DEIF A/S

Designer's Reference Handbook

Basic Gen-set Controller

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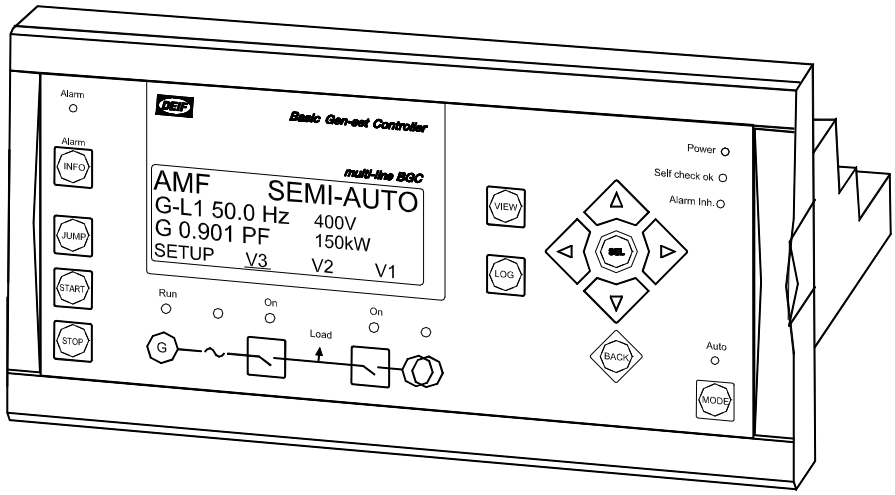

- *Functional descriptions*
- *Display unit and menu structure*
- *Procedure for parameter setup*
- *Parameter lists*

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Table of contents

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.

Please make sure to read this handbook before working with the Multi-line 2 controller and the gen-set to be controlled. Failure to do this could result in human injury or damage to the equipment.

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 and warnings, which will be used throughout this handbook, are presented.

Legal information and responsibility

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

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

Electrostatic discharge awareness

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

Safety issues

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

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

Definitions

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

Notes

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

Warnings

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

3. General product information

This chapter will deal with the 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 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 and control 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.

Options

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

A full options list is included in the data sheet, document no. 4921240273.

PC utility software warning

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

4. Functional descriptions

This chapter includes functional descriptions of 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 most significant standard functions of the BGC are listed. The list is not complete; please contact DEIF for further details.

Applications

- AMF (no synchronising)
- Island mode (stand alone)

Generator controls

- Engine start/stop
- Configurable start sequence

Protection and I/Os (ANSI)

- Reverse power (32)
- Overcurrent, 2 levels (51)
- 3 configurable VDO inputs
- 1-5 configurable digital inputs
- 1-3 configurable outputs

Display

- Status texts
- Easy readable
- Password protected setup
- Configurable views
- Complete alarm list
- Event log (150 events)
- Language configuration

M-logic

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

Measurement system

- 3-phase true RMS (100-480V AC)
- Supports delta V applications
- -/1 and -/5A AC
- 100-25000V AC trafo ratios

Breaker types

- Contactor
- Circuit breaker
- Compact breaker

General

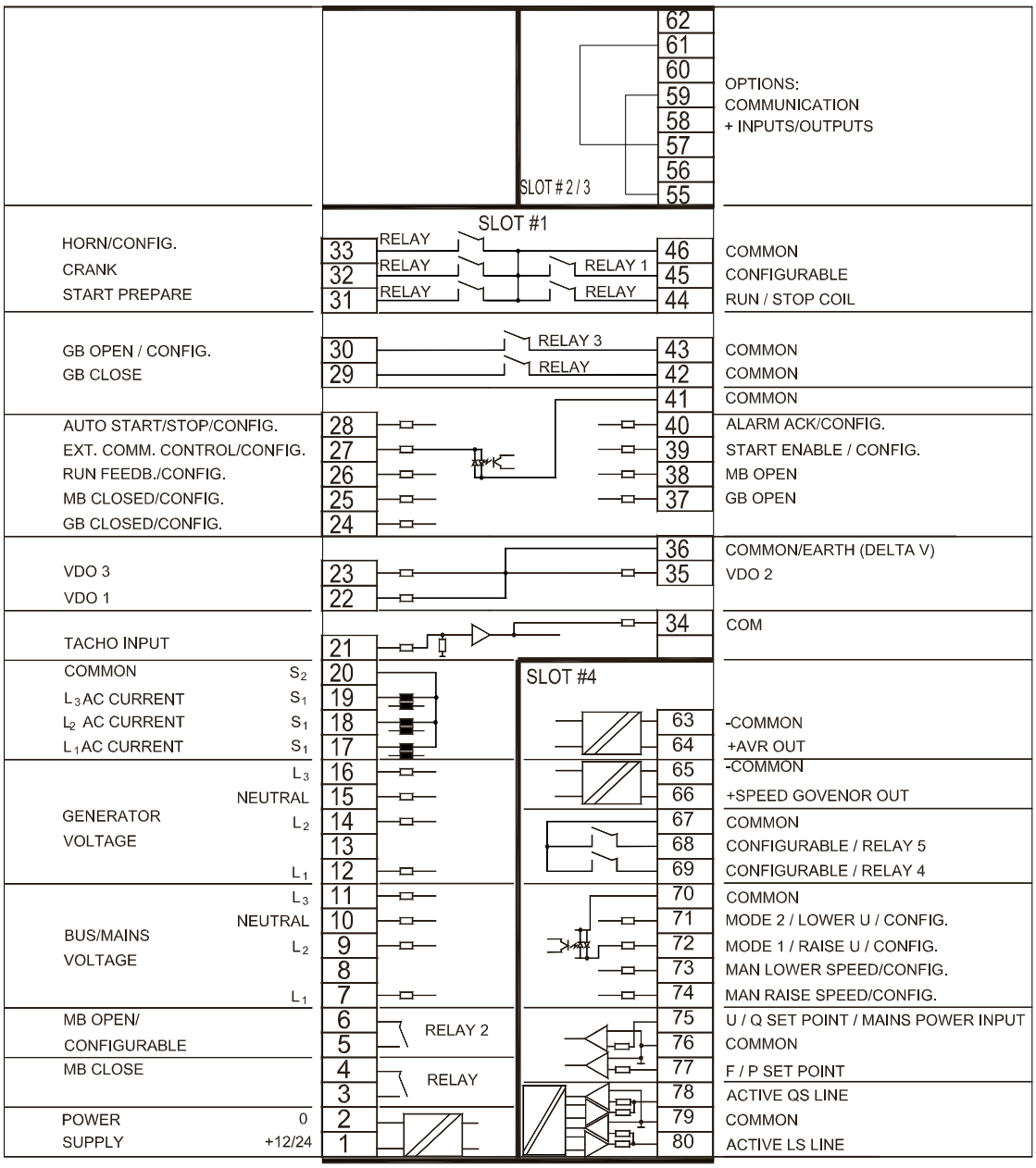
- Approval: Gost-R
- PC software available
- Additional functions available
- Additional applications available
- Additional I/Os available

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

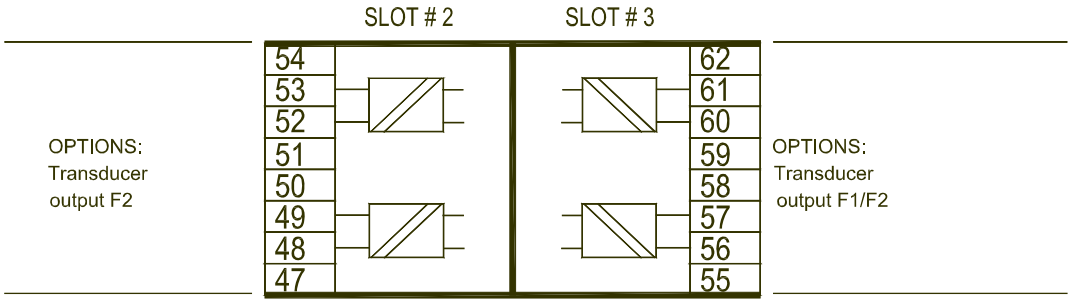


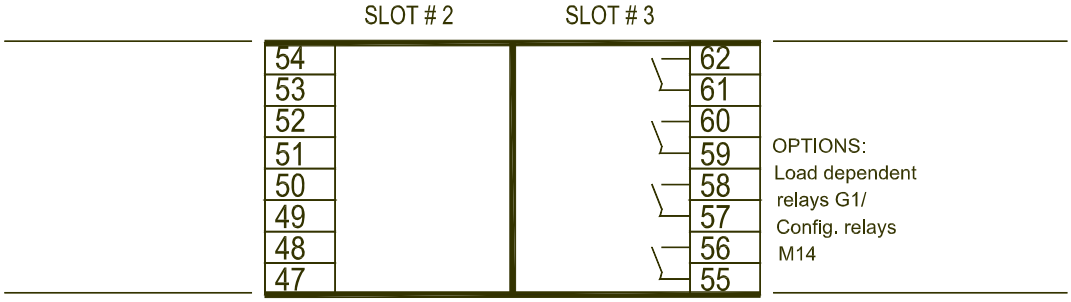
Terminal 36 must be connected depending on the hardware type of the BGC.

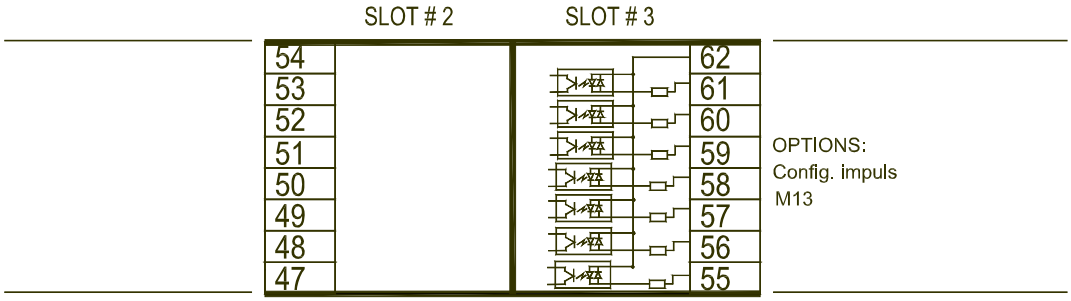
MKII: Terminal 36 should not be connected to earth (Delta V cannot be selected).
MKIII: Terminal 36 must be connected to earth, if the Delta V measuring principle is selected in menu 4950.

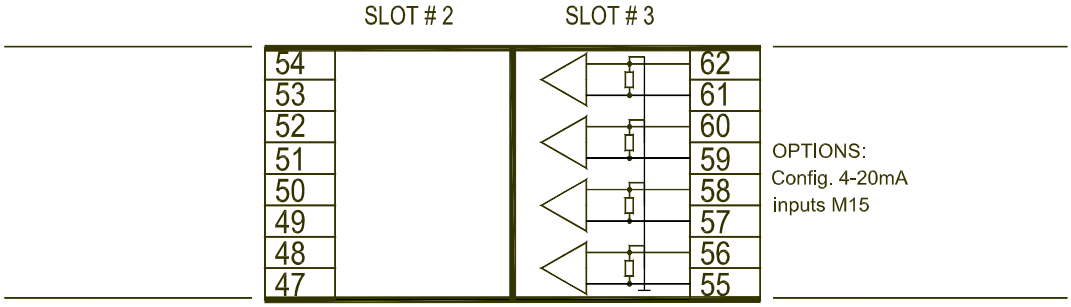
Identify the hardware type of the BGC (MKII or MKIII) on the type label which is located on the side of the BGC.

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 takeover	Requires option G2

Option G2, (synchronising with analogue lines) is included in the option G3 (synchronising with analogue lines and kW load sharing).

But not vice versa! (Option G3 is not included in 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 takeover	X	X	X	X

The MAN selection is only available if option G2 or option G3 is selected.

See Mode overview in chapter 5.

AMF (no back sync.)

Please refer to page 16 for general mode descriptions of Semi, Test, Man and Block.

Auto mode description:

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

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

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

When the mains returns, the BGC will switch back to mains supply and cool down and stop the gen-set. The switching back to mains supply is done without back synchronisation when the adjusted 'mains OK delay' has expired; so a short black-out will be experienced.

AMF (with back sync.)

Please refer to page 16 for general mode descriptions of Semi, Test, Man and Block.

Auto mode description:

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

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

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

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

Island operation

Please refer to page 16 for general mode descriptions of Semi, Man and Block.

Auto mode description:

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

A stop command will initiate the deload sequence. This means that because the generator is running 'stand-alone', the frequency will start dropping. At $f_{NOMINAL}$ -0.5 Hz (typical 49.5 or 59.5 Hz) the generator breaker is opened.

Island operation (load sharing)

Please refer to page 16 for general mode descriptions of Semi, Man and Block.

Auto mode description:

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

A stop command will initiate the deload sequence. This means that if the generator is parallel to another set, the load will be transferred to this particular set. If however the generator is running 'stand-alone', the frequency will start dropping. At $f_{NOMINAL}$ -0.5 Hz (typical 49.5 or 59.5 Hz) the generator breaker is opened.

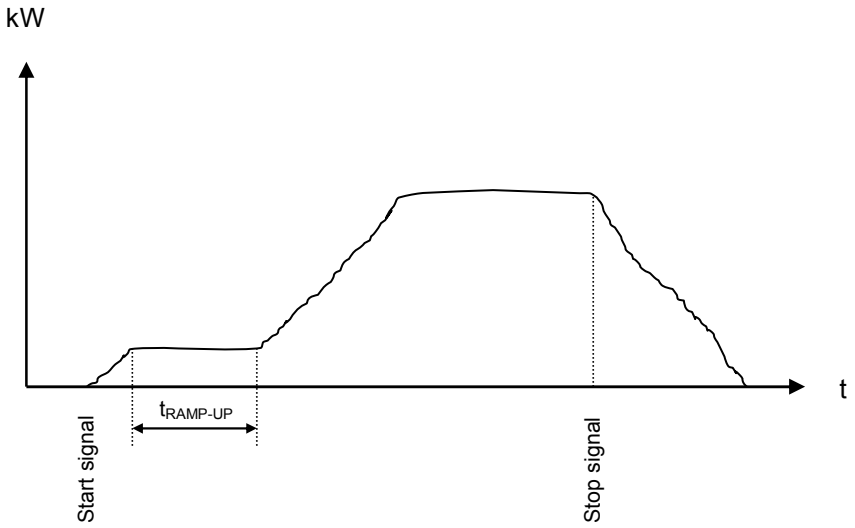
Fixed power to mains

Please refer to page 16 for general mode descriptions of Semi, Test, Man and Block.

'Fixed power' is also referred to as 'Base load'.

Auto mode description

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



Diagram, fixed power - principle

The Ramp-up time which is shown on the diagram above is meant for heating the engine before commencing to take load. The time can be adjusted to 0.0 seconds when this function is not necessary.

Peak shaving

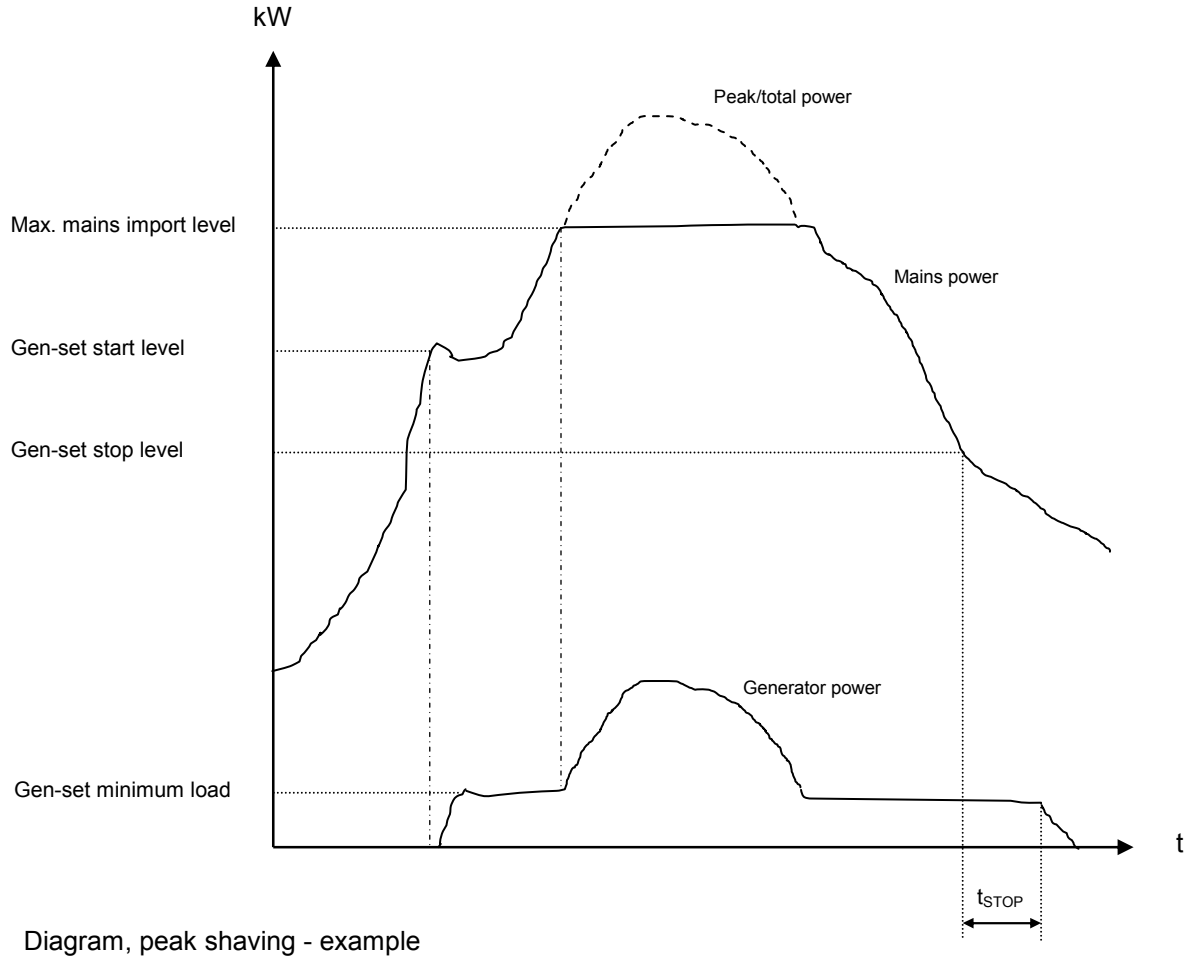
Please refer to page 16 for general mode descriptions of Semi, Test, Man and Block.

Auto mode description:

The gen-set will start at a predefined mains import level and run at a fixed minimum load, e.g. 10%. As long as the mains import has not increased above, the mains import setpoint. When the mains import increases above this setpoint, the gen-set will supply the extra load in order to maintain the mains import at the maximum import level.

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

A 0-10 V DC transducer is used for indication of the power imported from the mains. It is recommended to use the TAS-331 DG transducer.



Diagram, peak shaving - example

Load takeover

Please refer to page 16 for general mode descriptions of Semi, Test, Man and Block.

Auto mode description

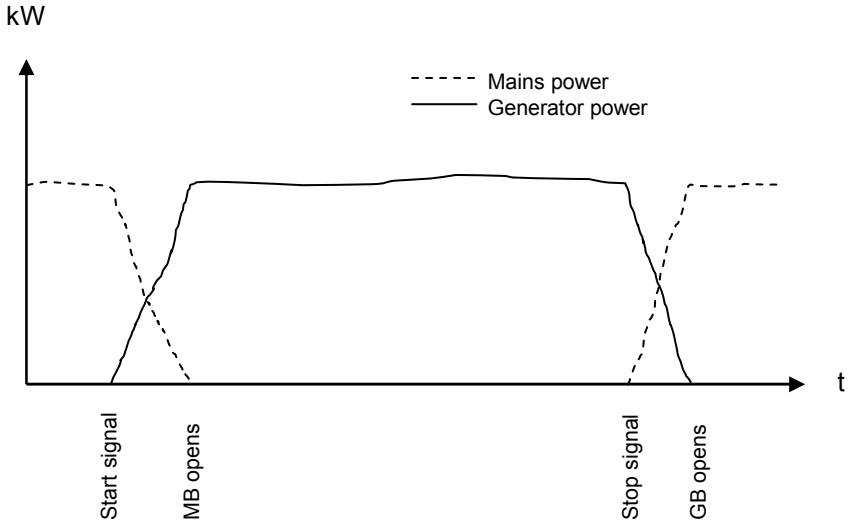
Back synchronising ON

The purpose of the load takeover 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 (digital input: 'Auto start/stop'), 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 imported 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 transducer is used for indication of the power imported from the mains. It is recommended to use the TAS-331DG transducer.



Diagram, load takeover - principle

The load takeover 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 takeover sequence is stopped.

Back synchronising OFF
When the start command is given (digital input: 'Auto start/stop'), 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 transducer is used for indication of the power imported from the mains. It is recommended to use the TAS-331DG transducer.

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

General semi-auto mode description

The unit can be operated in semi-automatic mode. Semi-auto means that the unit will not initiate any sequences automatically, as is the case with the auto mode. It will only initiate sequences, if external commands are given.

An external command may be given in three ways:

1. Push-buttons on the display are used
2. Digital inputs are used
3. Modbus/Profibus/CANopen command.

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

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

Manual control of the AVR can be achieved in the same way. It is option-dependent (option D1).

The following sequences can be activated in semi-auto:

Command	Description	Comment
Start	The start sequence is initiated and continues until the gen-set starts or the maximum number of start attempts has been reached. The frequency (and voltage) will be regulated to make the GB ready to close.	
Stop	The gen-set will be stopped. After disappearance of the running signal, the stop sequence will continue to be active in the 'extended stop time' period. The gen-set is stopped without cooling-down time.	If the button is configured to 'Block' then the block mode is selected.
Close GB	The unit will close the generator breaker, if the mains breaker is open, synchronise and close the generator breaker, if the mains breaker is closed.	When AMF mode is selected, the unit will not regulate after breaker closure.
Open GB	The unit will ramp down the power and open the generator breaker at the breaker open point. The breaker will be opened at $f_{NOMINAL}$ -0.5 Hz if the generator is running in stand-alone.	
Close MB	The unit will close the mains breaker, if the generator breaker is open, synchronise and close the mains breaker, if the generator breaker is closed.	
Open MB	The unit opens the mains breaker instantly.	
Manual GOV UP	The regulator is deactivated and the governor output is activated as long as the GOV input is ON.	
Manual GOV DOWN	The regulator is deactivated and the governor output is activated as long as the GOV input is ON.	
Manual AVR UP	The regulator is deactivated and the governor output is activated as long as the AVR input is ON.	Option D1 or D2 is required.
Manual AVR DOWN	The regulator is deactivated and the governor output is activated as long as the AVR input is ON.	Option D1 or D2 is required.

General test mode description

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 operations are performed.

Parallel test:

If the mains is OK and the mains breaker is closed, the test sequence can be initiated. When the generator is started and the frequency and voltage is OK on the gen-set, the generator breaker will be synchronised and closed. Now the gen-set is parallel to the mains and it will be ramped

up to the power setting in parameter 3070. When the test is stopped, the gen-set will deload and open the generator breaker, cool down and stop.

If the condition for starting 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. When the generator is started and the frequency and voltage is OK on the gen-set, the generator breaker will be synchronised and closed. Now the gen-set is parallel to the mains and it will be ramped up to the point where the mains import is 0 kW (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.

Settings

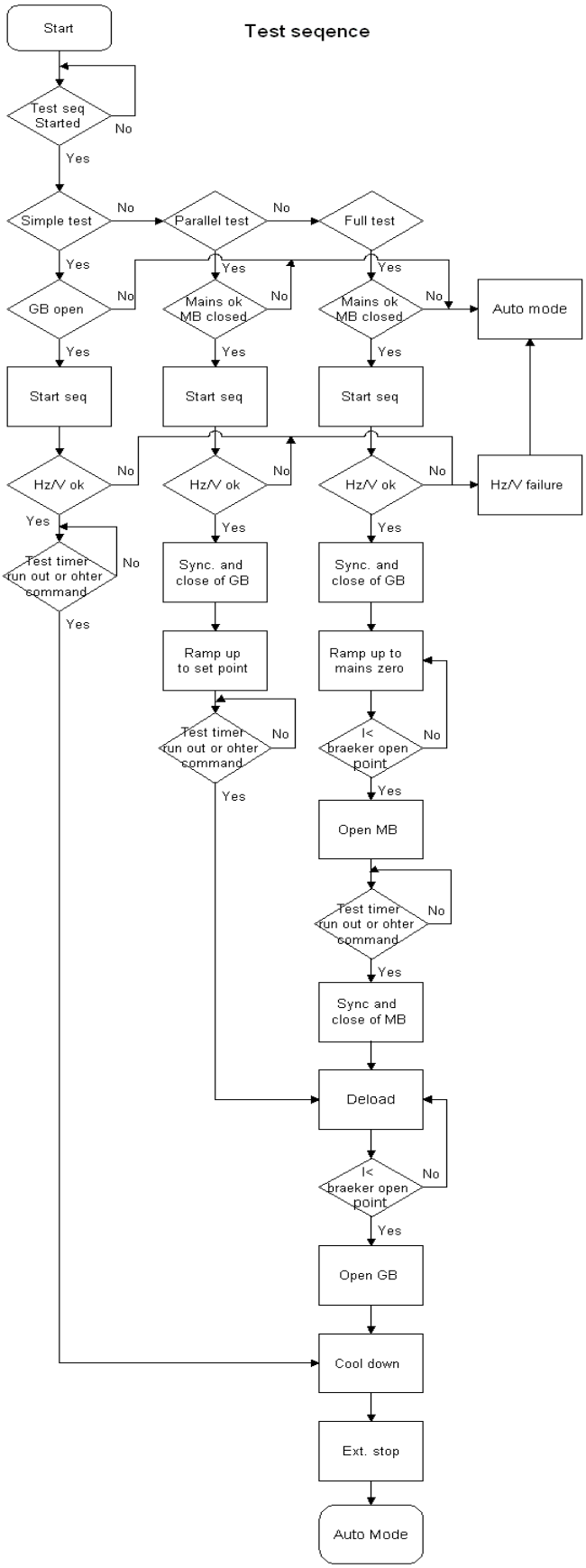
Common for all three types of test sequences is the timer in the parameter 3070 and the enabling of this timer in the parameter 3074. If this timer is enabled, it will start when the test sequence is initiated. When the timer has reached the selected time, it will end the test sequence and the BGC will 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 external communication (Modbus/Profibus/CANopen).

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:

Menu	Function	Description
3071	Limit	Load setpoint 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	Enable timer	Enabling of the timer 3072


Test seqence
Start
Test seq Started
No
Yes
Simple test
No
Parallel test
No
Full test
Yes
Yes
Yes
GB open
No
Mains ok MB closed
No
Mains ok MB closed
No
Auto mode
Yes
Yes
Yes
Start seq
Start seq
Start seq
Hz/V ok
No
Hz/V ok
No
Hz/V ok
No
Hz/V failure
Yes
Yes
Yes
Test timer run out or ohter command
No
Sync. and close of GB
Sync. and close of GB
Yes
Ramp up to set point
Ramp up to mains zero
Test timer run out or ohter command
No
I< braeker open point
No
Yes
Yes
Open MB
Test timer run out or ohter command
No
Yes
Sync and close of MB
Deload
I< braeker open point
No
Yes
Open GB
Cool down
Ext. stop
Auto Mode

General manual mode description

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

Command	Comment
Start	Gen-set starts.
Stop	Gen-set opens GB and stops without cooling-down. If the stop button is configured to 'block' the mode is changed to Block.
Manual increase speed	Unit gives increase signal to speed governor.
Manual decrease speed	Unit gives decrease signal to speed governor.
Manual increase voltage	Unit gives increase signal to the AVR. (Option D1).
Manual decrease voltage	Unit gives decrease signal to the AVR. (Option D1).
GB ON	The BGC synchronises/closes the generator breaker
GB OFF	The BGC deloads/opens the generator breaker
MB ON	The BGC synchronises/closes the mains breaker
MB OFF	The BGC opens the mains breaker.

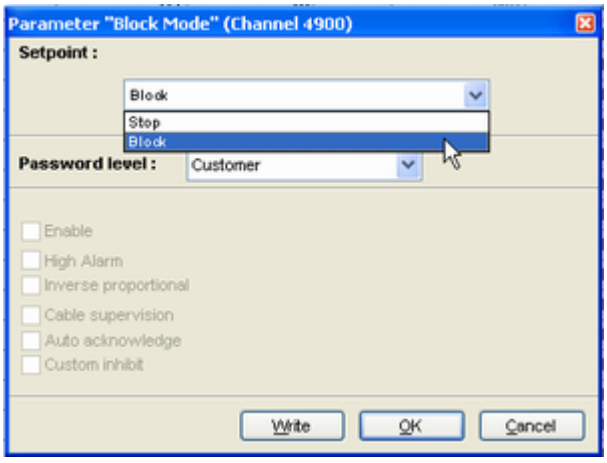
Manual increase and decrease can be performed either by push-buttons on the display or by using digital inputs. (The number of configurable inputs is option-dependent, please see the data sheet.)

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

General block mode description

When the block mode is selected, the unit is locked for certain actions. This means that starting is prevented.

To use the block mode in the BGC unit it must be configured. The setup is made in the menu 4900. The screen shot shows the dialogue box where the block mode is configured.



Two selections are possible and the selection defines the functionality of the STOP button.

- Stop (The red stop button has stop function only.)
- Block (The red stop button has stop function + block mode selection)

When 'Block' is configured, select this particular mode by pressing the red stop button on the display. Since the button is the normal stop button a press on the button while the generator is running means that it is stopped and the mode is changed to block.

If the selection is set to 'Stop' then the red stop button has the traditional stop function, i.e. the generator is stopped but the mode does not change.

To leave the block mode it is necessary to select another mode, i.e. press the mode button and make a different mode selection.

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

Block mode can only be selected from the display. It is not possible through digital inputs.

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

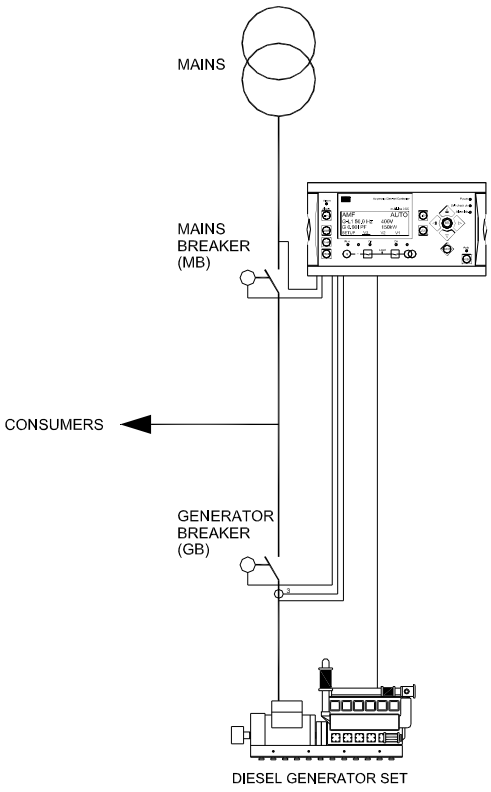
Alarms are not influenced by block mode selection.

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

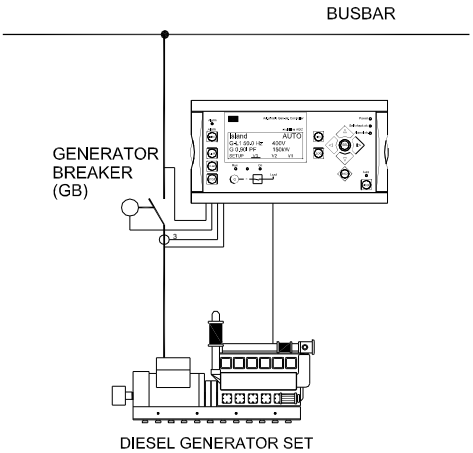
Single line diagrams

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

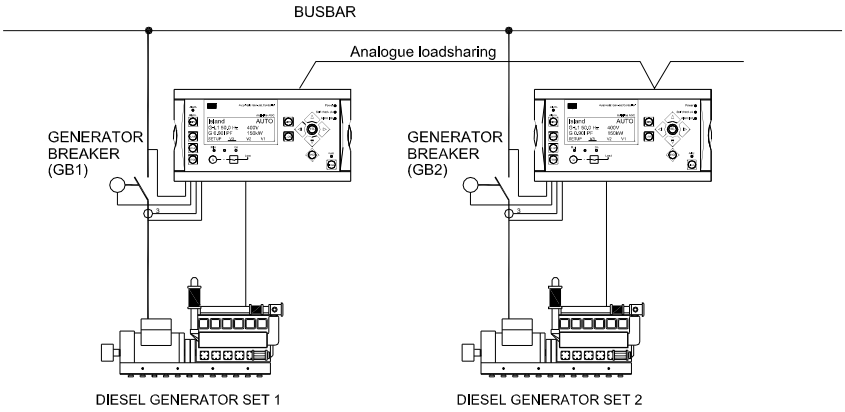
Automatic mains failure (standard – No synchronising)



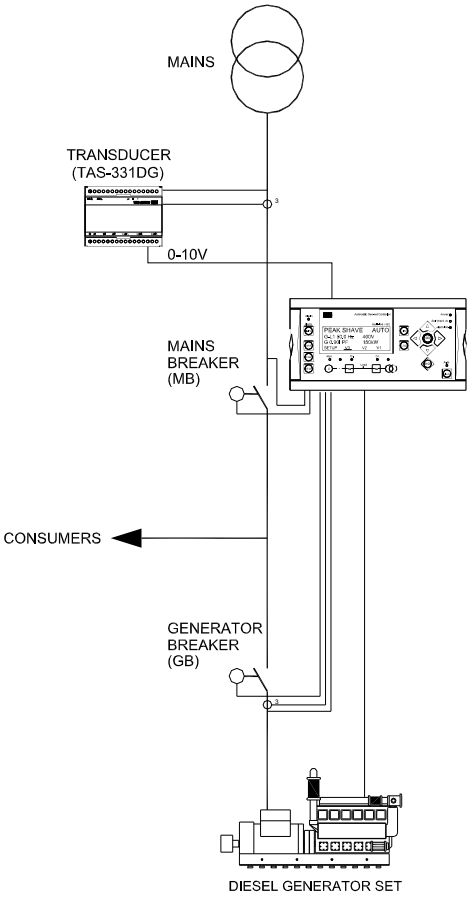
Island operation (standard)



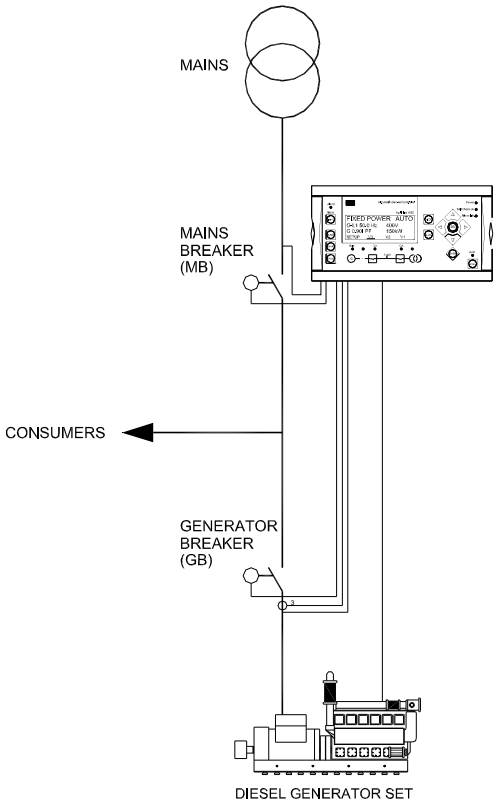
Multiple gen-sets, load sharing (optional)



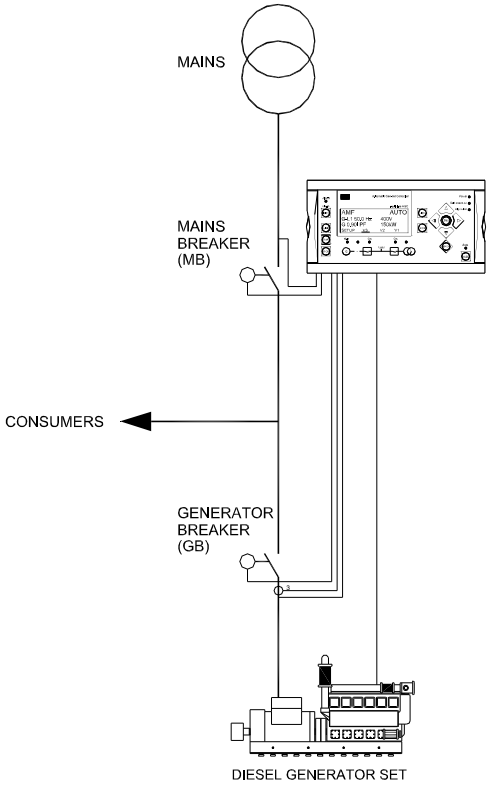
Peak shaving (optional)



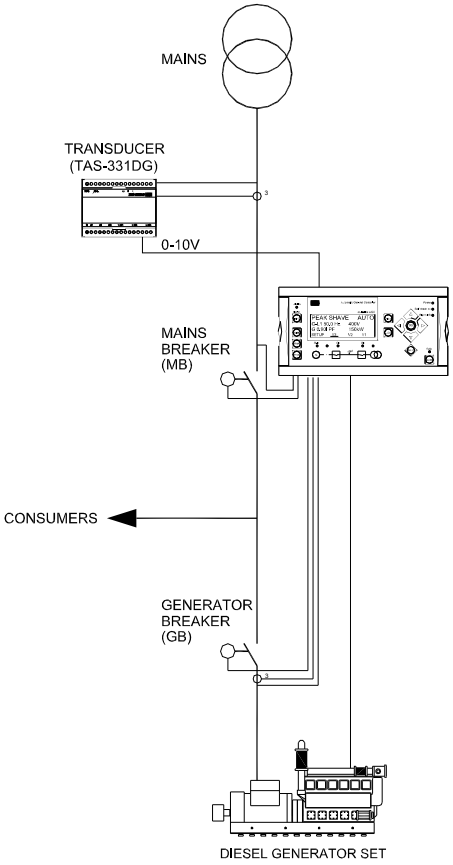
Fixed power to mains (optional)



Automatic mains failure (back sync.) (optional)



Load takeover (optional)



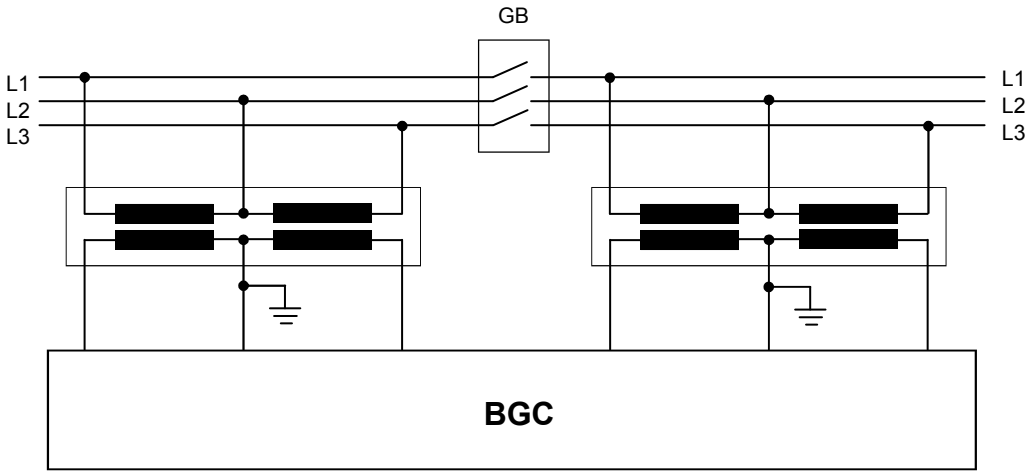
Measurement principle

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.

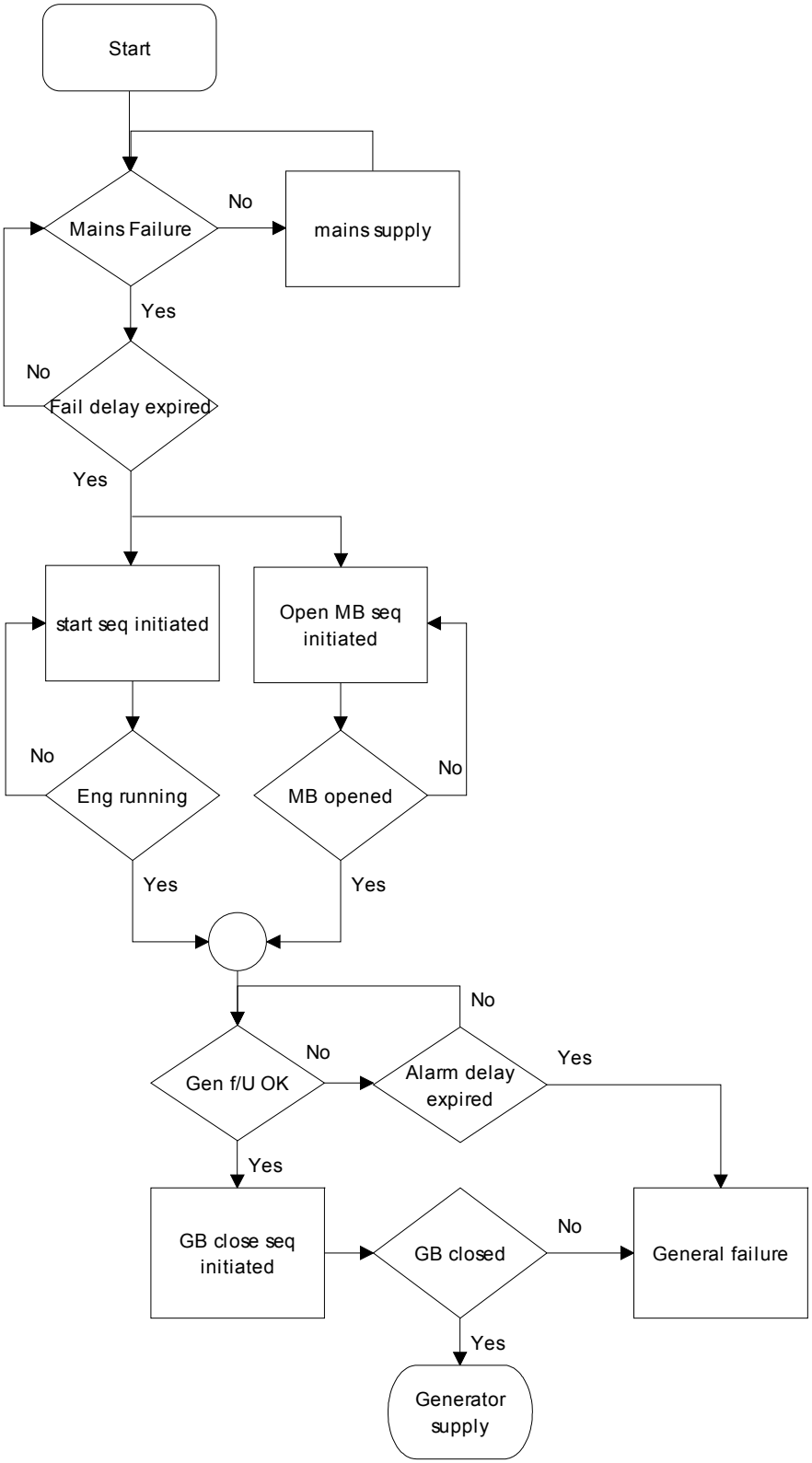
Flow chart sequences

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

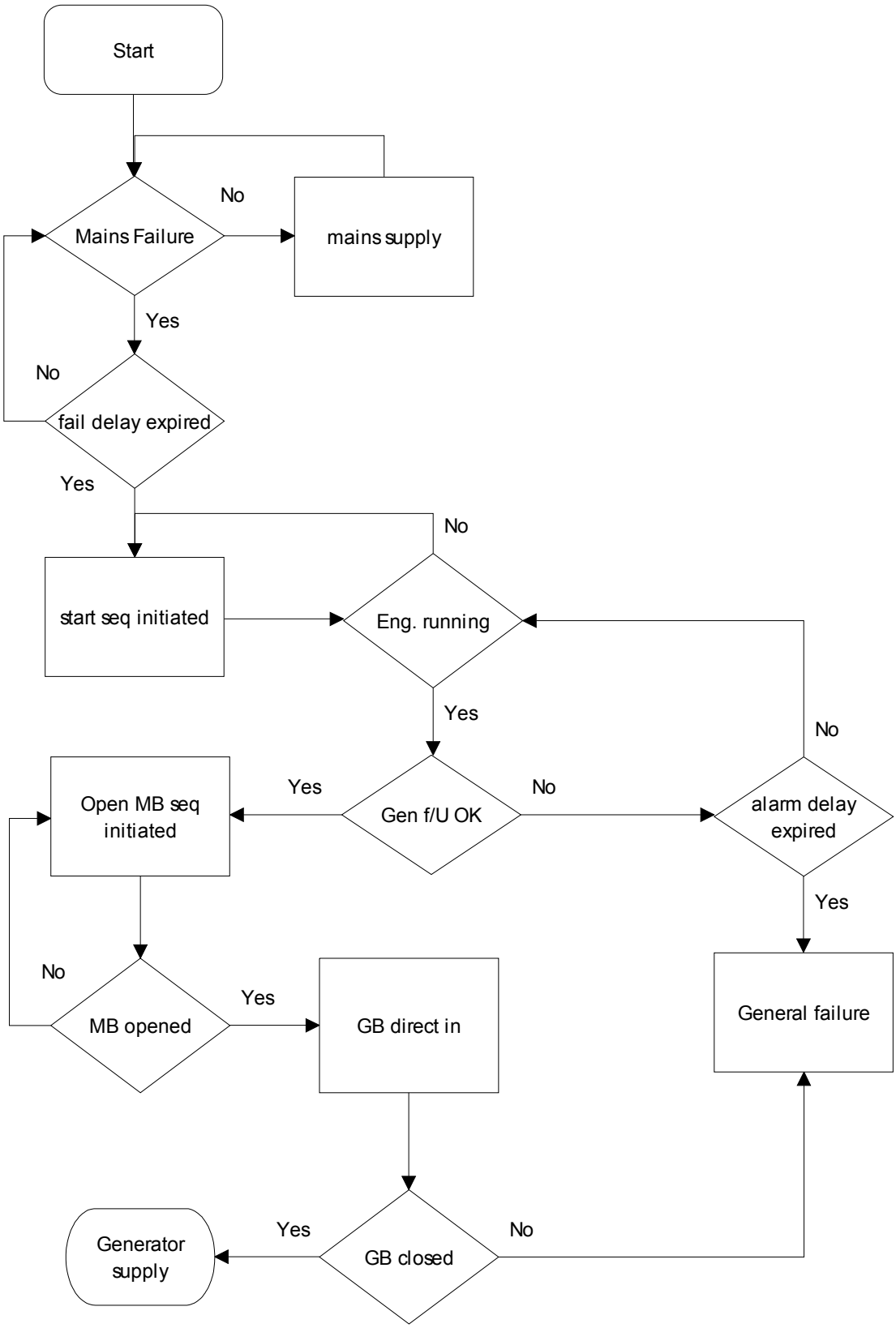
AMF sequences

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)

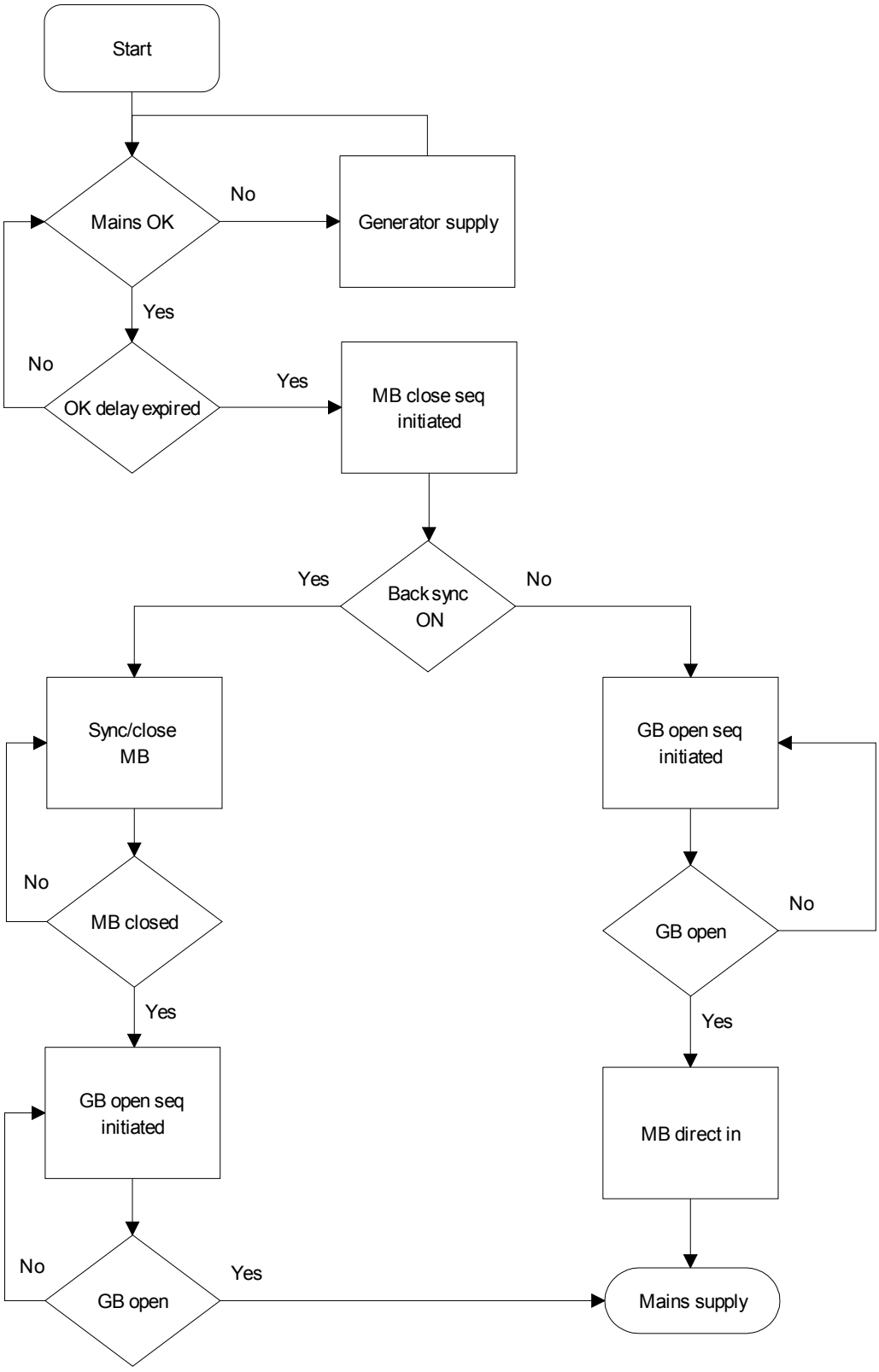


Start sequence adjusted to *Start engine* (menu 4425)



Mains return sequence

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



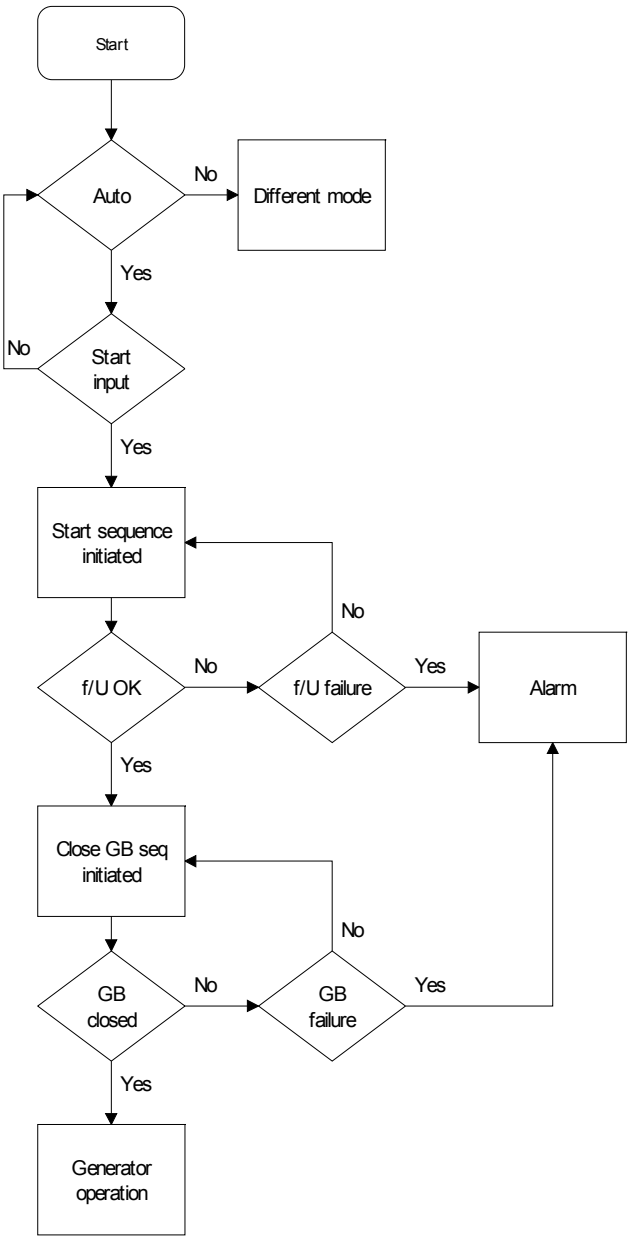
Island operation sequence

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_{NOM} – 0,5Hz (typically 49,5Hz/59,5Hz) the breaker will open, Alarm setpoints for low frequency alarms should be adjusted lower than this to avoid nuisance 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. The events are not deleted when the auxiliary supply is switched off.

: Moves the cursor left for manoeuvring in the menus.

: Increases the value of the selected setpoint (in the setup menu). In the setup menu this button function is used for scrolling the second line displaying of generator values. In the View menu the button is used for scrolling through the V1 views.

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

: Decreases the value of the selected setpoint (in the setup menu). In the setup menu this button function is used for scrolling the second line displaying of generator values. In the View menu the button is used for scrolling through the V1 views.

: Moves the cursor right for manoeuvring in the menus.

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

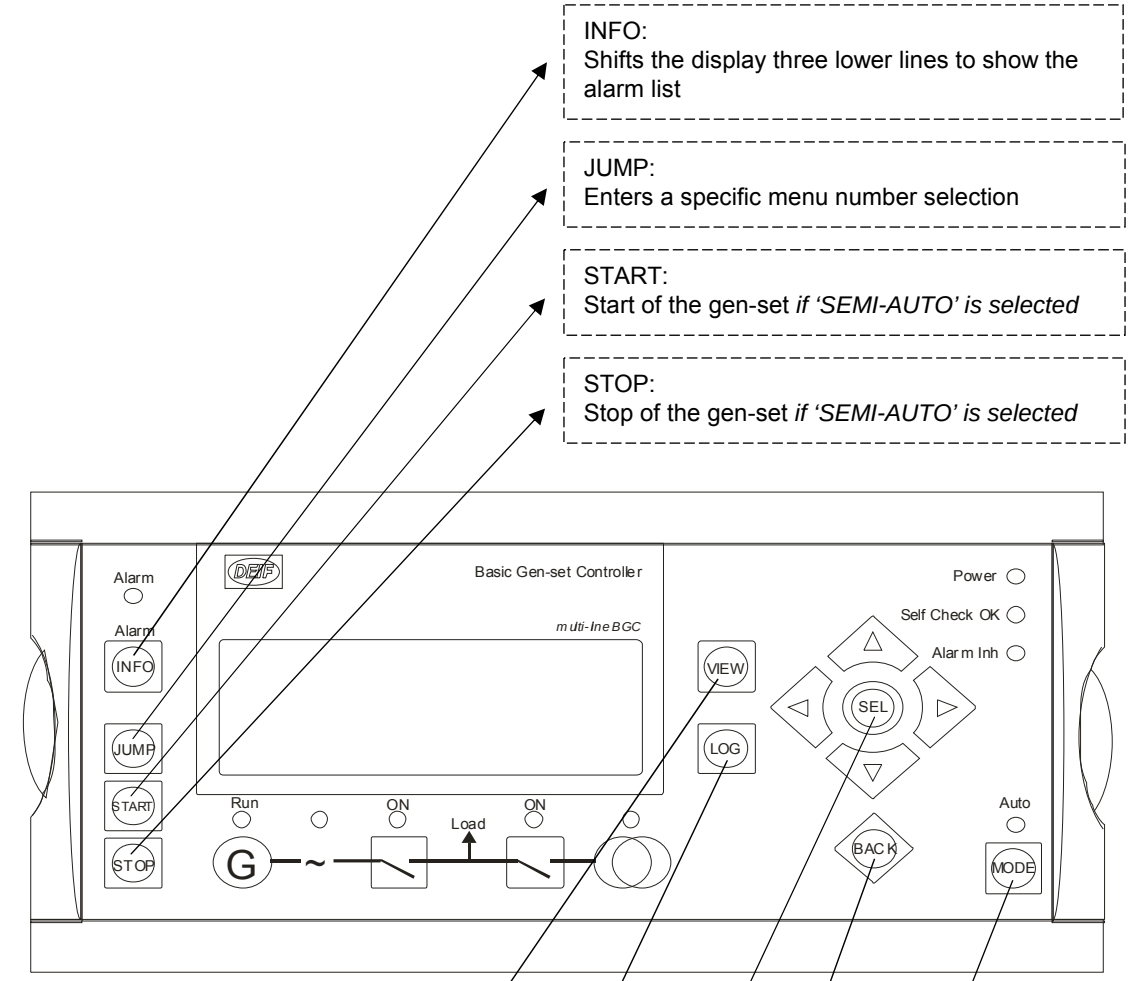
START: Start of the gen-set *if 'SEMI-AUTO' or 'MAN' is selected*.

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

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

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

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



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

JUMP:
Enters a specific menu number selection

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

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

VIEW:
Shifts the first line displaying in the setup menus

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

SEL:
Selects the underscored entry in the fourth display line

BACK:
Jumps one step backwards in the menu

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

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.

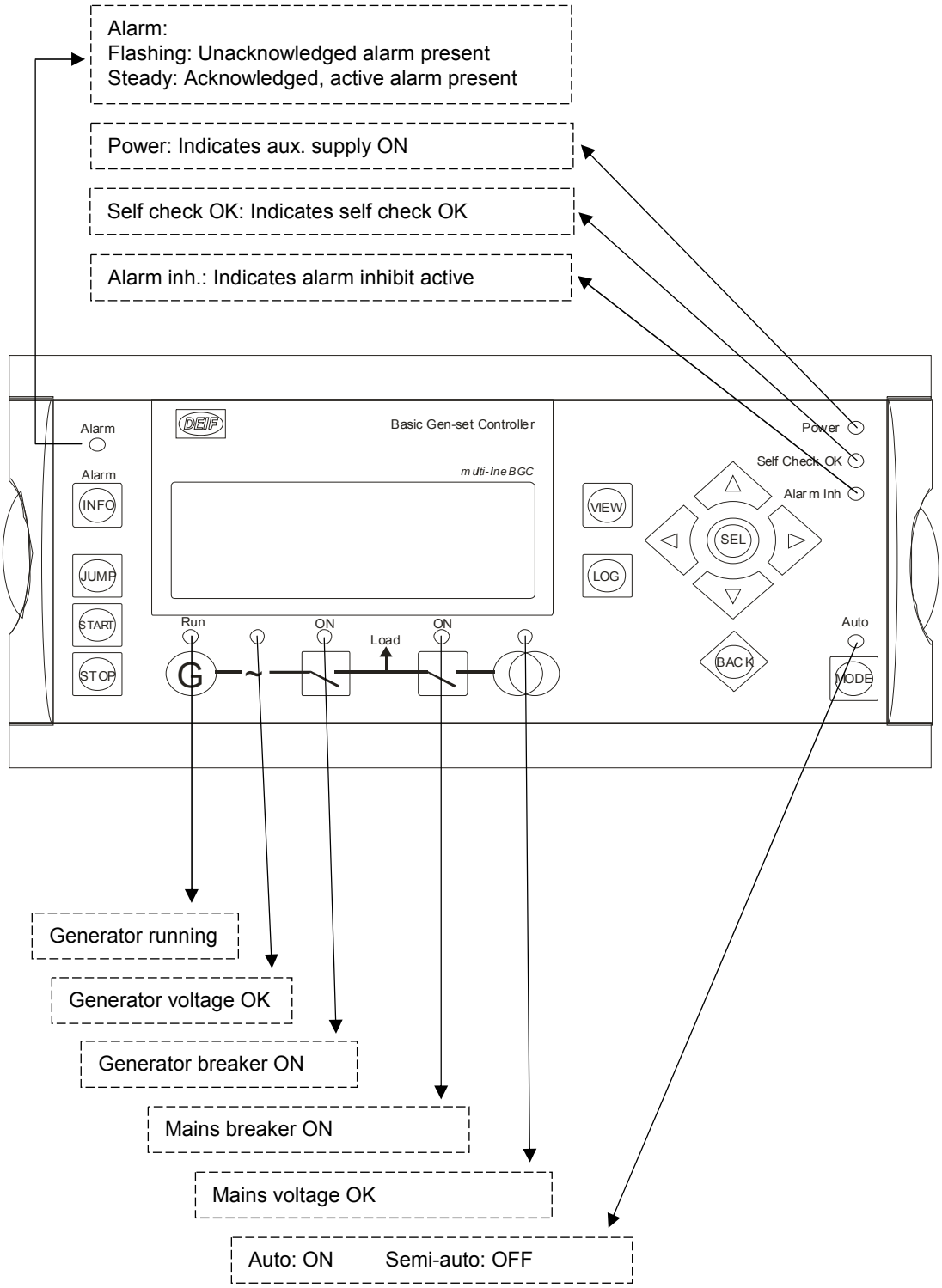
(GB) ON: LED indicates that the generator breaker is closed.

(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:

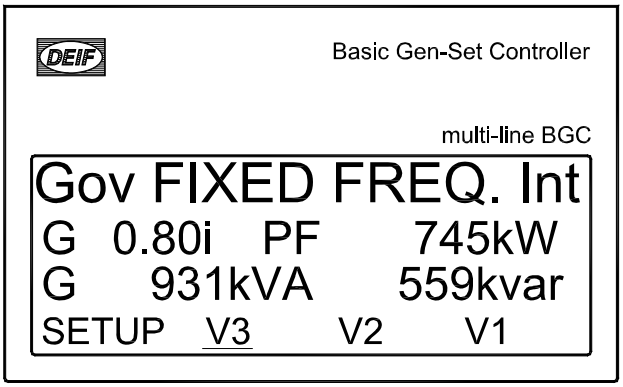
View menu system
This is the commonly used menu system. 15 windows are configurable and can be entered by using the arrow push-buttons.

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

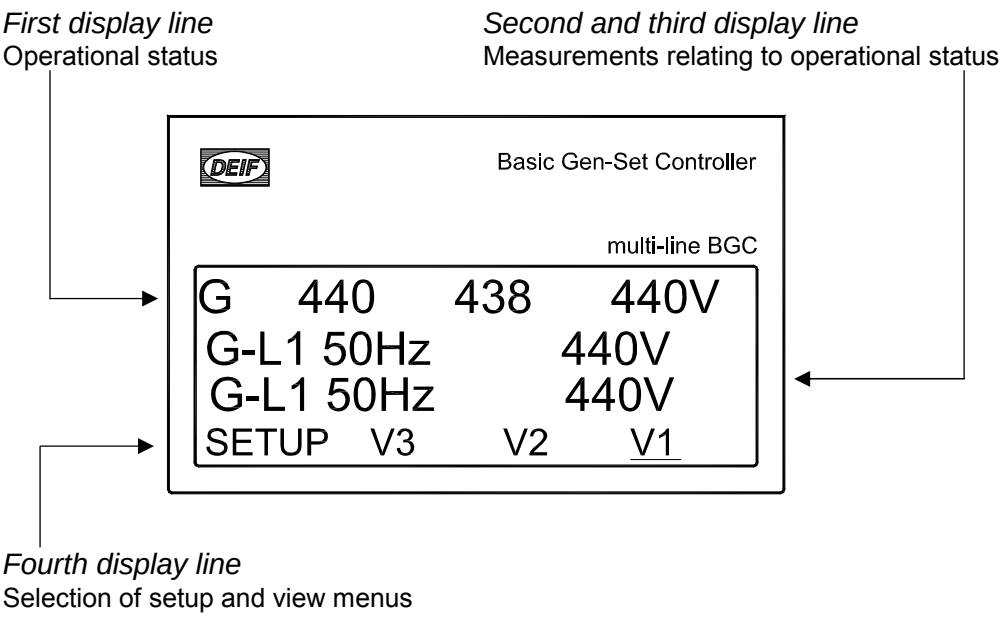
When the unit is powered up, an entry window appears. The entry window is the turning point in the menu structure and as such the gateway to the other menus. It can always be reached by pressing the BACK push-button 3 times.

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.

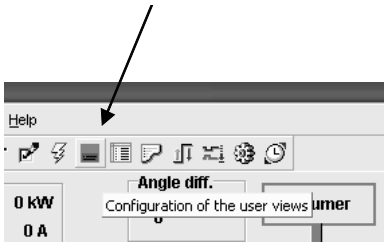


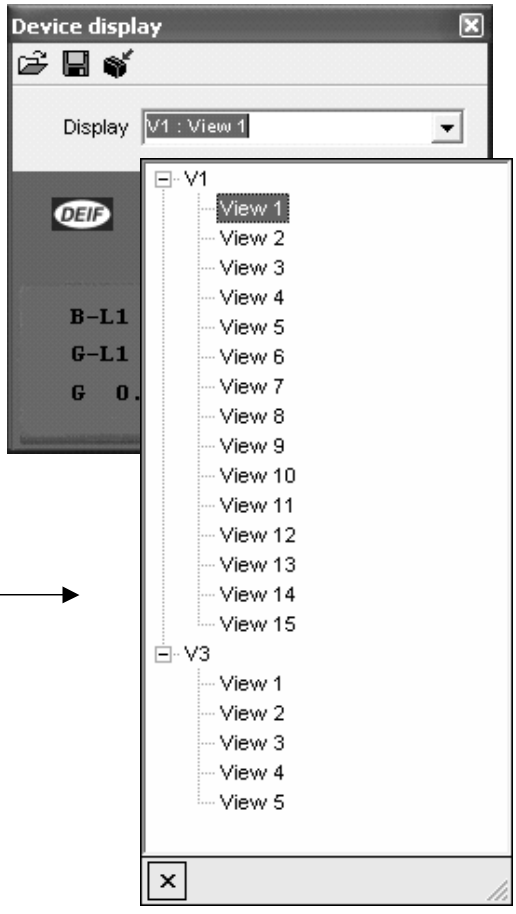
In the view menus various measured values are on display.

View window configuration

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

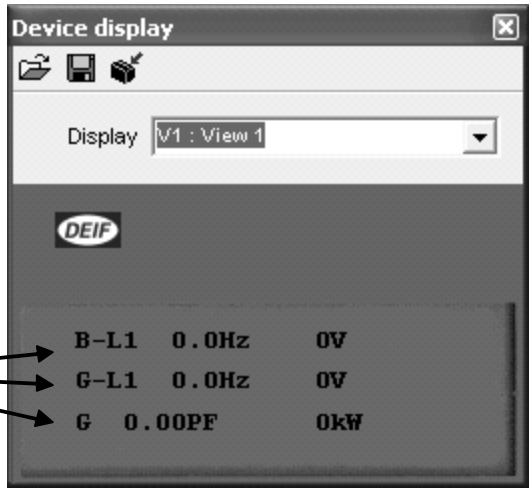
Use this button to go to the configuration.





Select the view window to be configured.

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.

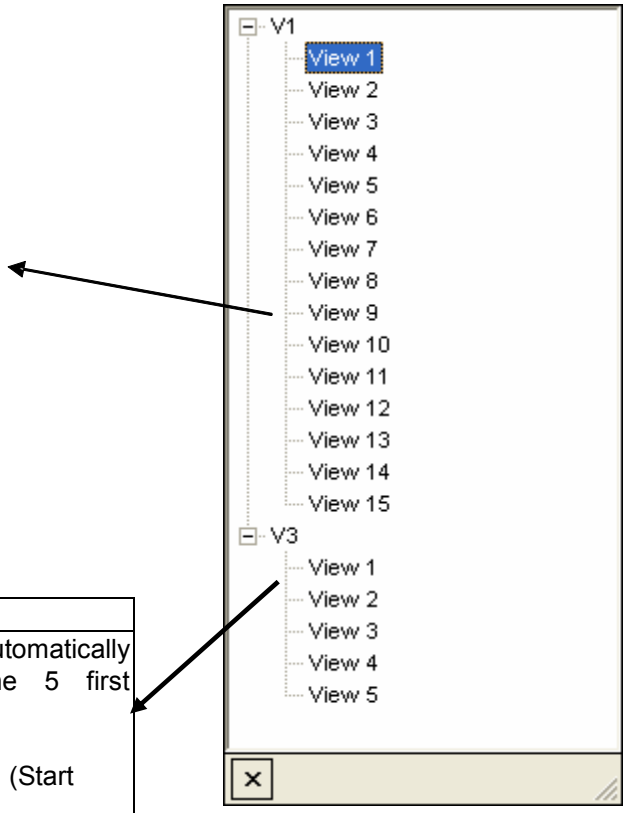
The selectable values and measurements are presented in the table on page 38 in this handbook.

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	

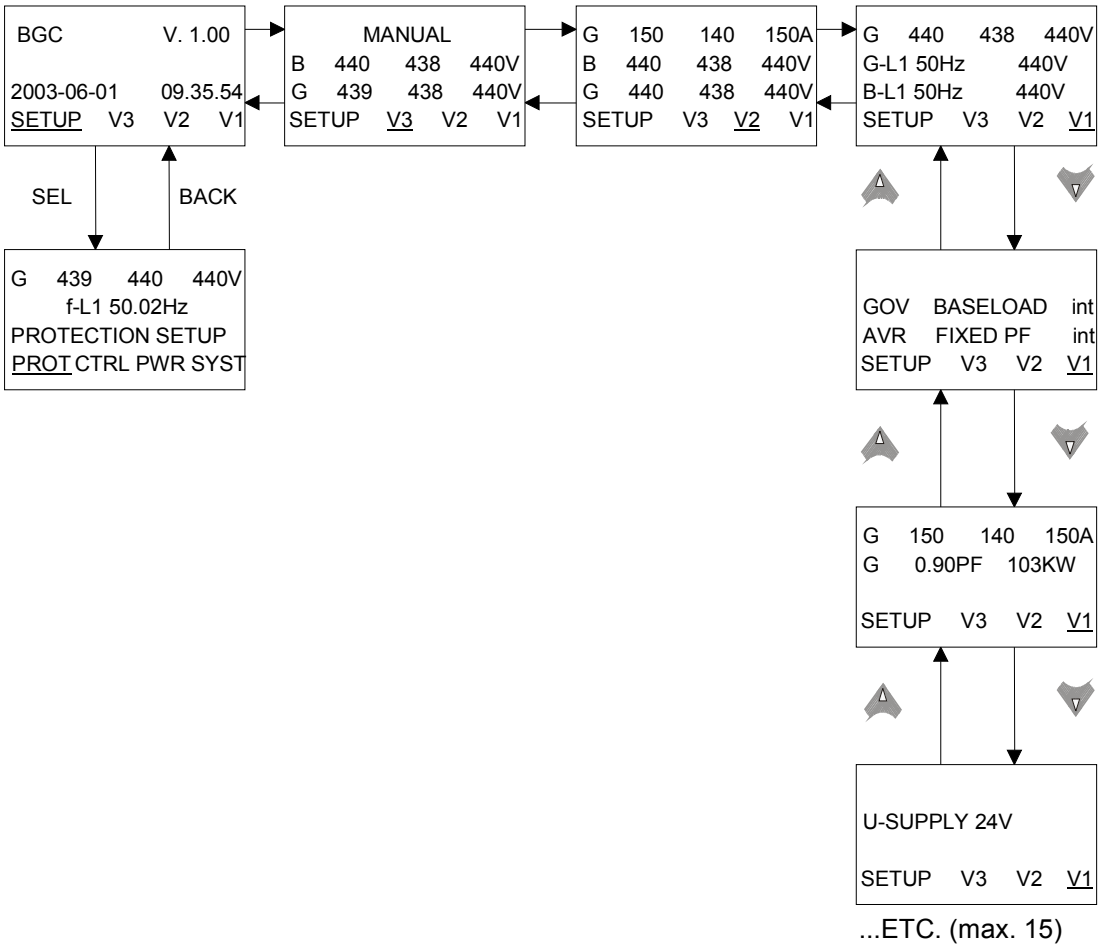


Windows	View 2	View 3
Window 1	Changes automatically between the 5 first windows: 1. window 1 (Start prepare) 2. window 2 (Sync.) 3. window 3 (Ramp up/down) 4. window 4 5. window 5 (Default*) No manual selection. *All three lines show measuring values*	Changes automatically between the 5 first windows: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

* *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

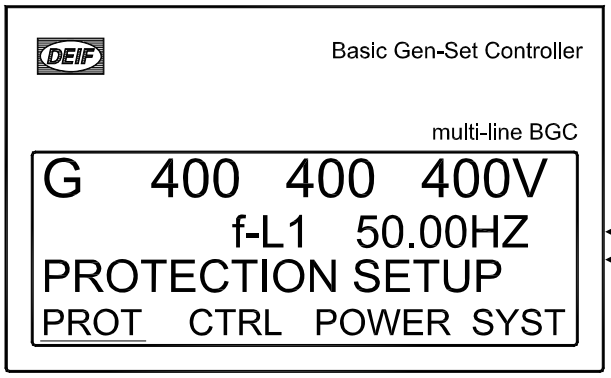
(Daily use) The first line is used to display generator and BUS values

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

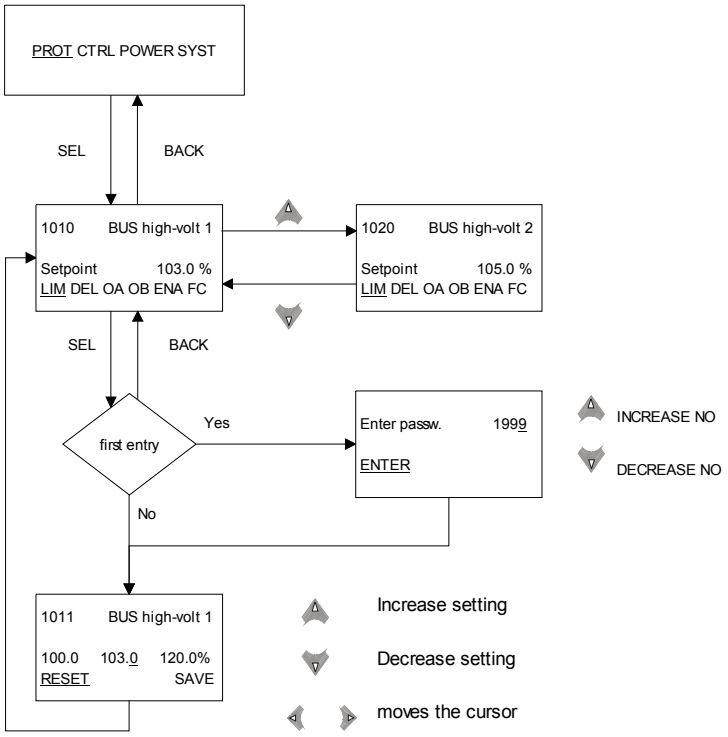
Possible values in second display line

(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 *Voltage L1-N (V AC)* *Voltage L2-N (V AC)* *Voltage L3-N (V AC)* 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) *Frequency L2 (Hz)* Frequency L3 (Hz) Active power (kW) Reactive power (kVAr) Apparent power (kVA) Energy counter (kWh) Power factor *Voltage angle between L1-L2 (deg.)* *Voltage angle between L2-L3 (deg.)* Voltage angle between L3-L1 (deg.) Run time (h) Number of GB operations Number of MB operations Next service Start attempts counter	*Voltage L1-N (V AC)* *Voltage L2-N (V AC)* *Voltage L3-N (V AC)* 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) *Voltage angle between L1-L2 (deg.)* Voltage angle between generator voltage and bus voltage (deg.) Power supply voltage (V DC) Delta V only: Voltage angle between L3-L1 (deg.)	Analogue 1 Analogue 2 Analogue 3 Analogue 4 Analogue 5 Analogue 6 Analogue 7 Analogue 8 Pt100 no. 1 Pt100 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 + block mode. For detailed information see the applications chapter page 12.

Auto

In auto mode the BGC will operate automatically, and the operator cannot initiate any sequences manually. The BGC will start the generator automatically depending on the gen-set mode.

Start 'condition' / Mode	Digital input 'Auto start/stop'	Main power import (setpoint)	Mains failure
Island mode	X		
AMF	(X)		X
Fixed power	X		
Peak shaving		X	
Load takeover	X		

If the setting 'mode shift' menu 4441 is enabled, the mains failure sequence can be executed in 'Fixed power', 'Peak shaving' and 'Load takeover' as well as AMF.

If 'Auto start/stop' is activated in AMF, the gen-set starts but the generator breaker does not close.

Semi-auto

In semi-auto mode the operator has to initiate all sequences. This can be done via the push-button functions, digital inputs or communication. 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. Please refer to page 17 for a general description of the test mode.

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.

Block

Block mode deactivates the possibility to start the gen-set. Block mode is only available if configured in menu 4900. Please refer to page 20 for a general description of the block mode.

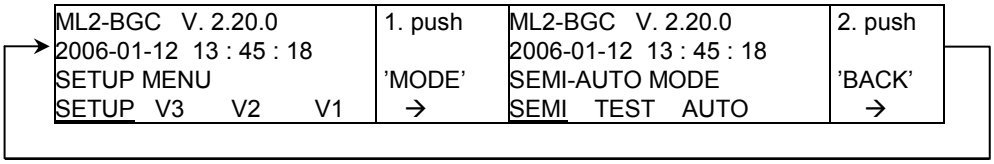
Mode selection

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

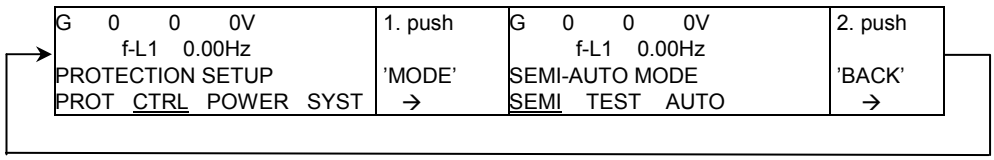
Pushing the MODE push-button will change the displayed text. After pushing 'MODE', the fourth display line indicates the selectable modes. In the third display line the underscored (fourth line) selection will be displayed.

Two possibilities are now available:

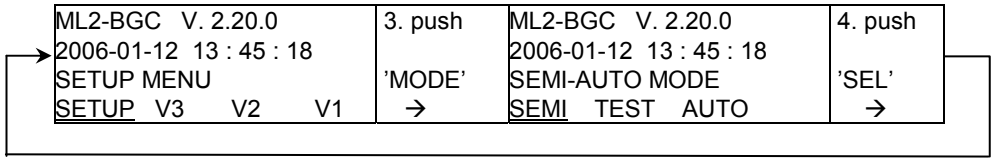
If 'BACK' is pushed, the display returns to the original text without changing the mode.



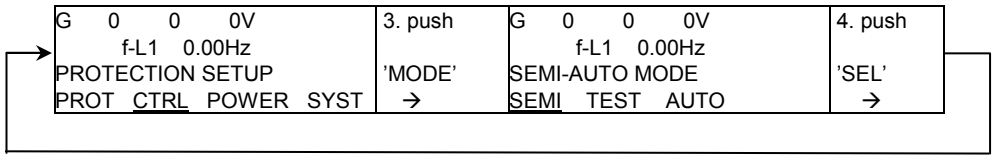
or



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



or



Password

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

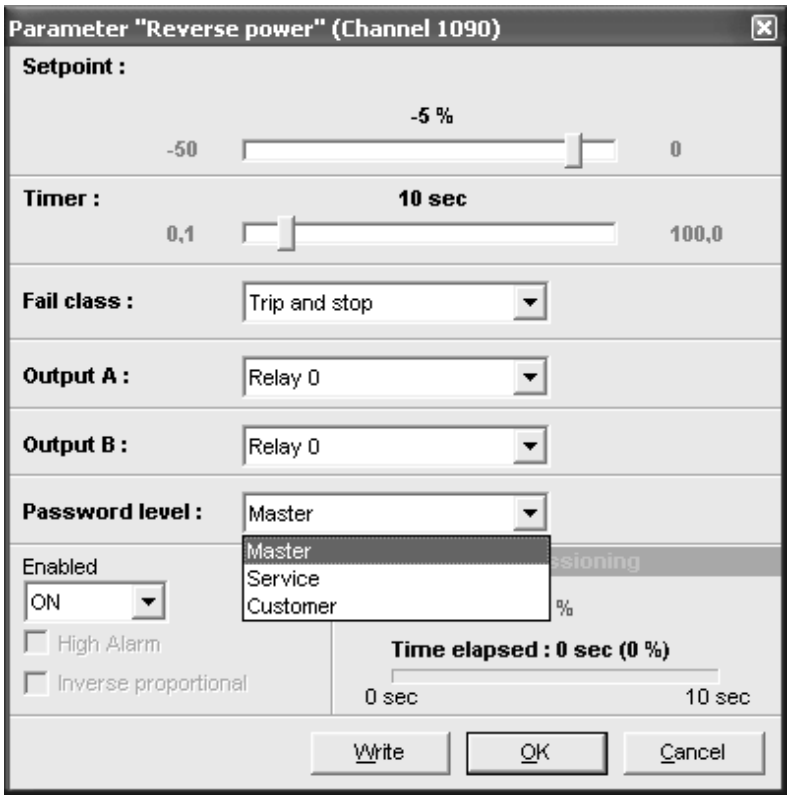
Available password levels:

Password level	Factory setting	Menu for configuration	Access		
			Customer	Service	Master
Customer	2000	4971	X		
Service	2001	4972	X	X	
Master	2002	4973	X	X	X

Contact DEIF A/S, Customer service (tel. +45 96 14 96 14) for details regarding the DEIF back-up password should the user configurable backup password be lost.

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.

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

6. Additional functions

This chapter describes the additional functions of the BGC.

Command timers

The primary 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 but it can also be used for additional purposes in M-logic. (They are available in M-logic as inputs in event A, B and C.

The function is available in island mode, fixed power mode and load takeover mode, and the function works in AUTO mode only.

Up to 8 commands can be used for either start or stop. The settings are set up in menus 4710-4780 from the display or the utility software. Each command can be set for the following time periods:

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

The digital start/stop input ('Auto start/stop') cannot be used at the same time as the time-dependent start/stop command.

Command timers in M-logic

The command timers are available in M-logic as input events.

Please refer to the M-logic manual for details about M-logic and its configuration.

When the command timers are used in M-logic it overrules the traditional start/stop functionality.

It is *not* possible to combine the command timers, e.g. command 1-4 for generator start/stop and command 5-8 for M-logic purposes!

If the command timers are used for activating a relay, this relay will be activated for 1 minute + the adjusted off-delay of this relay (default off-delay is 5 sec., meaning the relay will be activated for 65 seconds). If it is intended to use the command timers together with the 'Auto start/start' input, then be aware that the relay deactivates after 1 minute + off-delay. So an external circuit must be made.

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 (including TEST mode), or if the commands are selected in the SEMI-AUTO or MAN mode. In SEMI or MAN the commands are started e.g. by the operator or a PLC.

In the SEMI-AUTO and MAN 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

Breaker feedback and configuration

The BGC requires feedbacks for breaker position. the amount of feedback depends on the application and the used breaker type. The breaker type can be adjusted to circuit breaker, compact breaker or contactor. The need for breaker feedbacks is as shown in the table below (the default terminal numbers are shown in parenthesis):

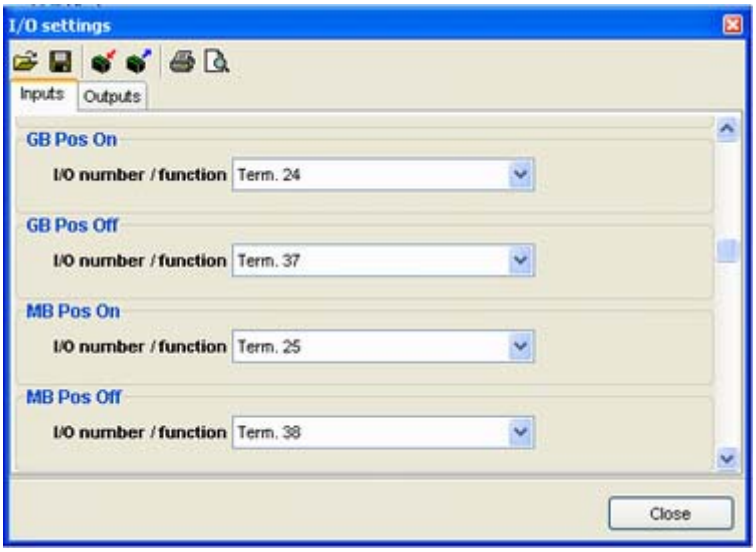
	GB closed (24)	**GB open** (37)	**MB closed** (25)	**MB open** (38)
Circuit breaker	X	X	X	X
Contactor	-	X	-	X
Compact	X	X	X	X

If the BGC is configured to island mode it is not necessary to connect the breaker feedback for MB position OFF or to make any configuration in the utility software for MB feedbacks.

If the contactor is used, it is possible but not necessary to use both breaker feedbacks.

Configuration

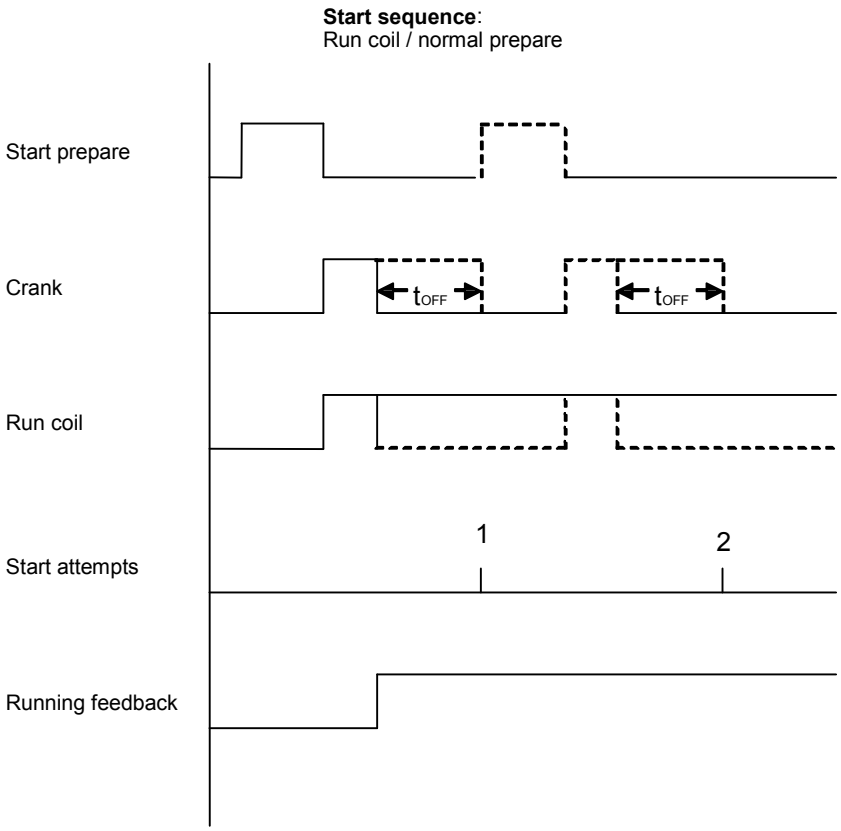
In the utility software it is possible to change the configuration depending on breaker type or if the inputs are needed for something else. Go to settings and click input/output and the configuration dialogue box appears.



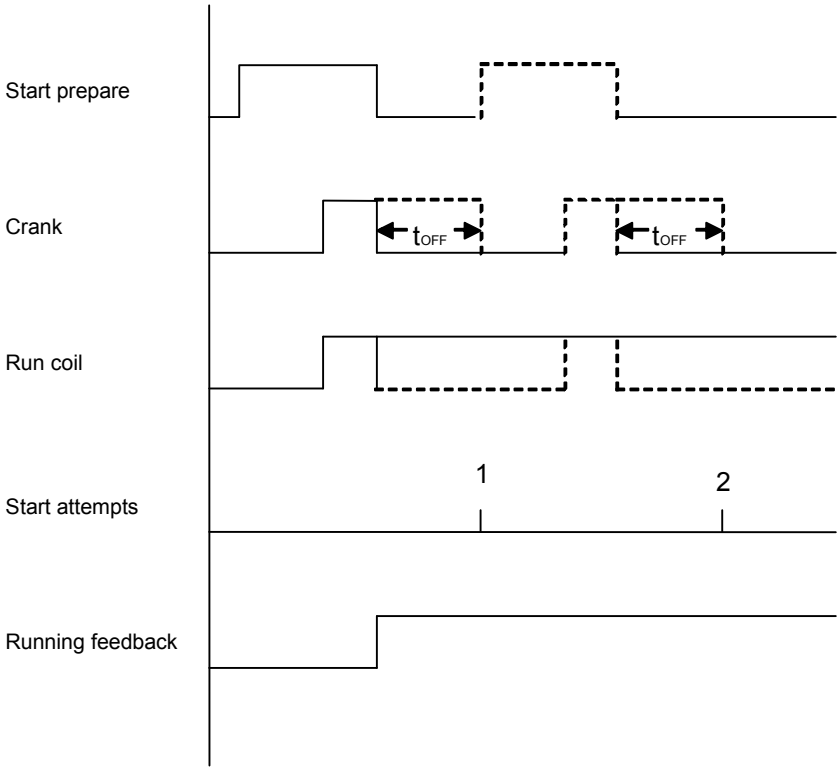
To download the new configuration, press the red download button.

START sequence

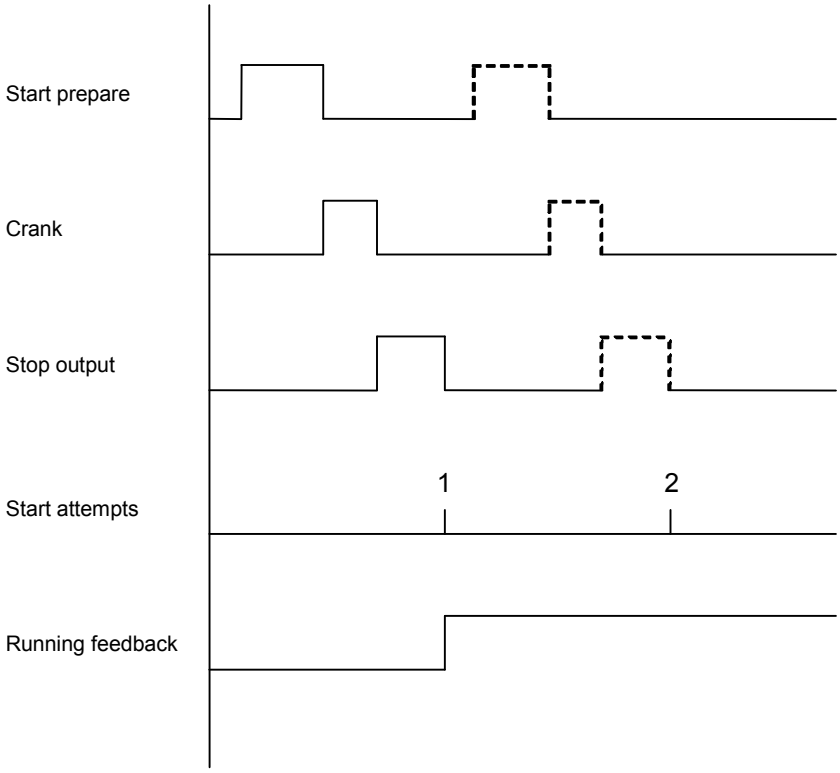
The drawings illustrate the start sequences schematically.

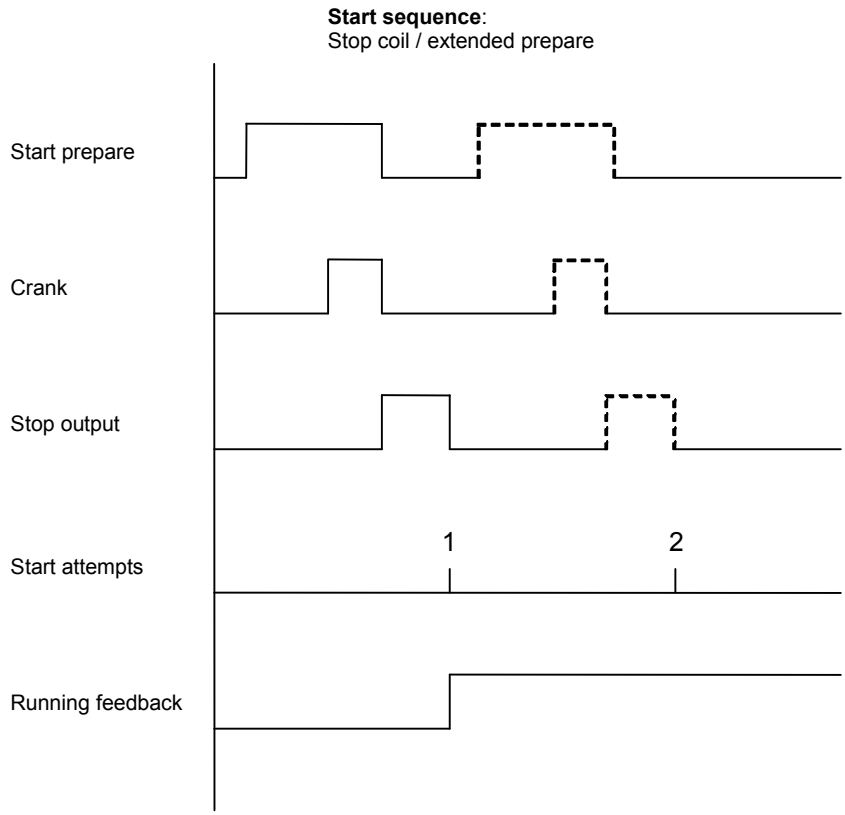


Start sequence:
Run coil / extended prepare



Start sequence:
Stop coil / normal prepare





Interruption of start sequence
The start sequence is interrupted in the situations shown in the table below:

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	Limits
Stop signal		
Start failure		
Running feedback	Tacho setpoint, menu 4351.	Upper limit is the tacho setpoint. Lower limit is 95% of the tacho setpoint
Running feedback	Digital input	
Running feedback	Frequency measurement. The frequency measurement requires a voltage measurement of 30% x U_{NOM}	Upper limit 32Hz Lower limit 30Hz
Running feedback	Voltage detection.	Upper limit 32% x U_{NOM} Lower limit 30% x U_{NOM}
Emergency stop		
Stop push-button on the display	Only in Semi and Man operation	
'Auto start/stop'	Auto mode: Load takeover, island or fixed power (not time-dependent start/stop)	'Auto start stop' input = low
'Remote start'	Semi: all modes	'Remote stop' = high

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 input settings in the utility software).

Running feedback selection

The running feedback cannot be selected in the BGC. The start sequence will be interrupted when any of the abovementioned feedbacks appear.

However the digital running feedback and the tacho input must be configured for correct function.

Config. / Feedback	Configuration	Default setting
Tacho input	Configure number of teeth on the flywheel and the RPM level where the starter must be disengaged.	No. of teeth = 167 RPM level = 400.
Binary running feedback	Configure the terminal number used for running feedback.	Terminal 26

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.

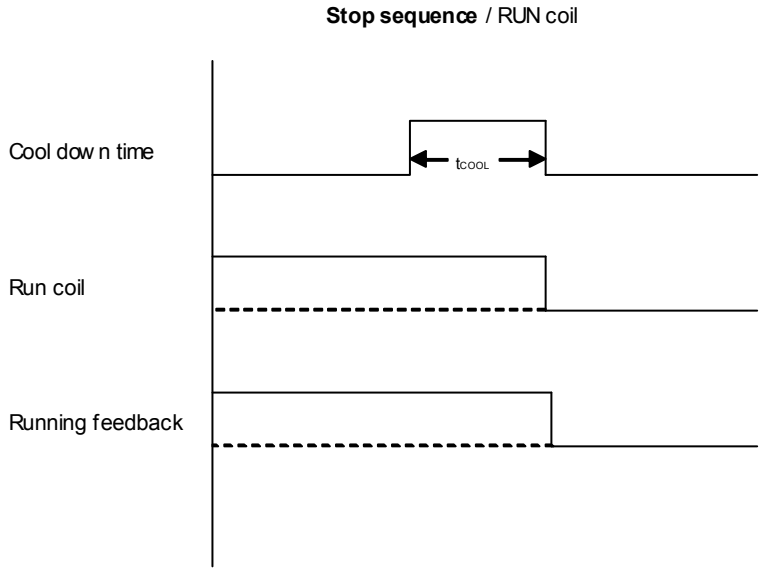
Start prepare (menu 4364)

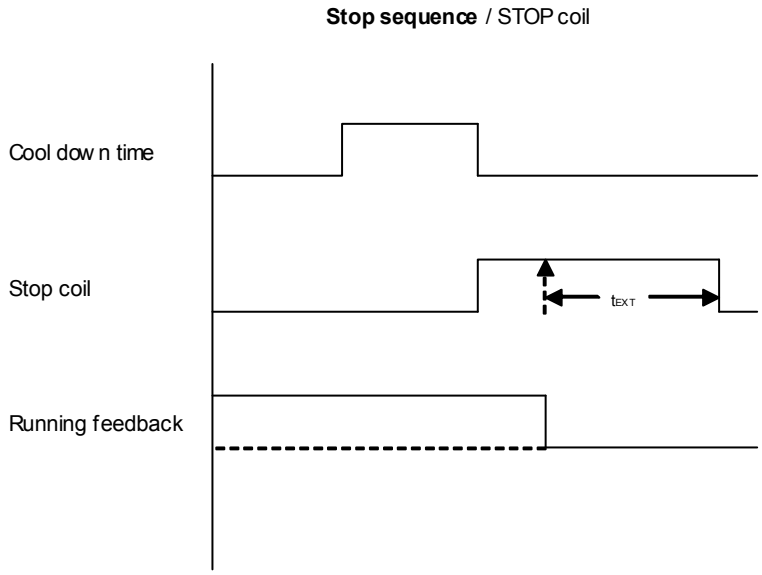
There are two possibilities for use of the start prepare timer:

Selection	Description
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	Controlled stop after mains failure
Trip and stop alarm	X	X	
Stop button on display		X	Semi-auto and manual
'Remote stop' input		X	'Remote stop' = high
'Auto start/stop'	X	X	'Auto start/stop' input = low
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
'Auto start/stop' input	Auto mode: AMF, load takeover, 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 after a certain period of time. 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
Manual	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:

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

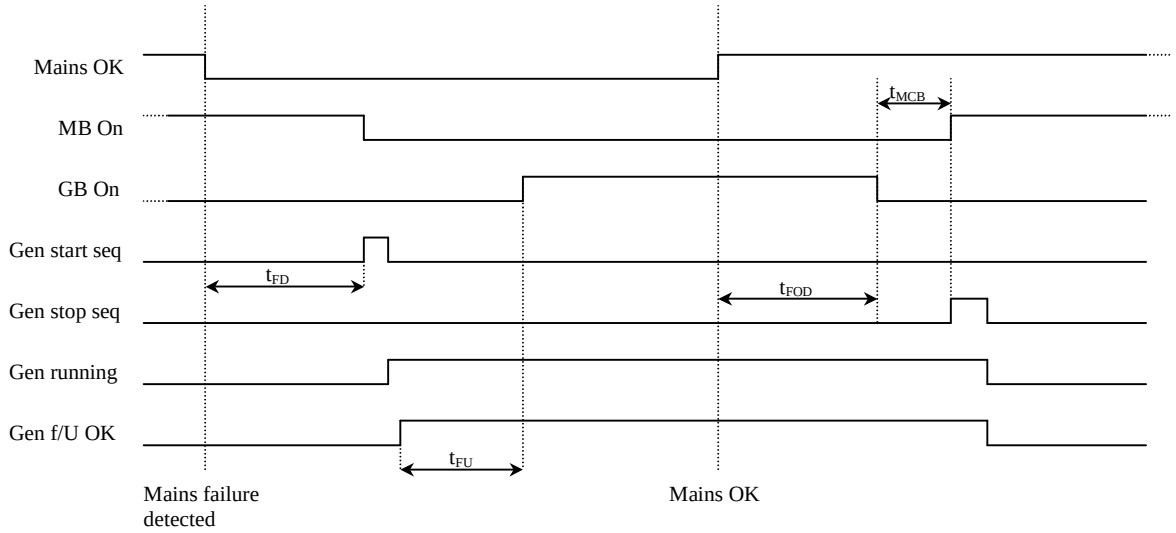
The time charts describe the functionality at a mains failure and at a mains return. Back synchronisation is deactivated.

The timers in the system:

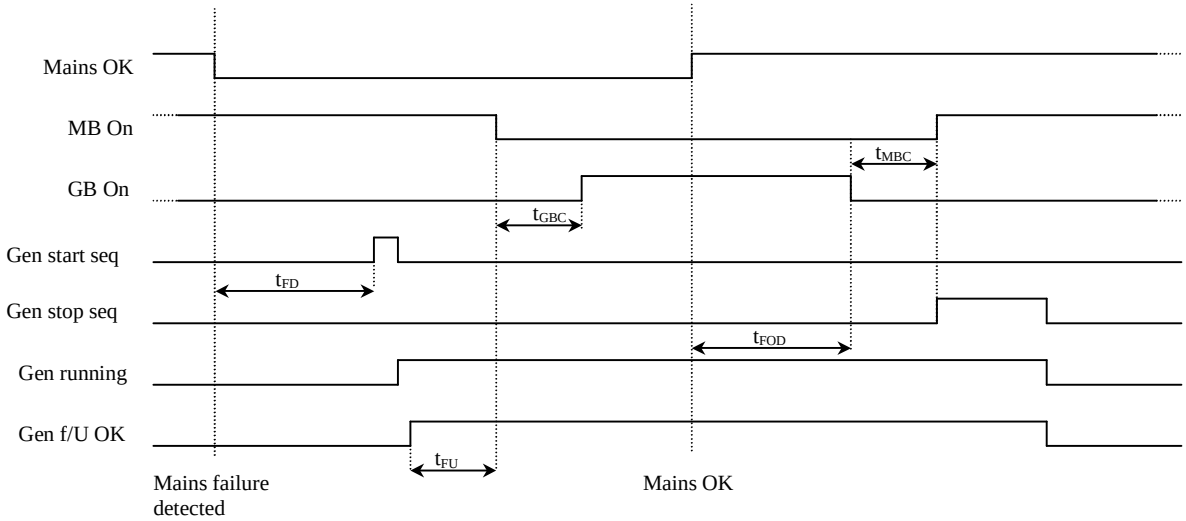
Timer	Description	Channel number
t_{FD}	Mains failure delay	4421/4431
t_{FU}	Frequency/voltage OK	4381
t_{FOD}	Mains failure OK delay	4422/4432
t_{GBC}	GB ON delay	4461
t_{MBC}	MB ON delay	4442

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.

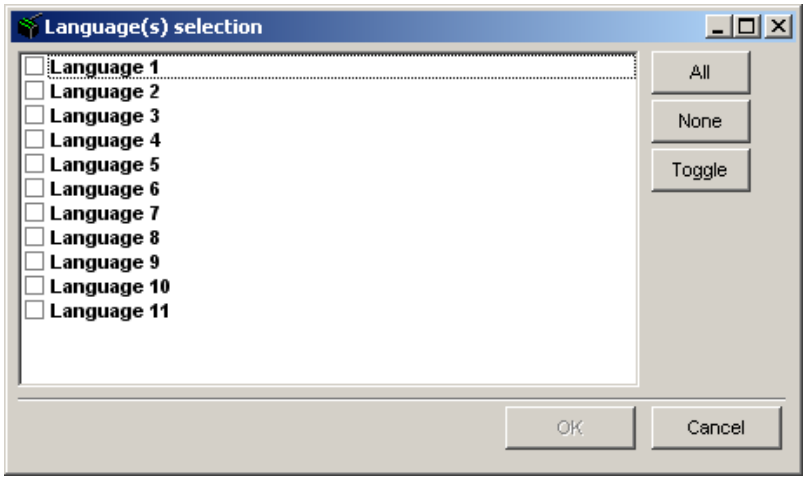
The language is selected in the system setup, menu 4241.

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.

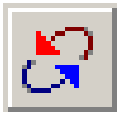
Buttons used in the utility SW

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.

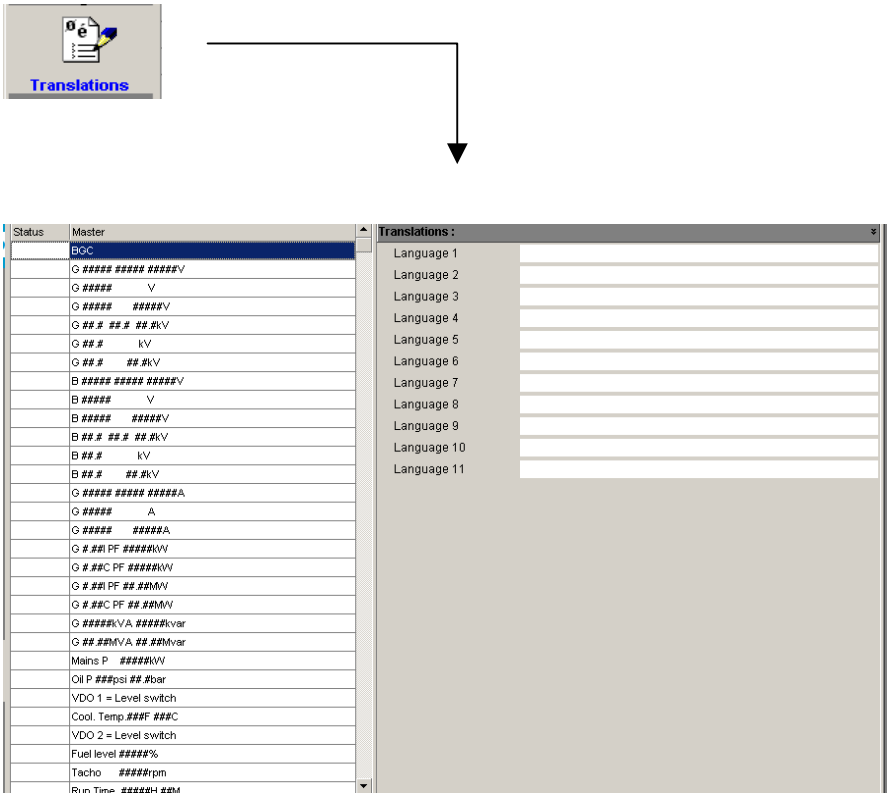


Synchronise a language file with the device:
This button function will synchronise a language file from a previous version of the software with a newer version. New functions that are not translated will be marked.

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):



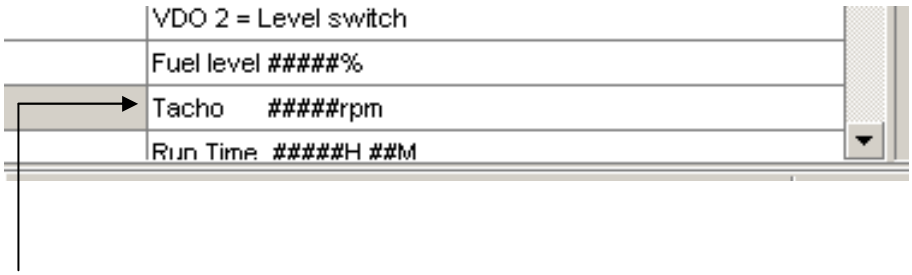
All configurable entries are shown in the left side column. The list can be scrolled with Page Down/Page Up.

Example:

Language 1 = Danish.
Changes to make on the Tacho name in this example:

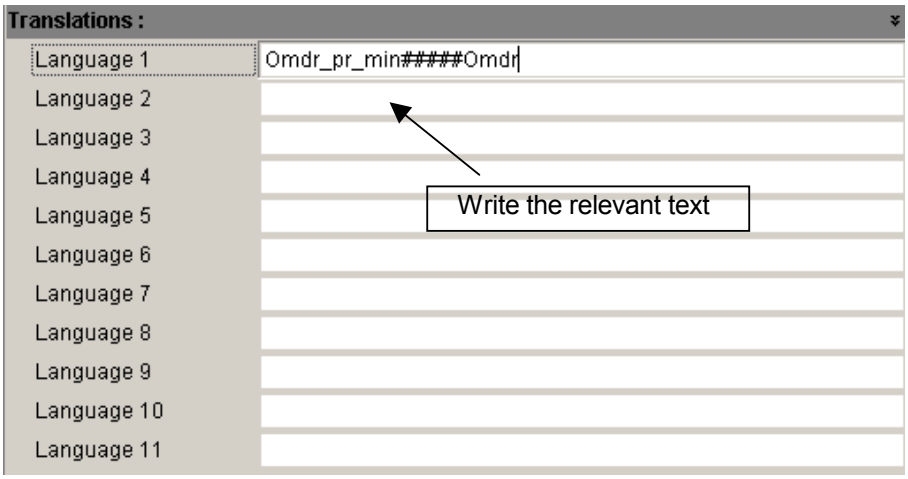
- 'Tacho' is changed to 'Omdr pr min'
- 'RPM' is changed to 'Omdr'

Select the line, which needs to be edited.



Select tacho

Select language 1 and write the relevant text.



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 setpoint	X	X	X	X	Constant
18	External U/Q setpoint	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 (GB ON + GB OFF) 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 (MB ON + MB OFF) 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 takeover 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 setpoint, 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 setpoint, 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 setpoint, 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 setpoint, 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 setpoint
Activates the external f/U setpoint on slot #4. Can be used in island operation and fixed power mode.

18. External U/Q setpoint
Activates the external U/Q setpoint 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. Remote start input
The input initiates the start sequence of the gen-set in semi-auto mode.

26. Remote stop input
The input initiates the stop sequence of the gen-set in semi-auto mode.

27. Remote GB OFF
The generator breaker OFF sequence will be initiated in semi-auto mode. If the mains breaker is opened, the generator breaker will attempt to deload or open without deload, if it is stand alone (when it is running in stand alone, the instant opening happens at $f_{NOMINAL}$ – 0.5 Hz). 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 in semi-auto mode. The breaker will 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 (in semi-auto).

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 (in semi-auto).

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:

Inputs / Modes	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% x U_{NOM}	Synchronise breaker
<60% x 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.

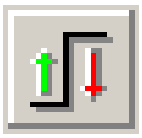
39. Temperature control
When the input is on, the gen-set will start/continue to run, and the stop is not possible. It will run at the nominal speed, if the low speed input above is low, and it will run at the idle speed when the low speed input is high.

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).

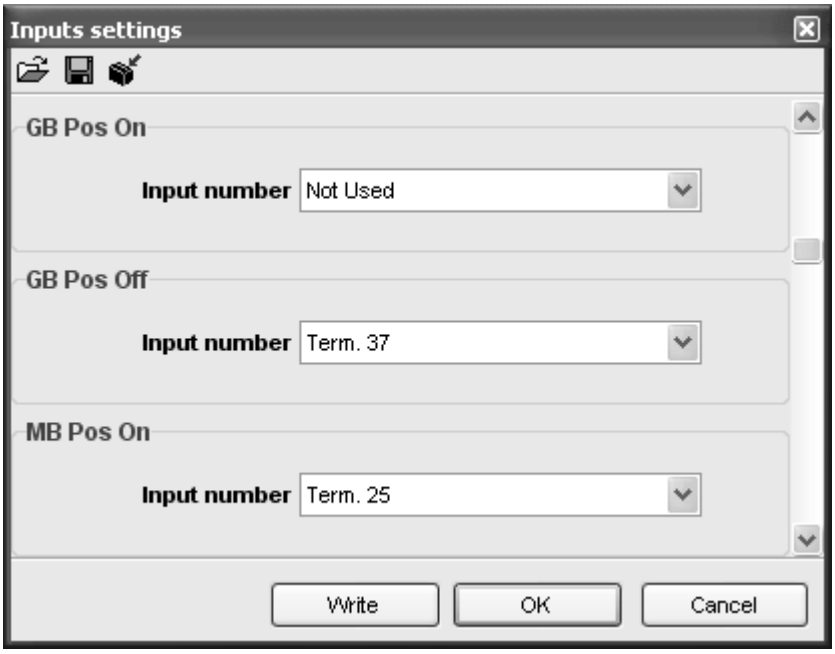
Configuration

The digital inputs are configured via the utility software.

Select the inputs icon in the horizontal toolbar.



The desired terminal number can now be selected for the selected input function or an input function can be adjusted to 'Not used' if the function is not necessary, see example below.

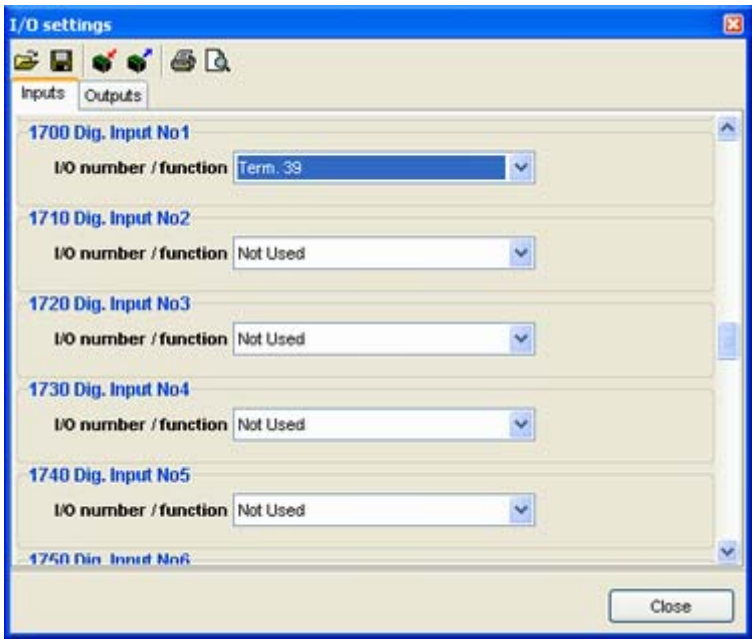


Alarm inputs

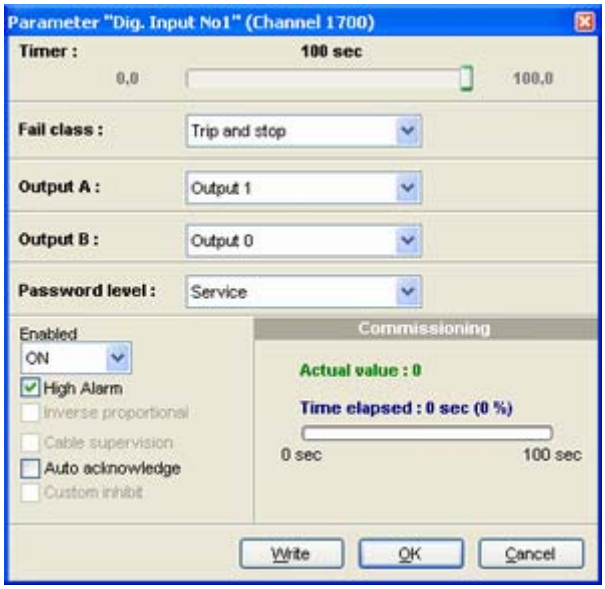
If the digital inputs have to be used as alarm inputs, they can be connected to e.g. pressure and temperature switches for alarm, trip or shut down purposes.

The procedure for configuring the digital input as an alarm input is described in the example below where the digital input terminal 39 must be used as a 'too low fuel level' alarm.

Step 1:
To prepare the digital for alarm purpose, select the specific input for the specific alarm menu, e.g. input 39 to menu 1700:

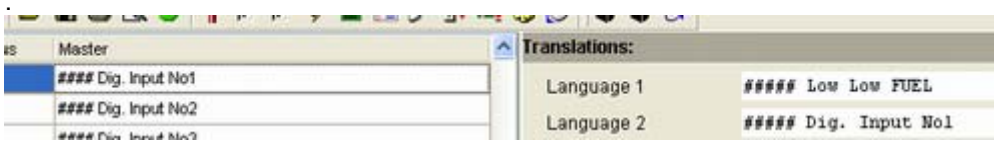


Step 2:
Make the proper adjustments in the parameter file and load them to the BGC either using the "write" function or by downloading the entire parameter file.



Step 3:
In the translations function please change the name of the input to the relevant name. In this example the text is changed to 'Low Low FUEL'

.



When the alarm occurs it will now be presented as '1700 Low Low FUEL'. If the alarm message is '1700 Dig. Input No 1', the language has not been configured.

Note that the digital inputs are mentioned twice in the translations list. This is because the input also appears in the service menu (menu 4980) and this text can also be configured.

Step 4:
Change language in the parameter file, menu 4240 to the language number where you made the adjustments. (Language 1 in this example.)

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 or temperature

The VDO inputs are internally supplied and therefore no external supply must be connected!

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**
>200Ω	Normal situation, no alarm
<200Ω	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**
°C	**Ω**	**Ω**	**Ω**
40	291.5	480.7	Configurable
50	197.3	323.6	
60	134.0	222.5	
70	97.1	157.1	
80	70.1	113.2	
90	51.2	83.2	
100	38.5	62.4	
110	29.1	47.6	
120	22.4	36.8	
130		28.9	
140		22.8	
150		18.2	

The configurable type is configurable with 8 points.

Level switch type

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

VDO input 3

This VDO input can be used for the fuel level sensor or for a second temperature sensor. The default setting is the fuel level sensor.

Fuel level sensor

	VDO sensor type FUEL		
Type / Value	Configurable	Type 1	Type 2
%	Resistance		
0	78.8 Ω	78.8 Ω	3 Ω
10			
20			
30			
40	47.9 Ω		
50	40.2 Ω		
60	32.5 Ω		
70	24.8 Ω		
80	17.0 Ω		
90	9.3 Ω		
100	1.6 Ω	1.6 Ω	180 Ω

The configurable type is configurable with 8 points.

Temperature sensor

	VDO sensor type TEMPERATURE	
Type / Temperature	Type 3	Configurable
°C	Ω	Ω
40	69.3	78.8 Ω
50		47.9 Ω
60	36.0	40.2 Ω
70		32.5 Ω
80	19.8	24.8 Ω
90		17.0 Ω
100	11.7	9.3 Ω
110		1.6 Ω
120	7.4	
130		
140		
150		

The configurable type is configurable with 8 points.

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

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
VDO input 3: **Temperature sensor** – alarm settings in menu 1470/1480

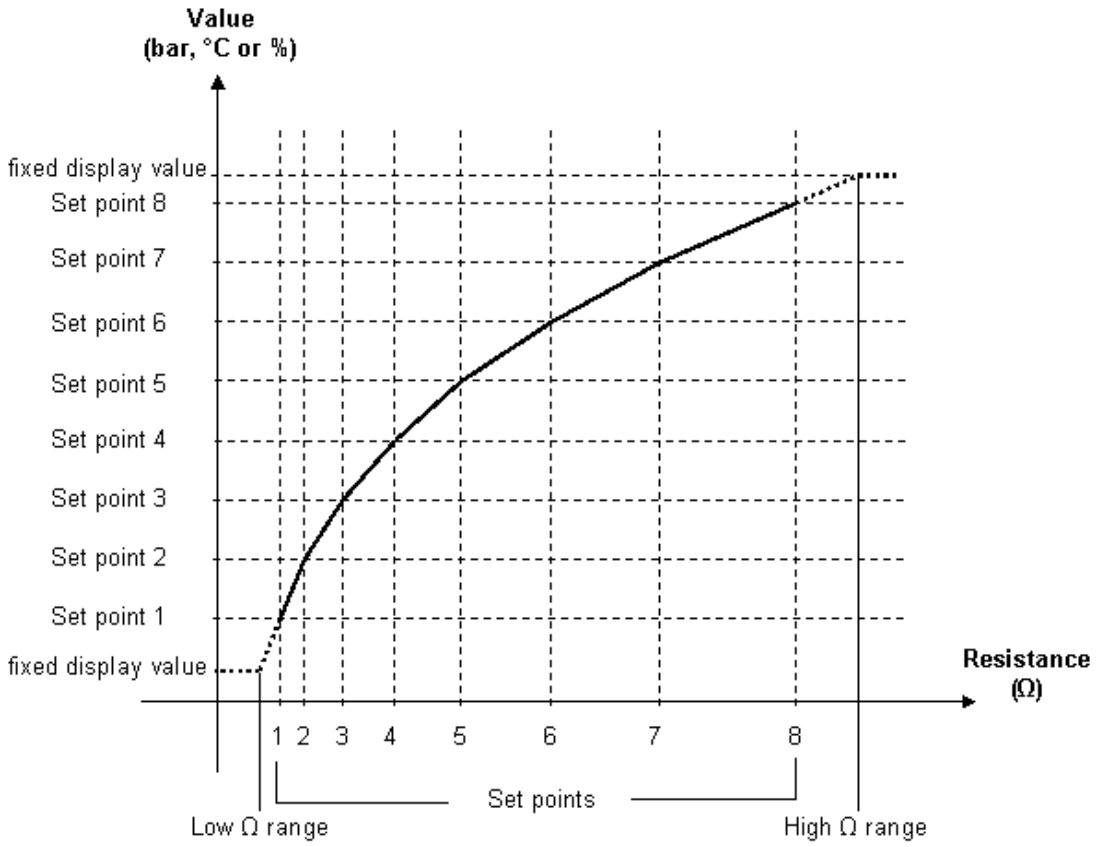
In addition, the VDO input 3 is also used for the fuel logic function. See chapter about fuel logic (page 73).

Note that VDO 3 is either used for temperature or level measurement.

Fuel pump logic is only available if VDO 3 is configured for fuel level sensing.

Illustration of configurable inputs

Curve:



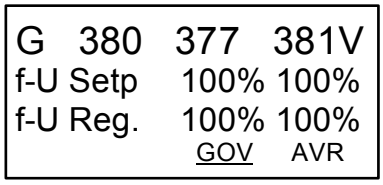
Configuration

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.

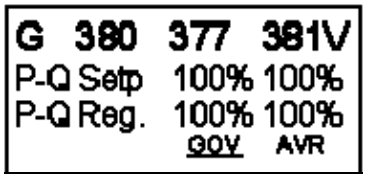
Manual governor and AVR regulation

This function can be activated by pressing the DOWN button on the display for 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 who is commissioning the gen-set an extra helpful tool.

When the DOWN button is pressed for 2 seconds, the following display window will appear: if the generator is running in island mode (or is stopped). frequency and voltage (option-dependant) setpoints can be manipulated.



If the generator is running parallel to mains, the following window will appear when the down button is pressed for two seconds: Power and reactive power (option-dependant) can be manipulated.



The function of the window depends on the selected mode:

AUTO and SEMI-AUTO

When the manual regulation window is displayed, the value setpoint (f-U Setp/P-Q Setp) can be changed by pressing the UP or DOWN button. When GOV is underlined, the governor setpoint will be changed, and the AVR setpoint is changed when AVR is underlined. (option-dependant)

The frequency and voltage can be changed when running in island mode (stand alone or load sharing) and the power and re-active power can be changed when running parallel to the mains.

When changing the setpoint value, an offset will be added to or subtracted from the setpoint value. This is e.g. the nominal frequency. The Reg. value (f-U Reg/P-Q Reg) is the output value from the regulator.

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 and the frequency/voltage is then regulated accordingly.

The UP and DOWN buttons have the same function as do the digital inputs increase/decrease GOV/AVR when the window is open. If the window is not open, the function is only accessible via the before-mentioned digital inputs.

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 G2 or G3 option is activated, GOV setpoint manipulation is possible. If a D1 or D2 option is activated, AVR setpoint manipulation is possible.

Alarm inputs

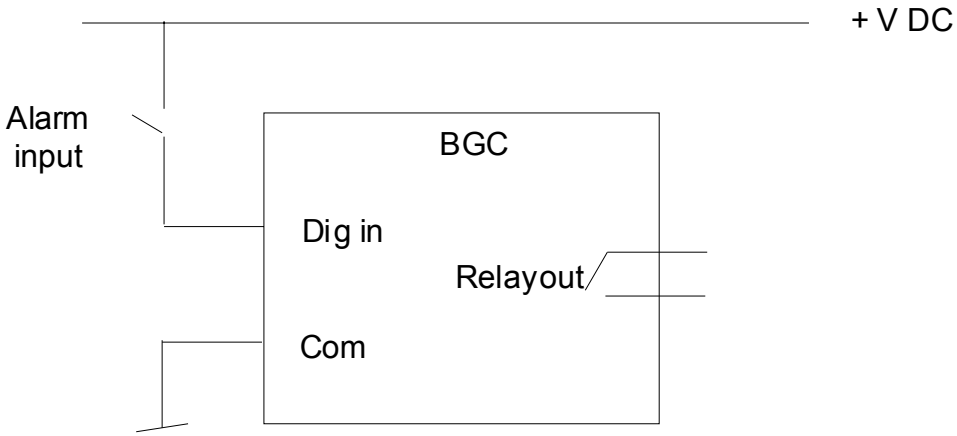
Digital input alarms can be configured with a possibility to select when the alarm is to be activated. The possible selections of the input function are normally open or normally closed.

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	Trip of gen. breaker	Stop gene-rator	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		
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 setpoints.

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 setpoints:

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 **Error! Bookmark not defined.**).

Tacho alarm

When the second setpoint is used, the following settings are valid:

	Tacho SP1	Tacho SP2
Setpoint	*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 setpoint 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.

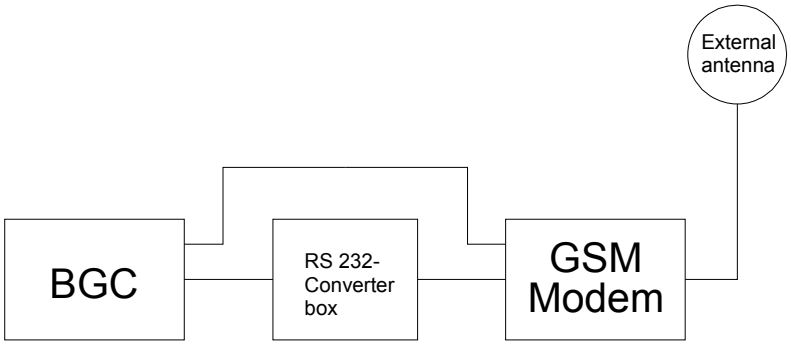
The service timer 2 is not deleted when downloading new software and parameters.

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.

System single-line diagram



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

Serial connection
The serial connection to the GSM modem is via the RS-232 converter box (option J5). The converter box is connected to the GSM modem via a straight RS-232 cable (not delivered in option J5. Option J1 can be used instead).

Other wirings
The GSM modem receives power directly from 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 a straight RS-232 cable (not delivered in option J5. Option J1 can be used instead).

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

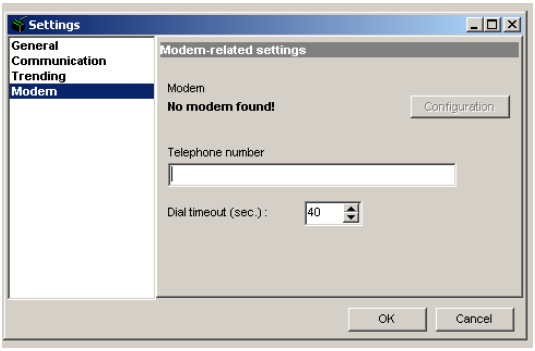
No.	Setting		Min. setting	Max. setting	Factory setting
6020	Service port	Setpoint	0 (normal USW)	1 (modem USW)	0 (normal USW)

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 dialogue 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.

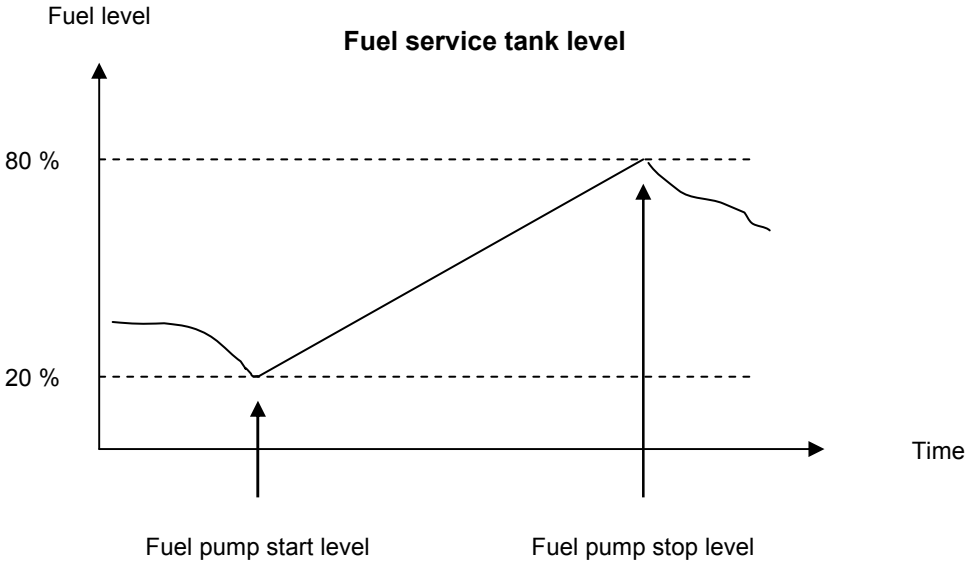
- Start level, factory setting at 20% (S2 – menu 1401)
- Stop level, factory setting at 80% (S3 – menu 1402)

Fuel pump logic is only available if VDO 3 is configured for fuel level sensing.

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.

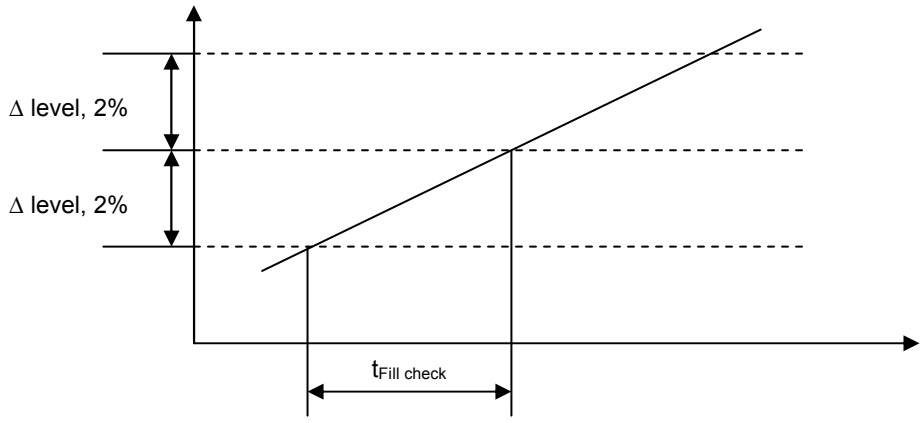
- Start level, relay 1 activates
- Stop level, relay 1 deactivates



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 42.

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

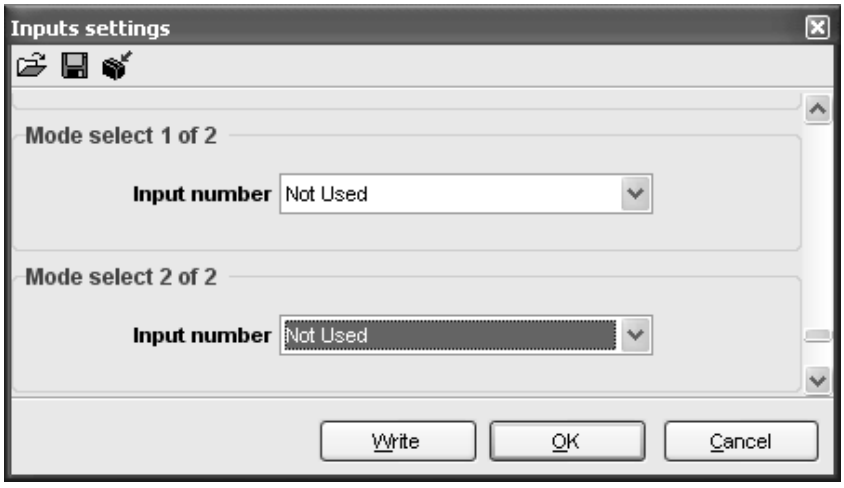
A mix between two inputs can be used to change the modes as follows:

Inputs / Modes	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.

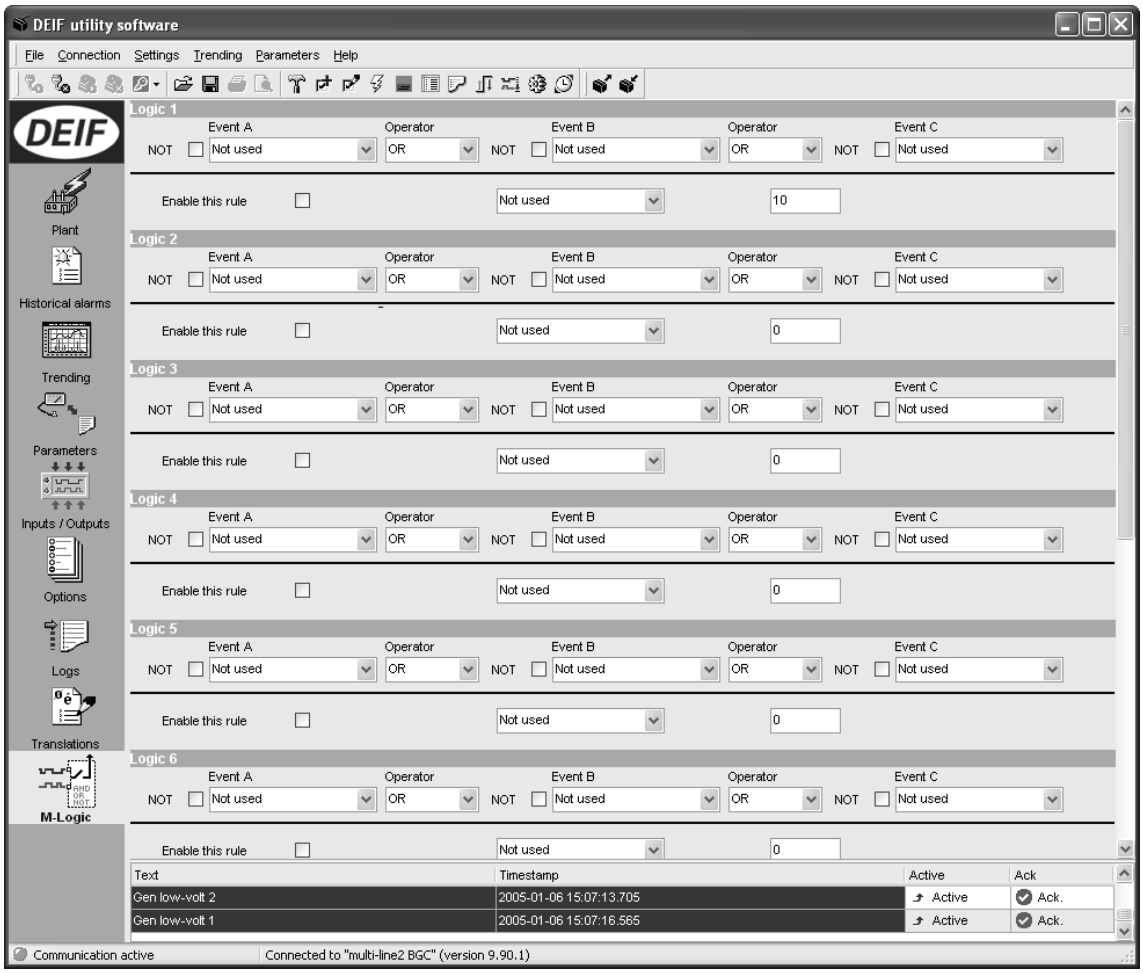
The M-logic is part of the PC utility software, and as such it can only be configured in the PC utility software and not via the display.

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.

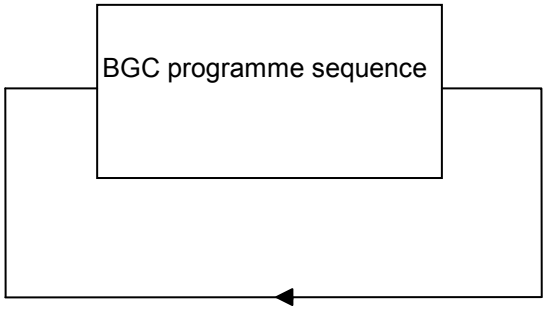
Programming

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

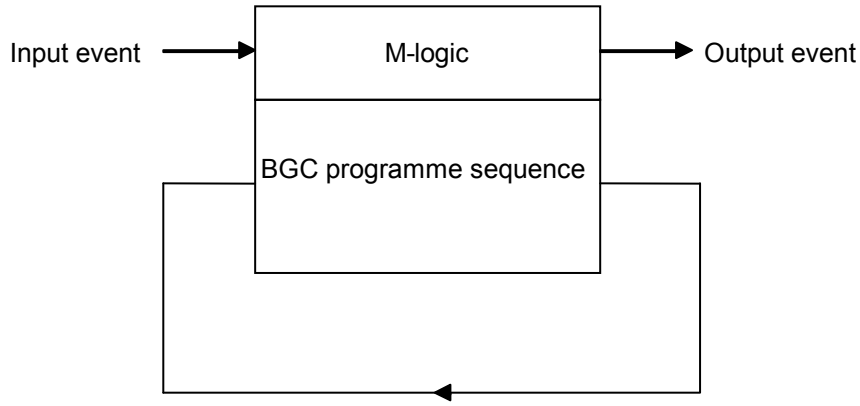


Description overview

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



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

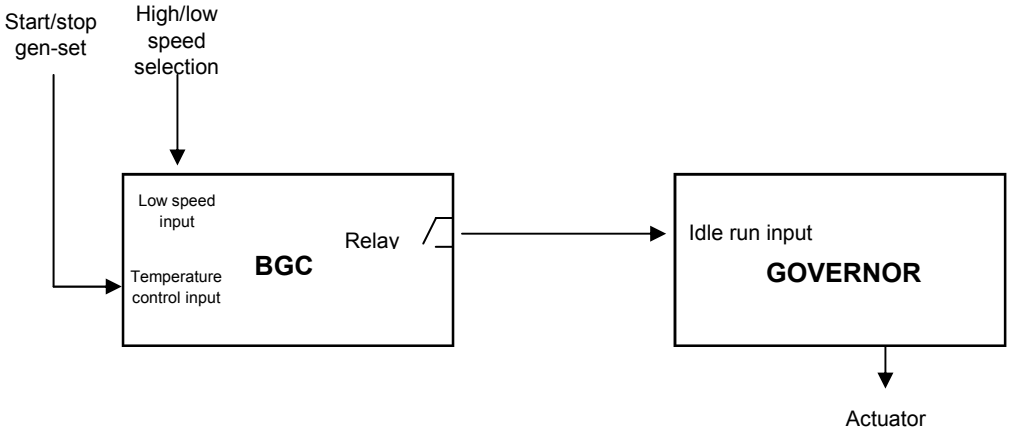
When the function is enabled, two digital inputs are used for control purposes:

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.

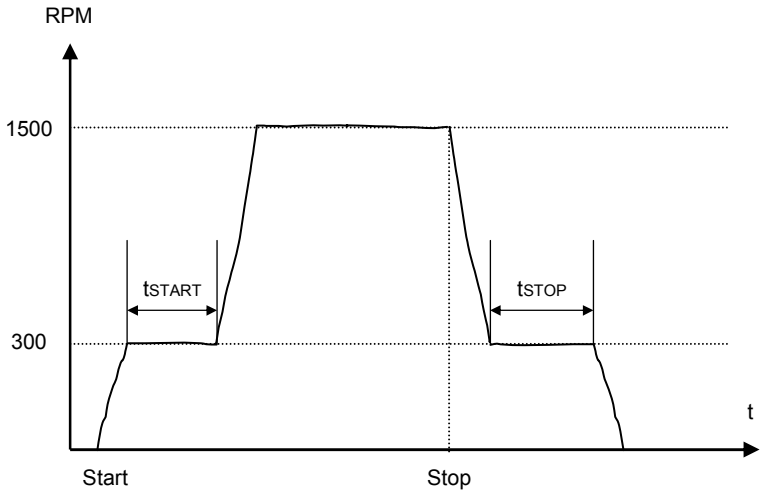
Turbo chargers not originally prepared for operating in the low speed area can be damaged, if the gen-set is running in 'idle run' for too long.



Examples

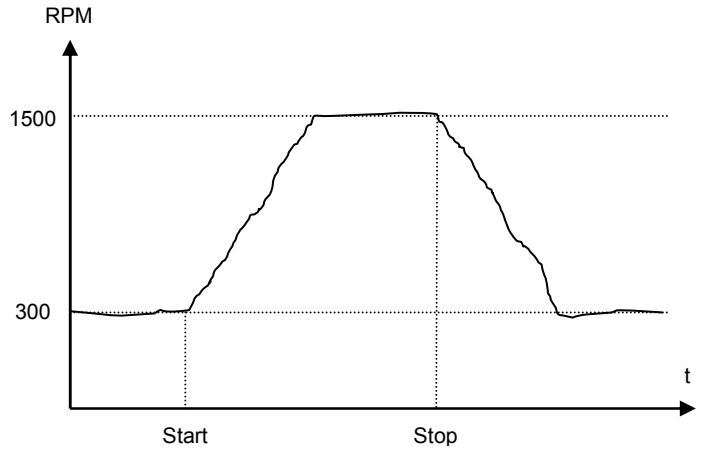
Idle speed during starting and stopping

(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

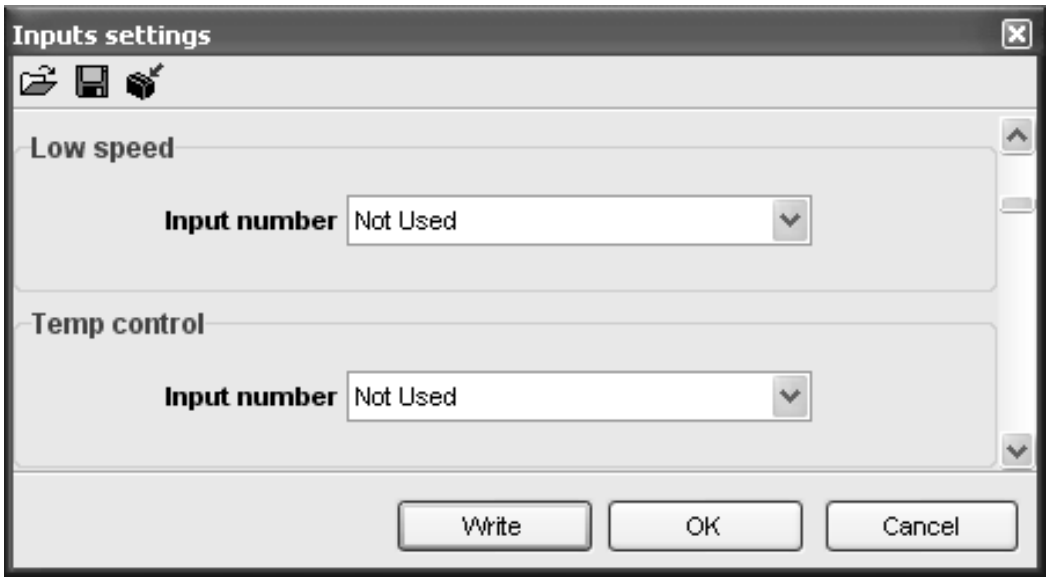
(In this example both timers are deactivated).
If the gen-set is to be prevented from stopping, then the digital input 'temp. control' must be left ON at all times. In that case the characteristic looks like this:



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).

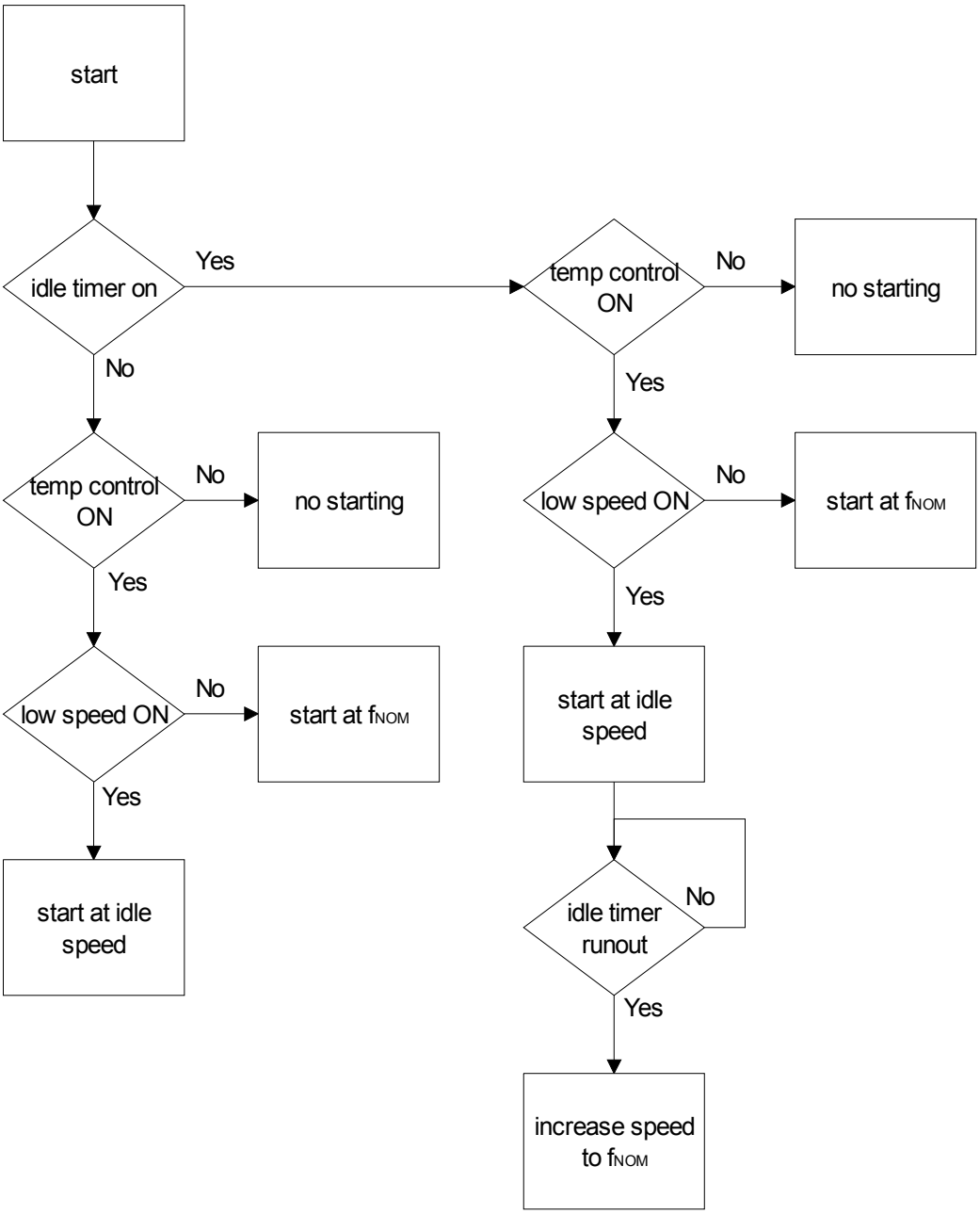
Running signal

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

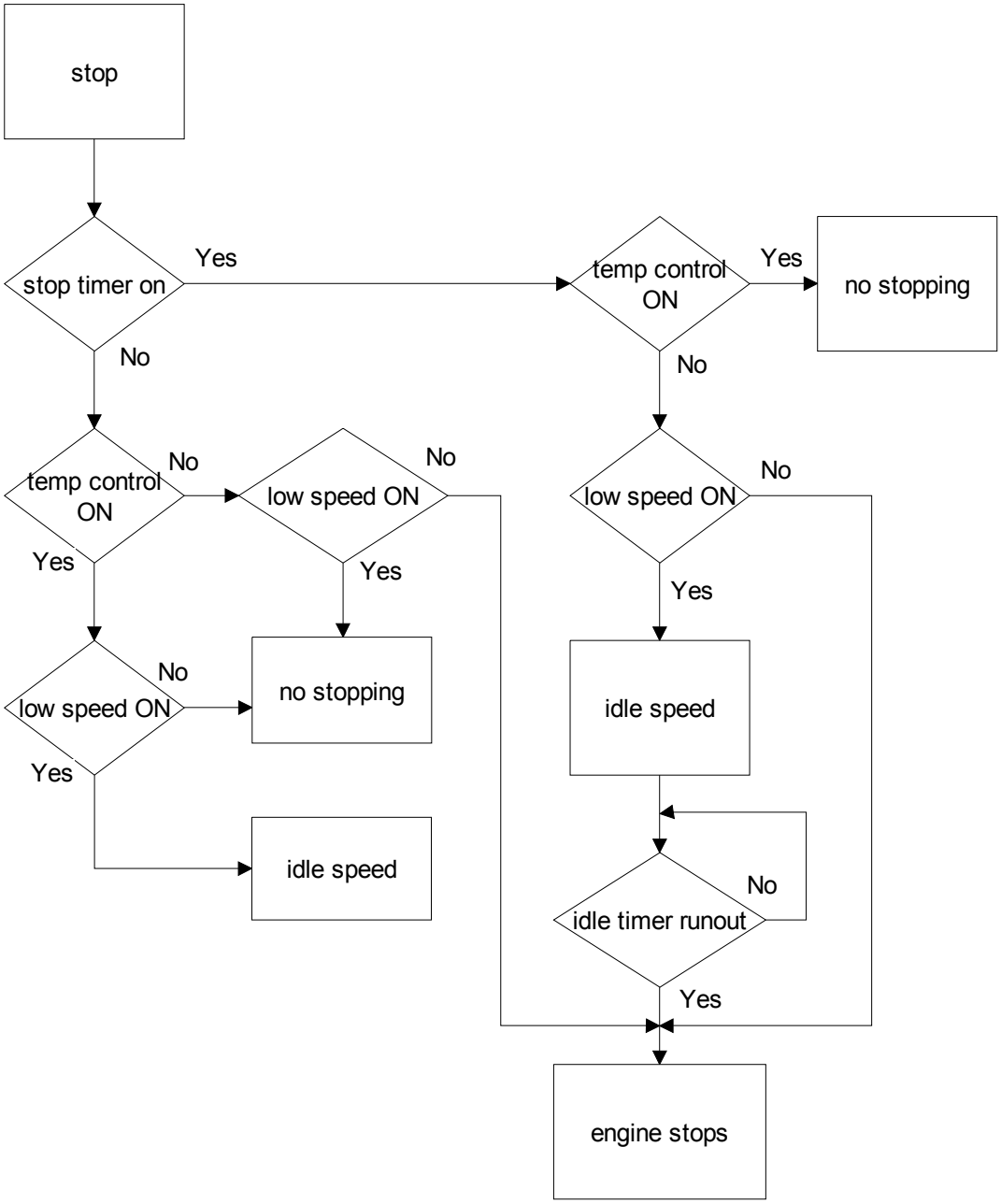
Idle speed flowcharts

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

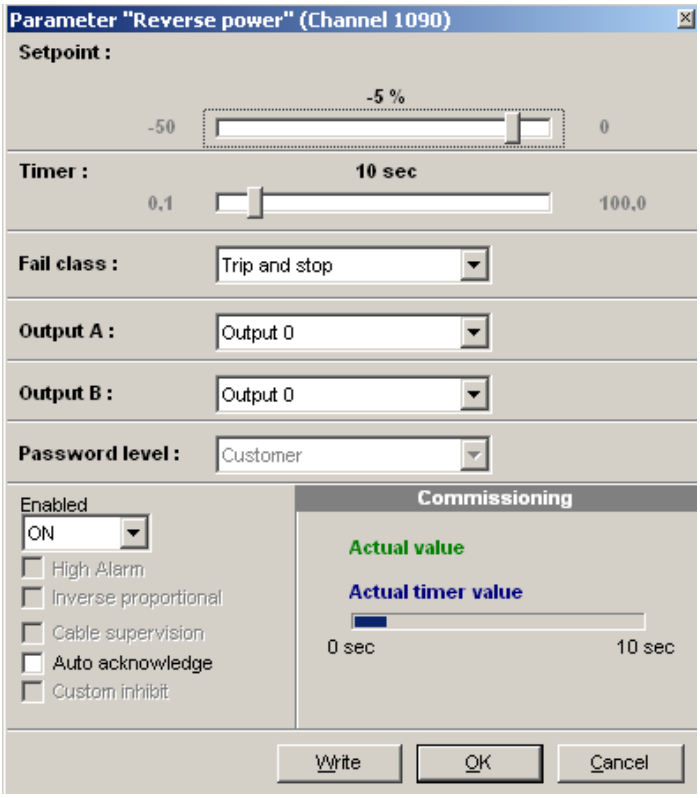

start
idle timer on
Yes
No
temp control ON
No
no starting
Yes
temp control ON
No
no starting
Yes
low speed ON
No
start at fNOM
Yes
low speed ON
No
start at fNOM
Yes
start at idle speed
start at idle speed
idle timer runout
No
Yes
increase speed to fNOM

Stop


stop
stop timer on
Yes
No
temp control ON
Yes
no stopping
No
temp control ON
No
low speed ON
No
Yes
Yes
low speed ON
No
Yes
no stopping
low speed ON
No
Yes
idle speed
idle timer runout
No
Yes
engine stops

Alarm auto acknowledge

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.



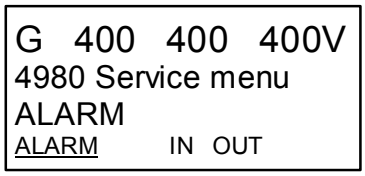
Service menu

The purpose of the service menu is to give information about the present operating condition of the gen-set. The service menu is entered using the 'JUMP' push-button (4920 Service menu).

Use the service menu for easy trouble-shooting in connection with the event log.

Entry window

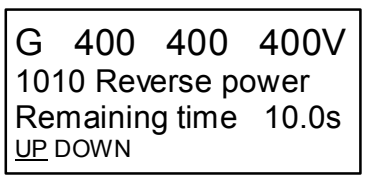
The entry shows the possible selections in the service menu.



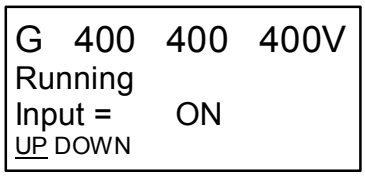
Available selections:

Alarm

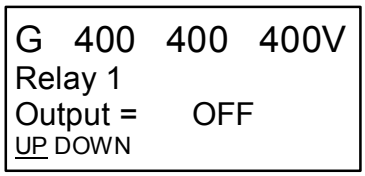
Shows the alarm timer and the remaining time. The indicated remaining time is minimum remaining time. The timer will count downwards when the setpoint has been exceeded.



IN (digital input)
Shows the status of the digital inputs.



OUT (digital output)
Shows the status of the digital outputs.



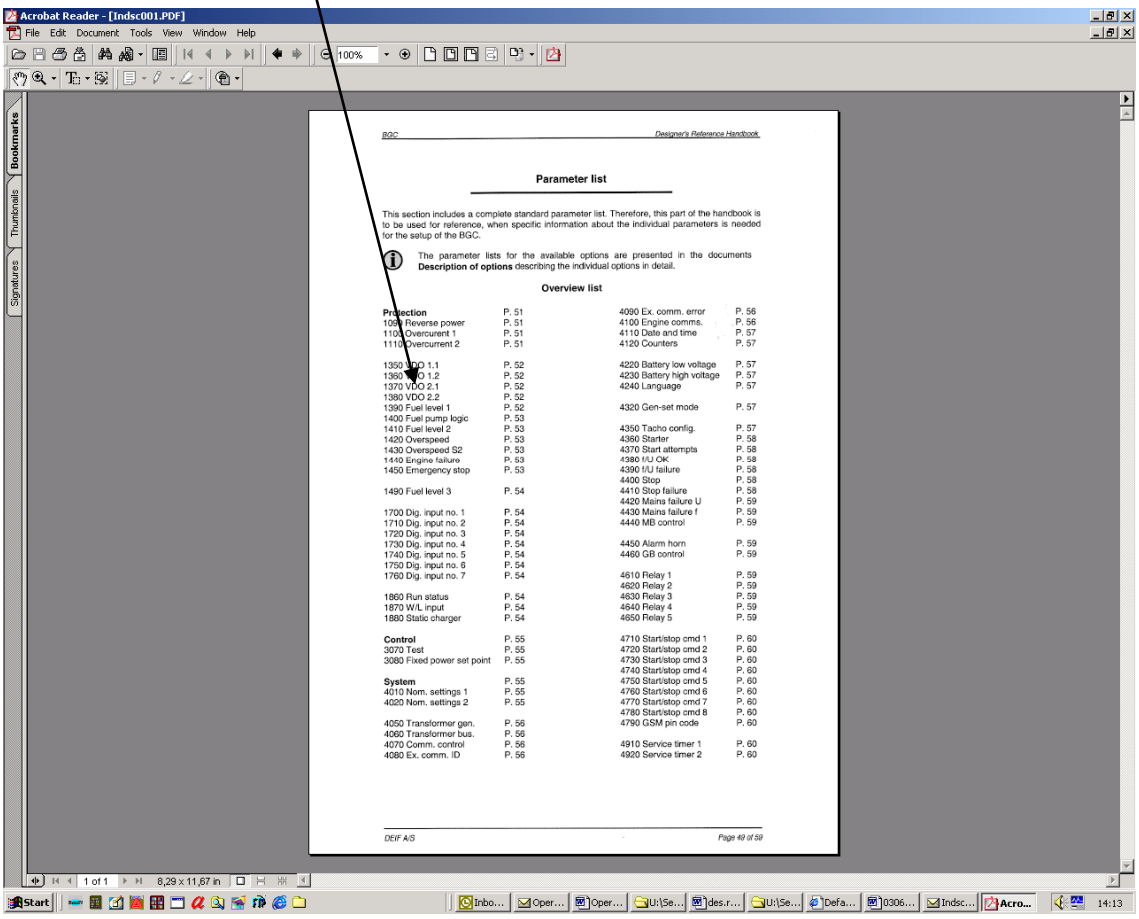
7. Procedure for parameter setup

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.

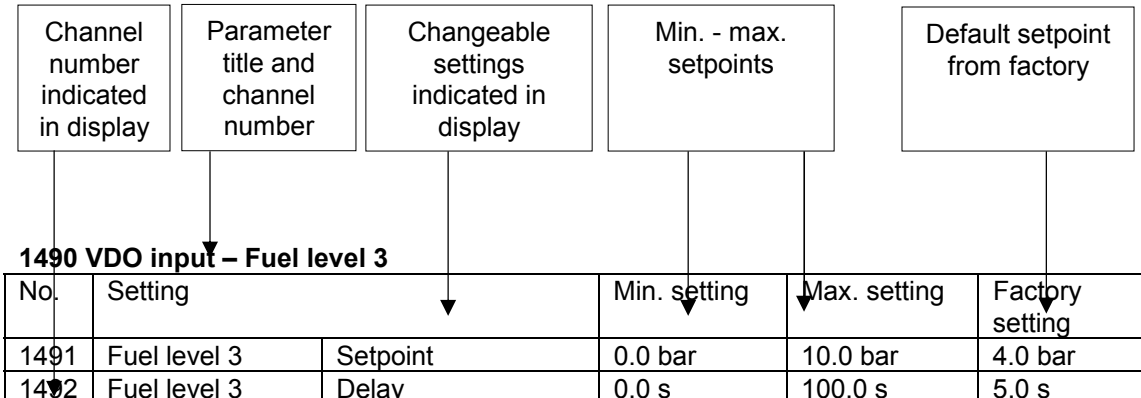
Find the individual parameter title in the overview list on page 87.



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:



1490 VDO input – Fuel level 3

No.	Setting		Min. setting	Max. setting	Factory setting
1491	Fuel level 3	Setpoint	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 setpoint available for this setting.

The fourth column indicates the default setpoint of the unit from the factory.

When it is necessary, additional information will be supplied after the table in order to make the individual parameter descriptions as informative as possible.

Setup

At this point of the process you will have located the specific parameter description that you were looking for. Now, follow the menu structure presented earlier in this handbook in order to set up the individual parameters.

(In this overall example we have chosen to change the setpoint of the parameter **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 'setpoint' menu via LIM in the fourth display line

Step 5: Enter password to change the setpoint

Step 6: Use push-buttons to increase/decrease the setpoint setting

Step 7: Use the 'underscore' to save the new setpoint 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

4080 Ex. comm. ID P. 94 5050 VDO 3 config. sensor P. 100

Parameter table description

The table consists of the following possible adjustments:

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

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

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

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

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

Fail class: When the alarm occurs, the 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	Setpoint	-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	Setpoint	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	Setpoint	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	Setpoint	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	Setpoint	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	Setpoint	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	Setpoint	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	Setpoint	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	Setpoint 1	0%	100%	20%
1402	Fuel pump logic	Setpoint 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	Setpoint	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	Setpoint	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	Setpoint	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

1470 VDO 3.1 Temp.

No.	Setting		Min. setting	Max. setting	Factory setting
1471	VDO 3.1 Temp.	Setpoint	40 deg.	150 deg.	100 deg.
1472	VDO 3.1 Temp.	Delay	0.0 s	100.0 s	5.0 s
1473	VDO 3.1 Temp.	Output A	R0 (none)	R3 (relay 3)	R0 (none)
1474	VDO 3.1 Temp.	Output B	R0 (none)	R3 (relay 3)	R0 (none)
1475	VDO 3.1 Temp.	Enable	OFF	ON	ON
1476	VDO 3.1 Temp.	Fail class	1 Alarm	6 Trip MB	2 Warning
1477	VDO 3.1 Temp.	Sensor type	Fuel level	Temperature	Fuel level

The parameter 1477 is only accessible from the utility software. The parameter is used to select the VDO 3 type to either level or temperature sensor. Menus 1470/1480 are available in the display when VDO 3 is selected for temperature.

1480 VDO 3.2 Temp.

No.	Setting		Min. setting	Max. setting	Factory setting
1481	VDO 3.2 Temp.	Setpoint	40 deg.	150 deg.	110 deg.
1482	VDO 3.2 Temp.	Delay	0.0 s	100.0 s	5.0 s
1483	VDO 3.2 Temp.	Output A	R0 (none)	R3 (relay 3)	R0 (none)
1484	VDO 3.2 Temp.	Output B	R0 (none)	R3 (relay 3)	R0 (none)
1485	VDO 3.2 Temp.	Enable	OFF	ON	ON
1486	VDO 3.2 Temp.	Fail class	1 Alarm	6 Trip MB	2 Warning

1490 VDO input – Fuel level 3

No.	Setting		Min. setting	Max. setting	Factory setting
1491	Fuel level 3	Setpoint	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	-	Pulse

Power

3070 Test

No.	Setting		Min. setting	Max. setting	Third setting	Factory setting
3071	Test	Setpoint	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 setpoint

No.	Setting		Min. setting	Max. setting	Factory setting
3081	Fixed power setpoint	P setpoint	0%	100%	100%
3082	Fixed power setpoint	PF setpoint	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	Setpoint	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	Setpoint	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 takeover	Load takeover	-

4350 Tacho config.

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

The tacho config. setpoint 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 57 and 'Interruption of start sequence' on page 49. 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 71 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% 40 deg	0 ohm	180 ohm	78.8 ohm
5052	VDO 3	VDO 3 at 40% 50 deg	0 ohm	180 ohm	47.9 ohm
5053	VDO 3	VDO 3 at 50% 60 deg	0 ohm	180 ohm	40.2 ohm
5054	VDO 3	VDO 3 at 60% 70 deg	0 ohm	180 ohm	32.5 ohm
5061	VDO 3	VDO 3 at 70% 80 deg	0 ohm	180 ohm	24.8 ohm
5062	VDO 3	VDO 3 at 80% 90 deg	0 ohm	180 ohm	17 ohm
5063	VDO 3	VDO 3 at 90% 100 deg	0 ohm	180 ohm	9.3 ohm
5064	VDO 3	VDO 3 at 100% 110 deg	0 ohm	180 ohm	1.6 ohm

VDO 3 can be used for fuel level measurement or temperature measurement

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.