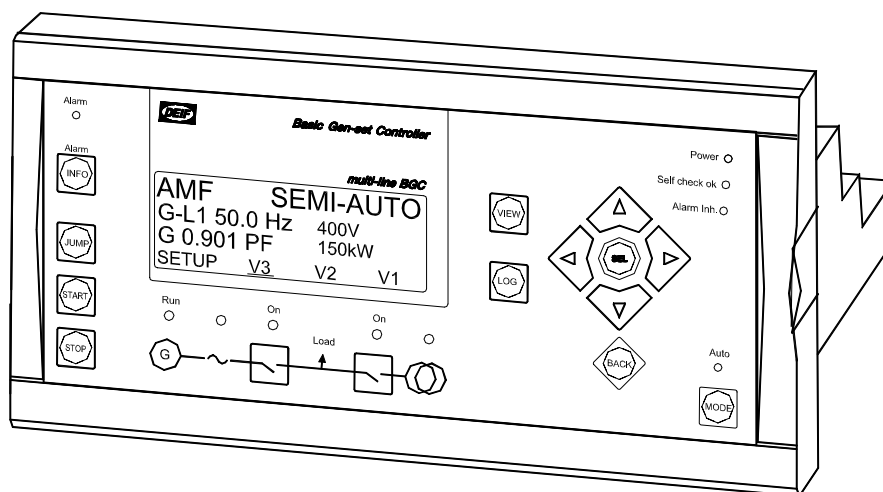


Basic Gen-set Controller

4189340298F

SW version 2.1X.X



- *Functional descriptions*
- *Display unit and menu structure*
- *Procedure for parameter setup*
- *Parameter lists*

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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 basic gen-set controller, the BGC. The document mainly includes functional descriptions, presentation of display unit and menu structure, 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 BGC 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.

Intended users

The handbook is mainly intended for the person responsible for the parameter setup of the BGC unit. 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 eight 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 eight 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 a note symbol, which will be used throughout the handbook.

General product information

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

Functional descriptions

This chapter will include functional descriptions of the standard functions of the BGC as well as illustrations of the application types relevant to the BGC. 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 will be illustrated.

Additional functions

This chapter describes the additional functions of the BGC.

Procedure for parameter setup

The seventh chapter deals with the procedure to be followed, when the parameters of the BGC 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

The eighth 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, 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 BGC unit, the company responsible for the installation or the operation of the set must be contacted.

The BGC units are not to be opened by unauthorized 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 BGC unit implies work with dangerous currents and voltages. Therefore, the installation of the BGC should only be carried out by authorized personnel who understand the risks involved in the working with live electrical equipment.

Notes

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



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3. General product information

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

Introduction

The BGC is a 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 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 concept of the BGC is to offer a cost-effective solution to gen-set builders who need a simple generator protection and control unit. Being a part of the multi-line product family the standard functions of the BGC can be supplemented with a variety of optional functions.

Type of product

The BGC is a micro-processor based control unit containing all necessary functions for protection of a gen-set and of mains and generator breaker control.

The BGC contains all necessary 3-phase measuring circuits and presents all values and alarms on the LCD display. The design of the BGC allows it to be built directly into the engine side panel of the switchboard door.

4. Functional descriptions

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

Standard functions

In the following chapters the standard functions of the BGC are listed.

AMF

- Engine start up (at a mains failure)
- Switching between mains and generator breaker
- Automatic switching from generator to mains when the mains restores

Island operation

- Semi-automatic control of the gen-set
- Semi-automatic control of the breakers

Time dependent start/stop

- Automatic gen-set and breaker control
- 8 different start/stop commands

Engine control

- Start preparation
- Start/stop sequences
- Fuel solenoid selection (coil type)

Protections

- Overcurrent, 2 levels
- Reverse power
- 3 configurable VDO inputs
- Configurable binary inputs:
 - Circuit breakers used: 5 binary inputs
 - Contactors used: 7 binary inputs

Generator and mains breaker

- Contactor (breaker close signal is a constant signal)
- Circuit breaker (breaker close signal is a 400 ms pulse)



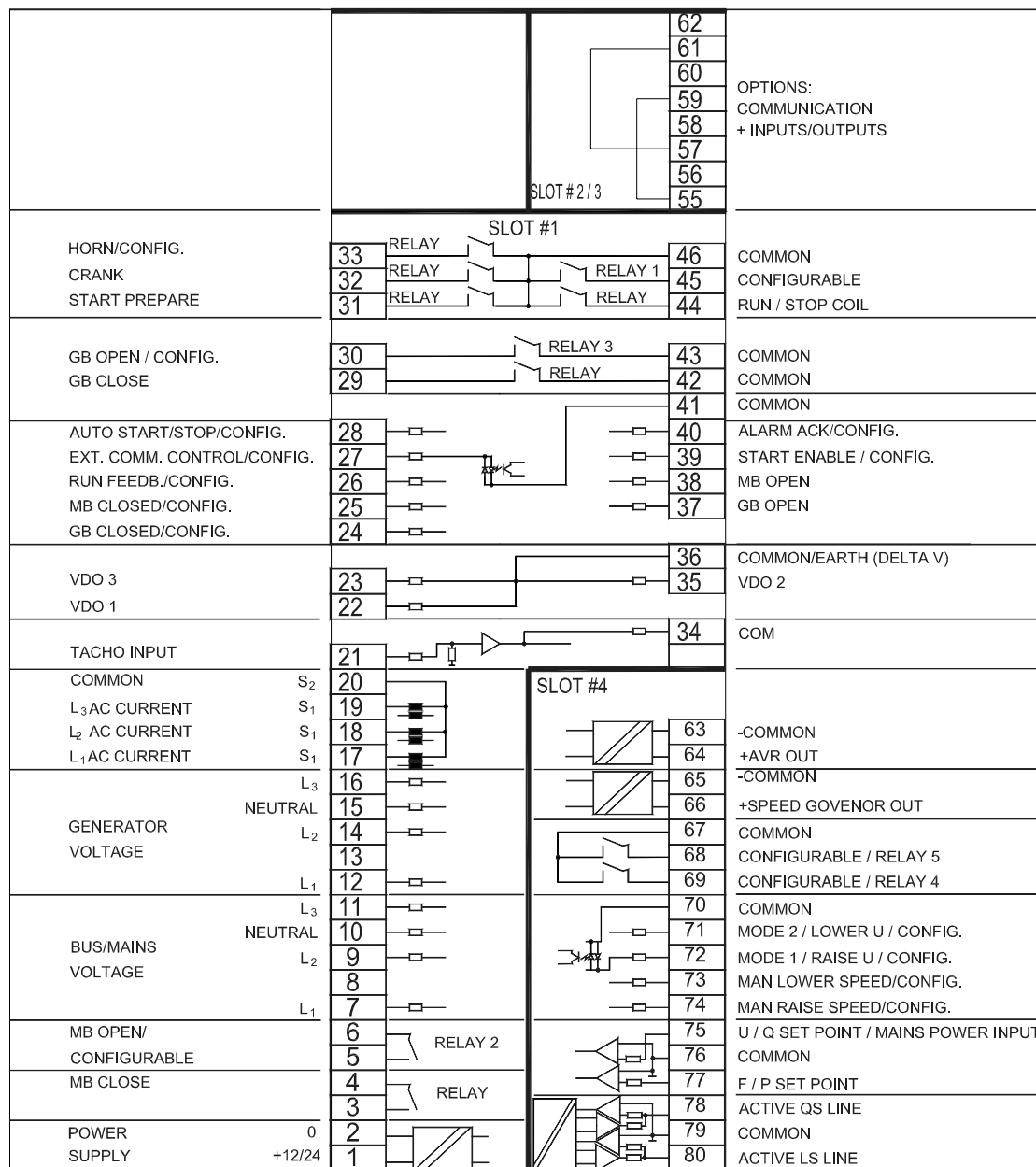
Note that the five configurable digital inputs can be used as protection inputs or as function inputs.

Terminal strip overview

The terminal strip overview below illustrates slots #1, #2, #3 and #4.



Slots #2 and #3 are not complete in the illustration since they are option dependent. For detailed information about the use of slots #2 and #3 for specific options, see next page.



The terminal 36 must be connected depending on the hardware type of the BGC.



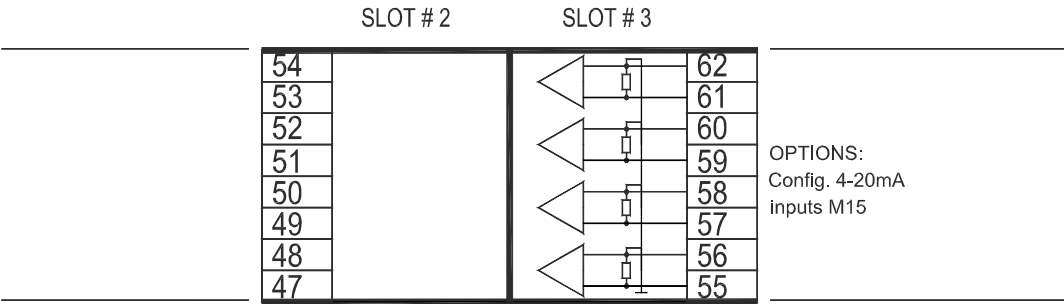
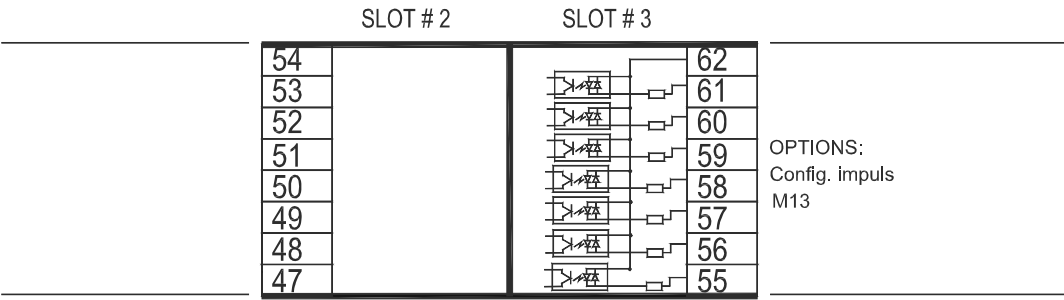
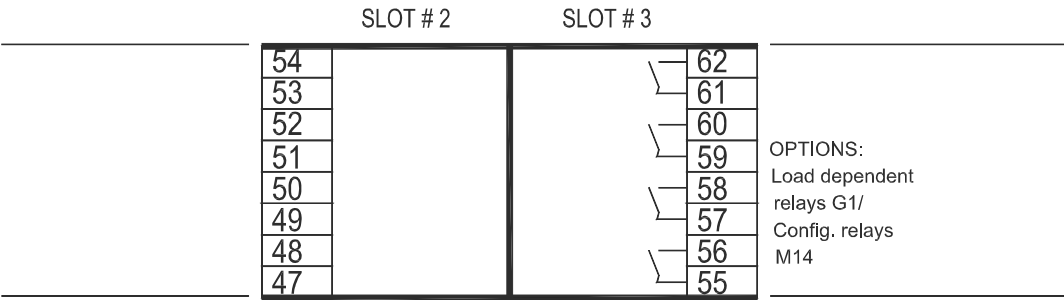
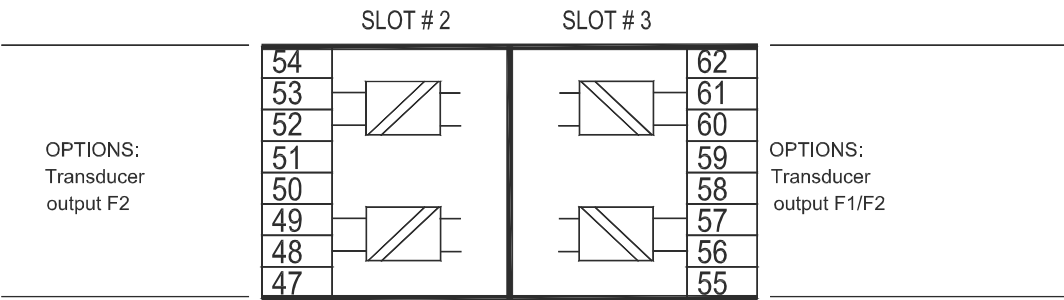
MKII: Terminal 36 should not be connected to earth (Delta V cannot be selected).
MKIII: Terminal 36 must be connected to earth, if the Delta V measuring principle is selected in menu 4950.

Identify the hardware type of the BGC (MKII or MKIII) on the type label which is located on the side of the BGC.



Note that relays 4-9 are described in the documents for the relevant options (Description of Options).

Below the terminal strips of slots #2 and #3 are illustrated. As indicated these slots are used for the options.



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 BGC 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)	Requires option G2
Island operation	Standard
Multiple gen-sets, load sharing	Requires option G3
Fixed power to mains	Requires option G2
Peak shaving	Requires option G2
Load take over	Requires option G2

Gen-set mode	Running mode			
	Semi	Auto	Test	Man (option)
AMF (no back sync)	X	X	X	X
AMF (with back sync)	X	X	X	X
Island operation	X	X	X	X
Multiple gen-sets, load sharing	X	X	X	X
Fixed power to mains	X	X	X	X
Peak shaving	X	X	X	X
Load take over	X	X	X	X



See Mode overview in chapter 5.

AMF (no back sync.)

Auto mode description:

In auto mode the BGC automatically starts the gen-set and switches to generator supply at a mains failure. It is possible to adjust the BGC to change to gen-set operation in two different ways. Either the mains breaker will be opened at gen-set start-up, or it will remain closed until the gen-set is running and the gen-set voltage and frequency is OK. In both cases, the mains breaker will be closed, when the generator voltage and frequency is OK.

When the mains returns, the BGC will switch back to mains supply. The switching back to mains supply is done without back synchronisation when the adjusted 'mains OK delay' has expired.

Semi-auto mode description:

In semi-auto mode the BGC can be operated from the display via the push-buttons. It is possible to start and stop the gen-set, and it is possible to open and close the mains and generator breakers. The normally used push-buttons can be used.

Test mode description:

See page 36.

Manual mode description:

In manual mode the digital inputs for speed up/down and voltage up/down can be used. These inputs can *only* be used in manual mode. It is possible to start and stop the gen-set, and it is possible to open and close the mains and generator breakers. The normally used push-buttons can be used.

AMF (with back sync.)

Auto mode description:

In auto mode the BGC automatically starts the gen-set and switches to generator supply at a mains failure. It is possible to adjust the BGC to change to gen-set operation in two different ways. Either the mains breaker will be opened at gen-set start-up, or it will remain closed until the gen-set is running and the gen-set voltage and frequency is OK. In both cases, the mains breaker will be closed, when the generator voltage and frequency is OK.

At the mains return, the BGC will synchronise the mains breaker to the busbar, when the 'mains OK delay' expires. The gen-set then cools down and stops.

Semi-auto mode description:

In semi-auto mode the BGC can be operated from the display via the push-buttons. It is possible to start and stop the gen-set, and it is possible to open and close the mains and generator breakers. The normally used push-buttons can be used.

Test mode description:

See page 36.

Manual mode description:

In manual mode the digital inputs for speed up/down and voltage up/down can be used. These inputs can *only* be used in manual mode. It is possible to start and stop the gen-set, and it is possible to open and close the mains and generator breakers. The normally used push-buttons can be used.

Island operation

Auto mode description:

In auto mode the BGC automatically starts the gen-set and switches to generator supply at a start command. At a stop command it goes to mains supply and stops the gen-set. The start and stop commands are applied by activating and deactivating a digital input. The auto mode is also used, if the *time dependent start/stop* commands are to be used. In this case, the digital start/stop input cannot be used.

Semi-auto mode description

In semi-auto mode the BGC can be operated from the display via the push-buttons. It is possible to start and stop the gen-set, and it is possible to open and close the mains and generator breakers. The normally used push-buttons can be used.

Test mode description:

See page 36.

Manual mode description:

In manual mode the digital inputs for speed up/down and voltage up/down can be used. These inputs can *only* be used in manual mode. It is possible to start and stop the gen-set, and it is possible to open and close the mains and generator breakers. The normally used push-buttons can be used.

Island operation (load sharing)

Auto mode description:

In auto mode the BGC automatically starts the gen-set and switches to generator supply at a start command. At a stop command it goes to mains supply and stops the gen-set. The start and stop commands are applied by activating and deactivating a digital input. The auto mode is also used, if the *time dependent start/stop* commands are to be used. In this case, the digital start/stop input cannot be used.

Semi-auto mode description

In semi-auto mode the BGC can be operated from the display via the push-buttons. It is possible to start and stop the gen-set, and it is possible to open and close the mains and generator breakers. The normally used push-buttons can be used.

Test mode description:

See page 36.

Manual mode description:

In manual mode the digital inputs for speed up/down and voltage up/down can be used. These inputs can *only* be used in manual mode. It is possible to start and stop the gen-set, and it is possible to open and close the mains and generator breakers. The normally used push-buttons can be used.

Fixed power to mains

Auto mode description:

In auto mode the BGC automatically starts the gen-set and synchronises to the mains. After the generator breaker closure the BGC ramps up the load to the set point level. The start and stop commands are applied by activating and deactivating a digital input. The auto mode is also used, if the *time dependent start/stop* commands are to be used. In this case, the digital start/stop input cannot be used.

Semi-auto mode description

In semi-auto mode the BGC can be operated from the display via the push-buttons. It is possible to start and stop the gen-set, and it is possible to open and close the mains and generator breakers. The normally used push-buttons can be used.

Test mode description

See page 36.

Manual mode description:

In manual mode the digital inputs for speed up/down and voltage up/down can be used. These inputs can *only* be used in manual mode. It is possible to start and stop the gen-set, and it is possible to open and close the mains and generator breakers. The normally used push-buttons can be used.

Peak shaving

Auto mode description:

The gen-set will start at a predefined mains import and supply the load above the max. mains import set point. When the load drops below the max. mains import set point, the gen-set will run at a minimum load, e.g 10%. When the mains import decreases below the stop set point, the gen-set cools down and stops.

Semi automatic mode description:

The gen-set will supply the load above the mains import set point, but the automatic start/stop of the gen-set is not active. The gen-set must be started and stopped manually via the push-buttons.

Test mode description:

See page 36.

Manual mode description:

In manual mode the digital inputs for speed up/down and voltage up/down can be used. These inputs can *only* be used in manual mode. It is possible to start and stop the gen-set, and it is possible to open and close the mains and generator breakers. The normally used push-buttons can be used.

Load take over

Auto mode description

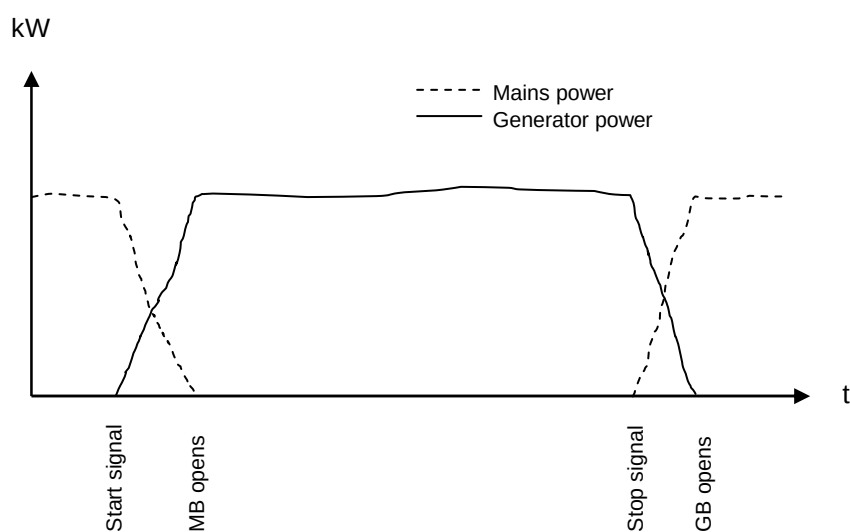
Back synchronising ON

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 and stopped.

A 0-10V DC terminal 75-76 transducer is used for indication of the power imported from the mains.



Diagram, load take over - principle



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



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

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 0-10V DC terminal 75-76 transducer is used for indication of the power imported from the mains.



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

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 (menu 6552).

Test mode description

See page 36.

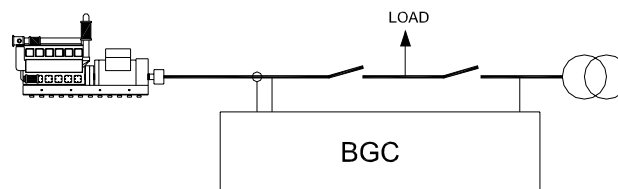
Manual mode description:

In manual mode the digital inputs for speed up/down and voltage up/down can be used. These inputs can *only* be used in manual mode. It is possible to start and stop the gen-set, and it is possible to open and close the mains and generator breakers. The normally used push-buttons can be used.

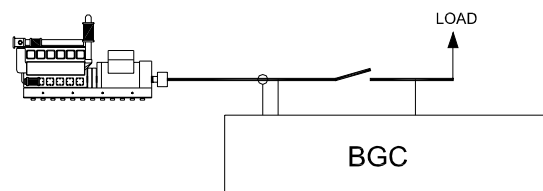
Single line diagrams

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

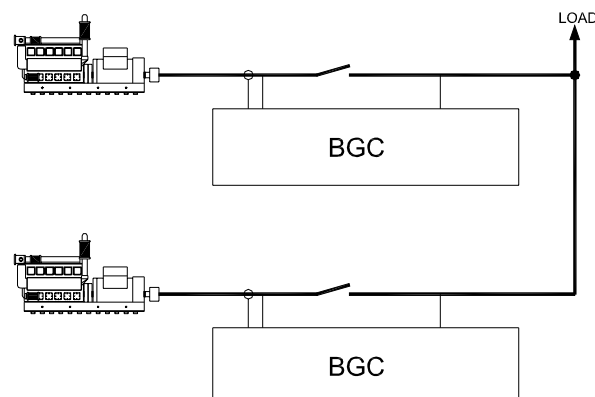
Automatic mains failure (standard)

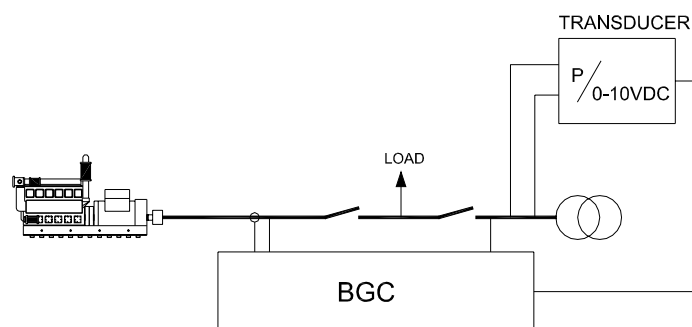
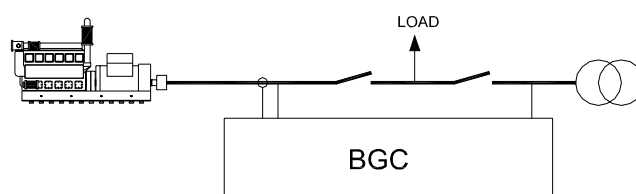
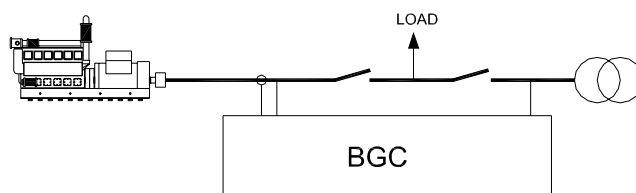
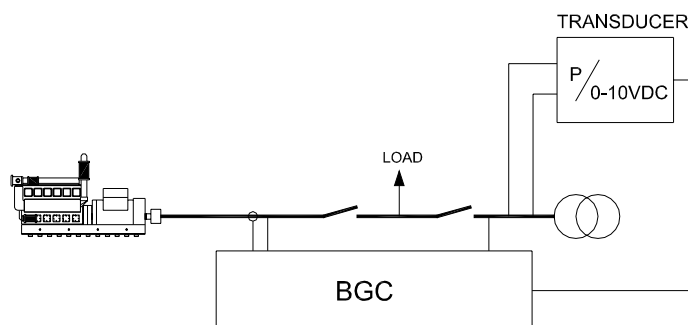


Island operation (standard)



Multiple gen-sets, load sharing (optional)



Peak shaving (optional)**Fixed power to mains (optional)****Automatic mains failure (back sync.) (optional)****Load take over (optional)**

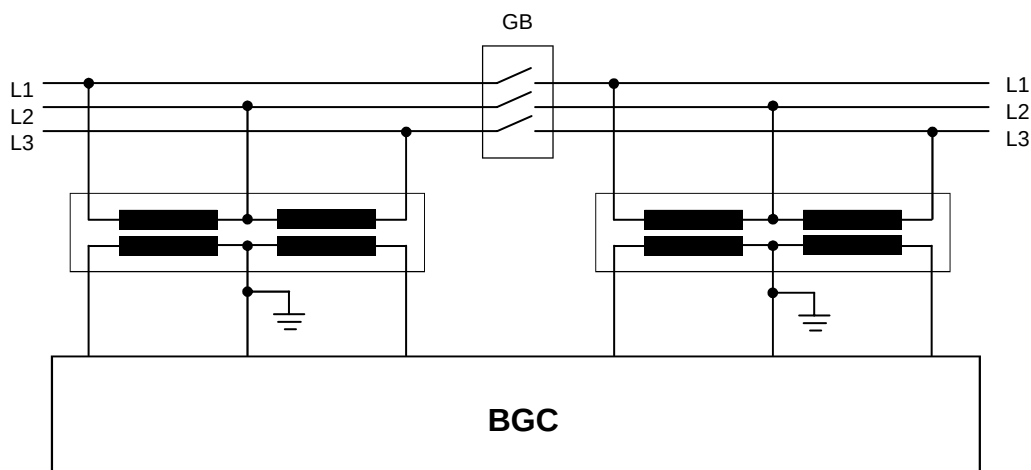
Measurement principle

The BGC is designed for measurement of voltages between 100 and 480V AC. The AC wiring diagrams are shown in the installation instructions for further reference. In the menu 4950 the measurement principle can be changed from the three phase principle to the delta V principle.

When the BGC is delivered from the factory, the three phase system is selected. When this principle is used, all three phases must be connected to the BGC as direct measurements or from three individual voltage transformers.

When the delta V principle is used, the measurement principle is changed in order to handle the three phased input of the delta V transformer coupling.

The drawing below illustrates the delta V principle.



The same measurement principle must be used on the measurement inputs of the generator and the mains/busbar. For exact wiring description please refer to the Installation Instructions.

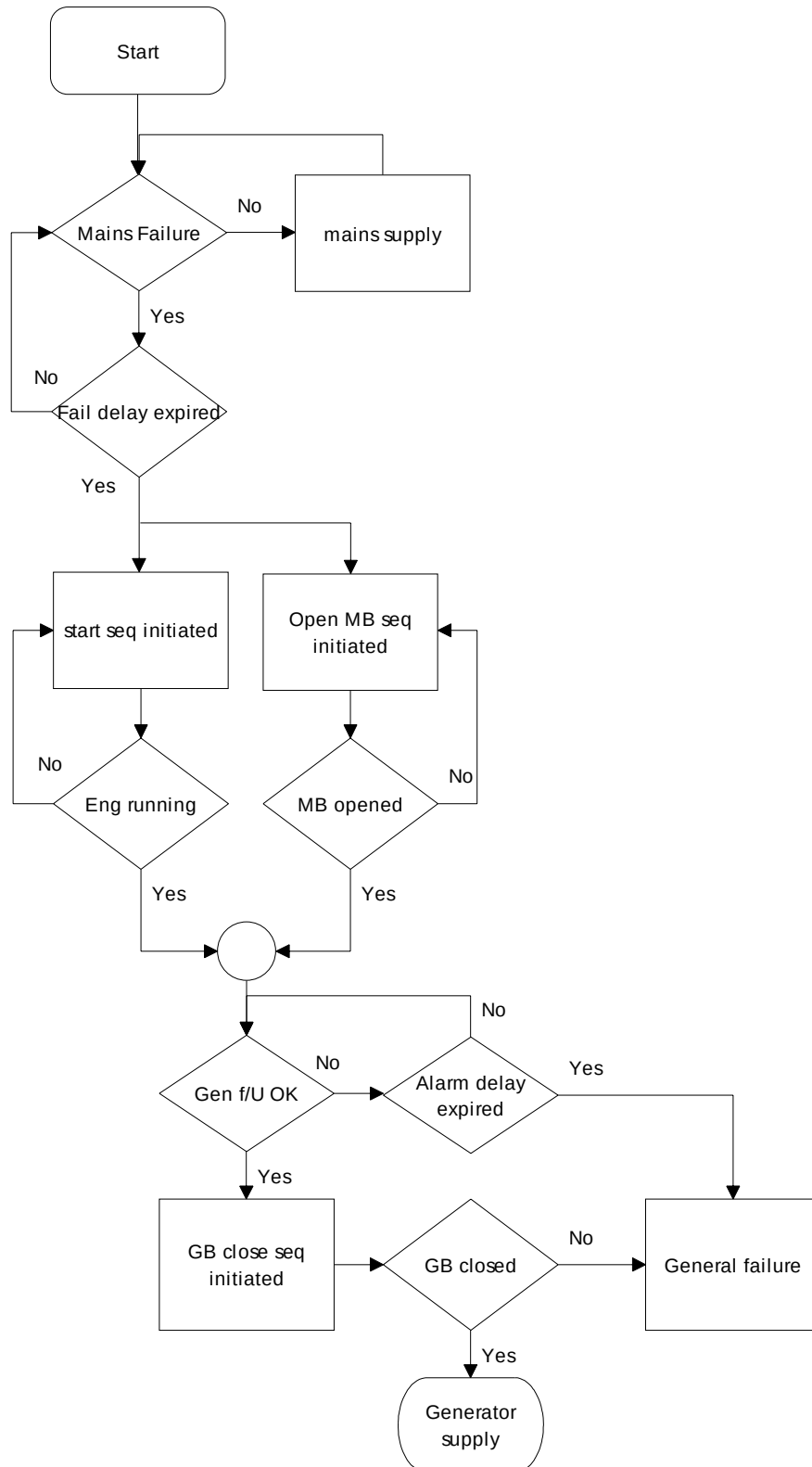
Flow chart sequences

Below flow chart sequences illustrating the standard applications namely AMF and island operation will be presented.

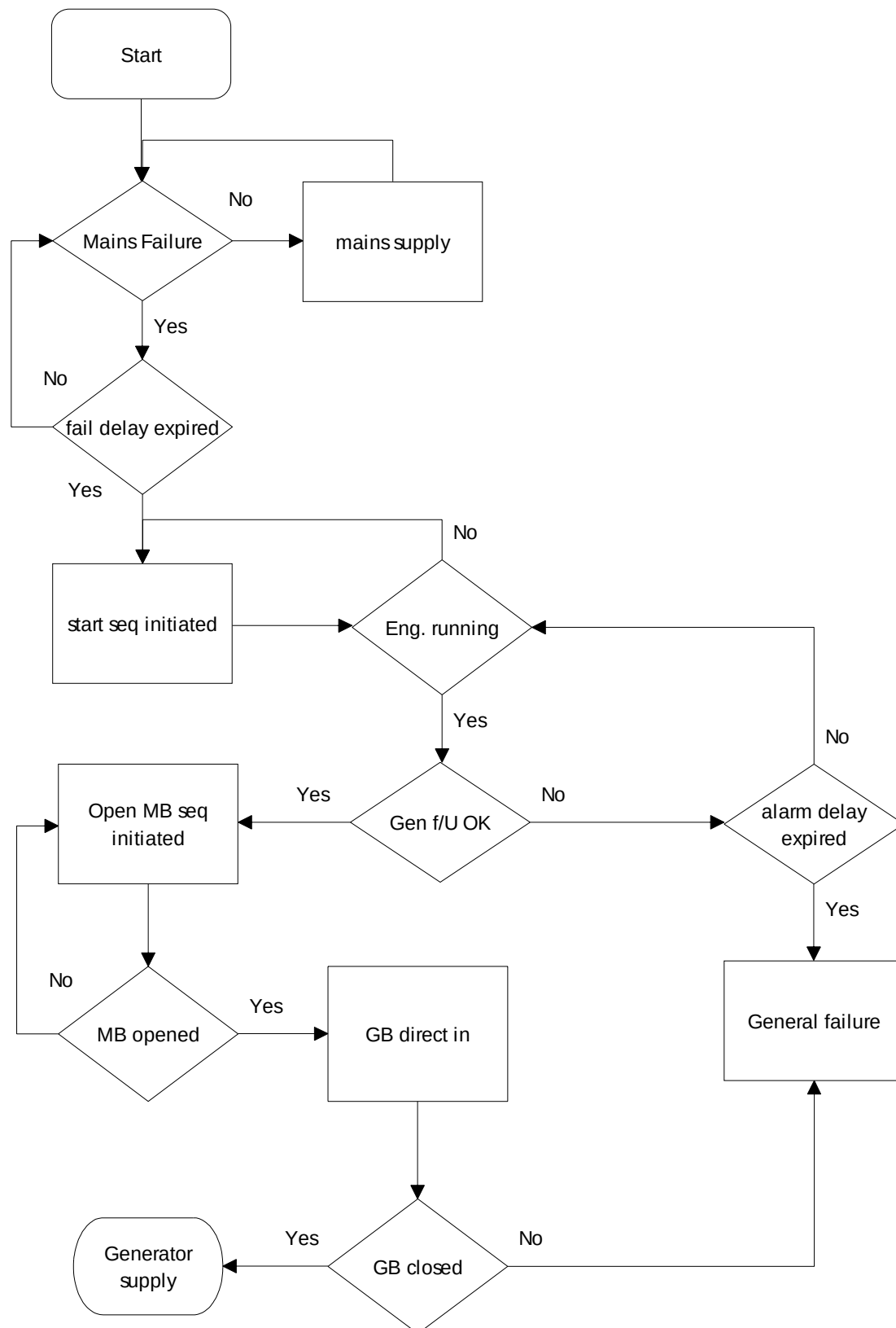
AMF sequences

The BGC can operate in the automatic mains failure mode. The flow charts below describe the AMF sequences. Two start sequence principles are available depending on whether to open the mains breaker at engine start or when the gen-set is running.

Start sequence adjusted to *Start engine and open MB* (menu 4425)

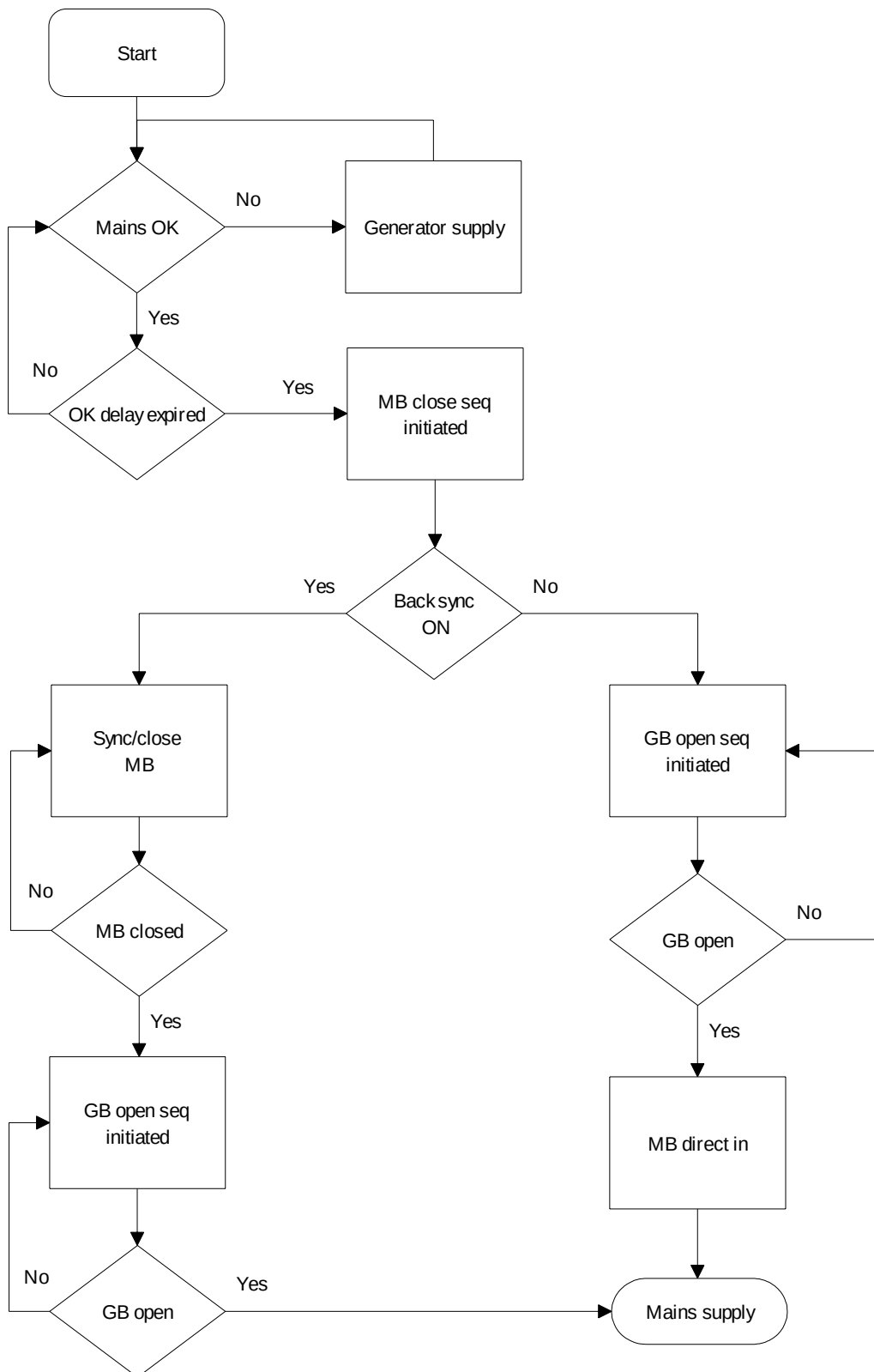


Start sequence adjusted to *Start engine* (menu 4425)



Mains return sequence

The same mains return sequence is used regardless of the mains fail control adjustment (menu 4425).



Island operation sequence

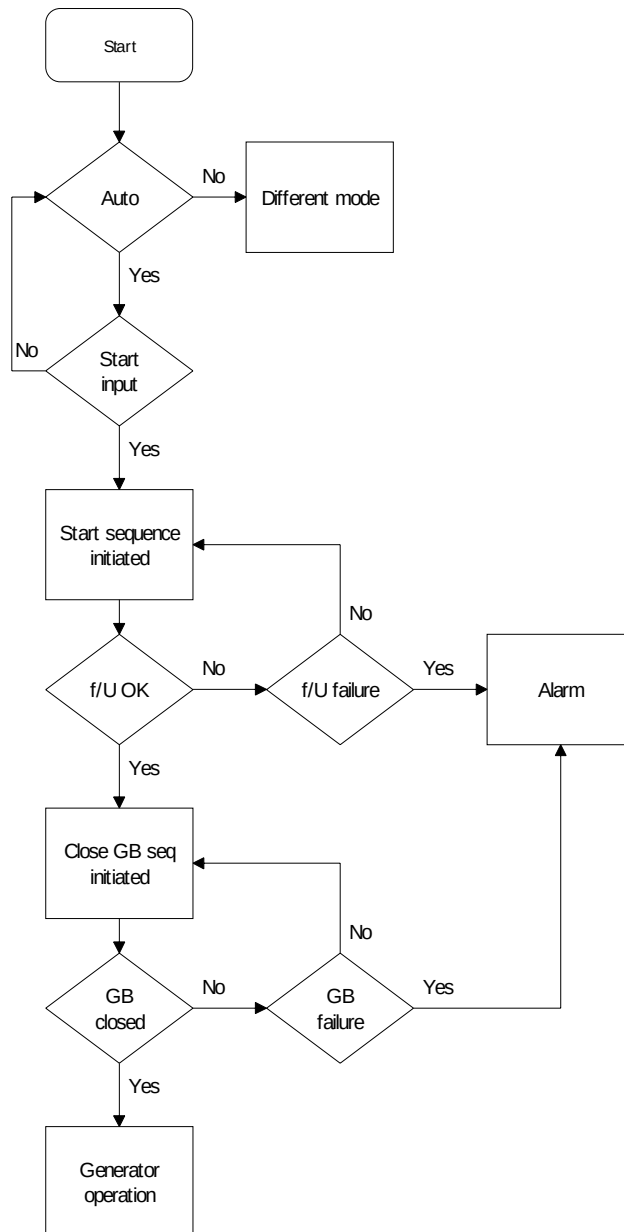
The BGC can be operated in island in all modes (auto, semi, manual and test). The auto sequence will automatically start the gen-set and close the generator breaker. The manual mode is option dependent/option G2 or G3 is required.

When the gen-set is stopped, two possibilities exist:

1. The deload input can be activated - the gen-set deloads and continues to run in idle until it is stopped. The input must be configured through the utility software.
2. The digital start input can be removed. The gen-set deloads, cools down and stops. The input must be configured through the utility software.



If the deload input is activated in island operation and stand alone, the frequency will start to drop. At $f_{\text{NOM}} - 1\text{Hz}$ (typically 49Hz/59Hz) the breaker will open to avoid under-frequency alarms.



The flow chart above illustrates that the start sequence is initiated by the start input only. Alternatively, an input can be configured as a *Start enable input*. If this is the case, both inputs (start and start enable) must be used.

5. Display unit and menu structure

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

Display unit

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



Display dimensions are H x W = 129 x 248 (mm).

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. Pressing this button for 2 seconds will acknowledge all alarms, and the alarm LED will go to fixed light until the next alarm occurs.

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

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

LOG: Shifts the display 3 lower lines to show the event and alarm list. The list holds 150 events. These events are deleted, when the BGC 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 second line displaying of generator values.

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



Decreases the value of the selected 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).

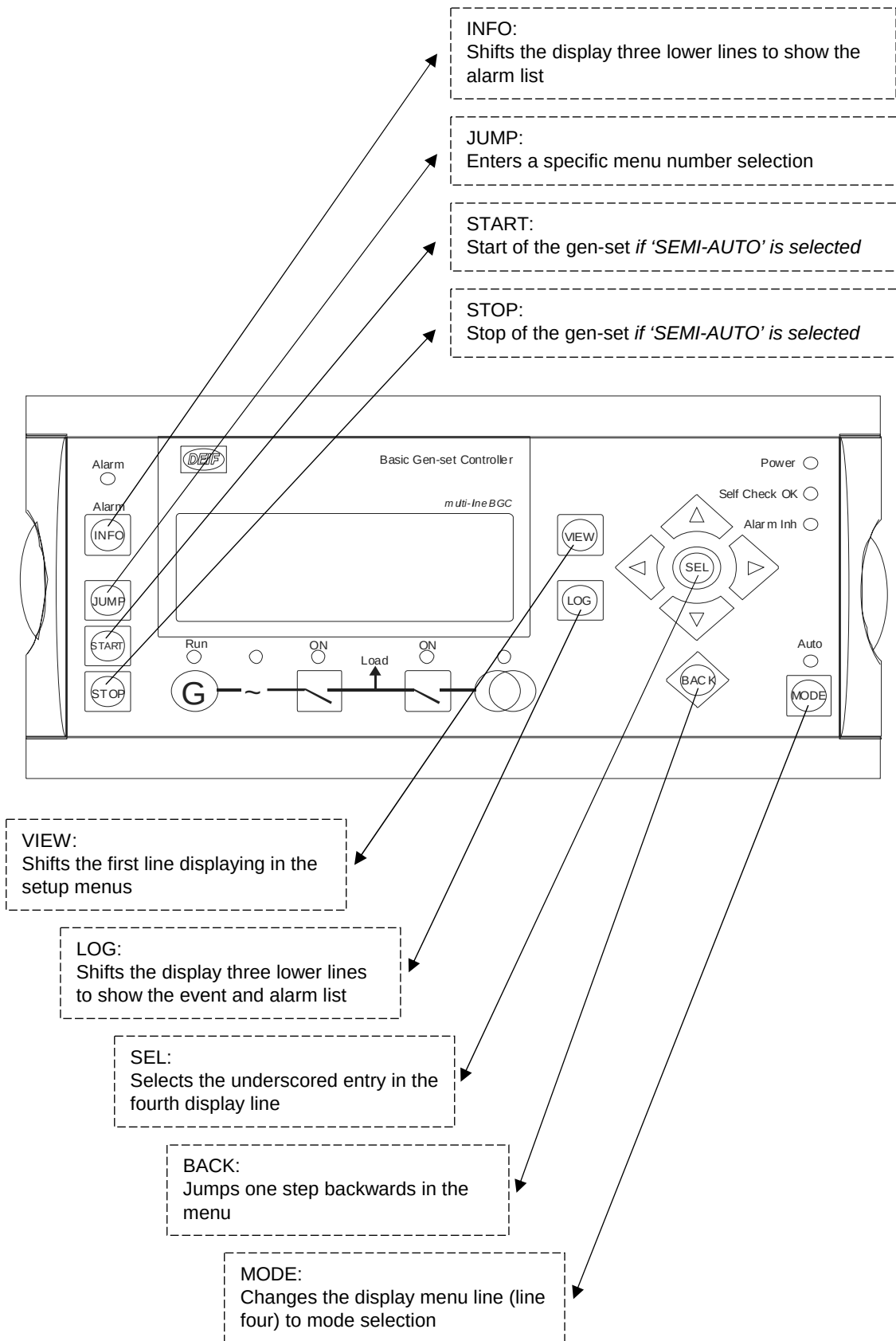
START: Start of the gen-set *if 'SEMI-AUTO' is selected.*

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

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

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

MODE: Changes the menu line (line 4) in the display to mode selection.
The push-buttons are placed as follows:

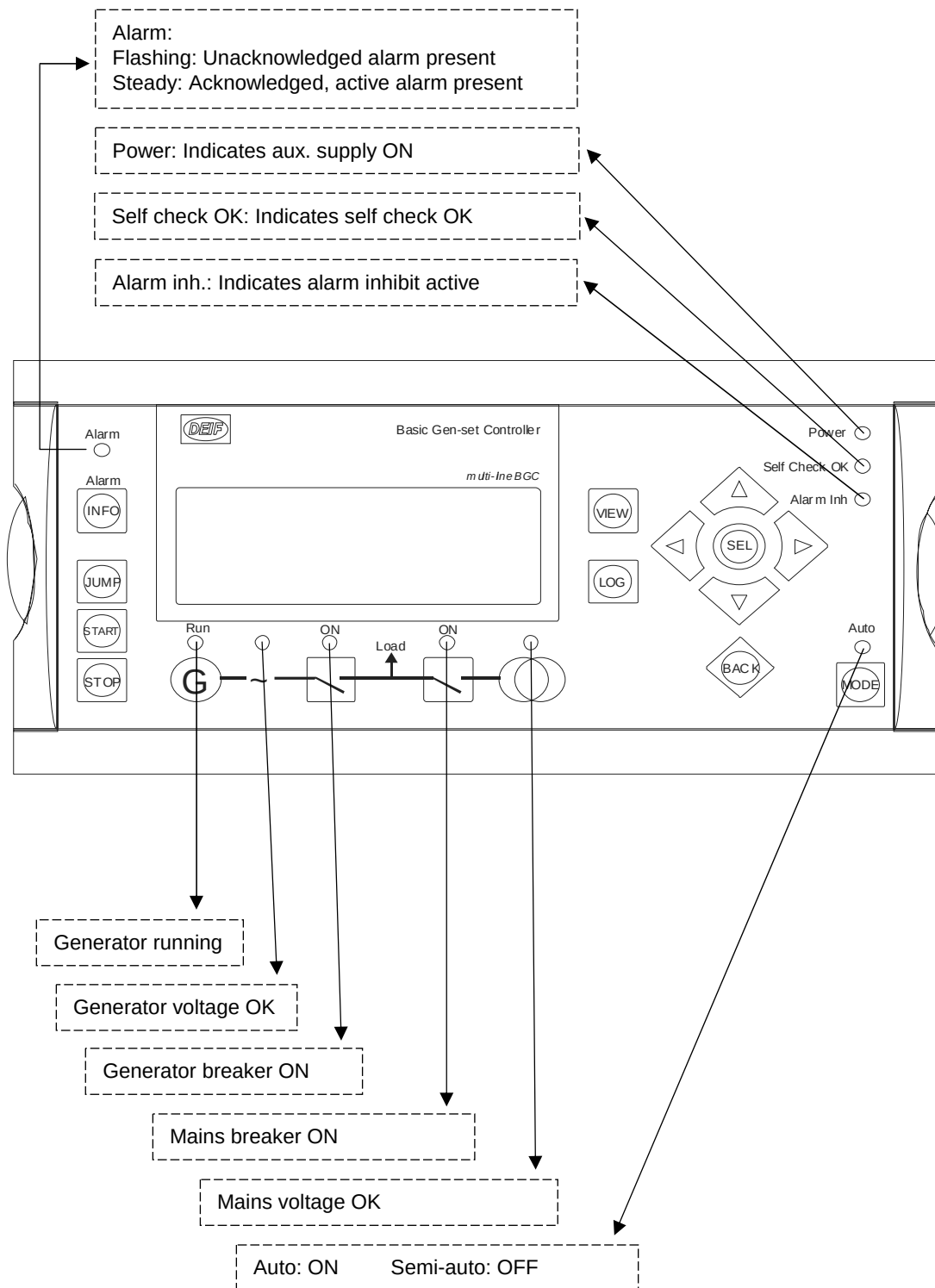


LED functions

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

ALARM:	LED flashing indicates that unacknowledged alarms are present. LED fixed light indicates that ALL alarms are acknowledged.
POWER:	LED indicates that the auxiliary supply is switched on.
Self check OK:	LED indicates that the unit is OK.
ALARM INH:	LED fixed light indicates that the BGC does not receive a running signal. The inhibit lamp will be switched off when the Run status timer in menu 1860 expires.
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 indicates that the generator breaker is closed.
(MB) ON:	LED indicates that the mains breaker is closed.
(MAINS) OK:	LED is green, if the mains is present and OK. LED is red at a 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 BGC display includes two menu systems, which can be used without password entry:

View menu system

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

Setup menu system

This menu system is used for setting up the unit, and if the user needs detailed information that is not available in the view menu system.

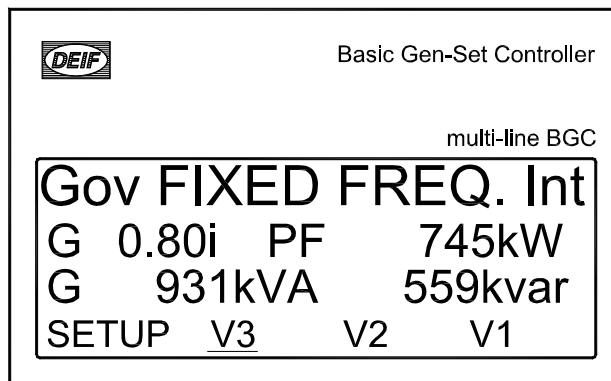
Changing of parameter settings is password protected.

Entry window

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

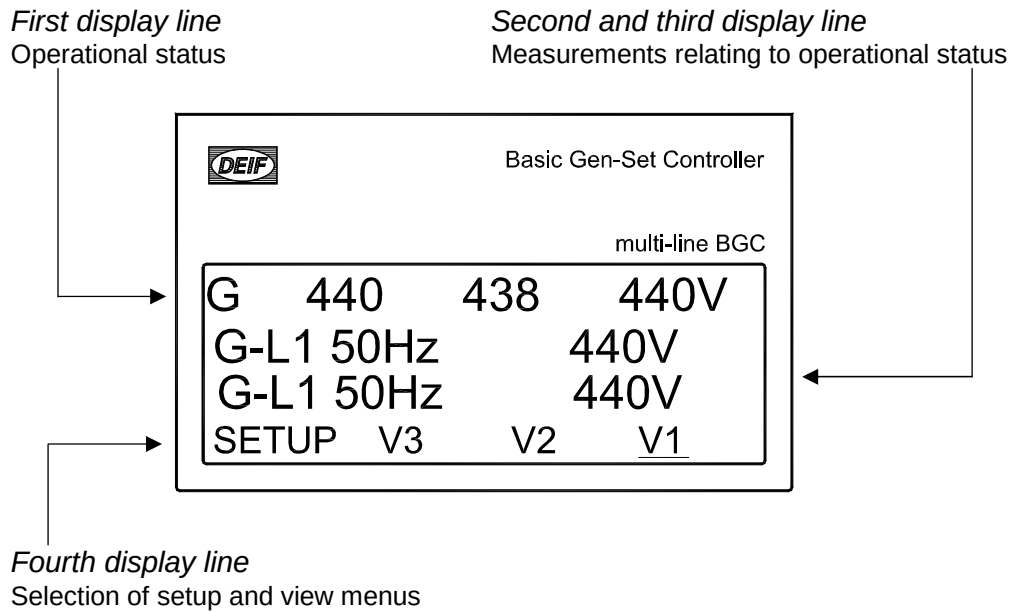


The event and alarm list will appear at power up, if an alarm is present.



View menu

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

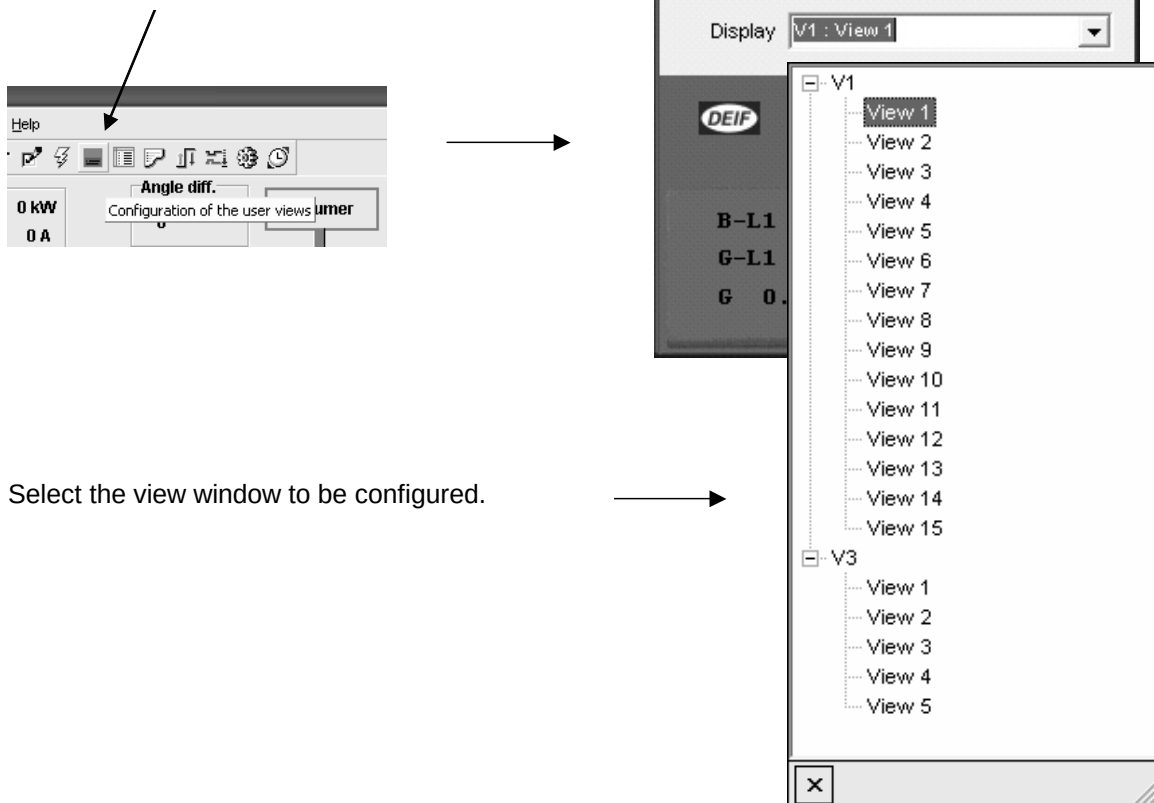


In the view menus various measured values are on display.

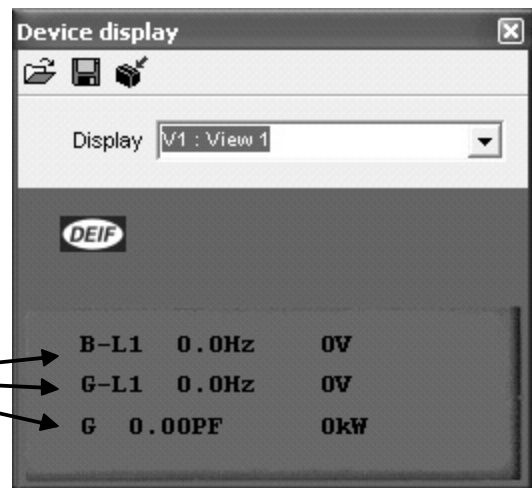
View window configuration

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

Use this button to go to the configuration.



Click here to change the configuration.



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

The selectable values and measurements are presented in the table on page 29 in this handbook.

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

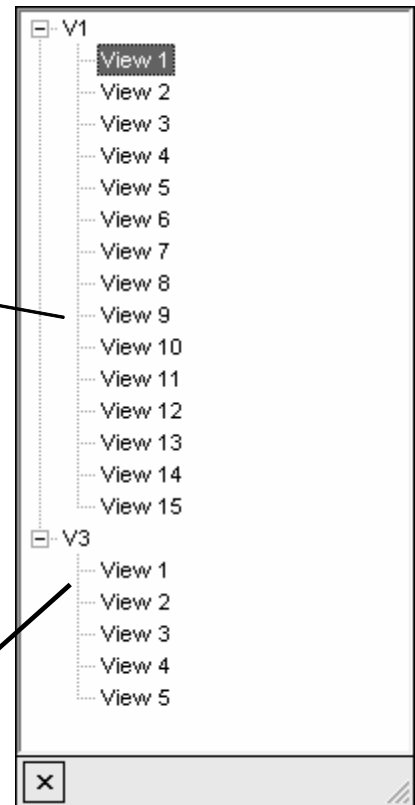


There is a maximum of 15 configurable view windows in V1 and 5 configurable view windows in V3.

View window overview

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

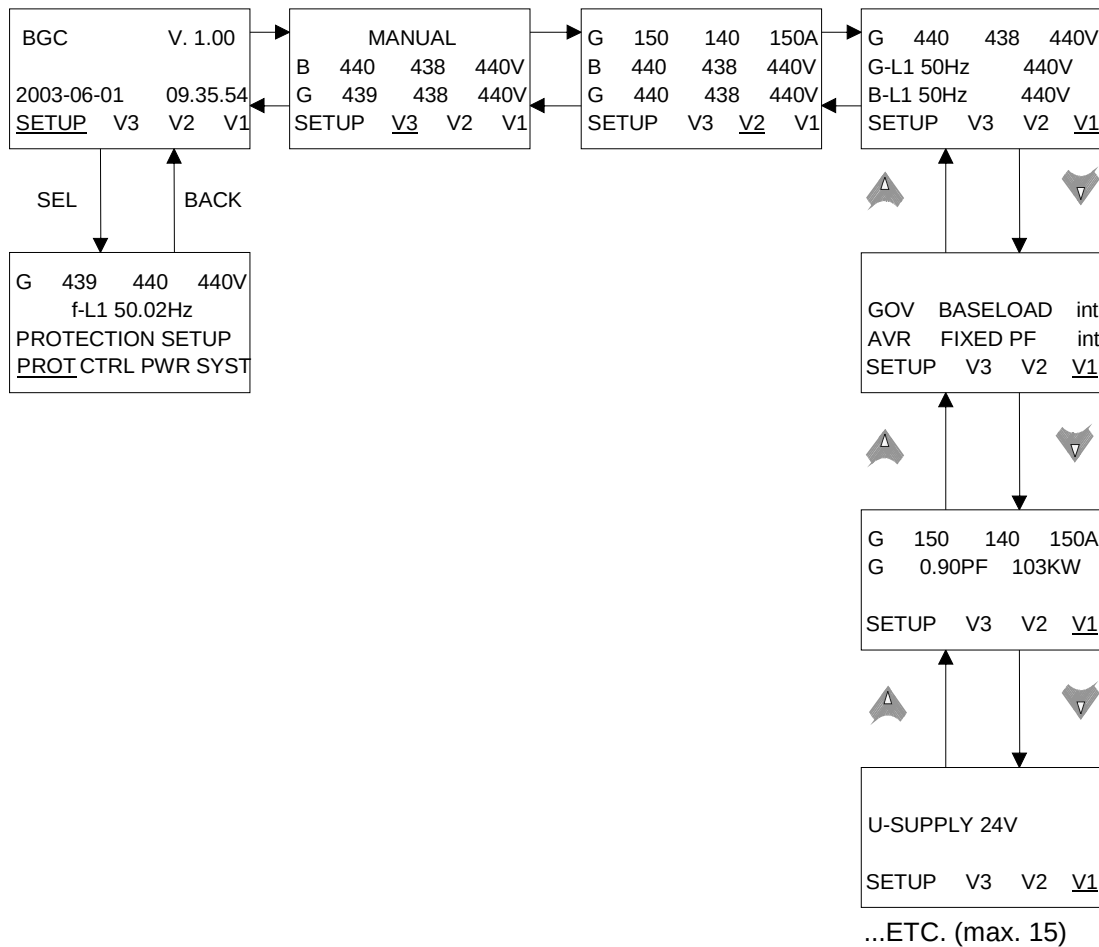
Windows	View 2	View 3
Window 1	Changes automatically between the 5 first windows:	Changes automatically between the 5 first windows:
Window 2	1. window 1 (Start prepare) 2. window 2 (Sync.) 3. window 3 (Ramp up/down) 4. window 4 5. window 5 (Default*)	1. window 1 (Start prepare) 2. window 2 (Sync.) 3.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



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

View menu example

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



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
 - Power 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.

First display line

(Daily use) The first line is used to display generator and BUS values

Second display line

(Daily use)

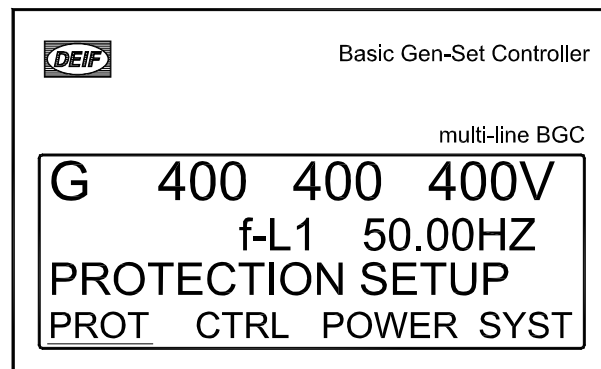
Various values can be displayed

(Menu system)

Information about the selected channel number

(Alarm/event list)

The latest alarm/event is displayed



Third display line

(Daily use)

Explanation for the fourth line selection of setup

(Setup menu)

Presents setting of the selected function, and, if changes are made, the possible max. and min. values for the setting

Fourth display line

(Daily use) Entry selection for the setup menu. Press SEL to enter the underscored menu

(Setup menu) Sub-functions for the individual parameters, e.g. limit

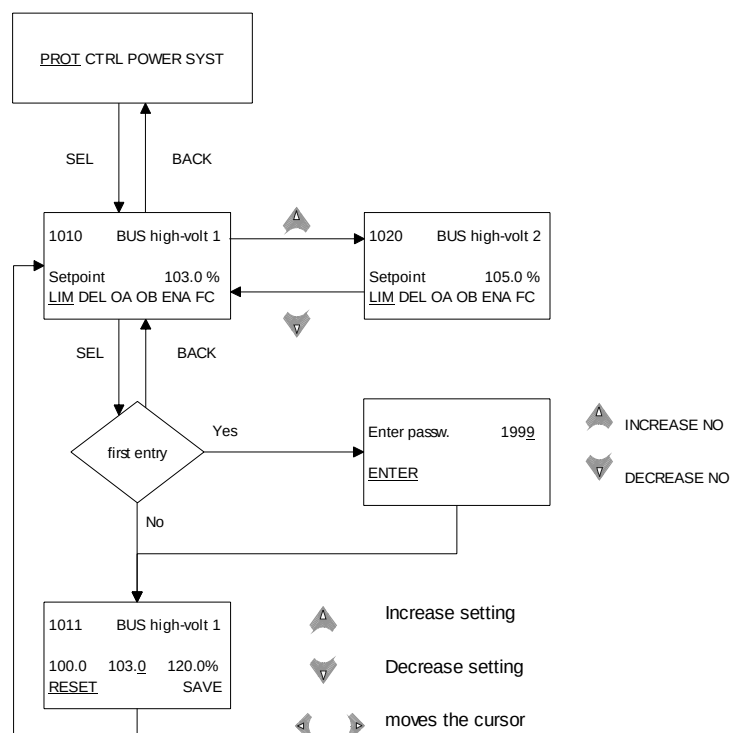
Possible values in second display line

(Values written in *italics* are not available, when the delta V connections are used).

Second display line		
For generator	For bus/mains	For analogue input
Date and time <i>Voltage L1-N (V AC)</i> <i>Voltage L2-N (V AC)</i> <i>Voltage L3-N (V AC)</i> Voltage L1-L2 (V AC) Voltage L2-L3 (V AC) Voltage L3-L1 (V AC) Voltage max. (V AC) Voltage min. (V AC) Current L1 (A) Current L2 (A) Current L3 (A) Frequency L1 (Hz) <i>Frequency L2 (Hz)</i> Frequency L3 (Hz) Active power (kW) Reactive power (kvar) Apparent power (kVA) Energy counter (kWh) Power factor <i>Voltage angle between L1-L2 (deg.)</i> <i>Voltage angle between L2-L3 (deg.)</i> Voltage angle between L3-L1 (deg.) Run time (h) Number of GB operations Number of MB operations Next service Start attempts counter	<i>Voltage L1-N (V AC)</i> <i>Voltage L2-N (V AC)</i> <i>Voltage L3-N (V AC)</i> Voltage L1-L2 (V AC) Voltage L2-L3 (V AC) Voltage L3-L1 (V AC) Voltage max. (V AC) Voltage min. (V AC) Frequency (Hz) <i>Voltage angle between L1-L2 (deg.)</i> Voltage angle between generator voltage and bus voltage (deg.) Power supply voltage (V DC) Delta V only: Voltage angle between L3-L1 (deg.)	Analog 1 Analog 2 Analog 3 Analog 4 Analog 5 Analog 6 Analog 7 Analog 8 PT 100 no. 1 PT 100 no. 2 Tacho

Setup example

The following example illustrates how a specific setting is changed in the setup menu. In this case **BUS high-volt 1** is the selected parameter.



Mode overview

The BGC has four different running modes. For detailed information see chapter 4, page 11.

Auto

In auto mode the BGC 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 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

This mode requires option G2 or G3.

In manual mode the operator has to initiate all sequences. This can be done via the push-button functions or digital inputs. When starting in manual mode, the gen-set will start without any subsequent regulation.

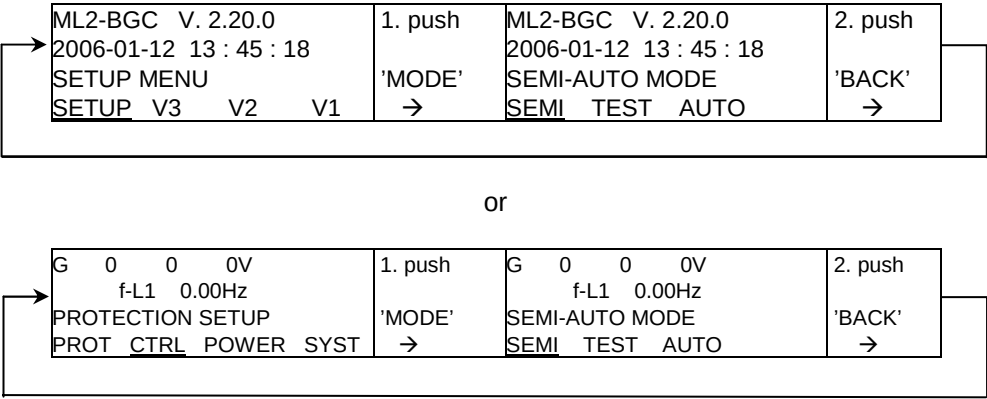
Mode selection

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

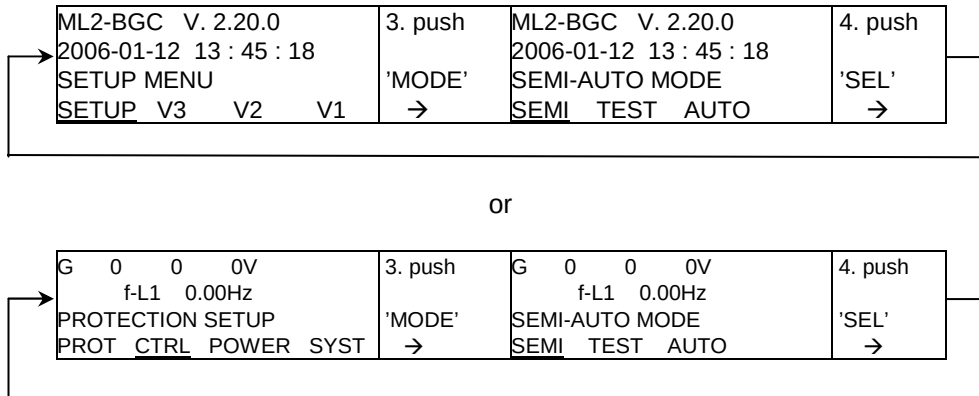
Pushing the MODE push-button will change the displayed text. After pushing 'MODE', the fourth display line indicates the selectable modes. In the third display line the underscored (fourth line) selection will be displayed.

Two possibilities are now available:

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



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



Password

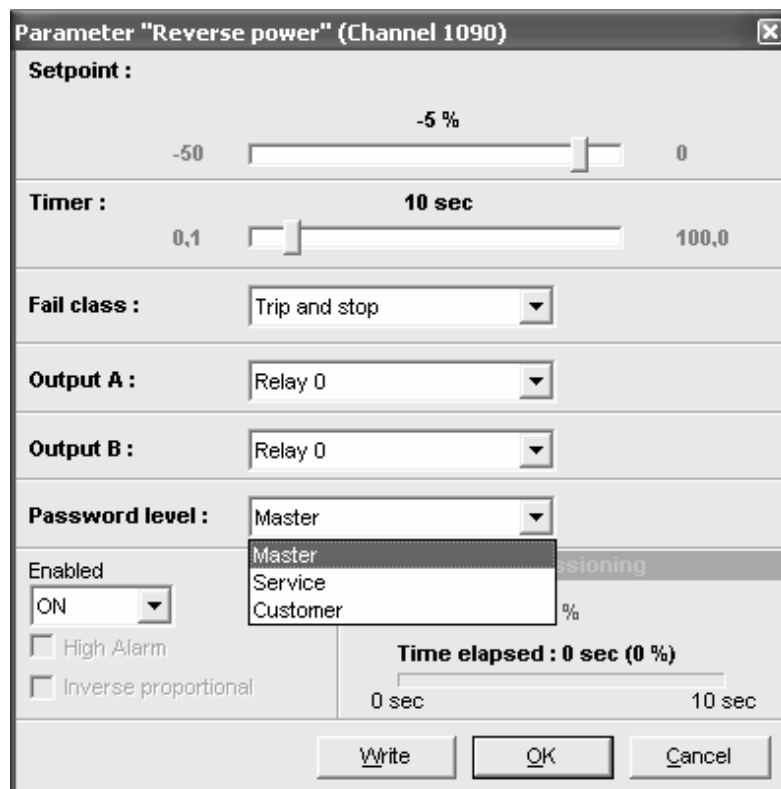
The BGC includes three password levels. All levels can be adjusted in the utility software.

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 utility software must be used. Enter the parameter to be configured and select the correct password level.



Parameter access

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



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

6. Additional functions

This chapter describes the additional functions of the BGC.

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.

The function is available in island and fixed power operation, if auto mode is activated.

Up to 8 commands can be used for either start or stop. The settings are set up in menus 4710-4780. 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 start/stop input cannot be used at the same time as the time dependent start/stop command.



The command timers can be used combined with M-logic. In M-logic the command timers are available as an input. If an M-logic rule has been enabled with a cmd timer, the command timer only works in M-logic.

Test

The test sequence can be selected to work in three different ways:

- Simple test
- Parallel test (requires G2/G3)
- Full test (requires G2/G3)

Simple test:

When initiated it will start up the gen-set and run it for the time selected or until another mode selection is done. When the test sequence is stopped, the gen-set will cool down and stop. No breaker operation.

Parallel test:

If the mains is OK and the mains breaker is closed, the test sequence can be initiated and the gen-set will be started up. When the Hz/V is OK on the gen-set, the generator breaker will be synchronised to close. Now the gen-set is parallel to the mains, it will be ramped up to the power setting in parameter 3070. When the test is stopped, the gen-set will ramp down and open the generator breaker, cool down and stop.



If the initial condition of the selected test sequence is not present at start of the test, a status message will be displayed for 3 seconds in the first line of V3, indicating the error. The test will not be started in this case.

Full test:

If the mains is OK and the mains breaker is closed, the test sequence can be initiated and the gen-set will be started up. When the Hz/V is OK on the gen-set, the generator breaker will be synchronised to close. Now the gen-set is parallel to the mains, the gen-set will be ramped up to the point where the mains import equals zero. When the mains power import is lower than the parameter setting 2122 open breaker point, the mains breaker will be opened. When the test is

stopped, the BGC will synchronise and close the mains breaker. When the mains breaker is closed, the gen-set is deloaded according to the ramp down settings. When the gen-set is deloaded to under the open breaker point, the generator breaker will be opened. The gen-set will cool down and stop.



Be aware that if there is no power transducer on the mains connection, the mains breaker will open directly after the generator breaker has been closed.

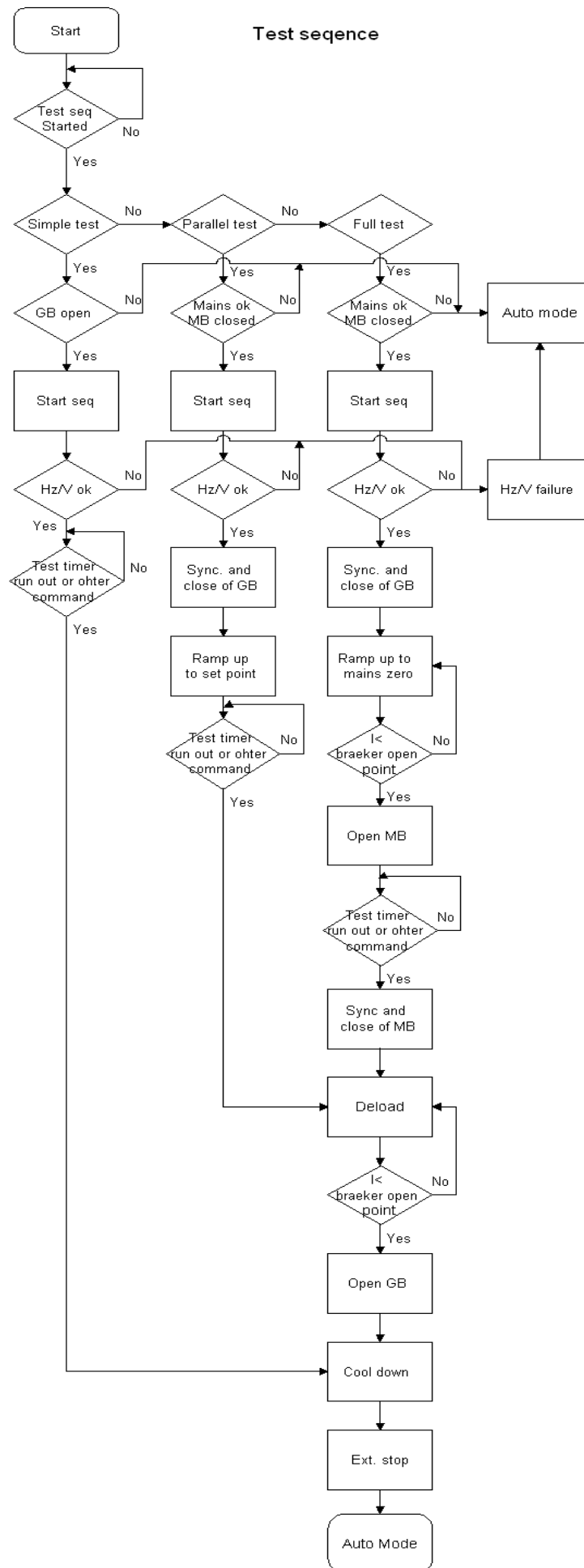
Common for all three types of test sequences is the timer in the parameter 3070 and the enabling of this timer in the parameter 3074. If this timer is enabled, it will start when the test sequence is initiated. When the timer has reached the selected time, it will end the test sequence and the BGC will return to AUTO mode. If the timer is not enabled, the test sequence is not stopped before another mode selection has been done; AUTO, SEMI-AUTO or MANUAL.

The test can be started via the mode button on the front, digital input or modbus option H2.

If a failure with a higher fail class than 'Warning' occurs in the test sequence, the test sequence is interrupted and the BGC returns to AUTO.

Parameter settings for test:

- 3071: Limit Load set point when paralleling to mains (optional)
- 3072: Timer Duration of the test
- 3073: Type Selection between the three test types. This selection can also be done via M-logic
- 3074: Enabling Enabling of the timer 3072



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

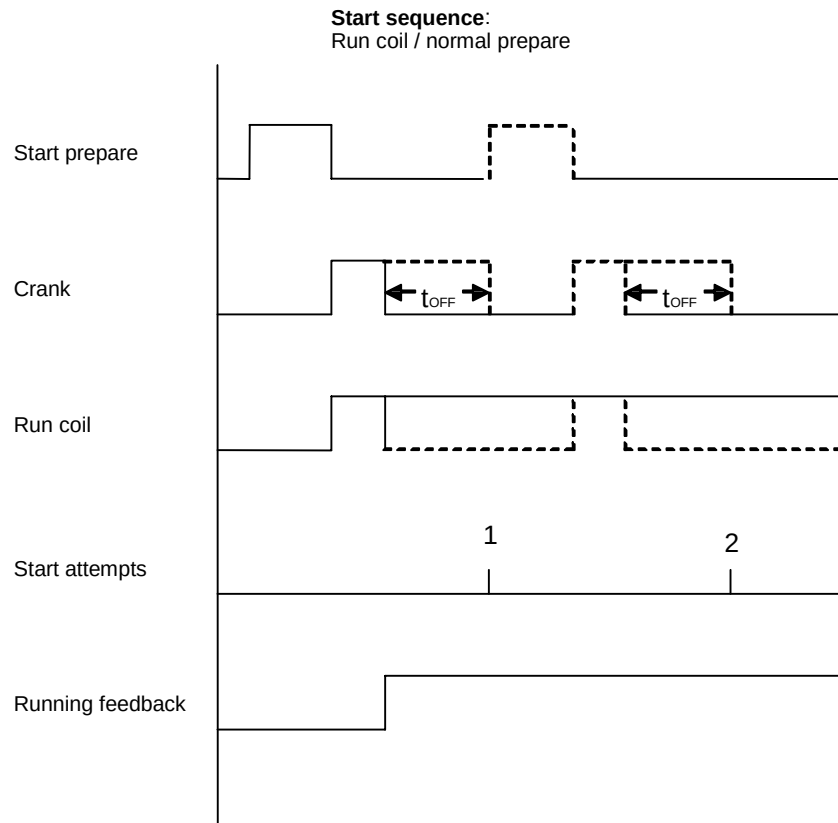
The following sequences will be illustrated below:

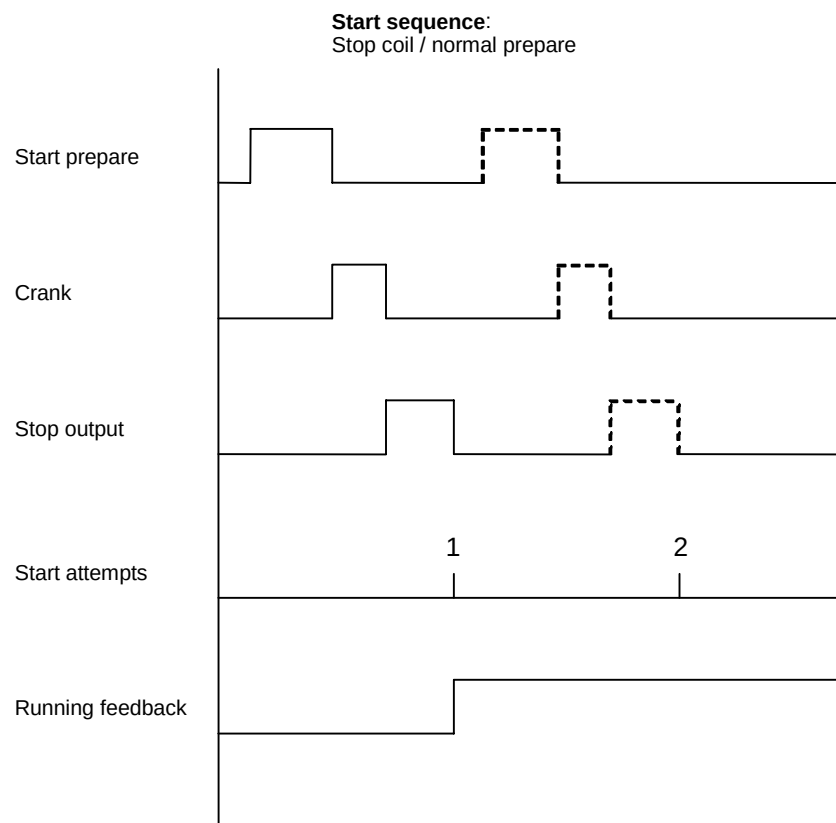
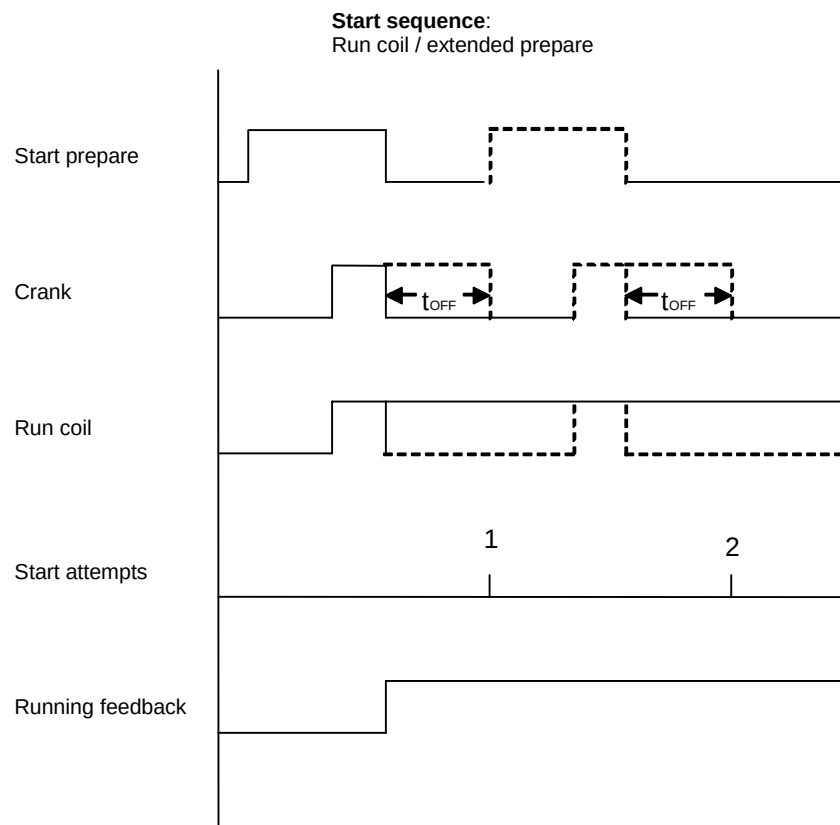
- START sequence
- STOP sequence
- Breaker sequences

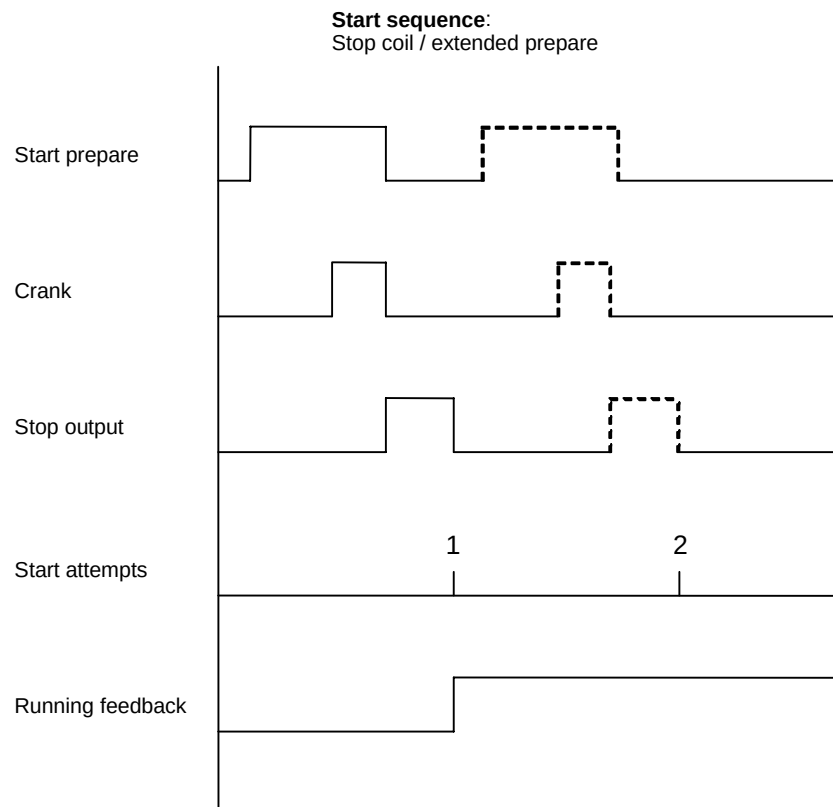
If island operation is selected, the digital input 'MB closed' must NOT be activated with a 12/24 volt input signal, and the MB closed input must be configured as not used. A 'Mains breaker failure' will occur, if the wiring of the mains breaker feedback inputs is wrong.

START sequence

The drawings illustrate the start sequences schematically.







Interruption of start sequence

The start sequence is interrupted in the following situations:



The analogue running feedback is made so that the unit detects running feedback when the analogue value reaches the upper level, but it does not stop detecting running feedback before the analogue value is below the lower limit.

Event	Comment
Stop signal	
Start failure	
Running feedback	Tacho set point, menu 4351. Upper limit tacho set point, lower limit 95% of tacho set point
Running feedback	Digital input
Running feedback	Frequency measurement. Upper limit 32Hz, lower limit 30Hz The frequency measurement requires a voltage measurement of 30% $\times U_{NOM}$
Running feedback	Voltage detection. Upper limit 32% of U_{NOM} , lower limit 30% of U_{NOM}
Emergency stop	
Stop push-button on the display	Only in semi-automatic operation
Binary stop input	Auto mode, island or fixed power (not time dependent start/stop)



If the tacho input is to be used as the running feedback, it has to be set up in menu 4351. If the digital input running feedback is to be used as digital input, terminal 26 has to be used. (Terminal 26 is the factory setting. This can be changed in the utility software).

Start failure alarm (menu 4370)

The start failure alarm will occur if the gen-set has not started after the last start attempt. This is adjusted in menu 4370. Output A (OA) and output B (OB) in this menu indicate the relay output(s) that will be activated at a start failure alarm.

When the engine is started (running feedback present), the start sequence is interrupted. If the engine for some reason stops (comes below the lower limit for the running feedback), the BGC will display a start attempt failure but will not automatically make further start attempts.

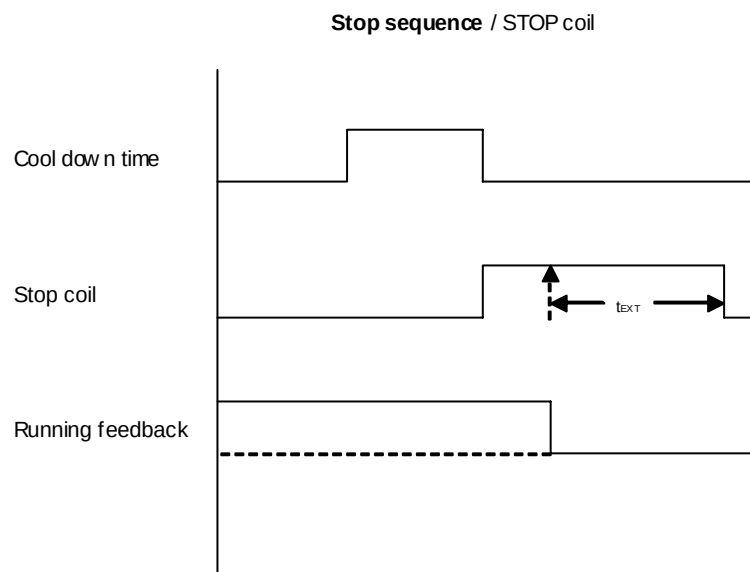
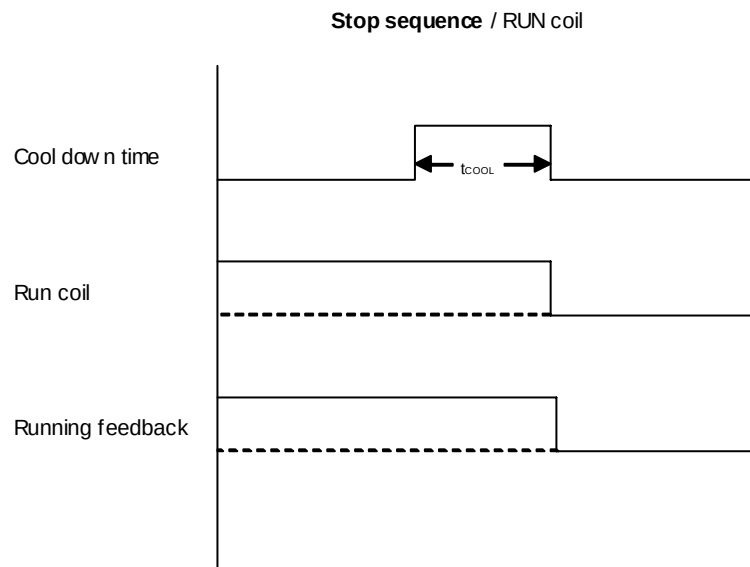
Start prepare (menu 4364)

There are two possibilities for use of the start prepare timer:

Normal start prepare	The start prepare relay is activated when the start sequence is initiated for the adjusted time and before each start attempt
Extended start prepare	The start prepare relay is activated when the start sequence is initiated, and it stays activated when the start relay is activated

Stop sequence

The drawings illustrate the stop sequence schematically.



Stop sequence, description

The stop sequence will be activated, if a stop command is given. The stop sequence can include the cool down time, if the stop is a normal or controlled stop.

Description	Cool down	Stop	Comment
Auto mode stop	X	X	
Trip and stop alarm	X	X	
Stop button on display		X	Semi-auto and manual
Binary stop input		X	Auto island and fixed power
Emergency stop		X	Engine shutdown and GB opens

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

Event	Comment
Mains failure occurs	AMF mode selected. Auto mode selected
Start button is pressed	Semi-auto mode only Engine will run in idle speed
Binary start input	Auto mode, island and fixed power
GB close button is pressed	Semi-auto mode only

Stop failure alarm

A stop failure alarm will occur, if the running feedback or the generator voltage and frequency are still present. The stop failure timer is adjusted in menu 4410. Output A (OA) and output B (OB) in this menu indicate the relay output(s) that will be activated at a stop failure alarm.

Breaker sequences

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

Mode	Gen-set mode	Breaker control
Auto	All	Controlled by the BGC
Semi-auto	All	Push-button

Before the breakers are closed it is checked that the voltage and frequency are OK. The limits can be adjusted in the parameters 2050.

BGC without sync. option:

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

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



BGC with sync. option:

If the GB or MB push-button is pressed, the BGC will start a synchronisation 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 (menu 4420)

It is possible to select the functionality of the mains breaker closing function. This is necessary, if the BGC 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 the mains failure occurs, the engine starts. When the generator is running, the MB opens and the GB closes

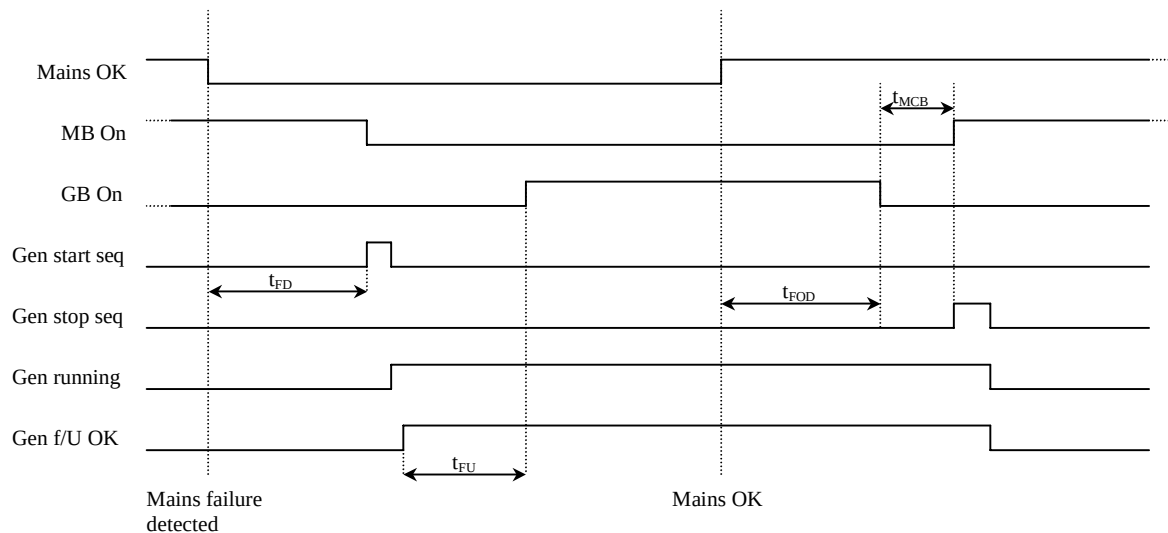
The time charts describe the functionality at a mains failure and at a mains return. Back synchronisation is deactivated.

The timers in the system:

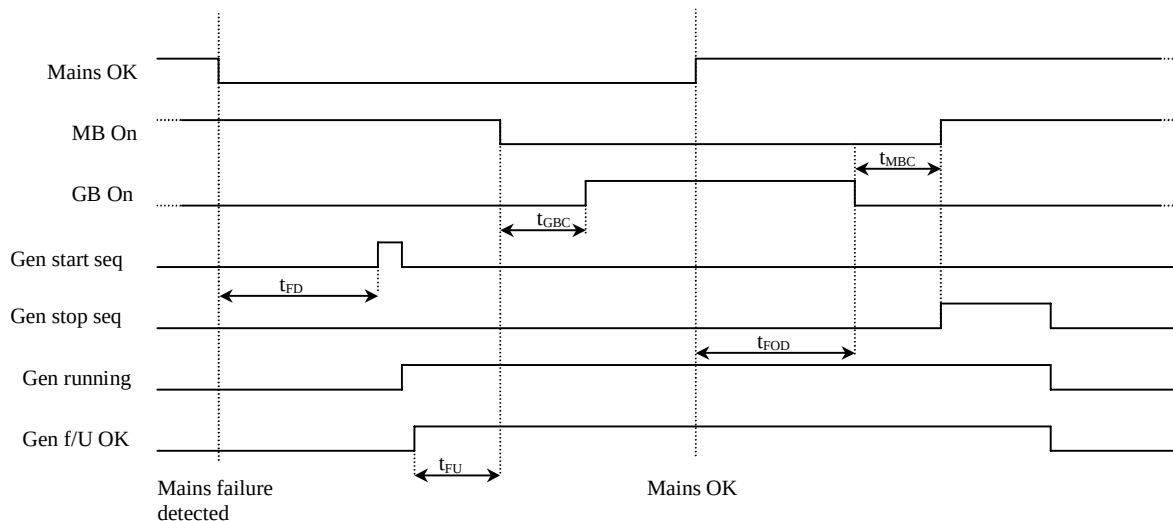
Timer	Description	Channel number
t_{FD}	Mains failure delay	4421/4431
t_{FU}	Frequency/voltage OK	4381
t_{FOD}	Mains failure OK delay	4422/4432
t_{GBC}	GB ON delay	4461
t_{MBC}	MB ON delay	4442

The timer t_{MBC} is only active, if back synchronisation is deactivated (channel 4443).

Example 1 (configuration channel 4425: Start engine and open MB):



Example 2 (configuration channel 4425: Start engine):



Conditions for breaker operations

The breaker sequences of the BGC 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, optional	Running feedback Generator frequency/voltage OK MB closed No generator failure alarms
MB ON, synchronising, optional	Mains frequency/voltage OK GB closed No generator failure alarms
GB OFF, direct opening	MB open
GB OFF, direct opening	Alarms with fail classes: Shutdown Trip GB alarms
GB OFF, deloading, optional	MB closed

Relay indication

The BGC can be set up to activate a relay output, when specific conditions are selected or present:

Emergency operation (menu 4031)

The output activates when the gen-set is running in 'emergency power operation'. The output will activate in AMF mode when the generator breaker is ON and the mains breaker is OFF, if no collective fault is present. (See below).

Collective fault (menu 4032)

The output will activate when an alarm is present, if it has fail class Alarm/'trip and stop'/trip GB/shutdown. A breaker position failure will also activate the collective fault relay.

Ready for operation (menu 4033)

The output will activate when there are no collective faults (see above), the BGC system is OK (self check OK) and the AUTO mode is selected. If the start enable input is used, then it must also be ON to activate the ready for operation output.

Language selection

The BGC 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 utility SW.

The language is selected in the system setup, menu 4241.

The language can be changed when connected to the utility SW. It is not possible to make language configuration from the display, but the configured languages can be selected.

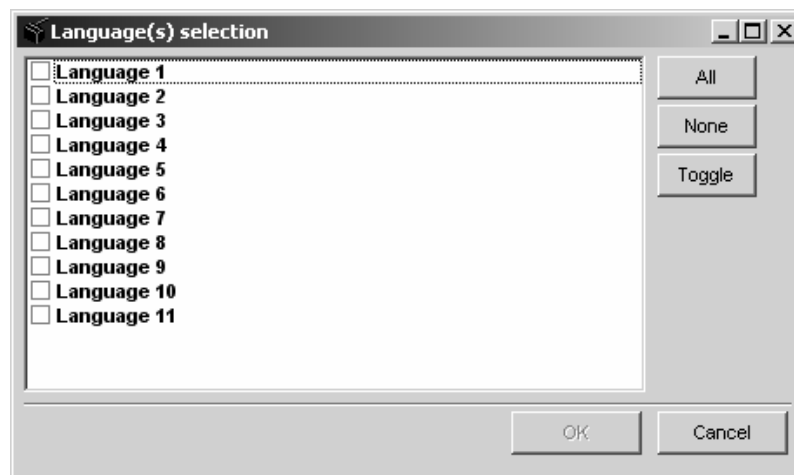
Buttons used in the utility SW



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



Send languages to the device:
Activating this button will open the pop-up window below.



The selected number of languages will be sent to the device when OK is pressed.

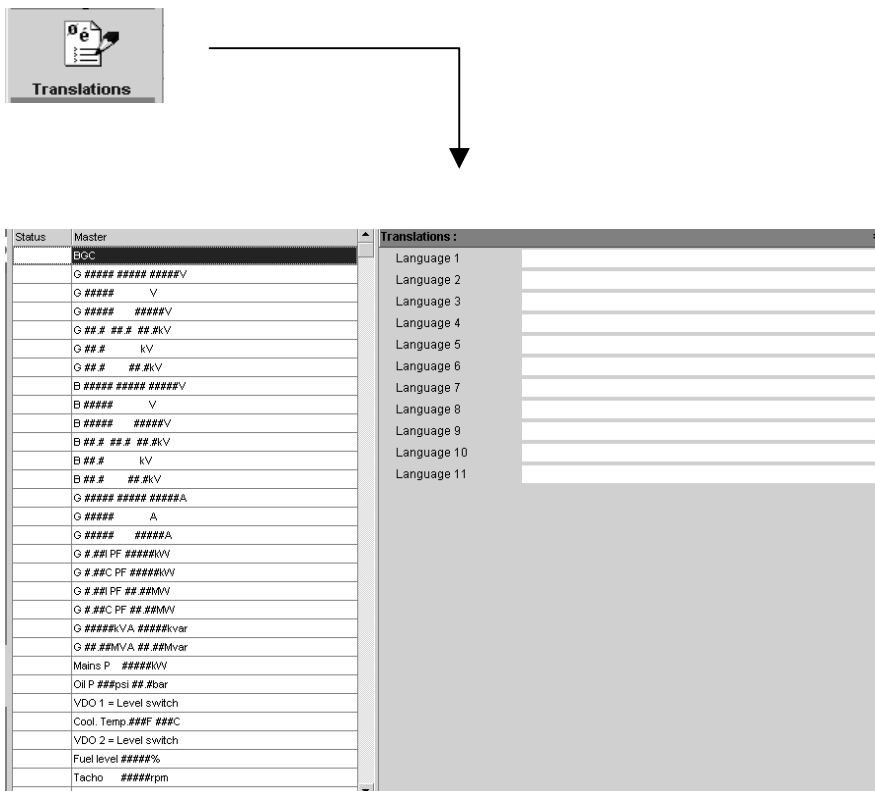


Synchronise a language file with the device:
This button function will synchronise a language file from a previous version of the software with a newer version. New functions that are not translated will be marked.

Language configuration

Besides the master language the BGC includes 11 empty language shells. These empty shells can be filled in through the utility SW.

Through the utility SW the language is configured in the *Translations* menu. Activate the menu by pressing the *Translations* icon (see below):



All configurable entries are shown in the left side column. The list can be scrolled with Page Down/Page Up.

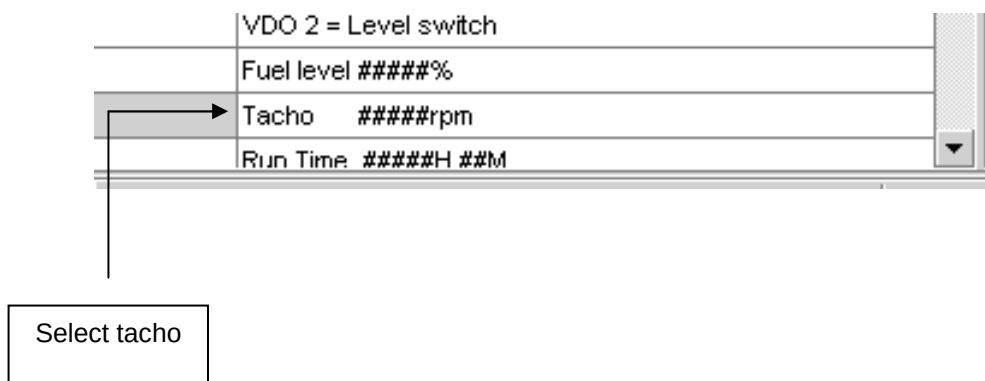
Example:

Language 1 = Danish.

Changes to make on the Tacho name in this example:

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

Select the line, which needs to be edited.



Select language 1 and write the relevant text.

The screenshot shows a window titled 'Translations :'. On the left is a list of languages from 'Language 1' to 'Language 11'. 'Language 1' is highlighted. To the right of the list is a table with two columns: the language name and a text input field. The text field for 'Language 1' contains 'Omdr_pr_min####Omdr'. An arrow points from a callout box containing the text 'Write the relevant text' to the '####' placeholder in the text field.

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

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

If e.g. language 1 is selected, then this language is shown in the display. It will also be this language that is shown when the parameter file is uploaded in the utility software.

Digital inputs

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

The number of digital inputs on the standard BGC is depending on the generator and mains breaker type.

Breaker type	Synchronising	Feedback signals	Available digital inputs
Pulse	Two relays: 1 close relay 1 open relay	Two signals: 1 opened 1 closed	5
Continuous	One relay: Continuous signal	One signal: 1 closed	7
Compact	Two relays: 1 close relay 1 open relay	Two signals: 1 opened 1 closed	5



Some of the following functions are option dependent.

	Input function	Auto	Semi	Test	Man	Input type
1	Fire pump without start of gen-set	X	X	X	X	Constant
2	Fire pump with start of gen-set	X	X	X	X	Constant
3	Generator breaker closed feedback	X	X	X	X	Constant
4	Generator breaker open feedback	Required				Constant
5	Mains breaker closed feedback	X	X	X	X	Constant
6	Mains breaker open feedback	Required				Constant
7	Engine running feedback	X	X	X	X	Constant
8	Start enable	X	X	X	X	Constant
9	Emergency stop	X	X	X	X	Pulse
10	Ext. communication control	X	X	X	X	Constant
11	Alarm acknowledge	X	X	X	X	
12	Auto start/stop	X				Constant
13	Manual GOV increase	X	X	X	X	Constant
14	Manual GOV decrease	X	X	X	X	Constant
15	Manual AVR increase	X	X	X	X	Constant
16	Manual AVR decrease	X	X	X	X	Constant
17	External f/P set point	X	X	X	X	Constant
18	External U/Q set point	X	X	X	X	Constant
19	Deload	X				Constant
20	Parameter shift	X	X	X	X	Constant
21	Digital inputs No 1...7 & 28...31	X	X	X	X	Constant
22	Access lock	X	X	X	X	Constant
23	Mode shift	X				Constant
24	GB open and block					Constant
25	Start input		X			Pulse
26	Stop input		X			Pulse
27	Remote GB OFF		X			Pulse
28	Remote GB ON		X			Pulse
29	Remote MB OFF		X			Pulse
30	Remote MB ON		X			Pulse
31	Lamp test	X	X	X	X	Pulse
32	Mode selection	X	X	X	X	Constant
33	Enable black busbar closing	X	X	X	X	Constant
34	Auto	X	X	X	X	Pulse
35	Semi-auto	X	X	X	X	Pulse
36	Test	X	X	X	X	Pulse
37	Manual	X	X	X	X	Pulse
38	Low speed (idle run)	X	X			Constant
39	Temperature control	X	X			Constant
40	Reset analogue governor	X	X	X	X	Constant

Functional description

1. Fire pump without start of gen-set

Deactivates all protection in the BGC except overspeed protection and the short circuit protections. Short circuit is option dependent (C1). The emergency stop input is *not* deactivated.

2. Fire pump with start of gen-set

The input has the same function as 'Fire pump without starting of gen-set', except that the start sequence will be initiated, if the gen-set is at standstill.

3. Generator breaker closed feedback

The input function is used by the BGC as an indication of the generator breaker position. The unit requires this feedback, when the breaker is closed or an alarm occurs.

4. Generator breaker open feedback

When the generator breaker type is a circuit breaker (GB ON signal = pulse), this input function must be used in order to tell the BGC that the generator breaker has opened. If the generator breaker type is a contactor (GB ON signal = continuously), this input function is not used.



If both breaker feedbacks are used:

The breaker LED will be flashing red, if the closed and open feedbacks have the same value (GB position is unknown). (This function is not used, if only the GB ON feedback is used).

5. Mains breaker closed feedback

The input function is used by the BGC as an indication of the mains breaker position. The BGC requires this feedback when the breaker closed or an alarm occurs.

6. Mains breaker open feedback

When the mains breaker type is a circuit breaker (GB ON signal = pulse) this input function must be used to inform the BGC that the mains breaker has opened.

If the mains breaker type is a contactor (GB ON signal = continuously) this input function is not used.



If both breaker feedbacks are used:

The breaker LED will be flashing red, if the closed and open feedbacks have the same value (MB position is unknown). (This function is not used, if only the MB ON feedback is used).

7. Engine running feedback

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

8. Start enable

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

9. Emergency stop

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

10. Ext. communications control

The input must be activated when writing to the BGC. See the control register table of the communication protocols.

11. Alarm acknowledge

Acknowledges all present alarms.

12. Auto start/stop

Activating this will start the gen-set. Deactivating the input will stop the gen-set. This input can be used when the BGC is in fixed power, AMF, load take over or island operation, and the running mode is selected to AUTO.

13. Manual GOV increase

In AUTO mode the input will add an offset to the nominal speed or the power regulator set point, until the input is deactivated. When the input is deactivated, the BGC will return to nominal setting. In SEMI-AUTO the input will open a new window in the display. When this window is present in the display, the offset is kept also when the input is inactive. To return to nominal settings the 'Back' button must be activated. In manual mode the input will increase the governor output value as long as the input is active.

14. Manual GOV decrease

In AUTO mode the input will subtract an offset from the nominal speed or the power regulator set point, until the input is deactivated. When the input is deactivated, the BGC will return to nominal setting. In SEMI-AUTO the input will open a new window in the display. When this window is present in the display, the offset is kept also when the input is inactive. To return to nominal settings the 'Back' button must be activated. In manual mode the input will decrease the governor output value as long as the input is active.

15. Manual AVR increase

In AUTO mode the input will add an offset to the nominal voltage or the var regulator set point, until the input is deactivated. When the input is deactivated, the BGC will return to nominal setting. In SEMI-AUTO the input will open a new window in the display. When this window is present in the display, the offset is kept also when the input is inactive. To return to nominal settings the 'Back' button must be activated. In manual mode the input will increase the AVR output value as long as the input is active.

16. Manual AVR decrease

In AUTO mode the input will subtract an offset from the nominal voltage or the var regulator set point, until the input is deactivated. When the input is deactivated, the BGC will return to nominal setting. In SEMI-AUTO the input will open a new window in the display. When this window is present in the display, the offset is kept also when the input is inactive. To return to nominal settings the 'Back' button must be activated. In manual mode the input will decrease the AVR output value as long as the input is active.

17. External f/P set point

Activates the external f/U set point on slot #4. Can be used in island operation and fixed power mode.

18. External U/Q set point

Activates the external U/Q set point on slot #4. Can be used in island operation and fixed power mode.

19. Deload

When activated the gen-set will deload and open the breaker.

20. Parameter shift

Enables the second set of nominal settings.

21. Digital inputs 1...7 & 28...31

These inputs are configurable as alarm inputs. See protection setup for the setup of the alarm settings.

22. Access lock

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

23. Mode shift

The input activates the mode shift function. When this input is used, the menu 4441 (MB control/mode shift) is ignored.

24. GB open and block

If the GB is open when the input is activated, then it will be blocked for further operations. If the GB is closed when the input is activated, then it will be opened without any delay and subsequently be blocked from further operations. When the input is deactivated, then the GB can be closed again.

25. Start input

The input initiates the start sequence of the gen-set.

26. Stop input

The input initiates the stop sequence of the gen-set.

27. Remote GB OFF

The generator breaker OFF sequence will be initiated. If the mains breaker is opened, 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.

28. Remote GB ON

The generator breaker ON sequence will be initiated and the breaker synchronise, if the mains

breaker is closed, or close without synchronising when the mains breaker is opened.

29. Remote MB OFF

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

30. Remote MB ON

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

31. Lamp test

When the input is activated, all LEDs on the display will be illuminated.

32. Mode selection

Using two digital inputs, it is possible to change modes like the following:

Modes \ Inputs	Mode selection Input 1	Mode selection Input 2
Auto	OFF	OFF
Semi-auto	OFF	ON
Test	ON	ON



Manual mode must be selected with another digital input.

33. Enable black busbar closing

When the input is high, then direct closing on the black busbar is possible. If the input is low, then the GB or MB will close depending on the measured voltage:

Measured voltage level	Action
$>60\% \times U_{NOM}$	Synchronise breaker
$<60\% \times U_{NOM}$	No closing of breaker

34. Auto

Changes the present running mode to auto.

35. Semi-auto

Changes the present running mode to semi-auto.

36. Test

Changes the present running mode to test.

37. Manual

Changes the present running mode to manual.

38. Low speed (idle run)

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



The governor must be prepared for this function.

39. Temperature control

When the input is on, the gen-set will start/continue to run, and the stop is not possible. It will run at the nominal speed, if the low speed input above is low, and it will run at the idle speed when the low speed input is high.

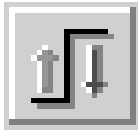
40. Reset analogue governor

When the input reset analogue governor is on, the analogue value present on the output analogue governor (term. 65 and 66) and AVR output (term. 63 and 64) is reset to the value analogue governor offset (2220) and analogue AVR offset (2210).

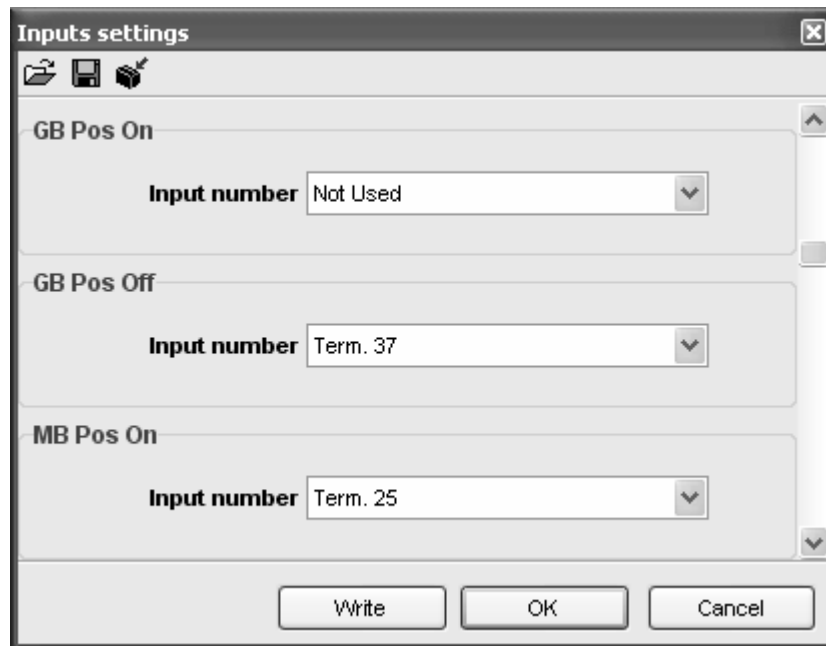
Configuration

The digital inputs are configured via the utility software.

Select the inputs icon in the horizontal toolbar.



The desired number can now be selected for the selected input function.



VDO inputs

There are three VDO inputs in the BGC. The inputs have different functions due to the hardware design being able to cover several VDO types.

- VDO input 1: Oil pressure
- VDO input 2: Cooling water temperature
- VDO input 3: Fuel level sensor

VDO input 1

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

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



The configurable type is configurable with 8 points.

Level switch type

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

VDO input 2

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

	VDO sensor type			
Temperature	Type 1	Type 2	Type 3	Type
$^{\circ}\text{C}$	Ω	Ω	Ω	Ω
40	291.5	480.7	69.3	Configurable
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.

Level switch type

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

VDO input 3

This VDO input is used for the fuel level sensor.

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

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

	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.

VDO usage

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

VDO input 1: Lubricating oil pressure – alarm settings in menus 1350/1360

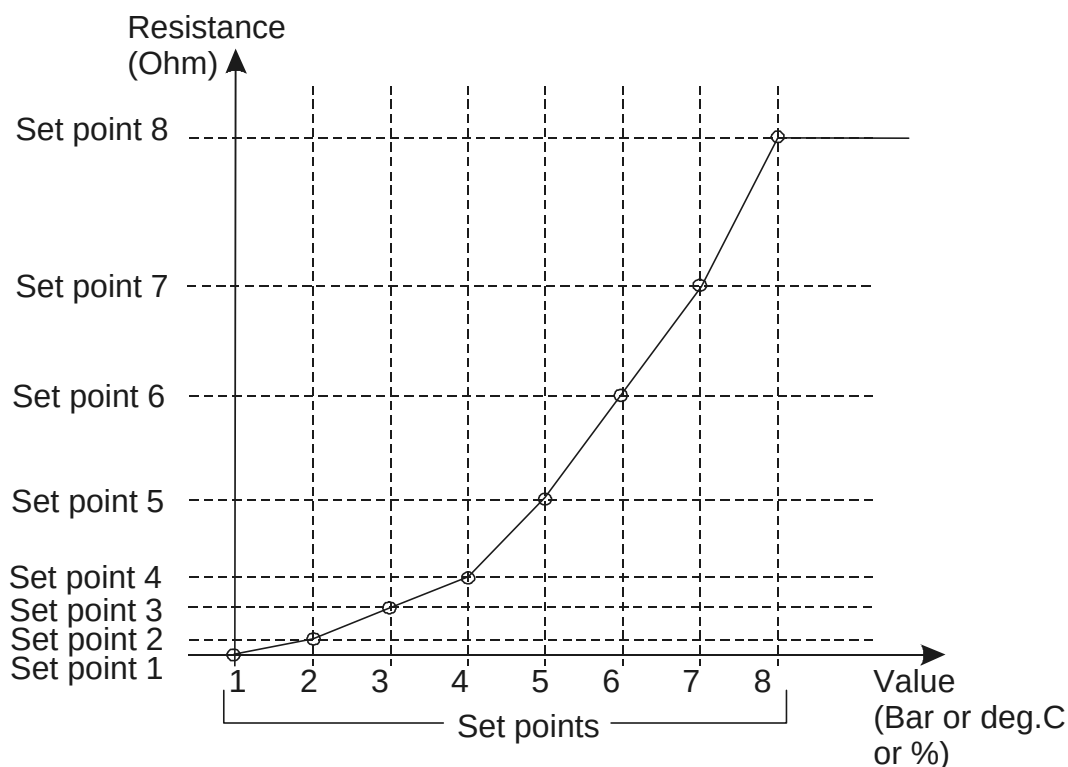
VDO input 2: Cooling water temperature – alarm settings in menu 1370/1380

VDO input 3: Fuel level switch – alarm settings in menu 1390/1410/1490

In addition, the VDO input 3 is also used for the fuel logic function. See chapter about fuel logic (page 62).

Illustration of configurable inputs

Curve:



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 in both the display and the PC utility software.

Governor and AVR manual regulation window

This function can be activated by pressing the arrow down button more than 2 seconds, or by activating the increase/decrease governor/AVR inputs in semi-auto mode. The intention of this function is to give the technician commissioning the gen-set an extra helpful tool.

The function of the window depends on the selected mode:

G	0	0	0V
P-Q Setp		100%	100%
P-Q Reg.		50%	60%
		<u>GOV.</u>	AVR

AUTO, SEMI-AUTO and TEST:

When the window is displayed, 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, it will be the active or reactive nominal power set point value that is changed. If it is a stand-alone gen-set not parallel to the mains it will be the nominal frequency or voltage set point that is changed and also displayed. When the 'Back' button is activated, the BGC will return to V3 display view. When the window is left, the BGC returns to nominal settings.

Manual:

In manual mode the regulation is deactivated. When activating the up and 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 increase/decrease GOV/AVR when the window is open. If the window is not open, the function is only accessible by the before-mentioned digital inputs.



This function is option dependent. If a G option is activated, GOV set point manipulation is possible. If a D option is activated, AVR set point manipulation is possible.

Input function selection

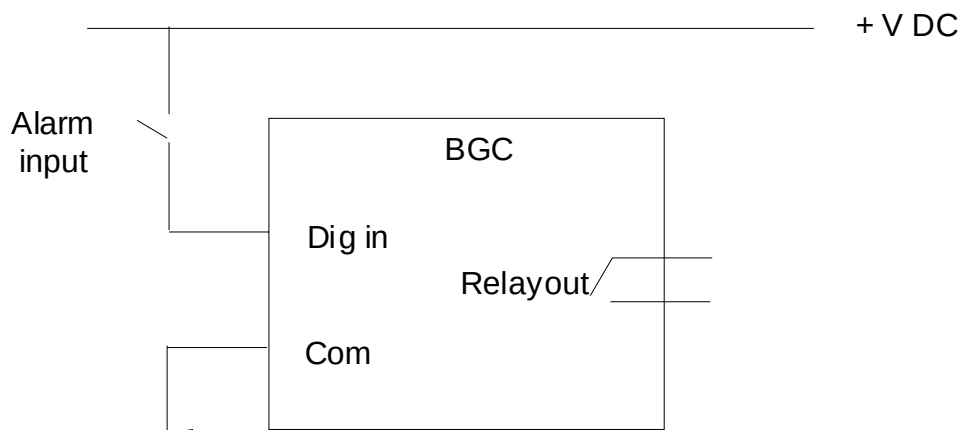
Digital input alarms can be configured with a possibility to select when the alarm is to be activated. The possible selections of the input function are normally open or normally closed.

The drawing below illustrates a digital input used as an alarm input. The input can be configured to activate the relay output in one of two ways:

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 circuit).



Fail class

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

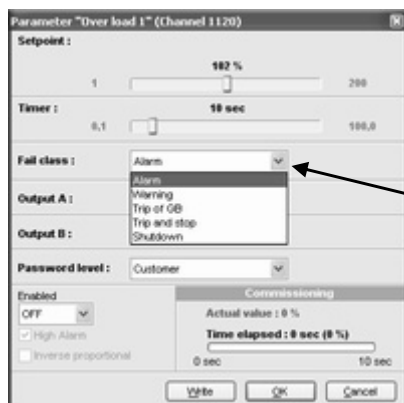
6 different fail classes can be used:

Fail class	Action							
	Alarm horn relay	Alarm display	Block engine start	Deload	Trip of gen. breaker	Stop generator	Shut-down	Trip of MB
1 Alarm	X	X	X					
2 Warning	X	X						
3 Trip of GB	X	X			X			
4 Trip and stop	X	X		X	X	X		
5 Shut down	X	X			X		X	
6 Trip of MB	X	X						X

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.



This is a dialog box for parameter setup of alarm set points.

The fail class roll-down panel is activated, and the user wants to select the 'trip and stop' fail class.

Nominal values

Two sets of nominal values can be configured in the BGC. The purpose of this function is to be able to use the gen-set on different sites where different values are needed. This could for instance be the case, if the BGC is installed in a rental gen-set that has to be able to operate at both 50Hz and 60Hz.

The following values have two set points:

Value	Menu SP1	Menu SP2
Frequency	4011	4021
Power	4012	4022
Current	4013	4023
Voltage	4014	4024
Tacho	1421	1431

To activate the second set of nominal values, the parameter shift input must be activated. The input is configured via the utility software (see chapter about inputs selection page 58).

Tacho alarm

When the second set point is used, the following settings are valid:

	Tacho SP1	Tacho SP2
Set point	1421	1431
Timer	1422	1422
Output A	1423	1423
Output B	1424	1424
Enable	1425	1425
Fail class	1426	1426

As indicated in the table, only the set point changes its menu.

Service timers

The BGC is able to monitor two different maintenance intervals. The menus can be reached using the JUMP push-button, and not via the setup menu system.

4910 – Service timer 1

4920 – Service timer 2

Both timers operate on either

1. Running hours or
2. Elapsed time

When the adjusted time expires, the BGC will display an alarm. Activating the alarm acknowledge resets this alarm.

When acknowledging the alarm, the timers will be reset, and a new service timer alarm will only reoccur after the adjusted time has elapsed.

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



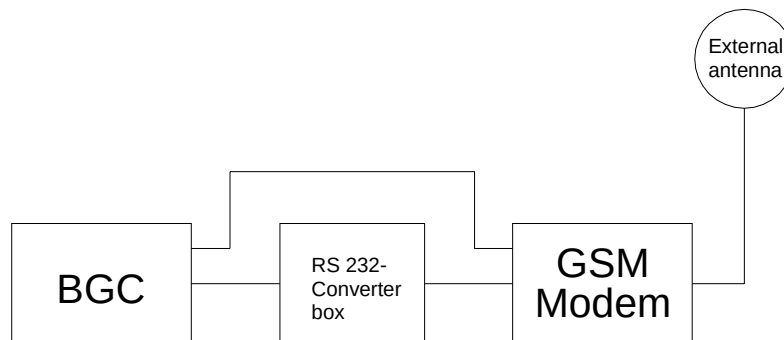
The service timer 2 is not deleted when downloading new software and parameters.

GSM communication

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

This section will include wiring diagrams for a BGC 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



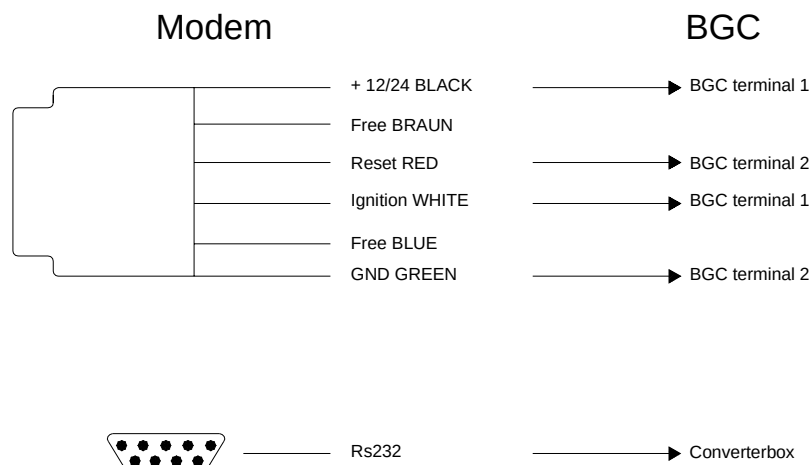
DEIF A/S recommends the use of a Siemens MC35 terminal, as the application has been tested with this terminal.

Serial connection

The serial connection to the GSM modem is via the RS-232 converter box (option J5). The converter box is connected to the GSM modem via an RS-232 cable (standard in J5).

Other wirings

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



Basic parameter settings

Setting no.	Name	Function	Set to
4790	GSM PIN code	Set PIN code for GSM modem	None
5111	12345678901	Set phone no. for SMS to cellular phone 1	None
5121	12345678901	Set phone no. for SMS to cellular phone 2	None
5131	12345678901	Set phone no. for SMS to cellular phone 3	None
5141	12345678901	Set phone no. for SMS to cellular phone 4	None
5151	12345678901	Set phone no. for SMS to cellular phone 5	None



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

PIN code configuration

After each auxiliary supply power up, the BGC will send the required PIN code to the modem, if this is needed. The PIN code is adjusted in the system setup menu (menu 4790).

USW communication

It is possible to communicate with the BGC through the utility software. The purpose of that is to be able to monitor and control the gen-set application.

Serial connection

The serial connection to the GSM modem is via the RS-232 converter box (option J5). The converter box is connected to the GSM modem via an RS-232 cable (standard in J5).

BGC setup

Change the modbus protocol type from RTU to ASCII. This is done in menu 6020. This menu can only be reached using the JUMP push-button. When selected to 1, the ASCII protocol type is used, and the BGC allows for the slower modem communication.

6020 Service port

No.	Setting	Min. setting	Max. setting	Factory setting
6020	Service port	0 (normal USW)	1 (modem USW)	0 (normal USW)



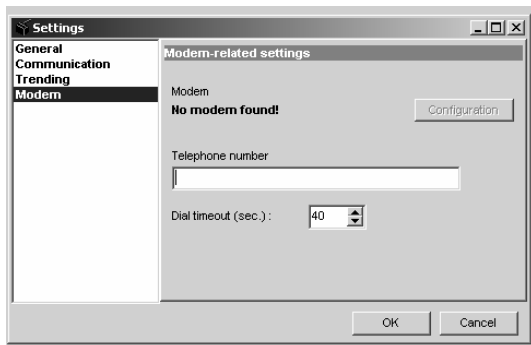
If the setting 6020 is adjusted to 1, the PC utility software cannot communicate with the BGC when the BGC is connected directly to the PC, and a modem is not used.

Application settings push-button

Enter the telephone number to the modem you want to dial up to, using the application settings tool.



Settings dialog box:



Safety

If the communication fails, the BGC 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 BGC will use these actual data.

Short circuit alarms

In addition to the standard overcurrent alarms two extra alarms can be used, if option C1 is selected.

- *Short circuit 1* *Menu 1290*
- *Short circuit 2* *Menu 1300*

The alarms can be used to detect a high overcurrent in the range interval 50...350%. The accuracy of the short circuit measurements is 10%. The accuracy is worse than 1%, because the measuring principle is different from the standard overcurrent measurement. The short circuit measurement is only used for the short circuit protection. The currents indicated as measurements in the display and the communications are measured by the standard overcurrent measuring circuit.

FUEL pump logic

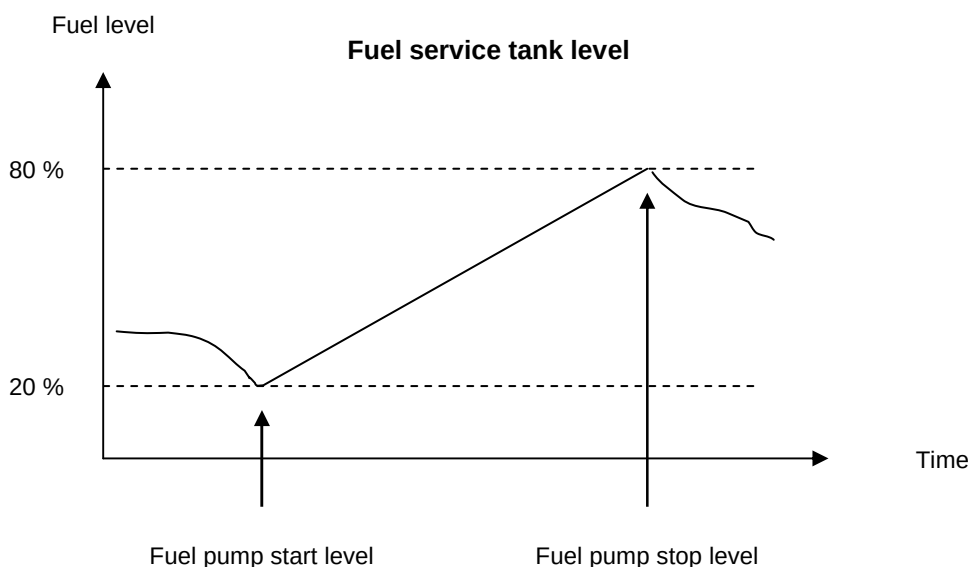
The fuel pump logic is used to start and stop the fuel supply pump to maintain the fuel level in the service tank at predefined levels. The start and stop limits are detected from the VDO input no. 3, terminals 23/36.

- Start level, factory setting at 20% (S2 – menu 1401)
- Stop level, factory setting at 80% (S3 – menu 1402)

Fuel pump relay function

The fuel pump relay is a NO relay and is by default configured to relay 1. This configuration cannot be changed. If other alarm functions have been configured to relay 1, and the fuel logic is being activated, then a *relay channel error* alarm occurs.

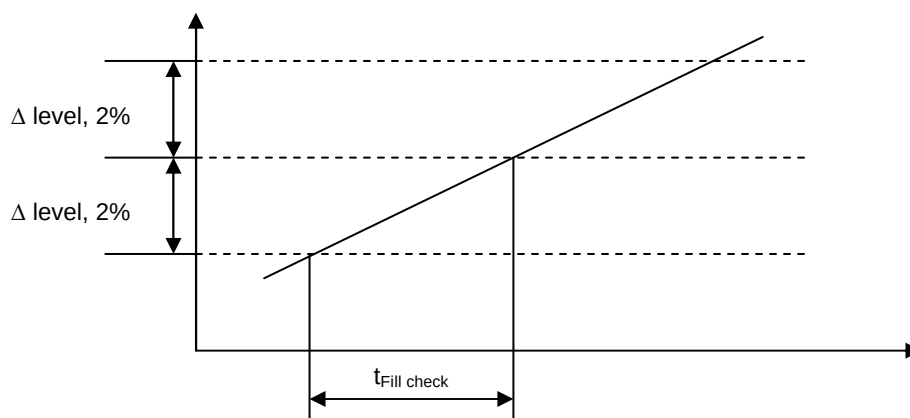
- Start level, relay 1 activates
- Stop level, relay 1 deactivates



Fuel fill check

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

When the fuel pump is running, the fuel level must increase with 2% within the *fuel fill check* timer. This timer is adjusted in menu 1405, but the level of increase cannot be changed. 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.



Mode selection

The mode selection in the BGC can be done from the display or using digital inputs. Mode selection from the display is described on page 33.

If digital inputs are used, there are two possibilities.

Individual inputs

Individual inputs can be configured to change mode to a specific mode like in the table below.

Terminal number	Function
37	Auto
38	Semi-auto
39	Test
40	Manual



The indicated terminal numbers are just examples. Selection of options, breakers and other applicational requirements determine the actual number of available terminals.

Combined inputs

A mix between two inputs can be used to change the modes as follows:

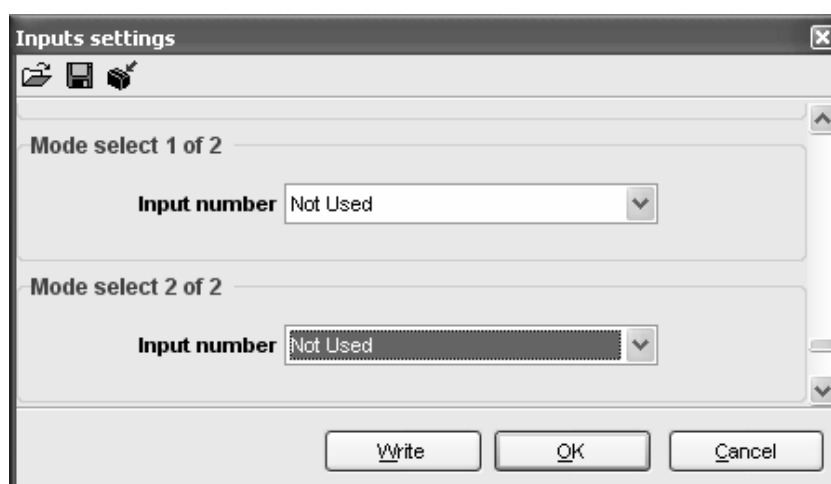
Modes \ Inputs	Mode selection Input 1	Mode selection Input 2
Auto	OFF	OFF
Semi-auto	OFF	ON
Test	ON	ON



Manual mode must be selected with an individual digital input.

Selection of inputs

In the utility software the inputs used for this function are called 'Mode select 1 of 2' and 'Mode select 2 of 2'.



Lamp test

The BGC includes a lamp test function.

When the BGC is powered up, the lamp test function activates. It is also possible to use a digital input, if it is required to make a lamp test function at regular intervals. The input must be configured through the utility software.

The lamp test lasts 3 seconds.

Breaker types

There are three possible selections for the setting of breaker type for both mains breaker and generator breaker. This is set in the parameters 2201 and 2202.

Continuous:

This type of signal is most often used combined with a contactor. When using this type of signal, the BGC will only use the close breaker relays. The relay will be closed for closing of the contactor and will be opened for opening of the contactor. The open relay can be used for other purposes.

Pulse:

This type of signal is most often used combined with circuit breaker. With the setting pulse the BGC will use the close command and the open command relay. The close breaker relay will close for a short time for closure of the circuit breaker. The open breaker relay will close for a short time for opening of the breaker.

Compact:

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

M-logic

M-logic functionality is included in units with software versions 2.00.0 and forward. It is not an option dependent function, but selecting additional options such as option M12, which offers additional digital inputs and outputs, can increase the functionality.

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

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



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

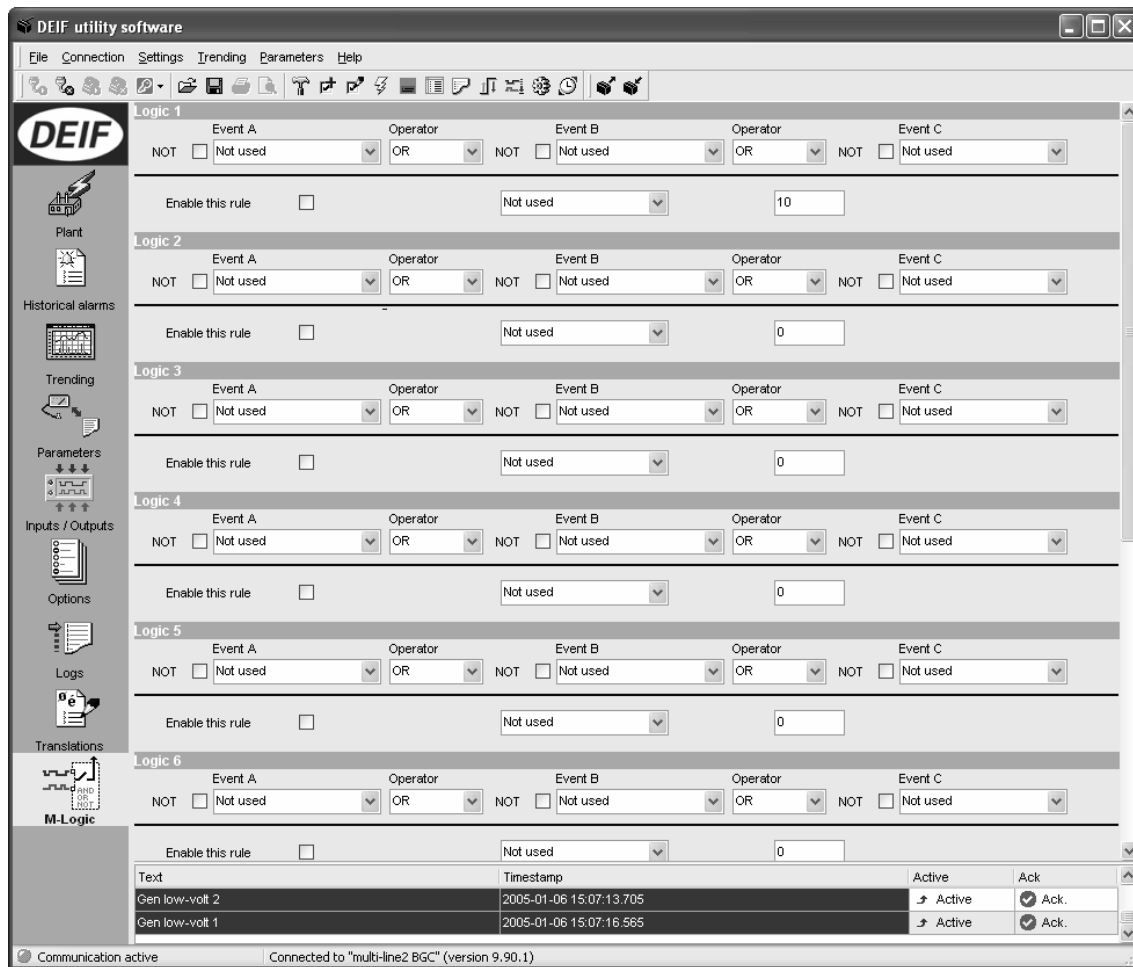


The M-logic icon is not active as default – 'Alt + F1' activates M-logic.

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

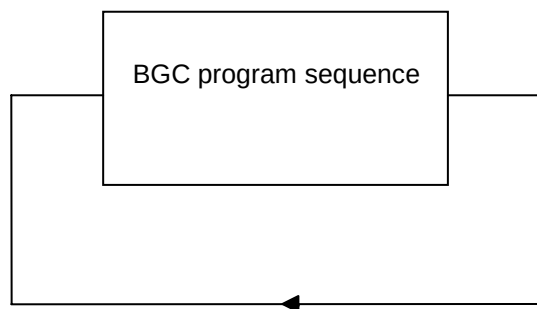
Programming

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

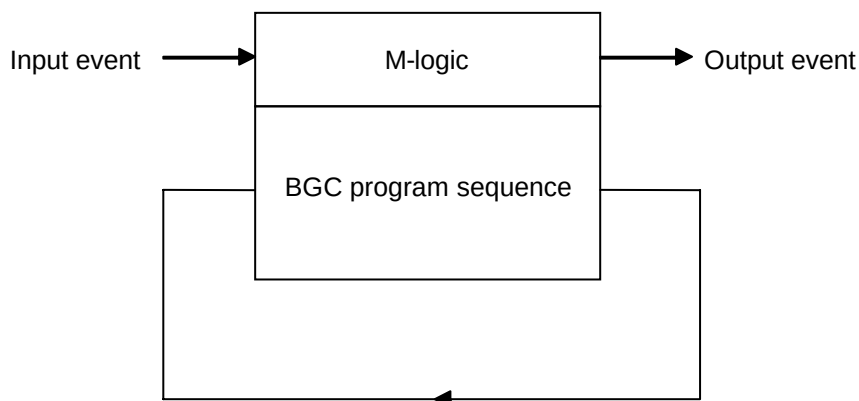


Description overview

This diagram illustrates the program sequence without the M-logic function enabled.



The diagram on the next page illustrates the program sequence with the M-logic function enabled – M-logic is part of the program sequence.



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

Idle run

The purpose of the idle run function is to change the start and stop sequences.

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 the other 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 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 menus 4961-4966. 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.



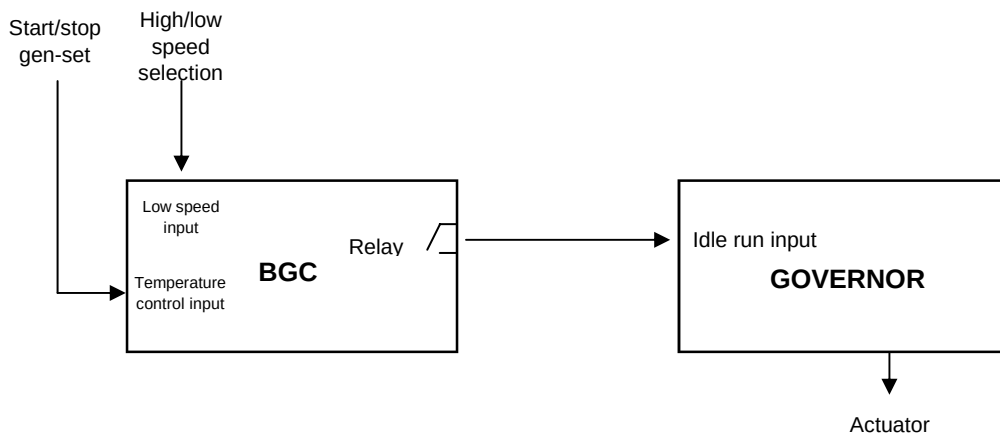
The input must be configured through the PC software at commissioning.



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.

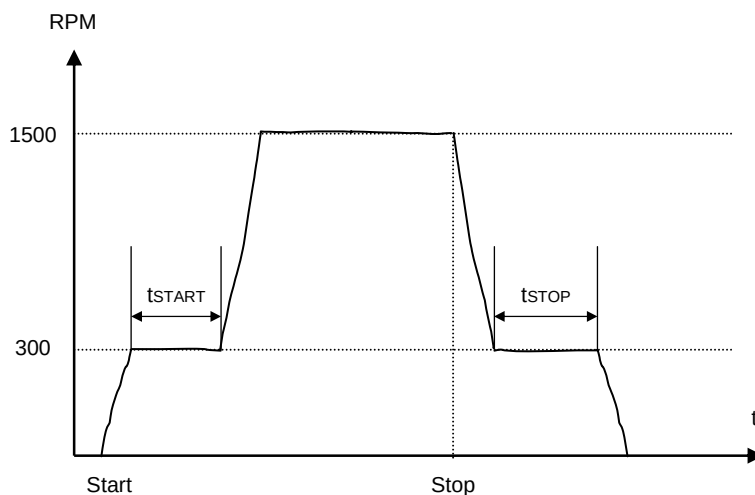


Examples

Idle speed during starting and stopping

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

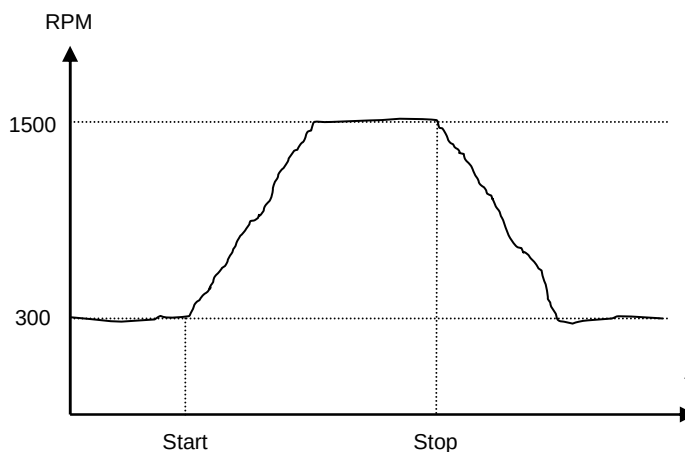
The start and stop sequences are changed in order to let the gen-set stay at the idle level before speeding up. It also decreases the speed to the idle level for a specified delay time before stopping.



Idle speed, no stopping

(In this example both timers are deactivated).

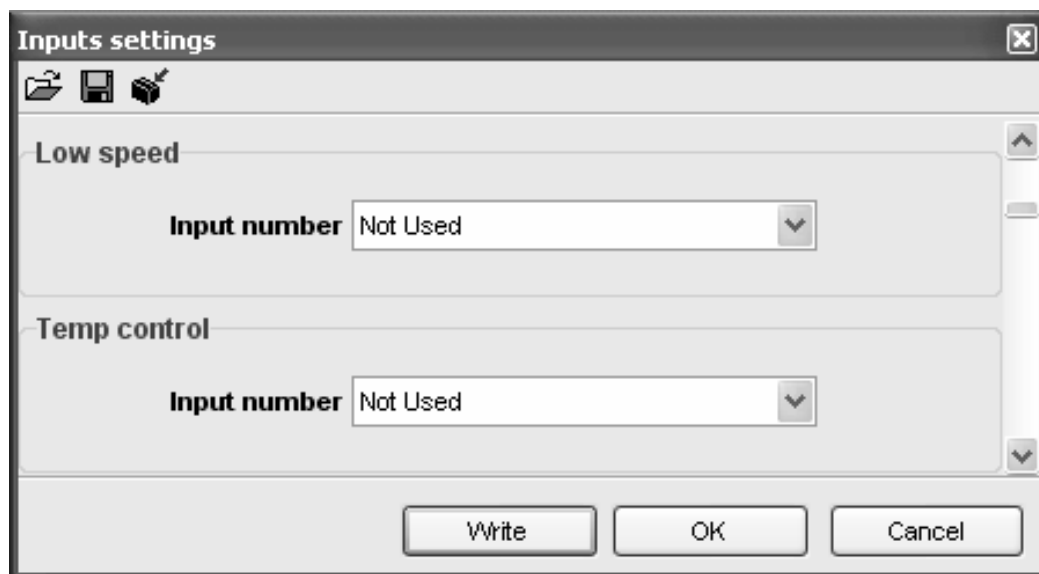
If the gen-set is to be prevented from stopping, then the digital input 'temp. control' must be left ON at all times. In that case the characteristic looks like this:



Emergency stop and shutdown protections are still active and will shut down the gen-set.

Configuration of digital input

The digital input is configured via the PC software.



Inhibit

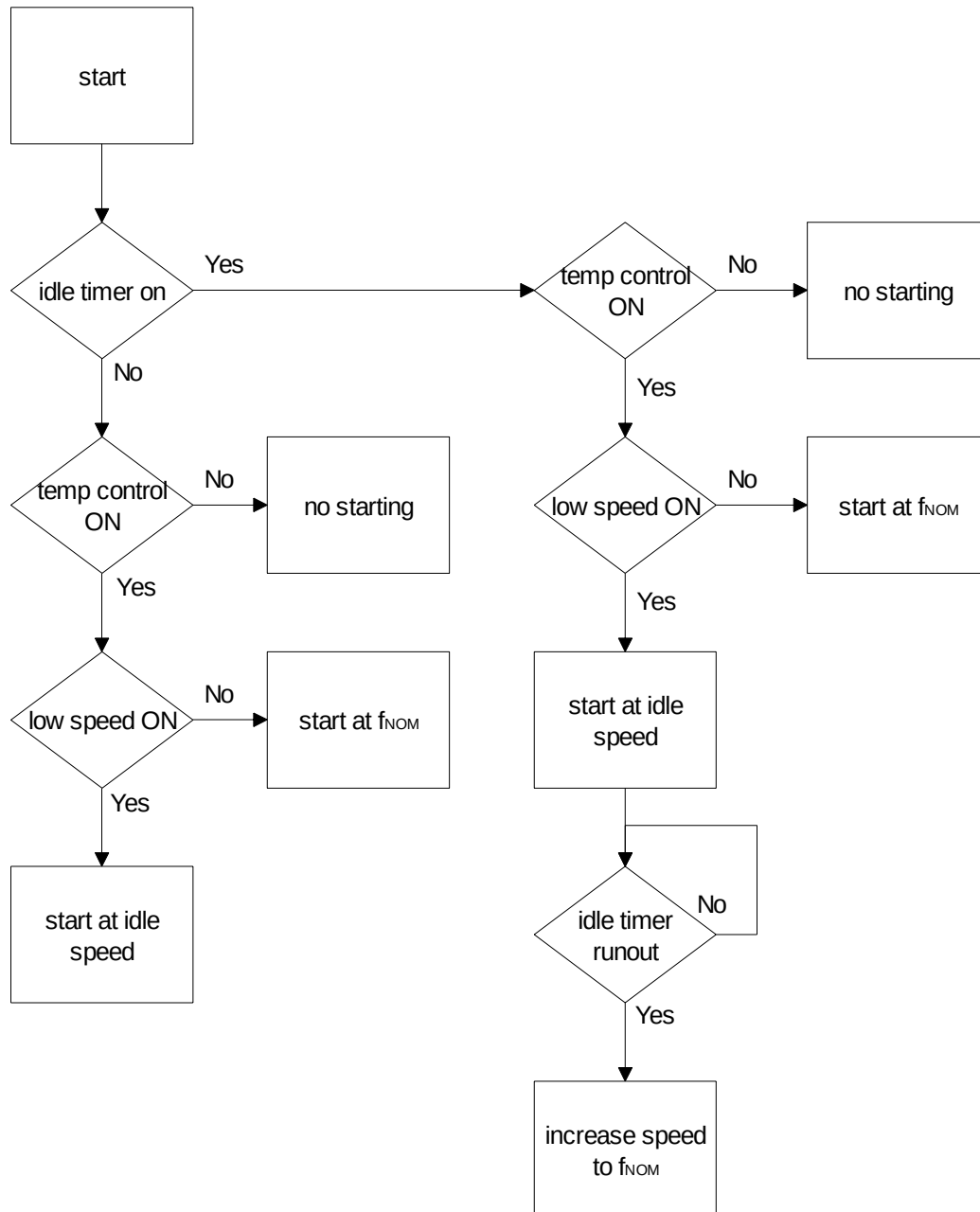
The alarms with run status are inhibited as usual, except for the oil pressure alarm, i.e. VDO 1 (terminal 22).

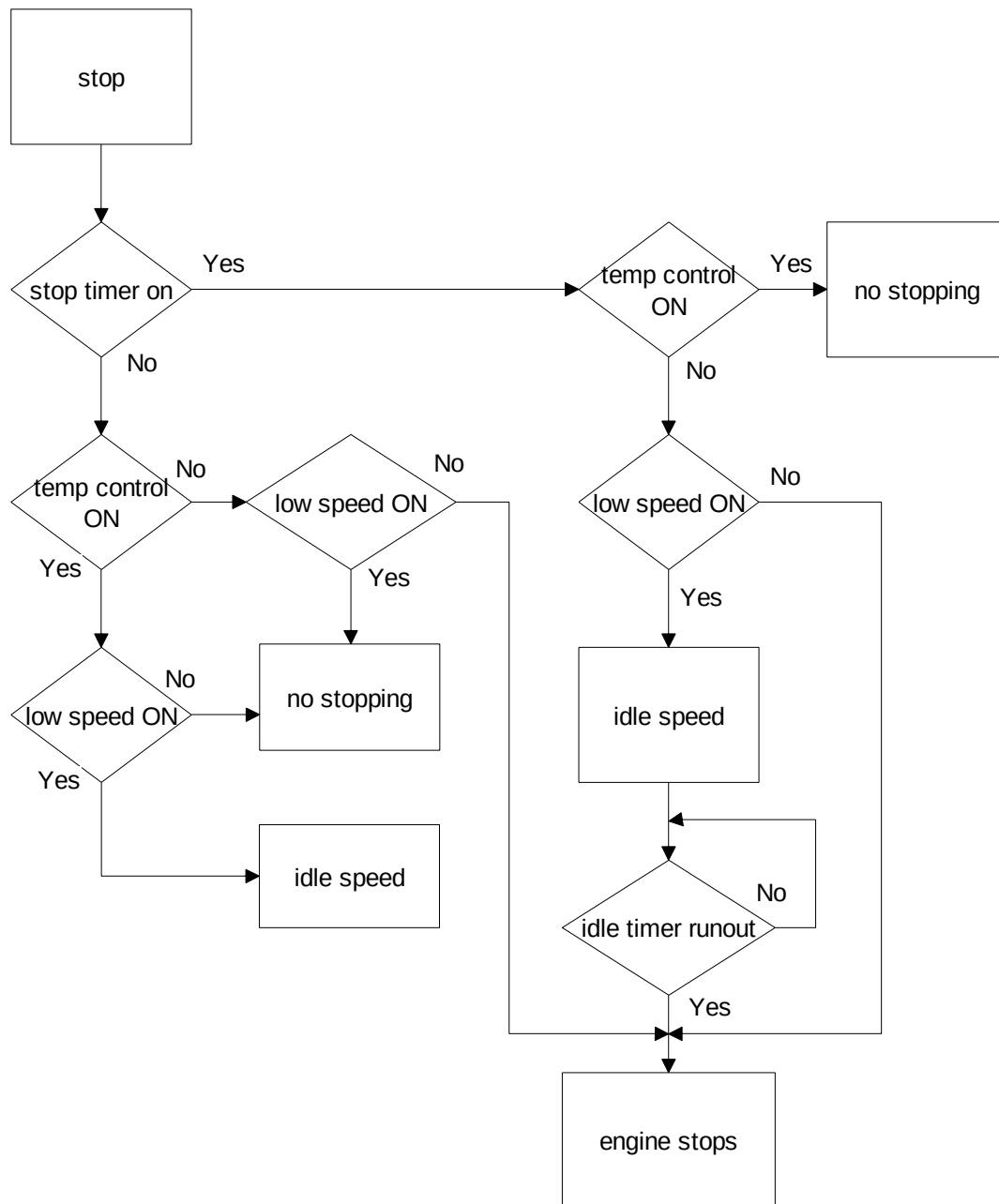
Running signal

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

Idle speed flowcharts

The flowcharts on the next pages illustrate the starting and stopping of the gen-set by use of the inputs 'Temp. control' and 'Low speed'.

Start

Stop

Alarm auto reset

The auto acknowledge function can be set to an individual alarm by marking the check box 'Auto acknowledge' in the utility software. This means that the alarms appear like normal, but they will be in an acknowledged state. As soon as the alarm situation disappears, the display message will also be cleared.

Parameter "Reverse power" (Channel 1090)

Setpoint : -50 -5 % 0

Timer : 0,1 10 sec 100,0

Fail class : Trip and stop

Output A : Output 0

Output B : Output 0

Password level : Customer

Enabled
☒ ON
☐ High Alarm
☐ Inverse proportional
☐ Cable supervision
☐ Auto acknowledge
☐ Custom inhibit

Commissioning
Actual value
Actual timer value
0 sec 10 sec

Write OK Cancel

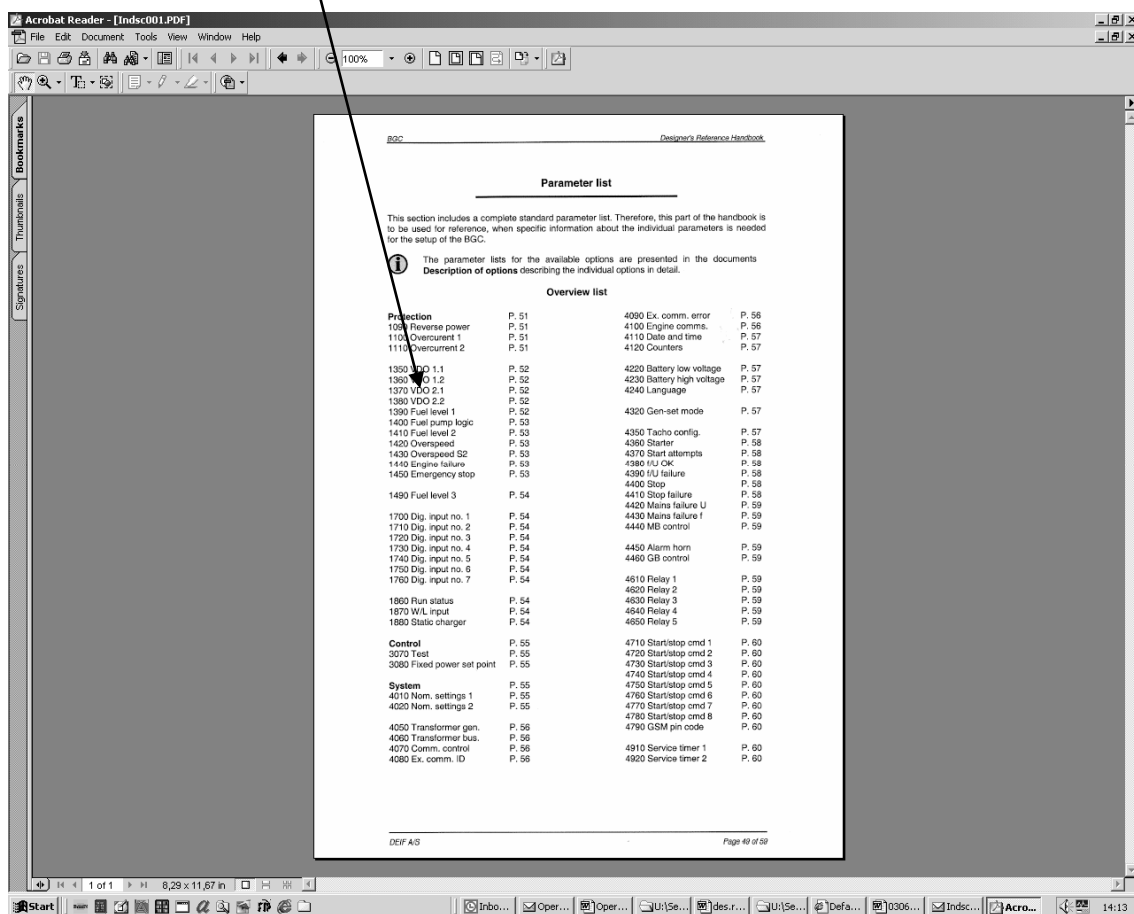
7. Procedure for parameter setup

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 the chapter called '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 75.



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

Parameter descriptions

In the chapter 'Parameter list' 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:

Channel number indicated in display

Parameter title and channel number

Changeable settings indicated in display

Min. - max. set points

Default set point from factory

1490 VDO input – Fuel level 3

No.	Setting		Min. setting	Max. setting	Factory setting
1491	Fuel level 3	Set point	0.0 bar	10.0 bar	4.0 bar
1492	Fuel level 3	Delay	0.0 s	100.0 s	5.0 s
1493	Fuel level 3	Output A	R0 (none)	R3 (relay 3)	R0 (none)
1494	Fuel level 3	Output B	R0 (none)	R3 (relay 3)	R0 (none)
1495	Fuel level 3	Enable	OFF	ON	OFF
1496	Fuel level 3	Fail class	1	5	2



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

The first column indicates the channel 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 fourth 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 **1490 VDO input – Fuel level 3**)

- 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 JUMP or   push-buttons to locate the selected parameter
- Step 4: Enter the 'set point' menu via LIM in the fourth display line
- Step 5: Enter password to change the set point
- Step 6: Use   push-buttons to increase/decrease the set point setting
- Step 7: Use the 'underscore' to save the new set point setting

8. 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 setup of the BGC.



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

Overview list

Protection	P. 76	4100 Engine comms.	P. 82
1090 Reverse power	P. 76	4110 Date and time	P. 82
1100 Overcurrent 1	P. 76	4120 Counters	P. 82
1110 Overcurrent 2	P. 76		
1350 VDO input 1.1	P. 77	4220 Battery low voltage	P. 82
1360 VDO input 1.2	P. 77	4230 Battery high voltage	P. 82
1370 VDO input 2.1	P. 77	4240 Language	P. 82
1380 VDO input 2.2	P. 77		
1390 VDO in. - Fuel level 1	P. 78	4320 Gen-set mode	P. 83
1400 Fuel pump logic	P. 78	4350 Tacho config.	P. 83
1410 VDO in. - Fuel level 2	P. 78	4360 Starter	P. 83
1420 Overspeed	P. 78	4370 Start attempts	P. 83
1430 Overspeed S2	P. 78	4380 f/U OK	P. 83
1450 Emergency stop	P. 78	4390 f/U failure	P. 83
1490 VDO in. - Fuel level 3	P. 79	4400 Stop	P. 84
1700 Dig. input no. 1	P. 79	4410 Stop failure	P. 84
1710 Dig. input no. 2	P. 79	4420 Mains failure U	P. 84
1720 Dig. input no. 3	P. 79	4430 Mains failure f	P. 84
1730 Dig. input no. 4	P. 79	4440 MB control	P. 84
1740 Dig. input no. 5	P. 79	4450 Alarm setup	P. 85
1750 Dig. input no. 6	P. 79	4460 GB control	P. 85
1760 Dig. input no. 7	P. 79		
1860 Run status	P. 79	4610 Relay 1	P. 85
1960 Dig. input no. 28	P. 79	4620 Relay 2	P. 85
1970 Dig. input no. 29	P. 79	4630 Relay 3	P. 85
1980 Dig. input no. 30	P. 79		
1990 Dig. input no. 31	P. 79	4710 Start/stop cmd 1	P. 85
		4720 Start/stop cmd 2	P. 85
Control	P. 79	4730 Start/stop cmd 3	P. 85
2050 Sync. blackout	P. 79	4740 Start/stop cmd 4	P. 85
2200 Breaker type	P. 80	4750 Start/stop cmd 5	P. 85
		4760 Start/stop cmd 6	P. 85
Power	P. 80	4770 Start/stop cmd 7	P. 85
3070 Test	P. 80	4780 Start/stop cmd 8	P. 85
3080 Fixed power set point	P. 80	4790 GSM pin code	P. 85
System	P. 80	4900 Block mode	P. 86
4010 Nom. settings 1	P. 80	4910 Service timer 1	P. 86
4020 Nom. settings 2	P. 80	4920 Service timer 2	P. 86
4030 Relay indication	P. 80	4950 Operation mode	P. 86
4040 Voltage trip	P. 80	4960 Idle	P. 86
4050 Transformer gen.	P. 81	4970 Password	P. 86
4060 Transformer BUS	P. 81		
4070 Comm. control	P. 81	5010 VDO 1 config. sensor	P. 87
4080 Ex. comm. ID	P. 81	5030 VDO 2 config. sensor	P. 87
4090 Ex. comm. error	P. 81	5050 VDO 3 config. sensor	P. 87

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.

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

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

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

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

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

Protection

1090 Reverse power

No.	Setting		Min. setting	Max. setting	Third setting	Factory setting
1091	Reverse power	Set point	-50.0%	0.0%	-	-5.0%
1092	Reverse power	Timer	0.1 s	100.0 s	-	10.0 s
1093	Reverse power	Relay output A	R0 (none)	R3 (relay 3)	-	R0 (none)
1094	Reverse power	Relay output B	R0 (none)	R3 (relay 3)	-	R0 (none)
1095	Reverse power	Enable	OFF	ON	RUN	ON
1096	Reverse power	Fail class	1 Alarm	6 Trip MB	-	3 Trip GB

1100 Overcurrent 1

No.	Setting		Min. setting	Max. setting	Third setting	Factory setting
1101	Overcurrent 1	Set point	50.0%	200.0%	-	110.0%
1102	Overcurrent 1	Timer	0.1 s	999.9 s	-	10.0 s
1103	Overcurrent 1	Relay output A	R0 (none)	R3 (relay 3)	-	R0 (none)
1104	Overcurrent 1	Relay output B	R0 (none)	R3 (relay 3)	-	R0 (none)
1105	Overcurrent 1	Enable	OFF	ON	RUN	ON
1106	Overcurrent 1	Fail class	1 Alarm	6 Trip MB	-	2 Warning

1110 Overcurrent 2

No.	Setting		Min. setting	Max. setting	Third setting	Factory setting
1111	Overcurrent 2	Set point	50.0%	200.0%	-	120.0%
1112	Overcurrent 2	Timer	0.1 s	999.9 s	-	5.0 s
1113	Overcurrent 2	Relay output A	R0 (none)	R3 (relay 3)	-	R0 (none)
1114	Overcurrent 2	Relay output B	R0 (none)	R3 (relay 3)	-	R0 (none)
1115	Overcurrent 2	Enable	OFF	ON	RUN	ON
1116	Overcurrent 2	Fail class	1 Alarm	6 Trip MB	-	3 Trip GB

1350 VDO input 1.1

No.	Setting		Min. setting	Max. setting	Factory setting
1351	VDO 1.1	Set point	0.0 bar	10.0 bar	4.0 bar
1352	VDO 1.1	Delay	0.0 s	100.0 s	5.0 s
1353	VDO 1.1	Output A	R0 (none)	R3 (relay 3)	R0 (none)
1354	VDO 1.1	Output B	R0 (none)	R3 (relay 3)	R0 (none)
1355	VDO 1.1	Enable	OFF	ON	RUN
1356	VDO 1.1	Fail class	1 Alarm	6 Trip MB	5 Shut down
1357	VDO 1.1	Sensor type	0	3 Config.	0



The parameter 1357 is only accessible from the utility software.

1360 VDO input 1.2

No.	Setting		Min. setting	Max. setting	Factory setting
1361	VDO 1.2	Set point	0.0 bar	10.0 bar	5.0 bar
1362	VDO 1.2	Delay	0.0 s	100.0 s	5.0 s
1363	VDO 1.2	Output A	R0 (none)	R3 (relay 3)	R0 (none)
1364	VDO 1.2	Output B	R0 (none)	R3 (relay 3)	R0 (none)
1365	VDO 1.2	Enable	OFF	ON	RUN
1366	VDO 1.2	Fail class	1 Alarm	6 Trip MB	2 Warning

1370 VDO input 2.1

No.	Setting		Min. setting	Max. setting	Factory setting
1371	VDO 2.1	Set point	40 deg.	150 deg.	100 deg.
1372	VDO 2.1	Delay	0.0 s	100.0 s	5.0 s
1373	VDO 2.1	Output A	R0 (none)	R3 (relay 3)	R0 (none)
1374	VDO 2.1	Output B	R0 (none)	R3 (relay 3)	R0 (none)
1375	VDO 2.1	Enable	OFF	ON	ON
1376	VDO 2.1	Fail class	1 Alarm	6 Trip MB	2 Warning
1377	VDO 2.1	Sensor type	0	4 Config.	0



The parameter 1377 is only accessible from the utility software.

1380 VDO input 2.2

No.	Setting		Min. setting	Max. setting	Factory setting
1381	VDO 2.2	Set point	40 deg.	150 deg.	110 deg.
1382	VDO 2.2	Delay	0.0 s	100.0 s	5.0 s
1383	VDO 2.2	Output A	R0 (none)	R3 (relay 3)	R0 (none)
1384	VDO 2.2	Output B	R0 (none)	R3 (relay 3)	R0 (none)
1385	VDO 2.2	Enable	OFF	ON	OFF
1386	VDO 2.2	Fail class	1 Alarm	6 Trip MB	5 Shut down

1390 VDO input – Fuel level 1

No.	Setting		Min. setting	Max. setting	Factory setting
1391	Fuel level 1	Set point	0%	100%	10%
1392	Fuel level 1	Delay	0.0 s	100.0 s	5.0 s
1393	Fuel level 1	Output A	R0 (none)	R3 (relay 3)	R0 (none)
1394	Fuel level 1	Output B	R0 (none)	R3 (relay 3)	R0 (none)
1395	Fuel level 1	Enable	OFF	ON	ON
1396	Fuel level 1	Fail class	1 Alarm	6 Trip MB	2 Warning
1397	Fuel level 1	Sensor type	0	2 Config.	1



The parameter 1397 is only accessible from the utility software.

1400 Fuel pump logic

No.	Setting		Min. setting	Max. setting	Factory setting
1401	Fuel pump logic	Set point 1	0%	100%	20%
1402	Fuel pump logic	Set point 2	0%	100%	80%
1403	Fuel pump logic	Output A	R1 (relay 1)	R1 (relay 1)	R1 (relay 1)
1404	Fuel pump logic	Enable	OFF	ON	OFF
1405	Fuel pump logic	Timer	0.1 s	300.0 s	60.0 s

1410 VDO input – Fuel level 2

No.	Setting		Min. setting	Max. setting	Factory setting
1411	Fuel level 2	Set point	0%	100%	99%
1412	Fuel level 2	Delay	0.0 s	100.0 s	5.0 s
1413	Fuel level 2	Output A	R0 (none)	R3 (relay 3)	R0 (none)
1414	Fuel level 2	Output B	R0 (none)	R3 (relay 3)	R0 (none)
1415	Fuel level 2	Enable	OFF	ON	OFF
1416	Fuel level 2	Fail class	1 Alarm	6 Trip MB	2 Warning

1420 Overspeed

No.	Setting		Min. setting	Max. setting	Third setting	Factory setting
1421	Overspeed	Set point	1 RPM	4500 RPM	-	1600 RPM
1422	Overspeed	Timer	0.2 s	100.0 s	-	10.0 s
1423	Overspeed	Relay output A	R0 (none)	R3 (relay 3)	-	R0 (none)
1424	Overspeed	Relay output B	R0 (none)	R3 (relay 3)	-	R0 (none)
1425	Overspeed	Enable	OFF	ON	RUN	OFF
1426	Overspeed	Fail class	1 Alarm	6 Trip MB	-	5 Shut down

1430 Overspeed S2

No.	Setting		Min. setting	Max. setting	Third setting	Factory setting
1431	Overspeed	Set point	1 RPM	4500 RPM	-	1600 RPM

Overspeed S2 is used, if the second set of nominal values is selected.

1450 Emergency stop

No.	Setting		Min. setting	Max. setting	Factory setting
1451	Emergency STOP	Relay output A	R0 (none)	R3 (relay 3)	R0 (none)
1452	Emergency STOP	Relay output B	R0 (none)	R3 (relay 3)	R0 (none)
1453	Emergency STOP	Enable	OFF	ON	ON
1454	Emergency STOP	Fail class	1 Alarm	6 Trip MB	5 Shut down
1455	Emergency STOP	Normal open/close	NC	NO	NO

1490 VDO input – Fuel level 3

No.	Setting		Min. setting	Max. setting	Factory setting
1491	Fuel level 3	Set point	0%	100%	10%
1492	Fuel level 3	Delay	0.0 s	100.0 s	10.0 s
1493	Fuel level 3	Output A	R0 (none)	R3 (relay 3)	R0 (none)
1494	Fuel level 3	Output B	R0 (none)	R3 (relay 3)	R0 (none)
1495	Fuel level 3	Enable	OFF	ON	OFF
1496	Fuel level 3	Fail class	1 Alarm	6 Trip MB	2 Warning

1700-1760 Digital input No1 – No7, Mainboard

No.	Setting		Min. setting	Max. setting	Third setting	Factory setting
17X1	Dig. input no.	Timer	0.0 s	100.0 s	-	10.0 s
17X2	Dig. input no.	Relay output A	R0 (none)	R3 (relay 3)	-	R0 (none)
17X3	Dig. input no.	Relay output B	R0 (none)	R3 (relay 3)	-	R0 (none)
17X4	Dig. input no.	Enable	OFF	ON	RUN	OFF
17X5	Dig. input no.	Fail class	1 Alarm	6 Trip MB	-	2 Warning
17X6	Dig. input no.	NO/NC	NO	NC		NO

1860 Run status

No.	Setting		Min. setting	Max. setting	Factory setting
1861	Run status	Timer	0.0 s	60.0 s	5.0 s
1862	Run status	Relay output A	R0 (none)	R3 (relay 3)	R0 (none)
1863	Run status	Relay output B	R0 (none)	R3 (relay 3)	R0 (none)
1864	Run status	Enable	OFF	ON	OFF

The running status detection has two purposes:

1. When the time delay period expires, all the alarms indicated above which are selected to 'RUN' will be enabled.
2. An output relay can be selected, if one is available. In that case, the settings Output A and Output B must be set according to the desired relay. Typically the function of this relay must be selected to 'Limit' function to avoid a 'RUN STATUS ALARM' when the gen-set starts. See menus 4600 and forward.

1960-1990 Digital input No28 – No31

No.	Setting		Min. setting	Max. setting	Third setting	Factory setting
19X1	Dig. input no.	Timer	0.0 s	100.0 s	-	10.0 s
19X2	Dig. input no.	Relay output A	R0 (none)	R3 (relay 3)	-	R0 (none)
19X3	Dig. input no.	Relay output B	R0 (none)	R3 (relay 3)	-	R0 (none)
19X4	Dig. input no.	Enable	OFF	ON	RUN	OFF
19X5	Dig. input no.	Fail class	1 Alarm	6 Trip MB	-	2 Warning
19X6	Dig. input no.	NO/NC	NO	NC		NO

Control**2050 DG f/U limits sync blackout**

No.	Setting		Min. setting	Max. setting	Factory setting
2051	DG f/U limits	df max.	0.0Hz	5.0Hz	3.0Hz
2052	DG f/U limits	dU max.	2%	10%	5%

Settings are accepted limits (generator voltage and frequency) for closing the generator breaker. The 'dU max.' setting is related to nominal generator voltage.

2200 Breaker type

No.	Setting		First setting	Second setting	Third setting	Factory setting
2201	GB type	Signal type	Pulse	Continuous	Compact	Pulse
2202	MB type	Signal type	Pulse	Continuous	Compact	Pulse

Power**3070 Test**

No.	Setting		Min. setting	Max. setting	Third setting	Factory setting
3071	Test	Set point	1%	100%	-	80%
3072	Test	Timer	0.0 s	9999.0 s	-	300.0 s
3073	Test	Test mode	Simple	Full	Parallel	Simple
3074	Test	Timer enable	Disable	Enable	-	Enable

3080 Fixed power/PF set point

No.	Setting		Min. setting	Max. setting	Factory setting
3081	Fixed power set point	P set point	0%	100%	100%
3082	Fixed power set point	PF set point	0.60	1.00	0.90

System**4010 Nominal settings 1**

No.	Setting		Min. setting	Max. setting	Factory setting
4011	Nominal settings	Frequency	48.0Hz	62.0Hz	60.0Hz
4012	Nominal settings	Generator power	10kW	20000kW	480kW
4013	Nominal settings	Generator current	0A	9000A	787A
4014	Nominal settings	Generator volt.	100V	25000V	440V

4020 Nominal settings 2

No.	Setting		Min. setting	Max. setting	Factory setting
4021	Nominal settings 2	Frequency	48.0Hz	62.0Hz	60.0Hz
4022	Nominal settings 2	Generator power	10kW	20000kW	480kW
4023	Nominal settings 2	Generator current	0A	9000A	787A
4024	Nominal settings 2	Generator volt.	100V	25000V	440V

4030 Relay indication

No.	Setting		Min. setting	Max. setting	Factory setting
4031	Relay indication	Emergency operation	R0 (none)	R3 (relay 3)	R0 (none)
4032	Relay indication	Collective fault	R0 (none)	R3 (relay 3)	R0 (none)
4033	Relay indication	Ready for operation	R0 (none)	R3 (relay 3)	R0 (none)
4034	Relay indication	Lamp test relay	R0 (none)	R3 (relay 3)	R0 (none)

4040 Voltage trip

No.	Setting		Min. setting	Max. setting	Factory setting
4041	Voltage trip	Measuring type	Phase-neutral	Phase-phase	Phase-phase



The setting 4040 Voltage trip is not present, if 4950 is set to Delta V.

4050 Transformer gen.

No.	Setting		Min. setting	Max. setting	Factory setting
4051	Transformer gen.	Volt. prim.	100V	25000V	440V
4052	Transformer gen.	Volt. sec.	100V	480V	440V
4053	Transformer gen.	Current prim.	5A	9000A	1000A
4054	Transformer gen.	Current sec.	1A	5A	5A

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

4060 Transformer BUS

No.	Setting		Min. setting	Max. setting	Factory setting
4061	Transformer bus.	Volt. prim.	100V	25000V	440V
4062	Transformer bus.	Volt. sec.	100V	480V	440V

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

4070 Communication control

No.	Setting		Min. setting	Max. setting	Factory setting
4071	Communication control	Power	OFF	ON	OFF
4072	Communication control	Frequency	OFF	ON	OFF
4073	Communication control	Voltage	OFF	ON	OFF
4074	Communication control	PF	OFF	ON	OFF



Selecting communication control ON will overrule external and internal settings.

4080 External communication ID

No.	Setting		Min. setting	Max. setting	Factory setting
4081	Ext. communication ID	ID	1	247	3
4082	Ext. communication ID	Baud rate	9600	19200	9600

The Baud rate can only be changed with Modbus communication.
The Baud rate is automatically changed with Profibus communication.

4090 External communication error

No.	Setting		Min. setting	Max. setting	Factory setting
4091	Ext. communication error	Timer	1.0 s	100.0 s	10.0 s
4092	Ext. communication error	Relay output A	R0 (none)	R3 (relay 3)	R0 (none)
4093	Ext. communication error	Relay output B	R0 (none)	R3 (relay 3)	R0 (none)
4094	Ext. communication error	Enable	OFF	ON	OFF

4100 Engine communications

No.	Setting		Min. setting	Max. setting	Factory setting
4101	Engine communications	Selection	OFF	MDEC	OFF
				DDEC	
				EMR	
				JDEC	
				Volvo Penta	
				Scania EMS	
				Volvo P EMS 2	
				Scania EMS 2	

4110 Date and time

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

No.	Setting		Min. setting	Max. setting	Factory setting
4111	Date and time	Year	2001	2100	Depends on software version
4112	Date and time	Month	1	12	
4113	Date and time	Date	1	31	
4114	Date and time	Hour	0	23	
4115	Date and time	Minute	0	59	

4120 Counters

No.	Setting		Min. setting	Max. setting	Factory setting
4121	Counter	Running time	0	20000	0
4122	Counter	GB operations	0	20000	0
4123	Counter	MB operations	0	20000	0
4124	Counter	Reset kWh counter	OFF	ON	OFF
4125	Counter	Start attempts count	0	20000	0

4220 Battery low voltage

No.	Setting		Min. setting	Max. setting	Factory setting
4221	Battery low V	Set point	5.0V	36.0V	18.0V
4222	Battery low V	Timer	0.0 s	10.0 s	2.0 s
4223	Battery low V	Relay output A	R0 (none)	R3 (relay 3)	R0 (none)
4224	Battery low V	Relay output B	R0 (none)	R3 (relay 3)	R0 (none)
4225	Battery low V	Enable	OFF	ON	ON

4230 Battery high voltage

No.	Setting		Min. setting	Max. setting	Factory setting
4231	Battery high V	Set point	12.0V	36.0V	30.0V
4232	Battery high V	Timer	0.0 s	10.0 s	2.0 s
4233	Battery high V	Relay output A	R0 (none)	R3 (relay 3)	R0 (none)
4234	Battery high V	Relay output B	R0 (none)	R3 (relay 3)	R0 (none)
4235	Battery high V	Enable	OFF	ON	ON

4240 Language

No.	Setting		Setting	Factory setting
4241	Language	English	English	English

4320 Gen-set mode

No.	Setting		Setting	Factory setting
4321	Gen-set mode	Island operation	Island operation	-
	Gen-set mode	AMF	AMF	AMF
	Gen-set mode	Fixed power	Fixed power	-
	Gen-set mode	Peak shaving	Peak shaving	-
	Gen-set mode	Load take over	Load take over	-

4350 Tacho config.

No.	Setting		Min. setting	Max. setting	Factory setting
4351	Tacho config.	Set point	1 RPM	4000 RPM	400 RPM
4352	Tacho config.	Number of teeth	0 teeth	500 teeth	167 teeth

The tacho config. set point is used to deactivate the start relay. The number of teeth is used to configure the tacho input. The tacho input must be configured to 0 teeth when not in use, i.e. when the digital running feedback is used. Refer to the chapters 'Digital inputs' on page 46 and 'Interruption of start sequence' on page 39. The running feedback/RPM could also come from the option H4 or H5 engine communication.

4360 Starter

No.	Setting		Min. setting	Max. setting	Factory setting
4361	Starter	Start prepare	0.0 s	600.0 s	1.0 s
4362	Starter	Start ON time	1.0 s	30.0 s	12.0 s
4363	Starter	Start OFF time	1.0 s	99.0 s	12.0 s
4364	Starter	Start prep. type	Normal	Extended	Normal

The settings 'Start prepare', 'Start ON time' and 'Start OFF time' are the periods in which the specific relays are activated. The start prepare output can e.g. be used for prelubricating or preheating. The start relay output is for activating the engine starter. The start sequence can be activated manually by pressing the 'START' push-button in SEMI-AUTO mode.

4370 Start attempts

No.	Setting		Min. setting	Max. setting	Factory setting
4371	Start attempts	Attempts	1	10	3
4372	Start attempts	Relay output A	R0 (none)	R3 (relay 3)	R0 (none)
4373	Start attempts	Relay output B	R0 (none)	R3 (relay 3)	R0 (none)
4374	Start attempts	FP start attempts	0	10	7

The outputs A and B are activated at a start failure.

4380 f/U OK

No.	Setting		Min. setting	Max. setting	Factory setting
4381	f/U OK	Timer	1.0 s	99.0 s	5.0 s

The sinus LED on the display activates when the frequency and voltage have been OK for the adjusted delay time. See menu 2050 for the accepted levels.

4390 f/U failure

No.	Setting		Min. setting	Max. setting	Factory setting
4391	f/U failure	Timer	1.0 s	99.0 s	30.0 s
4392	f/U failure	Relay output A	R0 (none)	R3 (relay 3)	R0 (none)
4393	f/U failure	Relay output B	R0 (none)	R3 (relay 3)	R0 (none)
4394	f/U failure	Enable	OFF	ON	ON

When the frequency and voltage have not been OK for the adjusted delay time, an *f/U failure* alarm occurs, and outputs A and B activate. Refer to menu 2050 for the accepted levels.

4400 Stop

No.	Setting		Min. setting	Max. setting	Factory setting
4401	Stop	Cool down time	0.0 s	999.0 s	240.0 s
4402	Stop	Extended STOP	1.0 s	99.0 s	5.0 s
4403	Stop	Coil type	STOP	RUN	RUN
4404	Stop	FP cool down	0.0 s	999.0 s	30.0 s

4410 Stop failure

No.	Setting		Min. setting	Max. setting	Factory setting
4411	Stop failure	Timer	10.0 s	120.0 s	20.0 s
4412	Stop failure	Relay output A	R0 (none)	R3 (relay 3)	R0 (none)
4413	Stop failure	Relay output B	R0 (none)	R3 (relay 3)	R0 (none)

If the engine has not stopped within the delay time, outputs A and B will activate, and a *stop failure* alarm occurs.

4420 Mains failure U (voltage)

No.	Setting		Min. setting	Max. setting	Factory setting
4421	Mains failure U	Fail. delay	0.5 s	990.0 s	5.0 s
4422	Mains failure U	Mains OK delay	10.0 s	990.0 s	30.0 s
4423	Mains failure U	Low voltage	50%	100%	90%
4424	Mains failure U	High voltage	100%	150%	103%
4425	Mains failure U	Mains fail. control	Start eng. + open MB	Start eng.	Start eng. + open MB

The setting *mains failure control* is used to select when to open the breaker; at the same time as the engine starts or when the generator *f/U* is OK. Refer to functional description for details.

4430 Mains failure f (frequency)

No.	Setting		Min. setting	Max. setting	Factory setting
4431	Mains failure f	Fail. delay	0.5 s	990.0 s	5.0 s
4432	Mains failure f	Mains OK delay	10.0 s	990.0 s	60.0 s
4433	Mains failure f	Low frequency	80%	100%	97%
4434	Mains failure f	High frequency	100%	120%	103%

4440 MB control

No.	Setting		Min. setting	Max. setting	Factory setting
4441	MB control	Function	Mode shift OFF	Mode-AMF-mode	Mode shift OFF
4442	MB control	Timer t_{MBC}	0.0 s	30.0 s	0.5 s
4443	MB control	Back synchronisation	OFF	ON	OFF

4450 Alarm setup

No.	Setting		Min. setting	Max. setting	Factory setting
4451	Alarm horn	Timer	0.0 s	990.0 s	20.0 s

The horn relay will be activated continuously, until the alarm is acknowledged, if the timer setting is adjusted to 0.



Be aware that the horn relay function can be set to another relay from M-logic.

4460 GB control

No.	Setting		Min. setting	Max. setting	Factory setting
4461	GB control	Timer t_{GBC}	0.0 s	30.0 s	2.0 s

4610...4630 Relay 1 - 3

No.	Setting		First/min. setting	Second/max. setting	Factory setting
46X1	Relay X	Function	Alarm	Limit	Alarm
46X2	Relay X	Off delay	0.0 s	999.9 s	5.0 s

The relays can be configured in the two different ways described below.

Alarm relay function: When an alarm activates the relay, it is activated as long as the alarm is present and unacknowledged.

Limit function: When an alarm activates the relay, no alarm message is displayed. After the condition activating this relay has returned to normal, the relay will deactivate, when the 'Off delay' has expired.



A limit relay is not affected by the inhibit function. I.e. when the inhibit lamp is ON, the relay will activate when the specific condition occurs.

4710...4780 Start/stop cmd 1...8

No.	Setting		Min. setting	Max. setting	Factory setting
47X1	Start/stop command x	Enable	OFF	ON	OFF
47X2	Start/stop command x	Function	Stop	Start	
47X3	Start/stop command x	Day	See description		
47X4	Start/stop command x	Hour	0	23	
47X5	Start/stop command x	Minute	0	59	

4790 GSM pin code

No.	Setting		Min. setting	Max. setting	Factory setting
4791	GSM pin code	1933	0	9999	1933
4792	Telephone number	12345678901	OFF	ON	OFF
4793	Telephone number	12345678901	OFF	ON	OFF
4794	Telephone number	12345678901	OFF	ON	OFF
4795	Telephone number	12345678901	OFF	ON	OFF
4796	Telephone number	12345678901	OFF	ON	OFF



The telephone number can only be configured from the utility software, but the number can be enabled from the display.

Please see the GSM communication description on page 60 for further details.

4900 Block mode

No.	Setting		Min. setting	Max. setting	Factory setting
4900	Block mode	Function	Stop	Block	Stop
4901	Block mode	Password	Disable	Enable	Enable

4910 Service timer 1

No.	Setting		Min. setting	Max. setting	Factory setting
4911	Service timer	Enable	OFF	ON	ON
4912	Service timer	Run time/hours	10	10000	150
4913	Service timer	Run time/days	1	1000	365
4914	Service timer	Fail class	1 Alarm	6 Trip MB	2 Warning
4915	Service timer	Output A	R0 (none)	R3 (relay 3)	R0 (none)
4916	Service timer	Reset	OFF	ON	OFF

4920 Service timer 2

No.	Setting		Min. setting	Max. setting	Factory setting
4921	Service timer	Enable	OFF	ON	ON
4922	Service timer	Run time/hours	10	10000	150
4923	Service timer	Run time/days	1	1000	365
4924	Service timer	Fail class	1 Alarm	6 Trip MB	2 Warning
4925	Service timer	Output A	R0 (none)	R3 (relay 3)	R0 (none)
4926	Service timer	Reset	OFF	ON	OFF



The service timer can only be configured in the display via the jump function. It can also be configured via the utility software.

4950 Operation mode

No.	Setting		Min. setting	Max. setting	Factory setting
4951		Function	Three-phase	Delta V	Three-phase



This setting can only be changed, if the master password is entered.

4960 Idle

No.	Setting		Min. setting	Max. setting	Factory setting
4961	Idle	Idle start timer	0.0 s	999.0 s	300.0 s
4962	Idle	Idle start timer enable	OFF	ON	OFF
4963	Idle	Idle stop timer	0.0 s	999.0 s	300.0 s
4964	Idle	Idle stop timer enable	OFF	ON	OFF
4965	Idle	Output A	Relay 0	Relay 3	Relay 0
4966	Idle	Idle running enable	OFF	ON	OFF

4970 Password

No.	Setting		Min. setting	Max. setting	Factory setting
4971	Password	User password	0	32000	2000
4972	Password	Service password	0	32000	2001
4973	Password	Master password	0	32000	2002



The password setting can only be changed from the utility software, or the password can be configured from the jump menu.

5010-5020 VDO 1 configurable sensor

No.	Setting		Min. setting	Max. setting	Factory setting
5011	VDO 1	VDO 1 at 0.0 bar	0 ohm	240 ohm	10 ohm
5012	VDO 1	VDO 1 at 2.5 bar	0 ohm	240 ohm	44.9 ohm
5013	VDO 1	VDO 1 at 5.0 bar	0 ohm	240 ohm	81 ohm
5014	VDO 1	VDO 1 at 6.0 bar	0 ohm	240 ohm	134.7 ohm
5021	VDO 1	VDO 1 at 7.0 bar	0 ohm	240 ohm	184 ohm
5022	VDO 1	VDO 1 at 8.0 bar	0 ohm	240 ohm	200 ohm
5023	VDO 1	VDO 1 at 9.0 bar	0 ohm	240 ohm	210 ohm
5024	VDO 1	VDO 1 at 10.0 bar	0 ohm	240 ohm	220 ohm

5030-5040 VDO 2 configurable sensor

No.	Setting		Min. setting	Max. setting	Factory setting
5031	VDO 2	VDO 2 at 40 deg. C	0 ohm	480 ohm	292 ohm
5032	VDO 2	VDO 2 at 50 deg. C	0 ohm	480 ohm	197 ohm
5033	VDO 2	VDO 2 at 60 deg. C	0 ohm	480 ohm	134 ohm
5034	VDO 2	VDO 2 at 70 deg. C	0 ohm	480 ohm	97 ohm
5041	VDO 2	VDO 2 at 80 deg. C	0 ohm	480 ohm	70 ohm
5042	VDO 2	VDO 2 at 90 deg. C	0 ohm	480 ohm	51 ohm
5043	VDO 2	VDO 2 at 100 deg. C	0 ohm	480 ohm	39 ohm
5044	VDO 2	VDO 2 at 110 deg. C	0 ohm	480 ohm	29 ohm

5050-5060 VDO 3 configurable sensor

No.	Setting		Min. setting	Max. setting	Factory setting
5051	VDO 3	VDO 3 at 0%	0 ohm	180 ohm	78.8 ohm
5052	VDO 3	VDO 3 at 40%	0 ohm	180 ohm	47.9 ohm
5053	VDO 3	VDO 3 at 50%	0 ohm	180 ohm	40.2 ohm
5054	VDO 3	VDO 3 at 60%	0 ohm	180 ohm	32.5 ohm
5061	VDO 3	VDO 3 at 70%	0 ohm	180 ohm	24.8 ohm
5062	VDO 3	VDO 3 at 80%	0 ohm	180 ohm	17 ohm
5063	VDO 3	VDO 3 at 90%	0 ohm	180 ohm	9.3 ohm
5064	VDO 3	VDO 3 at 100%	0 ohm	180 ohm	1.6 ohm



The configurable VDO input sensors can only be set from the utility software.

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