DEIF A/S

Designer's Reference Handbook

Automatic Gen-set Controller/GS multi-line 2

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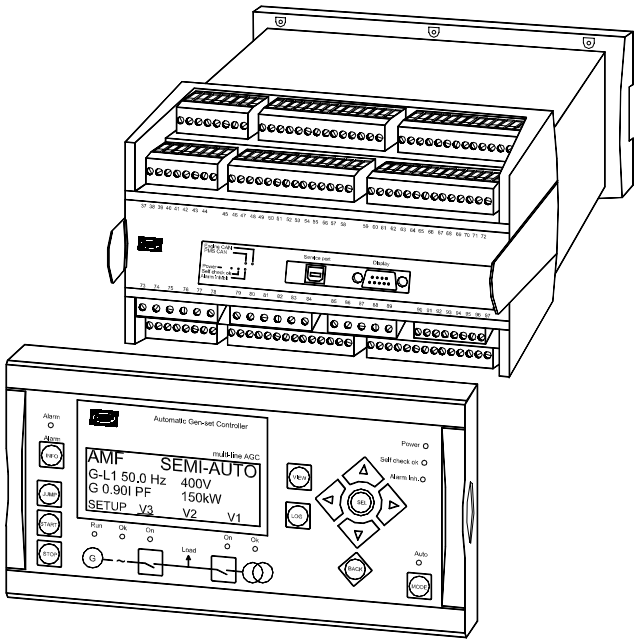

- *Functional descriptions*
- *Display unit and menu structure*
- *PID-controller*
- *Procedure for parameter setup*
- *Parameter list*

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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.

PID-controller

This chapter offers information about the PID-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. 4921240295.

PC utility software warning

It is possible to remote control the gen-set from the PC utility software M-Vision 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
- Run and stop coil
- Relay outputs for governor control

Protections (ANSI)

- Overcurrent, 4 levels (51)
- Reverse power, 2 levels (32)
- Multi inputs (digital, 4-20mA, 0-40V DC, PT100, PT1000 or VDO)
- 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

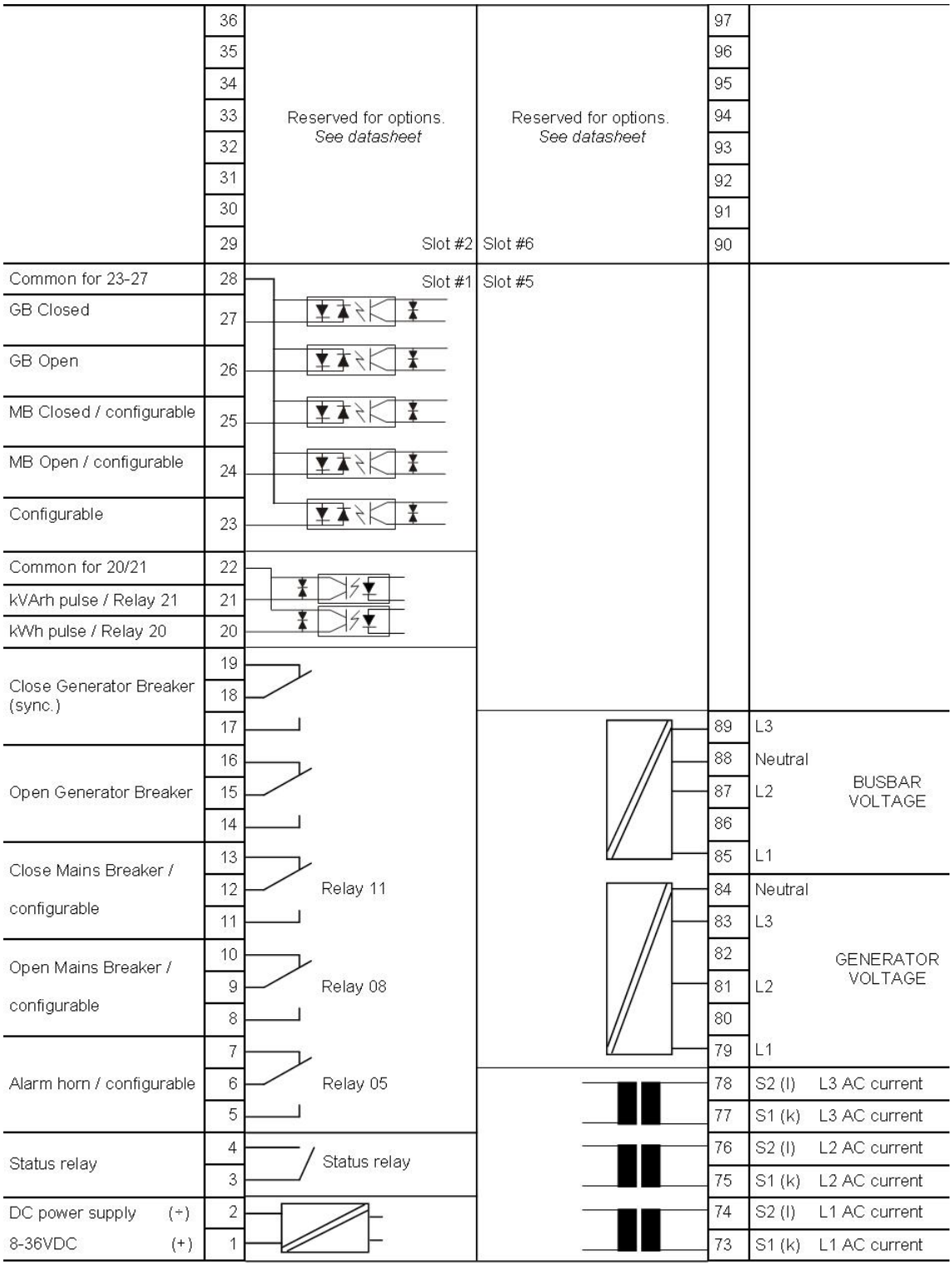
Terminal strip overview

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

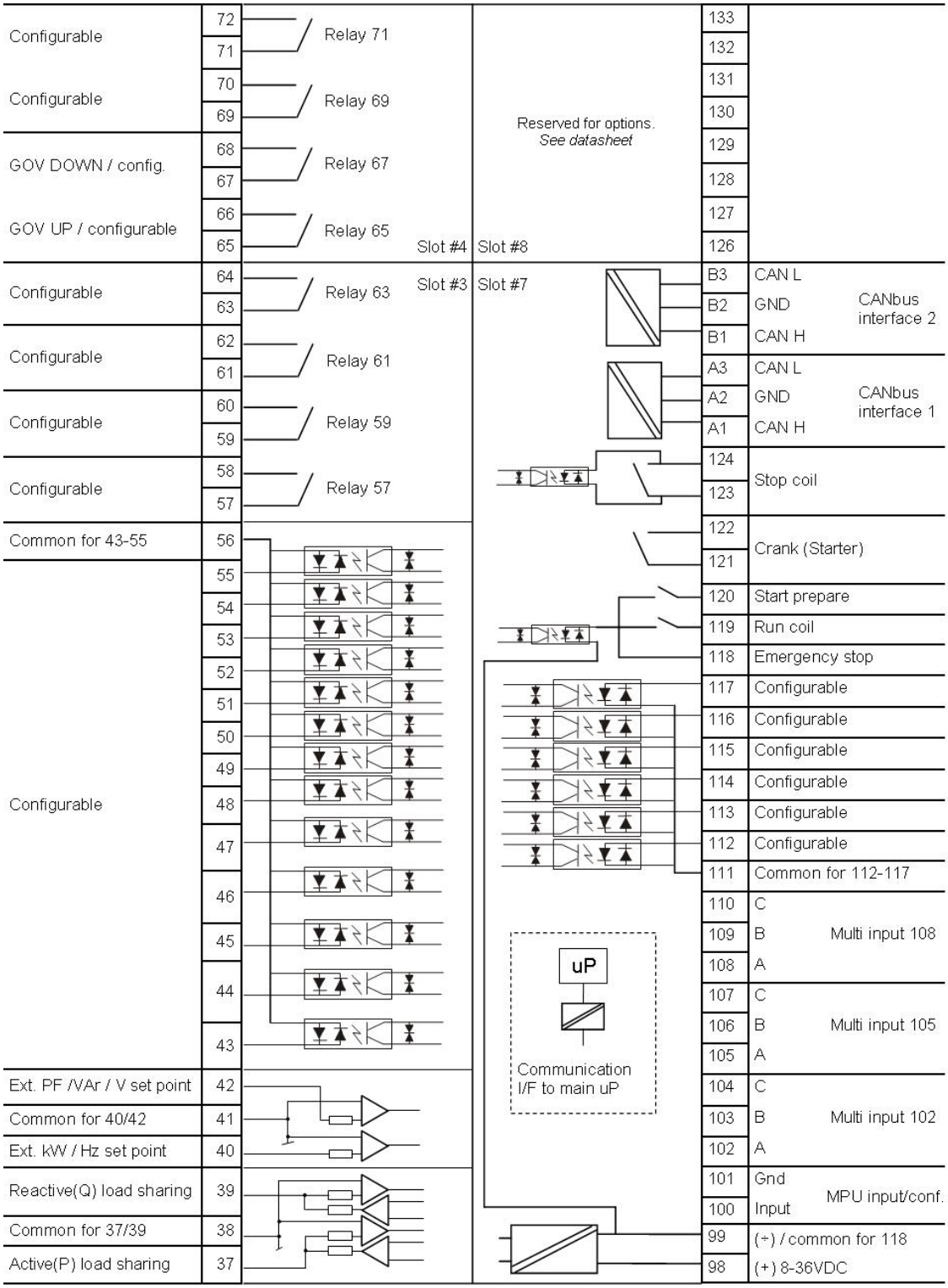
Refer to the data sheet for accurate information about possible configurations of the AGC.

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

Slot #1, #2, #5 and #6



Slot #3, #4, #7 and #8



The hardware shown in slot #3 is option M12 and G3. For a detailed description of these options, please refer to the option descriptions.

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

Power Management (option G5): Test mode is not available in an island application or with the plant mode set to 'Island operation'.

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

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 set point for the speed governor. If AVR control (option D1) is selected, then the nominal voltage is used as set point.

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

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 'Overlap' 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 'Overlap' 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 set point for the speed governor. If AVR control (option D1) is selected, the nominal voltage is used as the set point.

When the generator is paralleled to the mains, the governor regulation will no longer be active. If AVR control (option D1) is selected, then the set point will be the adjusted power factor **(7050 Fixed power set).**

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

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

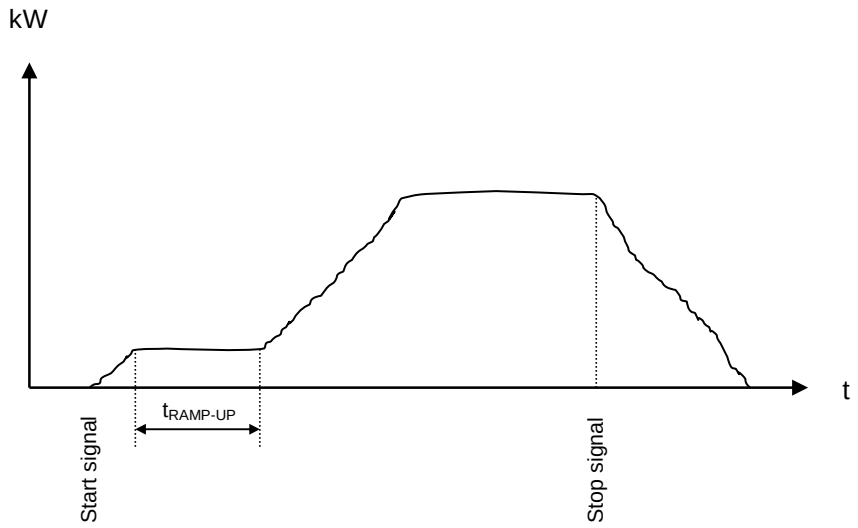
When the generator breaker is closed, the unit will use the nominal frequency as set point for the speed governor. If AVR control (option D1) is selected, the nominal voltage is used as set point.

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

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 set point 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 set point for the speed governor. If AVR control (option D1) is selected, the nominal voltage is used as set point.

When the generator is paralleled to the mains, the generator power will be increased to the fixed power set point **(7050 Fixed power set)**.

If AVR control (option D1) is selected, then the set point will be the adjusted power factor **(7050 Fixed power set)**.

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

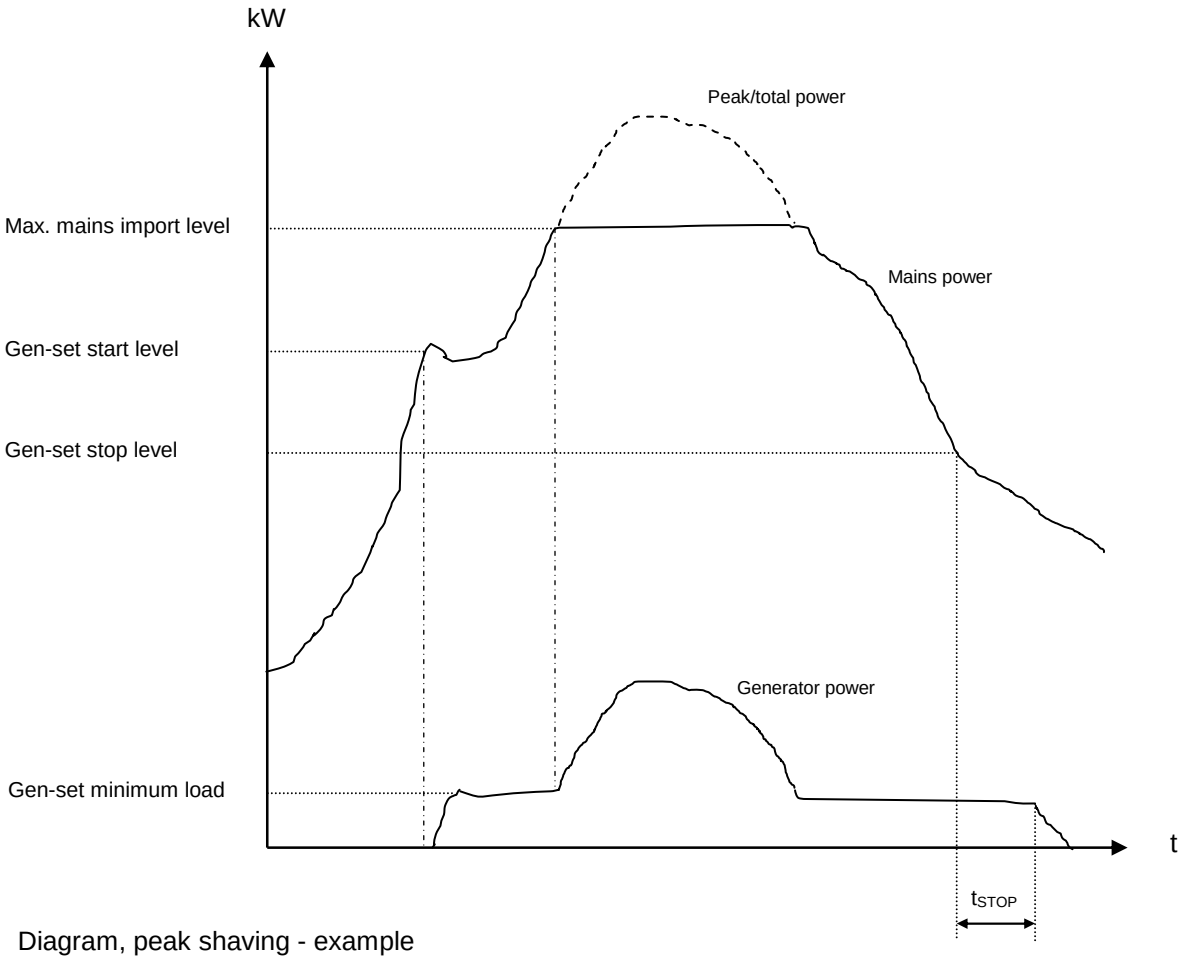
Peak shaving

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 set point, 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 maximum mains import set point, the gen-set will run at min. load again. When the mains import decreases below the stop set point, 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 set point for the speed governor. If AVR control (option D1) is selected, the nominal voltage is used as set point.

When the generator is paralleled to the mains, the generator will be controlled according to the peak shaving set point. So the maximum mains import will not be exceeded in spite of the semi-auto mode. If AVR control (option D1) is selected, the set point is the adjusted power factor **(7050 Fixed power set)**.

Set points related to peak shaving

7000 Mains power

Day and night: The mains power import limits for the peak shaving.
Tmax and Tmin: The transducer range in kW which corresponds to the 4-20mA transducer signal connected on multi input 102.

7010 Daytime period

These settings define the daytime period. The hours outside the daytime period are considered to be the night-time period.

7020 Start generator

Start set point: The start set point is in percent of the day and night settings in menu 7000 Mains power.
Delay: The gen-set will start when the start set point has been exceeded and this delay has expired.
Load: The minimum load the gen-set will produce when parallel to mains.

7030 Stop generator

Stop set point: The stop set point is in percent of the day and night settings in menu 7000 Mains power.
Delay: The gen-set will stop when the stop set point has been exceeded and this delay has expired.

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

Load take over

Auto mode description

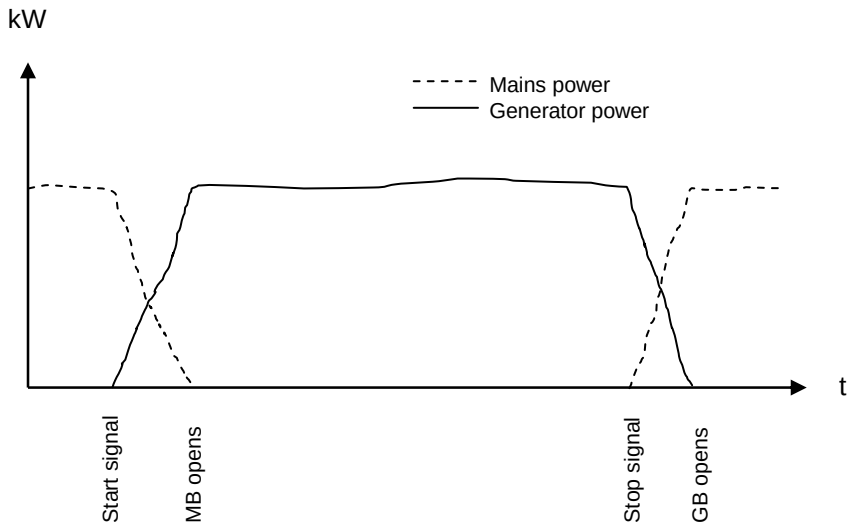
- Back synchronising ON

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 overlap function. In that case, the generator and the mains breakers will never be closed at the same time for a longer period than the adjusted 'overlap' 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 set point for the speed governor. If AVR control (option D1) is selected, the nominal voltage is used as set point.

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 set point is the adjusted power factor **(7050 Fixed power set)**.

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

Mains power export (fixed power to mains)

Auto mode description

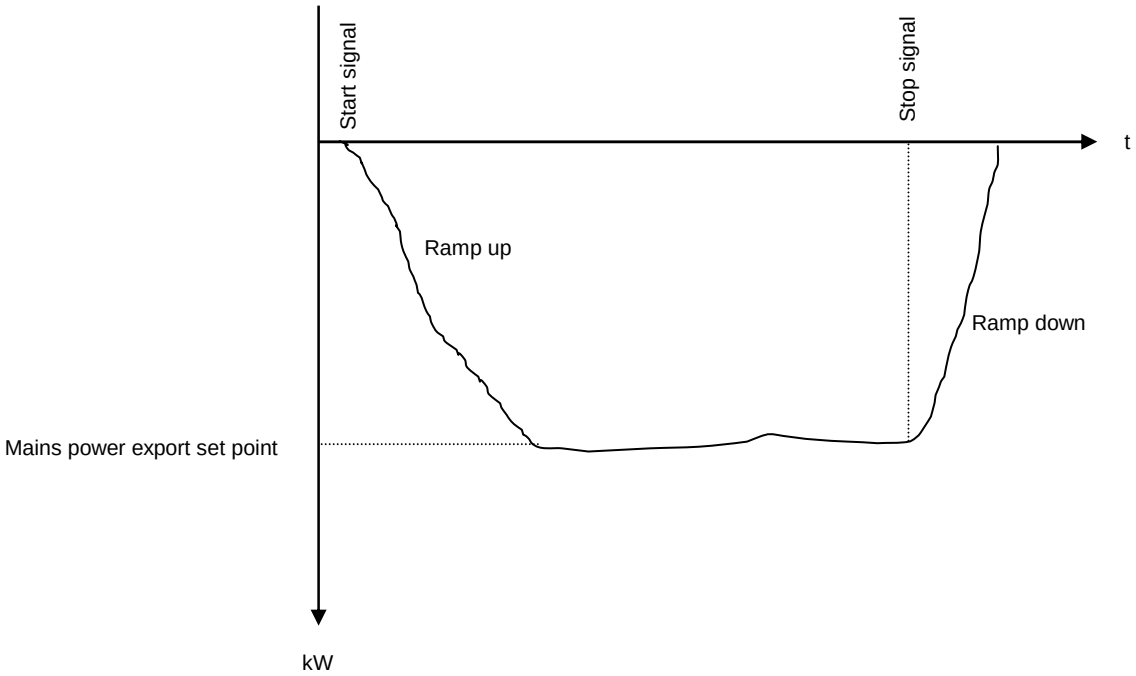
The mains power export mode can be used to maintain a constant level of power through the mains breaker. The power can be exported to the mains or imported from the mains, but always at a constant level.

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 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.



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 set point for the speed governor. If AVR control (option D1) is selected the nominal voltage is used as set point.

When the generator is paralleled to the mains, it will be controlled according to the mains power export set point. If AVR control (option D1) is selected, the set point is the adjusted power factor **(7050 Fixed power set)**.

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

Running mode description

Semi-auto mode

The unit can be operated in semi-auto 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 'Digital inputs' 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.

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.

Test mode

The test mode function is activated by selecting test with the MODE push-button on the display or by activating a digital input.

The settings for the test function are set up in menu

7040 Test

- Set point: Load set point 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).
- Type: Selection of one of the 3 types of tests: Simple, Load or Full.

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

Power Management (option G5): Test mode is not available in an island application or with the plant mode set to 'Island operation'.

Simple test

The simple test will only start the gen-set and run it at nominal frequency with the generator breaker open. The test will run until the timer expires.

Load test

The load test will start the gen-set and run it at nominal frequency, synchronise the generator breaker and produce the power typed in the set point in menu 7041. The test will run until the timer expires.

To run the load test it is required that 'Sync to Mains' is enabled in menu 7084.

When running a load test sequence the overlap function is ignored.

Full test

The full test will start the gen-set and run it at nominal frequency, synchronise the generator breaker and transfer the load to the generator before opening the mains breaker. When the test timer expires, the mains breaker will be synchronised and the load is transferred back to the mains before the generator breaker is opened and the generator is stopped.

To run the full test it is required that 'Sync to Mains' is enabled in menu 7084.

Manual mode

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

Command	Comment
Start (input or push button)	Gen-set starts (no regulation).
Stop (input or push button)	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.

Block mode

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.

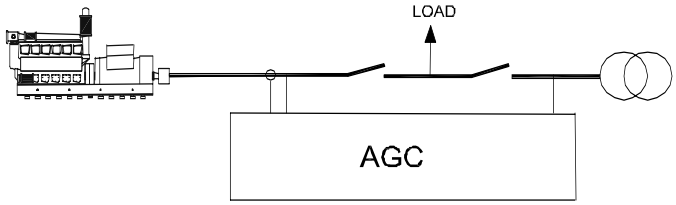
Alarms are not influenced by block mode selection.

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

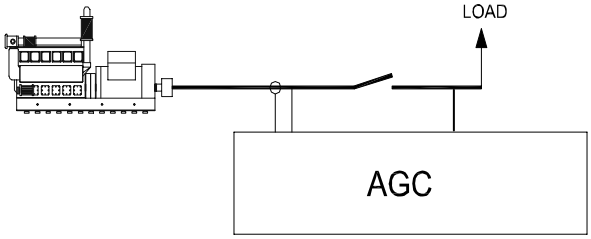
Single-line diagrams

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

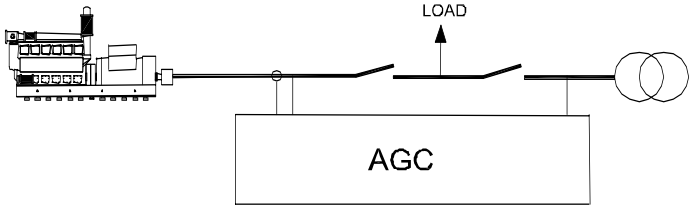
Automatic Mains Failure



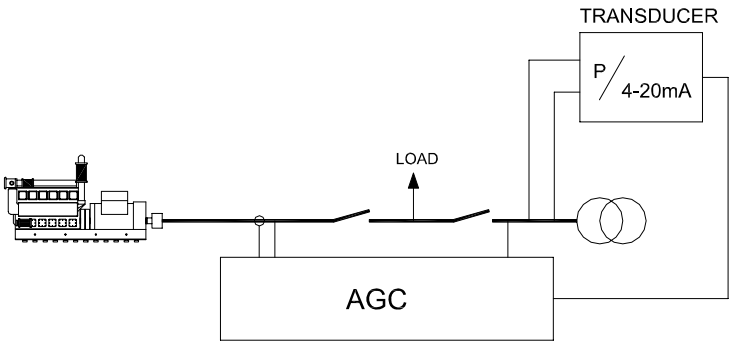
Island operation



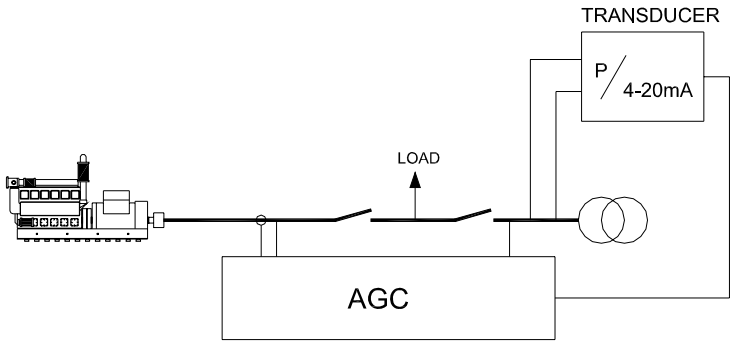
Fixed power/base load



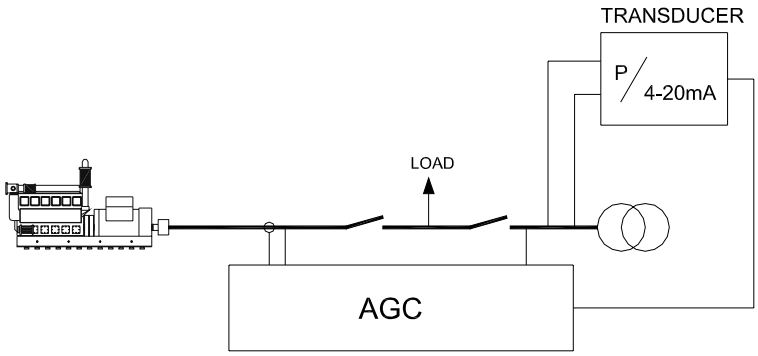
Peak shaving



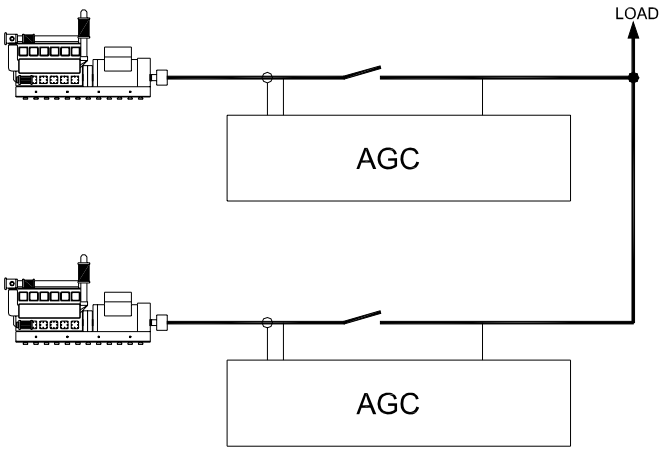
Load take over



Mains power export

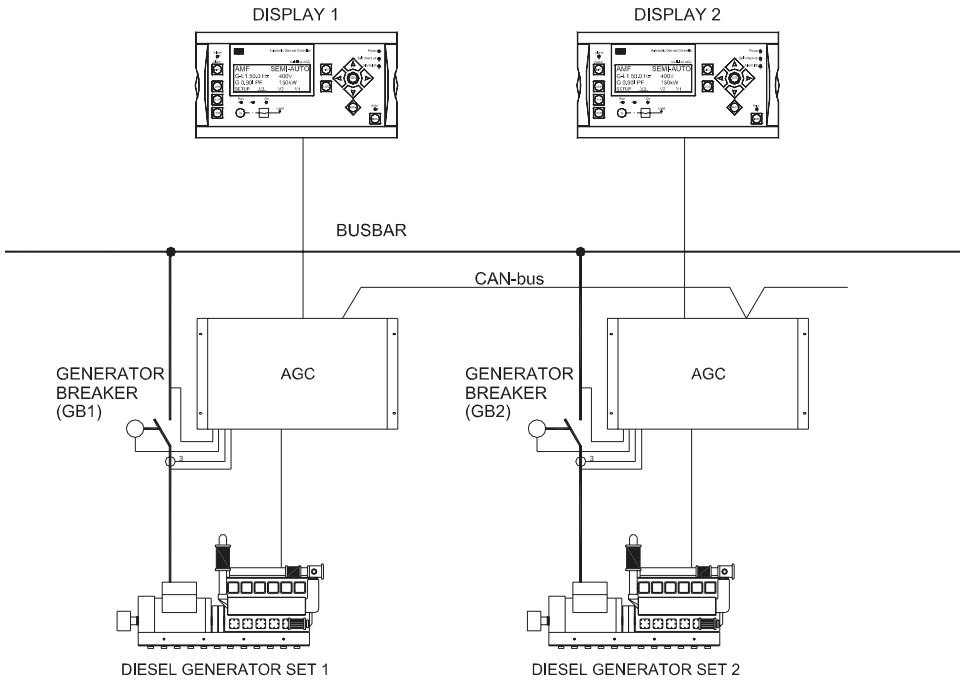


Multiple gen-sets, load sharing (option G3 required)

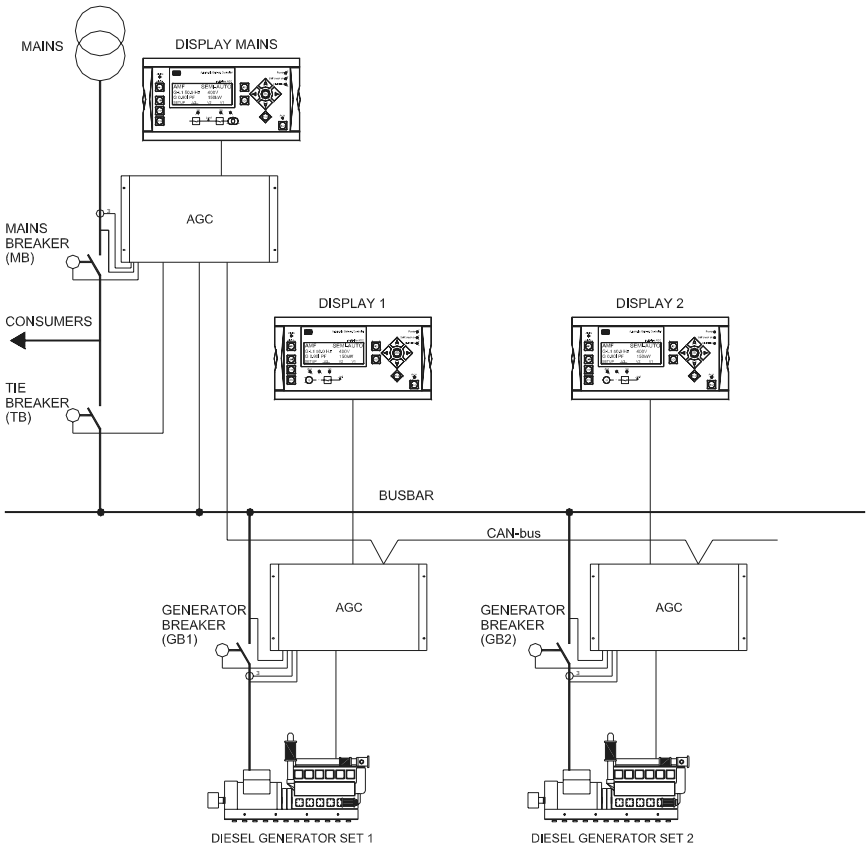


Multiple gen-sets, power management (option G5 required)

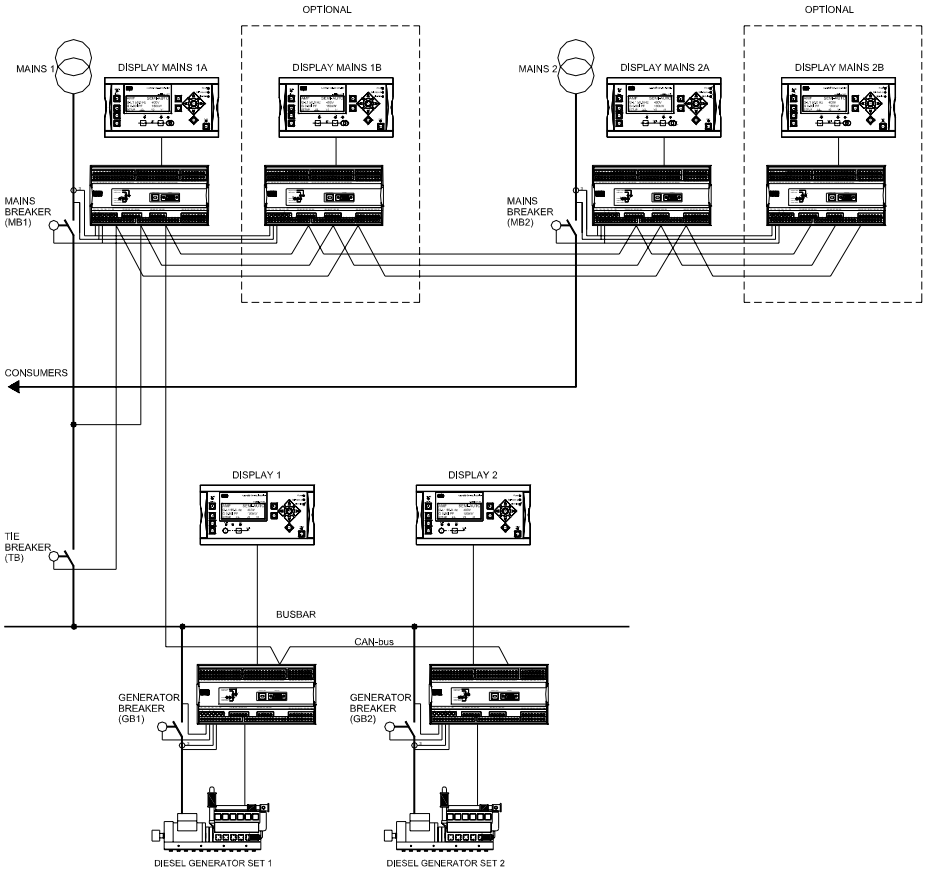
- Island mode application



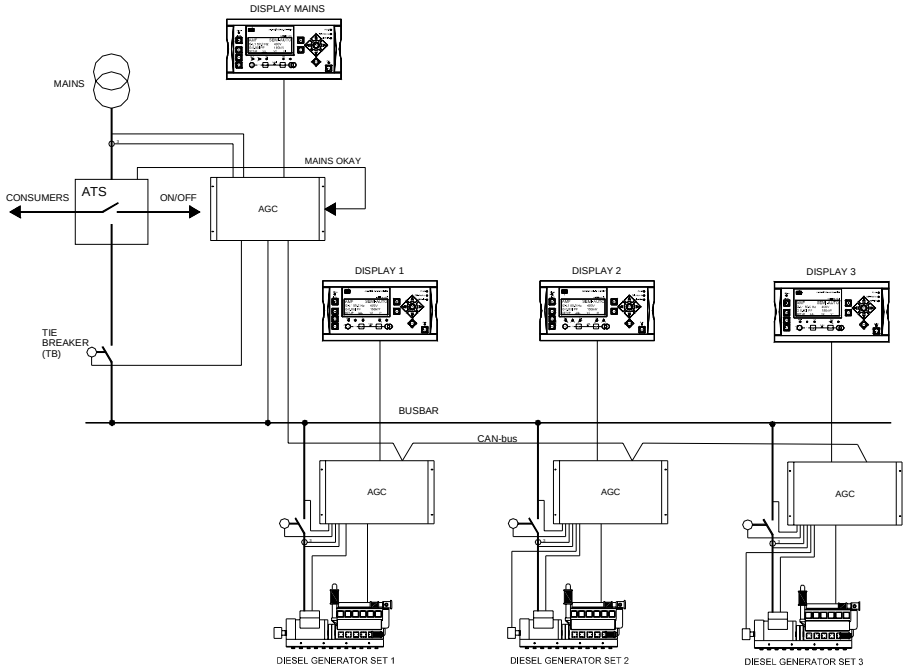
- Parallel to mains application



- Parallel with 2 mains with a tie breaker (the tie breaker is optional)



- ATS plant, mains unit



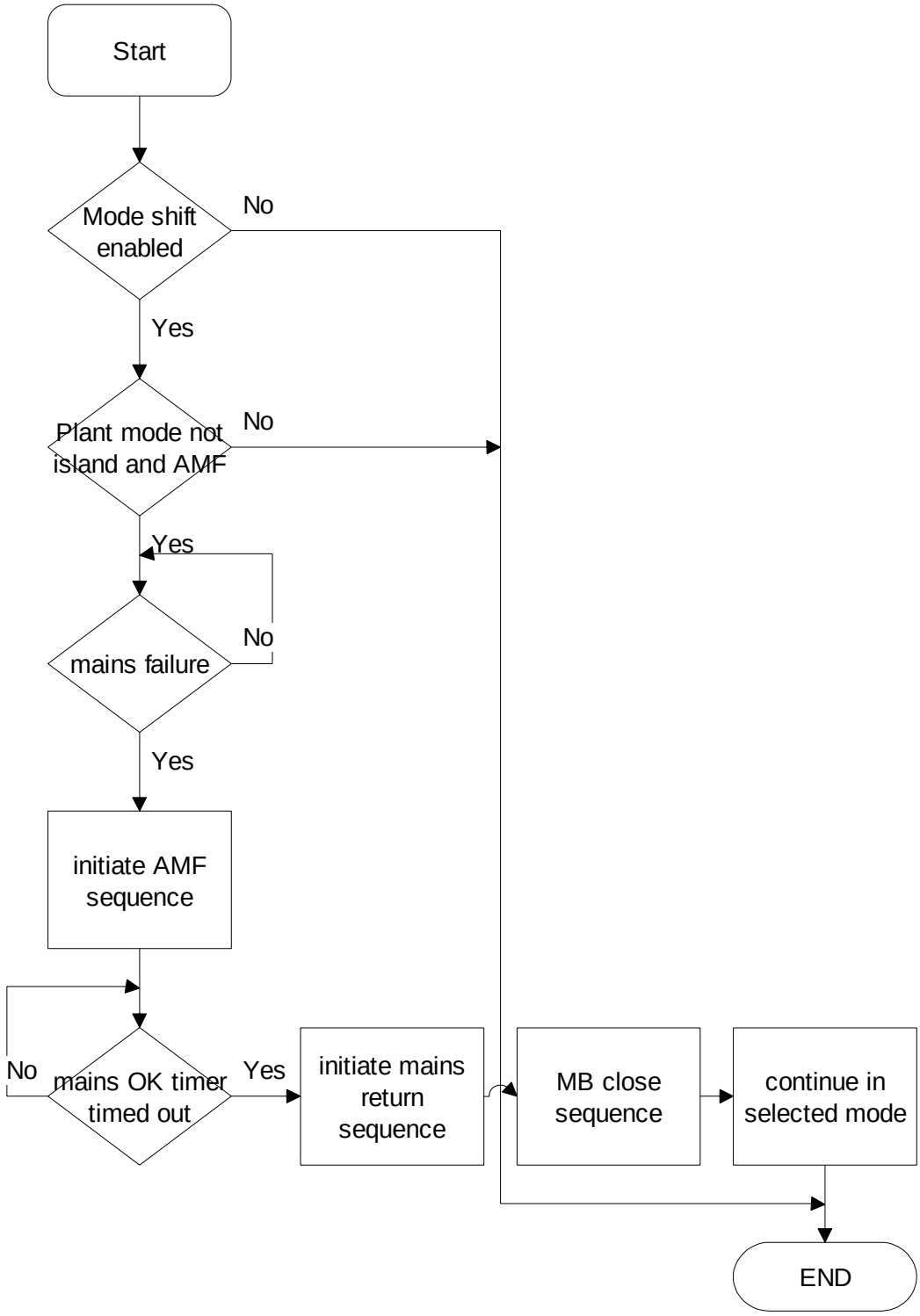
Flowcharts

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

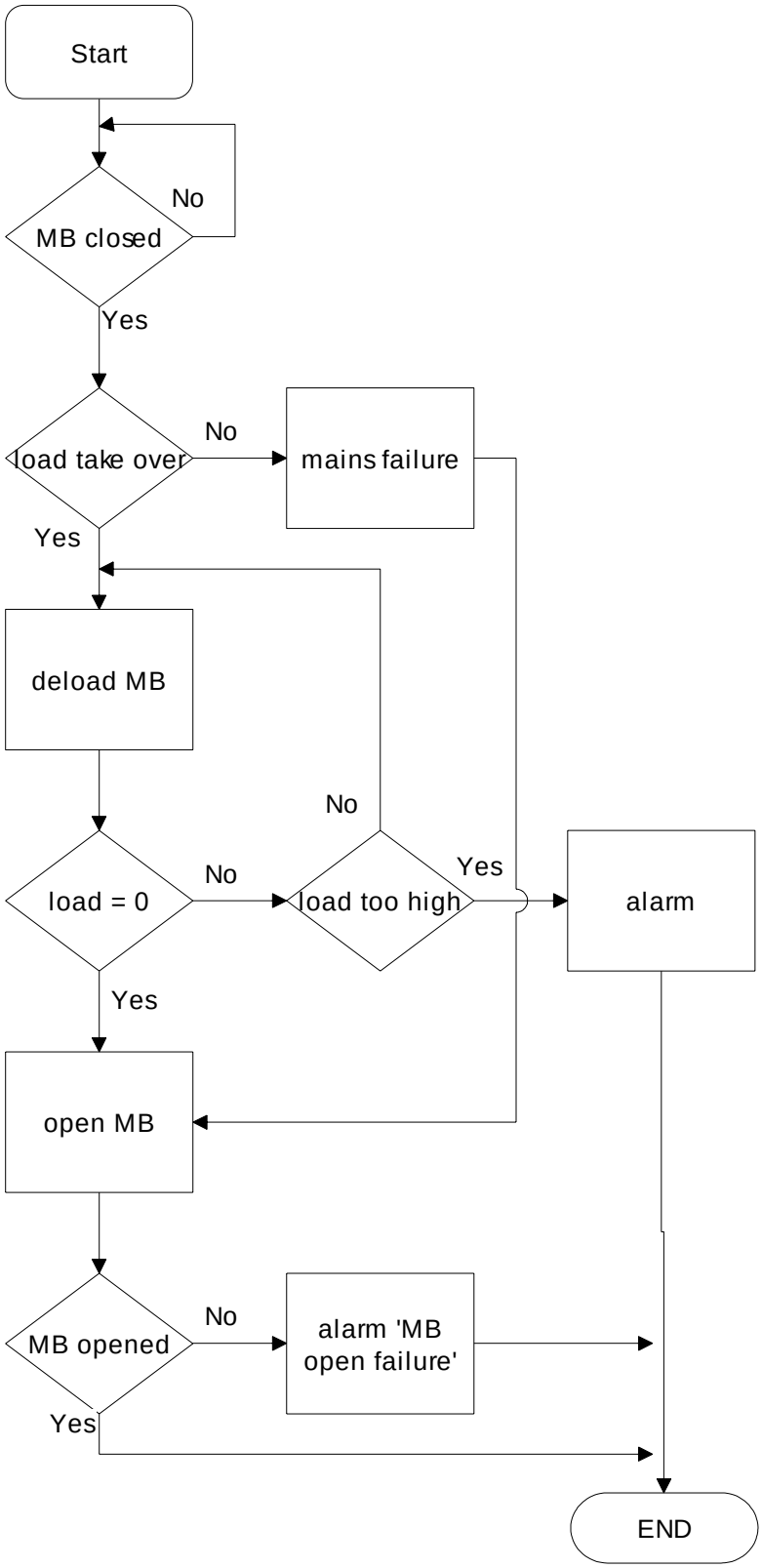
- Mode shift
- MB open sequence
- GB open sequence
- Stop sequence
- Start sequence
- MB close sequence
- GB close sequence
- Fixed power
- Load take over
- Island operation
- Peak shaving
- Mains power export
- Automatic Mains Failure
- Test sequence

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

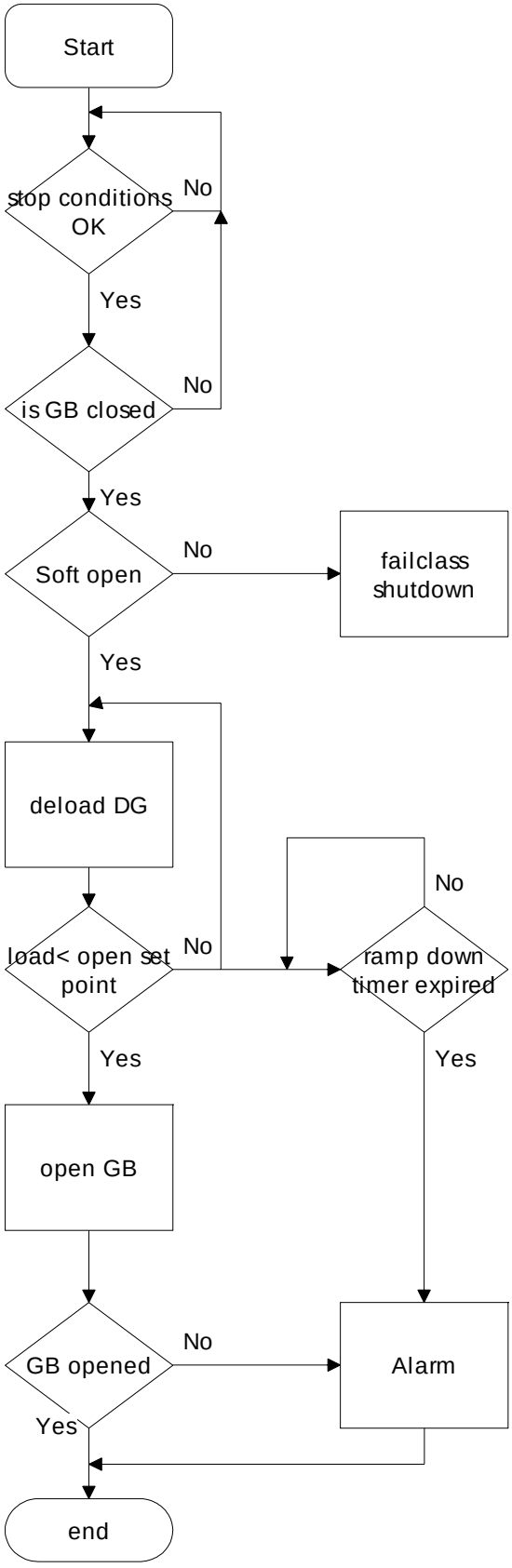
Mode shift


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

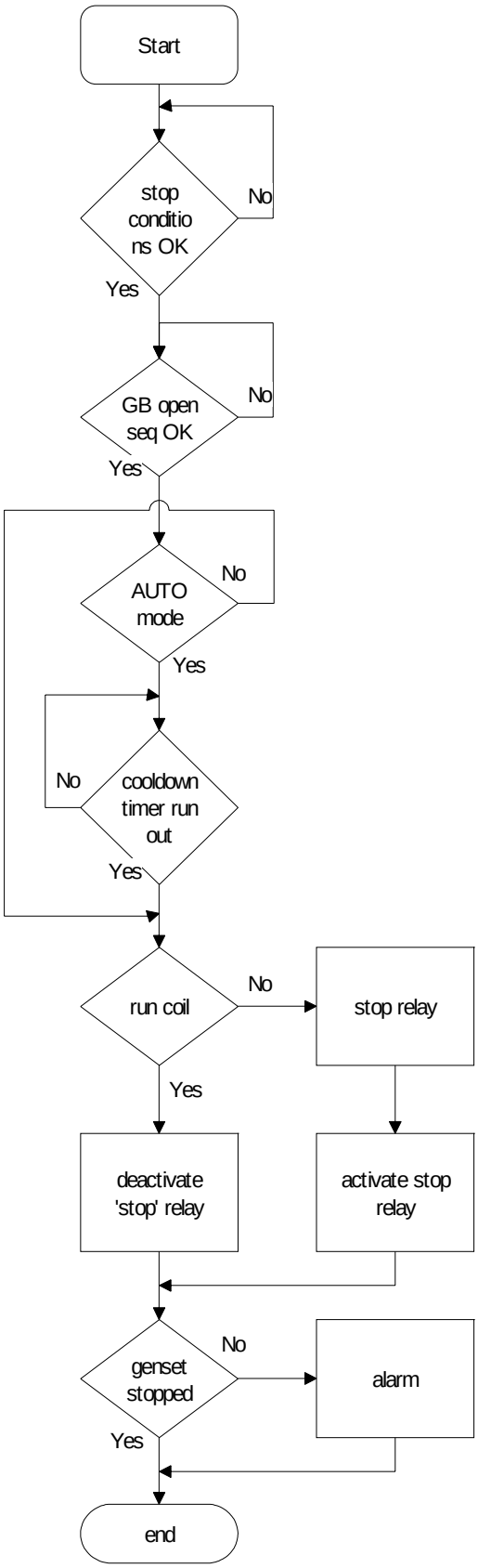
MB open sequence



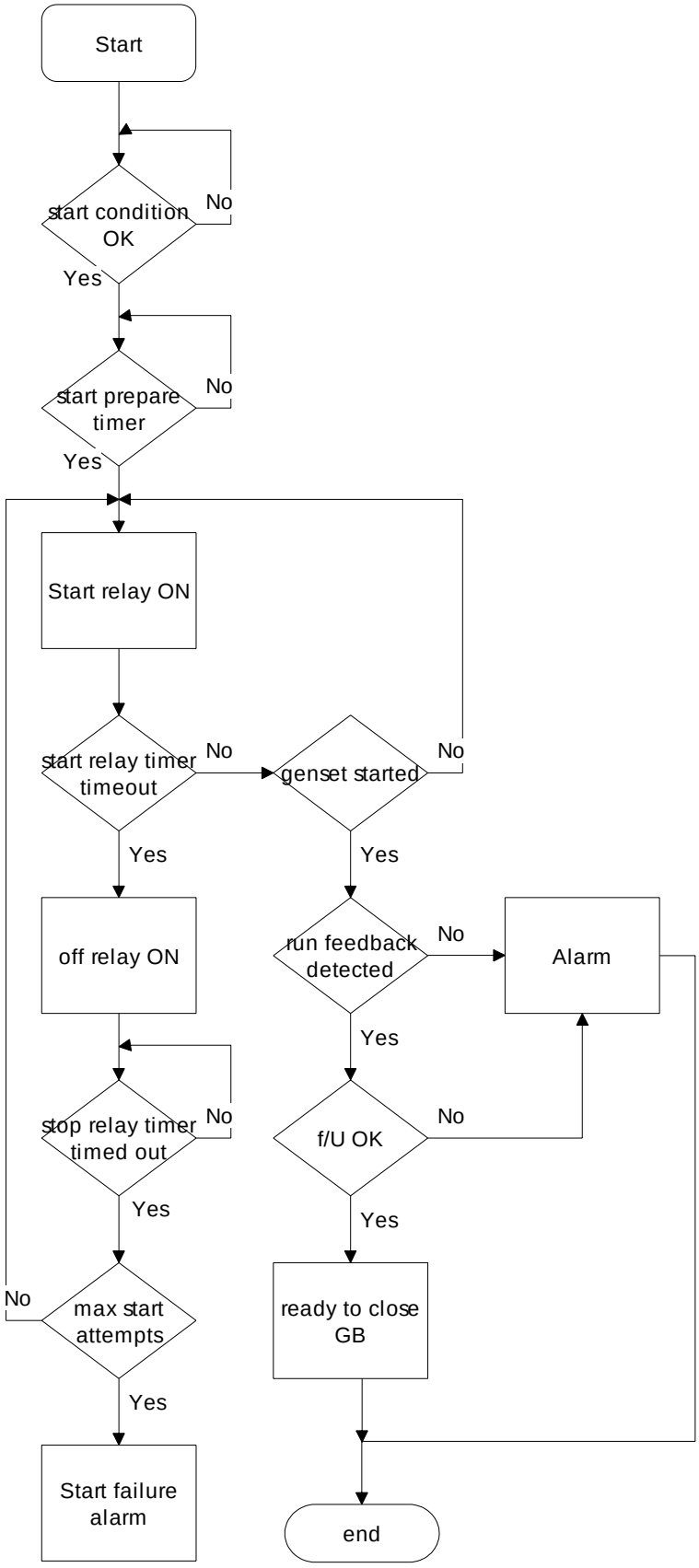
GB open sequence



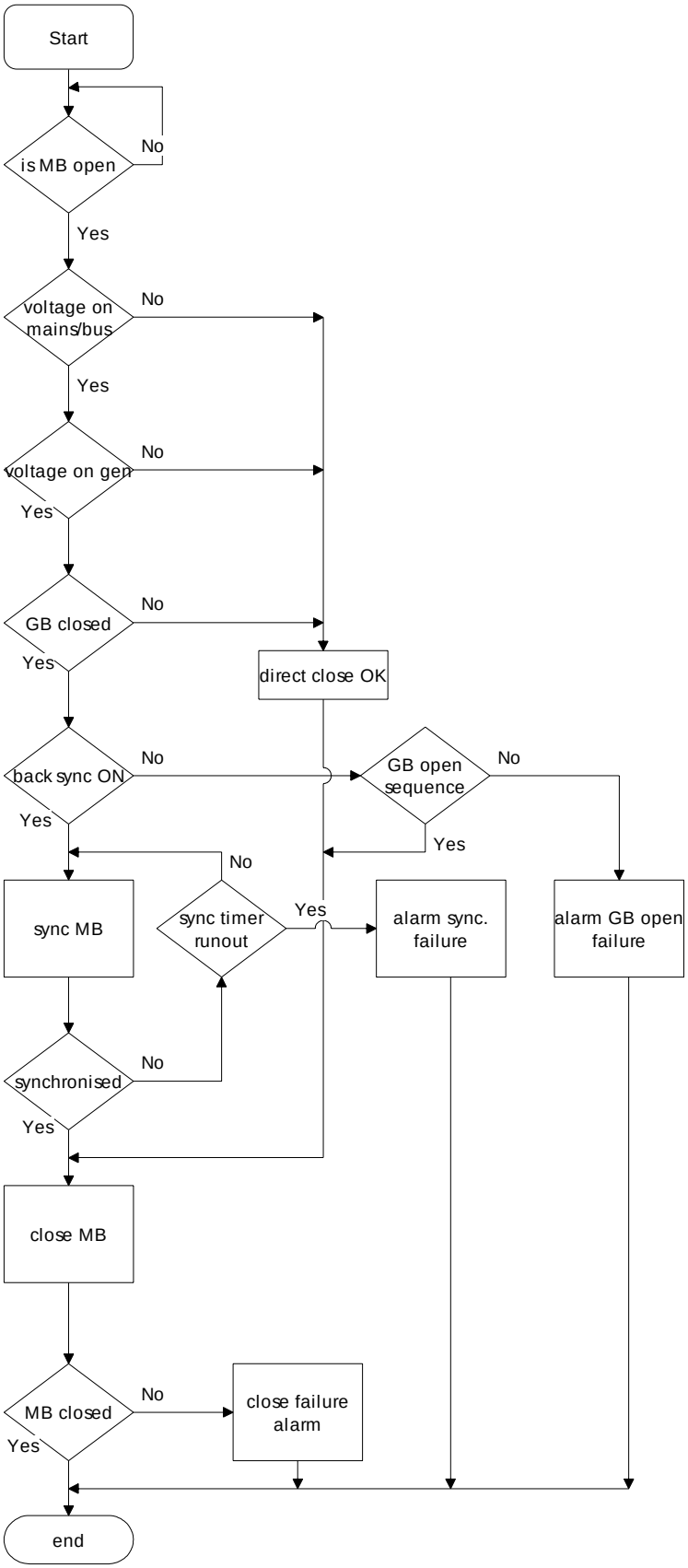
Stop sequence



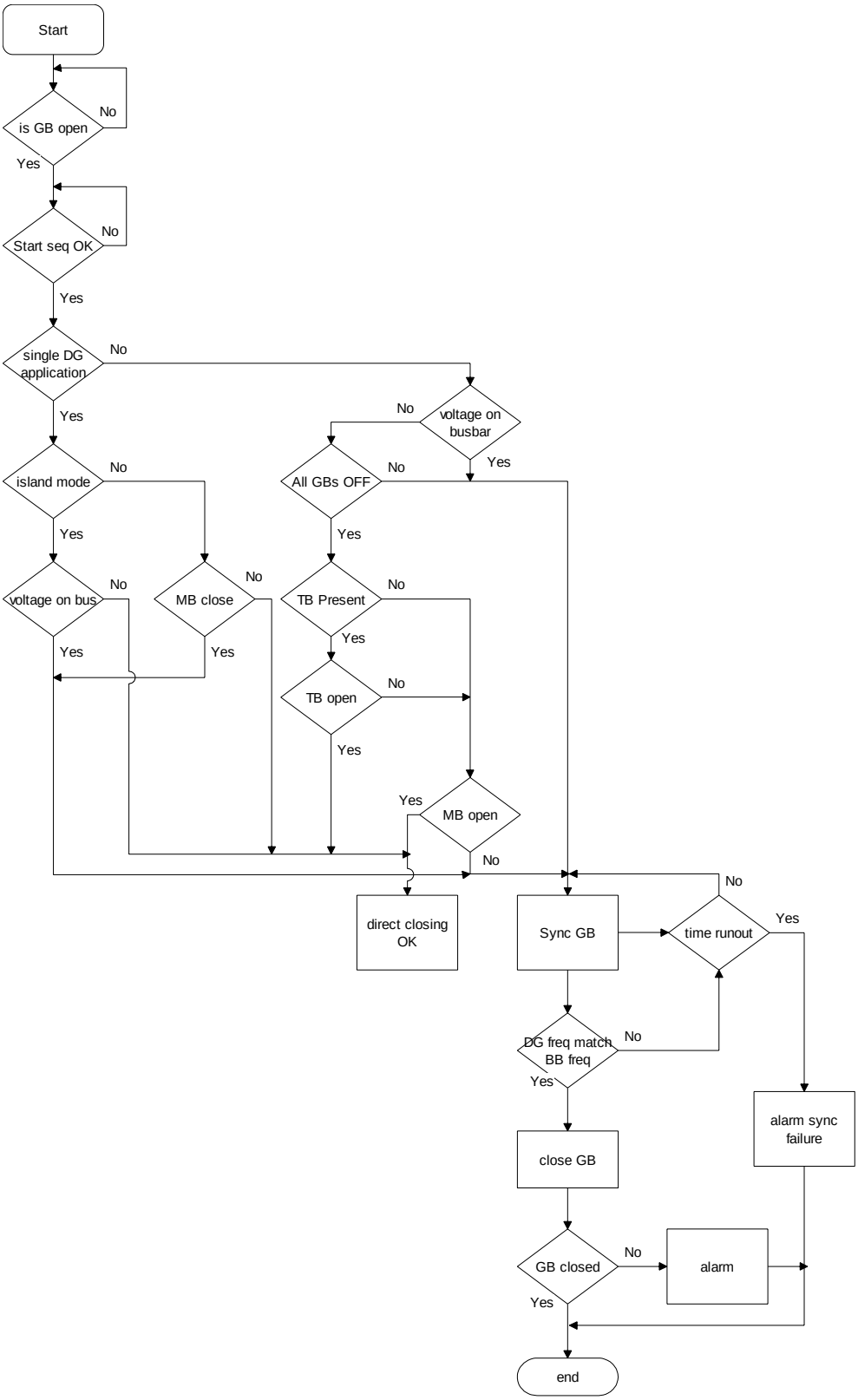
Start sequence



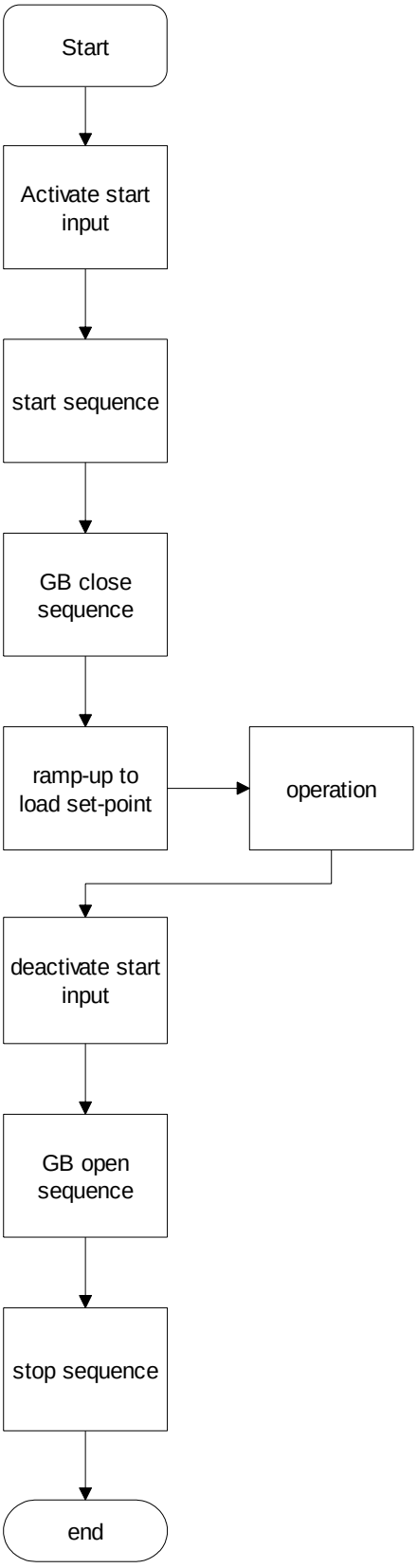
MB close sequence



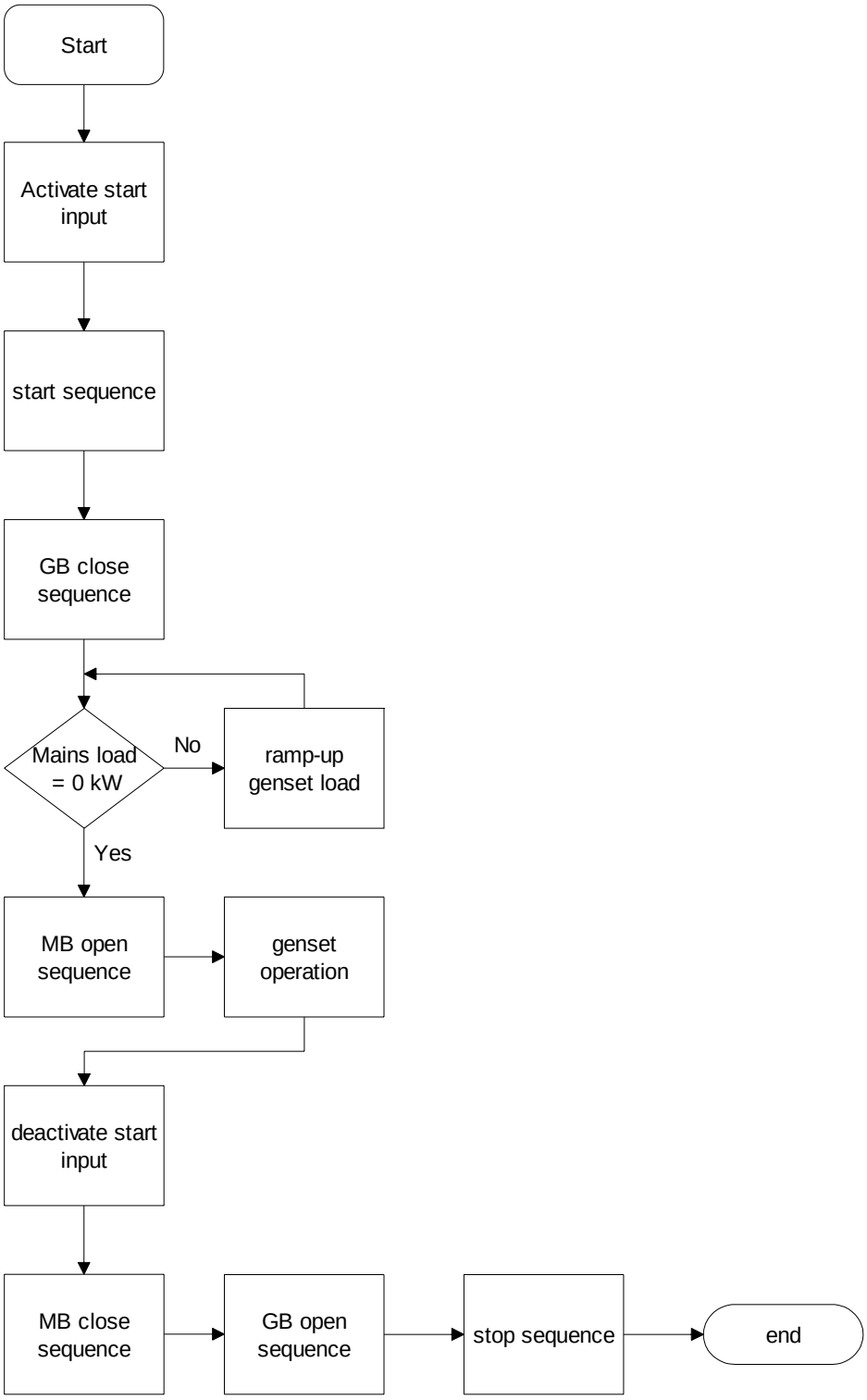
GB close sequence



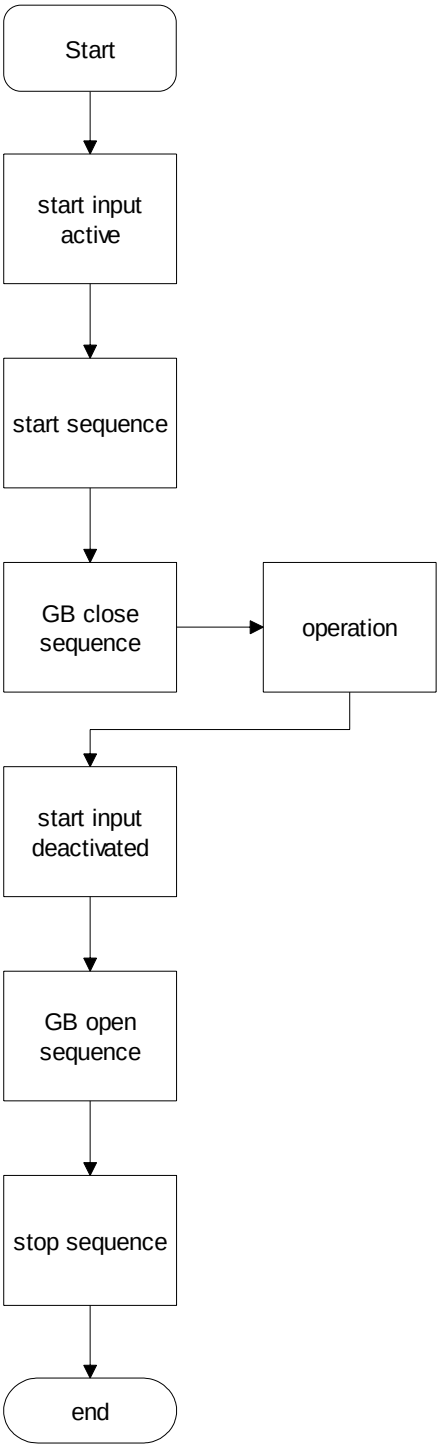
Fixed power


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

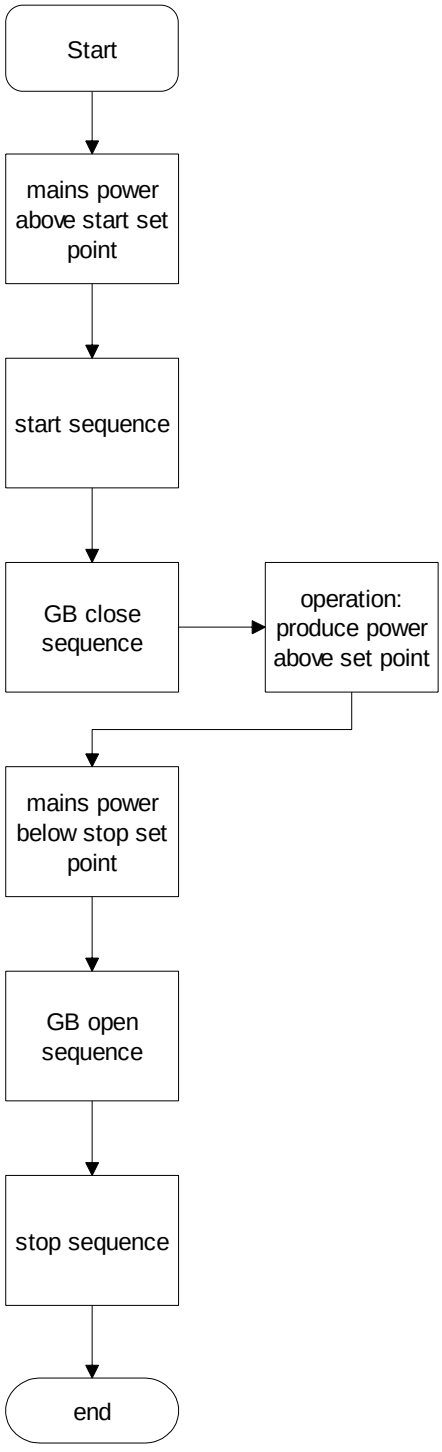
Load take over



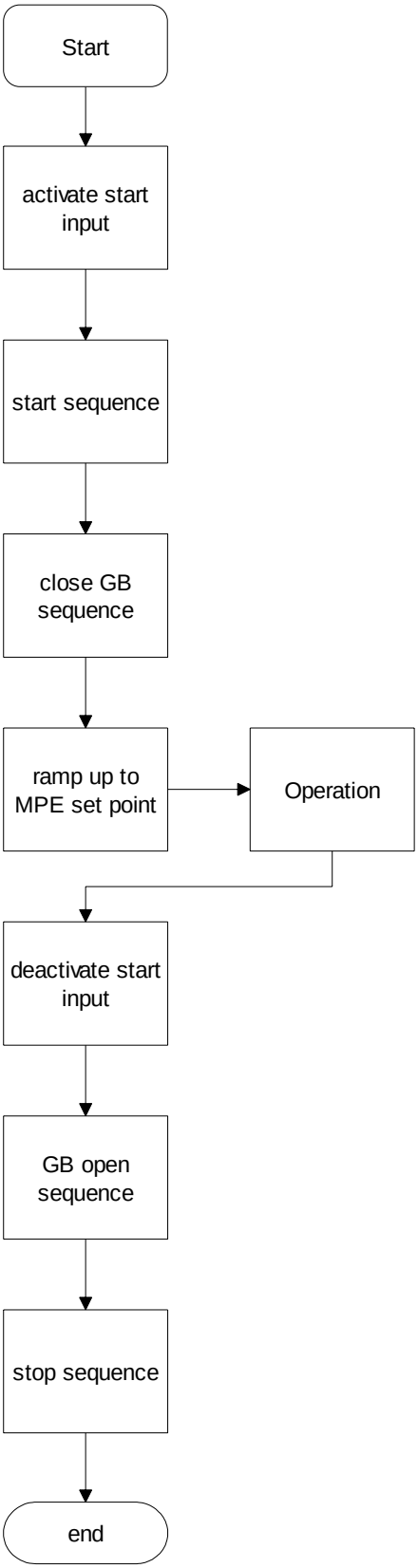
Island operation



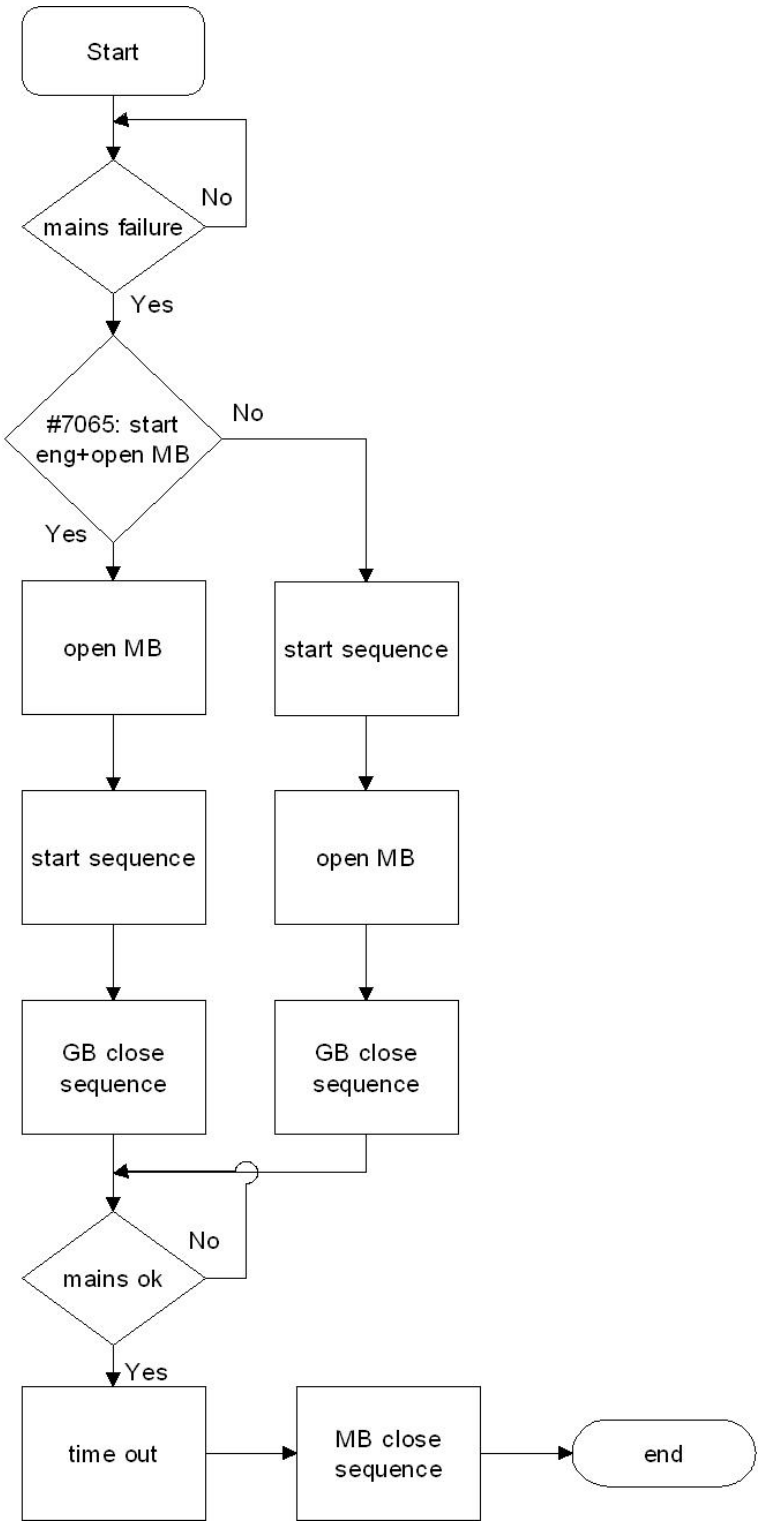
Peak shaving



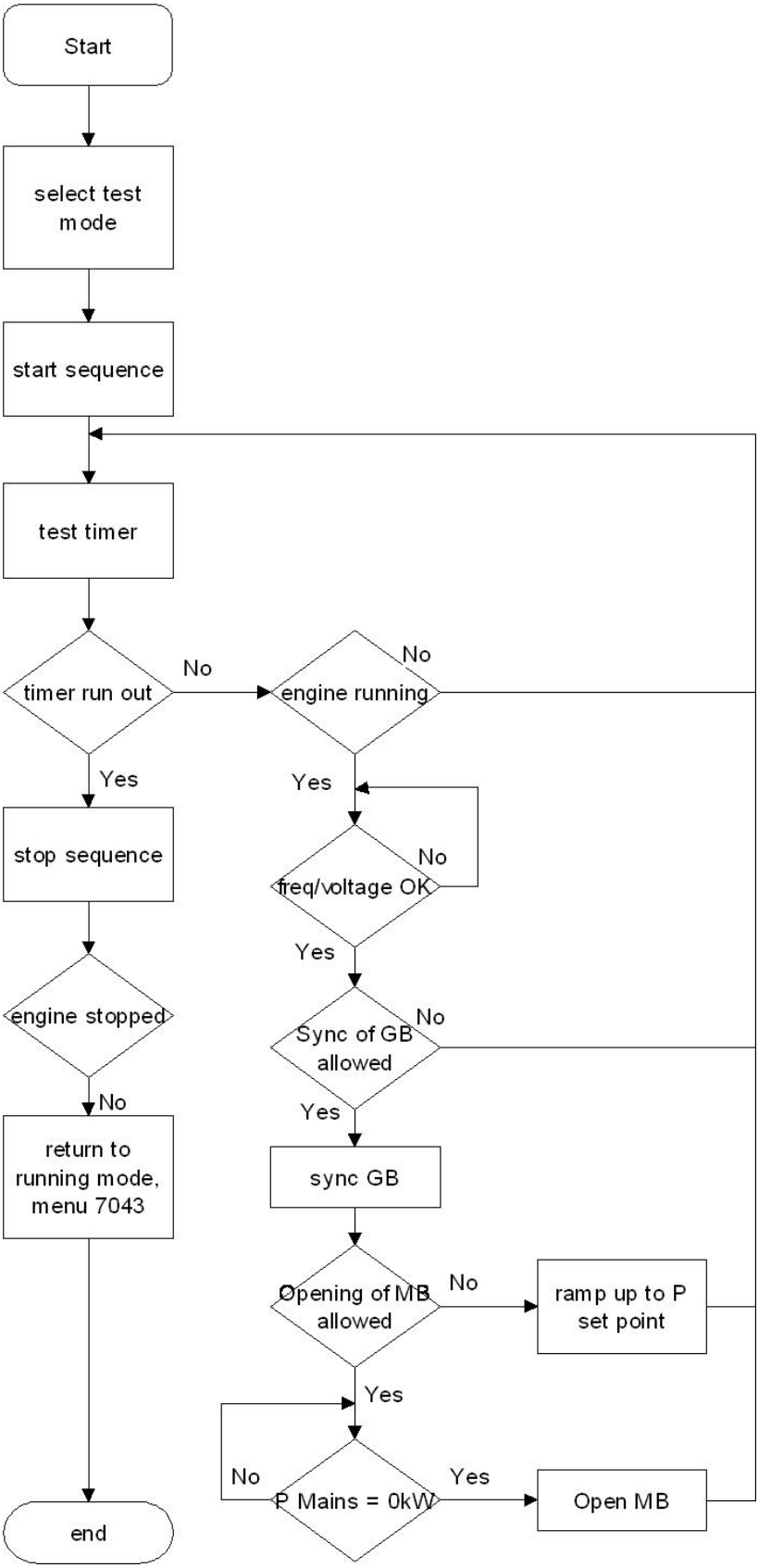
Mains power export



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

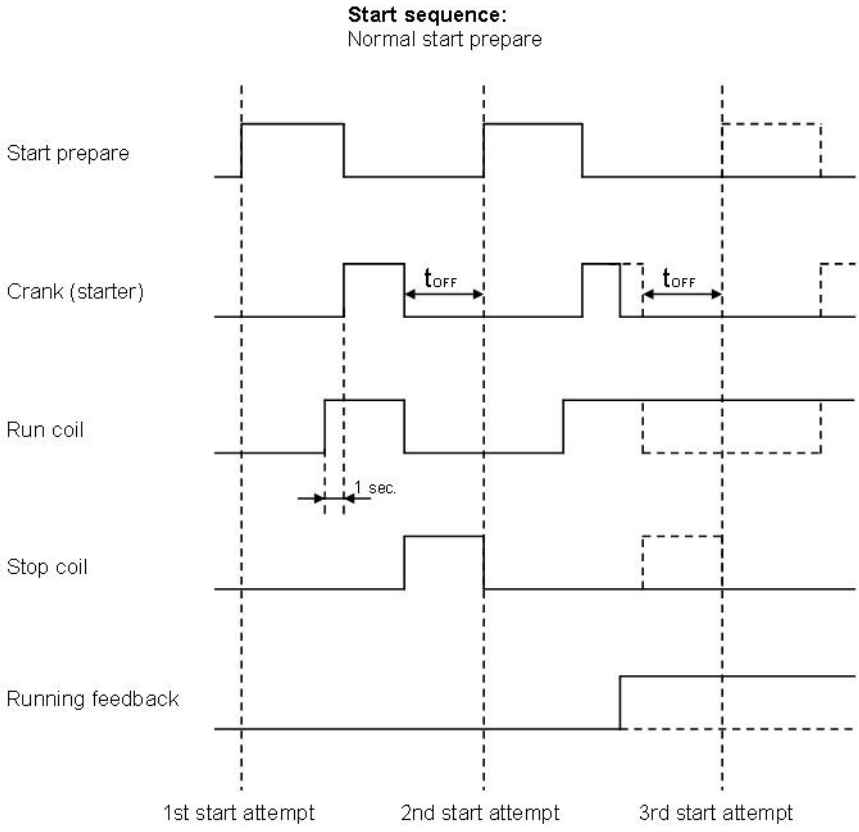
If island operation is selected, the digital input 'MB closed' must NOT be activated with a 12/24 volt input signal. A 'mains breaker failure' will occur, if the wiring of the mains breaker feedback inputs is wrong.

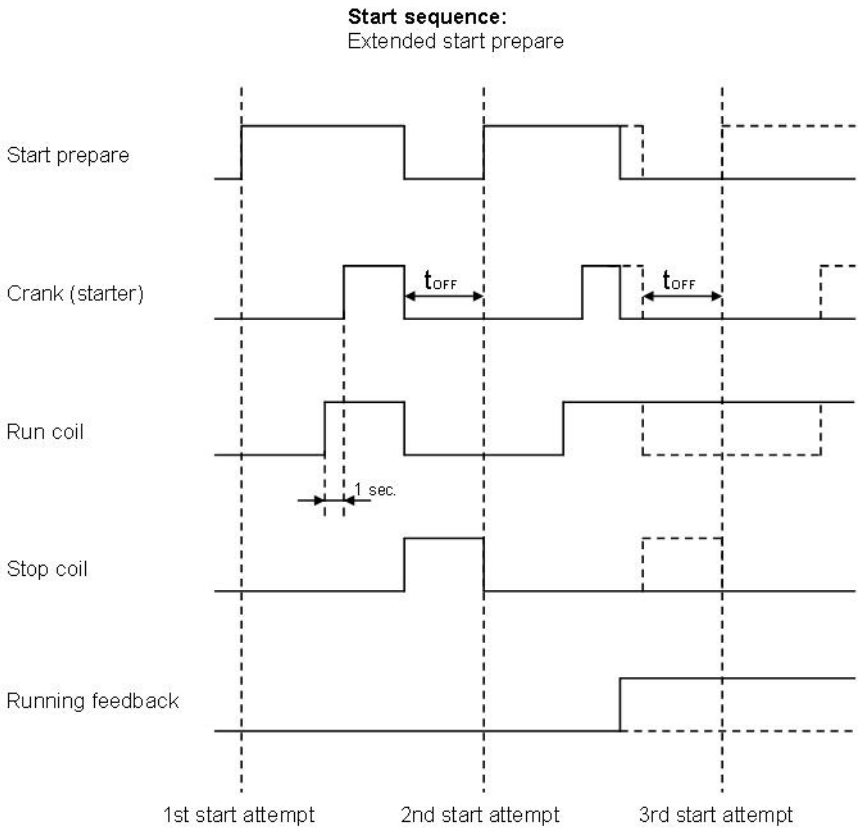
Refer to our 'Application Notes' or 'Installation Instructions' for information about the required breaker wiring.

Start sequence

The following drawings illustrate the start sequences of the gen-set with normal start prepare and extended start prepare.

No matter the choice of start prepare function, the running coil is activated 1 s before the start relay (starter).





Please see page 44 for a description of the settings related to the start sequence.

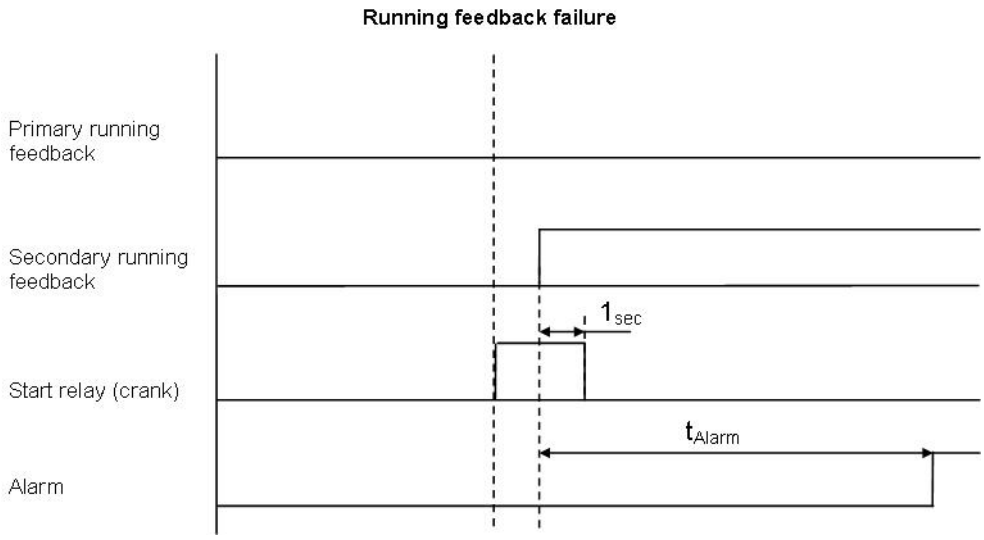
Running feedback

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

The running detection is made with a built-in safety routine. The running feedback selected is the primary feedback. At all times all the types of running feedback is used for running detection. If, for some reason, the primary choice is not detecting any running feedback, the starter relay will stay activated for 1 additional second. If a running feedback is detected based on one of the secondary choices, the 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.



Interruption of start sequence

The start sequence is interrupted in the following situations:

Event	Comment
Stop signal	
Start failure	
Remove starter feedback	Tacho set point.
Running feedback	Digital input.
Running feedback	Tacho set point.
Running feedback	Frequency measurement above 32Hz. The frequency measurement requires a voltage measurement of 30% of U_{NOM}. The running detection based on the frequency measurement can replace the running feedback based on tacho or digital input or engine communication.
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 MPU input is to be used to remove the starter, it has to be set up in menu 6174.

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

Set points related to the start sequence

- Crank failure alarm **(4530 Crank failure)**
If MPU is chosen as the primary running feedback, this alarm will be raised if the specified rpm is not reached before the delay has expired.

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

- Hz/V failure **(4550 Hz/V failure)**

If the frequency and voltage are not within the limits set in menu 2110 after the running feedback is received, this alarm is raised when the delay has expired.

- Start failure alarm **(4570 Start failure)**

The start failure alarm occurs, if the gen-set has not started after the number of start attempts set in menu 6190.

- Start prepare **(6180 Starter)**

Normal prepare: The start prepare timer can be used for start preparation purposes, e.g. pre-lubrication or pre-glowing. The start prepare relay is activated when the start sequence is initiated and deactivated when the start relay is activated. If the timer is set to 0.0 s, the start prepare function is deactivated.

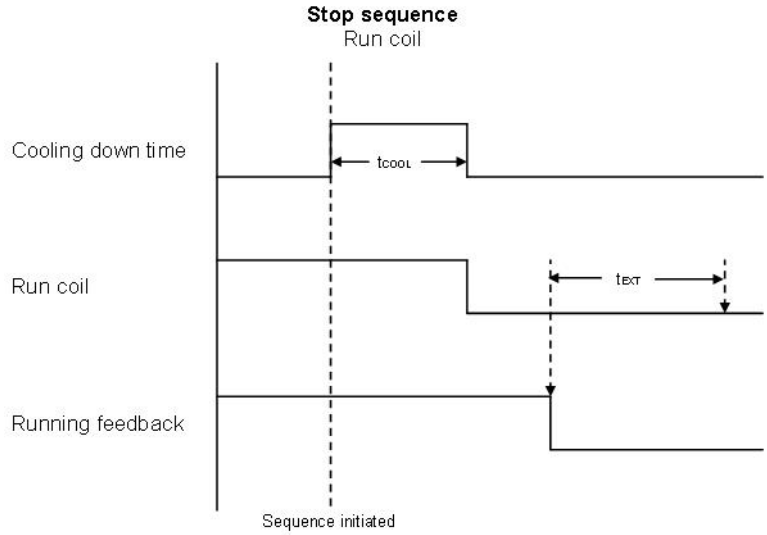
Extended prepare: The extended prepare will activate the start prepare relay when the start sequence is initiated and keep it activated when the start relay activates until the specified time has expired. If the ext. prepare time exceeds the start ON time, the start prepare relay is deactivated when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

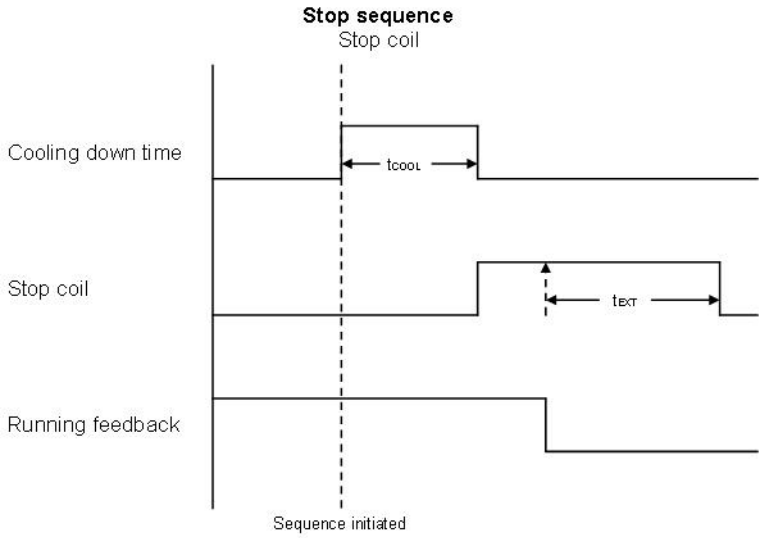
Start ON time: The starter will be activated for this period when cranking.

Start OFF time: The pause between two start attempts.

Stop sequence

The drawings illustrate the stop sequence.





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

Description	Cooling down	Stop	Comment
Auto mode stop	X	X	
Trip and stop alarm	X	X	
Stop button on display		X	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 set point	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, the analogue speed governor output is reset to the offset value if option E1, E2, EF2 or EF4 is selected. Please refer to the mentioned option descriptions.

Set points related to the stop sequence

- Stop failure **(4580 Stop failure)**

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

- Stop **(6210 Stop)**

Cooling down: The length of the cooling down period.
Extended stop: The delay after the running feedback has disappeared until a new start sequence is allowed.

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 menu 2110 Sync. blackout.

Set points related to MB control

7080 MB control

Mode shift: When enabled the AGC will perform the AMF sequence in case of a mains failure regardless of the actual gen-set mode.

MB close delay: The time from GB OFF to MB ON when back synchronisation is OFF.

Back sync.: Enables synchronisation from mains to generator.

Sync. to mains: Enables synchronisation from generator to mains.

Type: Selection of breaker type. If 'No breaker' is selected, the relays and inputs normally used for MB control become configurable.

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

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 **(7060 U mains failure)**

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

The possibilities are:

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

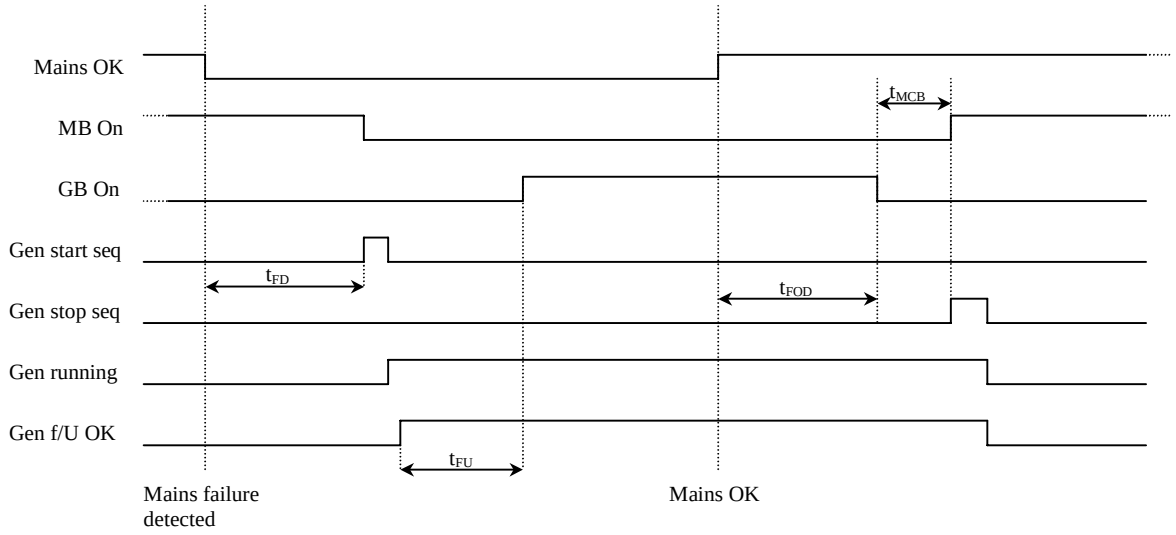
The time charts describe the functionality at a mains failure and at mains return. Back synchronisation is deactivated. The timers used by the AMF function are indicated in the table below:

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

The timer t_{MBC} is only active, if back synchronisation is deactivated.

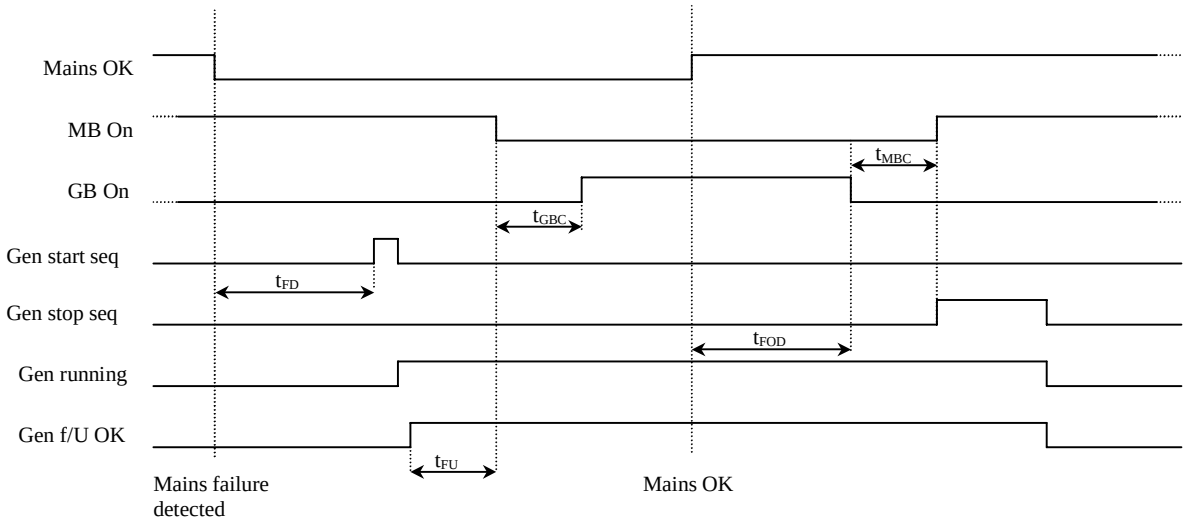
Example 1:

7065 Mains fail control: Start engine and open MB



Example 2:

7065 Mains fail control: Start engine



Conditions for breaker operations

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

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

Conditions for breaker operations	
Sequence	**Condition**
GB ON, direct closing	Running feedback Generator frequency/voltage OK MB open
MB ON, direct closing	Mains frequency/voltage OK GB open
GB 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 or Trip MB alarms
GB OFF, deloading	MB closed
MB OFF, deloading	Alarms with fail class: Trip and stop

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 (DU-2)

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: Displays the LOG SETUP window where you can choose between the Event, Alarm and Battery logs. The logs 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 set point (in the setup menu). In the daily use display, this button function is used for scrolling the View lines in V1 or the second line (in the setup menu) 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 set point (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*.

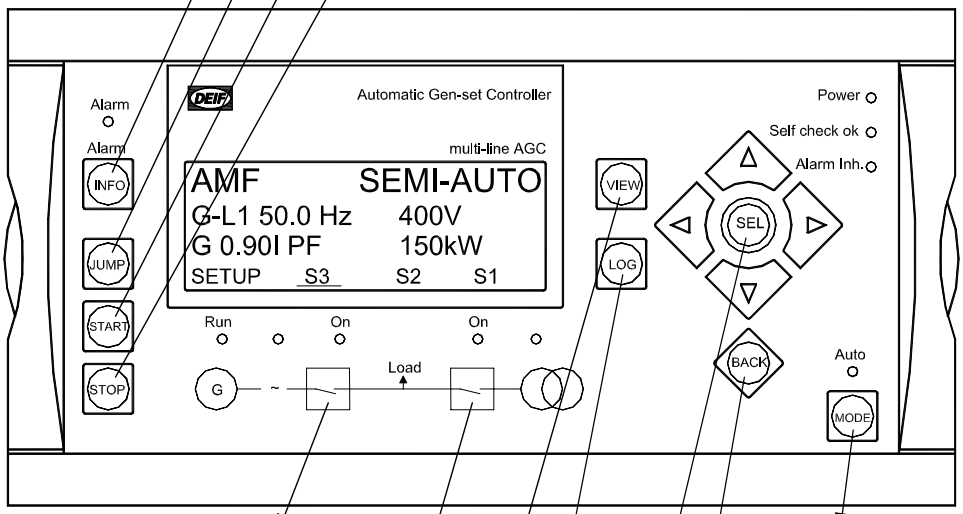
STOP: Stop of the gen-set *if 'SEMI-AUTO' or 'MANUAL' is selected*.

(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:



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

JUMP:
Enters a specific menu number selection.

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:
Opens the GB, if it is closed.
Closes (sync.) the GB, if it is opened.

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

MB:
Opens the MB, if it is closed.
Closes (sync.) the MB, if it is opened.

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

LOG:
Shifts the display three lower lines to show the event and alarm list.

SEL:
Selects the underscored entry in the fourth display line.

BACK:
Jumps one step backwards in the menu.

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: Please refer to 'Alarm inhibit' in the chapter 'Additional functions'.

Run: LED indicates that the generator is running.

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

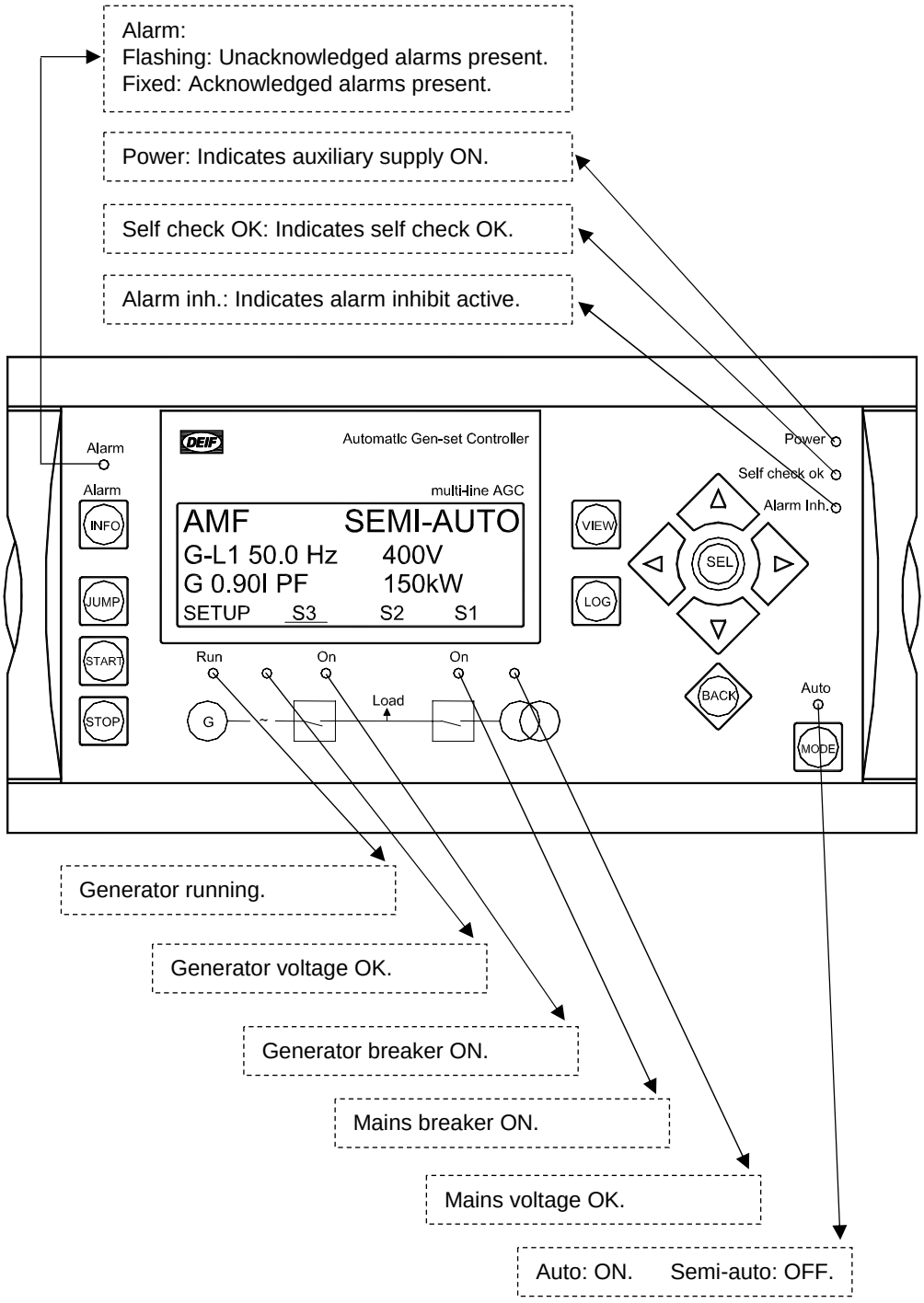
(GB) ON: LED green light indicates that the generator breaker is closed.
LED yellow light indicates that the generator breaker has received a command to close on a black BUS, but the breaker is not yet closed due to interlocking of the GB.
LED is flashing orange if the 'GB spring loaded' signal from the breaker is missing or the GB load time has not expired.

(MB) ON: LED indicates that the mains breaker is closed.
LED is flashing orange if the 'MB spring loaded' signal from the breaker is missing or the MB load time has not expired.

(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:

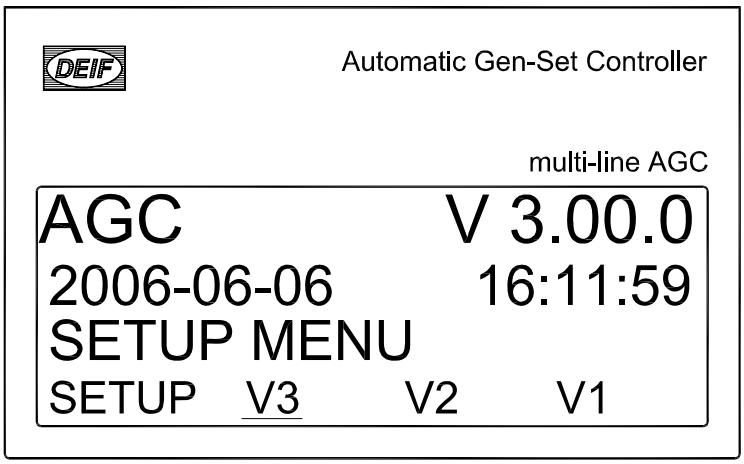
View menu system
This is the commonly used menu system. 15 windows are configurable and can be entered by using the arrow push-buttons.

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

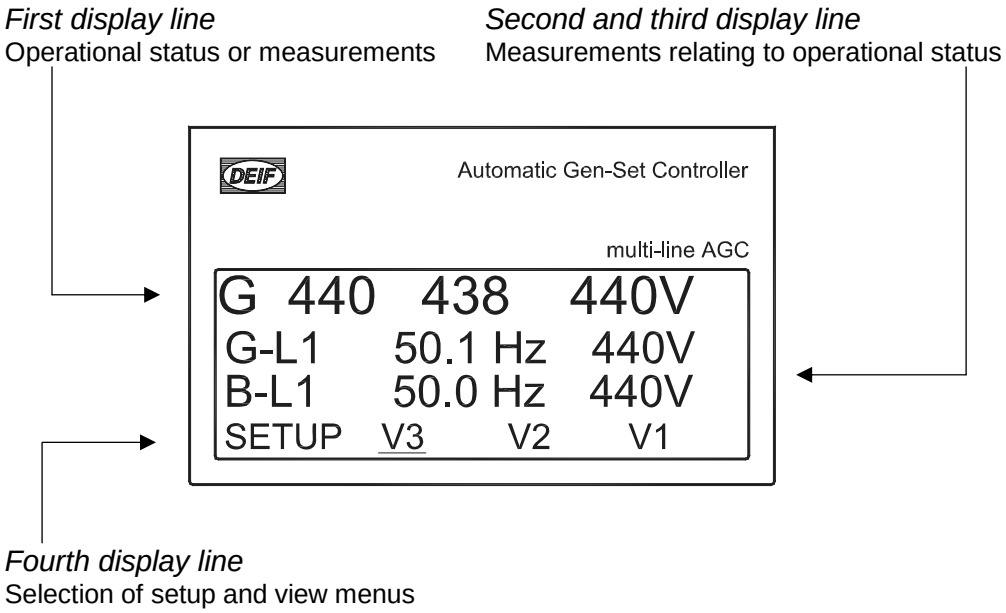
When the unit is powered up, an entry window appears. The entry window is the turning point in the menu structure and as such the gateway to the other menus. It can always be reached by pressing the BACK push-button 3 times.

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.

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

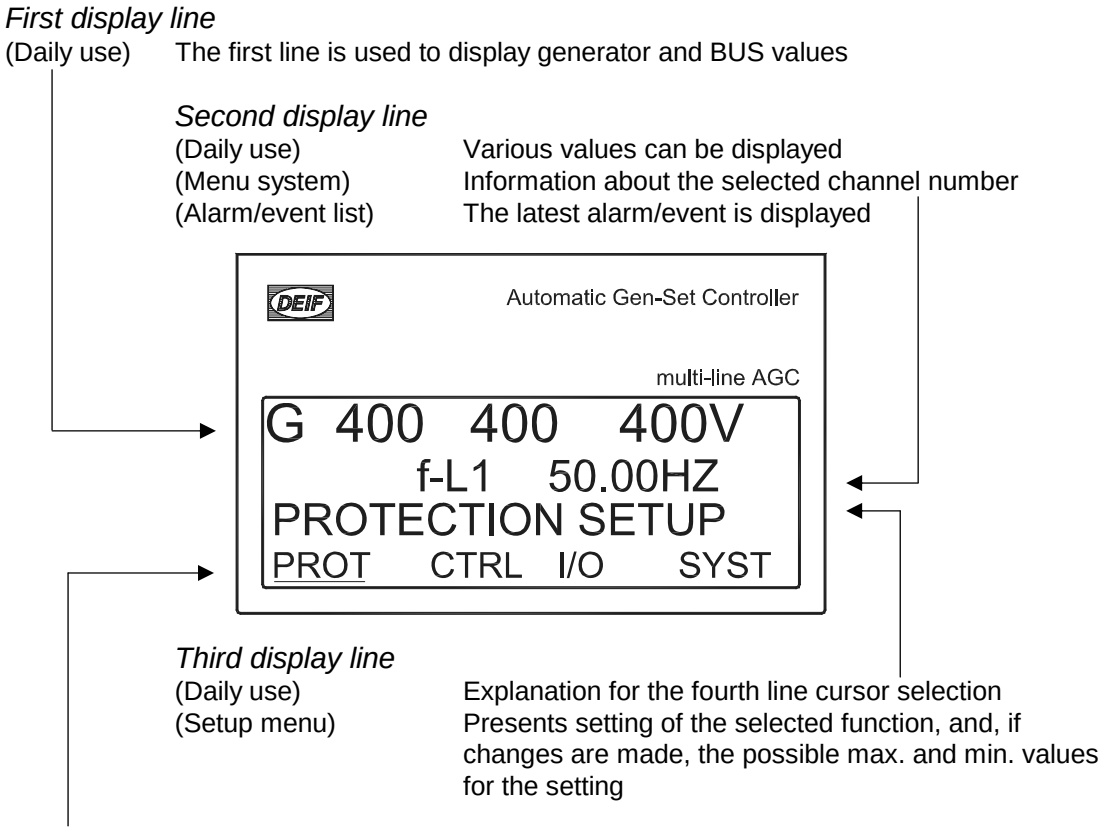
The entry window displays view 3, (in the illustration above the window where 'manual' is displayed).

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.

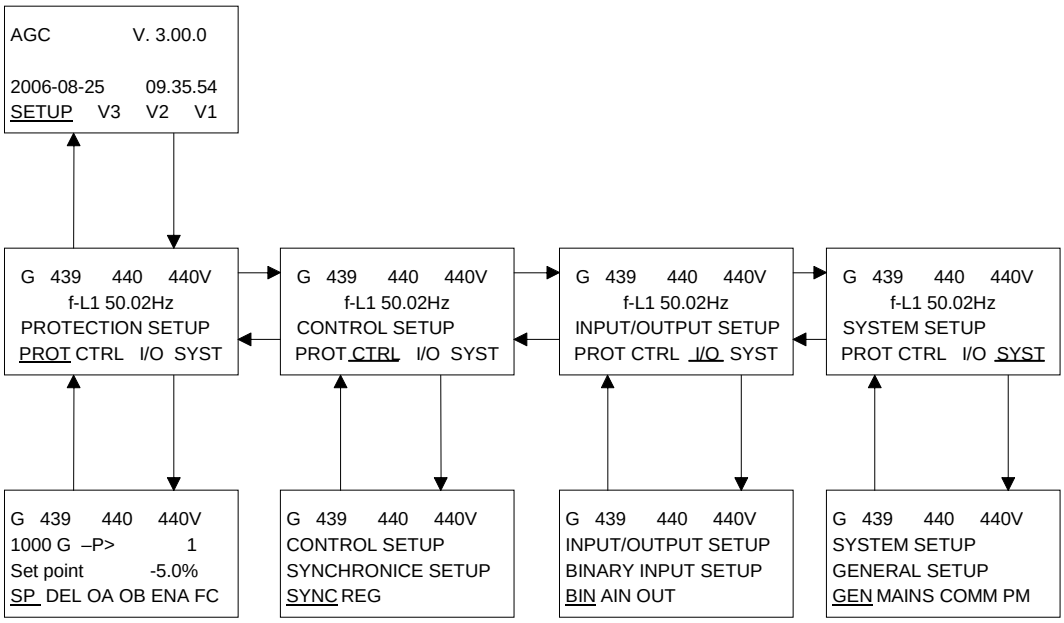


Possible values in second display line

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)	Multi input 1	Power supply voltage (V DC)
Voltage L1-N (V AC)	Voltage L1-N (V AC)	Multi input 2	
Voltage L2-N (V AC)	Voltage L2-N (V AC)		
Voltage L3-N (V AC)	Voltage L3-N (V AC)	Multi input 3	
Voltage L1-L2 (V AC)	Voltage L1-L2 (V AC)	Mains power A102	
Voltage L2-L3 (V AC)	Voltage L2-L3 (V AC)	Analog 91	
Voltage L3-L1 (V AC)	Voltage L3-L1 (V AC)	Analog 93	
Voltage max. (V AC)	Voltage max. (V AC)	Analog 95	
Voltage min. (V AC)	Voltage min. (V AC)	Analog 97	
Current L1 L2 L3 (A)	Frequency L1 (Hz)	MPU	
Current L1 (A)		Battery asym 1	
Current L2 (A)		Battery asym 2	

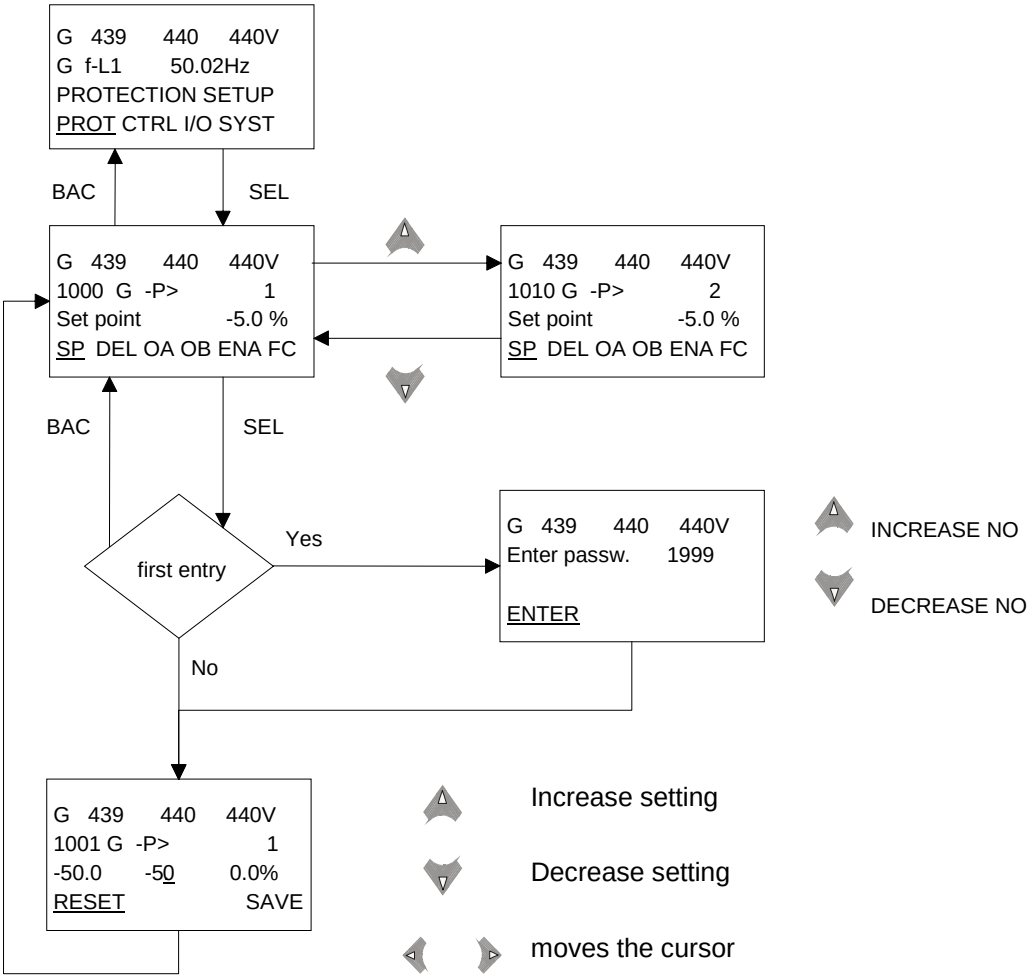
View line/second display line configuration			
For generator	**For bus/mains**	**For analogue input**	**Communication/ other**
Current L3 (A)	Voltage angle between L1-L2 (deg.)		
Frequency/voltage L1 (Hz/V AC)	Voltage angle between generator voltage and bus voltage (deg.)		
Frequency L1 (Hz)	Available power (kW)		
Frequency L2 (Hz)			
Frequency L3 (Hz)			
Active power (kW)	Total generator power (kW)		
Reactive power (kVAr)	Mains power (kW)		
Apparent power (kVA)	Negative voltage		
	Negative current		
	Zero voltage		
	Zero current		
Power factor			
Voltage angle between L1-L2 (deg.)			
Voltage angle between L2-L3 (deg.)			
Voltage angle between L3-L1 (deg.)			
Energy counter, total (kWh)			
Energy counter, daily (kWh)			
Energy counter, weekly (kWh)			
Energy counter, monthly (kWh)			
Absolute run time (hrs)			
Relative run time (hrs)			
Next priority shift (hrs and min.)			
Shutdown override run time			
Number of GB operations			
Number of MB operations			
Service timer 1			
Service timer 2			

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 genset.

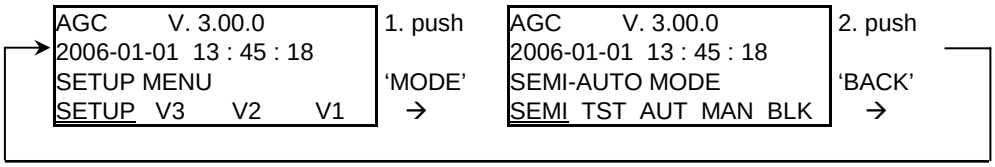
Mode selection

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

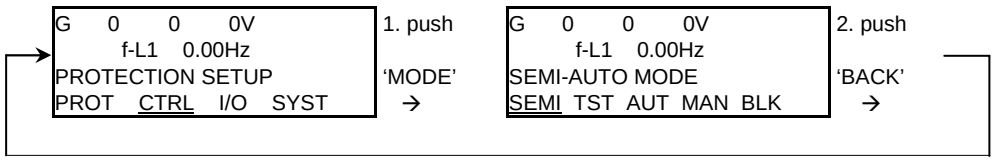
Pushing the MODE push-button will change the displayed text. After pushing 'MODE', the fourth display line indicates the selectable modes. In the third display line, the underscored (fourth line) selection will be displayed.

Two possibilities are now available:

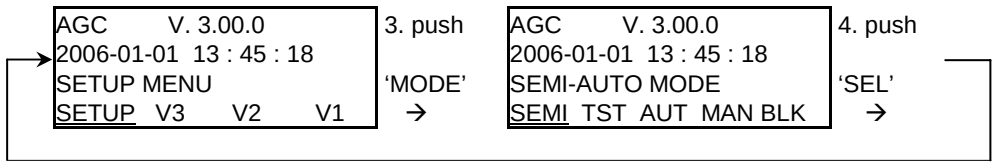
If 'BACK' is pushed, the display returns to the original text without changing the mode.



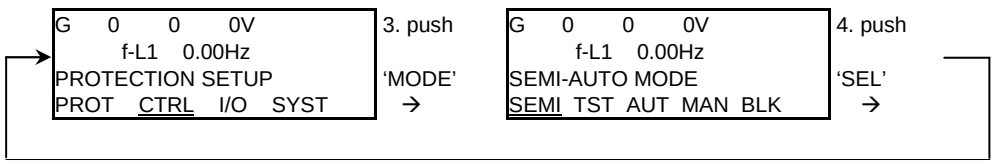
or



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.



or



Password

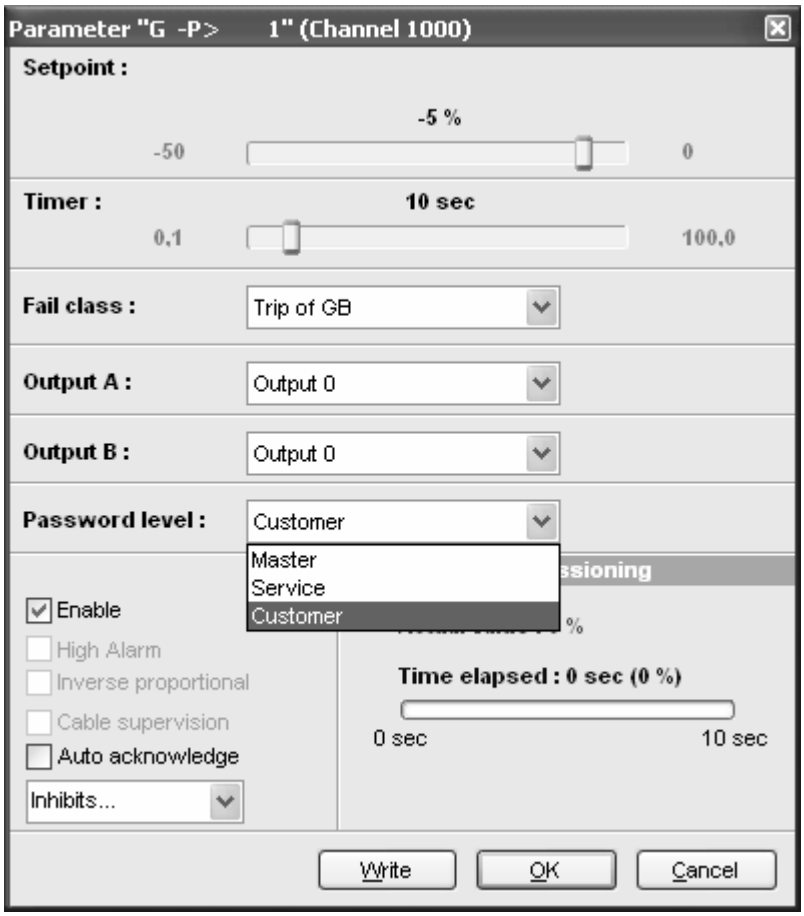
The unit includes three password levels. All levels can be adjusted in the PC software.

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

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

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

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

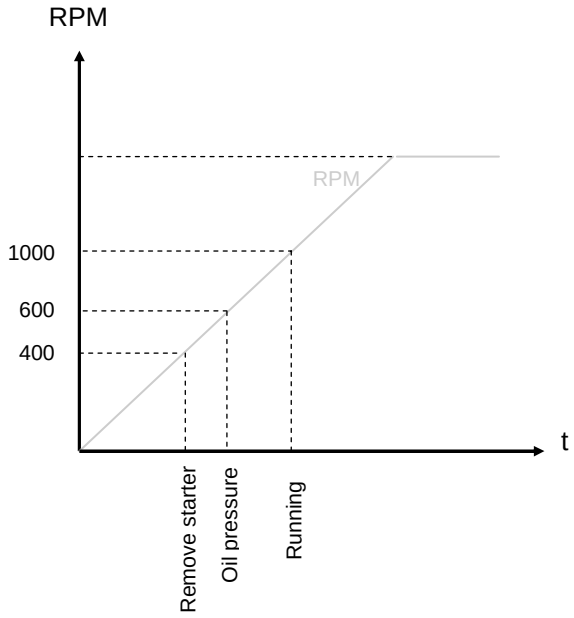
The unit will start the gen-set when the start command is given. The start sequence is deactivated when the remove starter event occurs or when the running feedback is present.

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

See page 43 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 set point 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.

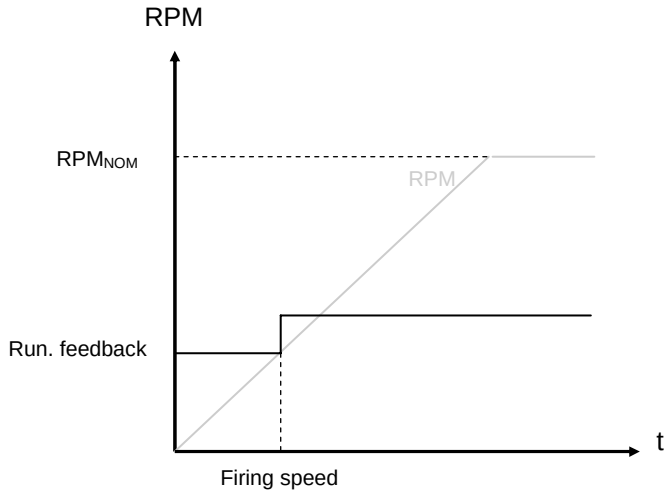


Digital feedbacks

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

Running feedback

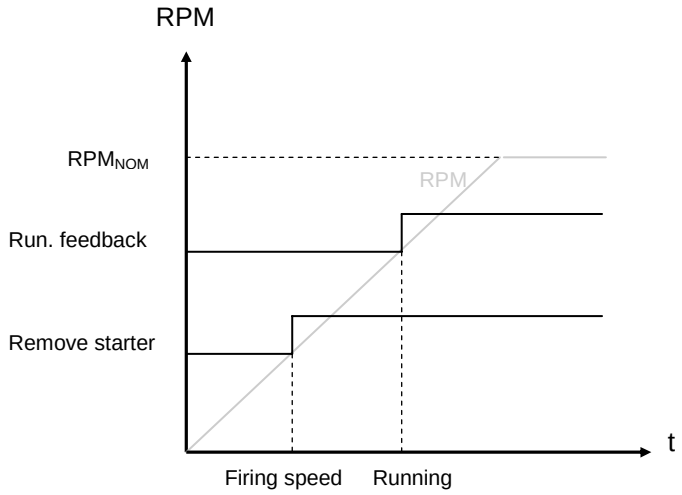
When the digital running feedback is active, the start relay is deactivated and the starter motor will be disengaged.



The diagram illustrates how the digital running feedback (terminal 117) is activated, when the engine has reached its firing speed.

Remove starter

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



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

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

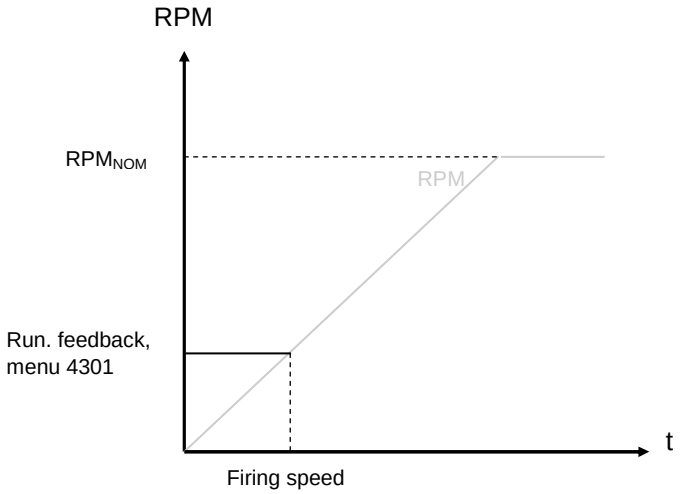
The running feedback is detected by either the digital input (see diagram above), frequency measurement above 32Hz, RPM measured by magnetic pick-up or EIC (option H5/H7).

Analogue tacho feedback

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

Running feedback.

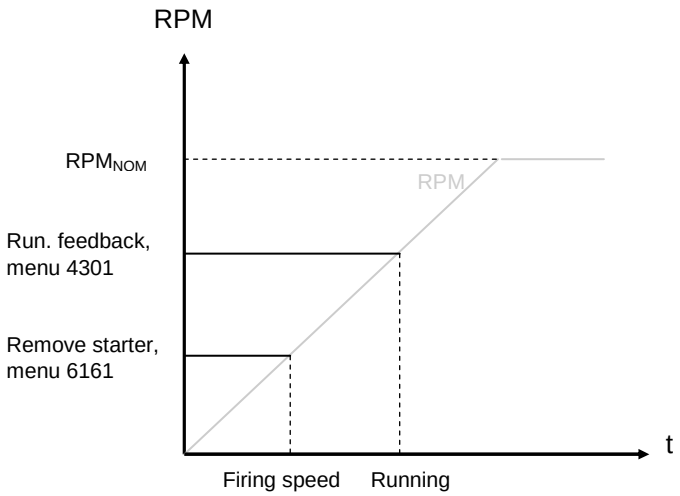
The diagram below shows how the running feedback is detected at the firing speed level. The factory setting is 1000 RPM **(6170 Running detect.)**.



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

Remove starter input

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



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

Breaker spring load time

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

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

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

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

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

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.

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

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

Breaker LED indication

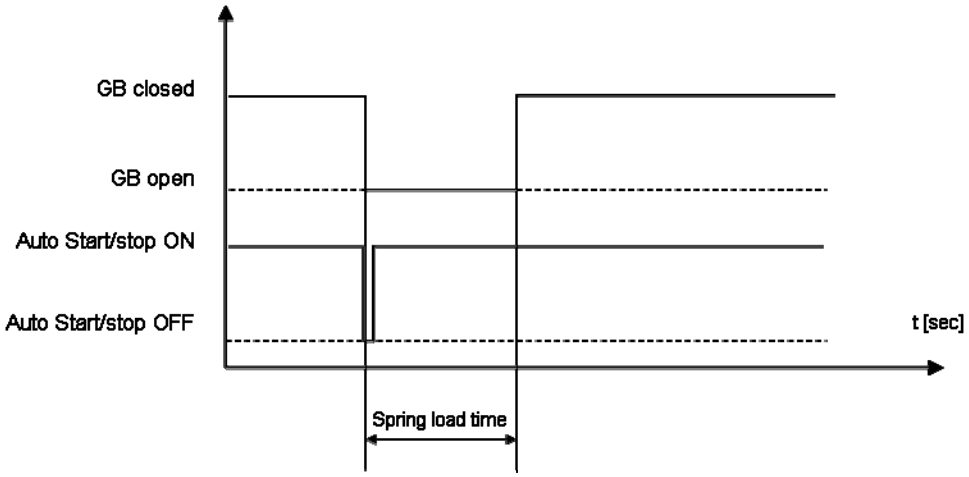
To alert the user that the breaker close sequence has been initiated but is waiting for permission to give the close command, the LED indication for the breaker will be flashing yellow in this case.

If the breaker needs time to reload the spring after it has opened, then the 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

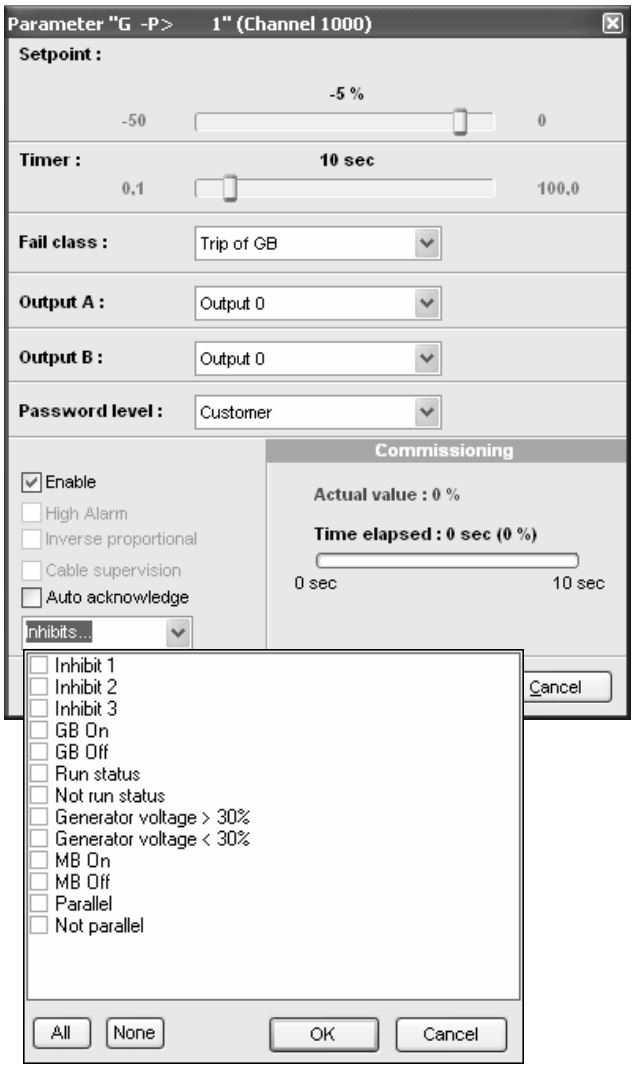
The diagram shows an example where a single AGC in island mode is controlled by the AUTO start/stop input.

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.



Alarm inhibit

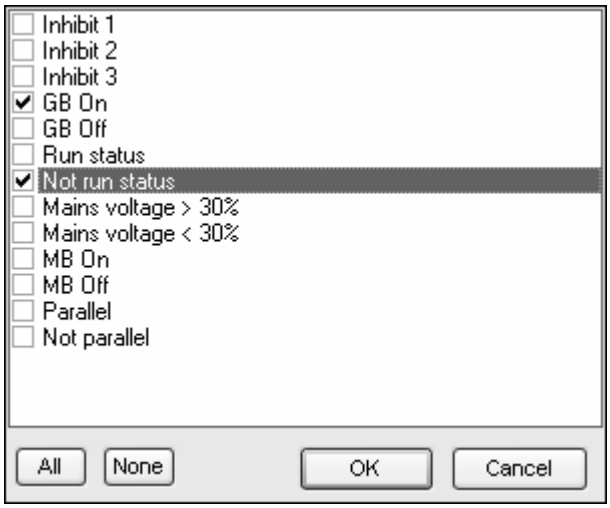
In order to select when the alarms are to be active, a configurable inhibit setting for every alarm has been made. The inhibit functionality is only available via the PC utility software. For every alarm there is a drop-down window where it is possible to select which signals that have to be present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



Selections for alarm inhibit:

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

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



In this example, inhibit is set to *Not run status* and *GB ON*. Here, the alarm will be active when the generator has started. When the generator has been synchronised to the busbar, the alarm will be disabled again.

The inhibit LED on the unit and on the display will activate when one of the inhibit functions is active.

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

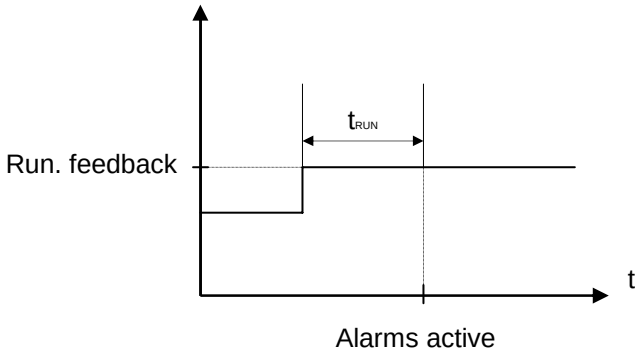
If an alarm is configured to activate a limit relay, the relay will activate despite that the inhibit input is ON.

The tie breaker unit has no running detection that can be configured, so the only inhibit functions are the binary input and the TB position.

Run status (6160)

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

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



Access lock

The purpose of access lock is to deny the operator the possibility to configure the unit parameters and change the running modes.

The input to be used for the access lock function is defined in the ML-2 PC utility software (USW).

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.

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

Input name	Input status	Comment
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	

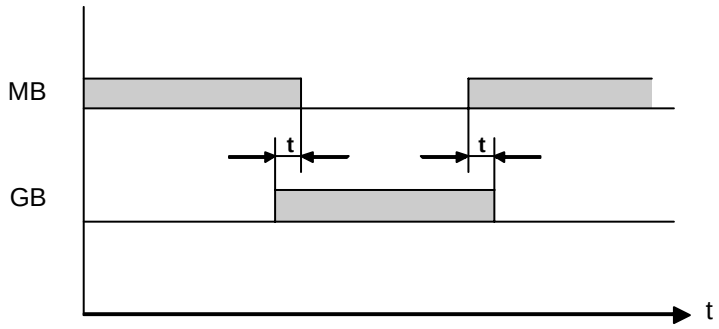
AOP buttons are not locked when access lock is activated.

Overlap

The purpose of the *overlap* 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 overlap 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 overlap 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.

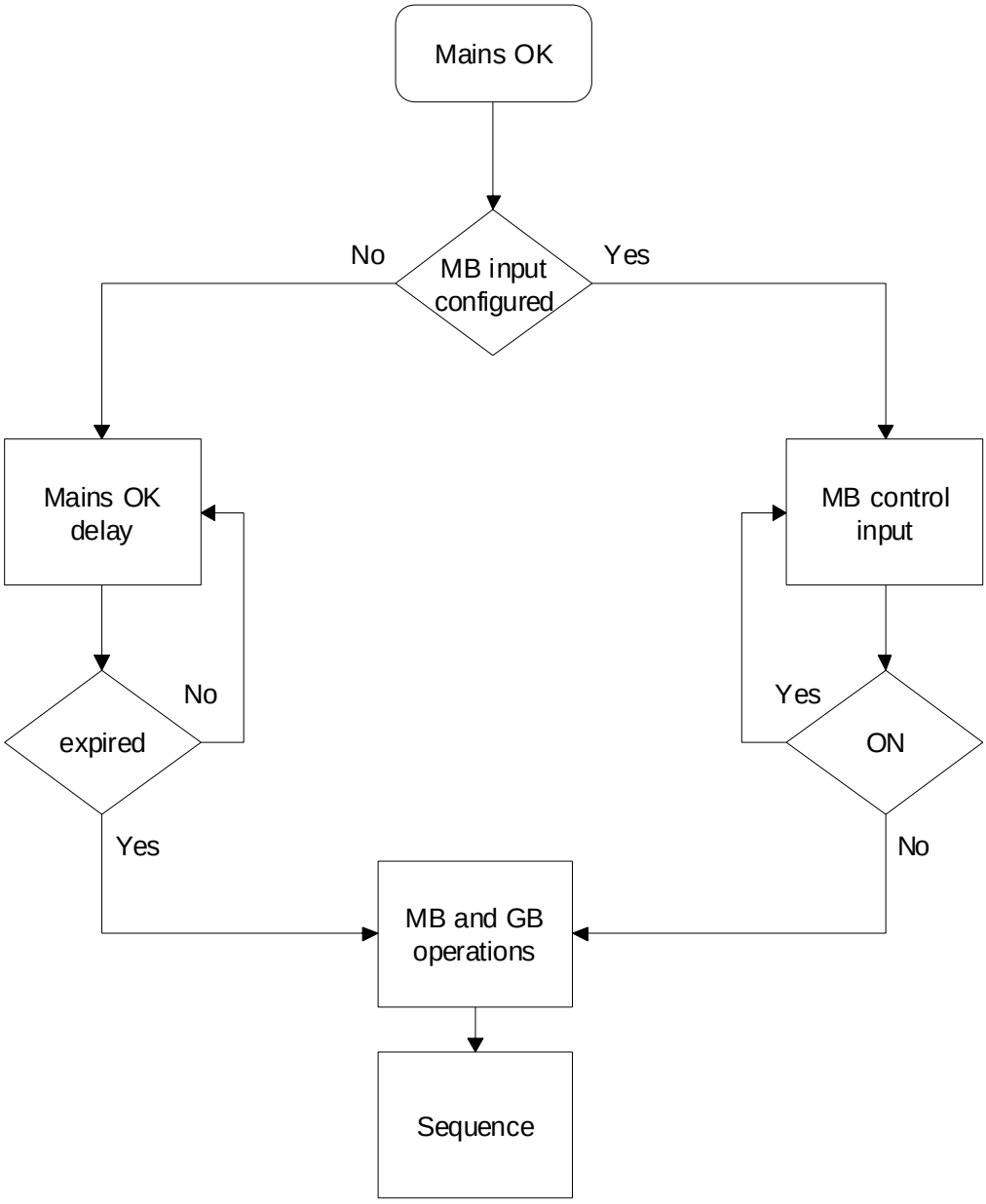
The short time parallel function is set up in **2760 Overlap**.

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

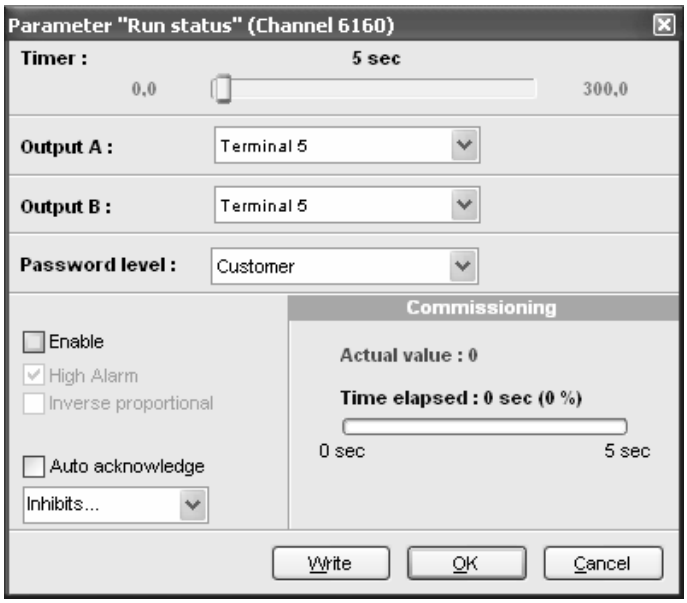
The digital input 'auto start/stop' cannot be used, when this function is enabled.

The time dependent start and stop commands are pulses that are not sent until the moment the adjusted time is reached.

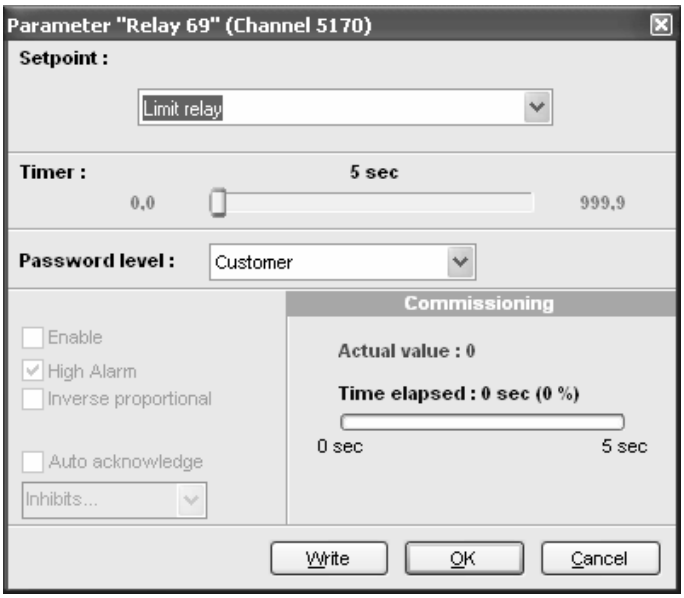
It is necessary to use the PC utility software when setting up the time dependent start/stop function.

Running output

6160 Run 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	Comment
Multi input 102	0-40V DC 4-20mA PT100/1000 VDO Digital
Multi input 105	
Multi input 108	
EIC	
M-logic	

Select the needed input in **6260 Power 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 Power derate)

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

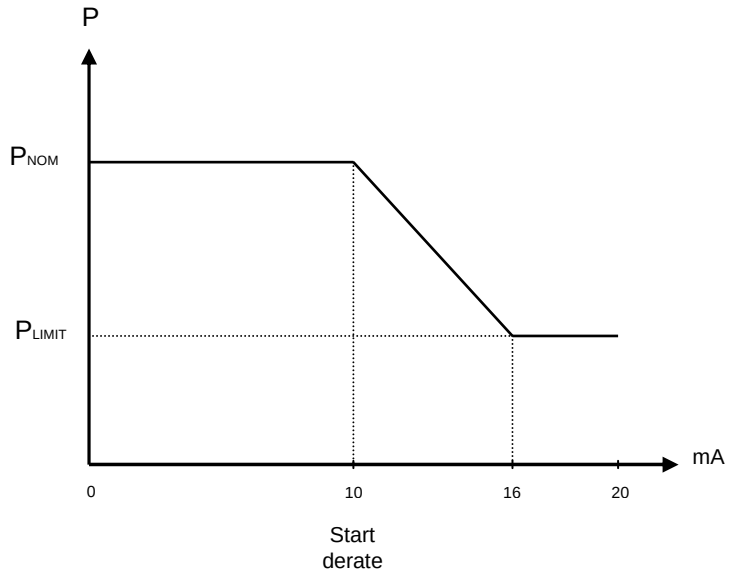
Slope (6260 Power derate)

Adjust the derating speed. The adjustment is in percent per unit, i.e. if the 4-20mA input is used, then the derating will be in %/mA, and if the PT100/PT1000/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 Power derate)

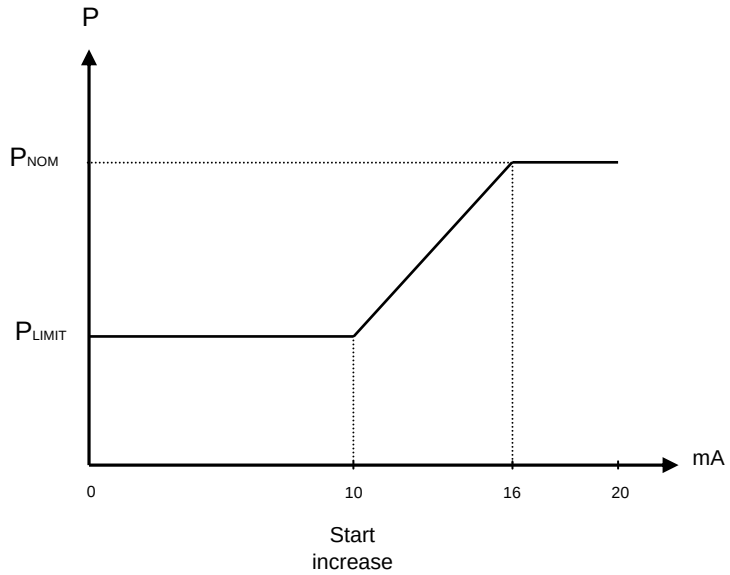
This is the lowest derate level.



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 set point (in the example above the control value is an mA signal).

The derate characteristic is selected in **6260** Power 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 6290 Idle running. It has to be noted that the governor itself must handle the idle speed based on a digital signal from the unit (see the principle diagram below).

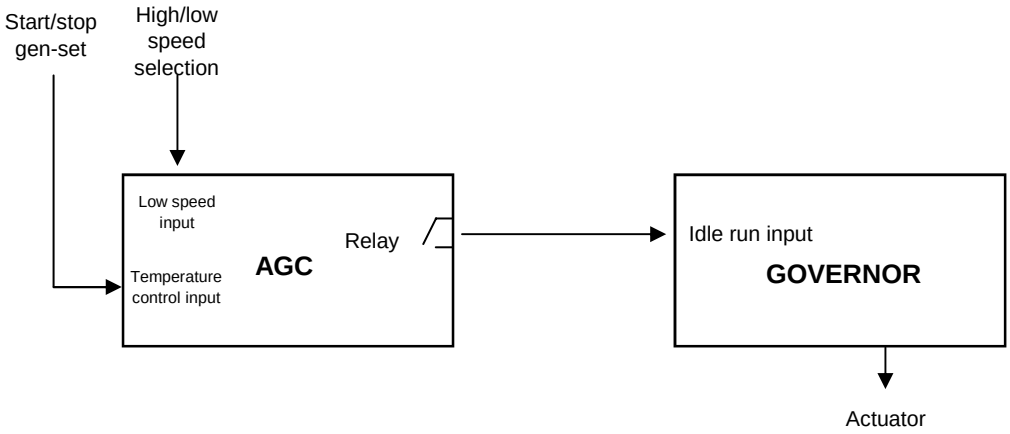
When the function is enabled, two digital inputs are used for control purposes:

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.

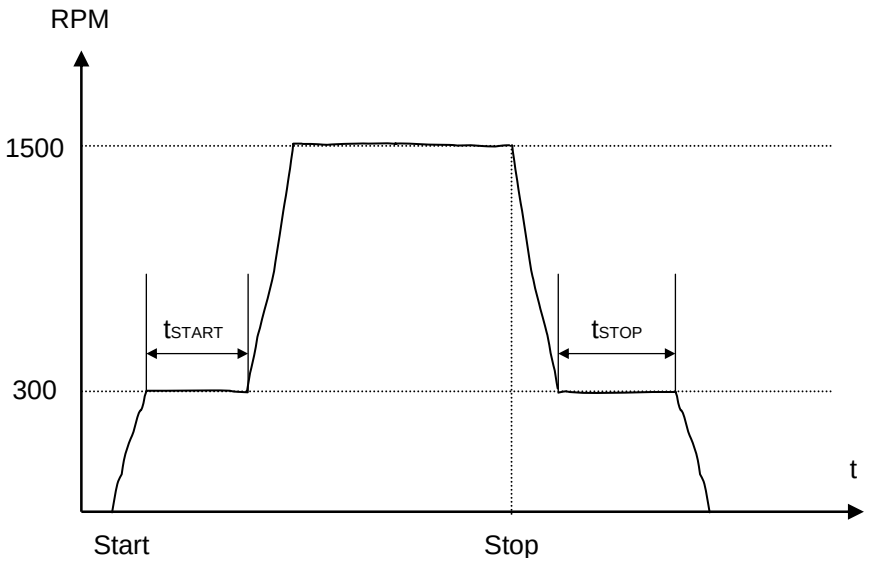


Examples

Idle speed during starting and stopping

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

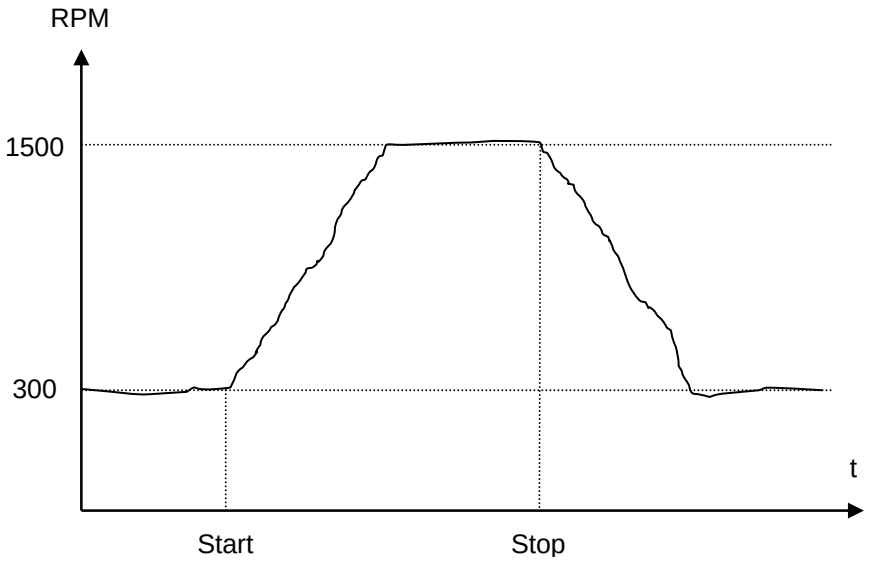
The start and stop sequences are changed in order to let the gen-set stay at the idle level before speeding up. It also decreases the speed to the idle level for a specified delay time before stopping.



Idle speed, no stopping

In this example both timers are deactivated.

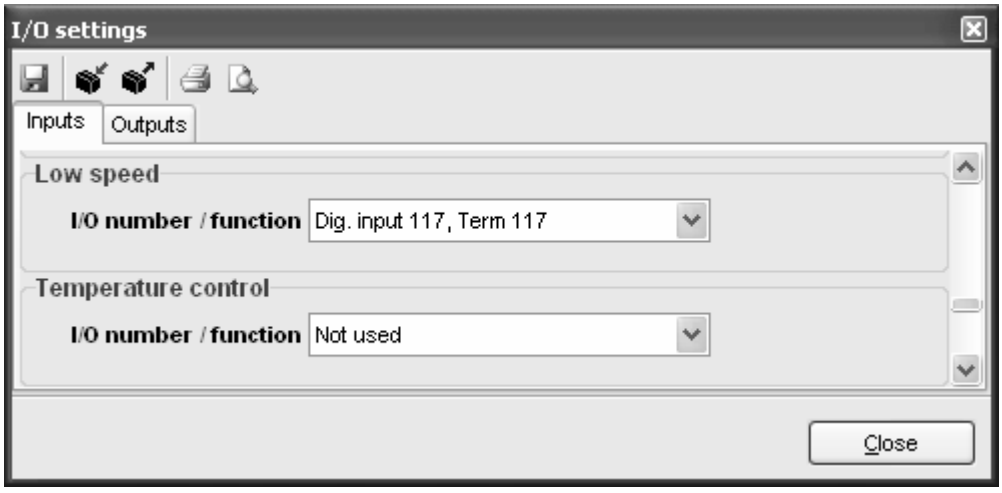
If the gen-set is to be prevented from stopping, then the digital input 'temp control' must be left ON at all times. In that case the characteristic looks like this:



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

Configuration of digital input

The digital input is configured via the PC software.



Inhibit

The alarms that are deactivated by the inhibit function are inhibited in the usual manner, except for the oil pressure alarms; VDO oil 102, 105 and 108 which are active during 'idle run' as well.

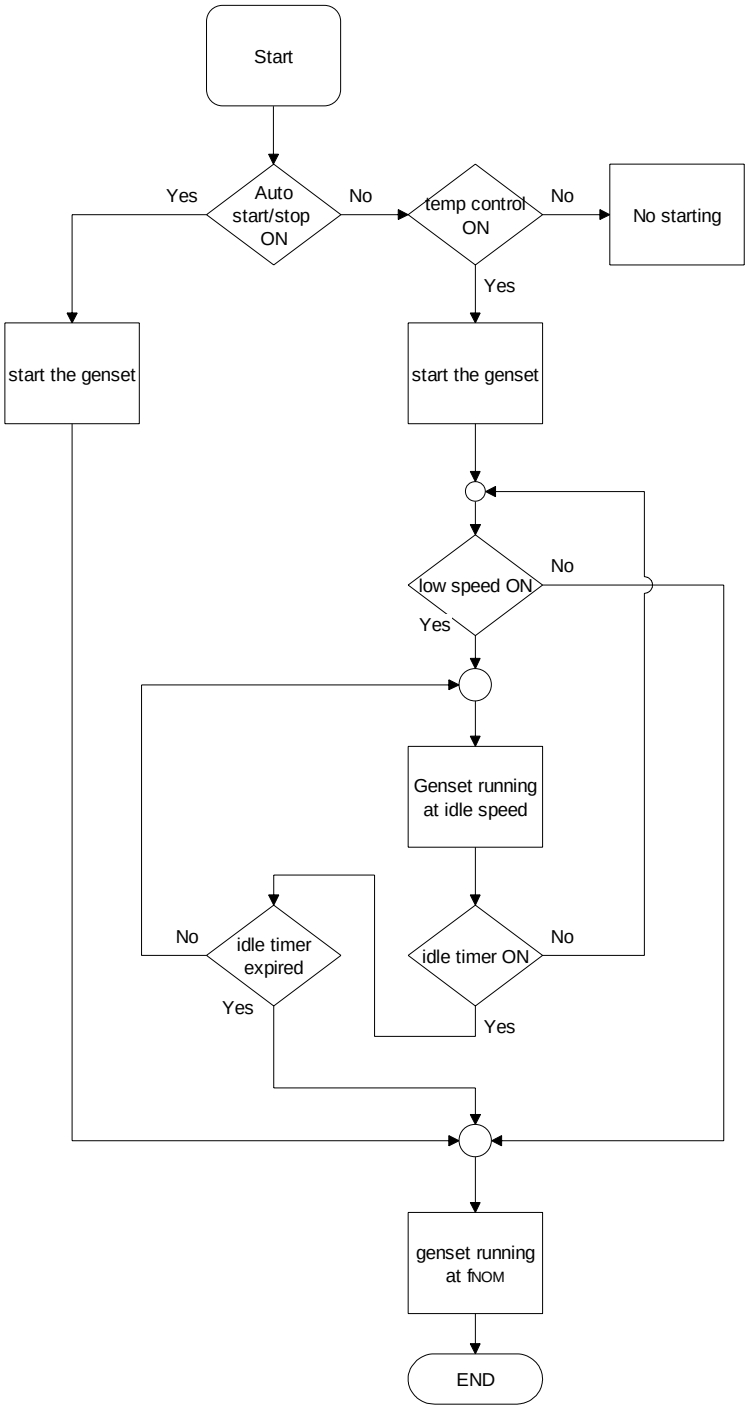
Running signal

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

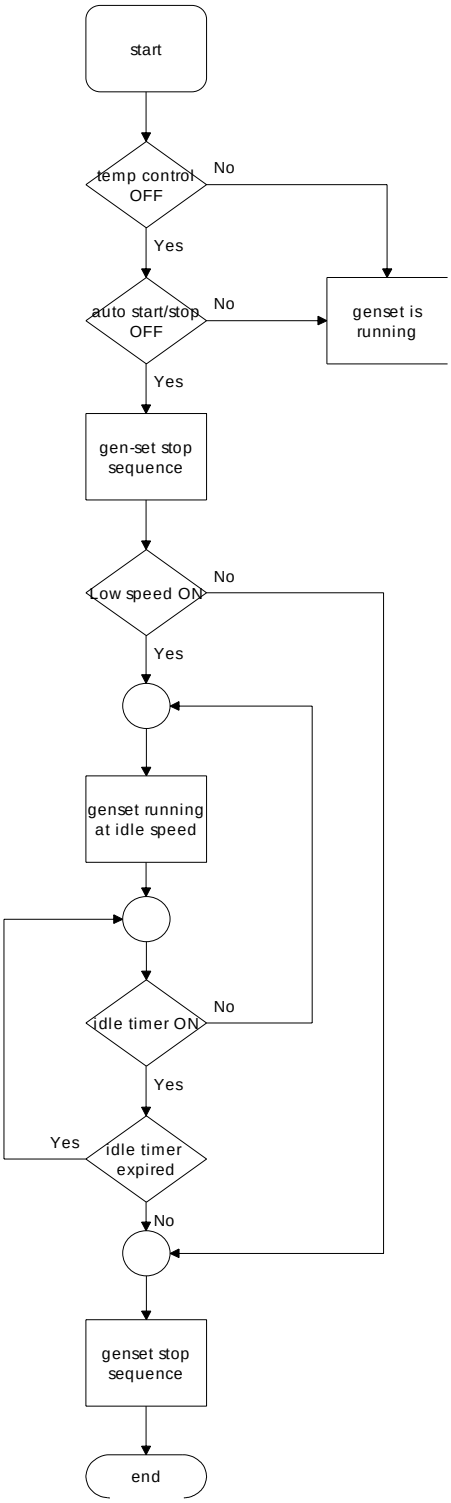
Idle speed flowcharts

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

Engine heater

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

The set points adjusted in menu 6320 are:

Set point: This set point +/- the hysteresis is the start and stop points for the engine heater.

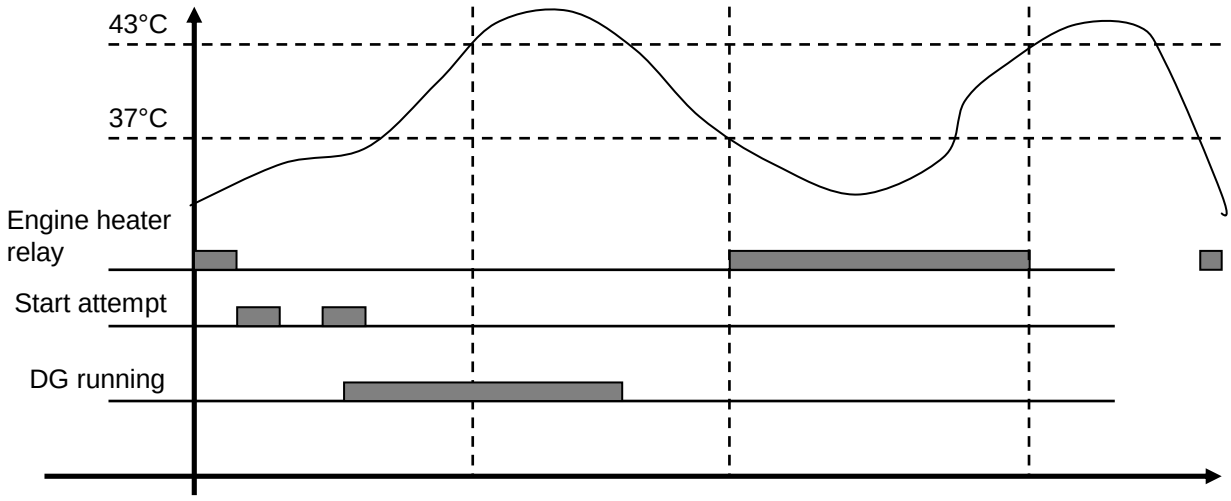
Output A: The relay output for the engine heater.

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

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

Enable: Enables the engine heater function.

Principle diagram:



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

Engine heater alarm

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

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 set point 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

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

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

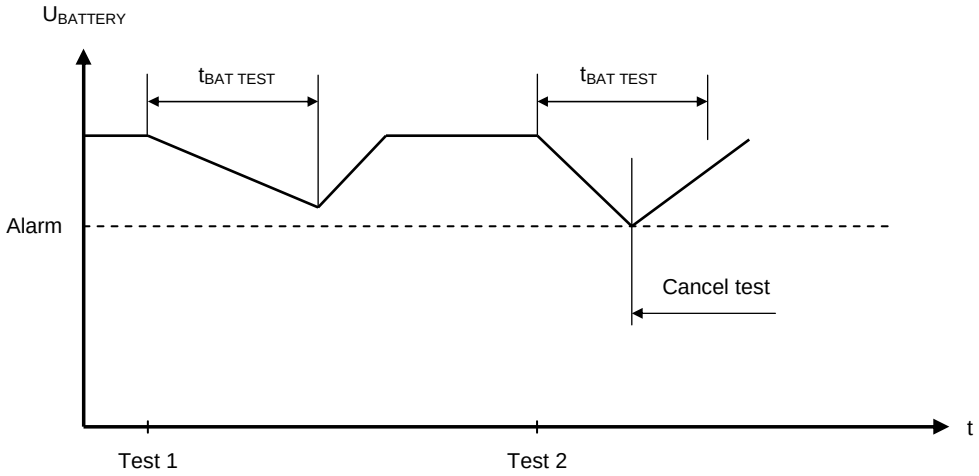
$$t_{TOTAL} = 15030s \sim 4{,}1hours$$

Battery test

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



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

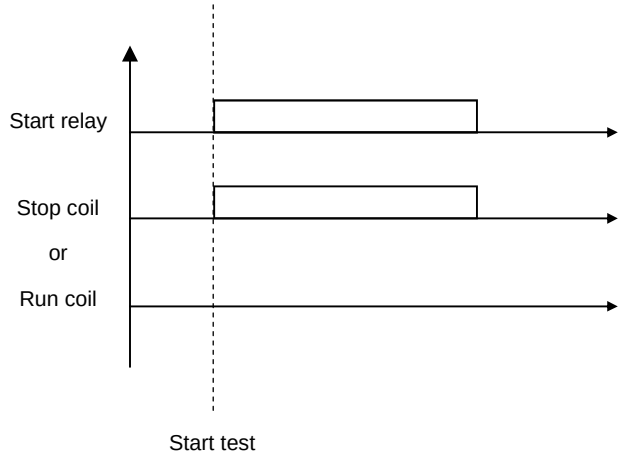
As there is no reason to wear the battery down even more, the test stops when the battery test alarm occurs.

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:

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.

Auto configuration

If the automatic battery test is used, the function has to be enabled in menu 6420. When the function is enabled, the battery test will be carried out with a specified interval, e.g. once a week. Completed battery tests will be logged in a separate battery test log.

The factory setting in menu 6424 is 52 weeks. This means that the automatic battery test will be executed once a year.

If application 3, 6 or 7 is used, it is expected that one of the multi inputs is used for the battery test of the starter battery.

It is expected that the multi inputs used for the battery test are configured to '0-40V DC'.

Battery asymmetry (6430 Batt. asymmetry)

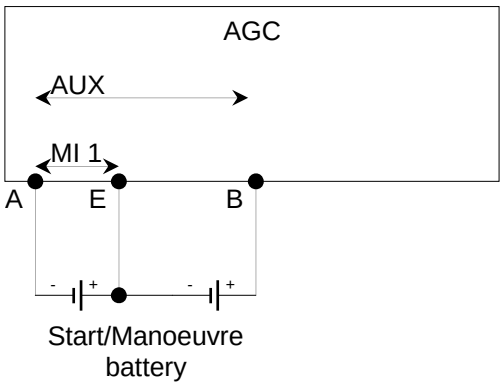
The reason to make the battery asymmetry test is to determine if one of the batteries is getting weak. The battery asymmetry is a combination of measurements and calculations.

Set points available:

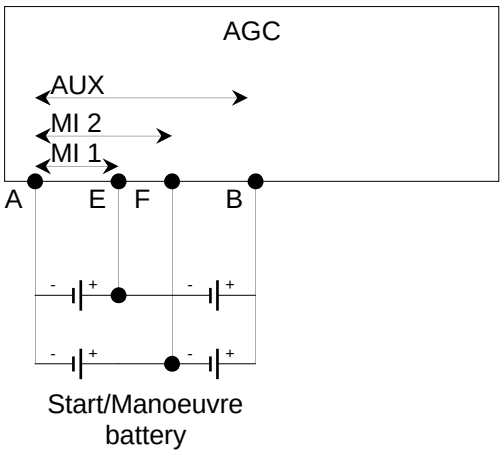
T1: The input type to be used for calculation of battery asymmetry 1.
RF1: Reference of asymmetry measurement no. 1.
T2: The input type to be used for calculation of battery asymmetry 2.
RF2: Reference of asymmetry measurement no. 2.

The following 7 battery applications are supported. The shown applications are merely examples – the choice of multi input (MI) or power supply input is configurable in menu 6410.

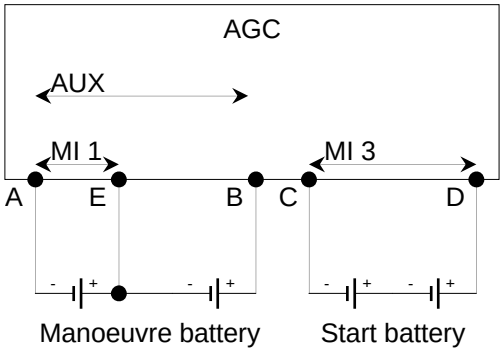
Application 1:



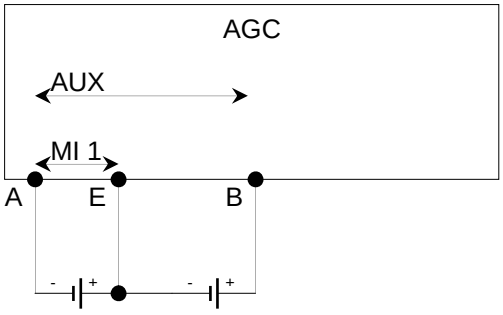
Application 2:



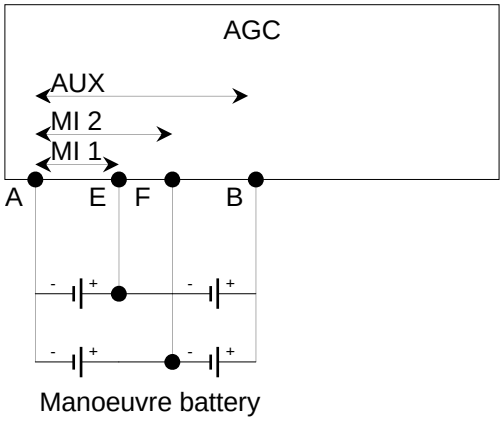
Application 3:



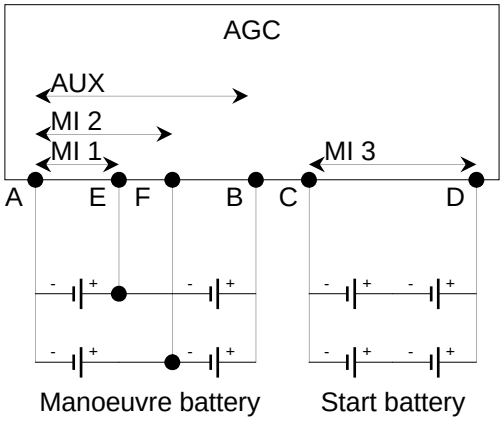
Application 4:



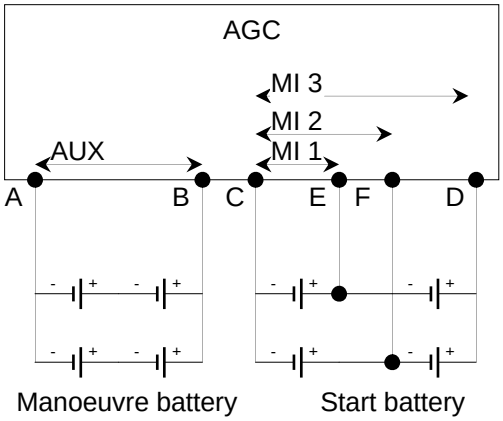
Application 5:



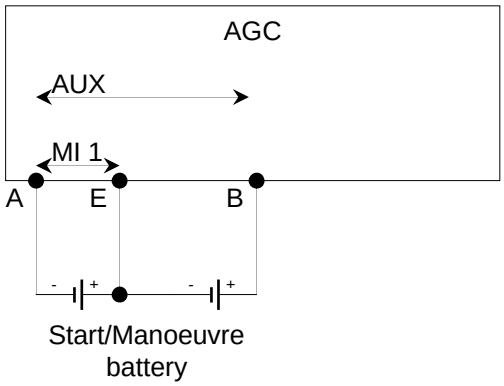
Application 7



Application 6:



Looking at battery application 1 as an example:



The power supply measurement is used as the reference RF1 (point A and B) in menu 6432 and multi input 1 is used as the type T1 (point A and E) in menu 6431. By making these measurements it is possible to calculate the voltage between E and B. This gives a full picture of battery voltages, e.g.:

Measured value A/B (RF1) = 21V DC
Measured value A/E (T1) = 12V DC
Calculated value E/B (RF1 – T1) = 9V DC

Battery asymmetry = E/B – (RF1*1/2) = 9 – (21*1/2) = -1.5V DC

It is expected that the multi inputs used for the battery asymmetry are configured to '0-40V DC'.

The selection power supply is referring to the supply on terminals 1 and 2.

Battery asymmetry alarm
Alarms for battery asymmetry 1 and 2 are set up in menus 6440 and 6450.

The set point in menus 6440 and 6450 is only set in positive values, however, it will also trigger if the battery asymmetry calculation results in a negative value.

Ventilation

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

Set points available **(6460 Max ventilation)**:

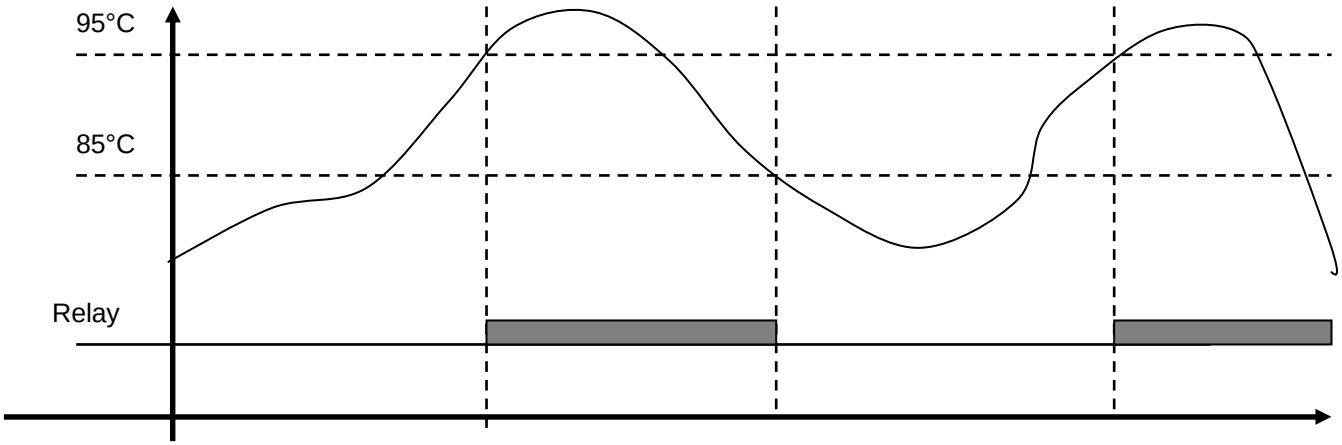
Set point: The limit for activation of the relay set in OA.

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

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

Enable: Enable/disable the ventilation function.

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



Max. ventilation alarm

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

Summer/winter time

This function is used to make the AGC unit automatically adjust the clock in the unit according to summer and winter time. The function is enabled in menu 6490.

The function only supports the Danish rules.

Switchboard error

The switchboard error function is handled in two different menus: 6500 'Block swbd error' and 6510 'Stop Swbd error'. The functions are activated by using 1 configurable input (switchboard error) which is configured with the PC utility software

The functionality of the "switchboard error" input is active as soon as the input is configured. The "enable" in menus 6500 and 6510 only refers to the alarm function.

Block swbd error (menu 6500)

When activated, this function will block the start sequence of the gen-set in case the gen-set is not running.

Set points available:

Delay: When the input is active the alarm will be activated when this delay has expired.

Parallel: OFF: Only AMF start sequence is blocked when the input is active.
ON: All start sequences, regardless of running mode, are blocked when the input is active.

Output A: Relay to activate when the delay has expired.

Output B: Relay to activate when the delay has expired.

Enable: Enable/disable the alarm function.

Fail class: The fail class of the alarm.

Stop swbd error (menu 6510)

When activated, this function will stop the gen-set if the gen-set is running in Auto mode.

Set points available:

Delay: When the input is active and the delay has expired the gen-set will trip the breaker, cool down and stop. The function is active regardless of the 'Enable' setting.

Output A: Relay to activate when the delay has expired.

Output B: Relay to activate when the delay has expired.

Enable: Enable/disable the alarm function.

Fail class: The fail class of the alarm.

Not in Auto

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

Fuel pump logic

The fuel pump logic is used to start and stop the fuel supply pump to maintain the fuel level in the service tank at predefined levels. The start and stop limits are detected from one of the 3 multi inputs.

Set points available in menu 6550:

Set point 1: Start level.

Set point 2: Stop level.

Delay: If the fuel level has not increased by 2% within this delay a *Fuel fill alarm* will be raised.

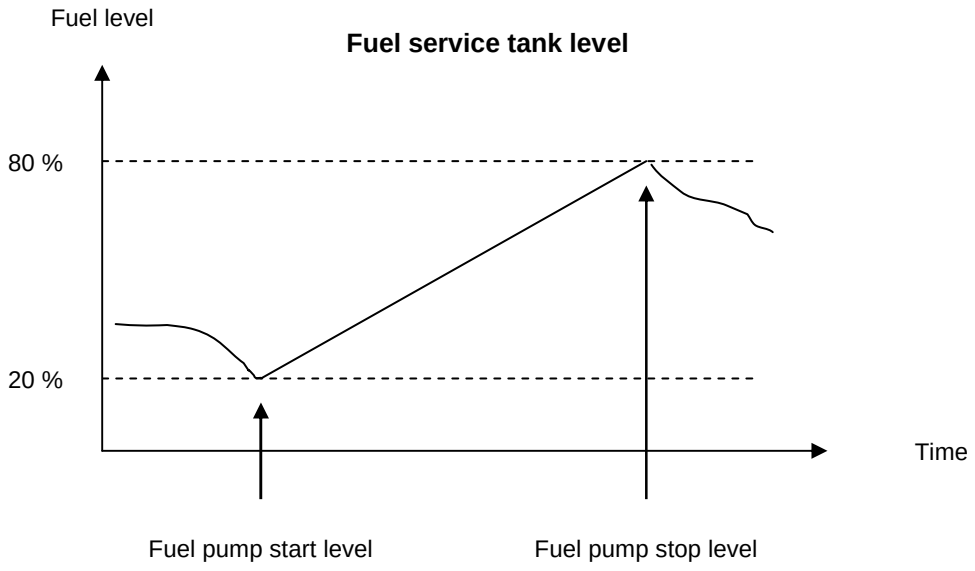
Output A (OA): The relay to be used for control of the fuel pump. The selected relay activates below the start limit and deactivates above the stop level.

Type: The multi input to be used for the fuel level sensor.

Fail class: The fail class of the *Fuel fill alarm.*

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

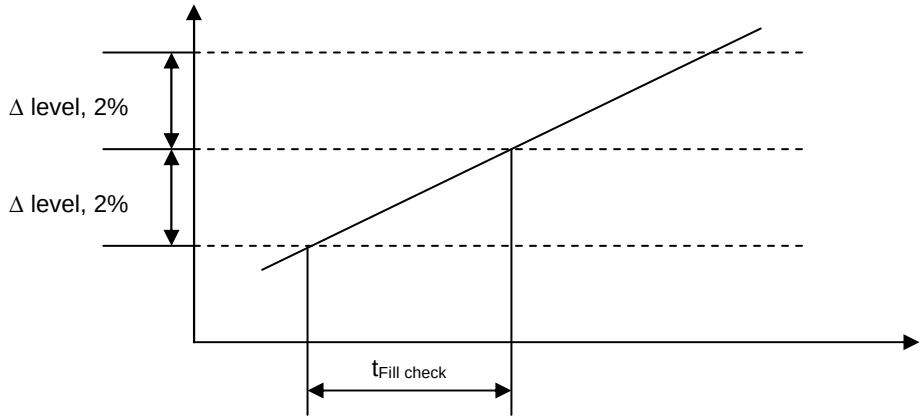
The below drawing shows how the fuel pump is activated when the level reaches 20% and stopped again when the level has reached 80%.



Fuel fill check

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

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



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

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

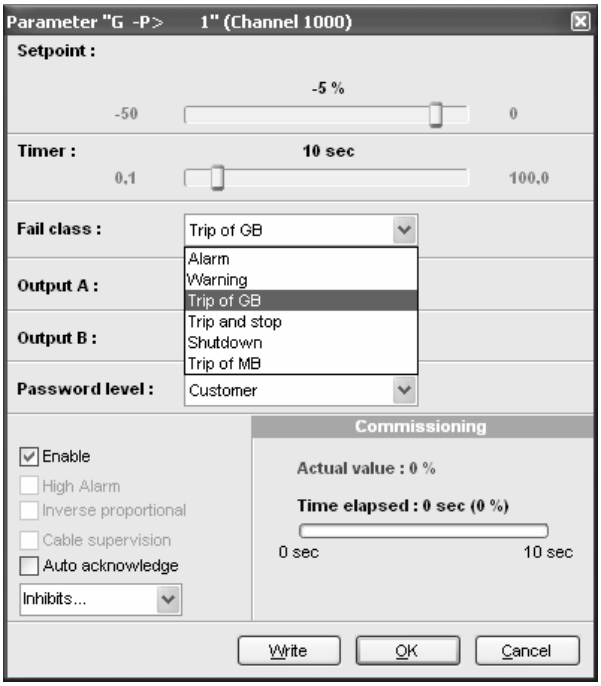
Action / Fail class	Block engine start	Block MB sequence	Block GB sequence
1 Alarm	X		
2 Warning			
3 Trip of GB	X		X
4 Trip and stop	X		X
5 Shutdown	X		X
6 Trip of MB		X	

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.



Service timers

The unit is able to monitor the maintenance intervals. 2 service timers are available to cover different intervals. The service timers are set up in menu 6110 and 6120.

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

The running hours is counting, when the running feedback is present.

Set points available in menus 6110 and 6120:

Enable: Enable/disable the alarm function.

Running hours: The number of running hours to activate the alarm.

Day: The number of days to activate the alarm – if the running hours are not reached before this number of days, the alarm will be raised.

Fail class: The fail class of the alarm.

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

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

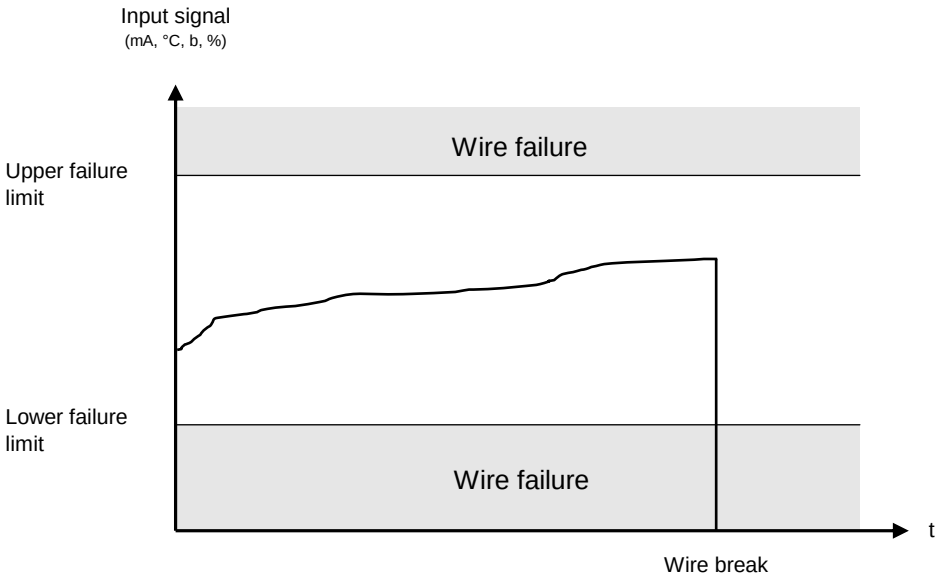
Wire fail detection

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

Input	Wire failure area	Normal range	Wire failure area
4-20mA	< 3mA	4-20mA	> 21mA
0-40V DC	≤ 0V DC	-	N/A
VDO Oil, type 1	< 10.0 ohm	-	> 184.0 ohm
VDO Oil, type 2	< 10.0 ohm	-	> 184.0 ohm
VDO Temp, type 1	< 22.4 ohm	-	> 291.5 ohm
VDO Temp, type 2	< 18.3 ohm	-	> 480.7 ohm
VDO Temp, type 3	< 7.4 ohm	-	> 69.3 ohm
VDO Fuel, type 1	< 1.6 ohm	-	> 78.8 ohm
VDO Fuel, type 2	< 3.0 ohm	-	> 180.0 ohm
VDO configurable	< lowest resistance	-	> highest resistance
PT100	< 82.3 ohm	-	> 194.1 ohm
PT1000	< 823 ohm	-	> 1941 ohm
Level switch	Only active if the switch is open		

Principle

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



MPU wire break (menu 4550)

The MPU wire break function is only active when the gen-set is not running. In this case an alarm will be raised if the wire connection between the AGC and MPU breaks.

Stop coil wire break (menu 6270)

The alarm will occur when the stop coil is not activated (generator is running) and the input is de-energised.

Digital inputs

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

Engine interface card	Available digital inputs – not configurable	Available digital inputs – configurable
M4 (standard)	**1**	**6**

	Input function	Auto	Semi	Test	Man	Block	Configurable	Input type
1	Shutdown override	X	X	X	X	X	Configurable	Constant
2	Access lock	X	X	X	X	X	Configurable	Constant
3	Running feedback	X	X	X	X	X	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	X	Configurable	Pulse
19	Manual GOV up	X	X	X	X		Configurable	Constant
20	Manual GOV down	X	X	X	X		Configurable	Constant
21	Manual AVR up	X	X	X	X		Configurable	Constant
22	Manual AVR down	X	X	X	X		Configurable	Constant
23	GB position ON	X	X	X	X	X	Not configurable	Constant
24	GB position OFF	X	X	X	X	X	Not configurable	Constant
25	MB position ON	X	X	X	X	X	Not configurable	Constant
26	MB position OFF	X	X	X	X	X	Not configurable	Constant
27	Emergency stop	X	X	X	X	X	Not configurable	Constant
28	Low speed	X	X	X			Configurable	Constant
29	Temperature control	X	X	X			Configurable	Constant
30	Battery test	X	X				Configurable	Pulse
31	Mains OK	X	X	X	X	X	Configurable	Constant
32	External f control	X	X	X			Configurable	Constant
33	External P control	X	X	X			Configurable	Constant
34	External PF control	X	X	X			Configurable	Constant
35	External U control	X	X	X			Configurable	Constant
36	External Q power	X	X	X			Configurable	Constant
37	Print status	X	X	X	X	X	Configurable	Pulse
38	Print event log	X	X	X	X	X	Configurable	Pulse
39	MB close inhibit	X	X	X	X	X	Configurable	Constant
40	Enable mode shift	X	X	X	X	X	Configurable	Constant

	Input function	Auto	Semi	Test	Man	Block	Configurable	Input type
41	Enable GB black close	X	X	X	X	X	Configurable	Constant
42	Enable sep. sync.	X	X	X	X	X	Configurable	Constant
43	Start enable	X	X	X	X		Configurable	Constant
44	Alternative start	X	X	X	X	X	Configurable	Constant
45	Switchboard error	X	X	X	X	X	Configurable	Constant
46	Total test	X	X	X	X	X	Configurable	Constant
47	GB spring loaded	X	X	X	X	X	Configurable	Constant
48	MB spring loaded	X	X	X	X	X	Configurable	Constant
49	1st priority mains	X	X	X	X	X	Configurable	Constant
50	Ext. MB pos. OFF	X	X	X	X	X	Configurable	Constant

Functional description

1. Shutdown override
This input deactivates all protections except the overspeed protection and the emergency stop input. The number of start attempts is 7 by default, but it can be configured in **6180 Start**. 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. 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.

24. 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.

25. 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.

26. 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.

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

The shutdown fail class must be selected.

28. Low speed
Disables the regulators and keeps the gen-set running at a low RPM.

The governor must be prepared for this function.

29. 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).

30. Battery test
Activates the starter 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.

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

32. External frequency control
The nominal frequency set point will be controlled from the analogue inputs terminal 40/41. The internal set point will not be used.

33. External power control
The power set point in fixed power will be controlled from the analogue inputs terminal 40/41. The internal set point will not be used.

34. External power factor control
The power factor set point will be controlled from the analogue inputs terminal 41/42. The internal set point will not be used.

35. External voltage control
The nominal voltage set point will be controlled from the analogue inputs terminal 41/42. The internal set point will not be used.

36. External reactive power
The reactive power set point will be controlled from the analogue inputs terminal 41/42. The internal set point will not be used.

37. 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.

38. 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.

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

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

41. Enable GB black close
When the input is activated, the AGC is allowed to close the generator on a black busbar, providing that the frequency and voltage are inside the limits setup in menu 2110.

42. 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 138.

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

43. 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.

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

45. Switchboard error
The input will stop or block the gen-set depending on running status.

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

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

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

49. 1st priority mains
This input is used in G5 applications with 2 mains connections to select which mains connection has 1st priority.

50. Ext. MB pos. OFF
This input is used in G5 applications with 2 mains connections to tell the AGC mains units that the mains breaker not controlled by them has been tripped.

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

Multi-inputs

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

1. 4-20mA
2. 0-40V DC
3. PT100
4. PT1000
5. VDO oil
6. VDO water
7. VDO fuel
8. Digital

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

For each input 2 alarm levels are available, the menu numbers of the alarm settings for each multi input is controlled by the configured input type as seen in the following table.

Input type	Multi input 102	Multi input 105	Multi input 108
4-20mA	4120/4130	4250/4260	4380/4390
0-40V DC	4140/4150	4270/4280	4400/4410
PT100/PT1000	4160/4170	4290/4300	4420/4430
VDO oil	4180/4190	4310/4320	4440/4450
VDO water	4200/4210	4330/4340	4460/4470
VDO fuel	4220/4230	4350/4360	4480/4490
Digital	3400	3410	3420

Only 1 alarm level is available for the digital input type.

4-20mA

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

0-40V DC

The 0-40V DC input has primarily been designed to handle the battery asymmetry test.

PT100/1000

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

VDO inputs

The unit can contain up to three VDO inputs. The inputs have different functions, as the hardware design allows for several VDO types.

These various types of VDO inputs are available for all multi inputs:

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

For each type of VDO input it is possible to select between different characteristics including a configurable.

VDO oil

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

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

The configurable type is configurable with 8 points in the range 0-480Ω. The resistance as well as the pressure can be adjusted.

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 water

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	
50	197.3	323.6		
60	134.0	222.5	36.0	
70	97.1	157.1		
80	70.1	113.2	19.8	
90	51.2	83.2		
100	38.5	62.4	11.7	
110	29.1	47.6		
120	22.4	36.8	7.4	
130		28.9		
140		22.8		
150		18.2		

The configurable type is configurable with 8 points in the range 0-480Ω. The temperature as well as the resistance can be adjusted.

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 fuel

This VDO input is used for the fuel level sensor.

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

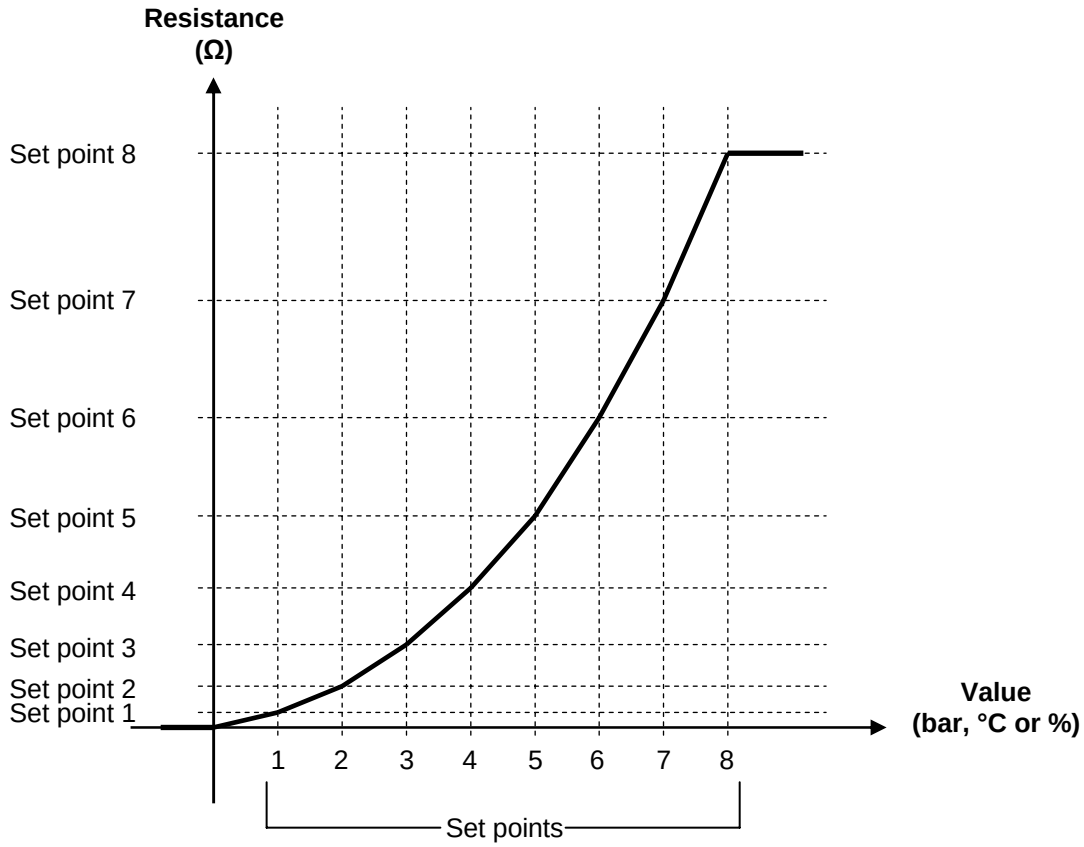
	VDO sensor type
	Type 2
Value	**Resistance**
0%	3Ω
100%	180Ω

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	
10	
20	
30	
40	
50	
60	
70	
80	
90	
100	

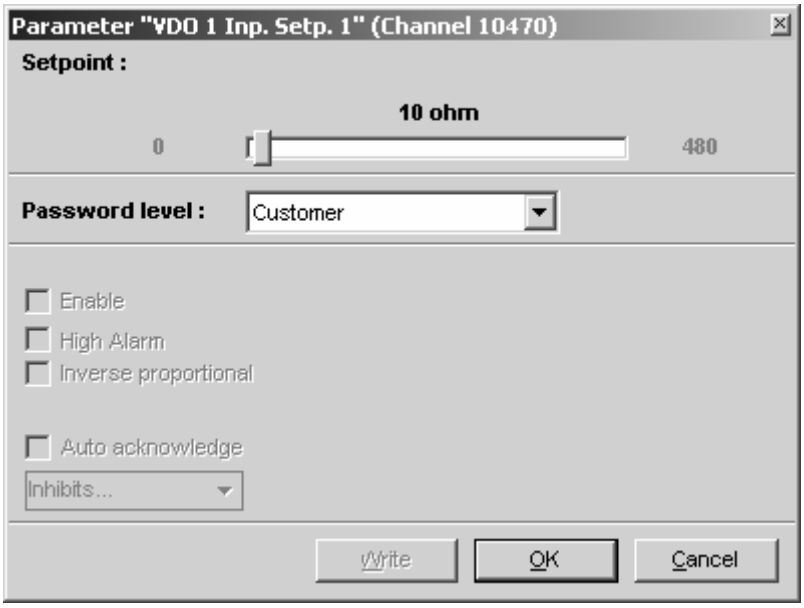
The configurable type is configurable with 8 points in the range 0-480Ω. The value as well as the resistance can be adjusted.

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.

Digital

If the multi inputs are configured to 'Digital', they become available as a configurable input.

Manual governor and AVR control

This function can be activated by pressing  more than 2 seconds, or by activating the digital inputs or AOP buttons for governor or AVR control in semi-auto mode. The intention of this function is to give the commissioning engineer a helpful tool for adjustment of the regulation.

The function of the regulation window depends on the selected mode:

G	0	0	0V
P-Q Setp		100%	100%
P-Q Reg.		50%	60%
		GOV	AVR

Manual mode
In manual mode the regulation is deactivated. When activating the up or down arrows, the output value to GOV or AVR is changed, this is the Reg. value in the display. The up and down arrows have the same function as the digital inputs or AOP buttons for governor and AVR control when the window is open. To exit the regulation window press 'back'.

Semi-auto mode
As in manual mode, the up and down arrows have the same function as the digital inputs or AOP buttons for governor or AVR control when the window is open.

The value setp can be changed by pressing the arrow up or down. When GOV is underlined, the governor set point will be changed, and vice versa when the AVR is underlined. When changing the setp value, an offset will be added to or subtracted from the nominal value. The reg. value is the output value from the regulator. If the gen-set is running in parallel, the active or reactive nominal power set point value will be changed. If it is a stand-alone gen-set not parallel to the mains the nominal frequency or voltage set point will be changed and also displayed. When the 'back' button is activated, the regulation set point returns to nominal.

If the digital inputs or AOP buttons are activated in semi-auto, the regulation window is automatically opened.

Auto and test mode
Like semi-auto, except from the fact that activating the digital inputs or AOP buttons for governor or AVR control will change the regulation set point but not open the regulation window. When the digital inputs or AOP buttons are deactivated, the regulation set point returns to nominal.

AVR set point manipulation requires option D1.

Regarding AOP setup, please see refer to 'Help' in the PC utility software.

Input function selection

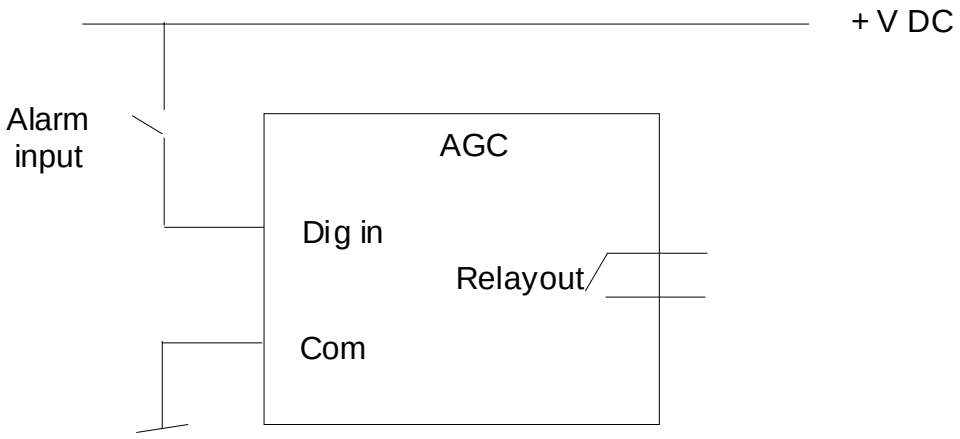
Digital input alarms can be configured with a possibility to select when the alarms are to be activated. The possible selections of the input function are normally open or normally closed.

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

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	Block mode is activated	
SIMPLE TEST	Test mode is activated	
LOAD TEST		
FULL TEST		
SIMPLE TEST ###.#min	Test mode activated and test timer counting down	
LOAD TEST ###.#min		
FULL TEST ###.#min		
ISLAND MAN	Gen-set stopped or running and no other action taking place	
ISLAND SEMI		
READY ISLAND AUTO	Gen-set stopped in Auto	
ISLAND ACTIVE	Gen-set running in Auto	
AMF MAN	Gen-set stopped or running and no other action taking place	
AMF SEMI		
READY AMF AUTO	Gen-set stopped in Auto	
AMF ACTIVE	Gen-set running in Auto	
FIXED POWER MAN	Gen-set stopped or running and no other action taking place	
FIXED POWER SEMI		
READY FIXED P AUTO	Gen-set stopped in Auto	
FIXED POWER ACTIVE	Gen-set running in Auto	
PEAK SHAVING MAN	Gen-set stopped or running and no other action taking place	
PEAK SHAVING SEMI		
READY PEAK SHAV AUTO	Gen-set stopped in Auto	
PEAK SHAVING ACTIVE	Gen-set running in Auto	
LOAD TAKE OVER MAN	Gen-set stopped or running and no other action taking place	
LOAD TAKE OVER SEMI		
READY LTO AUTO	Gen-set stopped in Auto	
LTO ACTIVE	Gen-set running in Auto	
MAINS P EXPORT MAN	Gen-set stopped or running and no other action taking place	
MAINS P EXPORT SEMI		
READY MPE AUTO	Gen-set stopped in Auto	
MPE ACTIVE	Gen-set running in Mains power export mode	
DG BLOCKED FOR START	Generator stopped and active alarm(s) on the generator	
GB ON BLOCKED	Generator running, GB open and an active 'Trip GB' alarm.	
Shutdown override	The configurable input is active.	
Access lock	The configurable input is activated, and the operator tries to activate one of the blocked keys.	
GB trip externally	Some external equipment has tripped the breaker.	An external trip is logged in the event log.
MB trip externally	Some external equipment has tripped the breaker.	An external trip is logged in the event log.
TB trip externally	Some external equipment has tripped the breaker.	An external trip is logged in the event log.
POWER DERATE	The 'Power derate' function is activated and the nominal power set point has been decreased.	
IDLE RUN	The 'Idle run' function is active. The gen-set will not stop until a timer has expired.	

Status text	Condition	Comment
IDLE RUN ###.#min	The timer in the 'Idle run' function is active.	
COMPENSATION FREQ.	Compensation is active.	The frequency is not at the nominal setting.
Aux. test ##.#V ####s	Battery test activated	
DELOAD	Decreasing the load of the gen-set in order to open the breaker	
RAMP DOWN	Decreasing the load of the gen-set.	
RAMP UP	Increasing the load of the gen-set.	
START DG(s) IN ###s	The start gen-set set point is exceeded.	Option G5 must be available.
STOP DG(s) IN ###s	The stop gen-set set point is exceeded	Option G5 must be available.
START PREPARE	The start prepare relay is activated.	
START RELAY ON	The start relay is activated.	
START RELAY OFF	The start relay is deactivated during the start sequence.	
MAINS FAILURE	Mains failure and mains failure timer expired.	
MAINS FAILURE IN ###s	Frequency or voltage measurement is outside the limits.	The timer shown is the Mains failure delay. Text in mains units
MIANS U OK DEL ####s	Mains voltage is OK after a mains failure.	The timer shown is the Mains OK delay.
MAINS f OK DEL ####s	Mains frequency is OK after a mains failure.	The timer shown is the Mains OK delay.
Hz/V OK IN ###s	The voltage and frequency on the gen-set is OK.	When the timer runs out it is allowed to operate the generator breaker.
COOLING DOWN ###s	Cooling down period is activated.	
GEN-SET STOPPING	This info is shown when cool down has finished.	
EXT. STOP TIME ###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	
UNIT STANDBY	If redundant mains units are present this message is shown on the redundant unit.	Option G5 must be available
TOO SLOW 00<----------	Generator running too slow during synchronising.	
----------> 00 TOO FAST	Generator running too fast during synchronising.	
EXT. START ORDER	A planned AMF sequence is activated.	There is no failure on the mains during this sequence.

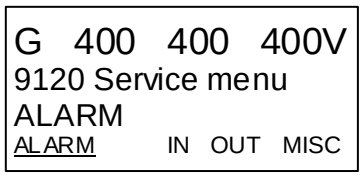
Service menu

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.

Entry window

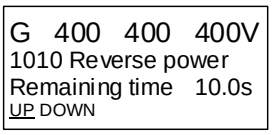
The entry shows the possible selections in the service menu.



Available selections:

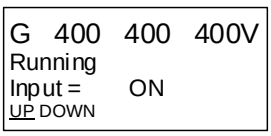
Alarm

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



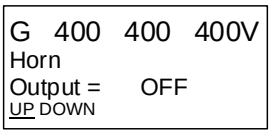
IN (digital input)

Shows the status of the digital inputs.



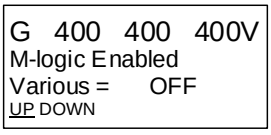
OUT (digital output)

Shows the status of the digital outputs.



MISC (miscellaneous)

Shows miscellaneous messages.



Event log

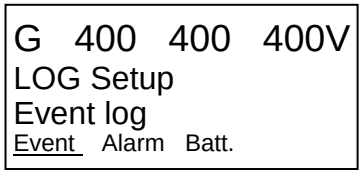
The logging of data is divided in 3 different groups:

- Event log containing 150 loggings.
- Alarm log containing 30 loggings.
- Battery test log containing 52 loggings.

The logs can be viewed in the display or in the PC utility software. When the individual logs are full, each new event will overwrite the oldest event following the 'first in – first out' principle.

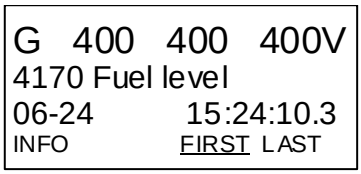
Display

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



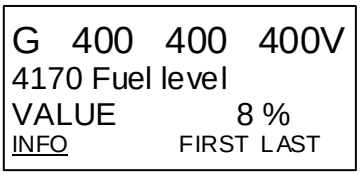
Now it is possible to select one of the 3 logs.

If the 'Event' is selected, the log could look like this:



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.

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 in menu 6100:

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

kWh/kVArh counters

The AGC has two transistor outputs, each representing a value for the power production. The outputs are pulse outputs, and the pulse length for each of the activations is 1 second.

Term. number	Output
20	kWh
21	kVArh
22	Common terminal

The number of pulses depends on the actual adjusted setting of the nominal power:

Generator power	Value	Number of pulses (kWh)	Number of pulses (kVArh)
P_{NOM}	<100 kW	1 pulse/kWh	1 pulse/kVArh
P_{NOM}	100-1000 kW	1 pulse/10 kWh	1 pulse/10 kVArh
P_{NOM}	>1000 kW	1 pulse/100 kWh	1 pulse/100 kVArh

The kWh measurement is shown in the display as well, but the kVArh measurement is only available through the transistor output.

Be careful – the maximum burden for the transistor outputs is 10mA.

M-logic

M-logic functionality is included in the unit and is not an option dependent function, however 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 main purpose of M-logic is to give the operator/designer more flexible possibilities of operating the generator control system.

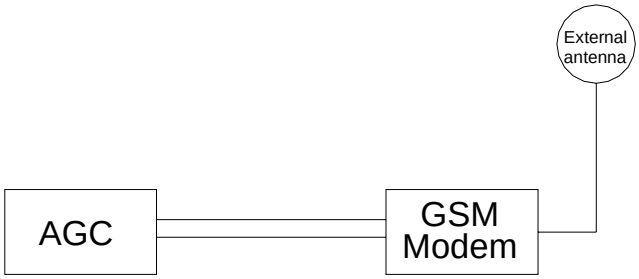
Please refer to the 'Help' function in the PC utility software for a full description of this configuration tool.

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.

This section will include wiring diagrams for a unit connected to a GSM modem. The wiring is made with a Siemens MC35 terminal (this is a GSM modem using the 900/1800 GSM net).

System single-line diagram



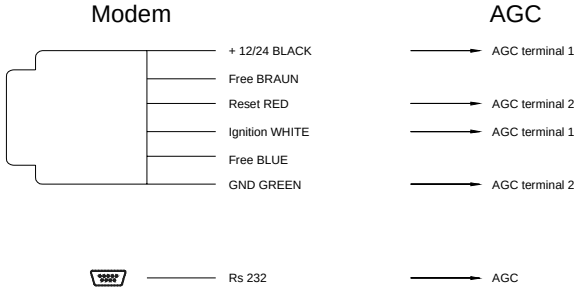
DEIF recommends using a MOXA OnCell G2150I, Siemens MC35, Wavecom WMOD2 or Westermo GDW-11 terminal, as the application has been tested with these terminals.

Serial connection

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

Other wirings

The GSM modem receives power directly from the unit (two additional control lines are also connected directly to the unit).



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).

Because of the RS232 communication the GSM function is only available with option H11.

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	Set point	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

Please refer to the PC utility software help file.

Safety

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

Nominal settings

The nominal settings can be changed to match different voltages and frequencies. The AGC has four sets of nominal values, and they are adjusted in menus 6000 to 6030 (Nominal settings 1 to 4).

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

Activation

The switching between the nominal set points can be done in three ways; digital input, AOP or menu 6006.

Digital input

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

Example:

Event A		Event B		Event C	Output
Dig. input no. 115	or	Not used	or	Not used	Set nom. parameter settings 1
Not Dig. input no. 115	or	Not used	or	Not used	Set nom. parameter settings 2

See the 'Help' file in the PC utility software for details.

AOP

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

Example:

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

See the 'Help' file in the PC utility software for details.

Menu settings

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

7. PID controller

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

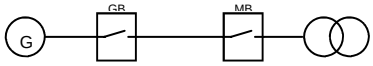
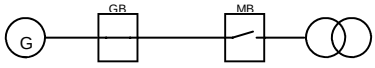
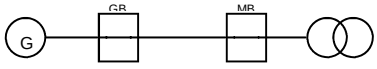
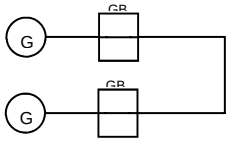
See 'General Guidelines for Commissioning'.

Controllers

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

Controller	GOV	AVR	Comment
Frequency	X		Controls the frequency
Power	X		Controls the power
P load sharing	X		Controls the active power load sharing
Voltage (option D1)		X	Controls the voltage
VAr (option D1)		X	Controls the power factor
Q load sharing (option D1)	X	X	Controls the reactive power load sharing

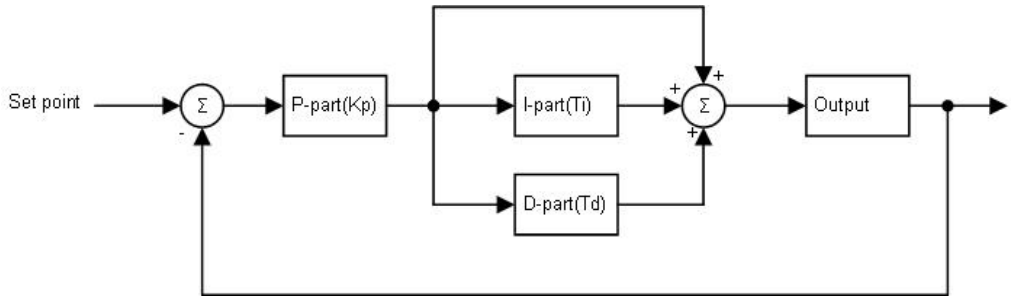
The table below indicates when each of the controllers is active. This means that the controllers can be tuned in when the shown running situations are present.

Governor			AVR (option dependent)			Schematic
Frequency	Power	P LS	Voltage	VAr	Q LS	
X			X			
X			X			
	X			X		
		X			X	

Load sharing mode is option dependent (option G3/G5).

Principle drawing

The drawing below shows the basic principle of the PID controller.



$$\mathrm{PID}(s) = Kp \cdot \left(1 + \frac{1}{Ti \cdot s} + Td \cdot s\right)$$

As illustrated in the above drawing and equation, each regulator (P, I and D) gives an output which is summarised to the total controller output.

The adjustable settings for the PID controllers in the AGC unit are:

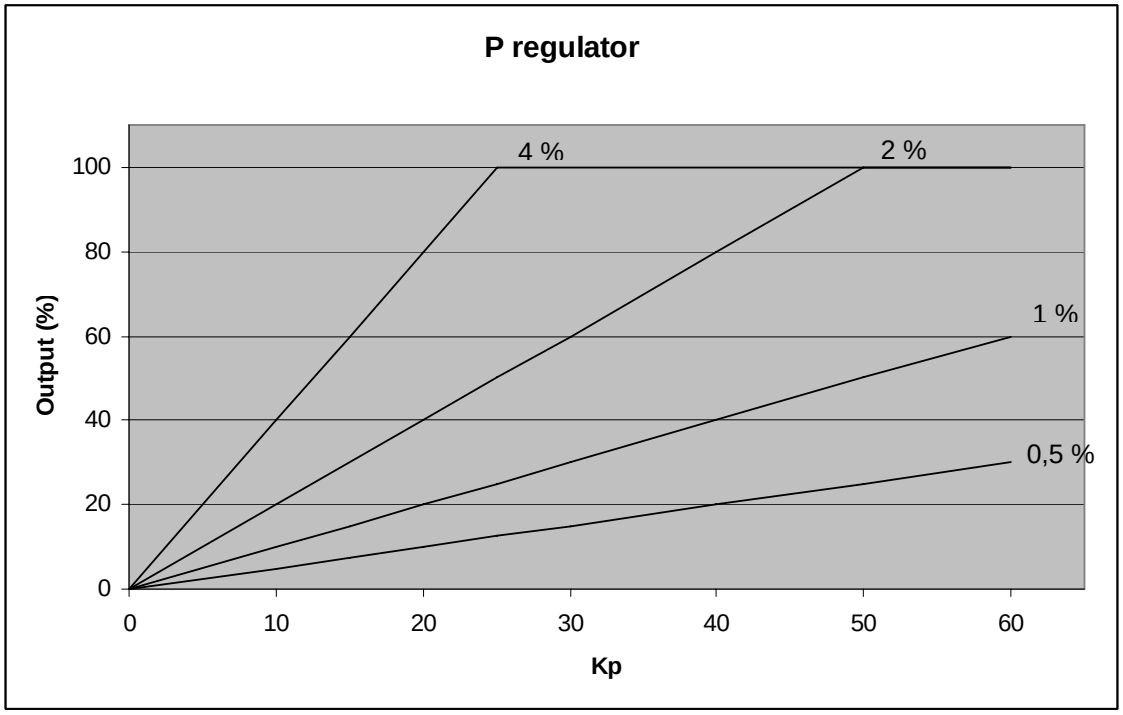
Kp: The gain for the proportional part.
Ti: The integral action time for the integral part.
Td: The differential action time for the differential part.

The function of each part is described in the following.

Proportional regulator

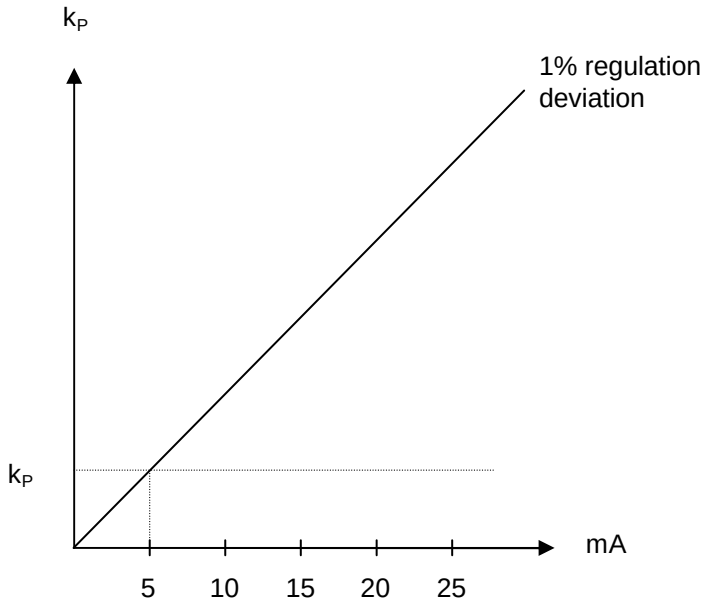
When the regulation deviation occurs, the proportional part will cause an immediate change of the output. The size of the change depends on the gain Kp.

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.

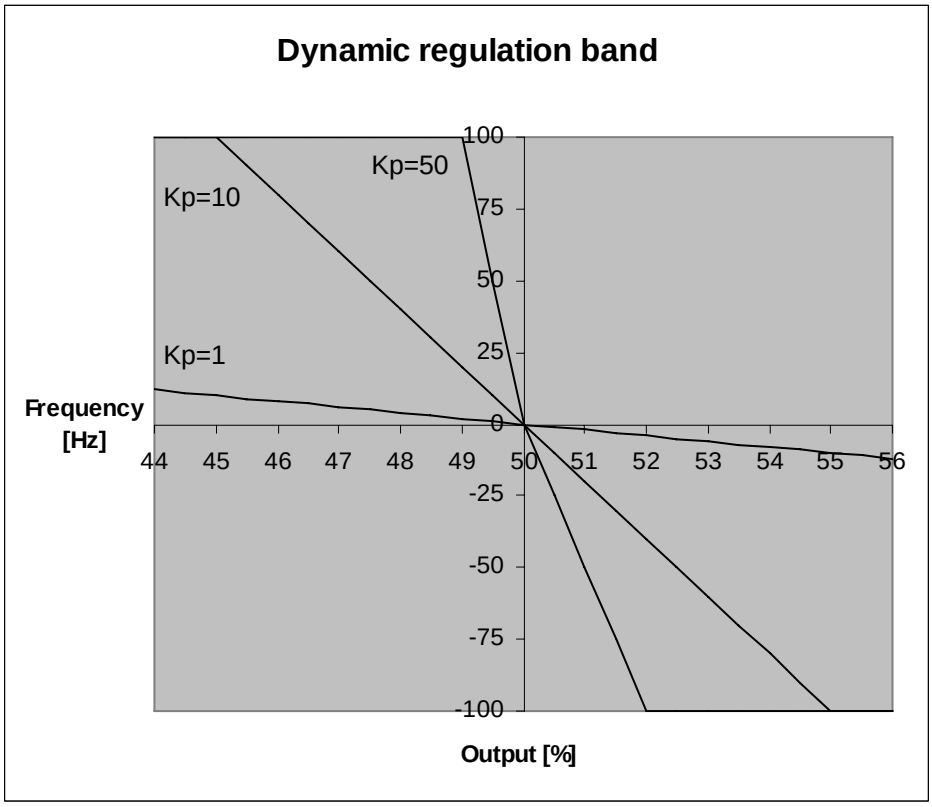


A 1% regulation deviation occurs. With the Kp setting adjusted, the deviation causes the output to change 5mA. The table shows that the output of the AGC changes relatively much, if the maximum speed range is low.

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

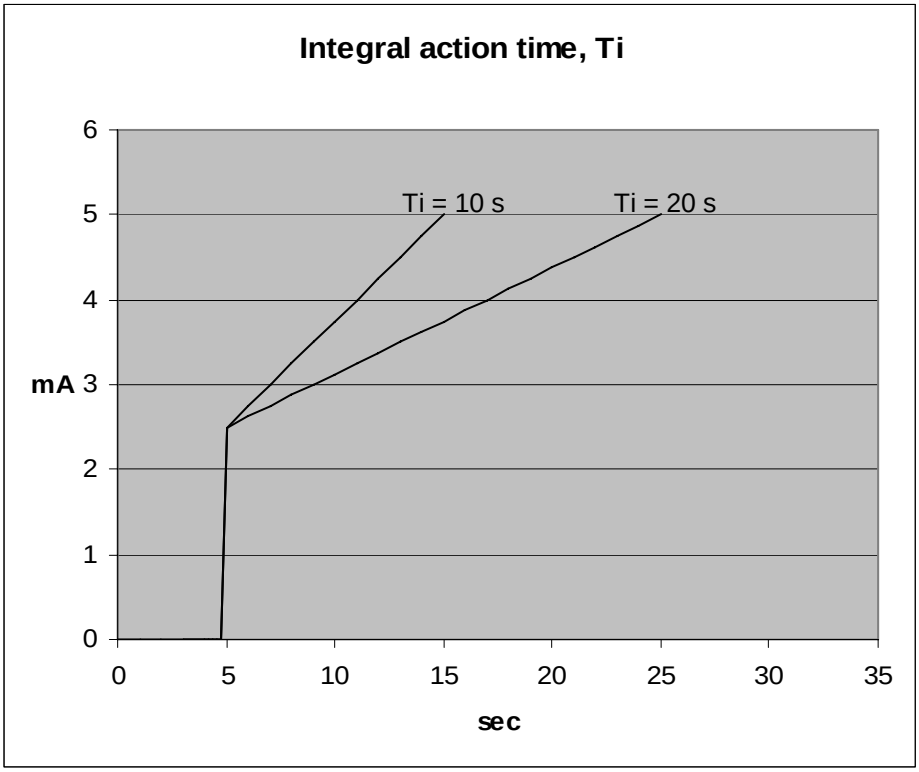
The drawing below shows the dynamic regulation area at given values of Kp. The dynamic area gets smaller, if the Kp is adjusted to a higher value.



Integral regulator

The main function of the integral regulator is to eliminate offset. The integral action time Ti 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 integral action time is then measured when the output reaches 2 x 2.5mA = 5mA.



As seen on the drawing the output reaches 5mA twice as fast at a Ti setting of 10 s than with a setting of 20 s.

The integrating function of the I-regulator is increased if the integral action time is decreased. This means that a lower setting of the integral action time Ti results in a faster regulation.

If the Ti is adjusted to 0 s, the I-regulator is switched OFF.

The integral action time Ti, must not be too low. This will make the regulation hunt similar to a too high proportional action factor, Kp.

Differential regulator

The main purpose of the differential regulator (D-regulator) is to stabilise the regulation, thus making it possible to set a higher gain and a lower integral action time Ti. This will make the overall regulation eliminate deviations much faster.

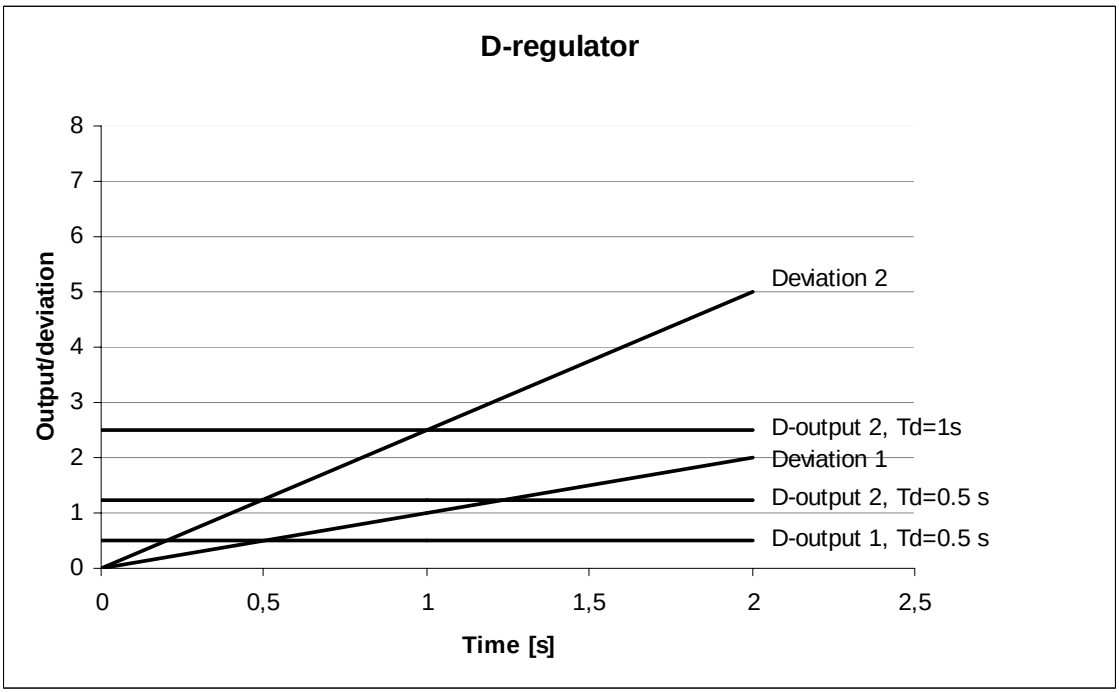
In most cases, the differential regulator is not needed; however in case of very precise regulation situations, e.g. static synchronisation, it can be very useful.

The output from the D-regulator can be explained with the equation: $D = Td \cdot Kp \cdot \frac{de}{dt}$

D = Regulator output
Kp = Gain
de/dt = Slope of the deviation (how fast does the deviation occur)

This means that the D-regulator output depends on the slope of the deviation, the Kp and the Td setting.

Example:
In the following example it is assumed that Kp = 1.



Deviation 1: A deviation with a slope of 1.
Deviation 2: A deviation with a slope of 2.5 (2.5 times bigger than deviation 1).
D-output 1, Td=0.5 s: Output from the D-regulator when Td=0.5 s and the deviation is according to Deviation 1.
D-output 2, Td=0.5 s: Output from the D-regulator when Td=0.5 s and the deviation is according to Deviation 2.
D-output 2, Td=1 s: Output from the D-regulator when Td=1 s and the deviation is according to Deviation 2.

The example shows that the bigger deviation and the higher Td setting, the bigger output from the D-regulator. Since the D-regulator is responding to the slope of the deviation, it also means that when there is no change the D-output will be zero.

When commissioning, please keep in mind that the Kp setting has influence on the D-regulator output.

If the Td is adjusted to 0 s, the D-regulator is switched OFF.

The differential action time Td, must not be too high. This will make the regulation hunt similar to a too high proportional action factor, Kp.

Load share controller

The load share controller is used in the AGC whenever load sharing mode is activated. The load share controller is a PID controller similar to the other controllers in the system and it takes care of frequency control as well as power control.

Adjustment of the load share controller is done in menu 2540 (analogue control) or 2590 (relay control).

The primary purpose of the PID controller is always frequency control because frequency is variable in a load sharing system as well as the power on the individual generator is. Since the load sharing system requires power regulation as well, then the PID controller can be affected by the power regulator. For this purpose a so-called weight factor is used (P_{WEIGHT}).

The regulation deviation from the power regulator can therefore have great or less influence on the PID controller. An adjustment of 0% means that the power control is switched off. An adjustment of 100% means that the power regulation is not limited by the weight factor. Any adjustment in between is possible.

The difference between adjusting the weight value to a high or low value is the speed of how fast the power regulation deviation is eliminated. So if a firm load sharing is needed, the weight factor must be adjusted to a higher value than if an easy load sharing is required.

An expected disadvantage of a high weight factor is that when a frequency deviation and a power deviation exist, then hunting could be experienced. The cure for this is to decrease either the weight factor or the parameters of the frequency regulator.

Synchronising controller

The synchronising controller is used in the AGC whenever synchronising is activated. After a successful synchronisation the frequency controller is deactivated and the relevant controller is activated. This could e.g. be the load sharing controller. The adjustments are made in the menu 2050.

Dynamic synchronising

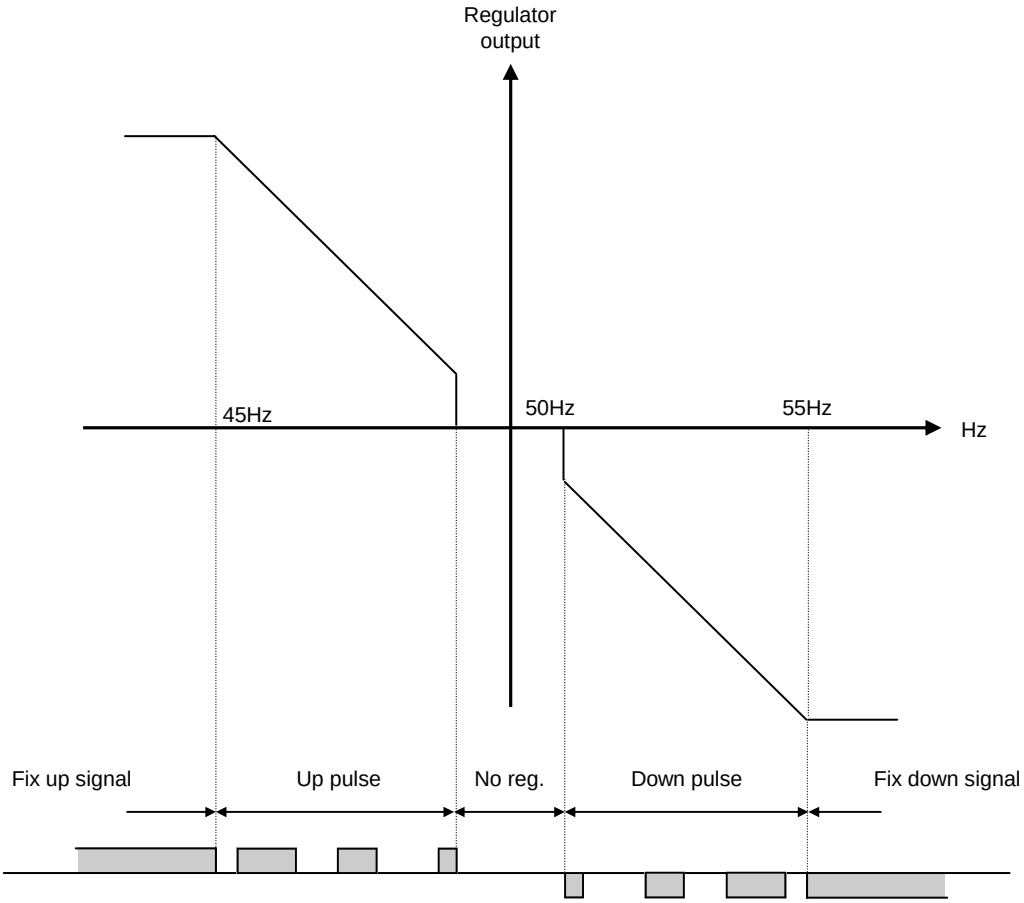
When dynamic synchronising is used the controller '2050 f_{SYNC} controller' is used during the entire synchronising sequence. One of the advantages of dynamic synchronising is that it is relatively fast. In order to improve the speed of the synchronising further, the generator will be speeded up between the points of synchronisation (12 o'clock to 12 o'clock) of the two systems. (normally a slip frequency of 0.1Hz gives synchronism each 10 seconds, but with this system on a steady engine the time between synchronism is reduced.

Static synchronising

When synchronising is started, the synchronising controller '2050 f_{SYNC} controller' is activated and the generator frequency is controlled towards the busbar/mains frequency. The phase controller takes over when the frequency deviation is so small that the phase angle can be controlled. The phase controller is adjusted in the menu 2070. ('2070 phase controller').

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.

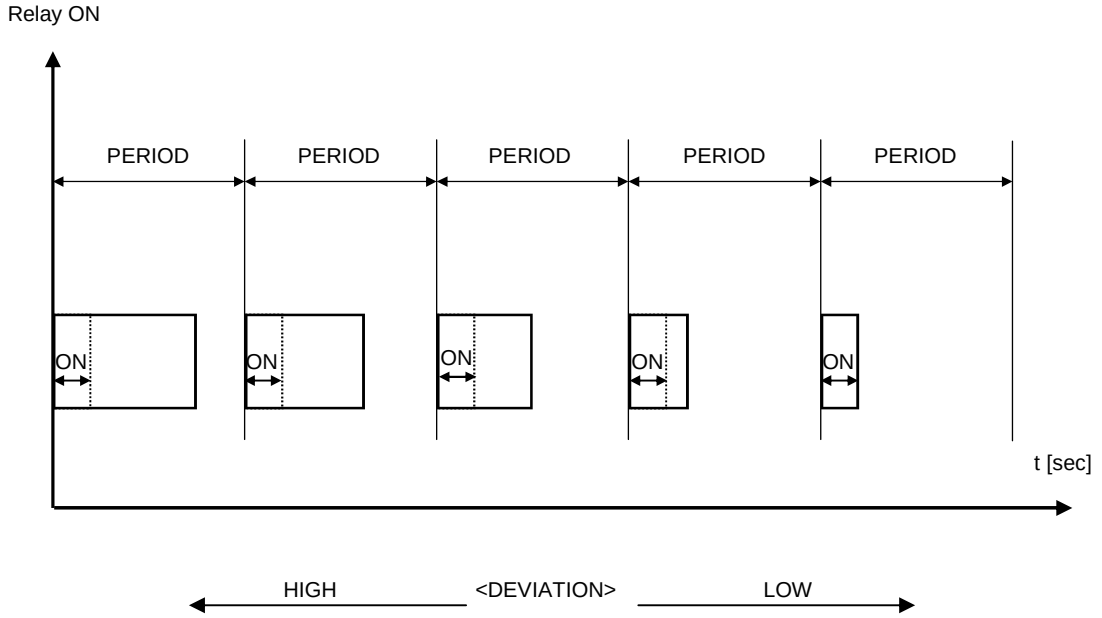
As the drawing indicates, the relays will be fixed ON if the regulation deviation is big, and they will be pulsing if it is closer to the set point. In the dynamic range the pulses get shorter and shorter when the regulation deviation gets smaller. Just before the dead band area the pulse is as short 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.

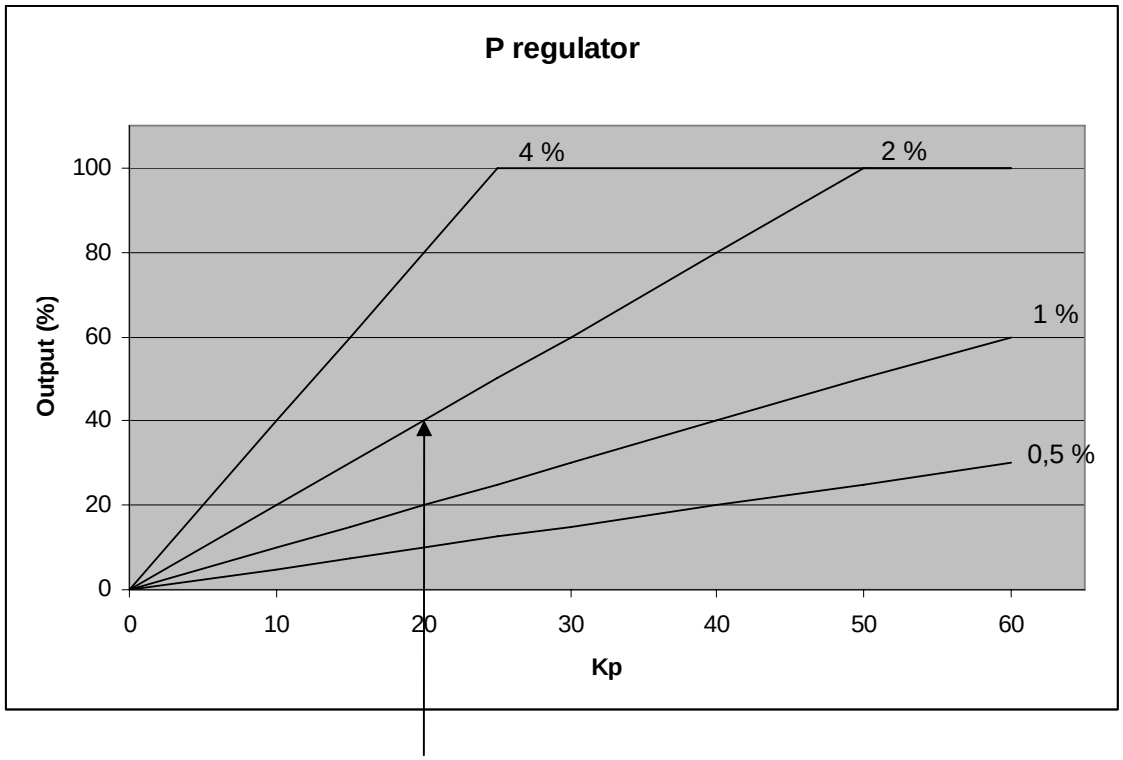
Adjustment	Description	Comment
Period time	Maximum relay time	The time between the beginnings of two subsequent relay pulses.
ON time	Minimum relay time	The minimum length of the relay pulse. The relays will never be activated for a shorter time than the ON time.

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 = 20. 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.

8. Synchronisation

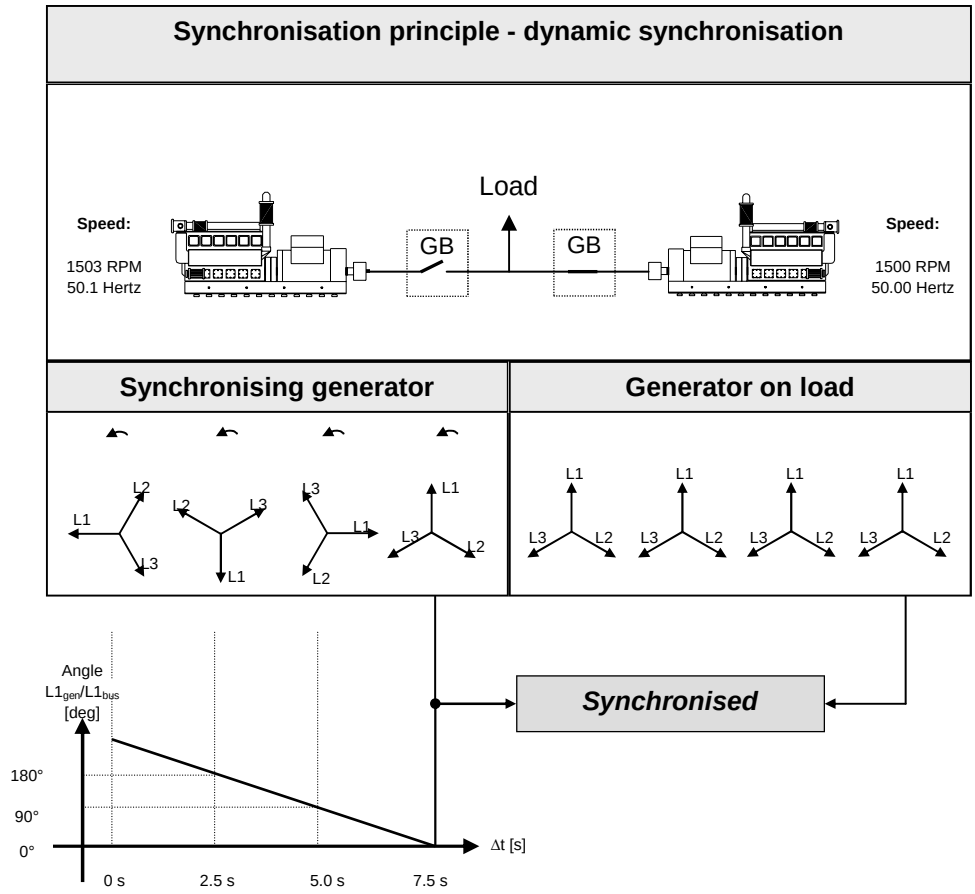
The unit can be used for synchronisation of generator and mains breaker (if installed). Two different synchronisation principles are available, namely static and dynamic synchronisation (dynamic is selected by default). This chapter describes the principles of the synchronisation functions and the adjustment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

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

Please observe the chapter regarding PID controllers and the synchronising controllers on page 136 regarding the time between synchronism.

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 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.

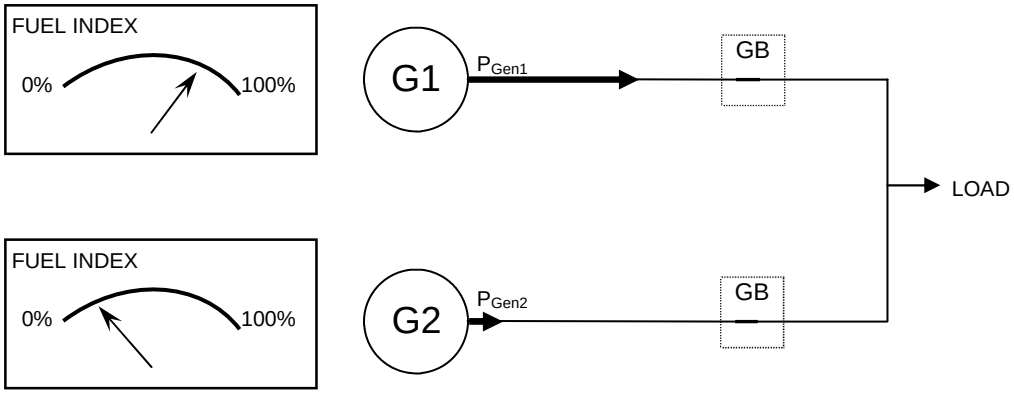


Illustration 1, POSITIVE slip frequency

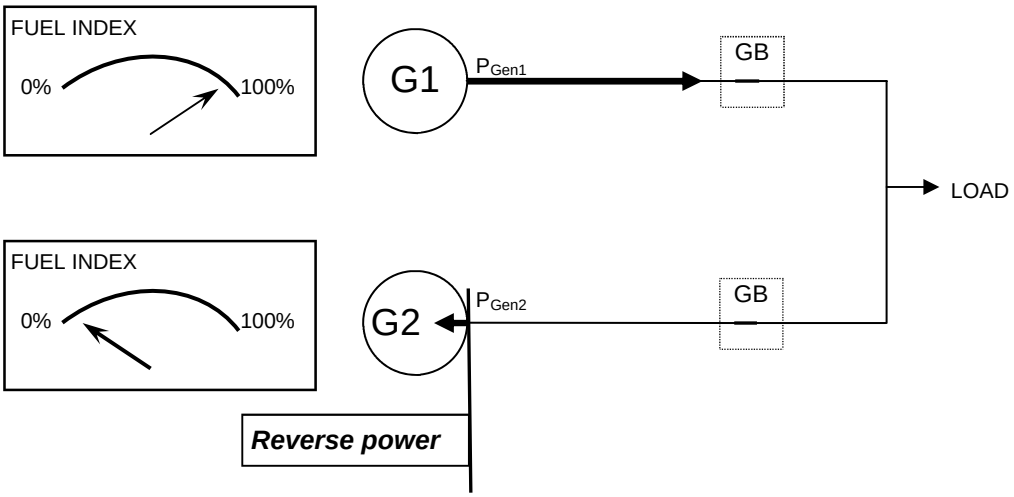


Illustration 2, NEGATIVE slip frequency

Adjustments

The dynamic synchroniser is selected in **2000 Sync. type** in the control setup and is adjusted in **2020 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 difference (+/- 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 set point, then synchronising can still occur as long as the frequency is within the limits of the slip frequency adjustments.

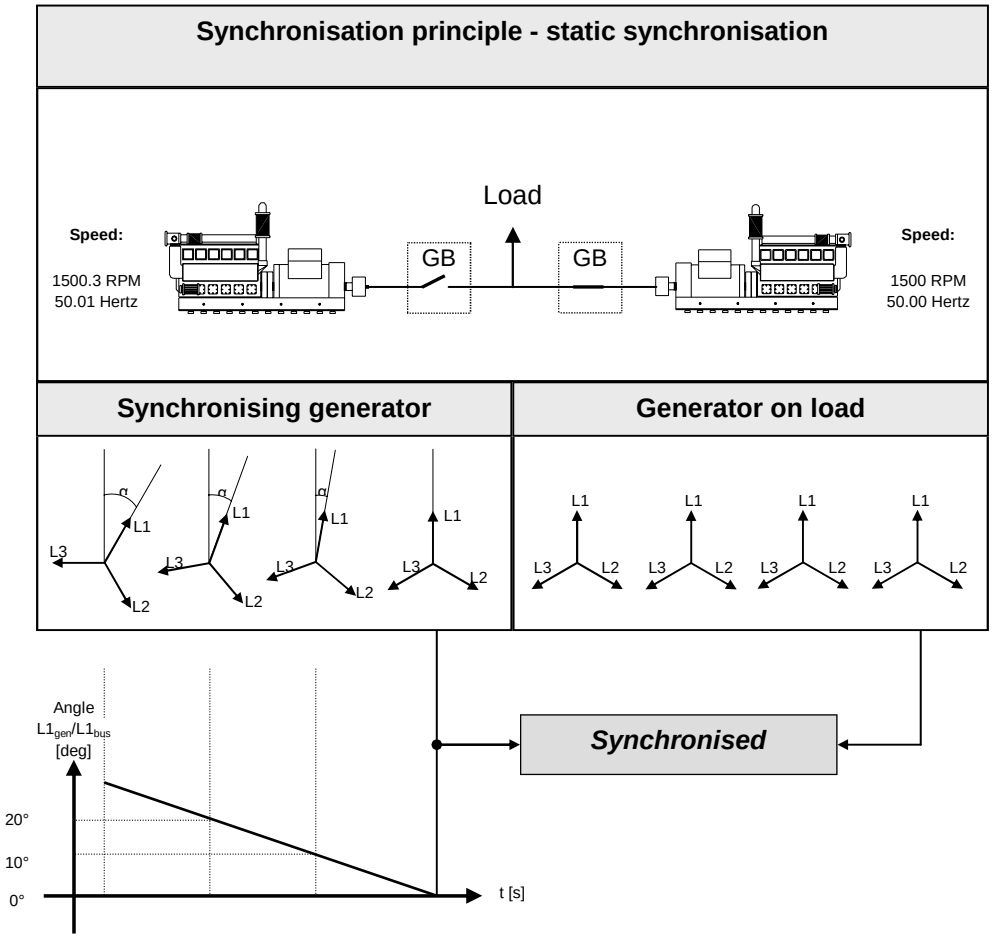
Dynamic synchronisation is recommended where fast synchronisation is required, and where the incoming gen-sets are able to take load just after the breaker has been closed.

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.


Synchronisation principle - static synchronisation
Load
Speed:
1500.3 RPM
50.01 Hertz
GB
GB
Speed:
1500 RPM
50.00 Hertz
Synchronising generator
Generator on load
L1
L2
L3
Synchronised
Angle
L1gen/L1bus
[deg]
20°
10°
0°
t [s]

Phase controller

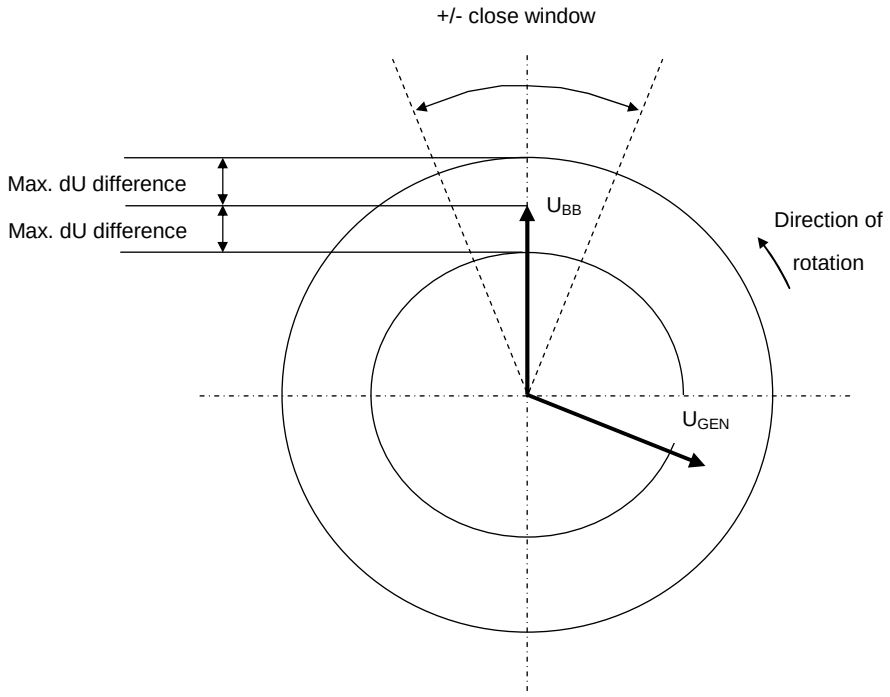
When the static synchronisation is used and the synchronising is activated, the frequency controller will bring the gen-set frequency towards the busbar frequency. When the gen-set frequency is within 50mHz of the busbar frequency, then the phase controller takes over. This controller uses the angle 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 set point. 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 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 set point 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.

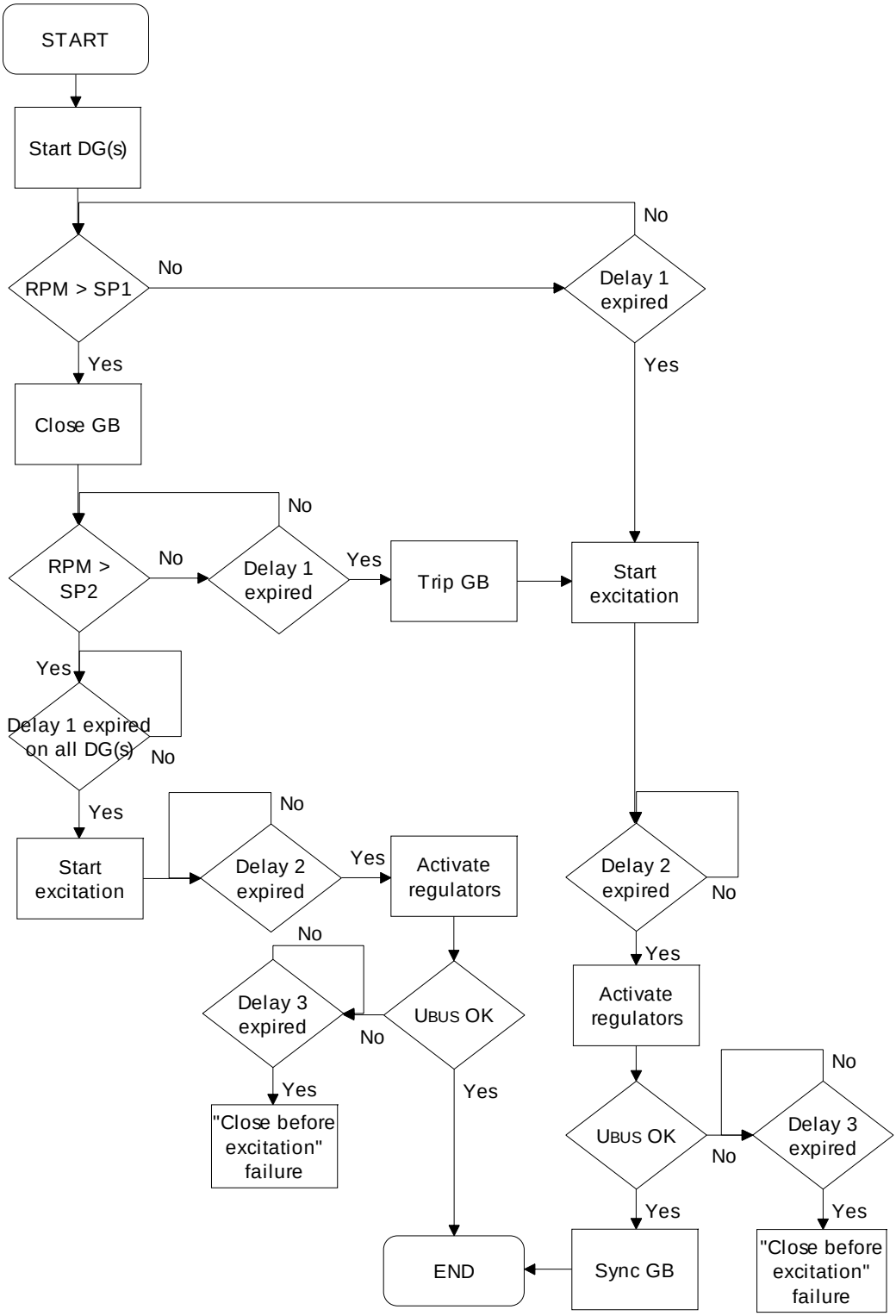
The function can be used in the single AGC but also the AGC with option G5. The only exception is that when option G3 is selected, then the 'close before excitation' function is not available.

The principle is described in the flowcharts below.

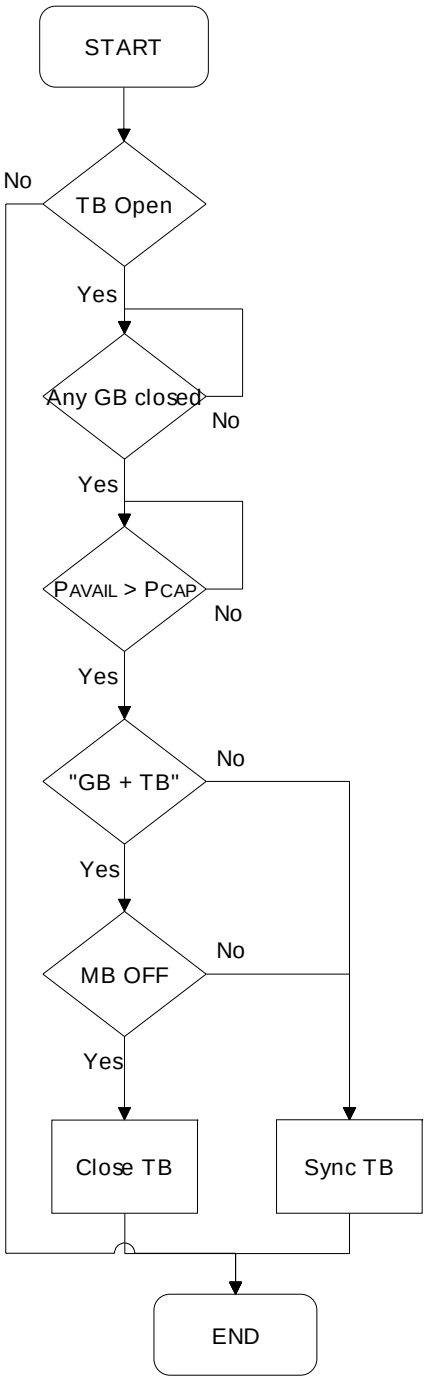
Flowchart abbreviations

Delay 1	=	Menu 2252
Delay 2	=	Menu 2262
Delay 3	=	Menu 2271
SP1	=	Menu 2251
SP2	=	Menu 2263

Flowchart 1, GB handling



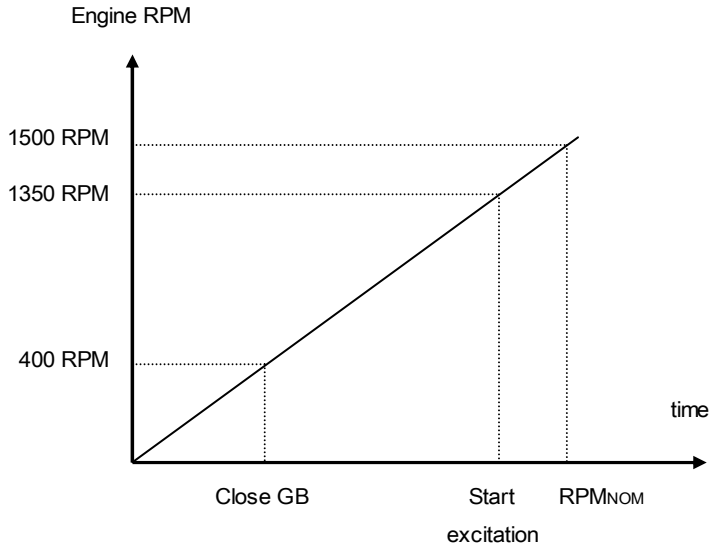
Flowchart 2, TB handling (option G5)



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
2251	RPM set point 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.
2252	RPM timer	The gen-set must reach the set point (menu 2263) within the adjusted delay. When the delay expires and the RPM is above the set point, then the excitation will be started. If the RPM is below the set point, then the GB will be tripped.
2253	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.
2255	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 set point (menu 2263) (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 2261 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
2261	Breaker selection	Select breakers to close: GB or GB + TB.
2262	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.
2263	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 2270 'Cl.bef.exc.fail' 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 2400, and the input is selected in the input settings in the utility software.

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

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.

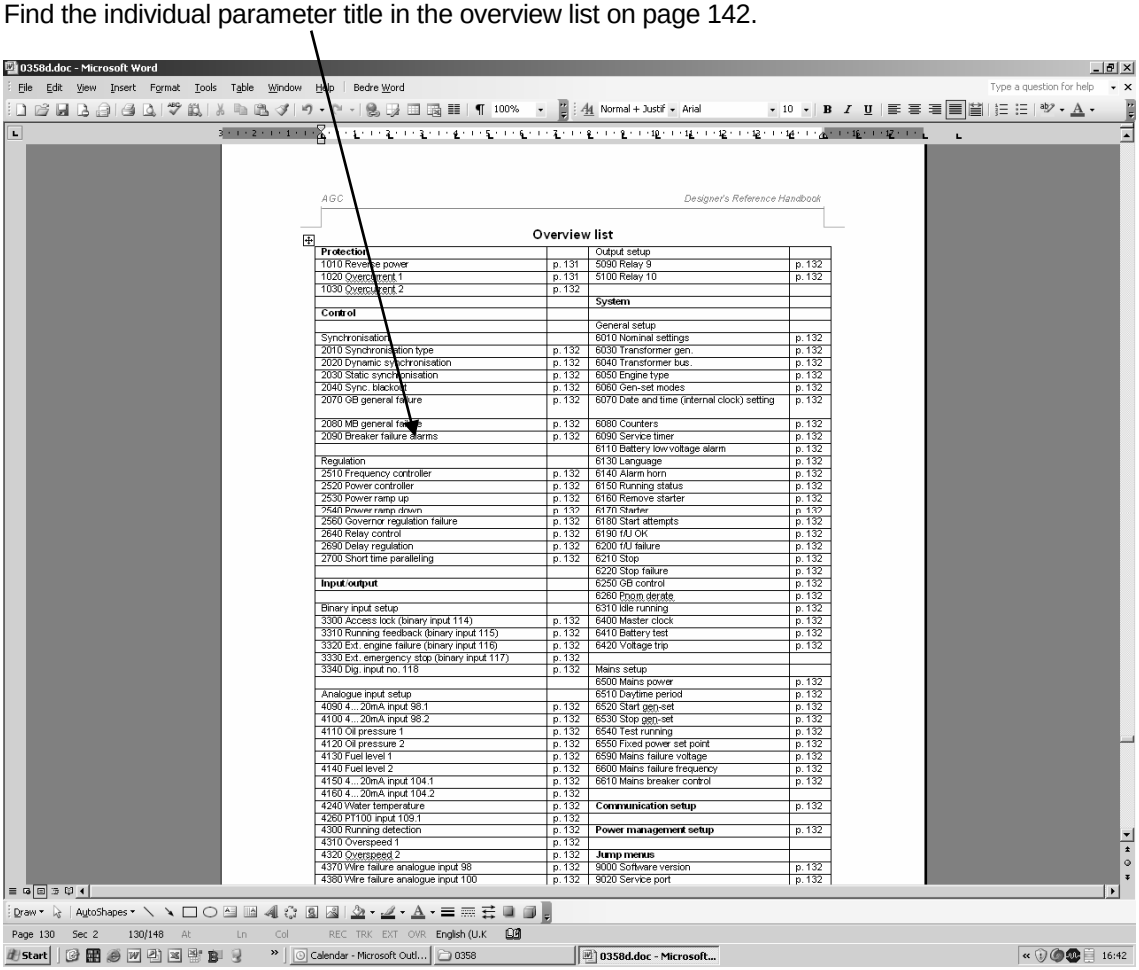
9. Procedure for parameter setup

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 142.

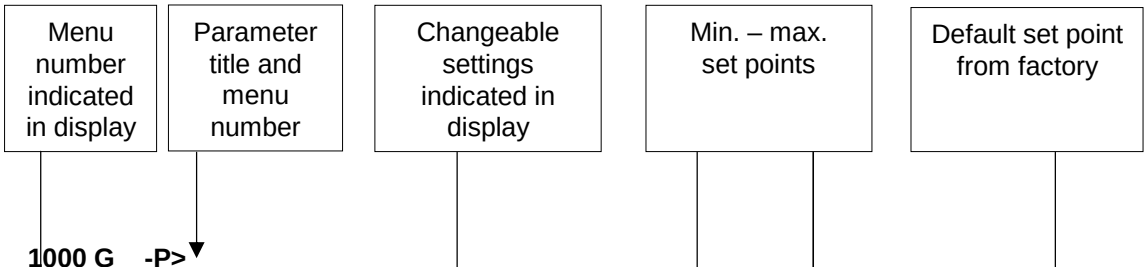


Protection		Output setup	
1010 Reverse power	p. 131	5090 Relay 9	p. 132
1020 Overcurrent 1	p. 131	5100 Relay 10	p. 132
1030 Overcurrent 2	p. 132		
		System	
Control			
		General setup	
Synchronisation		6010 Nominal settings	p. 132
2010 Synchronisation type	p. 132	6030 Transformer gen.	p. 132
2020 Dynamic 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:



1000 G -P>

No.	Setting		Min. setting	Max. setting	Factory setting
1001	G -P>	Set point	-50.0%	0.0%	-5.0%
1002	G -P>	Delay	0.1 s	100.0 s	10.0 s
1003	G -P>	Relay output A	Not used	R3 (relay 3)	Not used
1004	G -P>	Relay output B	Not used	R3 (relay 3)	Not used
1005	G -P>	Enable	OFF	ON	ON
1006	G -P>	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 set point available for this setting.

The fifth column indicates the default set point 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 set point of the parameter **1000 G -P>**).

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: Use the ▽ and △ push-buttons to locate the selected parameter
Step 4: Enter the 'set point' menu via SP in the fourth display line
Step 5: Enter password to change the set point
Step 6: Use the ▽ and △ push-buttons to increase/decrease the set point setting
Step 7: Move the 'underscore' to save and press SEL, the new set point setting has now been saved.

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:

Set point: The alarm set point is adjusted in the set point menu. The setting is a percentage of the nominal values.

Delay: 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.

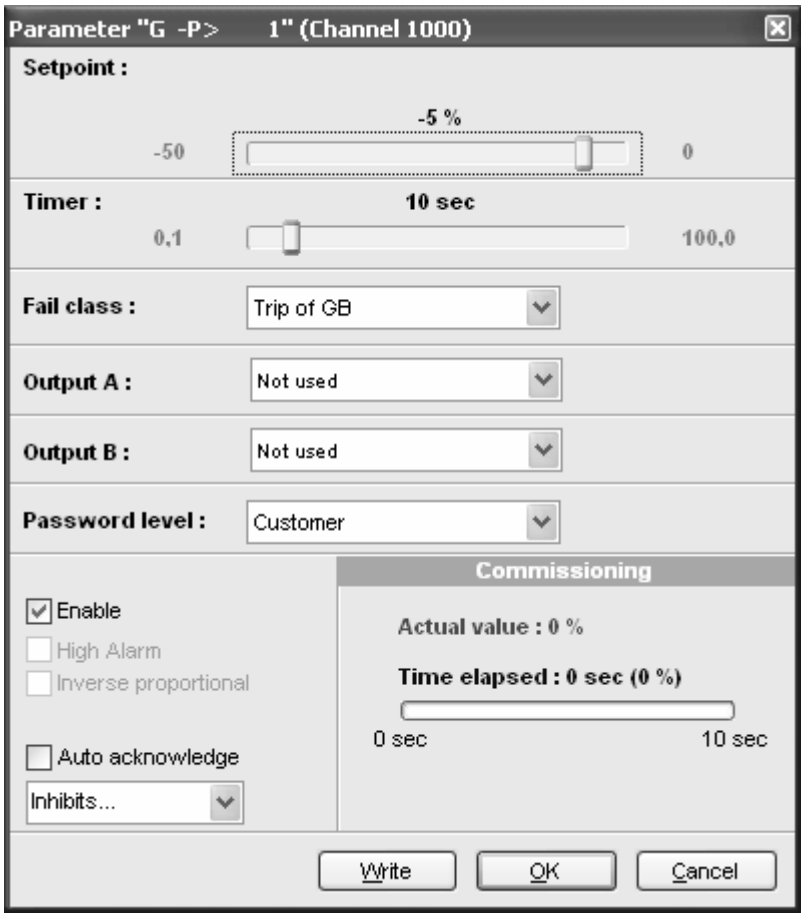
Enable: The alarm can be activated or deactivated. ON means always activated, RUN means that the alarm has run status. This means it is activated when the running signal is present.

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 "G -P> 1" (Channel 1000)
Setpoint :
-5 %
-50
0
Timer :
10 sec
0,1
100,0
Fail class :
Trip of GB
Output A :
Not used
Output B :
Not used
Password level :
Customer
Commissioning
Enable
High Alarm
Inverse proportional
Auto acknowledge
Inhibits...
Actual value : 0 %
Time elapsed : 0 sec (0 %)
0 sec
10 sec
Write
OK
Cancel

Overview list

Protection		4460 VDO water 108.1	P. 161
1000 G -P> 1	P. 144	4470 VDO water 108.2	P. 161
1010 G -P> 2	P. 144	4480 VDO fuel 108.1	P. 161
1030 G I> 1	P. 144	4490 VDO fuel 108.2	P. 161
1040 G I> 2	P. 144	4500 W. fail 108	P. 161
1050 G I> 3	P. 144	4510 Overspeed 1	P. 162
1060 G I> 4	P. 145	4520 Overspeed 2	P. 162
		4530 Crank failure	P. 162
Control		4540 Run feedb. fail	P. 162
- Synchronisation		4550 MPU wire fail	P. 162
2000 Sync. type	P. 145	4560 Hz/V failure	P. 163
2020 Dynamic sync.	P. 145	4570 Start failure	P. 163
2030 Static sync.	P. 145	4580 Stop failure	P. 163
2050 f sync. control	P. 145	4960 U< aux. term. 1	P. 163
2070 Phase control	P. 145	4970 U> aux. term. 1	P. 163
2110 Sync. blackout	P. 146	4980 U< aux. term.98	P. 164
2120 Sync. window	P. 146	4990 U> aux. term.98	P. 164
2130 GB sync failure	P. 146		
2140 MB sync failure	P. 146	**- Output setup**	
2150 Phase seq error	P. 146	5000 Relay 05	P. 164
2160 GB open fail	P. 147	5010 Relay 08	P. 164
2170 GB close fail	P. 147	5020 Relay 11	P. 164
2180 GB pos. fail	P. 147	5050 Relay 20	P. 164
2200 MB open fail	P. 147	5060 Relay 21	P. 165
2210 MB close fail	P. 147	5150 Relay 65	P. 165
2220 MB pos. fail	P. 147	5160 Relay 67	P. 165
2240 Sep. sync. relay	P. 148	5170 Relay 69	P. 165
2250 Close bef. exc.	P. 148	5180 Relay 71	P. 165
2260 Breaker seq.	P. 148	5270 Trans. setup	P. 165
2270 Cl.bef.exc.fail	P. 148		
		System	
- Regulation		**- General setup**	
2570 f control relay	P. 149	6000 Nom. settings	P. 166
2580 P control relay	P. 149	6010 Nom. settings 2	P. 166
2560 GOV reg. fail	P. 149	6020 Nom. settings 3	P. 166
2600 Relay control	P. 149	6030 Nom. settings 4	P. 166
2610 Power ramp up	P. 149	6040 G transformer	P. 166
2620 Power ramp down	P. 150	6050 BB settings	P. 167
2630 Deload error	P. 150	6070 Gen-set mode	P. 167
2740 Delay reg.	P. 150	6080 Language	P. 167
2760 Overlap	P. 150	6090 Date and time (internal clock)	P. 167
2780 Reg. output	P. 150	6100 Counters	P. 167
		6110 Service timer 1	P. 168
Input/output		6120 Service timer 2	P. 168
- Binary input setup		6130 Alarm horn	P. 168
3000 Dig. input 23	P. 151	6160 Run status	P. 168
3010 Dig. input 24	P. 151	6170 Running detect.	P. 169
3020 Dig. input 25	P. 151	6180 Starter	P. 169
3400 Dig. input 102	P. 151	6190 Start attempts	P. 169
3410 Dig. input 105	P. 152	6210 STOP	P. 169
3420 Dig. input 108	P. 152	6220 Hz/V OK	P. 169
3430 Dig. input 112	P. 152	6230 GB control	P. 169
3440 Dig. input 113	P. 152	6260 Power derate	P. 170
3450 Dig. input 114	P. 153	6270 Stop coil wire fail	P. 170
3460 Dig. input 115	P. 153	6280 Int. comm. fail	P. 170
3470 Dig. input 116	P. 153	6290 Idle running	P. 170
3480 Dig. input 117	P. 153	6320 Engine heater	P. 170
3490 Emergency stop	P. 153	6330 Engine heater 1	P. 171
		6400 Master clock	P. 171
- Analogue input setup		6410 Battery test	P. 171
4120 4-20mA 102.1	P. 154	6420 Auto batt. test	P. 171

4130 4-20mA 102.2	P. 154	6430 Batt. asymmetry	P. 171
4140 V DC 102.1	P. 154	6440 Battery asym. 1	P. 172
4150 V DC 102.2	P. 154	6450 Battery asym. 2	P. 172
4160 PT 102.1	P. 155	6460 Max. ventilation	P. 172
4170 PT 102.2	P. 155	6470 Max. vent. 1	P. 172
4180 VDO oil 102.1	P. 155	6480 Max. vent. 2	P. 172
4190 VDO oil 102.2	P. 155	6490 Sum/Win time	P. 172
4200 VDO water 102.1	P. 155	6500 Blk. swbd error	P. 173
4210 VDO water 102.2	P. 156	6510 Stp. swbd error	P. 173
4220 VDO fuel 102.1	P. 156	6540 Not in auto	P. 173
4230 VDO fuel 102.2	P. 156	6550 Fuel pump logic	P. 173
4240 W. fail 102	P. 156		
4250 4-20mA 105.1	P. 156	**Mains setup**	
4260 4-20mA 105.2	P. 157	7000 Mains power	P. 173
4270 V DC 105.1	P. 157	7010 Daytime period	P. 174
4280 V DC 105.2	P. 157	7020 Start generator	P. 174
4290 PT 105.1	P. 157	7030 Stop generator	P. 174
4300 PT 105.2	P. 157	7040 Test	P. 174
4310 VDO oil 105.1	P. 158	7050 Fixed power set	P. 174
4320 VDO oil 105.2	P. 158	7060 U mains failure	P. 175
4330 VDO water 105.1	P. 158	7070 f mains failure	P. 175
4340 VDO water 105.2	P. 158	7080 MB control	P. 175
4350 VDO fuel 105.1	P. 158		
4360 VDO fuel 105.2	P. 159	**Jump menus**	
4370 W. fail 105	P. 159	9000 Software version	P. 176
4380 4-20mA 108.1	P. 159	9020 Service port	P. 176
4390 4-20mA 108.2	P. 159	9070 M4 SW version	P. 176
4400 V DC 108.1	P. 159	911X User password	P. 176
4410 V DC 108.2	P. 160	9120 Service menu	P. 176
4420 PT 108.1	P. 160	9130 AC config.	P. 176
4430 PT 108.2	P. 160	9140 Angle comp. BB/G	P. 177
4440 VDO oil 108.1	P. 160		
4450 VDO oil 108.2	P. 160		

Protection

1000 G -P> 1

No.	Setting			Min. setting	Max. setting	Factory setting
1001	G –P>	1	Set point	-50.0%	0.0%	-5.0%
1002	G –P>	1	Delay	0.1 s	100.0 s	10.0 s
1003	G –P>	1	Relay output A	Not used	Option dependent	Not used
1004	G –P>	1	Relay output B	Not used		Not used
1005	G –P>	1	Enable	OFF	ON	ON
1006	G –P>	1	Fail class	Alarm (1)	Trip MB (6)	Trip GB (3)

1010 G -P> 2

No.	Setting			Min. setting	Max. setting	Factory setting
1011	G –P>	2	Set point	-50.0%	0.0%	-5.0%
1012	G –P>	2	Delay	0.1 s	100.0 s	10.0 s
1013	G –P>	2	Relay output A	Not used	Option dependent	Not used
1014	G –P>	2	Relay output B	Not used		Not used
1015	G –P>	2	Enable	OFF	ON	ON
1016	G –P>	2	Fail class	Alarm (1)	Trip MB (6)	Trip GB (3)

1030 G I> 1

No.	Setting			Min. setting	Max. setting	Factory setting
1031	G I>	1	Set point	50.0%	200.0%	115.0%
1032	G I>	1	Delay	0.1 s	100.0 s	10.0 s
1033	G I>	1	Relay output A	Not used	Option dependent	Not used
1034	G I>	1	Relay output B	Not used		Not used
1035	G I>	1	Enable	OFF	ON	ON
1036	G I>	1	Fail class	Alarm (1)	Trip MB (6)	Warning (2)

1040 G I> 2

No.	Setting			Min. setting	Max. setting	Factory setting
1041	G I>	2	Set point	50.0%	200.0%	120.0%
1042	G I>	2	Delay	0.1 s	100.0 s	5.0 s
1043	G I>	2	Relay output A	Not used	Option dependent	Not used
1044	G I>	2	Relay output B	Not used		Not used
1045	G I>	2	Enable	OFF	ON	ON
1046	G I>	2	Fail class	Alarm (1)	Trip MB (6)	Trip GB (3)

1050 G I> 3

No.	Setting			Min. setting	Max. setting	Factory setting
1051	G I>	3	Set point	50.0%	200.0%	115.0%
1052	G I>	3	Delay	0.1 s	100.0 s	10.0 s
1053	G I>	3	Relay output A	Not used	Option dependent	Not used
1054	G I>	3	Relay output B	Not used		Not used
1055	G I>	3	Enable	OFF	ON	ON
1056	G I>	3	Fail class	Alarm (1)	Trip MB (6)	Trip GB (3)

1060 G I> 4

No.	Setting		Min. setting	Max. setting	Factory setting
1061	G I> 4	Set point	50.0%	200.0%	120.0%
1062	G I> 4	Delay	0.1 s	100.0 s	5.0 s
1063	G I> 4	Relay output A	Not used	Option dependent	Not used
1064	G I> 4	Relay output B	Not used		Not used
1065	G I> 4	Enable	OFF	ON	ON
1066	G I> 4	Fail class	Alarm (1)	Trip MB (6)	Trip GB (3)

Synchronisation

2000 Sync. type

No.	Setting		First setting	Second setting	Factory setting
2001	Sync. type	Type	Static sync.	Dynamic sync.	Dynamic sync.

2020 Dynamic sync.

No.	Setting		Min. setting	Max. setting	Factory setting
2021	Dynamic sync.	dfMax.	0.0Hz	0.5Hz	0.3Hz
2022	Dynamic sync.	dfMin.	-0.5Hz	0.5Hz	0.0Hz
2023	Dynamic sync.	dUMax.	2%	10%	5%
2024	Dynamic sync.	GB	40 ms	300 ms	50 ms
2025	Dynamic sync.	MB	40 ms	300 ms	50 ms

Menu 2020 is only available if Dynamic sync. is chosen in menu 2001.

2030 Static sync.

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.	Delay	0.1 s	99.0 s	1.0 s

Menu 2030 is only available if Static sync. is chosen in menu 2001.

2050 f sync. control

No.	Setting		Min. setting	Max. setting	Factory setting
2051	f sync.	Kp	0	100	10

2070 Phase control

No.	Setting		Min. setting	Max. setting	Factory setting
2071	Phase	Kp	0	100	10

2110 Sync. blackout

No.	Setting		Min. setting	Max. setting	Factory setting
2111	Sync. blackout	df max.	0.0Hz	5.0Hz	3.0Hz
2112	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.

2120 Sync. window

No.	Setting		Min. setting	Max. setting	Factory setting
2121	Sync. window	Set point	2.0%	20.0%	15.0%
2122	Sync. window	Delay	0.1 s	2.0 s	0.5 s
2123	Sync. window	Relay output A	Not used	Option dependent	Not used
2124	Sync. window	Relay output B	Not used		Not used
2125	Sync. window	Enable	OFF	ON	OFF

2130 GB sync failure

No.	Setting		Min. setting	Max. setting	Factory setting
2131	GB sync failure	Delay	30.0 s	300.0 s	60.0 s
2132	GB sync failure	Relay output A	Not used	Option dependent	Not used
2133	GB sync failure	Relay output B	Not used		Not used
2134	GB sync failure	Enable	OFF	ON	ON
2135	GB sync failure	Fail class	Alarm (1)	Trip MB (6)	Warning (2)

2140 MB sync failure

No.	Setting		Min. setting	Max. setting	Factory setting
2141	MB sync failure	Delay	30.0 s	300.0 s	60.0 s
2142	MB sync failure	Relay output A	Not used	Option dependent	Not used
2143	MB sync failure	Relay output B	Not used		Not used
2144	MB sync failure	Enable	OFF	ON	ON
2145	MB sync failure	Fail class	Alarm (1)	Trip MB (6)	Warning (2)

2150 Phase seq error

No.	Setting		Min. setting	Max. setting	Factory setting
2151	Phase seq error	Relay output A	Not used	Option dependent	Not used
2152	Phase seq error	Relay output B	Not used		Not used
2153	Phase seq error	Fail class	Alarm (1)	Trip MB (6)	Alarm (1)

2160 GB open fail

No.	Setting		Min. setting	Max. setting	Factory setting
2161	GB open fail	Delay	2.0 s	2.0 s	2.0 s
2162	GB open fail	Relay output A	Not used	Option dependent	Not used
2163	GB open fail	Relay output B	Not used		Not used
2164	GB open fail	Enable	OFF	ON	ON
2165	GB open fail	Fail class	Alarm (1)	Trip MB (6)	Warning (2)

2170 GB close fail

No.	Setting		Min. setting	Max. setting	Factory setting
2171	GB close fail	Delay	2.0 s	2.0 s	2.0 s
2172	GB close fail	Relay output A	Not used	Option dependent	Not used
2173	GB close fail	Relay output B	Not used		Not used
2174	GB close fail	Enable	OFF	ON	ON
2175	GB close fail	Fail class	Alarm (1)	Trip MB (6)	Warning (2)

2180 GB pos. fail

No.	Setting		Min. setting	Max. setting	Factory setting
2181	GB pos. failure	Delay	1.0 s	1.0 s	1.0 s
2182	GB pos. failure	Relay output A	Not used	Option dependent	Not used
2183	GB pos. failure	Relay output B	Not used		Not used
2184	GB pos. failure	Enable	OFF	ON	ON
2185	GB pos. failure	Fail class	Alarm (1)	Trip MB (6)	Warning (2)

2200 MB open fail

No.	Setting		Min. setting	Max. setting	Factory setting
2201	MB open fail	Delay	2.0 s	2.0 s	2.0 s
2202	MB open fail	Relay output A	Not used	Option dependent	Not used
2203	MB open fail	Relay output B	Not used		Not used
2204	MB open fail	Enable	OFF	ON	ON
2205	MB open fail	Fail class	Alarm (1)	Trip MB (6)	Warning (2)

2210 MB close fail

No.	Setting		Min. setting	Max. setting	Factory setting
2211	MB close fail	Delay	2.0 s	2.0 s	2.0 s
2212	MB close fail	Relay output A	Not used	Option dependent	Not used
2213	MB close fail	Relay output B	Not used		Not used
2214	MB close fail	Enable	OFF	ON	ON
2215	MB close fail	Fail class	Alarm (1)	Trip MB (6)	Warning (2)

2220 MB pos. fail

No.	Setting		Min. setting	Max. setting	Factory setting
2221	MB pos. fail	Delay	1.0 s	1.0 s	1.0 s
2222	MB pos. fail	Relay output A	Not used	Option dependent	Not used
2223	MB pos. fail	Relay output B	Not used		Not used
2224	MB pos. fail	Enable	OFF	ON	ON
2225	MB pos. fail	Fail class	Alarm (1)	Trip MB (6)	Warning (2)

2240 Sep. sync. relay

No.	Setting		Min. setting	Max. setting	Factory setting
2241	Sep. sync. relay	GB	Not used	Option dependent	Not used
2242	Sep. sync. relay	MB	Not used		Not used

2250 Close bef. exc.

No.	Setting		Min. setting	Max. setting	Factory setting
2251	Close bef. exc.	Set point	0 RPM	4000 RPM	0 RPM
2252	Close bef. exc.	Timer	0.0 s	999.0 s	5.0 s
2253	Close bef. exc.	Relay output A	Not used	Option dependent	Not used
2254	Close bef. exc.	Enable	OFF	ON	OFF

2260 Breaker seq.

No.	Setting		Min. setting	Max. setting	Factory setting
2261	Breaker seq.	Break	Close GB	Close GB+TB	Close GB
2262	Breaker seq.	Delay	0.0 s	999.0 s	5.0 s
2263	Breaker seq.	RpmOK	0 RPM	4000 RPM	1450 RPM

2270 Cl.bef.exc.fail

No.	Setting		Min. setting	Max. setting	Factory setting
2271	Cl.bef.exc.fail	Delay	0.0 s	999.0 s	5.0 s
2272	Cl.bef.exc.fail	Relay output A	Not used	Option dependent	Not used
2273	Cl.bef.exc.fail	Relay output B	Not used		Not used
2274	Cl.bef.exc.fail	Enable	OFF	ON	OFF
2275	Cl.bef.exc.fail	Fail class	Alarm (1)	Trip MB (6)	Warning (2)

Regulation

2570 f control relay

No.	Setting		Min. setting	Max. setting	Factory setting
2571	f control relay	Deadband	0.2%	10.0%	1.0%
2572	f control relay	Kp	0	100	10

2580 P control relay

No.	Setting		Min. setting	Max. setting	Factory setting
2581	P control relay	Deadband	0.2%	10.0%	2.0%
2582	P control relay	Kp	0	100	10

2560 GOV reg. fail

No.	Setting		Min. setting	Max. setting	Factory setting
2561	GOV reg. fail	Deadband	1.0%	100.0%	30.0%
2562	GOV reg. fail	Delay	10.0 s	300.0 s	60.0 s
2563	GOV reg. fail	Relay output A	Not used	Option dependent	Not used
2564	GOV reg. fail	Relay output B	Not used		Not used

The alarm is activated, if the difference between the measured value and the set point is outside the deadband for a longer time period than specified by the delay set point.

2600 Relay control

No.	Setting		Min. setting	Max. setting	Factory setting
2601	Relay control	GOV ON time	10 ms	6500 ms	500 ms
2602	Relay control	GOV per. time	50 ms	32500 ms	2500 ms
2603	Relay control	Increase relay	Not used	Option dependent	Not used
2604	Relay control	Decrease relay	Not used		Not used

2610 Power ramp up

No.	Setting		Min. setting	Max. setting	Factory setting
2611	Power ramp up	Speed	1.0 %/s	20.0 %/s	2.0 %/s
2612	Power ramp up	Delay point	1%	100%	10%
2613	Power ramp up	Delay time	0.0 s	9900 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.

2620 Power ramp down

No.	Setting		Min. setting	Max. setting	Factory setting
2621	Power ramp down	Speed	0.1%/s	20.0%/s	10.0%/s
2622	Power ramp down	Breaker open point	1%	20%	5%

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.

2630 Deload error

No.	Setting		Min. setting	Max. setting	Factory setting
2631	Deload error	Output A	Not used	Option dependent	Not used
2632	Deload error	Output B	Not used		Not used
2633	Deload error	Enable	OFF	ON	ON
2634	Deload error	Fail class	Alarm (1)	Trip MB (6)	Warning (2)

2740 Delay reg.

No.	Setting		Min. setting	Max. setting	Factory setting
2741	Delay reg.	Delay	0 s	9900 s	0 s
2742	Delay reg.	Output A	Not used	Option dependent	Not used
2743	Delay reg.	Output B	Not used		Not used
2744	Delay reg.	Enable	OFF	ON	OFF

2760 Overlap

No.	Setting		Min. setting	Max. setting	Factory setting
2761	Overlap	Enable	OFF	ON	OFF
2762	Overlap	Delay	0.10 s	99.90 s	0.30 s

2780 Reg. output

No.	Setting		1st setting	2nd setting	3rd setting	Factory setting
2781	Reg. output	GOV	Relay	Analogue	EIC	Relay

'Analogue' and 'EIC' selections are option dependent.

Input/output

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

Binary input setup

3000 Dig. input 23

No.	Setting		Min. setting	Max. setting	Factory setting
3001	Dig. input 23	Delay	0.0 s	100.0 s	10.0 s
3002	Dig. input 23	Relay output A	Not used	Option dependent	Not used
3003	Dig. input 23	Relay output B	Not used		Not used
3004	Dig. input 23	Enable	OFF	ON	OFF
3005	Dig. input 23	Fail class	Alarm (1)	Trip MB (6)	Warning (2)
3006	Dig. input 23	N/X	N/O	N/C	N/O

3010 Dig. input 24

No.	Setting		Min. setting	Max. setting	Factory setting
3011	Dig. input 24	Delay	0.0 s	100.0 s	10.0 s
3012	Dig. input 24	Relay output A	Not used	Option dependent	Not used
3013	Dig. input 24	Relay output B	Not used		Not used
3014	Dig. input 24	Enable	OFF	ON	OFF
3015	Dig. input 24	Fail class	Alarm (1)	Trip MB (6)	Warning (2)
3016	Dig. input 24	N/X	N/O	N/C	N/O

3020 Dig. input 25

No.	Setting		Min. setting	Max. setting	Factory setting
3021	Dig. input 25	Delay	0.0 s	100.0 s	10.0 s
3022	Dig. input 25	Relay output A	Not used	Option dependent	Not used
3023	Dig. input 25	Relay output B	Not used		Not used
3024	Dig. input 25	Enable	OFF	ON	OFF
3025	Dig. input 25	Fail class	Alarm (1)	Trip MB (6)	Warning (2)
3026	Dig. input 25	N/X	N/O	N/C	N/O

Menus 3010 and 3020 (dig. input no. 24 and 25) are only available when menu 7085 'MB type' is set to 'No breaker'.

3400 Dig. input 102

No.	Setting		Min. setting	Max. setting	Factory setting
3401	Wire fail. 102	Enable	OFF	ON	OFF
3402	Dig. input 102	Delay	0.0 s	100.0 s	10.0 s
3403	Dig. input 102	Relay output A	Not used	Option dependent	Not used
3404	Dig. input 102	Relay output B	Not used		Not used
3405	Dig. input 102	Enable	OFF	ON	OFF
3406	Dig. input 102	Fail class	Alarm (1)	Trip MB (6)	Warning (2)

Menu 3400 is only available when multi input 102 is configured to 'Digital'.

3410 Dig. input 105

No.	Setting		Min. setting	Max. setting	Factory setting
3411	Wire fail. 105	Enable	OFF	ON	OFF
3412	Dig. input 105	Delay	0.0 s	100.0 s	10.0 s
3413	Dig. input 105	Relay output A	Not used	Option dependent	Not used
3414	Dig. input 105	Relay output B	Not used		Not used
3415	Dig. input 105	Enable	OFF	ON	OFF
3416	Dig. input 105	Fail class	Alarm (1)	Trip MB (6)	Warning (2)

Menu 3410 is only available when multi input 105 is configured to 'Digital'.

3420 Dig. input 108

No.	Setting		Min. setting	Max. setting	Factory setting
3421	Wire fail. 108	Enable	OFF	ON	OFF
3422	Dig. input 108	Delay	0.0 s	100.0 s	10.0 s
3423	Dig. input 108	Relay output A	Not used	Option dependent	Not used
3424	Dig. input 108	Relay output B	Not used		Not used
3425	Dig. input 108	Enable	OFF	ON	OFF
3426	Dig. input 108	Fail class	Alarm (1)	Trip MB (6)	Warning (2)

Menu 3420 is only available when multi input 108 is configured to 'Digital'.

3430 Dig. input 112

No.	Setting		Min. setting	Max. setting	Factory setting
3431	Dig. input 112	Delay	0.0 s	100.0 s	10.0 s
3432	Dig. input 112	Relay output A	Not used	Option dependent	Not used
3433	Dig. input 112	Relay output B	Not used		Not used
3434	Dig. input 112	Enable	OFF	ON	OFF
3435	Dig. input 112	Fail class	Alarm (1)	Trip MB (6)	Warning (2)
3436	Dig. input 112	N/X	N/O	N/C	N/O

3440 Dig. input 113

No.	Setting		Min. setting	Max. setting	Factory setting
3441	Dig. input 113	Delay	0.0 s	100.0 s	10.0 s
3442	Dig. input 113	Relay output A	Not used	Option dependent	Not used
3443	Dig. input 113	Relay output B	Not used		Not used
3444	Dig. input 113	Enable	OFF	ON	OFF
3445	Dig. input 113	Fail class	Alarm (1)	Trip MB (6)	Warning (2)
3446	Dig. input 113	N/X	N/O	N/C	N/O

3450 Dig. input 114

No.	Setting		Min. setting	Max. setting	Factory setting
3451	Dig. input 114	Delay	0.0 s	100.0 s	10.0 s
3452	Dig. input 114	Relay output A	Not used	Option dependent	Not used
3453	Dig. input 114	Relay output B	Not used		Not used
3454	Dig. input 114	Enable	OFF	ON	OFF
3455	Dig. input 114	Fail class	Alarm (1)	Trip MB (6)	Warning (2)
3456	Dig. input 114	N/X	N/O	N/C	N/O

3460 Dig. input 115

No.	Setting		Min. setting	Max. setting	Factory setting
3461	Dig. input 115	Delay	0.0 s	100.0 s	10.0 s
3462	Dig. input 115	Relay output A	Not used	Option dependent	Not used
3463	Dig. input 115	Relay output B	Not used		Not used
3464	Dig. input 115	Enable	OFF	ON	OFF
3465	Dig. input 115	Fail class	Alarm (1)	Trip MB (6)	Warning (2)
3466	Dig. input 115	N/X	N/O	N/C	N/O

3470 Dig. input 116

No.	Setting		Min. setting	Max. setting	Factory setting
3471	Dig. input 116	Delay	0.0 s	100.0 s	10.0 s
3472	Dig. input 116	Relay output A	Not used	Option dependent	Not used
3473	Dig. input 116	Relay output B	Not used		Not used
3474	Dig. input 116	Enable	OFF	ON	OFF
3475	Dig. input 116	Fail class	Alarm (1)	Trip MB (6)	Warning (2)
3476	Dig. input 116	N/X	N/O	N/C	N/O

3480 Dig. input 117

No.	Setting		Min. setting	Max. setting	Factory setting
3481	Dig. input 117	Delay	0.0 s	100.0 s	10.0 s
3482	Dig. input 117	Relay output A	Not used	Option dependent	Not used
3483	Dig. input 117	Relay output B	Not used		Not used
3484	Dig. input 117	Enable	OFF	ON	OFF
3485	Dig. input 117	Fail class	Alarm (1)	Trip MB (6)	Warning (2)
3486	Dig. input 117	N/X	N/O	N/C	N/O

3490 Emergency stop

No.	Setting		Min. setting	Max. setting	Factory setting
3491	Emergency stop	Delay	0.0 s	100.0 s	0.0 s
3492	Emergency stop	Relay output A	Not used	Option dependent	Not used
3493	Emergency stop	Relay output B	Not used		Not used
3494	Emergency stop	Enable	OFF	ON	OFF
3495	Emergency stop	Fail class	Alarm (1)	Trip MB (6)	Shutdown (5)

Analogue input setup

Multi input no. 102

The available menus for multi input no. 102 depend on the input type configured in the PC utility software (menu 10980).

4120 4-20mA 102.1

No.	Setting		Min. setting	Max. setting	Factory setting
4121	4-20mA 102.1	Set point	4mA	20mA	10mA
4122	4-20mA 102.1	Delay	0.0 s	600.0 s	10.0 s
4123	4-20mA 102.1	Relay output A	Not used	Option dependent	Not used
4124	4-20mA 102.1	Relay output B	Not used		Not used
4125	4-20mA 102.1	Enable	OFF	ON	OFF
4126	4-20mA 102.1	Fail class	Alarm (1)	Trip MB (6)	Warning (2)

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

4130 4-20mA 102.2

No.	Setting		Min. setting	Max. setting	Factory setting
4131	4-20mA 102.2	Set point	4mA	20mA	10mA
4132	4-20mA 102.2	Delay	0.0 s	600.0 s	10.0 s
4133	4-20mA 102.2	Relay output A	Not used	Option dependent	Not used
4134	4-20mA 102.2	Relay output B	Not used		Not used
4135	4-20mA 102.2	Enable	OFF	ON	OFF
4136	4-20mA 102.2	Fail class	Alarm (1)	Trip MB (6)	Warning (2)

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

4140 V DC 102.1

No.	Setting		Min. setting	Max. setting	Factory setting
4141	V DC 102.1	Set point	0.0V DC	40.0V DC	20.0V DC
4142	V DC 102.1	Delay	0.2 s	999.0 s	10.0 s
4143	V DC 102.1	Relay output A	Not used	Option dependent	Not used
4144	V DC 102.1	Relay output B	Not used		Not used
4145	V DC 102.1	Enable	OFF	ON	OFF
4146	V DC 102.1	Fail class	Alarm (1)	Trip MB (6)	Warning (2)

4150 V DC 102.2

No.	Setting		Min. setting	Max. setting	Factory setting
4151	V DC 102.2	Set point	0.0V DC	40.0V DC	20.0V DC
4152	V DC 102.2	Delay	0.0 s	600.0 s	10.0 s
4153	V DC 102.2	Relay output A	Not used	Option dependent	Not used
4154	V DC 102.2	Relay output B	Not used		Not used
4155	V DC 102.2	Enable	OFF	ON	OFF
4156	V DC 102.2	Fail class	Alarm (1)	Trip MB (6)	Warning (2)

4160 PT 102.1

No.	Setting		Min. setting	Max. setting	Factory setting
4161	PT 102.1	Set point	-49	482	80
4162	PT 102.1	Delay	0.0 s	999.0 s	5.0 s
4163	PT 102.1	Relay output A	Not used	Option dependent	Not used
4164	PT 102.1	Relay output B	Not used		Not used
4165	PT 102.1	Enable	OFF	ON	OFF
4166	PT 102.1	Fail class	Alarm (1)	Trip MB (6)	Warning (2)

4170 PT 102.2

No.	Setting		Min. setting	Max. setting	Factory setting
4171	PT 102.2	Set point	-49	482	80
4172	PT 102.2	Delay	0.2 s	999.0 s	10.0 s
4173	PT 102.2	Relay output A	Not used	Option dependent	Not used
4174	PT 102.2	Relay output B	Not used		Not used
4175	PT 102.2	Enable	OFF	ON	OFF
4176	PT 102.2	Fail class	Alarm (1)	Trip MB (6)	Warning (2)

4180 VDO oil 102.1

No.	Setting		Min. setting	Max. setting	Factory setting
4181	VDO oil 102.1	Set point	0.0 bar	10.0 bar	4.0 bar
4182	VDO oil 102.1	Delay	0.0 s	990.0 s	5.0 s
4183	VDO oil 102.1	Relay output A	Not used	Option dependent	Not used
4184	VDO oil 102.1	Relay output B	Not used		Not used
4185	VDO oil 102.1	Enable	OFF	ON	OFF
4186	VDO oil 102.1	Fail class	Alarm (1)	Trip MB (6)	Warning (2)

4190 VDO oil 102.2

No.	Setting		Min. setting	Max. setting	Factory setting
4191	VDO oil 102.2	Set point	0.0 bar	10.0 bar	4.0 bar
4192	VDO oil 102.2	Delay	0.2 s	990.0 s	5.0 s
4193	VDO oil 102.2	Relay output A	Not used	Option dependent	Not used
4194	VDO oil 102.2	Relay output B	Not used		Not used
4195	VDO oil 102.2	Enable	OFF	ON	OFF
4196	VDO oil 102.2	Fail class	Alarm (1)	Trip MB (6)	Warning (2)

4200 VDO water 102.1

No.	Setting		Min. setting	Max. setting	Factory setting
4201	VDO water 102.1	Set point	40	150	100
4202	VDO water 102.1	Delay	0.0 s	990.0 s	5.0 s
4203	VDO water 102.1	Relay output A	Not used	Option dependent	Not used
4204	VDO water 102.1	Relay output B	Not used		Not used
4205	VDO water 102.1	Enable	OFF	ON	OFF
4206	VDO water 102.1	Fail class	Alarm (1)	Trip MB (6)	Warning (2)

4210 VDO water 102.2

No.	Setting		Min. setting	Max. setting	Factory setting
4211	VDO water 102.2	Set point	40	150	100
4212	VDO water 102.2	Delay	0.2 s	990.0 s	5.0 s
4213	VDO water 102.2	Relay output A	Not used	Option dependent	Not used
4214	VDO water 102.2	Relay output B	Not used		Not used
4215	VDO water 102.2	Enable	OFF	ON	OFF
4216	VDO water 102.2	Fail class	Alarm (1)	Trip MB (6)	Warning (2)

4220 VDO fuel 102.1

No.	Setting		Min. setting	Max. setting	Factory setting
4221	VDO fuel 102.1	Set point	0%	100%	10%
4222	VDO fuel 102.1	Delay	0.0 s	990.0 s	10.0 s
4223	VDO fuel 102.1	Relay output A	Not used	Option dependent	Not used
4224	VDO fuel 102.1	Relay output B	Not used		Not used
4225	VDO fuel 102.1	Enable	OFF	ON	OFF
4226	VDO fuel 102.1	Fail class	Alarm (1)	Trip MB (6)	Warning (2)

4230 VDO fuel 102.2

No.	Setting		Min. setting	Max. setting	Factory setting
4231	VDO fuel 102.2	Set point	0%	100%	10%
4232	VDO fuel 102.2	Delay	0.2 s	990.0 s	10.0 s
4233	VDO fuel 102.2	Relay output A	Not used	Option dependent	Not used
4234	VDO fuel 102.2	Relay output B	Not used		Not used
4235	VDO fuel 102.2	Enable	OFF	ON	OFF
4236	VDO fuel 102.2	Fail class	Alarm (1)	Trip MB (6)	Warning (2)

4240 W. fail 102

No.	Setting		Min. setting	Max. setting	Factory setting
4241	W. fail 102	Relay output A	Not used	Option dependent	Not used
4242	W. fail 102	Relay output B	Not used		Not used
4243	W. fail 102	Enable	OFF	ON	OFF
4244	W. fail 102	Fail class	Alarm (1)	Trip MB (6)	Warning (2)

Multi input no. 105

The available menus for multi input no. 105 depend on the input type configured in the PC utility software (menu 10990).

4250 4-20mA 105.1

No.	Setting		Min. setting	Max. setting	Factory setting
4251	4-20mA 105.1	Set point	4mA	20mA	10mA
4252	4-20mA 105.1	Delay	0.0 s	600.0 s	10.0 s
4253	4-20mA 105.1	Relay output A	Not used	Option dependent	Not used
4254	4-20mA 105.1	Relay output B	Not used		Not used
4255	4-20mA 105.1	Enable	OFF	ON	OFF
4256	4-20mA 105.1	Fail class	Alarm (1)	Trip MB (6)	Warning (2)

4260 4-20mA 105.2

No.	Setting		Min. setting	Max. setting	Factory setting
4261	4-20mA 105.2	Set point	4mA	20mA	10mA
4262	4-20mA 105.2	Delay	0.0 s	600.0 s	10.0 s
4263	4-20mA 105.2	Relay output A	Not used	Option dependent	Not used
4264	4-20mA 105.2	Relay output B	Not used		Not used
4265	4-20mA 105.2	Enable	OFF	ON	OFF
4266	4-20mA 105.2	Fail class	Alarm (1)	Trip MB (6)	Warning (2)

4270 V DC 105.1

No.	Setting		Min. setting	Max. setting	Factory setting
4271	V DC 105.1	Set point	0.0V DC	40.0V DC	20.0V DC
4272	V DC 105.1	Delay	0.0 s	600.0 s	10.0 s
4273	V DC 105.1	Relay output A	Not used	Option dependent	Not used
4274	V DC 105.1	Relay output B	Not used		Not used
4275	V DC 105.1	Enable	OFF	ON	OFF
4276	V DC 105.1	Fail class	Alarm (1)	Trip MB (6)	Warning (2)

4280 V DC 105.2

No.	Setting		Min. setting	Max. setting	Factory setting
4281	V DC 105.2	Set point	0.0V DC	40.0V DC	20.0V DC
4282	V DC 105.2	Delay	0.0 s	600.0 s	10.0 s
4283	V DC 105.2	Relay output A	Not used	Option dependent	Not used
4284	V DC 105.2	Relay output B	Not used		Not used
4285	V DC 105.2	Enable	OFF	ON	OFF
4286	V DC 105.2	Fail class	Alarm (1)	Trip MB (6)	Warning (2)

4290 PT 105.1

No.	Setting		Min. setting	Max. setting	Factory setting
4291	PT 105.1	Set point	-40	250	80
4292	PT 105.1	Delay	0.0 s	600.0 s	10.0 s
4293	PT 105.1	Relay output A	Not used	Option dependent	Not used
4294	PT 105.1	Relay output B	Not used		Not used
4295	PT 105.1	Enable	OFF	ON	OFF
4296	PT 105.1	Fail class	Alarm (1)	Trip MB (6)	Warning (2)

4300 PT 105.2

No.	Setting		Min. setting	Max. setting	Factory setting
4301	PT 105.2	Set point	-40	250	80
4302	PT 105.2	Delay	0.0 s	600.0 s	10.0 s
4303	PT 105.2	Relay output A	Not used	Option dependent	Not used
4304	PT 105.2	Relay output B	Not used		Not used
4305	PT 105.2	Enable	OFF	ON	OFF
4306	PT 105.2	Fail class	Alarm (1)	Trip MB (6)	Warning (2)

4310 VDO oil 105.1

No.	Setting		Min. setting	Max. setting	Factory setting
4311	VDO oil 105.1	Set point	0.0 bar	10.0 bar	4.0 bar
4312	VDO oil 105.1	Delay	0.0 s	600.0 s	10.0 s
4313	VDO oil 105.1	Relay output A	Not used	Option dependent	Not used
4314	VDO oil 105.1	Relay output B	Not used		Not used
4315	VDO oil 105.1	Enable	OFF	ON	OFF
4316	VDO oil 105.1	Fail class	Alarm (1)	Trip MB (6)	Warning (2)

4320 VDO oil 105.2

No.	Setting		Min. setting	Max. setting	Factory setting
4321	VDO oil 105.2	Set point	0.0 bar	10.0 bar	4.0 bar
4322	VDO oil 105.2	Delay	0.0 s	600.0 s	10.0 s
4323	VDO oil 105.2	Relay output A	Not used	Option dependent	Not used
4324	VDO oil 105.2	Relay output B	Not used		Not used
4325	VDO oil 105.2	Enable	OFF	ON	OFF
4326	VDO oil 105.2	Fail class	Alarm (1)	Trip MB (6)	Warning (2)

4330 VDO water 105.1

No.	Setting		Min. setting	Max. setting	Factory setting
4331	VDO water 105.1	Set point	40	150	100
4332	VDO water 105.1	Delay	0.0 s	600.0 s	10.0 s
4333	VDO water 105.1	Relay output A	Not used	Option dependent	Not used
4334	VDO water 105.1	Relay output B	Not used		Not used
4335	VDO water 105.1	Enable	OFF	ON	OFF
4336	VDO water 105.1	Fail class	Alarm (1)	Trip MB (6)	Warning (2)

4340 VDO water 105.2

No.	Setting		Min. setting	Max. setting	Factory setting
4341	VDO water 105.2	Set point	40	150	100
4342	VDO water 105.2	Delay	0.0 s	600.0 s	10.0 s
4343	VDO water 105.2	Relay output A	Not used	Option dependent	Not used
4344	VDO water 105.2	Relay output B	Not used		Not used
4345	VDO water 105.2	Enable	OFF	ON	OFF
4346	VDO water 105.2	Fail class	Alarm (1)	Trip MB (6)	Warning (2)

4350 VDO fuel 105.1

No.	Setting		Min. setting	Max. setting	Factory setting
4351	VDO fuel 105.1	Set point	0%	100%	10%
4352	VDO fuel 105.1	Delay	0.0 s	600.0 s	10.0 s
4353	VDO fuel 105.1	Relay output A	Not used	Option dependent	Not used
4354	VDO fuel 105.1	Relay output B	Not used		Not used
4355	VDO fuel 105.1	Enable	OFF	ON	OFF
4356	VDO fuel 105.1	Fail class	Alarm (1)	Trip MB (6)	Warning (2)

4360 VDO fuel 105.2

No.	Setting		Min. setting	Max. setting	Factory setting
4361	VDO fuel 105.2	Set point	0%	100%	10%
4362	VDO fuel 105.2	Delay	0.0 s	600.0 s	10.0 s
4363	VDO fuel 105.2	Relay output A	Not used	Option dependent	Not used
4364	VDO fuel 105.2	Relay output B	Not used		Not used
4365	VDO fuel 105.2	Enable	OFF	ON	OFF
4366	VDO fuel 105.2	Fail class	Alarm (1)	Trip MB (6)	Warning (2)

4370 W. fail 105

No.	Setting		Min. setting	Max. setting	Factory setting
4371	W. fail 105	Relay output A	Not used	Option dependent	Not used
4372	W. fail 105	Relay output B	Not used		Not used
4373	W. fail 105	Enable	OFF	ON	OFF
4374	W. fail 105	Fail class	Alarm (1)	Trip MB (6)	Warning (2)

Multi input no. 108

The available menus for multi input no. 108 depend on the input type configured in the PC utility software (menu 11000).

4380 4-20mA 108.1

No.	Setting		Min. setting	Max. setting	Factory setting
4381	4-20mA 108.1	Set point	4mA	20mA	10mA
4382	4-20mA 108.1	Delay	0.0 s	600.0 s	10.0 s
4383	4-20mA 108.1	Relay output A	Not used	Option dependent	Not used
4384	4-20mA 108.1	Relay output B	Not used		Not used
4385	4-20mA 108.1	Enable	OFF	ON	OFF
4386	4-20mA 108.1	Fail class	Alarm (1)	Trip MB (6)	Warning (2)

4390 4-20mA 108.2

No.	Setting		Min. setting	Max. setting	Factory setting
4391	4-20mA 108.2	Set point	4mA	20mA	10mA
4392	4-20mA 108.2	Delay	0.0 s	600.0 s	10.0 s
4393	4-20mA 108.2	Relay output A	Not used	Option dependent	Not used
4394	4-20mA 108.2	Relay output B	Not used		Not used
4395	4-20mA 108.2	Enable	OFF	ON	OFF
4396	4-20mA 108.2	Fail class	Alarm (1)	Trip MB (6)	Warning (2)

4400 V DC 108.1

No.	Setting		Min. setting	Max. setting	Factory setting
4401	V DC 108.1	Set point	0.0V DC	40.0V DC	20.0V DC
4402	V DC 108.1	Delay	0.0 s	600.0 s	10.0 s
4403	V DC 108.1	Relay output A	Not used	Option dependent	Not used
4404	V DC 108.1	Relay output B	Not used		Not used
4405	V DC 108.1	Enable	OFF	ON	OFF
4406	V DC 108.1	Fail class	Alarm (1)	Trip MB (6)	Warning (2)

4410 V DC 108.2

No.	Setting		Min. setting	Max. setting	Factory setting
4411	V DC 108.2	Set point	0.0V DC	40.0V DC	20.0V DC
4412	V DC 108.2	Delay	0.0 s	600.0 s	10.0 s
4413	V DC 108.2	Relay output A	Not used	Option dependent	Not used
4414	V DC 108.2	Relay output B	Not used		Not used
4415	V DC 108.2	Enable	OFF	ON	OFF
4416	V DC 108.2	Fail class	Alarm (1)	Trip MB (6)	Warning (2)

4420 PT 108.1

No.	Setting		Min. setting	Max. setting	Factory setting
4421	PT 108.1	Set point	-40	250	80
4422	PT 108.1	Delay	0.0 s	600.0 s	10.0 s
4423	PT 108.1	Relay output A	Not used	Option dependent	Not used
4424	PT 108.1	Relay output B	Not used		Not used
4425	PT 108.1	Enable	OFF	ON	OFF
4426	PT 108.1	Fail class	Alarm (1)	Trip MB (6)	Warning (2)

4430 PT 108.2

No.	Setting		Min. setting	Max. setting	Factory setting
4431	PT 108.2	Set point	-40	250	80
4432	PT 108.2	Delay	0.0 s	600.0 s	10.0 s
4433	PT 108.2	Relay output A	Not used	Option dependent	Not used
4434	PT 108.2	Relay output B	Not used		Not used
4435	PT 108.2	Enable	OFF	ON	OFF
4436	PT 108.2	Fail class	Alarm (1)	Trip MB (6)	Warning (2)

4440 VDO oil 108.1

No.	Setting		Min. setting	Max. setting	Factory setting
4441	VDO oil 108.1	Set point	0.0 bar	10.0 bar	4.0 bar
4442	VDO oil 108.1	Delay	0.0 s	600.0 s	10.0 s
4443	VDO oil 108.1	Relay output A	Not used	Option dependent	Not used
4444	VDO oil 108.1	Relay output B	Not used		Not used
4445	VDO oil 108.1	Enable	OFF	ON	OFF
4446	VDO oil 108.1	Fail class	Alarm (1)	Trip MB (6)	Warning (2)

4450 VDO oil 108.2

No.	Setting		Min. setting	Max. setting	Factory setting
4451	VDO oil 108.2	Set point	0.0 bar	10.0 bar	4.0 bar
4452	VDO oil 108.2	Delay	0.0 s	600.0 s	10.0 s
4453	VDO oil 108.2	Relay output A	Not used	Option dependent	Not used
4454	VDO oil 108.2	Relay output B	Not used		Not used
4455	VDO oil 108.2	Enable	OFF	ON	OFF
4456	VDO oil 108.2	Fail class	Alarm (1)	Trip MB (6)	Warning (2)

4460 VDO water 108.1

No.	Setting		Min. setting	Max. setting	Factory setting
4461	VDO water 108.1	Set point	40	150	100
4462	VDO water 108.1	Delay	0.0 s	600.0 s	10.0 s
4463	VDO water 108.1	Relay output A	Not used	Option dependent	Not used
4464	VDO water 108.1	Relay output B	Not used		Not used
4465	VDO water 108.1	Enable	OFF	ON	OFF
4466	VDO water 108.1	Fail class	Alarm (1)	Trip MB (6)	Warning (2)

4470 VDO water 108.2

No.	Setting		Min. setting	Max. setting	Factory setting
4471	VDO water 108.2	Set point	40	150	100
4472	VDO water 108.2	Delay	0.0 s	600.0 s	10.0 s
4473	VDO water 108.2	Relay output A	Not used	Option dependent	Not used
4474	VDO water 108.2	Relay output B	Not used		Not used
4475	VDO water 108.2	Enable	OFF	ON	OFF
4476	VDO water 108.2	Fail class	Alarm (1)	Trip MB (6)	Warning (2)

4480 VDO fuel 108.1

No.	Setting		Min. setting	Max. setting	Factory setting
4481	VDO fuel 108.1	Set point	0%	100%	10%
4482	VDO fuel 108.1	Delay	0.0 s	600.0 s	10.0 s
4483	VDO fuel 108.1	Relay output A	Not used	Option dependent	Not used
4484	VDO fuel 108.1	Relay output B	Not used		Not used
4485	VDO fuel 108.1	Enable	OFF	ON	OFF
4486	VDO fuel 108.1	Fail class	Alarm (1)	Trip MB (6)	Warning (2)

4490 VDO fuel 108.2

No.	Setting		Min. setting	Max. setting	Factory setting
4491	VDO fuel 108.2	Set point	0%	100%	10%
4492	VDO fuel 108.2	Delay	0.0 s	600.0 s	10.0 s
4493	VDO fuel 108.2	Relay output A	Not used	Option dependent	Not used
4494	VDO fuel 108.2	Relay output B	Not used		Not used
4495	VDO fuel 108.2	Enable	OFF	ON	OFF
4496	VDO fuel 108.2	Fail class	Alarm (1)	Trip MB (6)	Warning (2)

4500 W. fail 108

No.	Setting		Min. setting	Max. setting	Factory setting
4501	W. fail 108	Relay output A	Not used	Option dependent	Not used
4502	W. fail 108	Relay output B	Not used		Not used
4503	W. fail 108	Enable	OFF	ON	OFF
4504	W. fail 108	Fail class	Alarm (1)	Trip MB (6)	Warning (2)

4510 Overspeed 1

No.	Setting		Min. setting	Max. setting	Factory setting
4511	Overspeed 1	Set point	100%	150%	110%
4512	Overspeed 1	Delay	0.0 s	100.0 s	5.0 s
4513	Overspeed 1	Relay output A	Not used	Option dependent	Not used
4514	Overspeed 1	Relay output B	Not used		Not used
4515	Overspeed 1	Enable	OFF	ON	OFF
4516	Overspeed 1	Fail class	Alarm (1)	Trip MB (6)	Warning (2)

The set point in percent relates to nominal rpm.

4520 Overspeed 2

No.	Setting		Min. setting	Max. setting	Factory setting
4521	Overspeed 2	Set point	100%	150%	120%
4522	Overspeed 2	Delay	0.0 s	100.0 s	1.0 s
4523	Overspeed 2	Relay output A	Not used	Option dependent	Not used
4524	Overspeed 2	Relay output B	Not used		Not used
4525	Overspeed 2	Enable	OFF	ON	OFF
4526	Overspeed 2	Fail class	Alarm (1)	Trip MB (6)	Shutdown (5)

The set point in percent relates to nominal rpm.

4530 Crank failure

No.	Setting		Min. setting	Max. setting	Factory setting
4531	Crank failure	Set point	1 rpm	4000 rpm	50 rpm
4532	Crank failure	Delay	0.0 s	20.0 s	2.0 s
4533	Crank failure	Relay output A	Not used	Option dependent	Not used
4534	Crank failure	Relay output B	Not used		Not used
4535	Crank failure	Enable	OFF	ON	OFF
4536	Crank failure	Fail class	Alarm (1)	Trip MB (6)	Warning (2)

4540 Run feedb. fail

No.	Setting		Min. setting	Max. setting	Factory setting
4541	Run feedb. fail	Delay	0.0 s	20.0 s	2.0 s
4542	Run feedb. fail	Relay output A	Not used	Option dependent	Not used
4543	Run feedb. fail	Relay output B	Not used		Not used
4544	Run feedb. fail	Enable	OFF	ON	ON
4545	Run feedb. fail	Fail class	Alarm (1)	Trip MB (6)	Warning (2)

4550 MPU wire fail

No.	Setting		Min. setting	Max. setting	Factory setting
4551	MPU wire fail	Relay output A	Not used	Option dependent	Not used
4552	MPU wire fail	Relay output B	Not used		Not used
4553	MPU wire fail	Enable	OFF	ON	OFF
4554	MPU wire fail	Fail class	Alarm (1)	Trip MB (6)	Warning (2)

4560 Hz/V failure

No.	Setting		Min. setting	Max. setting	Factory setting
4561	Hz/V failure	Delay	1.0 s	99.0 s	30.0 s
4562	Hz/V failure	Relay output A	Not used	Option dependent	Not used
4563	Hz/V failure	Relay output B	Not used		Not used
4564	Hz/V failure	Enable	OFF	ON	ON
4565	Hz/V failure	Fail class	Alarm (1)	Trip MB (6)	Shutdown (5)

4570 Start failure

No.	Setting		Min. setting	Max. setting	Factory setting
4571	Start failure	Relay output A	Not used	Option dependent	Not used
4572	Start failure	Relay output B	Not used		Not used
4573	Start failure	Fail class	Alarm (1)	Trip MB (6)	Warning (2)

4580 Stop failure

No.	Setting		Min. setting	Max. setting	Factory setting
4581	Stop failure	Delay	10.0 s	120.0 s	30.0 s
4582	Stop failure	Relay output A	Not used	Option dependent	Not used
4583	Stop failure	Relay output B	Not used		Not used
4584	Stop failure	Enable	OFF	ON	ON
4585	Stop failure	Fail class	Alarm (1)	Trip MB (6)	Shutdown (5)

4960 U< aux. term. 1

No.	Setting		Min. setting	Max. setting	Factory setting
4961	U< aux. term. 1	Set point	8.0 V	32.0 V	18.0 V
4962	U< aux. term. 1	Delay	0.0 s	999.0 s	1.0 s
4963	U< aux. term. 1	Relay output A	Not used	Option dependent	Not used
4964	U< aux. term. 1	Relay output B	Not used		Not used
4965	U< aux. term. 1	Enable	OFF	ON	OFF
4966	U< aux. term. 1	Fail class	Alarm (1)	Trip MB (6)	Warning (2)

4970 U> aux. term. 1

No.	Setting		Min. setting	Max. setting	Factory setting
4971	U> aux. term. 1	Set point	12.0 V	36.0 V	30.0 V
4972	U> aux. term. 1	Delay	0.0 s	999.0 s	1.0 s
4973	U> aux. term. 1	Relay output A	Not used	Option dependent	Not used
4974	U> aux. term. 1	Relay output B	Not used		Not used
4975	U> aux. term. 1	Enable	OFF	ON	ON
4976	U> aux. term. 1	Fail class	Alarm (1)	Trip MB (6)	Warning (2)

4980 U< aux. term.98

No.	Setting		Min. setting	Max. setting	Factory setting
4981	U< aux. term.98	Set point	8.0 V	32.0 V	18.0 V
4982	U< aux. term.98	Delay	0.0 s	999.0 s	1.0 s
4983	U< aux. term.98	Relay output A	Not used	Option dependent	Not used
4984	U< aux. term.98	Relay output B	Not used		Not used
4985	U< aux. term.98	Enable	OFF	ON	ON
4986	U< aux. term.98	Fail class	Alarm (1)	Trip MB (6)	Warning (2)

4990 U> aux. term.98

No.	Setting		Min. setting	Max. setting	Factory setting
4991	U> aux. term.98	Set point	12.0 V	36.0 V	30.0 V
4992	U> aux. term.98	Delay	0.0 s	999.0 s	1.0 s
4993	U> aux. term.98	Relay output A	Not used	Option dependent	Not used
4994	U> aux. term.98	Relay output B	Not used		Not used
4995	U> aux. term.98	Enable	OFF	ON	ON
4996	U> aux. term.98	Fail class	Alarm (1)	Trip MB (6)	Warning (2)

Output setup

5000 Relay 05

No.	Setting		First/min. setting	Second/max. setting	Third setting	Factory setting
5001	Relay 05	Function	Alarm	Limit	Horn	Horn
5002	Relay 05	OFF delay	0.0 s	999.9 s	-	5.0 s

5010 Relay 08

No.	Setting		First/min. setting	Second/max. setting	Third setting	Factory setting
5011	Relay 08	Function	Alarm	Limit	Horn	Alarm
5012	Relay 08	OFF delay	0.0 s	999.9 s	-	5.0 s

5020 Relay 11

No.	Setting		First/min. setting	Second/max. setting	Third setting	Factory setting
5021	Relay 11	Function	Alarm	Limit	Horn	Alarm
5022	Relay 11	OFF delay	0.0 s	999.9 s	-	5.0 s

5050 Relay 20

No.	Setting		First/min. setting	Second/max. setting	Third setting	Factory setting
5051	Relay 20	Function	Alarm	Limit	Horn	Alarm
5052	Relay 20	OFF delay	0.0 s	999.9 s	-	5.0 s

Menu 5050 is only available when menu 5271 is set to 'Relay'.

5060 Relay 21

No.	Setting		First/min. setting	Second/max. setting	Third setting	Factory setting
5061	Relay 21	Function	Alarm	Limit	Horn	Alarm
5062	Relay 21	OFF delay	0.0 s	999.9 s	-	5.0 s

Menu 5060 is only available when menu 5272 is set to 'Relay'.

5150 Relay 65

No.	Setting		First/min. setting	Second/max. setting	Third setting	Factory setting
5151	Relay 65	Function	Alarm	Limit	Horn	Alarm
5152	Relay 65	OFF delay	0.0 s	999.9 s	-	5.0 s

5160 Relay 67

No.	Setting		First/min. setting	Second/max. setting	Third setting	Factory setting
5161	Relay 67	Function	Alarm	Limit	Horn	Alarm
5162	Relay 67	OFF delay	0.0 s	999.9 s	-	5.0 s

Relays 65 and 67 are normally used for governor up/down commands (menu 2600) and therefore these menus are not available as default.

5170 Relay 69

No.	Setting		First/min. setting	Second/max. setting	Third setting	Factory setting
5171	Relay 69	Function	Alarm	Limit	Horn	Alarm
5172	Relay 69	OFF delay	0.0 s	999.9 s	-	5.0 s

5180 Relay 71

No.	Setting		First/min. setting	Second/max. setting	Third setting	Factory setting
5181	Relay 71	Function	Alarm	Limit	Horn	Alarm
5182	Relay 71	OFF delay	0.0 s	999.9 s	-	5.0 s

5270 Trans. setup

The transistor outputs on terminals 21 and 22 can be configured as relay outputs or pulse signals. If 'Relay' is selected, the relays 20 and 21 will be available.

No.	Setting		Min. setting	Max. setting	Factory setting
5271	Transistor 20	T20	Relay	kWh	kWh
5272	Transistor 21	T21	Relay	kVAr	kVArh

If the transistor outputs are set to 'Relay', 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

6000 Nom. settings

No.	Setting		Min. setting	Max. setting	Factory setting
6001	Nom. settings	Frequency	48.0Hz	62.0Hz	50.0Hz
6002	Nom. settings	Power	10kW	20000kW	480kW
6003	Nom. settings	Current	0A	9000A	867A
6004	Nom. settings	Voltage	100V	25000V	400V
6005	Nom. settings	Rpm	100 rpm	4000 rpm	1500 rpm
6006	Nom. settings	Set	1	4	1

6010 Nom. settings 2

No.	Setting		Min. setting	Max. setting	Factory setting
6011	Nom. settings 2	Frequency	48.0Hz	62.0Hz	50.0Hz
6012	Nom. settings 2	Power	10kW	20000kW	230kW
6013	Nom. settings 2	Current	0A	9000A	345A
6014	Nom. settings 2	Voltage	100V	25000V	480V
6015	Nom. settings 2	Rpm	100 rpm	4000 rpm	1500 rpm

6020 Nom. settings 3

No.	Setting		Min. setting	Max. setting	Factory setting
6021	Nom. settings 3	Frequency	48.0Hz	62.0Hz	60.0Hz
6022	Nom. settings 3	Power	10kW	20000kW	230kW
6023	Nom. settings 3	Current	0A	9000A	345A
6024	Nom. settings 3	Voltage	100V	25000V	480V
6025	Nom. settings 3	Rpm	100 rpm	4000 rpm	1800 rpm

6030 Nom. settings 4

No.	Setting		Min. setting	Max. setting	Factory setting
6031	Nom. settings 4	Frequency	48.0Hz	62.0Hz	60.0Hz
6032	Nom. settings 4	Power	10kW	20000kW	230kW
6033	Nom. settings 4	Current	0A	9000A	345A
6034	Nom. settings 4	Voltage	100V	25000V	480V
6035	Nom. settings 4	Rpm	100 rpm	4000 rpm	1800 rpm

6040 G transformer

No.	Setting		Min. setting	Max. setting	Factory setting
6041	G transformer	U primary	100V	25000V	400V
6042	G transformer	U secondary	100V	690V	400V
6043	G transformer	I primary	5A	9000A	1000A
6044	G transformer	I secondary	1A	5A	5A

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

6050 BB settings

No.	Setting		Min. setting	Max. setting	Factory setting
6051	BB settings	U primary	100V	25000V	400V
6052	BB settings	U secondary	100V	690V	400V

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

6070 Gen-set mode

No.	Setting		Setting	Factory setting
6071	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	-

6080 Language

No.	Setting		Setting	Factory setting
6081	Language	English	English	English
	Language		Language 1-11	-

6090 Date and time (internal clock)

No.	Setting		Min. setting	Max. setting	Factory setting
6091	Date and time	Year	2001	2100	Depending on the software version
6092	Date and time	Month	1	12	
6093	Date and time	Day	1	31	
6094	Date and time	Weekday	1	7	
6095	Date and time	Hour	0	23	
6096	Date and time	Minute	0	59	

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

6100 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 'kWh' resets the value of the produced kWh.

No.	Setting		Min. setting	Max. setting	Factory setting
6101	Counters	Running, hours	0 hrs	999 hrs	0 hrs
6102	Counters	Running, th. hours	0 th. hrs	99 th. hrs	0 th. hrs
6103	Counters	GB operations	0	20000	0
6104	Counters	MB operations	0	20000	0
6105	Counters	kWh	OFF	ON	OFF
6106	Counters	Start attempts	0	20000	0

6110 Service timer 1

No.	Setting		Min. setting	Max. setting	Factory setting
6111	Service timer 1	Enable	OFF	ON	ON
6112	Service timer 1	Running hours	0 hrs	9000 hrs	500 hrs
6113	Service timer 1	Days	1 days	1000 days	365 days
6114	Service timer 1	Fail class	Alarm (1)	Trip MB (6)	Warning (2)
6115	Service timer 1	Relay output A	Not used	Option dependent	Not used
6116	Service timer 1	Reset	OFF	ON	OFF

The timer is reset by enabling menu 6116. The menu goes OFF automatically.

6120 Service timer 2

No.	Setting		Min. setting	Max. setting	Factory setting
6121	Service timer 2	Enable	OFF	ON	ON
6122	Service timer 2	Running hours	0 hrs	9000 hrs	500 hrs
6123	Service timer 2	Days	1 days	1000 days	365 days
6124	Service timer 2	Fail class	Alarm (1)	Trip MB (6)	Warning (2)
6125	Service timer 2	Relay output A	Not used	Option dependent	Not used
6126	Service timer 2	Reset	OFF	ON	OFF

The timer is reset by enabling menu 6126. The menu goes OFF automatically.

6130 Alarm horn

No.	Setting		Min. setting	Max. setting	Factory setting
6131	Alarm horn	ON time	0.0 s	990.0 s	20.0 s

If the setting is adjusted to 0 s, the horn relay will be activated continuously until the alarm is acknowledged.

6160 Run status

No.	Setting		Min. setting	Max. setting	Factory setting
6161	Run status	Delay	0.0 s	300.0 s	5.0 s
6162	Run status	Relay output A	Not used	Option dependent	Not used
6163	Run status	Relay output B	Not used		Not used
6164	Run status	Enable	OFF	ON	OFF

6170 Running detect.

No.	Setting		Min. setting	Max. setting	Factory setting
6171	Number of teeth	Teeth	0 teeth	500 teeth	0 teeth
6172	Run detect type	Type	Binary input		
			MPU input		
			Frequency		X
			Engine communication		
6173	Running detect.	Running rpm	0 rpm	4000 rpm	1000 rpm
6174	Remove starter	Remove starter	1 rpm	2000 rpm	400 rpm

When menu 6171 'Teeth' is set to 0, the MPU input is not active.

6180 Starter

No.	Setting		Min. setting	Max. setting	Factory setting
6181	Starter	Start prepare	0.0 s	600.0 s	5.0 s
6182	Starter	Ext. prepare	0.0 s	600.0 s	0.0 s
6183	Starter	Start ON time	1.0 s	30.0 s	5.0 s
6184	Starter	Start OFF time	1.0 s	99.0 s	5.0 s

6190 Start attempts

No.	Setting		Min. setting	Max. setting	Factory setting
6191	Start attempts	Set point	1	10	3

6210 STOP

No.	Setting		Min. setting	Max. setting	Factory setting
6211	STOP	Cooling down	0.0 s	990.0 s	240.0 s
6212	STOP	Extended stop	1.0 s	99.0 s	5.0 s

6220 Hz/V OK

No.	Setting		Min. setting	Max. setting	Factory setting
6221	Hz/V OK	Delay	1.0 s	99.0 s	5.0 s

6230 GB control

No.	Setting		Min. setting	Max. setting	Factory setting
6231	GB control	Close delay t_{GBC}	0.0 s	30.0 s	2.0 s
6232	GB control	Load time	0.0 s	30.0 s	0.0 s

6260 Power derate

No.	Setting		Min. setting	Max. setting	Factory setting
6261	Power derate	Input	Multi input 102		X
			Multi input 105		
			Multi input 108		
			M-logic		
			EIC		
6262	Power derate	Start derate	0	20000	16 units
6263	Power derate	Derate slope	0.1%/U	100.0%/U	5.0%/U
6264	Power derate	Proportional	OFF	ON	OFF
6265	Power derate	Enable	OFF	ON	OFF
6266	Power derate	Derate limit	0.0%	100.0%	80.0%

6270 Stop coil wire fail

No.	Setting		Min. setting	Max. setting	Factory setting
6271	Stop coil w. fail	Relay output A	Not used	Option dependent	Not used
6272	Stop coil w. fail	Relay output B	Not used		Not used
6273	Stop coil w. fail	Enable	OFF	ON	OFF
6274	Stop coil w. fail	Fail class	Alarm (1)	Trip MB (6)	Warning (2)

6280 Int. comm. fail

No.	Setting		Min. setting	Max. setting	Factory setting
6281	Int. comm. fail	Relay output A	Not used	Option dependent	Not used
6282	Int. comm. fail	Relay output B	Not used		Not used
6283	Int. comm. fail	Enable	OFF	ON	ON
6284	Int. comm. fail	Fail class	Alarm (1)	Trip MB (6)	Warning (2)

6290 Idle running

No.	Setting		Min. setting	Max. setting	Factory setting
6291	Idle running	Start timer	0.0 min	999.9 min	300.0 min
6292	Idle running	Enable start timer	OFF	ON	OFF
6293	Idle running	Stop timer	0.0 min	999.9 min	300.0 min
6294	Idle running	Enable stop timer	OFF	ON	OFF
6295	Idle running	Idle relay output	Not used	Option dependent	Not used
6296	Idle running	Enable	OFF	ON	OFF

6320 Engine heater

No.	Setting		Min. setting	Max. setting	Factory setting
6321	Engine heater	Set point	20 deg.	250 deg.	40 deg.
6322	Engine heater	Relay output	Not used	Option dependent	Not used
6323	Engine heater	Input type	Multi input 102		X
			Multi input 105		
			Multi input 108		
			EIC		
6324	Engine heater	Hysteresis	1 deg.	70 deg.	3 deg.
6325	Engine heater	Enable	OFF	ON	OFF

6330 Engine heater 1

No.	Setting		Min. setting	Max. setting	Factory setting
6331	Engine heater 1	Set point	10 deg.	250 deg.	30 deg.
6332	Engine heater 1	Delay	1.0 s	300.0 s	10.0 s
6333	Engine heater 1	Relay output A	Not used	Option dependent	Not used
6334	Engine heater 1	Relay output B	Not used		Not used
6335	Engine heater 1	Enable	OFF	ON	OFF
6336	Engine heater 1	Fail class	Alarm (1)	Trip MB (6)	Warning (2)

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	1 s	999 s	20 s
6404	Master clock	Set point	0.1Hz	1.0Hz	0.1Hz
6405	Master clock	Enable	OFF	ON	OFF

6410 Battery test

No.	Setting		Min. setting	Max. setting	Factory setting
6411	Battery test	Set point	8.0V DC	32.0V DC	18.0V DC
6412	Battery test	Delay	1 s	300 s	20 s
6413	Battery test	Input type	Power supply		X
			Multi input 102		
			Multi input 105		
			Multi input 108		
6414	Battery test	Relay output A	Not used	Option dependent	Not used
6415	Battery test	Enable	OFF	ON	OFF
6416	Battery test	Fail class	Alarm (1)	Trip MB (6)	Warning (2)

6420 Auto batt. test

No.	Setting		Min. setting	Max. setting	Factory setting
6421	Auto batt. test	Enable	OFF	ON	OFF
6422	Auto batt. test	Day	Monday (1)	Sunday (7)	Monday (1)
6423	Auto batt. test	Hours	0 h	23 h	10 h
6424	Auto batt. test	Week	1	52	52
6425	Auto batt. test	Relay output	Start relay	Option dependent	Start relay

6430 Batt. asymmetry

No.	Setting		Min. setting	Max. setting	Factory setting
6431	Batt. asymmetry	Input type 1	Power supply (1)	Multi input 108 (4)	Multi input 105 (3)
6432	Batt. asymmetry	Reference 1	Power supply (1)	Multi input 108 (4)	Power supply (1)
6434	Batt. asymmetry	Input type 2	Power supply (1)	Multi input 108 (4)	Multi input 108 (4)
6435	Batt. asymmetry	Reference 2	Power supply (1)	Multi input 108 (4)	Multi input 102 (2)

6440 Battery asym. 1

No.	Setting		Min. setting	Max. setting	Factory setting
6441	Battery asym. 1	Set point	0.1V	15.0V	1.0V
6442	Battery asym. 1	Delay	0.0 s	10.0 s	1.0 s
6443	Battery asym. 1	Relay output A	Not used	Option dependent	Not used
6444	Battery asym. 1	Relay output B	Not used		Not used
6445	Battery asym. 1	Enable	OFF	ON	ON

6450 Battery asym. 2

No.	Setting		Min. setting	Max. setting	Factory setting
6451	Battery asym. 2	Set point	0.1V	15.0V	1.0V
6452	Battery asym. 2	Delay	0.0 s	10.0 s	1.0 s
6453	Battery asym. 2	Relay output A	Not used	Option dependent	Not used
6454	Battery asym. 2	Relay output B	Not used		Not used
6455	Battery asym. 2	Enable	OFF	ON	ON

6460 Max. ventilation

No.	Setting		Min. setting	Max. setting	Factory setting
6461	Max. ventilation	Set point	20 deg.	250 deg.	90 deg.
6462	Max. ventilation	Relay output A	Not used	Option dependent	Not used
6463	Max. ventilation	Hysteresis	1 deg.	70 deg.	5 deg.
6464	Max. ventilation	Enable	OFF	ON	OFF

6470 Max. vent. 1

No.	Setting		Min. setting	Max. setting	Factory setting
6471	Max. vent. 1	Set point	20 deg.	250 deg.	95 deg.
6472	Max. vent. 1	Delay	0.0 s	60.0 s	1.0 s
6473	Max. vent. 1	Relay output A	Not used	Option dependent	Not used
6474	Max. vent. 1	Relay output B	Not used		Not used
6475	Max. vent. 1	Enable	OFF	ON	OFF
6476	Max. vent. 1	Fail class	Alarm (1)	Trip MB (6)	Warning (2)

6480 Max. vent. 2

No.	Setting		Min. setting	Max. setting	Factory setting
6481	Max. vent. 2	Set point	20 deg.	250 deg.	98 deg.
6482	Max. vent. 2	Delay	0.0 s	60.0 s	1.0 s
6483	Max. vent. 2	Relay output A	Not used	Option dependent	Not used
6484	Max. vent. 2	Relay output B	Not used		Not used
6485	Max. vent. 2	Enable	OFF	ON	OFF
6486	Max. vent. 2	Fail class	Alarm (1)	Trip MB (6)	Shutdown (5)

6490 Sum/Win time

No.	Setting		Min. setting	Max. setting	Factory setting
6491	Sum/Win time	Enable	OFF	ON	OFF

6500 Blk. swbd error

No.	Setting		Min. setting	Max. setting	Factory setting
6501	Blk. swbd error	Delay	0.0 s	999.0 s	10.0 s
6502	Blk. swbd error	Parallel	OFF	ON	OFF
6503	Blk. swbd error	Relay output A	Not used	Option dependent	Not used
6504	Blk. swbd error	Relay output B	Not used		Not used
6505	Blk. swbd error	Enable	OFF	ON	OFF
6506	Blk. swbd error	Fail class	Alarm (1)	Trip MB (6)	Warning (2)

6510 Stp. swbd error

No.	Setting		Min. setting	Max. setting	Factory setting
6511	Stp. swbd error	Delay	0.0 s	999.0 s	1.0 s
6512	Stp. swbd error	Relay output A	Not used	Option dependent	Not used
6513	Stp. swbd error	Relay output B	Not used		Not used
6514	Stp. swbd error	Enable	OFF	ON	OFF
6515	Stp. swbd error	Fail class	Alarm (1)	Trip MB (6)	Shutdown (5)

6540 Not in auto

No.	Setting		Min. setting	Max. setting	Factory setting
6541	Not in auto	Delay	10.0 s	900.0 s	300.0 s
6542	Not in auto	Relay output A	Not used	Option dependent	Not used
6543	Not in auto	Relay output B	Not used		Not used
6544	Not in auto	Enable	OFF	ON	OFF
6545	Not in auto	Fail class	Alarm (1)	Trip MB (6)	Warning (2)

6550 Fuel pump logic

No.	Setting		Min. setting	Max. setting	Factory setting
6551	Fuel pump logic	Set point 1	0%	100%	20%
6552	Fuel pump logic	Set point 2	0%	100%	80%
6553	Fuel pump logic	Delay	0.1 s	300.0 s	60.0 s
6554	Fuel pump logic	Relay output A	Not used	Option dependent	Not used
6555	Fuel pump logic	Input type	Multi input 102		X
			Multi input 105		
			Multi input 108		
6556	Fuel pump logic	Fail class	Alarm (1)	Trip MB (6)	Warning (2)

Mains setup

7000 Mains power

No.	Setting		Min. setting	Max. setting	Factory setting
7001	Mains power	Day	-20000kW	20000kW	750kW
7002	Mains power	Night	-20000kW	20000kW	1000kW
7003	Mains power	Transducer max.	0kW	20000kW	1500kW
7004	Mains power	Transducer min.	-20000kW	0kW	-1500kW

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

7010 Daytime period

No.	Setting		Min. setting	Max. setting	Factory setting
7011	Daytime period	Start hour	0 h	23 h	8 h
7012	Daytime period	Start minute	0 min	59 min	0 min
7013	Daytime period	Stop hour	0 h	23 h	16 h
7014	Daytime period	Stop minute	0 min	59 min	0 min

The period outside the daytime period is defined as the night time period.

7020 Start generator

No.	Setting		Min. setting	Max. setting	Factory setting
7021	Start generator	Set point	5%	100%	80%
7022	Start generator	Delay	0.0 s	990.0 s	10.0 s
7023	Start generator	Minimum load	0%	100%	5%

The set point refers to the mains power set points in menu 7000 Mains power.

7030 Stop generator

No.	Setting		Min. setting	Max. setting	Factory setting
7031	Stop generator	Set point	0%	80%	60%
7032	Stop generator	Delay	0.0 s	990.0 s	30.0 s

The set point refers to the mains power set points in menu 7000 Mains power.

7040 Test

No.	Setting		Min. setting	Max. setting	Factory setting
7041	Test	Set point	1%	100%	80%
7042	Test	Test time	0.5 min	999.0 min	5.0 min
7043	Test	Return mode	Semi-auto	Auto	Auto
7044	Test	Test type	Simple		X
			Load		
			Full		

7050 Fixed power set

No.	Setting		Min. setting	Max. setting	Factory setting
7051	Fixed power set	Power set point	0%	100%	100%

7060 U mains failure

No.	Setting		Min. setting	Max. setting	Factory setting
7061	U mains failure	Fail. delay	1.0 s	990.0 s	5.0 s
7062	U mains failure	Mains OK delay	10 s	9900 s	60 s
7063	U mains failure	U<	80%	100%	90%
7064	U mains failure	U>	100%	120%	110%
7065	U mains failure	Mains fail. control	Start eng. + open MB	Start eng.	Start eng. + open MB
7066	U mains failure	Unbalance U	2%	100%	100%

Set points 7063 and 7064 relate to the nominal setting.

Set point 7066 relates to the mean value of the measured voltage.

7070 f mains failure

No.	Setting		Min. setting	Max. setting	Factory setting
7071	f mains failure	Fail. delay	1.0 s	990.0 s	5.0 s
7072	f mains failure	Mains OK delay	10 s	9900 s	60 s
7073	f mains failure	f<	80.0%	100.0%	95.0%
7074	f mains failure	f>	100.0%	120.0%	105.0%

Set points 7073 and 7074 relate to the nominal setting.

7080 MB control

No.	Setting		Min. setting	Max. setting	Factory setting
7081	MB control	Mode shift	OFF	ON	OFF
7082	MB control	MB close delay t_{MBC}	0.0 s	30.0 s	0.5 s
7083	MB control	Back sync.	OFF	ON	OFF
7084	MB control	Sync. to mains	OFF	ON	ON
7085	MB control	Breaker type	MB	No breaker	MB
7086	MB control	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-H7 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 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.

9070 M4 SW version

Information about the software version in the engine I/F PCB placed in slot #8.

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	Timers	Shows remaining alarm delay time
9122	Service menu	Digital inputs	Shows digital input status
9123	Service menu	Digital outputs	Shows digital output status
9124	Service menu	Miscellaneous	Shows miscellaneous information

9130 AC config.

This menu is used to choose between the different AC measurement systems.

No.	Setting	Description
9131	AC config.	3 phase L1L2L3 (1)
		2 phase L1L3 (2)
		2 phase L1L2 (3)
		1 phase L1 (4)

Password level for this menu is Master.

9140 Angle comp. BB/G

No.	Setting		Min. setting	Max. setting	Factory setting
9140	Angle comp. BB/G	Degrees	-45.0	+45.0	0.0

Password level for this menu is Master.

If the transformer has an angle displacement then synchronising can ONLY be used with Yy1, Dy1, Yd1, Yy11, Dy11 and Yd11 transformers. (+/-30 deg. phase shift).

The factory setting is 0 degrees and it has to remain at that value except when one of the six mentioned transformers is installed between the generator and the mains/busbar measurements.

Any error in this setting will cause a false closing of the breaker! Therefore it is *essential* to make a check of the angular precision before allowing the AGC to perform a real breaker closing.

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