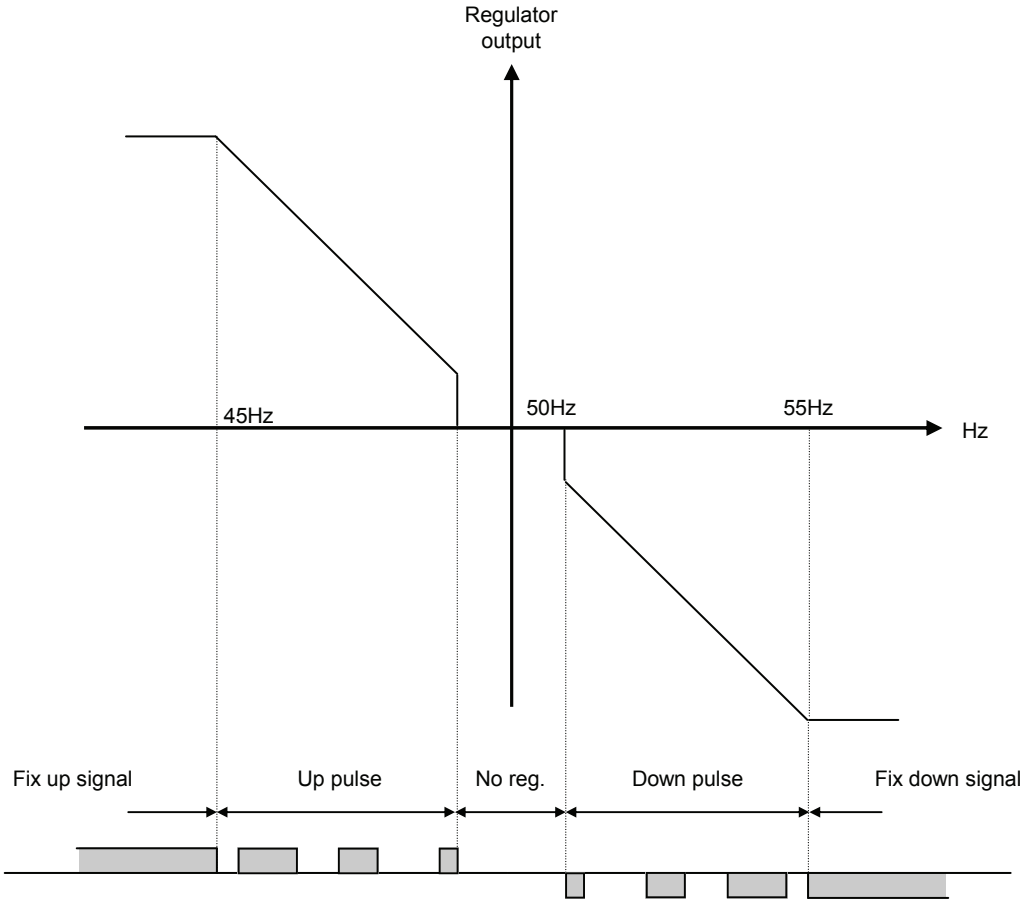
k_P \ k_I	**1**	**10**	**100**	**1000**
1	10	1	0.1	0.01
10	100	10	1	0.1
100	1000	100	10	1
1000	10000	1000	100	10

The integrating function of the I regulator is increased, if the integral action coefficient, KI, is increased. This means that the reset time gets smaller and a faster I regulation is achieved. If the KI is adjusted to 0 (reset time endless), the I regulator is switched off.

The integral action coefficient, KI, must not be too high. This will make the regulation hunt similar to a too high proportional action factor, KP.

Relay control

When the relay outputs are used for control purposes, the regulation works like this:



The regulation with relays can be split up into five steps.

#	Range	Description	Comment
1	Static range	Fix up signal	The regulation is active, but the increase relay will be constantly activated because of the size of the regulation deviation.
2	Dynamic range	Up pulse	The regulation is active, and the increase relay will be pulsing in order to eliminate the regulation deviation.
3	Dead band area	No reg.	In this particular range no regulation takes place. The regulation accepts a predefined dead band area in order to increase the lifetime of the relays.
4	Dynamic range	Down pulse	The regulation is active, and the decrease relay will be pulsing in order to eliminate the regulation deviation.
5	Static range	Fix down signal	The regulation is active, but the decrease relay will be constantly activated because of the size of the regulation deviation.

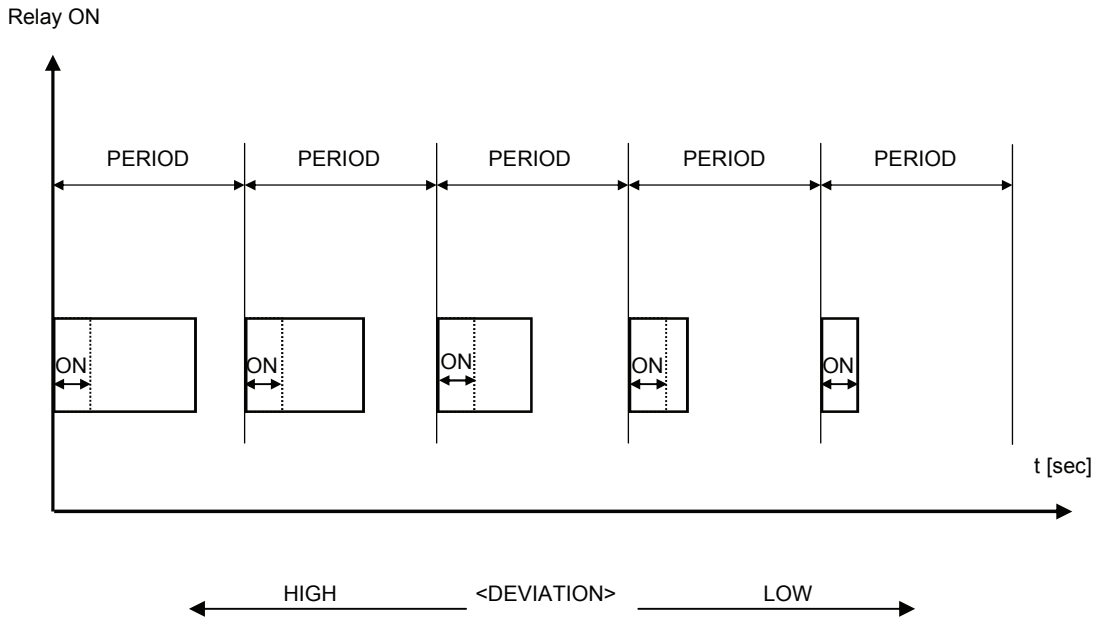
As the drawing indicates, the relays will be fixed on if the regulation deviation is big, and they will be pulsing if it is closer to the setpoint. In the dynamic range the pulses get shorter and shorter when the regulation deviation gets smaller. Just before the dead band area the pulse is as short as it can get. This is the adjusted time 'GOV ON time'/('AVR ON time'). The longest pulse will appear at the end of the dynamic range (45Hz in the example above).

Relay adjustments

The time settings for the regulation relays can be adjusted in the control setup. It is possible to adjust the 'period' time and the 'ON-time'. They are shown on the drawing below.

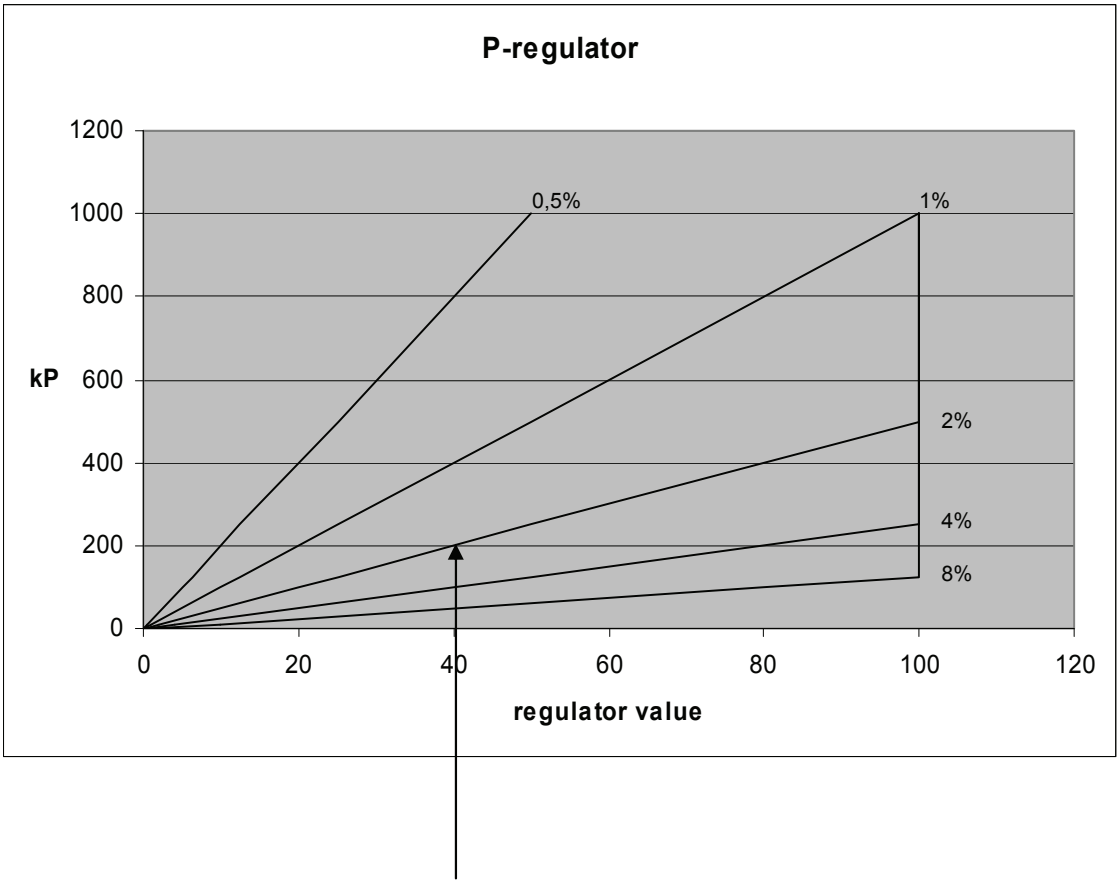
Adjustment	Description	Comment
Period time	Maximum relay time	The time between the beginnings of two subsequent relay pulses.
ON time	Minimum relay time	The minimum length of the relay pulse. The relays will never be activated for a shorter time than the ON time.

As it is indicated in the drawing below, the length of the relay pulse will depend on the actual regulation deviation. If the deviation is big, then the pulses will be long (or a continued signal). If the deviation is small, then the pulses will be short.



Signal length

The signal length is calculated compared to the adjusted period time. In the drawing below the effect of the proportional regulator is indicated.



In this example we have a 2 percent regulation deviation and an adjusted value of the KP = 200. The calculated regulator value of the unit is 40%. Now the pulse length can be calculated with a period time = 2500 ms:

$$e_{DEVIATION} / 100 * t_{PERIOD}$$

$$40 / 100 * 2500 = 1000 ms$$

The length of the period time will never be shorter than the adjusted ON time. The P regulator causes the relay output to activate. The I regulator has the same effect on the relay output as described on page 126 concerning the reset time t_N.

8. Synchronisation

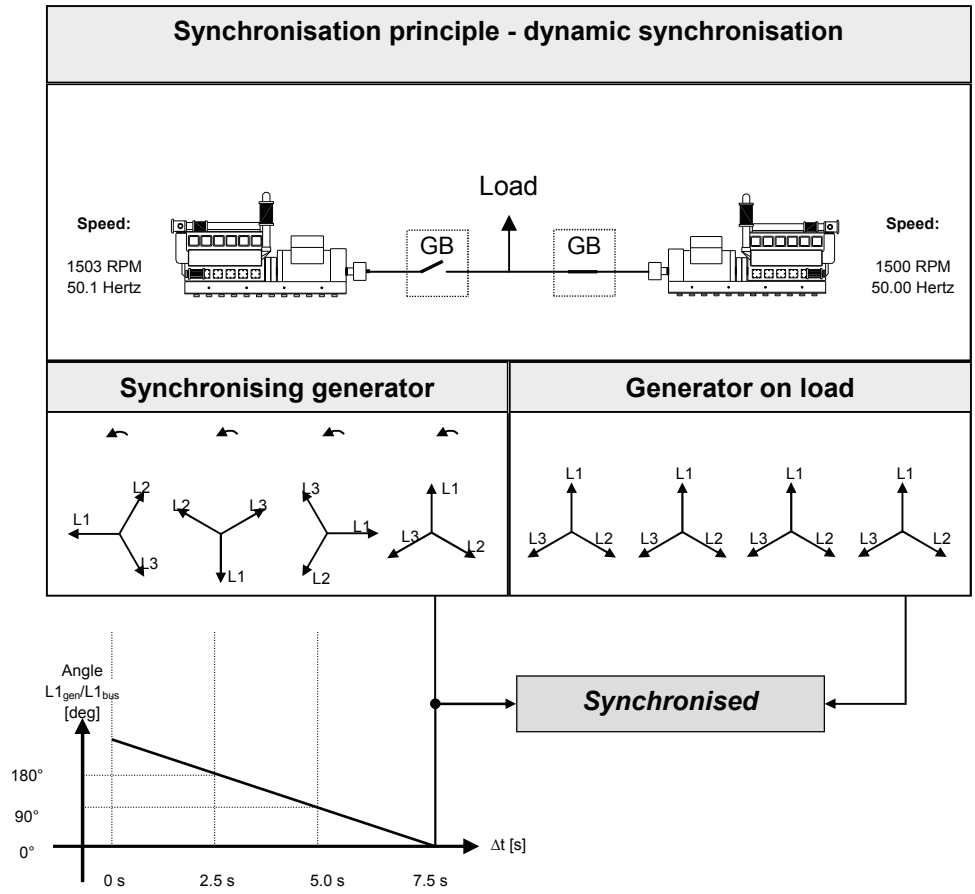
The unit can be used for synchronisation of generator and mains breaker (if installed). Two different synchronisation principles are available, namely static and dynamic synchronisation (dynamic is selected by default). This chapter describes the principles of the synchronisation functions and the adjustment of them.

In the following the term 'synchronisation' means *'synchronising and closing of the synchronised breaker'*.

Dynamic synchronisation

In dynamic synchronisation the synchronising gen-set is running at a different speed than the generator on the busbar. This speed difference is called *slip frequency*. Typically, the synchronising gen-set is running with a positive slip frequency. This means that it is running with a higher speed than the generator on the busbar. The objective is to avoid a reverse power trip after the synchronisation.

The dynamic principle is illustrated below.



In the example above the synchronising gen-set is running at 1503 RPM ~ 50.1Hz. The generator on load is running at 1500 RPM ~ 50.0Hz. This gives the synchronising gen-set a positive slip frequency of 0.1Hz.

The intention of the synchronising is to decrease the phase angle difference between the two rotating systems. These two systems are the three-phase system of the generator and the three-phase system of the busbar. On the illustration above phase L1 of the busbar is always pointing at 12 o'clock, whereas phase L1 of the synchronising gen-set is pointing in different directions due to the slip frequency.

Of course both three-phase systems are rotating, but for illustrative purposes the vectors for the generator on load are not shown to be rotating. This is because we are only interested in the slip frequency for calculating when to release the synchronisation pulse.

When the generator is running with a positive slip frequency of 0.1Hz compared to the busbar, then the two systems will be synchronised every 10 seconds.

$$t_{SYNC} = \frac{1}{50.1 - 50.0} = 10\,\text{sec}$$

In the illustration above the difference in the phase angle between the synchronising set and the busbar gets smaller and will eventually be zero. Then the gen-set is synchronised to the busbar, and the breaker will be closed.

Close signal

The unit always calculates when to close the breaker to get the most accurate synchronisation. This means that the close breaker signal is actually issued before being synchronised (read L1 phases exactly at 12 o'clock).

The breaker close signal will be issued depending on the breaker closing time and the slip frequency (response time of the circuit breaker is 250 ms, and the slip frequency is 0.1Hz):

$$\deg_{CLOSE} = 360 * t_{CB} * f_{SLIP}$$
$$\deg_{CLOSE} = 360 * 0.250 * 0.1$$
$$\deg_{CLOSE} = 9\,\deg$$

The synchronisation pulse is always issued, so the closing of the breaker will occur at the 12 o'clock position.

The length of the synchronisation pulse is the response time + 20 ms **(2020 Dynamic synchronisation)**.

Load picture after synchronising

When the incoming gen-set has closed its breaker, it will take a portion of the load depending on the actual position of the fuel rack. Illustration 1 below indicates that at a given *positive* slip frequency, the incoming gen-set will *export* power to the load. Illustration 2 below shows that at a given *negative* slip frequency, the incoming gen-set will *receive* power from the original gen-set. This phenomenon is called *reverse power*.

To avoid nuisance trips caused by reverse power the synchronising settings can be set up with a positive slip frequency.

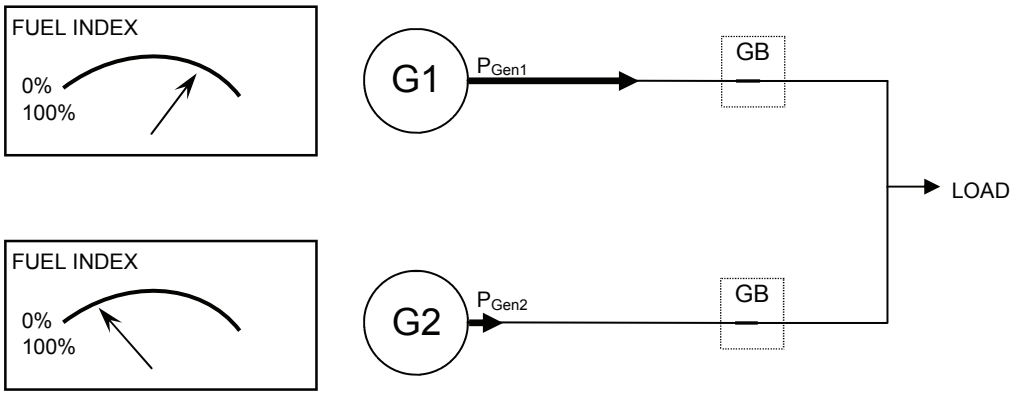


Illustration 1, POSITIVE slip frequency

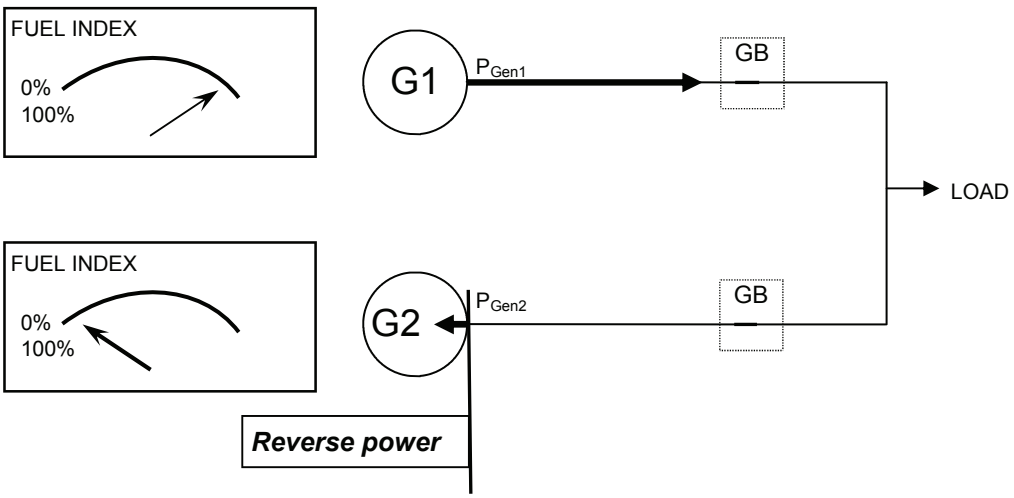


Illustration 2, NEGATIVE slip frequency

Adjustments

The dynamic synchroniser is selected in **2010 Synchronisation type** in the control setup and is adjusted in **2020 Dynamic synchronisation**

Setting	Description	Comment
2021 f_{MAX}	Maximum slip frequency.	Adjust the maximum positive slip frequency where synchronising is allowed.
2022 f_{MIN}	Minimum slip frequency.	Adjust the maximum negative slip frequency where synchronising is allowed.
2023 U_{MAX}	Maximum voltage differrence (+/- value).	The maximum allowed voltage difference between the busbar/mains and the generator.
2024 t_{GB}	Generator breaker closing time.	Adjust the response time of the generator breaker.
2025 t_{MB}	Mains breaker closing time.	Adjust the response time of the mains breaker.

It is obvious that this type of synchronisation is able to synchronise relatively fast because of the adjusted minimum and maximum slip frequencies. This actually means that when the unit is aiming to control the frequency towards its setpoint, then synchronising can still occur as long as the frequency is within the limits of the slip frequency adjustments.

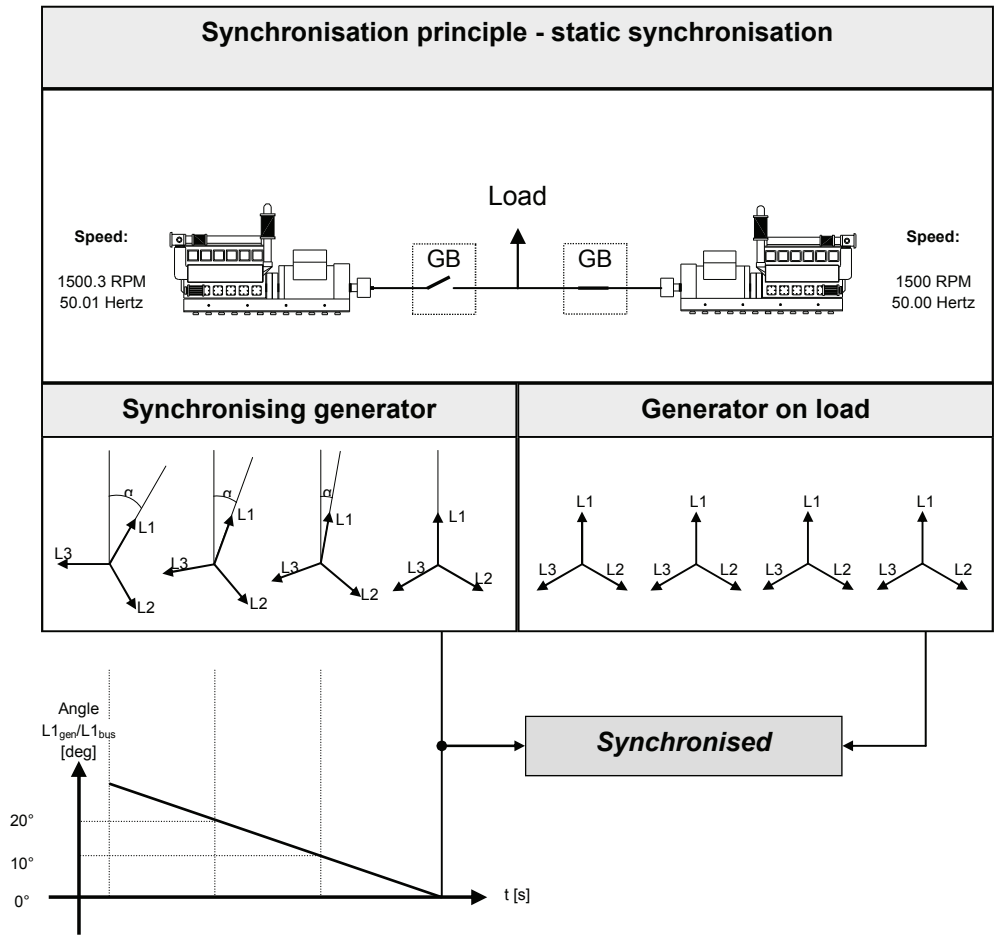
Dynamic synchronisation is recommended where fast synchronisation is required, and where the incoming gen-sets are able to take load just after the breaker has been closed.

Static synchronisation

In static synchronisation the synchronising gen-set is running very close to the same speed as the generator on the busbar. The aim is to let them run at exactly the same speed and with the phase angles between the three-phase system of the generator and the three-phase system of the busbar matching exactly.

It is not recommended to use the static synchronisation principle when relay regulation outputs are used. This is due to the slower nature of the regulation with relay outputs.

The static principle is illustrated below.



Phase controller

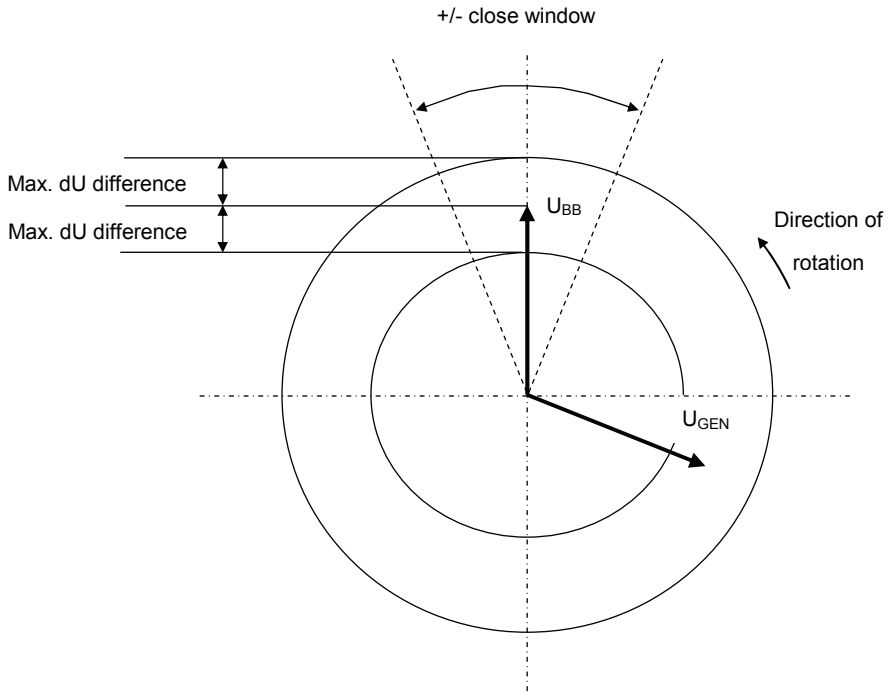
When the static synchronisation is used and the synchronising is activated, the frequency controller will bring the gen-set frequency towards the busbar frequency. When the gen-set frequency is within 50mHz of the busbar frequency, then the phase controller takes over. This controller uses the angle difference between the generator system and the busbar system as the controlling parameter.

This is illustrated in the example above where the phase controller brings the phase angle from 30 deg. to 0 deg.

Close signal

The close signal will be issued when phase L1 of the synchronising generator is close to the 12 o'clock position compared to the busbar which is also in 12 o'clock position. It is not relevant to use the response time of the circuit breaker when using static synchronisation, because the slip frequency is either very small or non-existing.

To be able to get a faster synchronisation a 'close window' can be adjusted. The close signal can be issued when the phase angle U_{GENL1}-U_{BBL1} is within the adjusted setpoint. The range is +/-0.1-20.0 deg. This is illustrated in the drawing below.



The synchronisation pulse is sent dependent on the settings in **2020 Dynamic synchronisation** . Depends if it is the GB or the MB, which is to be synchronised.

Load picture after synchronisation

The synchronised gen-set will not be exposed to an immediate load after the breaker closure, if the maximum df setting is adjusted to a low value. Since the fuel rack position almost exactly equals what is required to run at the busbar frequency, no load jump will occur.

If the maximum df setting is adjusted to a high value, then the observations in the section about 'dynamic synchronisation' must be observed.

After the synchronising the unit will change the controller setpoint according to the requirements of the selected gen-set mode.

Static synchronisation is recommended where a slip frequency is not accepted, for instance if several gen-sets synchronise to a busbar with no load groups connected.

Settings

The following settings must be adjusted, if the static synchroniser is selected:

Setting	Description	Comment
Maximum df	The maximum allowed frequency difference between the busbar/mains and the generator.	+/- value.
Maximum dU	The maximum allowed voltage difference between the busbar/mains and the generator.	+/- value, related to the nominal generator voltage.
Close window	The size of the window where the synchronisation pulse can be released.	+/- value.
Phase K_P	Adjustment of the proportional factor of the PI phase controller.	Only used during static synchronisation.
Phase K_I	Adjustment of the integral factor of the PI phase controller.	

GB closing before excitation

It is possible to adjust the AGC to start up the gen-set with the excitation switched off. When the gen-sets are started up, then the breakers will be closed and the excitation started. It is also possible to close the breaker before the engine is started. This function is called 'close before excitation'.

The purpose of the 'close before excitation' is that the gen-sets are able to be ready for the load very quickly. All of the gen-sets will be connected to the busbar as soon as they are started, and as soon as the excitation is switched on the gen-sets are ready for operation. This is faster than the normal synchronising, because in that case the breakers will not be closed until the generator voltage is in the synchronised position, and it takes some time to achieve that position.

The 'close before start' function can also be used, if the load requires a 'soft' start. This can be the case when the gen-sets connect to a transformer.

As soon as the excitation is activated, the generators will equalize the voltage and frequency and will eventually run in a synchronised system. When the excitation is activated, then the regulators of the AGC will be switched on after an adjustable delay.

The excitation must be increased slowly when this function is used.

This function can only be used when a magnetic pick-up is used.

The function can be used in the single AGC but also the AGC with option G5. The only exception is that when option G3 is selected, then the 'close before excitation' function is not available.

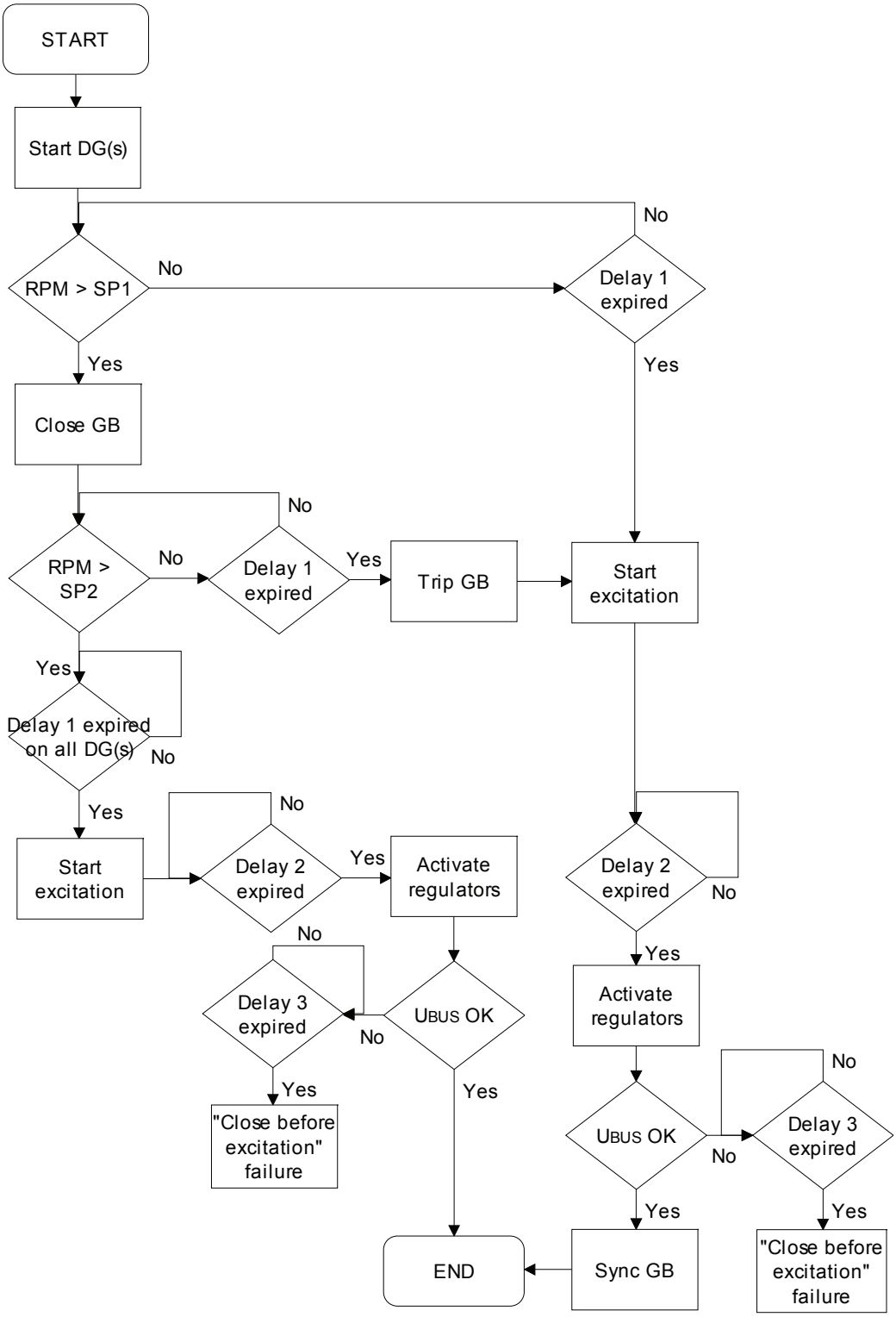
The principle is described in the flowcharts below.

Flowchart abbreviations

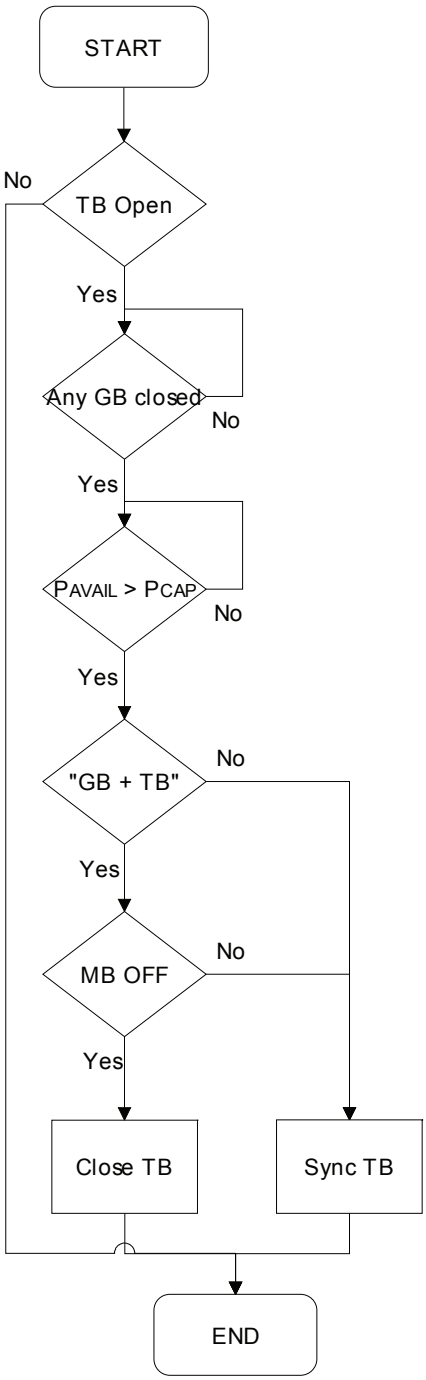
Delay 1 = Menu 2112
Delay 2 = Menu 2122
Delay 3 = Menu 2131

SP1 = Menu 2111
SP2 = Menu 2123

Flowchart 1, GB handling



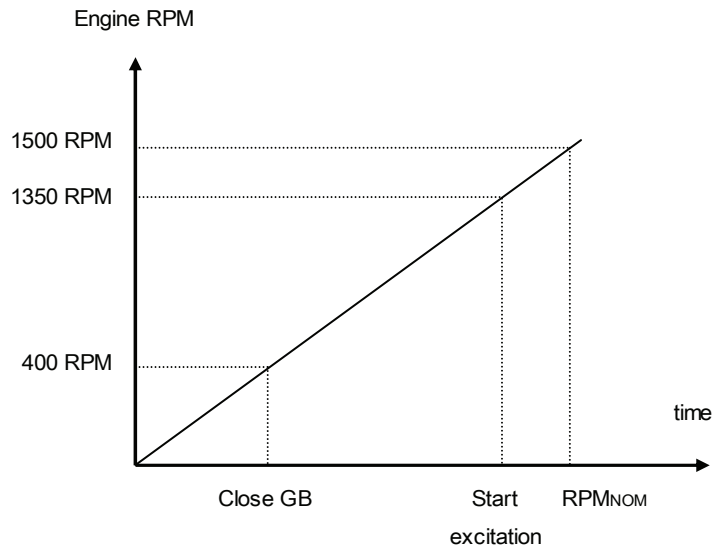
Flowchart 2, TB handling (option G5)



Gen-set start actions

The start sequence of the AGC is changed in order to achieve the function 'close before excitation'. The following parameters must be adjusted:

Menu	Description	Comment
2111	RPM setpoint for breaker closing	The generator breaker will close at the adjusted level. The range is from 0-400 RPM. If it is adjusted to 0, then the breaker will be closed when the start command is given. In the example below the setting is adjusted to 400.
2112	RPM timer	The gen-set must reach the setpoint (menu 2123) within the adjusted delay. When the delay expires and the RPM is above the setpoint, then the excitation will be started. If the RPM is below the setpoint, then the GB will be tripped.
2113	Output A	Select the relay output that must be used to start the excitation. Configure the relay to be a limit relay in the I/O setup.
2114	Output B	Select the relay output that must be used to start the excitation. Select the same relay as in the menu 2113.
2115	Enable	Enable the function 'close before excitation'.



The diagram above shows that the GB will be closed at 400 RPM. When the engine RPM has reached the setpoint (menu 2123) (1450 RPM), then the excitation is switched on.

Breaker sequence

The 'GB close before start' function can be used in three applications:

1. AGC single gen-set plant.
2. AGC power management plant - no tie breaker present.
3. AGC power management plant - tie breaker present.

In one of the applications a tie breaker is present, and it must be adjusted in the menu 2121 whether only the generator breaker must be closed or both the generator breaker and also the tie breaker.

The breaker sequence adjustments are the following:

Menu	Description	Comment
2121	Breaker selection	Select breakers to close: GB or GB + TB.
2122	Timer	The timer defines the period from the excitation is started and until the regulation is activated. The alarms set to 'RUN' will be activated after this timer has expired.
2123	Excitation start level	The setting defines at what level of RPM the excitation is started.

'Close before excitation' failure

If the starting of the gen-set does not succeed, then the alarm menu 2130 'Excit failure' will occur, and the selected fail class will be executed.

Separate synchronising relay

When the AGC gives the synchronising command, then the relays on terminal 17/18/19 (generator breaker) and terminal 11/12/13 (mains breaker) will activate, and the breaker must close when this relay output is activated.

This default function can be modified using a digital input and extra relay outputs depending on the required function. The relay selection is made in the menu 2100, and the input is selected in the input settings in the utility software.

This function is option dependent. Option M14 or M12 is required. Option M14 includes relays 1-4 and option M12 includes 13 digital inputs and relays 5-8.

The table below describes the possibilities.

Relay / Input	Relay selected Two relays used	Relay not selected One relay used
Not used	**Synchronising:** The breaker ON relay and the sync. relay activate at the same time when synchronising is OK. **Blackout closing:** The breaker ON relay and the sync. relay activate at the same time when the voltage and frequency are OK.	**Synchronising:** The breaker ON relay activates when synchronising is OK. **Blackout closing:** The breaker ON relay activates when the voltage and frequency are OK. **DEFAULT selection**
Low	**Synchronising:** Not possible. **Blackout closing:** The breaker ON relay and the sync. relay activate at the same time when the voltage and frequency are OK.	**Synchronising:** Not possible. **Blackout closing:** The breaker ON relay activates when the voltage and frequency are OK.

Relay / Input	Relay selected Two relays used	Relay not selected One relay used
High	**Synchronising:** The relays will activate in two steps when the synchronising is selected: 1. Breaker ON relay activates. 2. When synchronised the sync. relay activates. **See note below!** **Blackout closing:** The breaker ON relay and the sync. relay activate at the same time when the voltage and frequency are OK.	**Synchronising:** Not possible. **Blackout closing:** The breaker ON relay activates when the voltage and frequency are OK.

When two relays are used together with the separate sync. input, then please notice that the breaker ON relay will be activated as soon as the GB ON/synchronising sequence is activated.

Care must be taken that the GB ON relay cannot close the breaker, before the sync. signal is issued by the sync. relay.

The selected relay for this function must have the 'limit' function. This is adjusted in the I/O setup.

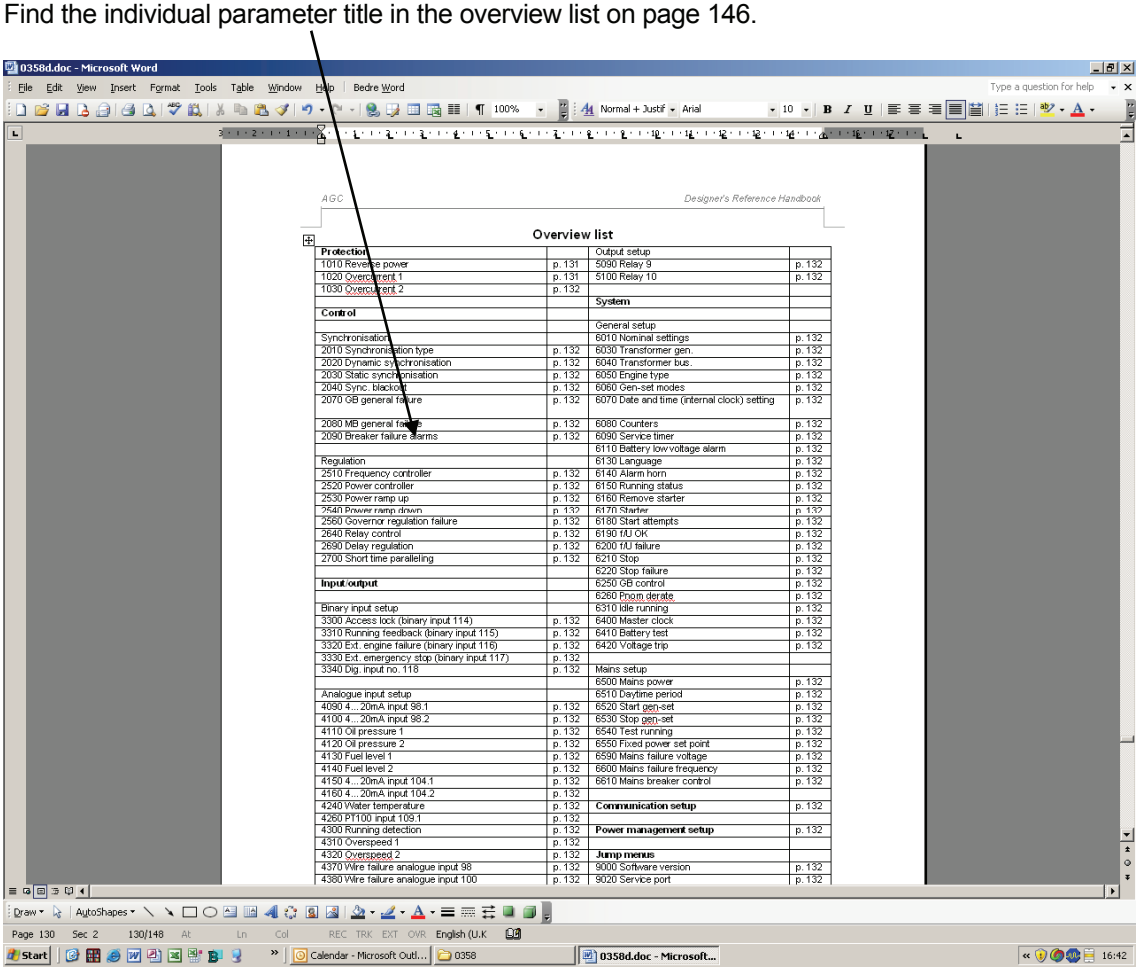
9. Procedure for parameter setup

This chapter deals with the procedure to be followed when the parameters of the unit are set up from the initial point of finding the individual parameter description in this handbook to the actual setup. By use of various illustrations the following will guide the user through the whole procedure for parameter setup step by step.

Finding the selected parameter

The first step in the parameter setup is finding the correct parameter descriptions. All parameter descriptions are located in chapter 10 'Parameter list' which is intended for reference purposes. The descriptions are structured according to their parameter titles and the main parameter group to which they belong.

Find the individual parameter title in the overview list on page 146.

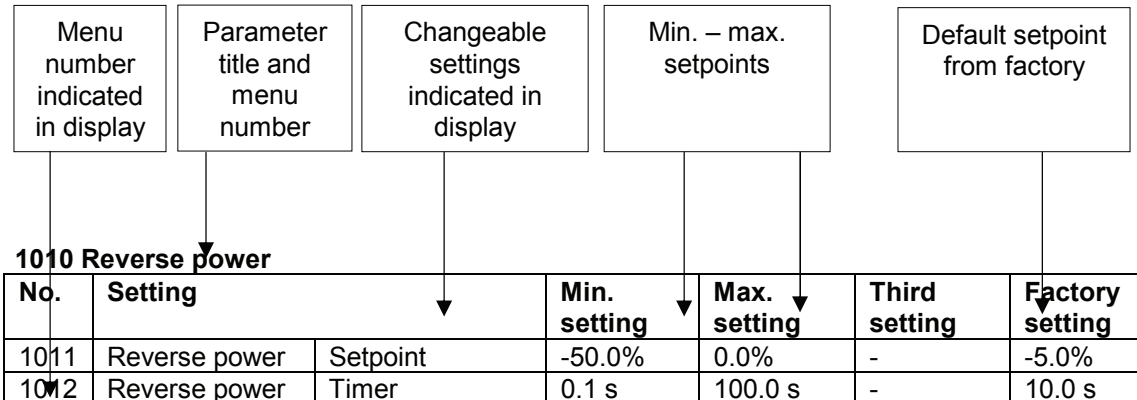


Protection		Output setup	
1010 Reverse power	p. 131	5090 Relay 9	p. 132
1020 Overcurrent 1	p. 131	5100 Relay 10	p. 132
1030 Overcurrent 2	p. 132		
		System	
Control			
		General setup	
Synchronisation		6010 Nominal settings	p. 132
2010 Synchronisation type	p. 132	6030 Transformer gen.	p. 132
2020 Dynamic synchronisation	p. 132	6040 Transformer bus.	p. 132
2030 Static synchronisation	p. 132	6050 Engine type	p. 132
2040 Sync. blackout	p. 132	6060 Gen-set modes	p. 132
2070 GB general failure	p. 132	6070 Date and time (internal clock) setting	p. 132
2080 MB general failure	p. 132	6080 Counters	p. 132
2090 Breaker failure alarms	p. 132	6090 Service timer	p. 132
		6110 Battery low voltage alarm	p. 132
Regulation		6130 Language	p. 132
2510 Frequency controller	p. 132	6140 Alarm horn	p. 132
2520 Power controller	p. 132	6150 Running status	p. 132
2530 Power ramp up	p. 132	6160 Remove starter	p. 132
2540 Power ramp down	p. 132	6170 Starter	p. 132
2560 Governor regulation failure	p. 132	6180 Start attempts	p. 132
2640 Relay control	p. 132	6190 f/U OK	p. 132
2690 Delay regulation	p. 132	6200 f/U failure	p. 132
2700 Short time paralleling	p. 132	6210 Stop	p. 132
		6220 Stop failure	p. 132
Input/output		6250 GB control	p. 132
		6260 Pnom derate	p. 132
Binary input setup		6310 Idle running	p. 132
3300 Access lock (binary input 114)	p. 132	6400 Master clock	p. 132
3310 Running feedback (binary input 115)	p. 132	6410 Battery test	p. 132
3320 Ext. engine failure (binary input 116)	p. 132	6420 Voltage trip	p. 132
3330 Ext. emergency stop (binary input 117)	p. 132		
3340 Dig. input no. 118	p. 132	Mains setup	
		6500 Mains power	p. 132
Analogue input setup		6510 Daytime period	p. 132
4090 4...20mA input 98.1	p. 132	6520 Start gen-set	p. 132
4100 4...20mA input 98.2	p. 132	6530 Stop gen-set	p. 132
4110 Oil pressure 1	p. 132	6540 Test running	p. 132
4120 Oil pressure 2	p. 132	6550 Fixed power set point	p. 132
4130 Fuel level 1	p. 132	6590 Mains failure voltage	p. 132
4140 Fuel level 2	p. 132	6600 Mains failure frequency	p. 132
4150 4...20mA input 104.1	p. 132	6610 Mains breaker control	p. 132
4160 4...20mA input 104.2	p. 132		
4240 Water temperature	p. 132	**Communication setup**	p. 132
4260 PT100 input 109.1	p. 132		
4300 Running detection	p. 132	**Power management setup**	p. 132
4310 Overspeed 1	p. 132		
4320 Overspeed 2	p. 132	**Jump menus**	
4370 Wire failure analogue input 98	p. 132	9000 Software version	p. 132
4380 Wire failure analogue input 100	p. 132	9020 Service port	p. 132

In the overview list you will find the page location of the parameter description you are looking for.

Parameter descriptions

In chapter 10 each parameter description is structured according to the same principles. Under the parameter title heading, the detailed parameter descriptions are illustrated and presented. First, a table indicating the parameter facts related to the individual parameter title is presented:



1010 Reverse power

No.	Setting		Min. setting	Max. setting	Third setting	Factory setting
1011	Reverse power	Setpoint	-50.0%	0.0%	-	-5.0%
1012	Reverse power	Timer	0.1 s	100.0 s	-	10.0 s
1013	Reverse power	Relay output A	R0 (none)	R3 (relay 3)	-	R0 (none)
1014	Reverse power	Relay output B	R0 (none)	R3 (relay 3)	-	R0 (none)
1015	Reverse power	Enable	OFF	ON	RUN	ON
1016	Reverse power	Fail class	1	5	-	3

Small differences due to the character of the parameters may exist between the individual tables.

The first column indicates the menu number in the display.

The second column indicates the changeable setting in the display.

The third and fourth columns indicate the minimum/maximum setpoint available for this setting.

The sixth column indicates the default setpoint of the unit from the factory. When it is necessary, additional information will be supplied after the table in order to make the individual parameter descriptions as informative as possible.

Setup

At this point of the process you will have located the specific parameter description that you were looking for. Now, follow the menu structure presented earlier in this handbook in order to set up the individual parameters. (In this overall example we have chosen to change the setpoint of the parameter **1010 Reverse power**).

Step 1: Enter the 'setup' menu via SETUP in the fourth display line in the entry window
Step 2: Enter the 'protection' menu via PROT in the fourth display line in the setup menu
Step 3: Enter the 'setpoint 1' menu via PROT1 in the fourth display line in the setup menu
Step 4: Use JUMP or the ▽ and △ push-buttons to locate the selected parameter
Step 5: Enter the 'setpoint' menu via LIM in the fourth display line
Step 6: Enter password to change the setpoint
Step 7: Use the ▽ and △ push-buttons to increase/decrease the setpoint setting
Step 8: Use the 'underscore' to save the new setpoint setting

10. Parameter list

This chapter includes a complete standard parameter list. Therefore, this part of the handbook is to be used for reference when specific information about the individual parameters is needed for the unit setup. An overview list can be seen on the next page.

The parameter lists for the available options are presented in the documents Description of Options describing the individual options in detail.

Parameter table description

The table consists of the following possible adjustments:

Setpoint: The alarm setpoint is adjusted in the setpoint menu. The setting is a percentage of the nominal values.

Timer: The timer setting is the time that must expire from the alarm level is reached until the alarm occurs.

Relay output A: A relay can be activated by output A.

Relay output B: A relay can be activated by output B.

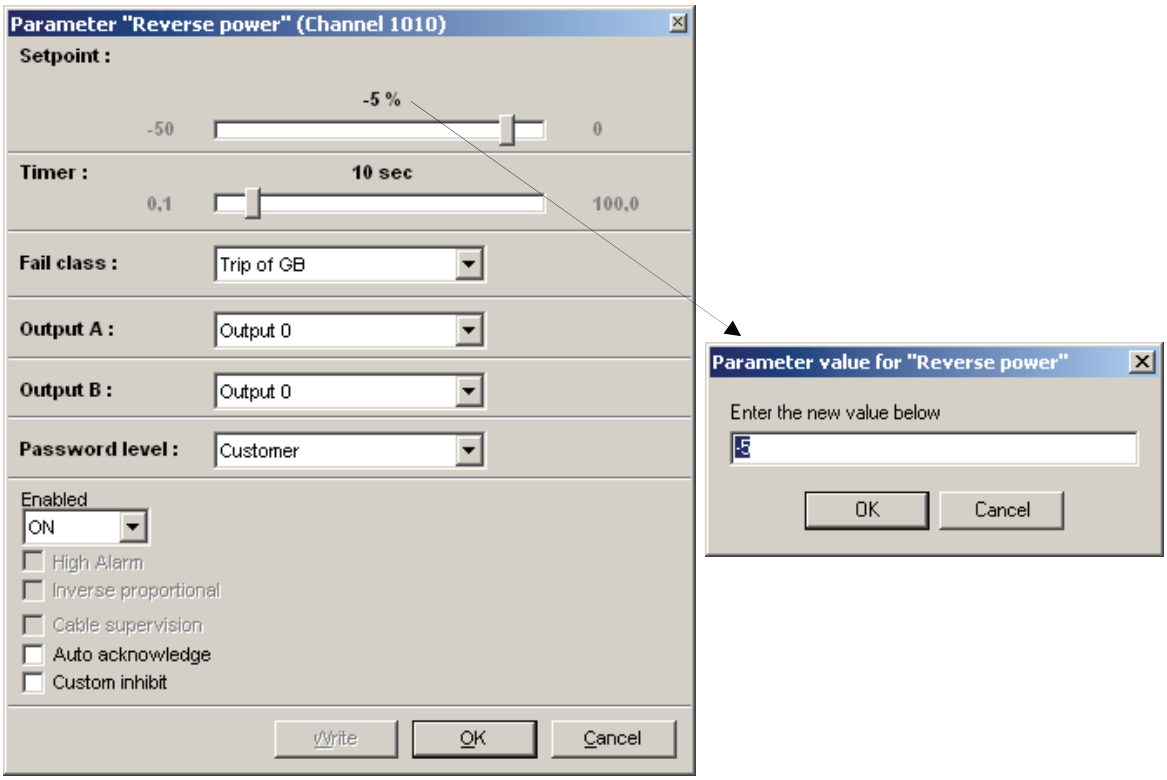
Enable: The alarm can be activated or deactivated. ON means always activated, RUN means that the alarm has run status. This means it is activated when the running signal is present.

Fail class: When the alarm occurs the unit will react depending on the selected fail class.

Small differences due to the character of the parameters may exist between the individual tables.

It is also possible to configure the parameters by using the PC utility software. It will be possible to make the same configurations as described above.

By using the PC utility software some extra functionalities are available. For all the protections it is possible to make an automatic acknowledgement of the alarm. Usually it is important when the mains protections are used, as the sequences are blocked until the alarm is acknowledged.


Parameter "Reverse power" (Channel 1010)
Setpoint :
-5 %
-50
0
Timer :
10 sec
0,1
100,0
Fail class :
Trip of GB
Output A :
Output 0
Output B :
Output 0
Password level :
Customer
Enabled
ON
High Alarm
Inverse proportional
Cable supervision
Auto acknowledge
Custom inhibit
Write
OK
Cancel
Parameter value for "Reverse power"
Enter the new value below
-5
OK
Cancel

Overview list

Protection

1010 Reverse power

No.	Setting		Min. setting	Max. setting	Third setting	Factory setting
1011	Reverse power	Setpoint	-50.0%	0.0%	-	-5.0%
1012	Reverse power	Timer	0.1 s	100.0 s	-	10.0 s
1013	Reverse power	Relay output A	R0 (none)	Option dependent	-	R0 (none)
1014	Reverse power	Relay output B	R0 (none)		-	R0 (none)
1015	Reverse power	Enable	OFF	ON	RUN	ON
1016	Reverse power	Fail class	Alarm (1)	Trip MB (6)	-	Trip GB (3)

1020 Overcurrent 1

No.	Setting		Min. setting	Max. setting	Third setting	Factory setting
1021	Overcurrent 1	Setpoint	50.0%	200.0%	-	115.0%
1022	Overcurrent 1	Timer	0.1 s	100.0 s	-	10.0 s
1023	Overcurrent 1	Relay output A	R0 (none)	Option dependent	-	R0 (none)
1024	Overcurrent 1	Relay output B	R0 (none)		-	R0 (none)
1025	Overcurrent 1	Enable	OFF	ON	RUN	ON
1026	Overcurrent 1	Fail class	Alarm (1)	Trip MB (6)	-	Warning (2)

1030 Overcurrent 2

No.	Setting		Min. setting	Max. setting	Third setting	Factory setting
1031	Overcurrent 2	Setpoint	50.0%	200.0%	-	120.0%
1032	Overcurrent 2	Timer	0.1 s	100.0 s	-	5.0 s
1033	Overcurrent 2	Relay output A	R0 (none)	Option dependent	-	R0 (none)
1034	Overcurrent 2	Relay output B	R0 (none)		-	R0 (none)
1035	Overcurrent 2	Enable	OFF	ON	RUN	ON
1116	Overcurrent 2	Fail class	Alarm (1)	Trip MB (6)	-	Trip GB (3)

Control

This setup menu consists of the synchronisation setup and the regulation setup.

Synchronisation

2010 Synchronisation type

No.	Setting		First setting	Second setting	Factory setting
2011	Sync. type	Sync. type	Static sync.	Dynamic sync.	Dynamic sync.

If dynamic synchronisation is chosen, the next menu will be **2020 Dynamic synchronisation** . If static synchronisation is chosen, the next menu will be **2030 Static synchronisation** .

2020 Dynamic synchronisation

No.	Setting		Min. setting	Max. setting	Factory setting
2021	Dynamic sync.	df max.	0.0Hz	0.5Hz	0.3Hz
2022	Dynamic sync.	df min.	-0.5Hz	0.5Hz	0.0Hz
2023	Dynamic sync.	dU max.	2%	10%	5%
2024	Dynamic sync.	Breaker delay	40 ms	300 ms	50 ms

2030 Static synchronisation

No.	Setting		Min. setting	Max. setting	Factory setting
2031	Static sync.	Maximum df	0.00Hz	0.50Hz	0.10Hz
2032	Static sync.	Maximum dU	2%	10%	5%
2033	Static sync.	Close window	0.1 deg.	20.0 deg.	10.0 deg.
2034	Static sync.	Phase K_P	0	1000	10
2035	Static sync.	Phase K_I	0	1000	10

2040 Sync. blackout

No.	Setting		Min. setting	Max. setting	Factory setting
2041	Sync. blackout	df max.	0.0Hz	5.0Hz	3.0Hz
2042	Sync. blackout	dU max.	2%	10%	5%

Settings are accepted limits (generator voltage and frequency) for closing the generator and mains breaker. The values are according to nominal values.

Example:
f_{NOM} and U_{NOM} = 50 Hertz and 400 volts.

With factory settings the breaker is able to close, if the frequency is between 47 and 53 Hertz and the voltage is between 380 and 420 volts.

2070 GB general failure

- Synchronisation time — Adjustable time delay channel 2071
- Breaker ON/OFF feedback fail. — 1 second fixed time delay
- Phase sequence error — 1 second fixed time delay

No.	Setting		Min. setting	Max. setting	Factory setting
2071	GB general fail.	Delay	30.0 s	300.0 s	60.0 s
2072	GB general fail.	Relay output A	R0 (none)	Option dependent	R0 (none)
2073	GB general fail.	Relay output B	R0 (none)		R0 (none)

The general failure alarms cannot be disabled.

2080 MB general failure

- Synchronisation time — Adjustable time delay channel 2081
- Breaker ON/OFF feedback fail. — 1 second fixed time delay
- Phase sequence error — 1 second fixed time delay

No.	Setting		Min. setting	Max. setting	Factory setting
2081	MB general fail.	Delay	30.0 s	300.0 s	60.0 s
2082	MB general fail.	Relay output A	R0 (none)	Option dependent	R0 (none)
2083	MB general fail.	Relay output B	R0 (none)		R0 (none)

The general failure alarms cannot be disabled.

2090 Breaker failure alarms

The fail class of the breaker open and close failure alarms can be adjusted in this menu.

No.	Setting		Min. setting	Max. setting	Factory setting
2091	MB open failure	Fail class	1	6	2 (warning)
2092	MB close failure	Fail class	1	6	2 (warning)
2093	GB open failure	Fail class	1	6	2 (warning)
2094	GB close failure	Fail class	1	6	2 (warning)

See page 91 regarding fail class selection.

2100 Separate synchronisation relay

No.	Setting		Min. setting	Max. setting	Factory setting
2101	Generator breaker	Relay output A	R0 (none)	Option dependent	R0 (none)
2102	Mains breaker	Relay output B	R0 (none)		R0 (none)

2110 Close before excitation

No.	Setting		Min. setting	Max. setting	Factory setting
2111	Close bf. excit.	Setpoint	0 RPM	4000 RPM	400 RPM
2112	Close bf. excit.	Timer	0.0 s	999.0 s	5.0 s
2113	Close bf. excit.	Relay output A	R0 (none)	Option dependent	R0 (none)
2114	Close bf. excit.	Relay output B	R0 (none)		R0 (none)
2115	Close bf. excit.	Enable	OFF	ON	OFF

2120 Breaker sequence

No.	Setting		Min. setting	Max. setting	Factory setting
2121	Breaker seq.	Break	Close GB	Close GB+TB	Close GB
2122	Breaker seq.	Timer	0.0 s	999.0 s	5.0 s
2123	Breaker seq.	Run 90	0 RPM	4000 RPM	1450 RPM

2130 Excitation failure

No.	Setting		Min. setting	Max. setting	Factory setting
2131	Excit. failure	Timer	0.0 s	999.0 s	5.0 s
2132	Excit. failure	Relay output A	R0 (none)	Option dependent	R0 (none)
2133	Excit. failure	Relay output B	R0 (none)		R0 (none)
2134	Excit. failure	Enable	OFF	ON	OFF
2135	Excit. failure	Fail class	Alarm (1)	Trip MB (6)	Warning (2)

Regulation

2510 Frequency controller

No.	Setting		Min. setting	Max. setting	Factory setting
2511	Freq. control	Dead band	0.2%	10.0%	1.0%
2512	Freq. control	F K_P	0	1000	10
2513	Freq. control	F K_I	0	1000	10

Frequency % settings relate to nominal generator frequency (setting 6011). It is used for frequency control (fixed frequency or load sharing) when the breaker is closed, and for synchronising if the breaker is open.

2520 Power controller

No.	Setting		Min. setting	Max. setting	Factory setting
2521	Power control	Dead band	0.2%	10.0%	2.0%
2522	Power control	P K_P	0	1000	10
2523	Power control	P K_I	0	1000	10

Power % settings relate to nominal generator power.

2530 Power ramp up

No.	Setting		Min. setting	Max. setting	Factory setting
2531	Power ramp up	Speed	1.0%/s	20.0%/s	2.0%/s
2532	Power ramp up	Delay point	1%	100%	10%
2533	Power ramp up	Delay time	0.0 s	180.0 s	10.0 s

The delay point determines when the generator will make a temporary stop ramping up after closing of the generator breaker to preheat the engine before commencing load taking. The time duration of this point is determined by the delay time setting. If the delay function is not needed, set this time to 0. Power % settings relate to nominal generator power.

2540 Power ramp down

No.	Setting		Min. setting	Max. setting	Factory setting
2541	Power ramp down	Speed	0.1%/s	20.0%/s	10.0%/s
2542	Power ramp down	Breaker open setpoint	1%	20%	5%
2543	Power ramp down	Fail class	1	6	2 (warning)

The breaker open point determines when the 'open breaker' relay output is activated to open the generator breaker before reaching 0 kW. Power % settings relate to nominal generator power.

2560 Governor regulation failure

No.	Setting		Min. setting	Max. setting	Factory setting
2561	Governor reg. failure	Reg. error	1.0%	100.0%	30.0%
2562	Governor reg. failure	Timer	10.0 s	360.0 s	60.0 s
2563	Governor reg. failure	Output A	R0 (none)	Option dependent	R0 (none)
2564	Governor reg. failure	Output B	R0 (none)		R0 (none)

The alarm is activated, if the difference between the measured value and the setpoint is outside the setpoint for a longer time period than specified by the timer setpoint.

2640 Relay control

No.	Setting		Min. setting	Max. setting	Factory setting
2641	Relay control	GOV ON time	10 ms	3000 ms	500 ms
2642	Relay control	GOV per. time	50 ms	15000 ms	2500 ms

2690 Delay regulation

No.	Setting		Min. setting	Max. setting	Factory setting
2691	Delay regulation	Timer	0 s	9900 s	0 s
2692	Delay regulation	Output A	R0 (none)	Option dependent	R0 (none)
2693	Delay regulation	Output B	R0 (none)		R0 (none)
2694	Delay regulation	Enable	OFF	ON	OFF

2700 Short time paralleling

No.	Setting		Min. setting	Max. setting	Factory setting
2701	Short paralleling	Enable	OFF	ON	OFF
2702	Short paralleling	Timer	0.10 s	99.90 s	0.30 s

Input/output

This menu consists of parameters for configuration of the inputs and outputs.

Binary input setup

3260 Dig. input no. 110 (option M2)

No.	Setting		Min. setting	Max. setting	Third setting	Factory setting
3261	Dig. input no. 110	Timer	0.0 s	100.0 s	-	10.0 s
3262	Dig. input no. 110	Relay output A	R0 (none)	Option dependent	-	R0 (none)
3263	Dig. input no. 110	Relay output B	R0 (none)		-	R0 (none)
3264	Dig. input no. 110	Enable	OFF	ON	RUN	OFF
3265	Dig. input no. 110	Fail class	Alarm (1)	Trip MB (6)	-	Warning (2)
3266	Dig. input no. 110	Type	N/O	N/C	-	N/O

3270 Dig. input no. 111 (option M2)

No.	Setting		Min. setting	Max. setting	Third setting	Factory setting
3271	Dig. input no. 111	Timer	0.0 s	100.0 s	-	10.0 s
3272	Dig. input no. 111	Relay output A	R0 (none)	Option dependent	-	R0 (none)
3273	Dig. input no. 111	Relay output B	R0 (none)		-	R0 (none)
3274	Dig. input no. 111	Enable	OFF	ON	RUN	OFF
3275	Dig. input no. 111	Fail class	Alarm (1)	Trip MB (6)	-	Warning (2)
3276	Dig. input no. 111	Type	N/O	N/C	-	N/O

3280 Dig. input no. 112 (option M2)

No.	Setting		Min. setting	Max. setting	Third setting	Factory setting
3281	Dig. input no. 112	Timer	0.0 s	100.0 s	-	10.0 s
3282	Dig. input no. 112	Relay output A	R0 (none)	Option dependent	-	R0 (none)
3283	Dig. input no. 112	Relay output B	R0 (none)		-	R0 (none)
3284	Dig. input no. 112	Enable	OFF	ON	RUN	OFF
3285	Dig. input no. 112	Fail class	Alarm (1)	Trip MB (6)	-	Warning (2)
3286	Dig. input no. 112	Type	N/O	N/C	-	N/O

3290 Dig. input no. 113 (option M2)

No.	Setting		Min. setting	Max. setting	Third setting	Factory setting
3291	Dig. input no. 113	Timer	0.0 s	100.0 s	-	10.0 s
3292	Dig. input no. 113	Relay output A	R0 (none)	Option dependent	-	R0 (none)
3293	Dig. input no. 113	Relay output B	R0 (none)		-	R0 (none)
3294	Dig. input no. 113	Enable	OFF	ON	RUN	OFF
3295	Dig. input no. 113	Fail class	Alarm (1)	Trip MB (6)	-	Warning (2)
3296	Dig. input no. 113	Type	N/O	N/C	-	N/O

3300 Access lock (binary input 114)

No.	Setting		Min. setting	Max. setting	Third setting	Factory setting
3301	Access lock	Timer	0.0 s	180.0 s	-	10.0 s
3302	Access lock	Relay output A	R0 (none)	Option dependent	-	R0 (none)
3303	Access lock	Relay output B	R0 (none)		-	R0 (none)
3304	Access lock	Enable	OFF	ON	RUN	OFF
3305	Access lock	Fail class	Alarm (1)	Trip MB (6)	-	Warning (2)
3306	Access lock	Type	N/O	N/C	-	N/O

3310 Running feedback (binary input 115)

No.	Setting		Min. setting	Max. setting	Third setting	Factory setting
3311	Run. feedback	Timer	0.0 s	180.0 s	-	10.0 s
3312	Run. feedback	Relay output A	R0 (none)	Option dependent	-	R0 (none)
3313	Run. feedback	Relay output B	R0 (none)		-	R0 (none)
3314	Run. feedback	Enable	OFF	ON	RUN	OFF
3315	Run. feedback	Fail class	Alarm (1)	Trip MB (6)	-	Warning (2)
3316	Run. feedback	Type	N/O	N/C	-	N/O

3320 Ext. engine failure (binary input 116)

No.	Setting		Min. setting	Max. setting	Third setting	Factory setting
3321	Engine failure	Timer	0.0 s	180.0 s	-	10.0 s
3322	Engine failure	Relay output A	R0 (none)	Option dependent	-	R0 (none)
3323	Engine failure	Relay output B	R0 (none)		-	R0 (none)
3324	Engine failure	Enable	OFF	ON	RUN	OFF
3325	Engine failure	Fail class	Alarm (1)	Trip MB (6)	-	Shutdown (5)
3326	Engine failure	Type	N/O	N/C	-	N/O

3330 Ext. emergency stop (binary input 117)

No.	Setting		Min. setting	Max. setting	Third setting	Factory setting
3331	Emergency STOP	Timer	0.0 s	60.0 s	-	0.0 s
3332	Emergency STOP	Relay output A	R0 (none)	Option dependent	-	R0 (none)
3333	Emergency STOP	Relay output B	R0 (none)		-	R0 (none)
3334	Emergency STOP	Enable	OFF	ON	RUN	OFF
3335	Emergency STOP	Fail class	Alarm (1)	Trip MB (6)	-	Shutdown (5)
3336	Emergency STOP	Type	N/O	N/C	-	N/O

3340 Dig. input no. 118

No.	Setting		Min. setting	Max. setting	Third setting	Factory setting
3341	Dig. input no. 118	Timer	0.0 s	100.0 s	-	10.0 s
3342	Dig. input no. 118	Relay output A	R0 (none)	Option dependent	-	R0 (none)
3343	Dig. input no. 118	Relay output B	R0 (none)		-	R0 (none)
3344	Dig. input no. 118	Enable	OFF	ON	RUN	OFF
3345	Dig. input no. 118	Fail class	Alarm (1)	Trip MB (6)	-	Warning (2)
3346	Dig. input no. 118	Type	N/O	N/C	-	N/O

Analogue input setup

4090 4…20mA input 98.1

The input is not configurable in the peak shaving mode, load takeover mode and mains power export, because it is used as a mains power input.

No.	Setting		Min. setting	Max. setting	Third setting	Factory setting
4091	4…20mA input 98.1	Setpoint	4mA	20mA	-	10mA
4092	4…20mA input 98.1	Timer	0.0 s	600.0 s	-	120.0 s
4093	4…20mA input 98.1	Relay output A	R0 (none)	Option dependent	-	R0 (none)
4094	4…20mA input 98.1	Relay output B	R0 (none)		-	R0 (none)
4095	4…20mA input 98.1	Enable	OFF	ON	RUN	OFF
4096	4…20mA input 98.1	Fail class	Alarm (1)	Trip MB (6)	-	Warning (2)

4100 4…20mA input 98.2

The input is not configurable in the peak shaving mode, load takeover mode and mains power export, because it is used as a mains power input.

No.	Setting		Min. setting	Max. setting	Third setting	Factory setting
4101	4…20mA input 98.2	Setpoint	4mA	20mA	-	10mA
4102	4…20mA input 98.2	Timer	0.0 s	600.0 s	-	120.0 s
4103	4…20mA input 98.2	Relay output A	R0 (none)	Option dependent	-	R0 (none)
4104	4…20mA input 98.2	Relay output B	R0 (none)		-	R0 (none)
4105	4…20mA input 98.2	Enable	OFF	ON	RUN	OFF
4106	4…20mA input 98.2	Fail class	Alarm (1)	Trip MB (6)	-	Warning (2)

4110 Oil pressure 1 (4…20mA input 100.1)

No.	Setting		Min. setting	Max. setting	Third setting	Factory setting
4111	Oil pressure 1	Setpoint	0 bar	50 bar	-	10 bar
4112	Oil pressure 1	Timer	0.0 s	180.0 s	-	5.0 s
4113	Oil pressure 1	Relay output A	R0 (none)	Option dependent	-	R0 (none)
4114	Oil pressure 1	Relay output B	R0 (none)		-	R0 (none)
4115	Oil pressure 1	Enable	OFF	ON	RUN	OFF
4116	Oil pressure 1	Fail class	Alarm (1)	Trip MB (6)	-	Warning (2)

4120 Oil pressure 2 (4…20mA input 100.2)

No.	Setting		Min. setting	Max. setting	Third setting	Factory setting
4121	Oil pressure 2	Setpoint	0 bar	50 bar	-	10 bar
4122	Oil pressure 2	Timer	0.0 s	180.0 s	-	5.0 s
4123	Oil pressure 2	Relay output A	R0 (none)	Option dependent	-	R0 (none)
4124	Oil pressure 2	Relay output B	R0 (none)		-	R0 (none)
4125	Oil pressure 2	Enable	OFF	ON	RUN	OFF
4126	Oil pressure 2	Fail class	Alarm (1)	Trip MB (6)	-	Warning (2)

4130 Fuel level 1 (4…20mA input 102.1)

No.	Setting		Min. setting	Max. setting	Third setting	Factory setting
4131	4…20mA input 102.1	Setpoint	0%	120%	-	10%
4132	4…20mA input 102.1	Timer	0.0 s	600.0 s	-	120.0 s
4133	4…20mA input 102.1	Relay output A	R0 (none)	Option dependent	-	R0 (none)
4134	4…20mA input 102.1	Relay output B	R0 (none)		-	R0 (none)
4135	4…20mA input 102.1	Enable	OFF	ON	RUN	OFF
4136	4…20mA input 102.1	Fail class	Alarm (1)	Trip MB (6)	-	Warning (2)

4140 Fuel level 2 (4…20mA input 102.2)

No.	Setting		Min. setting	Max. setting	Third setting	Factory setting
4141	4…20mA input 102.2	Setpoint	0%	120%	-	10%
4142	4…20mA input 102.2	Timer	0.0 s	600.0 s	-	120.0 s
4143	4…20mA input 102.2	Relay output A	R0 (none)	Option dependent	-	R0 (none)
4144	4…20mA input 102.2	Relay output B	R0 (none)		-	R0 (none)
4145	4…20mA input 102.2	Enable	OFF	ON	RUN	OFF
4146	4…20mA input 102.2	Fail class	Alarm (1)	Trip MB (6)	-	Warning (2)

4150 4…20mA input 104.1 (option M1)

No.	Setting		Min. setting	Max. setting	Third setting	Factory setting
4151	4…20mA input 104.1	Setpoint	4mA	20mA	-	10mA
4152	4…20mA input 104.1	Timer	0.2 s	100.0 s	-	10.0 s
4153	4…20mA input 104.1	Relay output A	R0 (none)	Option dependent	-	R0 (none)
4154	4…20mA input 104.1	Relay output B	R0 (none)		-	R0 (none)
4155	4…20mA input 104.1	Enable	OFF	ON	RUN	OFF
4156	4…20mA input 104.1	Fail class	Alarm (1)	Trip MB (6)	-	Warning (2)

4160 4…20mA input 104.2 (option M1)

No.	Setting		Min. setting	Max. setting	Third setting	Factory setting
4161	4…20mA input 104.2	Setpoint	4mA	20mA	-	10mA
4162	4…20mA input 104.2	Timer	0.2 s	100.0 s	-	10.0 s
4163	4…20mA input 104.2	Relay output A	R0 (none)	Option dependent	-	R0 (none)
4164	4…20mA input 104.2	Relay output B	R0 (none)		-	R0 (none)
4165	4…20mA input 104.2	Enable	OFF	ON	RUN	OFF
4166	4…20mA input 104.2	Fail class	Alarm (1)	Trip MB (6)	-	Warning (2)

4170 VDO 104.1 (option M2)

No.	Setting		Min. setting	Max. setting	Third setting	Factory setting
4171	VDO 104.1	Setpoint	0.0 bar	10.0 bar	-	4.0 bar
4172	VDO 104.1	Timer	0.0 s	100.0 s	-	5.0 s
4173	VDO 104.1	Relay output A	R0 (none)	Option dependent	-	R0 (none)
4174	VDO 104.1	Relay output B	R0 (none)		-	R0 (none)
4175	VDO 104.1	Enable	OFF	ON	RUN	OFF
4176	VDO 104.1	Fail class	Alarm (1)	Trip MB (6)	-	Warning (2)

4180 VDO 104.2 (option M2)

No.	Setting		Min. setting	Max. setting	Third setting	Factory setting
4181	VDO 104.2	Setpoint	0.0 bar	10.0 bar	-	5.0 bar
4182	VDO 104.2	Timer	0.0 s	100.0 s	-	5.0 s
4183	VDO 104.2	Relay output A	R0 (none)	Option dependent	-	R0 (none)
4184	VDO 104.2	Relay output B	R0 (none)		-	R0 (none)
4185	VDO 104.2	Enable	OFF	ON	RUN	OFF
4186	VDO 104.2	Fail class	Alarm (1)	Trip MB (6)	-	Trip/stop (4)

4190 VDO 105.1 (option M2)

No.	Setting		Min. setting	Max. setting	Third setting	Factory setting
4191	VDO 105.1	Setpoint	40 deg.	150 deg.	-	100 deg.
4192	VDO 105.1	Timer	0.0 s	100.0 s	-	5.0 s
4193	VDO 105.1	Relay output A	R0 (none)	Option dependent	-	R0 (none)
4194	VDO 105.1	Relay output B	R0 (none)		-	R0 (none)
4195	VDO 105.1	Enable	OFF	ON	RUN	OFF
4196	VDO 105.1	Fail class	Alarm (1)	Trip MB (6)	-	Warning (2)

4200 VDO 105.2 (option M2)

No.	Setting		Min. setting	Max. setting	Third setting	Factory setting
4201	VDO 105.2	Setpoint	40 deg.	150 deg.	-	110 deg.
4202	VDO 105.2	Timer	0.0 s	100.0 s	-	5.0 s
4203	VDO 105.2	Relay output A	R0 (none)	Option dependent	-	R0 (none)
4204	VDO 105.2	Relay output B	R0 (none)		-	R0 (none)
4205	VDO 105.2	Enable	OFF	ON	RUN	OFF
4206	VDO 105.2	Fail class	Alarm (1)	Trip MB (6)	-	Trip/stop (4)

4210 VDO 106.1 (option M2)

No.	Setting		Min. setting	Max. setting	Third setting	Factory setting
4211	VDO 106.1	Setpoint	0%	100%	-	10%
4212	VDO 106.1	Timer	0.0 s	100.0 s	-	10.0 s
4213	VDO 106.1	Relay output A	R0 (none)	Option dependent	-	R0 (none)
4214	VDO 106.1	Relay output B	R0 (none)		-	R0 (none)
4215	VDO 106.1	Enable	OFF	ON	RUN	OFF
4216	VDO 106.1	Fail class	Alarm (1)	Trip MB (6)	-	Warning (2)

4220 VDO 106.2 (option M2)

No.	Setting		Min. setting	Max. setting	Third setting	Factory setting
4221	VDO 106.2	Setpoint	0%	100%	-	5%
4222	VDO 106.2	Timer	0.0 s	100.0 s	-	10.0 s
4223	VDO 106.2	Relay output A	R0 (none)	Option dependent	-	R0 (none)
4224	VDO 106.2	Relay output B	R0 (none)		-	R0 (none)
4225	VDO 106.2	Enable	OFF	ON	RUN	OFF
4226	VDO 106.2	Fail class	Alarm (1)	Trip MB (6)	-	Trip/stop (4)

4240 Water temperature (PT100 input 106 - setpoint 1) **(option M1)**

No.	Setting		Min. setting	Max. setting	Third setting	Factory setting
4241	Water temp.	Setpoint	-40°C	250°C	-	80°C
4242	Water temp.	Timer	0.0 s	180.0 s	-	5.0 s
4243	Water temp.	Relay output A	R0 (none)	Option dependent	-	R0 (none)
4244	Water temp.	Relay output B	R0 (none)		-	R0 (none)
4245	Water temp.	Enable	OFF	ON	RUN	OFF
4246	Water temp.	Fail class	Alarm (1)	Trip MB (6)	-	Warning (2)

4260 PT100 input 109.1 (option M1)

No.	Setting		Min. setting	Max. setting	Third setting	Factory setting
4261	PT100 input 109	Setpoint	-40°C	250°C	-	80°C
4262	PT100 input 109	Timer	0.2 s	100.0 s	-	10.0 s
4263	PT100 input 109	Relay output A	R0 (none)	Option dependent	-	R0 (none)
4264	PT100 input 109	Relay output B	R0 (none)		-	R0 (none)
4265	PT100 input 109	Enable	OFF	ON	RUN	OFF
4266	PT100 input 109	Fail class	Alarm (1)	Trip MB (6)	-	Warning (2)

4300 Running detection

This setpoint is used to define the level where the gen-set is recognised as running. When this RPM level is reached, the automatic running detection is enabled **(6150 Running status)**.

Also take notice of the menu 'remove starter' setpoint (6160 Remove starter).

No.	Setting		Min. setting	Max. setting	Factory setting
4301	Running detection	Setpoint	1 RPM	4000 RPM	1000 RPM
4302	Running detection	Type	Frequency detection		X
	Running detection	Type	Tacho		
	Running detection	Type	Binary input		
	Running detection	Type	Engine I/F communication		

4310 Overspeed 1

No.	Setting		Min. setting	Max. setting	Factory setting
4311	Overspeed 1	Setpoint	1 RPM	4000 RPM	1450 RPM
4312	Overspeed 1	Timer	0.0 s	100.0 s	5.0 s
4313	Overspeed 1	Relay output A	R0 (none)	Option dependent	R0 (none)
4314	Overspeed 1	Relay output B	R0 (none)		R0 (none)
4315	Overspeed 1	Enable	OFF	ON	OFF
4316	Overspeed 1	Fail class	Alarm (1)	Trip MB (6)	Warning (2)

4320 Overspeed 2

No.	Setting		Min. setting	Max. setting	Factory setting
4321	Overspeed 2	Setpoint	1 RPM	4000 RPM	1750 RPM
4322	Overspeed 2	Timer	0.0 s	100.0 s	1.0 s
4323	Overspeed 2	Relay output A	R0 (none)	Option dependent	R0 (none)
4324	Overspeed 2	Relay output B	R0 (none)		R0 (none)
4325	Overspeed 2	Enable	OFF	ON	OFF
4326	Overspeed 2	Fail class	Alarm (1)	Trip MB (6)	Shutdown (5)

4370 Wire failure analogue input 98 (M1 and M2)

No.	Setting		Min. setting	Max. setting	Factory setting
4371	W. fail. ana. 98	Output A	R0 (none)	Option dependent	R0 (none)
4372	W. fail. ana. 98	Output B	R0 (none)		R0 (none)
4373	W. fail. ana. 98	Enable	OFF	ON	OFF
4374	W. fail. ana. 98	Fail class	Alarm (1)	Trip MB (6)	Warning (2)

4380 Wire failure analogue input 100 (M1 and M2)

No.	Setting		Min. setting	Max. setting	Factory setting
4381	W. fail. ana. 100	Output A	R0 (none)	Option dependent	R0 (none)
4382	W. fail. ana. 100	Output B	R0 (none)		R0 (none)
4383	W. fail. ana. 100	Enable	OFF	ON	OFF
4384	W. fail. ana. 100	Fail class	Alarm (1)	Trip MB (6)	Warning (2)

4390 Wire failure analogue input 102 (M1 and M2)

No.	Setting		Min. setting	Max. setting	Factory setting
4391	W. fail. ana. 102	Output A	R0 (none)	Option dependent	R0 (none)
4392	W. fail. ana. 102	Output B	R0 (none)		R0 (none)
4393	W. fail. ana. 102	Enable	OFF	ON	OFF
4394	W. fail. ana. 102	Fail class	Alarm (1)	Trip MB (6)	Warning (2)

4400 Wire failure analogue input 104 (M1)

No.	Setting		Min. setting	Max. setting	Factory setting
4401	W. fail. ana. 104	Output A	R0 (none)	Option dependent	R0 (none)
4402	W. fail. ana. 104	Output B	R0 (none)		R0 (none)
4403	W. fail. ana. 104	Enable	OFF	ON	OFF
4404	W. fail. ana. 104	Fail class	Alarm (1)	Trip MB (6)	Warning (2)

4410 Wire failure VDO input 104 (M2)

No.	Setting		Min. setting	Max. setting	Factory setting
4411	W. fail. VDO 104	Max.	60%	100%	100%
4412	W. fail. VDO 104	Min.	0%	40%	0%
4413	W. fail. VDO 104	Output A	R0 (none)	Option dependent	R0 (none)
4414	W. fail. VDO 104	Output B	R0 (none)		R0 (none)
4415	W. fail. VDO 104	Enable	OFF	ON	OFF
4416	W. fail. VDO 104	Fail class	Alarm (1)	Trip MB (6)	Warning (2)

4410 Wire failure PT100 input 106 (M1)

No.	Setting		Min. setting	Max. setting	Factory setting
4411	W. fail. PT100 106	Max.	60%	100%	100%
4412	W. fail. PT100 106	Min.	0%	40%	0%
4413	W. fail. PT100 106	Output A	R0 (none)	Option dependent	R0 (none)
4414	W. fail. PT100 106	Output B	R0 (none)		R0 (none)
4415	W. fail. PT100 106	Enable	OFF	ON	OFF
4416	W. fail. PT100 106	Fail class	Alarm (1)	Trip MB (6)	Warning (2)

4420 Wire failure VDO input 105 (M2)

No.	Setting		Min. setting	Max. setting	Factory setting
4421	W. fail. VDO 105	Max.	60%	100%	100%
4422	W. fail. VDO 105	Min.	0%	40%	0%
4423	W. fail. VDO 105	Output A	R0 (none)	Option dependent	R0 (none)
4424	W. fail. VDO 105	Output B	R0 (none)		R0 (none)
4425	W. fail. VDO 105	Enable	OFF	ON	OFF
4426	W. fail. VDO 105	Fail class	Alarm (1)	Trip MB (6)	Warning (2)

4420 Wire failure PT100 input 109 (M1)

No.	Setting		Min. setting	Max. setting	Factory setting
4421	W. fail. PT100 109	Max.	60%	100%	100%
4422	W. fail. PT100 109	Min.	0%	40%	0%
4423	W. fail. PT100 109	Output A	R0 (none)	Option dependent	R0 (none)
4424	W. fail. PT100 109	Output B	R0 (none)		R0 (none)
4425	W. fail. PT100 109	Enable	OFF	ON	OFF
4426	W. fail. PT100 109	Fail class	Alarm (1)	Trip MB (6)	Warning (2)

4430 Wire failure VDO input 106 (M2)

No.	Setting		Min. setting	Max. setting	Factory setting
4431	W. fail. VDO 106	Max.	60%	100%	100%
4432	W. fail. VDO 106	Min.	0%	40%	0%
4433	W. fail. VDO 106	Output A	R0 (none)	Option dependent	R0 (none)
4434	W. fail. VDO 106	Output B	R0 (none)		R0 (none)
4435	W. fail. VDO 106	Enable	OFF	ON	OFF
4436	W. fail. VDO 106	Fail class	Alarm (1)	Trip MB (6)	Warning (2)

Output setup

5090 Relay 9

The relay 9 is available, if options D1 are not selected and analogue governor outputs are not used.

No.	Setting		First/min. setting	Second/max. setting	Third setting	Factory setting
5091	Relay 9	Function	Alarm	Limit	Horn	Alarm
5092	Relay 9	Off delay	0.0 s	999.9 s	-	5.0 s

5100 Relay 10

The relay 10 is available, if options D1 are not selected and analogue governor outputs are not used.

No.	Setting		First/min. setting	Second/max. setting	Third setting	Factory setting
5101	Relay 10	Function	Alarm	Limit	Horn	Alarm
5102	Relay 10	Off delay	0.0 s	999.9 s	-	5.0 s

5110 Relay 11

No.	Setting		First/min. setting	Second/max. setting	Third setting	Factory setting
5111	Relay 11	Function	Alarm	Limit	Horn	Alarm
5112	Relay 11	Off delay	0.0 s	999.9 s	-	5.0 s

5120 Relay 12

The relay 12 is available, if 'Continues' is selected in menu 5491.

No.	Setting		First/min. setting	Second/max. setting	Third setting	Factory setting
5121	Relay 12	Function	Alarm	Limit	Horn	Alarm
5122	Relay 12	Off delay	0.0 s	999.9 s	-	5.0 s

5130 Relay 13

The relay 13 is available, if 'Continues' is selected in menu 5492.

No.	Setting		First/min. setting	Second/max. setting	Third setting	Factory setting
5131	Relay 13	Function	Alarm	Limit	Horn	Alarm
5132	Relay 13	Off delay	0.0 s	999.9 s	-	5.0 s

5490 Transistor setup

The transistor outputs on terminals 20 and 21 can be configured as constant or pulse signals. If 'Continues' is selected, the relays 12 and 13 will be available.

No.	Setting		First/min. setting	Second/max. setting	Factory setting
5491	Transistor 20	T20	Continues	kWh	kWh
5492	Transistor 21	T21	Continues	kVAr	kVArh

If the transistor outputs are set to 'Continues', external relays are needed due to the limited current output of the transistors. Max 10mA.

System

The menu includes parameters for the system setup.

General setup

6010 Nominal settings 1

No.	Setting		Min. setting	Max. setting	Factory setting
6011	Nominal settings 1	Frequency	48.0Hz	62.0Hz	50.0Hz
6012	Nominal settings 1	Generator power	10kW	20000kW	480kW
6013	Nominal settings 1	Generator current	0A	9000A	867A
6014	Nominal settings 1	Generator volt.	100V	25000V	400V

6020 Nominal settings 2

No.	Setting		Min. setting	Max. setting	Factory setting
6021	Nominal settings 2	Frequency	48.0Hz	62.0Hz	60.0Hz
6022	Nominal settings 2	Generator power	10kW	20000kW	285kW
6023	Nominal settings 2	Generator current	0A	9000A	345A
6024	Nominal settings 2	Generator volt.	100V	25000V	480V
6025	Nominal settings 2	Set	OFF	2	OFF

6030 Transformer gen.

No.	Setting		Min. setting	Max. setting	Factory setting
6031	Transformer gen.	Volt. prim.	100V	25000V	400V
6032	Transformer gen.	Volt. sec.	100V	690V	400V
6033	Transformer gen.	Current prim.	5A	9000A	1000A
6034	Transformer gen.	Current sec.	1A	5A	5A

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

6040 Transformer bus

No.	Setting		Min. setting	Max. setting	Factory setting
6041	Transformer bus.	Volt. prim.	100V	25000V	400V
6042	Transformer bus.	Volt. sec.	100V	690V	400V

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

6050 Engine type

No.	Setting		First setting	Second setting	Factory setting
6051	Engine type	Engine type	Diesel engine	None	Diesel engine

It is only possible to select diesel engine.

6060 Gen-set modes

No.	Setting		Setting	Factory setting
6061	Gen-set mode	Island operation	Island operation	-
	Gen-set mode	AMF	AMF	AMF
	Gen-set mode	Peak shaving	Peak shaving	-
	Gen-set mode	Fixed power	Fixed power	-
	Gen-set mode	Mains power export	Mains power export	-
	Gen-set mode	Load take over	Load take over	-

6070 Date and time (internal clock) setting

The date and time can easily be synchronised with the present time and date from the utility software.

No.	Setting		Min. setting	Max. setting	Factory setting
6071	Date and time	Year	2001	2100	Depending on the software version
6072	Date and time	Month	1	12	
6073	Date and time	Day	1	31	
6074	Date and time	Weekday	1	7	
6075	Date and time	Hour	0	23	
6076	Date and time	Minute	0	59	

6080 Counters

The settings below (except kWh) are offset values that need to be adjusted at the commissioning if the display is used for reading the values. A breaker operation is counted each time the breaker closes.

The setting 'reset kWh counter' resets the value of the produced kWh.

No.	Setting		Min. setting	Max. setting	Factory setting
6081	Counters	Running time	0	20000	0
6082	Counters	GB operations	0	20000	0
6083	Counters	MB operations	0	20000	0
6084	Counters	kWh	OFF	ON	OFF
6085	Counters	Start attempts	0	20000	0

6090 Service timer

The function of the service timer enables the user to get an alarm when service of the gen-set is needed. The timer is reset when the alarm is acknowledged or when the timer is disabled and enabled again.

No.	Setting		Min. setting	Max. setting	Factory setting
6091	Service timer	Setpoint	0 h	9000 h	500 h
6092	Service timer	Relay output A	R0 (none)	Option dependent	R0 (none)
6093	Service timer	Relay output B	R0 (none)		R0 (none)
6094	Service timer	Enable	OFF	ON	ON
6095	Service timer	Fail class	Alarm (1)	Trip MB (6)	Warning (2)

6110 Battery low voltage alarm

No.	Setting		Min. setting	Max. setting	Factory setting
6111	Battery low V	Setpoint	8/15.0V	32.0V	18.0V
6112	Battery low V	Timer	0.0 s	999.0 s	1.0 s
6113	Battery low V	Relay output A	R0 (none)	Option dependent	R0 (none)
6114	Battery low V	Relay output B	R0 (none)		R0 (none)
6115	Battery low V	Enable	OFF	ON	ON

The alarm is for the auxiliary power supply measured on terminal 1 and 2.

6120 Battery high voltage alarm

No.	Setting		Min. setting	Max. setting	Factory setting
6121	Battery high V	Setpoint	12.0V	36.0V	30.0V
6122	Battery high V	Timer	0.0 s	999.0 s	1.0 s
6123	Battery high V	Relay output A	R0 (none)	Option dependent	R0 (none)
6124	Battery high V	Relay output B	R0 (none)		R0 (none)
6125	Battery high V	Enable	OFF	ON	ON

The alarm is for the auxiliary power supply measured on terminals 1 and 2.

6130 Language

No.	Setting		Setting	Factory setting
6130	Language	Selection display	-	-
6131	Language	English	English	English
			Language 1-11	-

6140 Alarm horn

No.	Setting		Min. setting	Max. setting	Factory setting
6141	Alarm horn	Timer	0.0 s	990.0 s	20.0 s

The setting is the maximum time the horn relay activates at an alarm. If the setting is adjusted to 0 s, the horn relay will be activated continuously until the alarm is acknowledged.

6150 Running status

No.	Setting		Min. setting	Max. setting	Factory setting
6151	Run status	Timer	0.0 s	300.0 s	5.0 s
6152	Run status	Relay output A	R0 (none)	Option dependent	R0 (none)
6153	Run status	Relay output B	R0 (none)		R0 (none)
6154	Run status	Enable	OFF	ON	OFF

6160 Remove starter

No.	Setting		Min. setting	Max. setting	Factory setting
6161	Remove starter	Setpoint	1 RPM	2000 RPM	400 RPM
6162	Remove starter	Number of teeth	0 teeth	500 teeth	0 teeth

6170 Starter

No.	Setting		Min. setting	Max. setting	Factory setting
6171	Starter	Start prepare	0.0 s	600.0 s	5.0 s
6172	Starter	Start ON time	1.0 s	30.0 s	5.0 s
6173	Starter	Start OFF time	1.0 s	99.0 s	5.0 s

6180 Start attempts

No.	Setting		Min. setting	Max. setting	Factory setting
6181	Start attempts	Attempts	1	10	3
6182	Start attempts	Relay output A	R0 (none)	Option dependent	R0 (none)
6183	Start attempts	Relay output B	R0 (none)		R0 (none)
6184	Start attempts	Fire start attempt	1	10	7
6185	Start attempts	FP cool down	0.0 s	990.0 s	30.0 s

The number of start attempts adjusted in menu 6184 Fire start attempt, is used when the digital input 'fire pump' is used instead of the setting 6181.

6190 f/U OK

No.	Setting		Min. setting	Max. setting	Factory setting
6191	f/U OK	Timer	1.0 s	99.0 s	5.0 s

6200 f/U failure

No.	Setting		Min. setting	Max. setting	Factory setting
6201	f/U failure	Timer	1.0 s	99.0 s	30.0 s
6202	f/U failure	Relay output A	R0 (none)	Option dependent	R0 (none)
6203	f/U failure	Relay output B	R0 (none)		R0 (none)

6210 Stop

No.	Setting		Min. setting	Max. setting	Factory setting
6211	Stop	Cool down time	0.0 s	990.0 s	240.0 s
6212	Stop	Extended STOP	1.0 s	99.0 s	5.0 s
6213	Stop	Coil type	STOP	RUN	RUN

6220 Stop failure

No.	Setting		Min. setting	Max. setting	Factory setting
6221	Stop failure	Timer	10.0 s	120.0 s	30.0 s
6222	Stop failure	Relay output A	R0 (none)	Option dependent	R0 (none)
6223	Stop failure	Relay output B	R0 (none)		R0 (none)

6250 GB control

No.	Setting		Min. setting	Max. setting	Factory setting
6251	GB control	Timer t_{GBC}	0.0 s	30.0 s	2.0 s
6252	GB control	GB load time	0.0 s	30.0 s	0.0 s

6260 P_{nom} derate

No.	Setting		Min. setting	Max. setting	Factory setting
6261	P_{nom} derate	Input	4…20mA	VDO/PT100	4…20mA
6262	P_{nom} derate	Start derate	0	20000	16 units
6263	P_{nom} derate	Derate slope	0.1%/U	100.0%/U	5.0%/U
6264	P_{nom} derate	Proportional	OFF	ON	OFF
6265	P_{nom} derate	Enable	OFF	ON	OFF
6266	P_{nom} derate	Derate limit	0.0%	100.0%	80.0%

6310 Idle running

No.	Setting		Min. setting	Max. setting	Factory setting
6311	Idle running	Start timer	0.0 min	999.9 min	300.0 min
6312	Idle running	Enable start timer	OFF	ON	OFF
6313	Idle running	Stop timer	0.0 min	999.9 min	300.0 min
6314	Idle running	Enable stop timer	OFF	ON	OFF
6315	Idle running	Idle relay	Option dependent		R0 (none)
6316	Idle running	Enable	OFF	ON	OFF

6400 Master clock

No.	Setting		Min. setting	Max. setting	Factory setting
6401	Master clock	Start hour	0	23	8
6402	Master clock	Stop hour	0	23	8
6403	Master clock	Difference	0.1Hz	1.0Hz	0.1Hz
6404	Master clock	Setpoint	1 s	999 s	20 s
6405	Master clock	Enable	OFF	ON	OFF

6410 Battery test

No.	Setting		Min. setting	Max. setting	Factory setting
6411	Battery test	Setpoint	8.0V DC	32.0V DC	18.0V DC
6412	Battery test	Delay	1 s	300 s	20 s
6413	Battery test	Output A	Option dependent		R0 (none)
6414	Battery test	Output B			R0 (none)
6415	Battery test	Enable	OFF	ON	OFF

6420 Voltage trip

No.	Setting		Min. setting	Max. setting	Factory setting
6421	Voltage trip	Type	Phase-phase	Phase-neutral	Phase-phase

Mains setup

6500 Mains power

No.	Setting		Min. setting	Max. setting	Factory setting
6501	Mains power	Day	-20000 kW	20000 kW	750 kW
6502	Mains power	Night	-20000 kW	20000 kW	1000 kW
6503	Mains power	Transducer max	0 kW	20000 kW	1500 kW
6504	Mains power	Transducer min	-20000 kW	0 kW	-1500 kW

Transducer max. equals 20mA, and Transducer min. equals 4mA. Both settings must be adjusted.

6510 Daytime period

The period outside the daytime period is defined as the nighttime period.

No.	Setting		Min. setting	Max. setting	Factory setting
6511	Daytime period	Start hour	0 h	23 h	8 h
6512	Daytime period	Start minute	0 min	59 min	0 min
6513	Daytime period	Stop hour	0 h	23 h	16 h
6514	Daytime period	Stop minute	0 min	59 min	0 min

6520 Start gen-set

The setpoint refers to the mains power setpoints in **6500 Mains power**

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No.	Setting		Min. setting	Max. setting	Factory setting
6521	Start generator	Setpoint	5%	100%	80%
6522	Start generator	Timer	0.0 s	990.0 s	10.0 s
6523	Start generator	Minimum load	0%	100%	5%

6530 Stop gen-set

The setpoint refers to the mains power setpoints in **6500 Mains power**

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No.	Setting		Min. setting	Max. setting	Factory setting
6531	Stop generator	Setpoint	0%	80%	60%
6532	Stop generator	Timer	0.0 s	990.0 s	30.0 s

6540 Test running

No.	Setting		Min. setting	Max. setting	Factory setting
6541	Test	Setpoint	1%	100%	80%
6542	Test	Timer	0.5 min	999.0 min	5.0 min
6543	Test	Return	Semi-auto	Auto	Auto

6550 Fixed power setpoint

No.	Setting		Min. setting	Max. setting	Factory setting
6551	Fixed power setpoint	P setpoint	0%	100%	100%

6590 Mains failure voltage

No.	Setting		Min. setting	Max. setting	Factory setting
6591	Mains failure U	Fail. delay	1.0 s	990.0 s	5.0 s
6592	Mains failure U	Mains OK delay	10 s	9900 s	60 s
6593	Mains failure U	Low voltage	80%	100%	90%
6594	Mains failure U	High voltage	100%	120%	110%
6595	Mains failure U	Mains fail. control	Start eng. + open MB	Start eng.	Start eng. + open MB

6600 Mains failure frequency

No.	Setting		Min. setting	Max. setting	Factory setting
6601	Mains failure f	Fail. delay	1.0 s	990.0 s	5.0 s
6602	Mains failure f	Mains OK delay	10 s	9900 s	60 s
6603	Mains failure f	Low frequency	80.0%	100.0%	95.0%
6604	Mains failure f	High frequency	100.0%	120.0%	105.0%

6610 Mains breaker control

No.	Setting		Min. setting	Max. setting	Factory setting
6611	MB control	Function	Mode shift OFF	Mode-AMF-Mode	Mode shift OFF
6612	MB control	Timer t_{MBC}	0.0 s	30.0 s	0.5 s
6613	MB control	Back synchroni-sation	OFF	ON	OFF
6614	MB control	Sync. to mains	OFF	ON	ON
6615	MB control	MB load time	0.0 s	30.0 s	0.0 s

Communication setup

No parameters can be adjusted in this menu in a standard unit. If the options G5 or H2-H6 are selected, menus are available. Please refer to the option descriptions.

Power management setup

No parameters can be adjusted in this menu in a standard unit. If the option G5 is selected, menus are available. Please refer to the option G5 manuals.

Jump menus

A number of menus can only be entered using the jump menu.

9000 Software version

Information about the actual software downloaded to the unit. Please check this before contacting DEIF regarding service and support matters.

9020 Service port

The RS232 service port can be set up to use the ASCII communication. The ASCII communication is used when the utility software is connected through a modem.

Selection '0' must be used for cable connection between the AGC and the PC.
Selection '1' must be used for modem connection between the AGC and the PC.

911X User password

The user password menu can only be entered using the "JUMP" push-button.

No.	Setting		Min. setting	Max. setting	Factory setting
9116	User password	Setting	0	32000	2000
9117	Service password	YYYYY Setting	0	32000	2001
9118	Master password	XXXXX Setting	0	32000	2002

It is recommended to change the password levels of the user, service and master password, if access to parameter settings must be restricted.

9120 Service menu

The service menu can only be entered using the 'JUMP' push-button. This menu is used in service situations.

In the alarm selection you can see all the alarm timers and their remaining time if they are counting.

The input and output selections show the present status of the inputs and outputs. E.g. mode inputs, relay outputs and load sharing lines.

No.	Setting		Description
9121	Service menu	Alarm	Shows remaining alarm delay time
9122	Service menu	Digital input	Shows digital input status
9123	Service menu	Digital output	Shows digital output status
9124	Service menu	Miscellaneous	Shows miscellaneous information

9130 Single phase/split phase/three phase

No.	Setting		Description
9131	Mode	Mode	0 = Three phase system
			1 = Split phase system
			2 = Single phase system

DEIF A/S reserves the right to change any of the above.