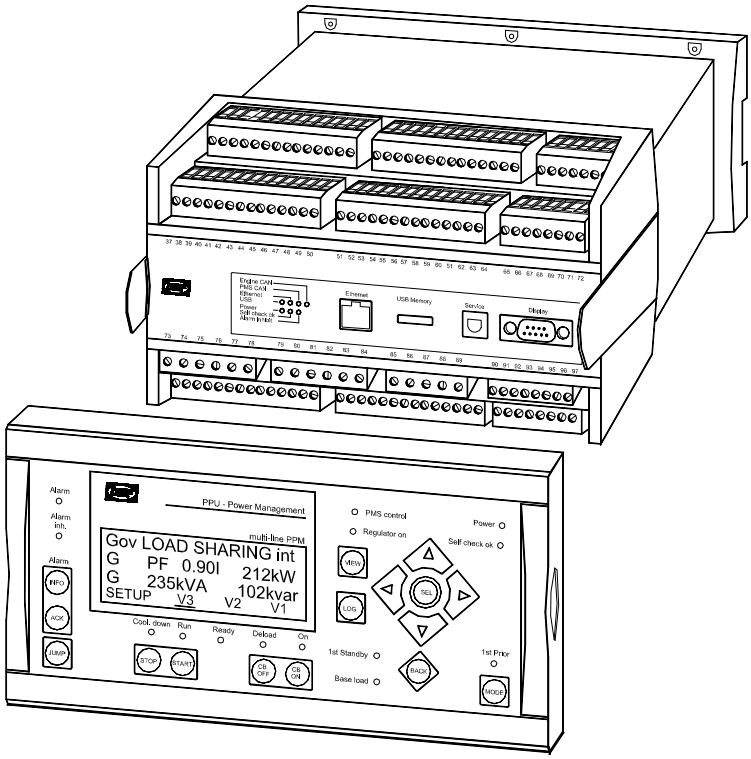
DEIF A/S

Operator's Manual

PPU Power Management (PPM)

4189340410E (UK)



- *User interface*
- *Alarm list*
- *Parameter list*
- *Failure mode and effect analysis (FMEA)*

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1. About this document

This document is the Operator's Manual for DEIF's PPU Power Management system PPM. The document mainly includes information about user interface, alarm and parameter list, failure mode and effect analysis and service guide.

The general purpose of the Operator's Manual is to offer practical and technical information about the PPM system for the daily operator.

Please make sure that you read this manual before starting to work with the PPM system. Failure to do this could result in damaging the equipment or even worse injury of personnel.

Intended users

This manual is mainly intended for the daily operator of the system. On the basis of this document, the operator will be able to perform simple and advanced operation of the PPM system.

Contents/overall structure

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

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.

2. Warnings and legal information

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.

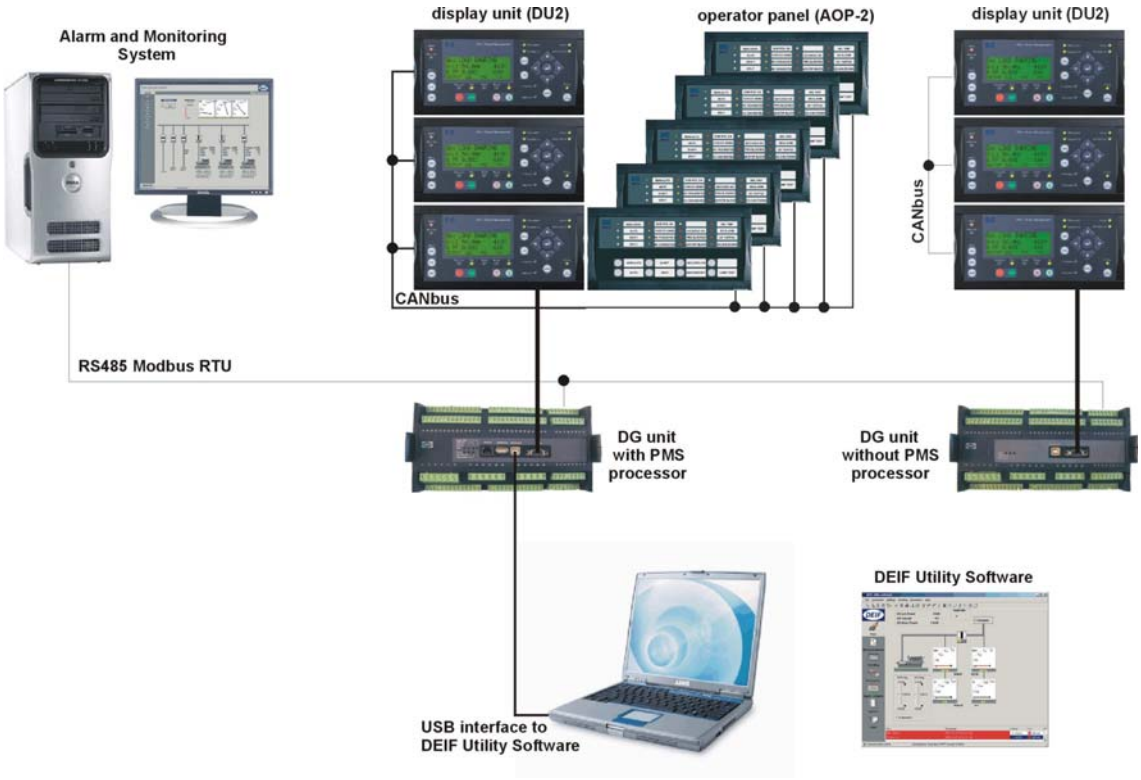
Be aware of the hazardous live currents and voltages. Do not touch any AC measurement inputs as this could lead to injury or death.

3. User interface

The Human Machine Interface (HMI) in the PPU Power Management can be done via the display unit, the **A**dditional **O**perator **P**anel (AOP-2), the DEIF utility software or via an external alarm and monitoring system.

The illustration below shows the HMI possibilities to the PPM units:

1) The display unit
2) The AOP-2
3) The DEIF utility software
4) Alarm and monitoring system



The display unit is connected to the main unit via a 9-pole Sub-D plug. The additional operator panel (AOP-2) is directly connected to the internal display CAN bus line that refers to the power management unit and can be placed anywhere in the switchboard (up to 500m distance from the display unit). The alarm and monitoring system or graphical touch screen display can be connected either to an RS485 RTU or an Ethernet TCP/IP modbus line. Both connections can be done separately or in parallel.

For service issues, a laptop can easily be connected to the main unit by using the USB port to adjust parameters or supervising the system.

Display push-buttons and LEDs

Push-button functions

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

INFO: Moves directly to the alarm list.

ACK: Acknowledges the active alarm shown on display.

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: Moves directly to the event and alarm list. The list holds 150 events.

 : Moves the cursor left for manoeuvring in the menus.

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

 : Selects the underscored entry in the fourth line of the display and acknowledges the active alarm shown on the display.

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

 : Moves the cursor right for manoeuvring in the menus.

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

STOP: Activates the stop sequence (only active in SEMI-AUTO plant mode).

START: Activates the engine start sequence (only active in SEMI-AUTO plant mode).

CB OFF: Activates the breaker OFF sequence incl. deloading (only active in SEMI-AUTO plant mode).

CB ON: Activates the breaker ON sequence incl. synchronising (only active in SEMI-AUTO plant mode).

1st PRIOR: The auxiliary engine will be selected for the first start priority.

The push-buttons are placed as follows:

INFO:
Moves directly to the alarm list.

ACK.:
Acknowledges the active alarm shown on display.

JUMP:
Enters a specific menu number selection.

ENTER:
Selects the underscored entry in the fourth display line and acknowledges alarms.

STOP:
Activates the stop sequence
(only in SEMI-AUTO plant mode).

START:
Activates the engine start sequence
(only in SEMI-AUTO plant mode).

CB OFF:
Activates the breaker OFF sequence
(only in SEMI-AUTO plant mode).

CB ON:
Activates the breaker ON sequence
(only in SEMI-AUTO plant mode).

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

LOG:
Moves directly to the event and alarm list.

BACK:
Jumps one step backwards in the menu.

1st PRIOR:
The auxiliary engine will be selected for the first start priority.

LED functions

The display unit holds 14 LED functions. The colour is green, red or yellow dependent on its function.

Alarm: LED red flashing indicates that unacknowledged alarms are present.
LED red fixed light indicates that ALL alarms are acknowledged, but some are still present.

Alarm inh.: LED yellow fixed light indicates that an alarm is enabled but inhibited or that the alarm inhibit input is active.

Cool. down: LED green when the cooling down function is active.

Run: LED green indicates that the generator is running.

Ready: LED green when the unit is ready for operation.

Deload: LED yellow when the deloading function is active.

On: LED green indicates that the breaker is closed.
LED yellow indicates that the synchronisation function is active.

PMS control: LED green when the unit is under power management control.
LED off when the unit is under switchboard control.

Regulator on: LED green when the load share function is active.

1st Standby: LED green when the diesel generator is the next to start.

Base load: LED green indicates that the base load function is selected and active.
LED yellow indicates that the base load function is selected and **not** active.

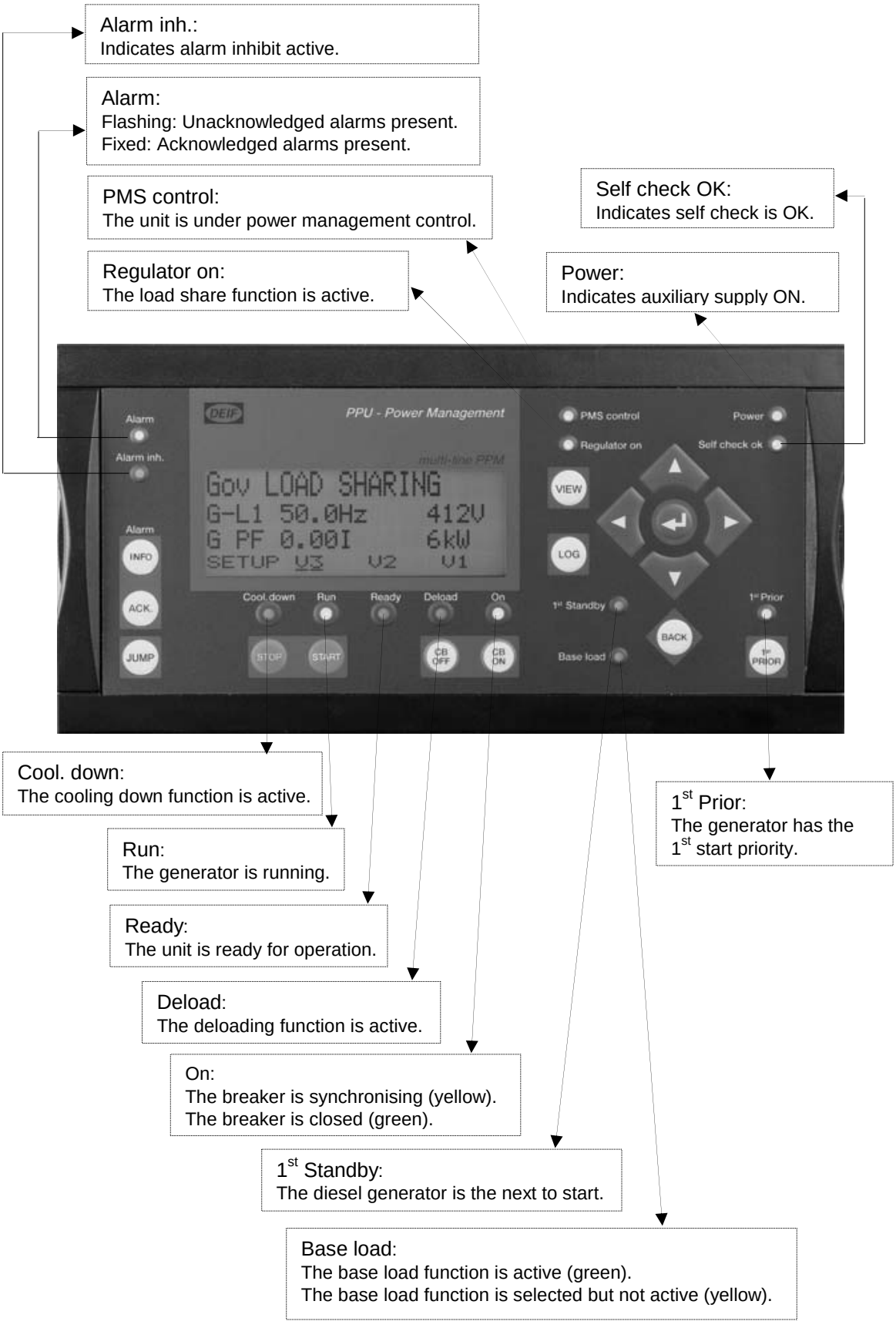
Power: LED green indicates that the auxiliary supply is switched on.

Self check OK: LED green indicates that the unit is OK.

1st Prior: LED green when the generator unit in question has the first start priority.

The illumination intensity of the backlight and the LEDs of the display are adjustable. See the PPM Designers Reference Handbook.

The display LEDs are indicating as follows:



Display and menu structure

LCD display

The display is a backlit LCD text display containing 4 lines with 20 characters in each line. Basically, all measured and calculated values can be read in the display. These may be selected via the PC utility software (USW).

Menu structure

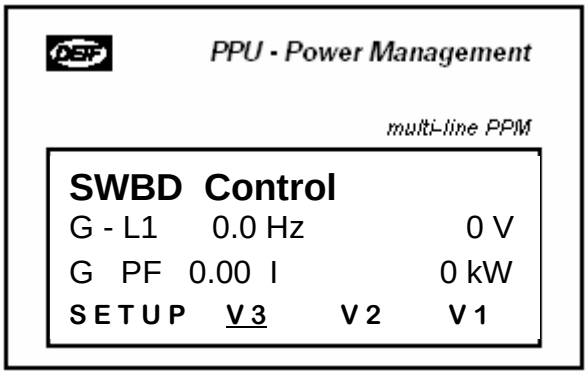
The display includes two menu systems:

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 operator 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 pushing the BACK push-button 3 times.

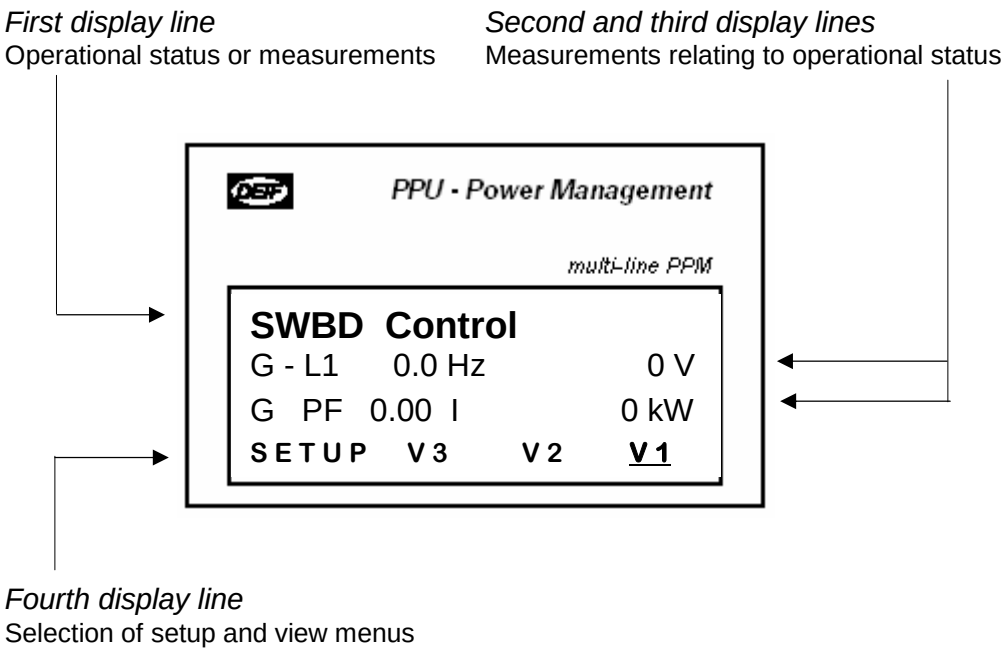


The text in the first line can differ depending on the system status.

The alarm page will appear if an alarm is present.

View menu

The view menus (V1, V2 and V3) are the daily use menus for the operator.



In the view menus, various measured values can be displayed.

View menu navigation

The readings etc. are all selected by moving the cursor (fourth display line).

Note! The underscore under V1 on the drawing above indicates where the cursor is.

The cursor is moved using the and push-buttons on the right side of the display.

View window 1

Display of measured values according to the selections made during configuration.

V1 contains up to 15 different windows which can be selected using the and push-buttons located on the right hand side of the display.

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

View window 2

Display of measured values according to the selections made during configuration.

Display V2 follows the selection in V1 as follows:

1: View 1: (Start prepare)
2: View 2: (Synchronising)
3: View 3: (Ramp up/down)
4: View 4:
5: View 5: (Default (when none of the above are in operation))

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

** The default window is automatically selected after the ramping up when the gen-set is in normal operation, e.g. load share mode.*

View window 3

Display of measured values according to the selections made during configuration. The V3 display changes with running modes, where:

The first display line indicates running status of the unit. The messages shown in the table at the end of this chapter can be displayed.
The second and third display lines display measured values.
The fourth display line displays the selection line.

Display V3 follows the selection in V1 as follows:

1: View 1: (Start prepare)
2: View 2: (Synchronising)
3: View 3: (Ramp up/down)
4: View 4:
5: View 5: (Default* (when none of the above are in operation))

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

* *The default window is automatically selected after the ramping up when the gen-set is in normal operation, e.g. load share mode.*

The operator can configure the desired read-outs of all measured values like e.g.:

For generator:	For busbar:	For analogue input:	For PM functions:
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 CB operations	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.) Frequency deviation (df/dt) (Hz/sec.) Voltage angle between generator voltage and bus voltage (deg.) Power supply voltage (V DC)	Analogue 1 Analogue 2 Analogue 3 Analogue 4 Tacho	P available P consumed

Status line text

This table explains the different status messages shown in the first display line under view 3.

Status text	Condition
FIXED FREQUENCY	The generator is running with fixed frequency
Gov LOAD SHARING	The load sharing function is active
Gov FIXED POWER	The gen-set is running with base load
RAMP DOWN	Decreasing the load of the gen-set
RAMP UP	Increasing the load of the gen-set
SWBD Control	Switchboard control has been selected externally
Ready for operation	The generator is ready for operation
Not Ready	The generator is not ready for operation
Start Prepare	The start prepare relay is activated
Start Relay On	The start relay is activated
Start Relay Off	The start relay is deactivated during the start sequence
Cooling Down ###.#s	Cooling down period is activated
Gen-set Stopping	This info is shown when cool down has finished
Ext. Stop T. ###.#s	Extended stop time after the running signal disappeared
TOO SLOW 00<----------	Generator running too slow during synchronising
----------> 00 TOO FAST	Generator running too fast during synchronising
Load dep. start	The load dependent start timer is running
Load dep. stop	The load dependent stop timer is running
PTH Mode active	Power Take Home mode is selected for the shaft generator
TB in operation	The bus tie breaker is closed and in operation

Info line text

This table explains the different info messages shown when a push-button is pressed and the operation is not possible (shown in the first display line under view 3).

NOT IN SEMI MODE	The system is not in SEMI-AUTO mode
NOT IN AUTO MODE	The system is not in AUTO mode
SG NOT IN PMS	The shaft generator is not under power management control
NOT IN PMS CTRL.	The diesel generator is not in power management control
START INHIBIT	The generator is blocked for start
BLOCK ALARM!	A block alarm is active
GEN. RUNNING	The generator is already running
DG STOP ALARM	A stop failure alarm has been detected
GEN. NOT RUNNING	The generator is not running
GB IS CLOSED	The generator breaker is closed
GB IS OPEN	The generator breaker is open
GB OFF NOT POSS.	The generator breaker cannot be opened (to prevent blackout)
TB BLOCK ALARM!	The bus tie breaker is blocked by an active block alarm
TB IS CLOSED	The bus tie breaker is closed
TB NOT IN PMS	The bus tie breaker is not in PMS control
TB IS OPEN	The bus tie breaker is open
TB OFF NOT POSS.	It is not possible to connect the bus tie breaker (at least one DG must be connected)
TB ON NOT POSS.	It is not allowed to connect the bus tie breaker (to prevent long time parallel operation between SG and DG)

Display manoeuvring in the menus

To go to the setup menus, select SETUP by moving the cursor under SETUP with the arrow keys.

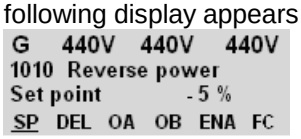
Press (ENTER).

The setup menu has 4 submenus:

- PROT (protection)
- CTRL (control)
- I/O (input/output)
- SYST (system)

Under the PROTECTION SETUP (PROT) all the protection functions can be configured.

To get to the **PROT** menu, use the cursor push-buttons to select PROT and press ENTER. The following display appears:

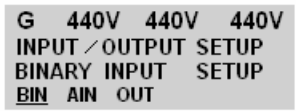


For each protection function the operator can configure the set point (SP), the delay time (DEL), output A (OA), output B (OB), enable (ENA) and the fail class (FC). For some protection functions it is possible to define a trip curve (e.g. inverse overcurrent) with 3 different set points and 3 different delays for the same protection function.

To get to the **CTRL** menu, use the cursor push-buttons to select **CTRL** and press ENTER. The following display appears:

The CONTROL menu is divided into CONTROL SETUP and REGULATION SETUP. Under the SYNC submenu all parameters, limits and delays regarding the synchronisation can be adjusted. Under the REG menu all parameters, limits and delays regarding the regulation can be configured.

In the **I/O** submenu the operator can configure the binary inputs, analogue inputs and outputs:



In the I/O submenu the binary inputs can be defined with delay, while the analogue inputs in addition can be configured with a set point (e.g. 10mA). The relay outputs can be defined for either an alarm function or a limit value. Each relay can be configured with a delay time.

When opening the **SYST** menu, three new submenus are available:

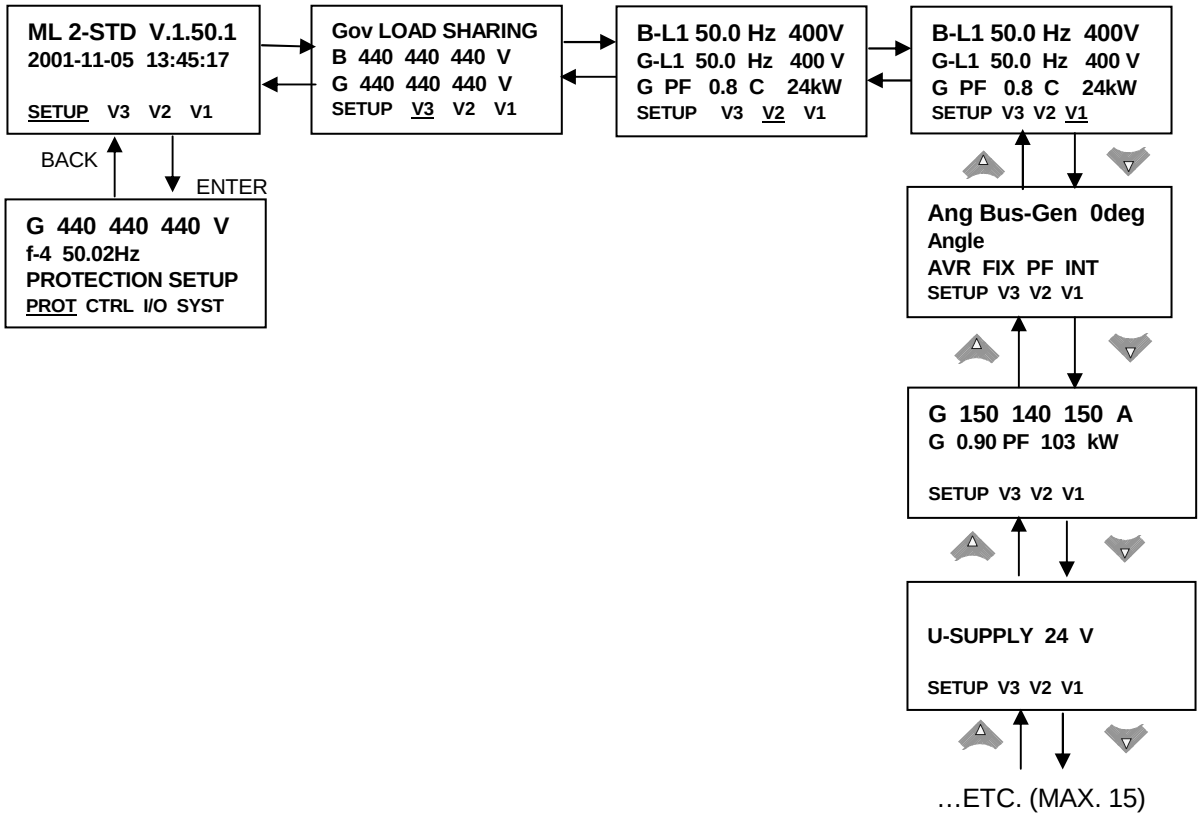
The first submenu is the general setup menu, where all general settings can be configured (e.g. nom. frequency, power, current etc.).
The second submenu is the communication setup, where all parameters regarding the communication can be configured.
The third submenu is the power management setup. This menu is only available for the PMS unit. All parameters regarding the PMS can be adjusted here.

Menu overview

The following is the menu structure when entering settings of the multi-line 2. The settings can be entered through the setup menu. If no entry has taken place before, the first display to appear is the **password** display. Enter the factory setting password to gain access to the menus. The factory password is 2000. If no actions have been taken within 3 minutes, the password entry will be de-activated, and a new password entry will be needed.

The menu overview is divided according to the daily use display selections in the fourth line (PROT, CTRL, I/O, SYST).

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



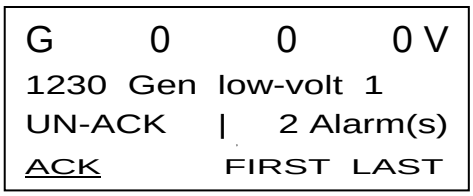
Alarm handling

When an alarm occurs, the unit will automatically jump to the alarm list for display of the alarm. If reading of the alarms is not desired, use the BACK push-button to exit the alarm list.

If you decide to enter the alarm list later, use the INFO push-button to jump directly to the alarm list reading.

The alarm list contains both acknowledged and unacknowledged alarms provided that they are still active (i.e. the alarm condition is still present). Once an alarm is acknowledged and the condition has disappeared, the alarm will no longer be displayed in the alarm list.

This means that if there are no alarms, the alarm list will be empty.



This display example indicates an unacknowledged alarm. The display can show only one alarm at a time. Therefore, all other alarms are hidden.

To see the other alarms, use the  and  push-buttons to scroll in the display.

To acknowledge an alarm, use the  push-button or place the cursor (underscore) under 'ACK' and then press "ENTER"  .

To jump to the first (oldest) or the last (youngest) alarm, place the cursor under the selection (FIRST or LAST) and press "ENTER".

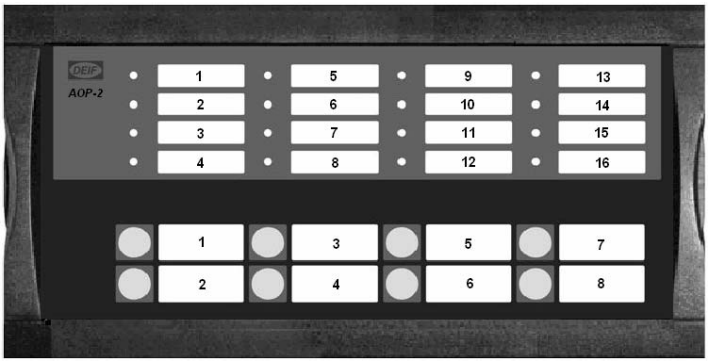
Log list

The log list contains up to 150 events. To enter the log list, press the LOG push-button.

An event is e.g. powering the system up. An alarm is e.g. overcurrent or high cooling water temperature.

It is also possible to go to the first (oldest) logging or the last (youngest) logging by placing the cursor (underscore) under the selection (move the cursor using the  and  push-buttons) and press the "ENTER" push-button.

Additional Operator Panel (AOP-2)



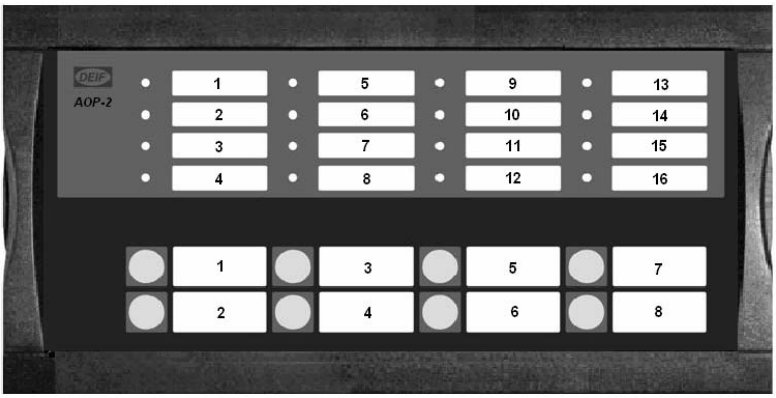
The power management unit will always be equipped with an additional operator panel for plant mode selection and control functions. The additional operator panel has 16 text messages and 8 push-buttons. The text messages for the LEDs and for the push-buttons can differ between the application types.

LED functions:

		System 01	System 02 (shaft)	System 02 (shore)	System 03
LED	**Colour**	**Text**	**Text**	**Text**	**Text**
1	*Green*	**SEMI-AUTO**	**SEMI-AUTO**	**SEMI-AUTO**	**SEMI-AUTO**
2	*Green*	**AUTO**	**AUTO**	**AUTO**	**AUTO**
3	*Green*	*Reserved*	**SHAFT**	**SHORE**	**SHAFT(2a) / SHORE (2b)**
4	*Green*	*Reserved*	*Reserved*	*Reserved*	**SPLIT**
5	*Green*	**SCB POS ON**	**SCB POS ON**	Not used	**SCB POS ON**
6	*Yellow*	**FORCED SWBD**	**FORCED SWBD**	**FORCED SWBD**	**FORCED SWBD**
7	*Yellow*	**HC REQUESTED**	**HC REQUESTED**	**HC REQUESTED**	**HC REQUESTED**
8	*Green*	**HC CONNECTED**	**HC CONNECTED**	**HC CONNECTED**	**HC CONNECTED**
9	*Green*	*Spare*	*Spare*	*Spare*	*Spare*
10	*Green*	**SECURED ON**	**SECURED ON**	**SECURED ON**	**SECURED ON**
11	*Red*	**PMS blocked**	**PMS blocked**	**PMS blocked**	**PMS blocked**
12	*Yellow*	**Ld stop blocked**	**Ld stop blocked**	**Ld stop blocked**	**Ld stop blocked**
13	*Red*	**NEL TRIP**	**NEL TRIP**	**NEL TRIP**	**NEL TRIP**
14	*Red*	**BUSBAR alarm**	**BUSBAR alarm**	**BUSBAR alarm**	**BUSBAR alarm**
15	*Red*	**CB TRIPPED**	**CB TRIPPED**	**CB TRIPPED**	**CB TRIPPED**
16	*Red*	**DG SHUTDOWN**	**DG SHUTDOWN**	**DG SHUTDOWN**	**DG SHUTDOWN**

SEMI-AUTO: The SEMI-AUTO mode has been selected.
AUTO: The AUTO mode has been selected. LED is yellow during mode change.
SHAFT: The SHAFT mode has been selected. LED is yellow during mode change.
SHORE: The SHORE mode has been selected. LED is yellow during mode change.
SPLIT: The SPLIT mode has been selected. LED is yellow during mode change.
SCB POS ON: The shore connection breaker is in position ON.
FORCED SWBD: The system is forced to switchboard control.
HC requested: Any heavy consumer in the system has been requested.
HC connected: Any heavy consumer in the system has been connected.
Configurable The input "terminal 51" on the master unit is set.
SECURED ON: The secured function is activated. An additional diesel generator is connected.
PMS blocked: The power management function is blocked.
Ld stop blocked: The load dependent stop function is blocked.

NEL TRIP: A **N**on **E**ssential **L**oad group has been tripped.
BUSBAR alarm: The system has detected a busbar failure, e.g. U <, U >, f <, f >
CB TRIPPED: The connection breaker of any unit has been tripped.
DG SHUTDOWN: The shutdown alarm sequence has been activated.



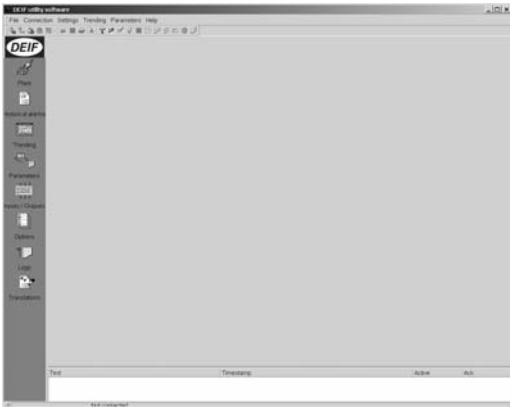
Push-button functions:

	System 01	System 02 (shaft)	System 02 (shore)	System 03
PB	**Text**	**Text**	**Text**	**Text**
1	**SEMI-AUTO**	**SEMI-AUTO**	**SEMI-AUTO**	**SEMI-AUTO**
2	**AUTO**	**AUTO**	**AUTO**	**AUTO**
3	*Reserved*	**SHAFT**	**SHORE**	**SHAFT**
4	*Reserved*	*Reserved*	*Reserved*	**SPLIT**
5	**SECURED ON**	**SECURED ON**	**SECURED ON**	**SECURED ON**
6	**SECURED OFF**	**SECURED OFF**	**SECURED OFF**	**SECURED OFF**
7	*Spare*	*Spare*	*Spare*	*Spare*
8	**LAMP TEST**	**LAMP TEST**	**LAMP TEST**	**LAMP TEST**

SEMI-AUTO: Selects the SEMI-AUTO plant mode.
AUTO: Selects the AUTO plant mode.
SHAFT: Selects the shaft generator plant mode.
SHORE: Selects the shore connection plant mode.
SPLIT: Selects the split plant mode.
SECURED ON: An additional diesel generator will be connected to the busbar. (Only active in AUTO and SPLIT plant mode).
SECURED OFF: The secured function will be deactivated. The normal load dependent start/stop function is set.
Configurable: When pressed, the relay no. 8 on the master unit will be activated (adjustable time).
LAMP TEST: All LEDs on the AOP-2 will light up for 3 seconds.

Utility software

The utility software is a powerful tool for the operator to access the multi-line 2 units. The historical alarm event is activated in all windows at the bottom. Whenever starting the utility software the following picture appears:



In the heading line the operator can select the following:

File Connection Settings Trending Parameters Help

Under "File" the following functions are possible:

Open/Save/Print/Preview/Settings and Exit.

Under "Connection" the functions Connect/ Disconnect and Readings are accessible.

With "Settings" the operator can choose between Views/Logs/Inputs/Outputs and Inhibits.
The "Trending" function is only active in the trending window and gives the possibility to zoom in and out and scroll left and right.
Under "Parameters" it is possible to upload and download all available parameters.

The second line is the symbol line with fast access to the desired functions, like e.g.:

The above symbols will be activated or deactivated depending on the actual open function window.


Start and stop the communication with the device.


Start and stop modem communication with the device.


Change your user level.


Open, Save, Print and Preview.


Application settings: General, Communication, Trending and Modem.


Opens the N configuration tools.


Upgrade options and write options (additional password required).


Flash/upload a firmware to the device.


Configuration of user views.


Show/hide the real-time readings window.


Retrieve the entire log stack.


Configuration of input settings and inhibit settings.


Send a command.


Synchronise the clock of the device with the PC.


Upload/download parameter from/to the device.


Show a full parameter list, or only parameters relevant for your device.

The operator can select between the plant overview (only the unit in question), historical alarms, trending, parameters, inputs/outputs, options and logs on the left side of the main picture.

Overview over the actual unit status. (actual power, current, phase angle, frequency, voltage, breaker position, regulator status and no. of active alarms).

All the alarms that are or have been active in the system including time stamp, active status and acknowledge status.

The trending function gives the operator the possibility to supervise measured values like e.g. actual generator power, current, frequency, voltage and much more.

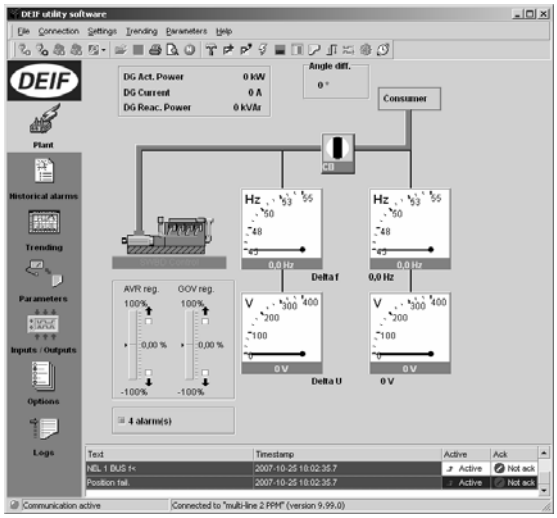
The parameter function allows the operator to adjust parameters and timers, configure text messages and alarms.

The input/output window gives the operator an overview over the actual status of all connected inputs and outputs.

The option window gives an overview over the activated options in the unit.

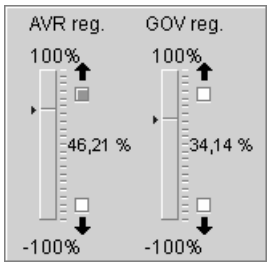
The event log is a very useful window to inform the operator about the last 150 events.

Plant



The plant overview window gives the user a complete overview over the actual unit status.

It is possible to define the shown values. The breaker position is indicated with a breaker switch symbol. The instruments can be configured.



The regulator status window will show the actual regulator condition. Up and down is indicated by a green symbol and the actual output level is in percent.

The alarm window 

shows the actual amount of active alarms.

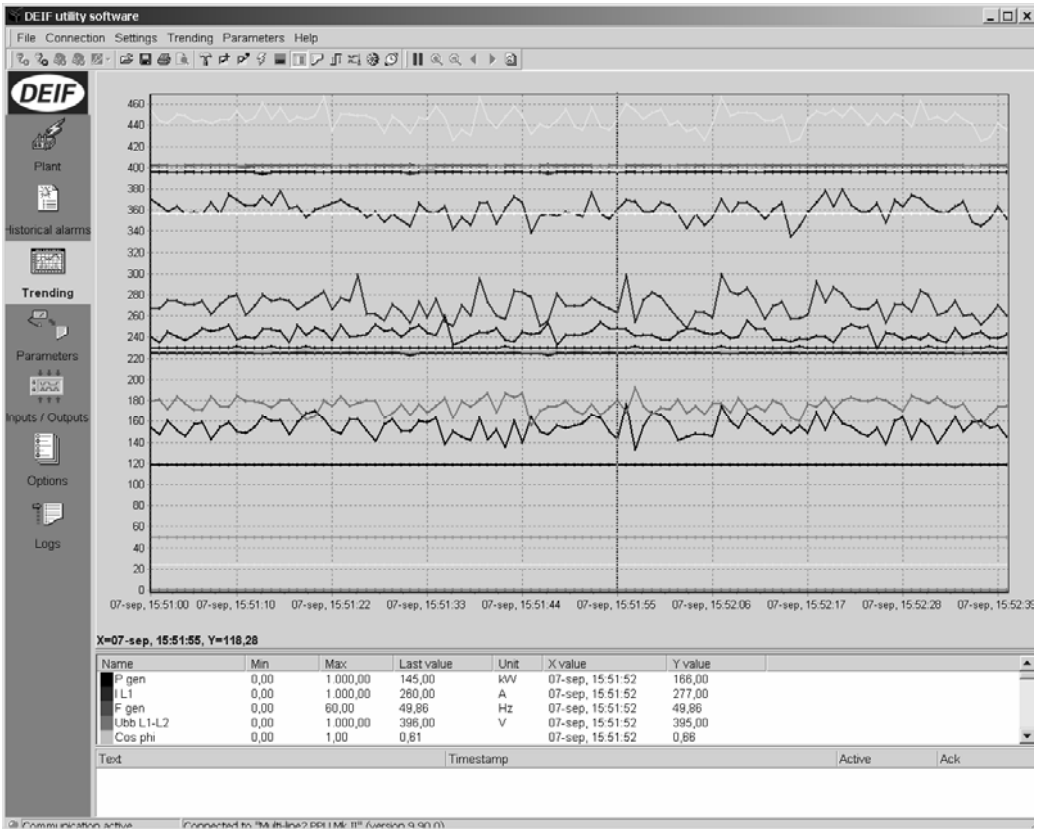
Historical alarms

The historical alarm list shows all the active alarms in the system, including complete text message, time stamp, active status and acknowledge status.

Over current 1	2004-09-07 13:57:36.410	Active	Not ack.
Over current 2	2004-09-07 13:57:36.410	Inactive	Ack.
Over current 1	2004-09-07 13:57:38.191	Inactive	Ack.
Over curr. inv	2004-09-07 13:57:39.379	Inactive	Ack.
CB Close failure	2004-09-07 14:09:07.983	Active	Not ack.

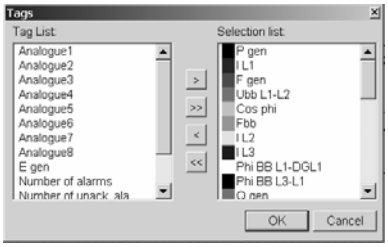
Trending

The trending window can be configured user dependent.



The operator can define the trending window and select all the values that have to be shown or are of interest.

To do this, the button  has to be activated. Now the user can choose the desired trending values.



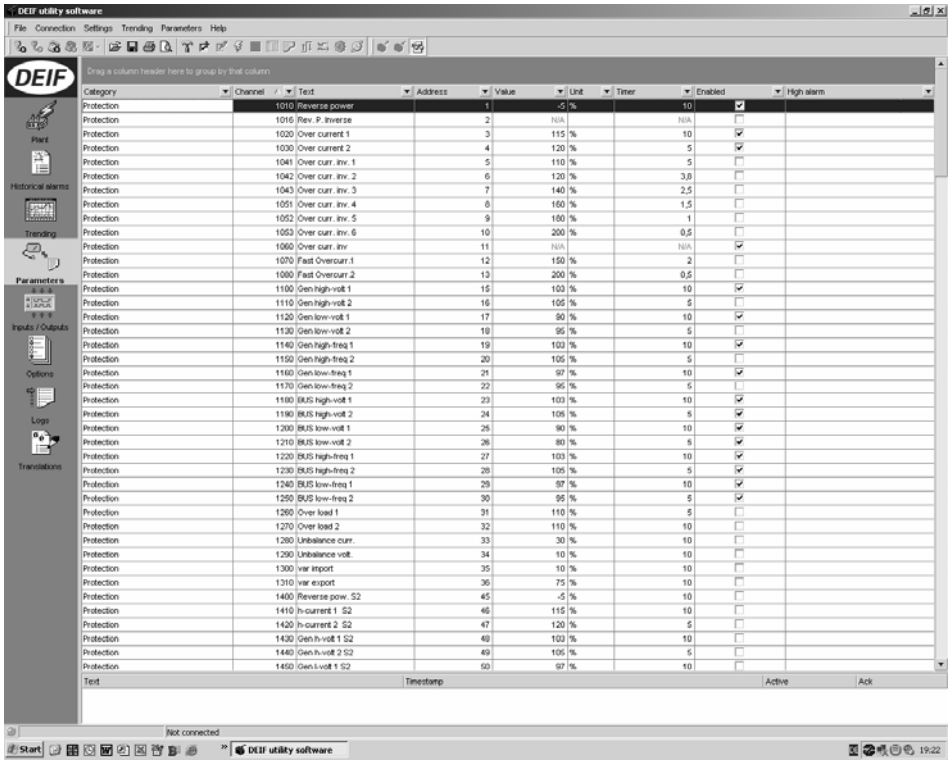
Parameters

All parameters that are available in the system can be adjusted.

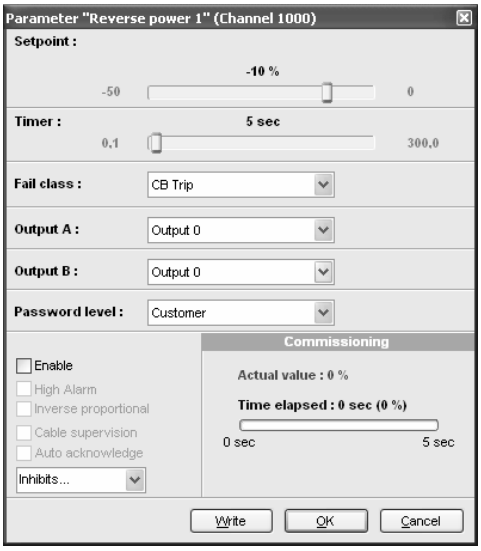
The parameter list is divided into:

- Category (kind of parameter, e.g. protection)
- Channel number (set point number)
- Text
- Address
- Value
- Unit
- Timer
- Enabled
- High alarm

By activating one the above features, the parameter list will be sorted according to that. E.g. sorting according to text, channel number or address is no problem.



By selecting one of the shown parameters (for example Reverse power), the following window will appear:



The operator can adjust set point, timer and relay outputs. Again it is possible to enable or disable the function.

The actual values are displayed all the time, and when the protection function is activated, the timer running status is shown.

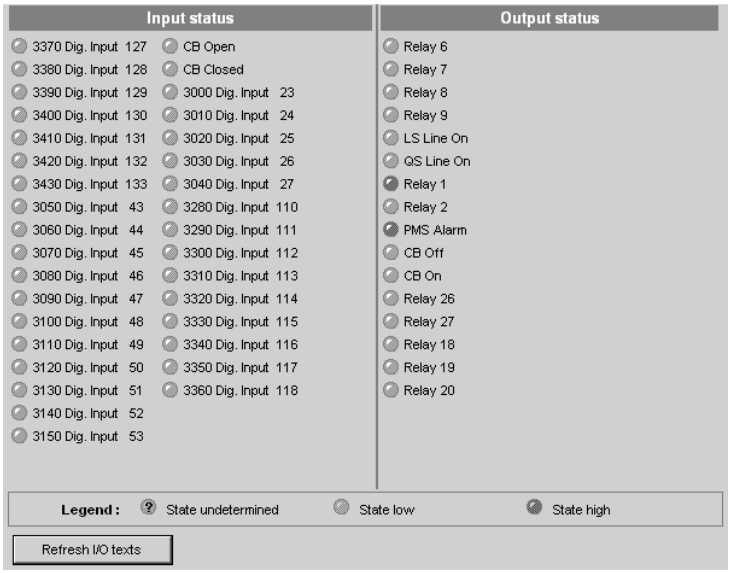
The elapsed time is shown in seconds and percent.

Inputs/Outputs

The actual status off all inputs and outputs will be shown in the "Inputs/Outputs" window.

The operator is able to change the text name for each input and output.

Whenever the text for an input has been changed, the new text can be shown by pressing the "Refresh I/O texts" button.

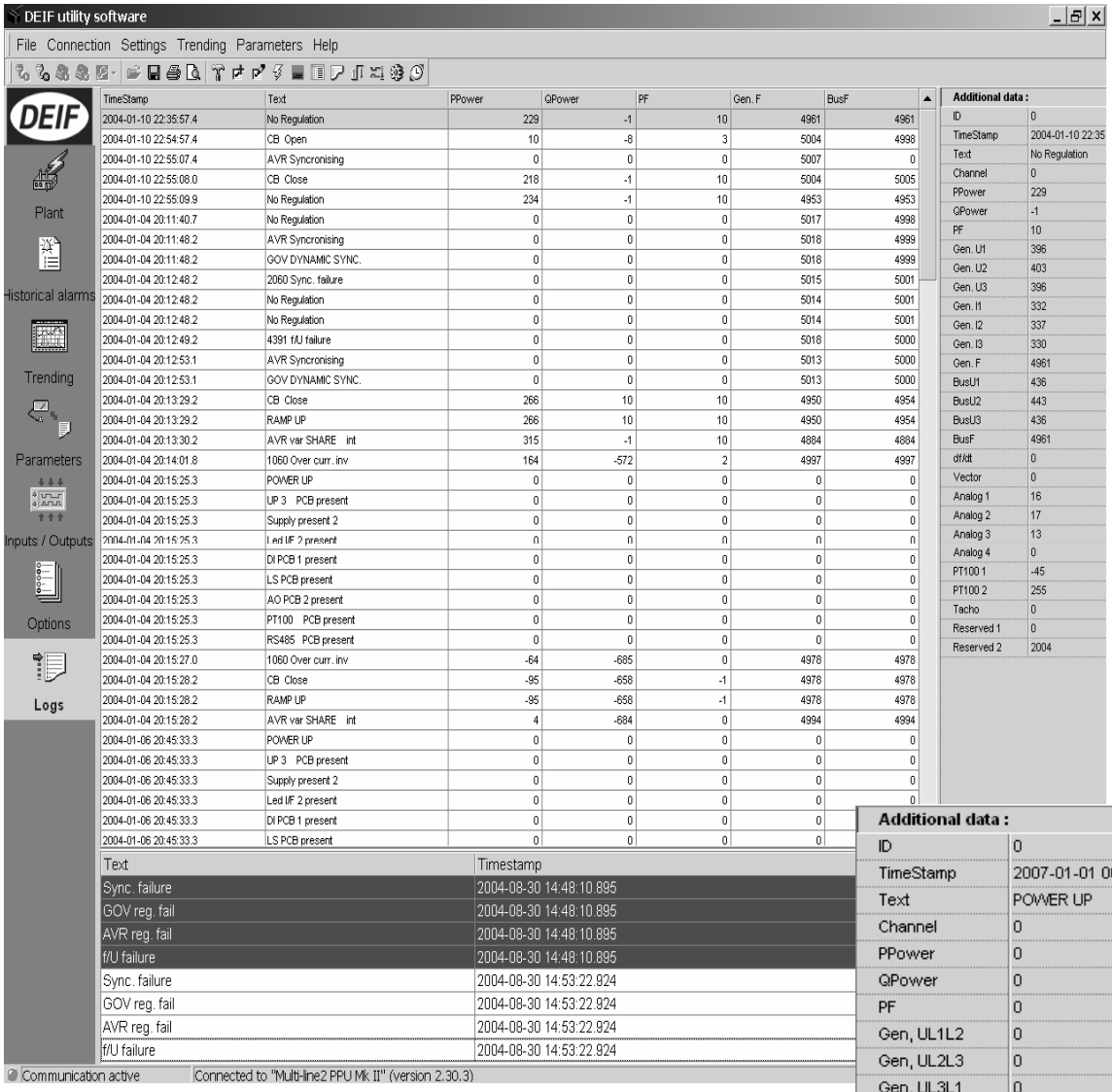


Options

Under the option window the operator can receive information about all options, which are activated in the unit.

Name	Description
B2	Single phase AC (generator), Over/under voltage protection, Over/under frequency protection
D1	Selectable (via binary inputs or (optional) serial interface) functions: Constant voltage (stand-alone), Constar
H2	Modbus

Logs



Additional data :	
ID	0
TimeStamp	2007-01-01 00:00
Text	POWER UP
Channel	0
PPower	0
QPower	0
PF	0
Gen, UL1L2	0
Gen, UL2L3	0
Gen, UL3L1	0
Gen. I1	0
Gen. I2	0
Gen. I3	0
Gen. F	0
Bus, UL1L2	0
Bus, UL2L3	0
Bus, UL3L1	0
BusF	0
Pavailable	0
Pconsumed	0
Analog 98	0
Analog 100	0
Analog 102	0
Plant mode	0
Regulator mode	0
Reserved 1	0
Tacho	0
Alarm value	0

For each selected event there is a list of additional data, which have been present at the moment the event occurred.

E.g. the first event "No regulation" happened on 10th January in the year 2004 at 22:35 o'clock.

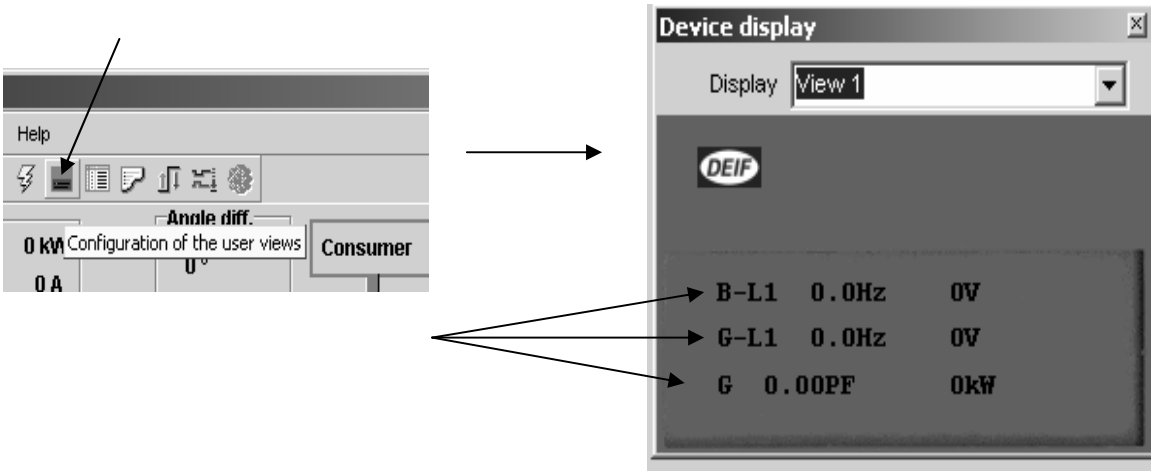
The power was 229 kW, the generator voltage was 400V AC, the frequency was 49.6Hz and the busbar voltage was 443V AC.

Additional functions

Configuration, view windows

The view windows are configured through the dialog box below. Select the view window number and the required measurements from the roll down panels.

Use this button to go to the configuration



Click here to change the configuration.

To be able to configure these parameters, the present parameter settings must be uploaded from the PPM (the upload button).

After the configuration of display view, inhibit and inputs, the parameters must be downloaded to the PPM (download button).

Parameter setting

Jump functions

The JUMP push-button is used to enter an exact channel number, and all channels can be entered using this button.

The following menus can only be reached using the JUMP push-button:

Use the and buttons to change the settings and the ENTER button to store the new settings.

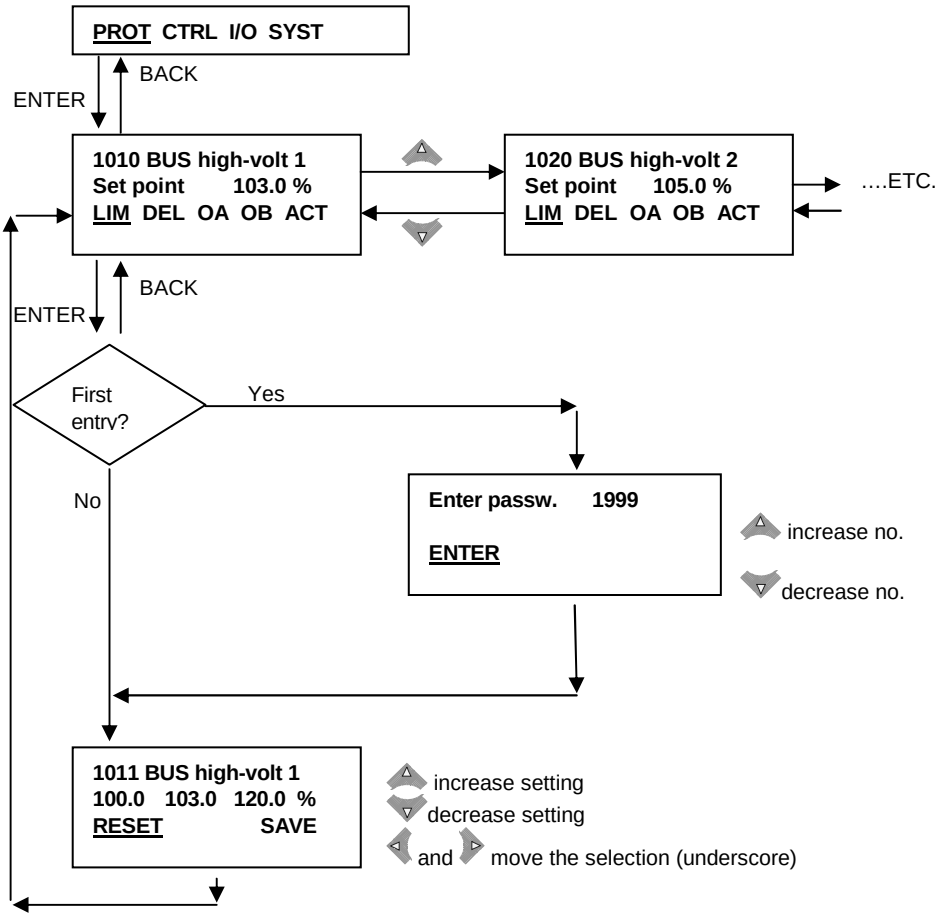
Password setting:	Channel 9116 (Customer), 9117 (Service), 9118 (Master)
Service menu:	Channel 9120
Software version:	Channel 9000
Phase compensation:	Channel 9130

Beware: Write down the new password. If you forget it, contact DEIF Support for details.

Setup menu system

The following is an example, but all menus operate in the same manner. Starting from the daily use display fourth line, select the menu indicated with underscore:

(Move the underscore with the and push-buttons).



4. Alarm list

The abbreviation DRH refers to the Designer's Reference Handbook.
The abbreviation II refers to the Installation Instructions.

Category Generator:

No.	Setting		Min. Max.	Factory setting	Notes	Ref.	Description
1001	Reverse power 1	Set point	-50.0% 0.0%	-10.0%		DRH ch. 4	The alarm and fail class are activated when the reverse power has been continuously above the programmed value during the programmed delay.
1002	Reverse power 1	Timer	0.1 s 300.0 s	5.0 s			
1003	Reverse power 1	Relay A	R0 Option dep.	R0 (none)			
1004	Reverse power 1	Relay B	R0 Option dep.	R0 (none)			
1005	Reverse power 1	Enable	OFF ON	ON			
1006	Reverse power 1	Fail class	F1..F8	Trip of CB (4)			
1011	Reverse power 2	Set point	-50.0% 0.0%	-15.0%		DRH ch. 4	The alarm and fail class are activated when the reverse power has been continuously above the programmed value during the programmed delay.
1012	Reverse power 2	Timer	0.1 s 300.0 s	1.0 s			
1013	Reverse power 2	Relay A	R0 Option dep.	R0 (none)			
1014	Reverse power 2	Relay B	R0 Option dep.	R0 (none)			
1015	Reverse power 2	Enable	OFF ON	OFF			
1016	Reverse power 2	Fail class	F1..F8	Trip of CB (4)			
1021	Rev. p. inverse	Set point	-500 0	-50		DRH ch. 4	The alarm and fail class are activated when the reverse power has been continuously above the programmed value during the programmed delay.
1022	Rev. p. inverse	Timer	0.1 s 300.0 s	10.0 s			
1023	Rev. p. inverse	Relay A	R0 Option dep.	R0 (none)			
1024	Rev. p. inverse	Relay B	R0 Option dep.	R0 (none)			
1025	Rev. p. inverse	Enable	OFF ON	OFF			
1026	Rev. p. inverse	Fail class	F1..F8	Trip of CB (4)			

No.	Setting		Min. Max.	Factory setting	Notes	Ref.	Description
1031	Overcurrent 1	Set point	50.0% 200.0%	110.0%		DRH ch. 4	The alarm and fail class are activated when the current has been continuously above the programmed value during the programmed delay.
1032	Overcurrent 1	Timer	0.1 s 100.0 s	20.0 s			
1033	Overcurrent 1	Relay A	R0 Option dep.	R0 (none)			
1034	Overcurrent 1	Relay B	R0 Option dep.	R0 (none)			
1035	Overcurrent 1	Enable	OFF ON	ON			
1036	Overcurrent 1	Fail class	F1..F8	Trip of CB (4)			
1041	Overcurrent 2	Set point	50.0% 200.0%	120.0%		DRH ch. 4	The alarm and fail class are activated when the current has been continuously above the programmed value during the programmed delay.
1042	Overcurrent 2	Timer	0.1 s 100.0 s	10.0 s			
1043	Overcurrent 2	Relay A	R0 Option dep.	R0 (none)			
1044	Overcurrent 2	Relay B	R0 Option dep.	R0 (none)			
1045	Overcurrent 2	Enable	OFF ON	OFF			
1046	Overcurrent 2	Fail class	F1..F8	Trip of CB (4)			
1051	Overcurrent 3	Set point	50.0% 200.0%	130.0%		DRH ch. 4	The alarm and fail class are activated when the current has been continuously above the programmed value during the programmed delay.
1052	Overcurrent 3	Timer	0.1 s 100.0 s	3.0 s			
1053	Overcurrent 3	Relay A	R0 Option dep.	R0 (none)			
1054	Overcurrent 3	Relay B	R0 Option dep.	R0 (none)			
1055	Overcurrent 3	Enable	OFF ON	OFF			
1056	Overcurrent 3	Fail class	F1..F8	Trip of CB (4)			
1061	Overcurrent 4	Set point	50.0% 200.0%	140.0%		DRH ch. 4	The alarm and fail class are activated when the current has been continuously above the programmed value during the programmed delay.
1062	Overcurrent 4	Timer	0.1 s 100.0 s	1.0 s			
1063	Overcurrent 4	Relay A	R0 Option dep.	R0 (none)			

No.	Setting		Min. Max.	Factory setting	Notes	Ref.	Description
1064	Overcurrent 4	Relay B	R0 Option dep.	R0 (none)			
1065	Overcurrent 4	Enable	OFF ON	OFF			
1066	Overcurrent 4	Fail class	F1..F8	Trip of CB (4)			
1071	Overcurr. inverse	Current set point 1	100.0% 200.0%	110.0%		DRH ch. 4	The alarm and fail class are activated when the current has been continuously above the programmed value during the programmed delay.
1072	Overcurr. inverse	Time set point 1	0.1 s 200.0 s	5.0 s			
1073	Overcurr. inverse	Current set point 2	100.0% 200.0%	120.0%			
1074	Overcurr. inverse	Time set point 2	0.1 s 200.0 s	3.8 s			
1075	Overcurr. inverse	Current set point 3	100.0% 200.0%	140.0%			
1076	Overcurr. inverse	Time set point 3	0.1 s 200.0 s	2.5 s			
1081	Overcurr. inverse	Current set point 4	100.0% 200.0%	160.0%			
1082	Overcurr. inverse	Time set point 4	0.1 s 200.0 s	1.5 s			
1083	Overcurr. inverse	Current set point 5	100.0% 200.0%	180.0%			
1084	Overcurr. inverse	Time set point 5	0.1 s 200.0 s	1.0 s			
1085	Overcurr. inverse	Current set point 6	100.0% 200.0%	200.0%			
1086	Overcurr. inverse	Time set point 6	0.1 s 200.0 s	0.5 s			
1091	Overcurr. inverse	Relay output A	R0 (none)	R0 (none)			
1092	Overcurr. inverse	Relay output B	R0 (none)	R0 (none)			
1093	Overcurr. inverse	Enable	OFF ON	OFF			
1094	Overcurr. inverse	Fail class	F1..F8	Trip of CB (4)			
1131	Fast overcurr. 1	Set point	150.0% 350.0%	200.0%		DRH ch. 4	The alarm and fail class are activated when the current has been continuously above the programmed value during the programmed delay.
1132	Fast overcurr. 1	Timer	0.0 s 100.0 s	0.5 s			
1133	Fast overcurr. 1	Relay A	R0 Option dep.	R0 (none)			
1134	Fast overcurr. 1	Relay B	R0 Option dep.	R0 (none)			
1135	Fast overcurr. 1	Enable	OFF ON	ON			

No.	Setting		Min. Max.	Factory setting	Notes	Ref.	Description
1136	Fast overcurr. 1	Fail class	F1..F8	Trip of CB (4)			
1141	Fast overcurr. 2	Set point	150.0% 350.0%	300.0%		DRH ch. 4	The alarm and fail class are activated when the current has been continuously above the programmed value during the programmed delay.
1142	Fast overcurr. 2	Timer	0.0 s 100.0 s	0.2 s			
1143	Fast overcurr. 2	Relay A	R0 Option dep.	R0 (none)			
1144	Fast overcurr. 2	Relay B	R0 Option dep.	R0 (none)			
1145	Fast overcurr. 2	Enable	OFF ON	OFF			
1146	Fast overcurr. 2	Fail class	F1..F8	Trip of CB (4)			
1151	Gen. high volt. 1	Set point	80.0% 120.0%	105.0%		DRH ch. 4	The alarm and fail class are activated when the voltage has been continuously above the programmed value during the programmed delay.
1152	Gen. high volt. 1	Timer	0.1 s 100.0 s	5.0 s			
1153	Gen. high volt. 1	Relay A	R0 Option dep.	R0 (none)			
1154	Gen. high volt. 1	Relay B	R0 Option dep.	R0 (none)			
1155	Gen. high volt. 1	Enable	OFF ON	ON			
1156	Gen. high volt. 1	Fail class	F1..F8	Block (3)			
1161	Gen. high volt. 2	Set point	80.0% 120.0%	115.0%		DRH ch. 4	The alarm and fail class are activated when the voltage has been continuously above the programmed value during the programmed delay.
1162	Gen. high volt. 2	Timer	0.1 s 100.0 s	1.0 s			
1163	Gen. high volt. 2	Relay A	R0 Option dep.	R0 (none)			
1164	Gen. high volt. 2	Relay B	R0 Option dep.	R0 (none)			
1165	Gen. high volt. 2	Enable	OFF ON	OFF			
1166	Gen. high volt. 2	Fail class	F1..F8	Block (3)			
1171	Gen. low volt. 1	Set point	80.0% 100.0%	95.0%		DRH ch. 4	The alarm and fail class are activated when the voltage has been continuously under the programmed value during the programmed delay.
1172	Gen. low volt. 1	Timer	0.1 s 100.0 s	5.0 s			
1173	Gen. low volt. 1	Relay A	R0 Option dep.	R0 (none)			

No.	Setting		Min. Max.	Factory setting	Notes	Ref.	Description
1174	Gen. low volt. 1	Relay B	R0 Option dep.	R0 (none)			
1175	Gen. low volt. 1	Enable	OFF ON	ON			
1176	Gen. low volt. 1	Fail class	F1..F8	Block (3)			
1181	Gen. low volt. 2	Set point	50.0% 100.0%	80.0%		DRH ch. 4	The alarm and fail class are activated when the voltage has been continuously under the programmed value during the programmed delay.
1182	Gen. low volt. 2	Timer	0.1 s 100.0 s	3.0 s			
1183	Gen. low volt. 2	Relay A	R0 Option dep.	R0 (none)			
1184	Gen. low volt. 2	Relay B	R0 Option dep.	R0 (none)			
1185	Gen. low volt. 2	Enable	OFF ON	OFF			
1186	Gen. low volt. 2	Fail class	F1..F8	Block (3)			
1191	Gen. low volt. 3	Set point	50.0% 100.0%	70.0%		DRH ch. 4	The alarm and fail class are activated when the voltage has been continuously under the programmed value during the programmed delay.
1192	Gen. low volt. 3	Timer	0.1 s 100.0 s	1.0 s			
1193	Gen. low volt. 3	Relay A	R0 Option dep.	R0 (none)			
1194	Gen. low volt. 3	Relay B	R0 Option dep.	R0 (none)			
1195	Gen. low volt. 3	Enable	OFF ON	OFF			
1196	Gen. low volt. 3	Fail class	F1..F8	Block (3)			
1201	Gen. volt. trip	Set point	L-L L-N	L-L		DRH ch. 4	L-L: Phase to phase. L-N: Phase to neutral.
1211	Gen. high freq. 1	Set point	80.0% 120.0%	105.0%		DRH ch. 4	The alarm and fail class are activated when the frequency has been continuously above the programmed value during the programmed delay.
1212	Gen. high freq. 1	Timer	0.2 s 100.0 s	5.0 s			
1213	Gen. high freq. 1	Relay output A	R0 Option dep.	R0 (none)			
1214	Gen. high freq. 1	Relay output B	R0 Option dep.	R0 (none)			
1215	Gen. high freq. 1	Enable	OFF ON	ON			
1216	Gen. high freq. 1	Fail class	F1..F8	Block (3)			

No.	Setting		Min. Max.	Factory setting	Notes	Ref.	Description
1221	Gen. high freq. 2	Set point	80.0% 120.0%	107.0%		DRH ch. 4	The alarm and fail class are activated when the frequency has been continuously above the programmed value during the programmed delay.
1222	Gen. high freq. 2	Timer	0.2 s 100.0 s	3.0 s			
1223	Gen. high freq. 2	Relay output A	R0 Option dep.	R0 (none)			
1224	Gen. high freq. 2	Relay output B	R0 Option dep.	R0 (none)			
1225	Gen. high freq. 2	Enable	OFF ON	OFF			
1226	Gen. high freq. 2	Fail class	F1..F8	Block (3)			
1231	Gen. high freq. 3	Set point	80.0% 120.0%	110.0%		DRH ch. 4	The alarm and fail class are activated when the frequency has been continuously above the programmed value during the programmed delay.
1232	Gen. high freq. 3	Timer	0.2 s 100.0 s	1.0 s			
1233	Gen. high freq. 3	Relay output A	R0 Option dep.	R0 (none)			
1234	Gen. high freq. 3	Relay output B	R0 Option dep.	R0 (none)			
1235	Gen. high freq. 3	Enable	OFF ON	OFF			
1236	Gen. high freq. 3	Fail class	F1..F8	Block (3)			
1241	Gen. low freq. 1	Set point	80.0% 100.0%	95.0%		DRH ch. 4	The alarm and fail class are activated when the frequency has been continuously under the programmed value during the programmed delay.
1242	Gen. low freq. 1	Timer	0.2 s 100.0 s	5.0 s			
1243	Gen. low freq. 1	Relay output A	R0 Option dep.	R0 (none)			
1244	Gen. low freq. 1	Relay output B	R0 Option dep.	R0 (none)			
1245	Gen. low freq. 1	Enable	OFF ON	ON			
1246	Gen. low freq. 1	Fail class	F1..F8	Block (3)			
1251	Gen. low freq. 2	Set point	80.0% 100.0%	93.0%		DRH ch. 4	The alarm and fail class are activated when the frequency has been continuously under the programmed value during the programmed delay.
1252	Gen. low freq. 2	Timer	0.2 s 100.0 s	3.0 s			
1253	Gen. low freq. 2	Relay output A	R0 Option dep.	R0 (none)			

No.	Setting		Min. Max.	Factory setting	Notes	Ref.	Description
1254	Gen. low freq. 2	Relay output B	R0 Option dep.	R0 (none)			
1255	Gen. low freq. 2	Enable	OFF ON	OFF			
1256	Gen. low freq. 2	Fail class	F1..F8	Block (3)			
1261	Gen. low freq. 3	Set point	80.0% 100.0%	90.0%		DRH ch. 4	The alarm and fail class are activated when the frequency has been continuously under the programmed value during the programmed delay.
1262	Gen. low freq. 3	Timer	0.2 s 100.0 s	1.0 s			
1263	Gen. low freq. 3	Relay output A	R0 Option dep.	R0 (none)			
1264	Gen. low freq. 3	Relay output B	R0 Option dep.	R0 (none)			
1265	Gen. low freq. 3	Enable	OFF ON	OFF			
1266	Gen. low freq. 3	Fail class	F1..F8	Block (3)			
1451	Overload 1	Set point	10.0% 200.0%	95.0%		DRH ch. 4	The alarm and fail class are activated when the power has been continuously above the programmed value during the programmed delay.
1452	Overload 1	Timer	0.1 s 100.0 s	20.0 s			
1453	Overload 1	Relay output A	R0 Option dep.	R0 (none)			
1454	Overload 1	Relay output B	R0 Option dep.	R0 (none)			
1455	Overload 1	Enable	OFF ON	OFF			
1456	Overload 1	Fail class	F1..F8	Warning (1)			
1461	Overload 2	Set point	10.0% 200.0%	110.0%		DRH ch. 4	The alarm and fail class are activated when the power has been continuously above the programmed value during the programmed delay.
1462	Overload 2	Timer	0.1 s 100.0 s	10.0 s			
1463	Overload 2	Relay output A	R0 Option dep.	R0 (none)			
1464	Overload 2	Relay output B	R0 Option dep.	R0 (none)			
1465	Overload 2	Enable	OFF ON	ON			
1466	Overload 2	Fail class	F1..F8	Trip CB (4)			
1471	Overload 3	Set point	10.0% 200.0%	115.0%		DRH ch. 4	The alarm and fail class are activated when the

No.	Setting		Min. Max.	Factory setting	Notes	Ref.	Description
1472	Overload 3	Timer	0.1 s 100.0 s	5.0 s			power has been continuously above the programmed value during the programmed delay.
1473	Overload 3	Relay output A	R0 Option dep.	R0 (none)			
1474	Overload 3	Relay output B	R0 Option dep.	R0 (none)			
1475	Overload 3	Enable	OFF ON	OFF			
1476	Overload 3	Fail class	F1..F8	Trip CB (4)			
1481	Overload 4	Set point	10.0% 200.0%	120.0%		DRH ch. 4	The alarm and fail class are activated when the power has been continuously above the programmed value during the programmed delay.
1482	Overload 4	Timer	0.1 s 100.0 s	3.0 s			
1483	Overload 4	Relay output A	R0 Option dep.	R0 (none)			
1484	Overload 4	Relay output B	R0 Option dep.	R0 (none)			
1485	Overload 4	Enable	OFF ON	OFF			
1486	Overload 4	Fail class	F1..F8	Trip CB (4)			
1491	Overload 5	Set point	10.0% 200.0%	130.0%		DRH ch. 4	The alarm and fail class are activated when the power has been continuously above the programmed value during the programmed delay.
1492	Overload 5	Timer	0.1 s 100.0 s	1.0 s			
1493	Overload 5	Relay output A	R0 Option dep.	R0 (none)			
1494	Overload 5	Relay output B	R0 Option dep.	R0 (none)			
1495	Overload 5	Enable	OFF ON	OFF			
1496	Overload 5	Fail class	F1..F8	Trip CB (4)			
1501	Current unbalance	Set point	0.0% 100.0%	30.0%		DRH ch. 4	The alarm and fail class are activated when the difference between the max. reading and the min. reading of the 3 measured currents has been continuously above the programmed value during the programmed delay.
1502	Current unbalance	Timer	0.1 s 100.0 s	10.0 s			
1503	Current unbalance	Relay output A	R0 Option dep.	R0 (none)			
1504	Current unbalance	Relay output B	R0 Option dep.	R0 (none)			

No.	Setting		Min. Max.	Factory setting	Notes	Ref.	Description
1505	Current unbalance	Enable	OFF ON	OFF			
1506	Current unbalance	Fail class	F1..F8	Block (3)			
1511	Voltage unbalance	Set point	0.0% 50.0%	10.0%		DRH ch. 4	The alarm and fail class are activated when the difference between the max. reading and the min. reading of the 3 measured generator voltages has been continuously above the programmed value during the programmed delay.
1512	Voltage unbalance	Timer	0.1 s 100.0 s	10.0 s			
1513	Voltage unbalance	Relay output A	R0 Option dep.	R0 (none)			
1514	Voltage unbalance	Relay output B	R0 Option dep.	R0 (none)			
1515	Voltage unbalance	Enable	OFF ON	OFF			
1516	Voltage unbalance	Fail class	F1..F8	Block (3)			
1521	VAr import	Set point	0.0% 150.0%	10.0%		DRH ch. 4	The alarm and fail class are activated when imported VAr has been continuously above the programmed value during the programmed delay.
1522	VAr import	Timer	0.1 s 100.0 s	10.0 s			
1523	VAr import	Relay output A	R0 Option dep.	R0 (none)			
1524	VAr import	Relay output B	R0 Option dep.	R0 (none)			
1525	VAr import	Enable	OFF ON	OFF			
1526	VAr import	Fail class	F1..F8	Block (3)			
1531	VAr export	Set point	0.0% 100.0%	75.0%		DRH ch. 4	The alarm and fail class are activated when exported VAr has been continuously above the programmed value during the programmed delay.
1532	VAr export	Timer	0.1 s 100.0 s	10.0 s			
1533	VAr export	Relay output A	R0 Option dep.	R0 (none)			
1534	VAr export	Relay output B	R0 Option dep.	R0 (none)			
1535	VAr export	Enable	OFF ON	OFF			
1536	VAr export	Fail class	F1..F8	Block (3)			

Category Busbar:

No.	Setting		Min. Max.	Factory setting	Notes	Ref.	Description
1271	Bus high volt. 1	Set point	90.0% 130.0%	105.0%		DRH ch. 4	The alarm and fail class are activated when the voltage has been continuously above the programmed value during the programmed delay.
1272	Bus high volt. 1	Timer	0.0 s 100.0 s	5.0 s			
1273	Bus high volt. 1	Relay output A	R0 Option dep.	R0 (none)			
1274	Bus high volt. 1	Relay output B	R0 Option dep.	R0 (none)			
1275	Bus high volt. 1	Enable	OFF ON	ON			
1276	Bus high volt. 1	Fail class	F1..F8	Warning (1)			
1281	Bus high volt. 2	Set point	90.0% 130.0%	120.0%		DRH ch. 4	The alarm and fail class are activated when the voltage has been continuously above the programmed value during the programmed delay.
1282	Bus high volt. 2	Timer	0.0 s 100.0 s	3.0 s			
1283	Bus high volt. 2	Relay output A	R0 Option dep.	R0 (none)			
1284	Bus high volt. 2	Relay output B	R0 Option dep.	R0 (none)			
1285	Bus high volt. 2	Enable	OFF ON	OFF			
1286	Bus high volt. 2	Fail class	F1..F8	Trip CB (4)			
1291	Bus high volt. 3	Set point	90.0% 130.0%	130.0%		DRH ch. 4	The alarm and fail class are activated when the voltage has been continuously above the programmed value during the programmed delay.
1292	Bus high volt. 3	Timer	0.0 s 100.0 s	1.0 s			
1293	Bus high volt. 3	Relay output A	R0 Option dep.	R0 (none)			
1294	Bus high volt. 3	Relay output B	R0 Option dep.	R0 (none)			
1295	Bus high volt. 3	Enable	OFF ON	OFF			
1296	Bus high volt. 3	Fail class	F1..F8	Trip CB (4)			
1301	Bus low volt. 1	Set point	80.0% 100.0%	95.0%		DRH ch. 4	The alarm and fail class are activated when the voltage has been continuously under the programmed value during the programmed delay.
1302	Bus low volt. 1	Timer	0.0 s 100.0 s	5.0 s			
1303	Bus low volt. 1	Relay output A	R0 Option dep.	R0 (none)			

No.	Setting		Min. Max.	Factory setting	Notes	Ref.	Description
1304	Bus low volt. 1	Relay output B	R0 Option dep.	R0 (none)			
1305	Bus low volt. 1	Enable	OFF ON	ON			
1306	Bus low volt. 1	Fail class	F1..F8	Warning (1)			
1311	Bus low volt. 2	Set point	50.0% 100.0%	80.0%		DRH ch. 4	The alarm and fail class are activated when the voltage has been continuously under the programmed value during the programmed delay.
1312	Bus low volt. 2	Timer	0.0 s 100.0 s	3.0 s			
1313	Bus low volt. 2	Relay output A	R0 Option dep.	R0 (none)			
1314	Bus low volt. 2	Relay output B	R0 Option dep.	R0 (none)			
1315	Bus low volt. 2	Enable	OFF ON	OFF			
1316	Bus low volt. 2	Fail class	F1..F8	Trip CB (4)			
1321	Bus low volt. 3	Set point	50.0% 100.0%	70.0%		DRH ch. 4	The alarm and fail class are activated when the voltage has been continuously under the programmed value during the programmed delay.
1322	Bus low volt. 3	Timer	0.0 s 100.0 s	2.0 s			
1323	Bus low volt. 3	Relay output A	R0 Option dep.	R0 (none)			
1324	Bus low volt. 3	Relay output B	R0 Option dep.	R0 (none)			
1325	Bus low volt. 3	Enable	OFF ON	OFF			
1326	Bus low volt. 3	Fail class	F1..F8	Trip CB (4)			
1331	Bus low volt. 4	Set point	50.0% 100.0%	60.0%		DRH ch. 4	The alarm and fail class are activated when the voltage has been continuously under the programmed value during the programmed delay.
1332	Bus low volt. 4	Timer	0.0 s 100.0 s	1.0 s			
1333	Bus low volt. 4	Relay output A	R0 Option dep.	R0 (none)			
1334	Bus low volt. 4	Relay output B	R0 Option dep.	R0 (none)			
1335	Bus low volt. 4	Enable	OFF ON	OFF			
1336	Bus low volt. 4	Fail class	F1..F8	Trip CB (4)			
1341	Bus volt. trip	Set point	L-L L-N	L-L		DRH ch. 4	L-L: Phase to phase. L-N: Phase to neutral.

No.	Setting		Min. Max.	Factory setting	Notes	Ref.	Description
1351	Bus high freq. 1	Set point	100.0% 130.0%	105.0%		DRH ch. 4	The alarm and fail class are activated when the frequency has been continuously above the programmed value during the programmed delay.
1352	Bus high freq. 1	Timer	0.0 s 100.0 s	5.0 s			
1353	Bus high freq. 1	Relay output A	R0 Option dep.	R0 (none)			
1354	Bus high freq. 1	Relay output B	R0 Option dep.	R0 (none)			
1355	Bus high freq. 1	Enable	OFF ON	ON			
1356	Bus high freq.1	Fail class	F1..F8	Warning (1)			
1361	Bus high freq. 2	Set point	100.0% 130.0%	110.0%		DRH ch. 4	The alarm and fail class are activated when the frequency has been continuously above the programmed value during the programmed delay.
1362	Bus high freq. 2	Timer	0.0 s 100.0 s	3.0 s			
1363	Bus high freq. 2	Relay output A	R0 Option dep.	R0 (none)			
1364	Bus high freq. 2	Relay output B	R0 Option dep.	R0 (none)			
1365	Bus high freq. 2	Enable	OFF ON	OFF			
1366	Bus high freq. 2	Fail class	F1..F8	Trip CB (4)			
1371	Bus high freq. 3	Set point	100.0% 130.0%	120.0%		DRH ch. 4	The alarm and fail class are activated when the frequency has been continuously above the programmed value during the programmed delay.
1372	Bus high freq. 3	Timer	0.0 s 100.0 s	1.0 s			
1373	Bus high freq. 3	Relay output A	R0 Option dep.	R0 (none)			
1374	Bus high freq. 3	Relay output B	R0 Option dep.	R0 (none)			
1375	Bus high freq. 3	Enable	OFF ON	OFF			
1376	Bus high freq. 3	Fail class	F1..F8	Trip CB (4)			
1381	Bus low freq. 1	Set point	80.0% 100.0%	96.0%		DRH ch. 4	The alarm and fail class are activated when the frequency has been continuously under the programmed value during the programmed delay.
1382	Bus low freq. 1	Timer	0.0 s 100.0 s	5.0 s			
1383	Bus low freq. 1	Relay output A	R0 Option dep.	R0 (none)			

No.	Setting		Min. Max.	Factory setting	Notes	Ref.	Description
1384	Bus low freq. 1	Relay output B	R0 Option dep.	R0 (none)			
1385	Bus low freq. 1	Enable	OFF ON	ON			
1386	Bus low freq. 1	Fail class	F1..F8	Warning (1)			
1391	Bus low freq. 2	Set point	80.0% 100.0%	93.0%		DRH ch. 4	The alarm and fail class are activated when the frequency has been continuously under the programmed value during the programmed delay.
1392	Bus low freq. 2	Timer	0.0 s 100.0 s	10.0 s			
1393	Bus low freq. 2	Relay output A	R0 Option dep.	R0 (none)			
1394	Bus low freq. 2	Relay output B	R0 Option dep.	R0 (none)			
1395	Bus low freq. 2	Enable	OFF ON	OFF			
1396	Bus low freq. 2	Fail class	F1..F8	Trip CB (4)			
1401	Bus low freq. 3	Set point	80.0% 100.0%	92.0%		DRH ch. 4	The alarm and fail class are activated when the frequency has been continuously under the programmed value during the programmed delay.
1402	Bus low freq. 3	Timer	0.0 s 100.0 s	5.0 s			
1403	Bus low freq. 3	Relay output A	R0 Option dep.	R0 (none)			
1404	Bus low freq. 3	Relay output B	R0 Option dep.	R0 (none)			
1405	Bus low freq. 3	Enable	OFF ON	OFF			
1406	Bus low freq. 3	Fail class	F1..F8	Trip CB (4)			
1411	Bus low freq. 4	Set point	80.0% 100.0%	90.0%		DRH ch. 4	The alarm and fail class are activated when the frequency has been continuously under the programmed value during the programmed delay.
1412	Bus low freq. 4	Timer	0.0 s 100.0 s	1.0 s			
1413	Bus low freq. 4	Relay output A	R0 Option dep.	R0 (none)			
1414	Bus low freq. 4	Relay output B	R0 Option dep.	R0 (none)			
1415	Bus low freq. 4	Enable	OFF ON	OFF			
1416	Bus low freq. 4	Fail class	F1..F8	Trip CB (4)			

Category NEL:

No.	Setting		Min. Max.	Factory setting	Notes	Ref.	Description
1901	NEL group no. 1 I >	Set point	50.0% 200.0%	100.0%		DRH ch. 4	Trip of Non Essential Load due to overcurrent. This function activates NEL group 1.
1902	NEL group no. 1 I >	Time	0.1 s 100.0 s	5.0 s			
1903	NEL group no. 1 I >	Enable	ON OFF	OFF			
1911	NEL group no. 2 I >	Set point	50.0% 200.0%	100.0%		DRH ch. 4	Trip of Non Essential Load due to overcurrent. This function activates NEL group 2.
1912	NEL group no. 2 I >	Time	0.1 s 100.0 s	10.0 s			
1913	NEL group no. 2 I >	Enable	ON OFF	OFF			
1921	NEL group no. 1 Busbar f <	Set point	70.0% 100.0%	95.0%		DRH ch. 4	Trip of Non Essential Load due to low frequency. This function activates NEL group 1.
1922	NEL group no. 1 Busbar f <	Time	0.1 s 100.0 s	5.0 s			
1923	NEL group no. 1 Busbar f <	Enable	ON OFF	OFF			
1931	NEL group no. 2 Busbar f <	Set point	70.0% 100.0%	95.0%			Trip of Non Essential Load due to low frequency. This function activates NEL group 2.
1932	NEL group no. 2 Busbar f <	Time	0.1 s 100.0 s	10.0 s			
1933	NEL group no. 2 Busbar f <	Enable	ON OFF	OFF			
1941	NEL group no. 1 P >	Set point	10.0% 200.0%	100.0%		DRH ch. 4	Trip of Non Essential Load due to overload. This function activates NEL group 1.
1942	NEL group no. 1 P >	Time	0.1 s 100.0 s	5.0 s			
1943	NEL group no. 1 P >	Enable	ON OFF	OFF			
1951	NEL group no. 2 P >	Set point	10.0% 200.0%	100.0%		DRH ch. 4	Trip of Non Essential Load due to overload. This function activates NEL group 2.
1952	NEL group no. 2 P >	Time	0.1 s 100.0 s	10.0 s			
1953	NEL group no. 2 P >	Enable	ON OFF	OFF			
1961	NEL group no. 1 P >>	Set point	10.0% 200.0%	110.0%		DRH ch. 4	Trip of Non Essential Load due to spring load. This function activates both NEL group 1 and NEL group 2.
1962	NEL group no. 1 P >>	Time	0.1 s 100.0 s	1.0 s			
1963	NEL group no. 1 P >>	Enable	ON OFF	OFF			
1971	NEL group no. 2 P >>	Set point	10.0% 200.0%	110.0%		DRH ch. 4	Trip of Non Essential Load due to spring load. This function activates both NEL group 1 and NEL group 2.
1972	NEL group no. 2 P >>	Time	0.1 s 100.0 s	1.0 s			
1973	NEL group no. 2 P >>	Enable	ON OFF	OFF			

Category Synchronisation:

No.	Setting		Min. Max.	Factory setting	Notes	Ref.	Description
2111	Sync. failure	Delay	30.0 s 300.0 s	120.0 s		DRH ch. 5	The controller has unsuccessfully tried to synchronise the generator to the busbar within the time delay.
2112	Sync. failure	Output A	R0 Option dep.	R0 (none)			
2113	Sync. failure	Output B	R0 Option dep.	R0 (none)			
2114	Sync. failure	Activate	OFF ON	ON			
2115	Sync. failure	Fail class	F1..F8	Block (3)			
2121	Phase seq. fail.	Delay	Fixed	1.0 s		DRH ch. 5	During synchronisation the controller has detected that the generator is rotating the opposite direction as the busbar.
2122	Phase seq. fail.	Output A	R0 Option dep.	R0 (none)			
2123	Phase seq. fail.	Output B	R0 Option dep.	R0 (none)			
2124	Phase seq. fail.	Activate	OFF ON	ON			
2125	Phase seq. fail.	Fail class	F1..F8	Block (3)			
2141	Close failure	Delay	1.0 s 5.0 s	2.0 s		DRH ch. 5	The CB close failure will occur, if the unit has transmitted a CB close signal and the CB feedback has not changed position from OFF to ON within 2 s.
2142	Close failure	Output A	R0 Option dep.	R0 (none)			
2143	Close failure	Output B	R0 Option dep.	R0 (none)			
2144	Close failure	Activate	OFF ON	ON			
2145	Close failure	Fail class	F1..F8	Block (3)			
2151	Open failure	Delay	1.0 s 5.0 s	2.0 s		DRH ch. 5	The CB open failure will occur, if the unit has transmitted a CB open signal and the CB feedback has not changed position from ON to OFF within 2 s.
2152	Open failure	Output A	R0 Option dep.	R0 (none)			
2153	Open failure	Output B	R0 Option dep.	R0 (none)			
2154	Open failure	Activate	OFF ON	ON			
2155	Open failure	Fail class	F1..F8	Block (3)			
2151	Position failure	Delay	1.0 s 5.0 s	2.0 s		DRH ch. 5	If the CB feedbacks for

No.	Setting		Min. Max.	Factory setting	Notes	Ref.	Description
2152	Position failure	Output A	R0 Option dep.	R0 (none)			ON and OFF are both missing for more than 2 s, this alarm will occur.
2153	Position failure	Output B	R0 Option dep.	R0 (none)			
2154	Position failure	Activate	OFF ON	ON			
2155	Position failure	Fail class	F1..F8	Block (3)			

Category Regulation:

No.	Setting		Min. Max.	Factory setting	Notes	Ref.	Description
2251	Ramp down fail	Delay	1.0 s 999.0 s	10.0 s		DRH ch. 5	If the generator fails to deload within the timer, the alarm is activated.
2252	Ramp down fail	Output A	R0 Option dep.	R0 (none)			
2253	Ramp down fail	Output B	R0 Option dep.	R0 (none)			
2254	Ramp down fail	Activate	OFF ON	ON			
2255	Ramp down fail	Fail class	F1..F8	Block (3)			
2591	GOV reg. fail	Set point	1.0% 100.0%	30.0%		DRH ch. 5	If the measured power or frequency continuously deviates from the internal set point for a longer time than the timer. Then the alarm is activated.
2592	GOV reg. fail	Timer	10.0 s 300.0 s	60.0 s			
2593	GOV reg. fail	Relay output A	R0 Option dep.	R0 (none)			
2594	GOV reg. fail	Relay output B	R0 Option dep.	R0 (none)			
2595	GOV reg. fail	Enable	OFF ON	ON			
2596	GOV reg. fail	Fail class	F1..F8	Block (3)			
2611	AVR reg. fail	Set point	1.0% 100.0%	30.0%		DRH ch. 5	If the measured voltage or VAr continuously deviates from the internal set point for a longer time than the timer. Then the alarm is activated.
2612	AVR reg. fail	Timer	10.0 s 300.0 s	60.0 s			
2613	AVR reg. fail	Relay output A	R0 Option dep.	R0 (none)			

No.	Setting		Min. Max.	Factory setting	Notes	Ref.	Description
2614	AVR reg. fail	Relay output B	R0 Option dep.	R0 (none)			
2615	AVR reg. fail	Enable	OFF ON	ON			
2616	AVR reg. fail	Fail class	F1..F8	Block (3)			

Category Binary inputs:

No.	Setting		Min. Max.	Factory setting	Notes	Ref.	Description
3001	Digital input 23	Timer	0.2 s 100.0 s	0.2 s		II ch. 4, 5, 6	The input is configurable and can have different functions on different units. With the utility software it is possible to select if the input is activated by a normally closed or a normally open contact.
3002	Digital input 23	Relay output A	R0 Option dep.	R0 (none)			
3003	Digital input 23	Relay output B	R0 Option dep.	R0 (none)			
3004	Digital input 23	Enable	ON OFF	ON			
3005	Digital input 23	Fail class	F1..F8	Shutdown (6)			
3011	Digital input 24	Timer	0.2 s 100.0 s	0.2 s		II ch. 4, 5, 6	The input is configurable and can have different functions on different units. With the utility software it is possible to select if the input is activated by a normally closed or a normally open contact.
3012	Digital input 24	Relay output A	R0 Option dep.	R0 (none)			
3013	Digital input 24	Relay output B	R0 Option dep.	R0 (none)			
3014	Digital input 24	Enable	ON OFF	ON			
3015	Digital input 24	Fail class	F1..F8	Short Circ (7)			
3021	Digital input 25	Timer	0.2 s 100.0 s	10.0 s		II ch. 4, 5, 6	The input is configurable and can have different functions on different units. With the utility software it is possible to select if the input is activated by a normally closed or a normally open contact.
3022	Digital input 25	Relay output A	R0 Option dep.	R0 (none)			
3023	Digital input 25	Relay output B	R0 Option dep.	R0 (none)			
3024	Digital input 25	Enable	ON OFF	OFF			
3025	Digital input 25	Fail class	F1..F8	Warning (1)			
3031	Digital input 26	Timer	0.2 s 100.0 s	10.0 s		II ch.	The input is configurable and can have different

No.	Setting		Min. Max.	Factory setting	Notes	Ref.	Description
3032	Digital input 26	Relay output A	R0 Option dep.	R0 (none)		4, 5, 6	functions on different units. With the utility software it is possible to select if the input is activated by a normally closed or a normally open contact.
3033	Digital input 26	Relay output B	R0 Option dep.	R0 (none)			
3034	Digital input 26	Enable	ON OFF	OFF			
3035	Digital input 26	Fail class	F1..F8	Warning (1)			
3051	Digital input 43	Timer	0.2 s 100.0 s	10.0 s		II ch. 4, 5, 6	The input is configurable and can have different functions on different units. With the utility software it is possible to select if the input is activated by a normally closed or a normally open contact.
3052	Digital input 43	Relay output A	R0 Option dep.	R0 (none)			
3053	Digital input 43	Relay output B	R0 Option dep.	R0 (none)			
3054	Digital input 43	Enable	ON OFF	OFF			
3055	Digital input 43	Fail class	F1..F8	Warning (1)			
3061	Digital input 44	Timer	0.2 s 100.0 s	10.0 s		II ch. 4, 5, 6	The input is configurable and can have different functions on different units. With the utility software it is possible to select if the input is activated by a normally closed or a normally open contact.
3062	Digital input 44	Relay output A	R0 Option dep.	R0 (none)			
3063	Digital input 44	Relay output B	R0 Option dep.	R0 (none)			
3064	Digital input 44	Enable	ON OFF	OFF			
3065	Digital input 44	Fail class	F1..F8	Warning (1)			
3071	Digital input 45	Timer	0.2 s 100.0 s	10.0 s		II ch. 4, 5, 6	The input is configurable and can have different functions on different units. With the utility software it is possible to select if the input is activated by a normally closed or a normally open contact.
3072	Digital input 45	Relay output A	R0 Option dep.	R0 (none)			
3073	Digital input 45	Relay output B	R0 Option dep.	R0 (none)			
3074	Digital input 45	Enable	ON OFF	OFF			
3075	Digital input 45	Fail class	F1..F8	Warning (1)			
3081	Digital input 46	Timer	0.2 s 100.0 s	10.0 s		II ch. 4, 5, 6	The input is configurable and can have different functions on different units. With the utility software
3082	Digital input 46	Relay output A	R0 Option dep.	R0 (none)			

No.	Setting		Min. Max.	Factory setting	Notes	Ref.	Description
3083	Digital input 46	Relay output B	R0 Option dep.	R0 (none)			it is possible to select if the input is activated by a normally closed or a normally open contact.
3084	Digital input 46	Enable	ON OFF	OFF			
3085	Digital input 46	Fail class	F1..F8	Warning (1)			
3091	Digital input 47	Timer	0.2 s 100.0 s	10.0 s		II ch. 4, 5, 6	The input is configurable and can have different functions on different units. With the utility software it is possible to select if the input is activated by a normally closed or a normally open contact.
3092	Digital input 47	Relay output A	R0 Option dep.	R0 (none)			
3093	Digital input 47	Relay output B	R0 Option dep.	R0 (none)			
3094	Digital input 47	Enable	ON OFF	OFF			
3095	Digital input 47	Fail class	F1..F8	Warning (1)			
3101	Digital input 48	Timer	0.2 s 100.0 s	10.0 s		II ch. 4, 5, 6	The input is configurable and can have different functions on different units. With the utility software it is possible to select if the input is activated by a normally closed or a normally open contact.
3102	Digital input 48	Relay output A	R0 Option dep.	R0 (none)			
3103	Digital input 48	Relay output B	R0 Option dep.	R0 (none)			
3104	Digital input 48	Enable	ON OFF	OFF			
3105	Digital input 48	Fail class	F1..F8	Warning (1)			
3111	Digital input 49	Timer	0.2 s 100.0 s	10.0 s		II ch. 4, 5, 6	The input is configurable and can have different functions on different units. With the utility software it is possible to select if the input is activated by a normally closed or a normally open contact.
3112	Digital input 49	Relay output A	R0 Option dep.	R0 (none)			
3113	Digital input 49	Relay output B	R0 Option dep.	R0 (none)			
3114	Digital input 49	Enable	ON OFF	OFF			
3115	Digital input 49	Fail class	F1..F8	Warning (1)			
3121	Digital input 50	Timer	0.2 s 100.0 s	10.0 s		II ch. 4, 5, 6	The input is configurable and can have different functions on different units. With the utility software it is possible to select if the input is activated by a normally closed or a
3122	Digital input 50	Relay output A	R0 Option dep.	R0 (none)			
3123	Digital input 50	Relay output B	R0 Option dep.	R0 (none)			

No.	Setting		Min. Max.	Factory setting	Notes	Ref.	Description
3124	Digital input 50	Enable	ON OFF	OFF			normally open contact.
3125	Digital input 50	Fail class	F1..F8	Warning (1)			
3131	Digital input 51	Timer	0.2 s 100.0 s	10.0 s		II ch. 4, 5, 6	The input is configurable and can have different functions on different units. With the utility software it is possible to select if the input is activated by a normally closed or a normally open contact.
3132	Digital input 51	Relay output A	R0 Option dep.	R0 (none)			
3133	Digital input 51	Relay output B	R0 Option dep.	R0 (none)			
3134	Digital input 51	Enable	ON OFF	OFF			
3135	Digital input 51	Fail class	F1..F8	Warning (1)			
3141	Digital input 52	Timer	0.2 s 100.0 s	10.0 s		II ch. 4, 5, 6	The input is configurable and can have different functions on different units. With the utility software it is possible to select if the input is activated by a normally closed or a normally open contact.
3142	Digital input 52	Relay output A	R0 Option dep.	R0 (none)			
3143	Digital input 52	Relay output B	R0 Option dep.	R0 (none)			
3144	Digital input 52	Enable	ON OFF	OFF			
3145	Digital input 52	Fail class	F1..F8	Warning (1)			
3151	Digital input 53	Timer	0.2 s 100.0 s	10.0 s		II ch. 4, 5, 6	The input is configurable and can have different functions on different units. With the utility software it is possible to select if the input is activated by a normally closed or a normally open contact.
3152	Digital input 53	Relay output A	R0 Option dep.	R0 (none)			
3153	Digital input 53	Relay output B	R0 Option dep.	R0 (none)			
3154	Digital input 53	Enable	ON OFF	OFF			
3155	Digital input 53	Fail class	F1..F8	Warning (1)			
3281	Digital input 110	Timer	0.2 s 100.0 s	1.0 s		II ch. 4, 5, 6	The input is configurable and can have different functions on different units. With the utility software it is possible to select if the input is activated by a normally closed or a normally open contact.
3282	Digital input 110	Relay output A	R0 Option dep.	R0 (none)			
3283	Digital input 110	Relay output B	R0 Option dep.	R0 (none)			
3284	Digital input 110	Enable	ON OFF	ON			

No.	Setting		Min. Max.	Factory setting	Notes	Ref.	Description
3285	Digital input 110	Fail class	F1..F8	Warning (1)			
3291	Digital input 111	Timer	0.2 s 100.0 s	1.0 s		II ch. 4, 5, 6	The input is configurable and can have different functions on different units. With the utility software it is possible to select if the input is activated by a normally closed or a normally open contact.
3292	Digital input 111	Relay output A	R0 Option dep.	R0 (none)			
3293	Digital input 111	Relay output B	R0 Option dep.	R0 (none)			
3294	Digital input 111	Enable	ON OFF	ON			
3295	Digital input 111	Fail class	F1..F8	Block (3)			
3301	Digital input 112	Timer	0.2 s 100.0 s	1.0 s		II ch. 4, 5, 6	The input is configurable and can have different functions on different units. With the utility software it is possible to select if the input is activated by a normally closed or a normally open contact.
3302	Digital input 112	Relay output A	R0 Option dep.	R0 (none)			
3303	Digital input 112	Relay output B	R0 Option dep.	R0 (none)			
3304	Digital input 112	Enable	ON OFF	ON			
3305	Digital input 112	Fail class	F1..F8	CB Trip (4)			
3311	Digital input 113	Timer	0.2 s 100.0 s	1.0 s		II ch. 4, 5, 6	The input is configurable and can have different functions on different units. With the utility software it is possible to select if the input is activated by a normally closed or a normally open contact.
3312	Digital input 113	Relay output A	R0 Option dep.	R0 (none)			
3313	Digital input 113	Relay output B	R0 Option dep.	R0 (none)			
3314	Digital input 113	Enable	ON OFF	OFF			
3315	Digital input 113	Fail class	F1..F8	Shutdown (6)			
3321	Digital input 114	Timer	0.2 s 100.0 s	0.2 s		II ch. 4, 5, 6	The input is configurable and can have different functions on different units. With the utility software it is possible to select if the input is activated by a normally closed or a normally open contact.
3322	Digital input 114	Relay output A	R0 Option dep.	R0 (none)			
3323	Digital input 114	Relay output B	R0 Option dep.	R0 (none)			
3324	Digital input 114	Enable	ON OFF	OFF			
3325	Digital input 114	Fail class	F1..F8	Shutdown (6)			

Category VDO binary inputs:

No.	Setting		Min. Max.	Factory setting	Notes	Ref.	Description
3251	VDO input 104	Timer	0.2 s 100.0 s	10.0 s		II ch. 5, 6, 7	The input is configurable and can have different functions on different units. With the utility software it is possible to select if the input is activated by a normally closed or a normally open contact.
3252	VDO input 104	Relay output A	R0 Option dep.	R0 (none)			
3253	VDO input 104	Relay output B	R0 Option dep.	R0 (none)			
3254	VDO input 104	Enable	ON OFF	ON			
3255	VDO input 104	Fail class	F1..F8	Shutdown (6)			
3261	VDO input 105	Timer	0.2 s 100.0 s	10.0 s		II ch. 5, 6, 7	The input is configurable and can have different functions on different units. With the utility software it is possible to select if the input is activated by a normally closed or a normally open contact.
3262	VDO input 105	Relay output A	R0 Option dep.	R0 (none)			
3263	VDO input 105	Relay output B	R0 Option dep.	R0 (none)			
3264	VDO input 105	Enable	ON OFF	ON			
3265	VDO input 105	Fail class	F1..F8	Shutdown (6)			
3271	VDO input 106	Timer	0.2 s 100.0 s	10.0 s		II ch. 5, 6, 7	The input is configurable and can have different functions on different units. With the utility software it is possible to select if the input is activated by a normally closed or a normally open contact.
3272	VDO input 106	Relay output A	R0 Option dep.	R0 (none)			
3273	VDO input 106	Relay output B	R0 Option dep.	R0 (none)			
3274	VDO input 106	Enable	ON OFF	ON			
3275	VDO input 106	Fail class	F1..F8	Shutdown (6)			

Category Analogue inputs:

No.	Setting		Min. Max.	Factory setting	Notes	Ref.	Description
4121	4-20mA 98.1	Set point	-9999 9999	10		II ch. 4, 5	Configurable analogue input.
4122	4-20mA 98.1	Timer	0.2 s 100.0 s	10			
4123	4-20mA 98.1	Relay output A	R0 Option dep.	R0 (none)			
4124	4-20mA 98.1	Relay output B	R0 Option dep.	R0 (none)			
4125	4-20mA 98.1	Enable	ON OFF	OFF			
4126	4-20mA 98.1	Fail class	F1..F8	Warning (1)			
4131	4-20mA 98.2	Set point	-9999 9999	10		II ch. 4, 5	Configurable analogue input.
4132	4-20mA 98.2	Timer	0.2 s 100.0 s	10			
4133	4-20mA 98.2	Relay output A	R0 Option dep.	R0 (none)			
4134	4-20mA 98.2	Relay output B	R0 Option dep.	R0 (none)			
4135	4-20mA 98.2	Enable	ON OFF	OFF			
4136	4-20mA 98.2	Fail class	F1..F8	Warning (1)			
4141	Wire fault no. 98	Timer	0.2 s 100.0 s	1.0 s		II ch. 4	The wire fault will detect if the current drops below 2mA or exceeds 22mA. In both cases the alarm will be active.
4142	Wire fault no. 98	Relay output A	R0 Option dep.	R0 (none)			
4143	Wire fault no. 98	Relay output B	R0 Option dep.	R0 (none)			
4144	Wire fault no. 98	Enable	ON OFF	OFF			
4145	Wire fault no. 98	Fail class	F1..F8	Warning (1)			
4151	4-20mA 100.1	Set point	-9999 9999	10		II ch. 4, 5	Configurable analogue input.
4152	4-20mA 100.1	Timer	0.2 s 100.0 s	10			
4153	4-20mA 100.1	Relay output A	R0 Option dep.	R0 (none)			
4154	4-20mA 100.1	Relay output B	R0 Option dep.	R0 (none)			

No.	Setting		Min. Max.	Factory setting	Notes	Ref.	Description
4155	4-20mA 100.1	Enable	ON OFF	OFF			
4156	4-20mA 100.1	Fail class	F1..F8	Warning (1)			
4161	4-20mA 100.2	Set point	-9999 9999	10		II ch. 4, 5	Configurable analogue input.
4162	4-20mA 100.2	Timer	0.2 s 100.0 s	10			
4163	4-20mA 100.2	Relay output A	R0 Option dep.	R0 (none)			
4164	4-20mA 100.2	Relay output B	R0 Option dep.	R0 (none)			
4165	4-20mA 100.2	Enable	ON OFF	OFF			
4166	4-20mA 100.2	Fail class	F1..F8	Warning (1)			
4171	Wire fault no. 100	Timer	0.2 s 100.0 s	1.0 s		II ch. 4	The wire fault will detect if the current drops below 2mA or exceeds 22mA. In both cases the alarm will be active.
4172	Wire fault no. 100	Relay output A	R0 Option dep.	R0 (none)			
4173	Wire fault no. 100	Relay output B	R0 Option dep.	R0 (none)			
4174	Wire fault no. 100	Enable	ON OFF	OFF			
4175	Wire fault no. 100	Fail class	F1..F8	Warning (1)			
4181	4-20mA 102.1	Set point	-9999 9999	10		II ch. 4, 5	Configurable analogue input.
4182	4-20mA 102.1	Timer	0.2 s 100.0 s	10			
4183	4-20mA 102.1	Relay output A	R0 Option dep.	R0 (none)			
4184	4-20mA 102.1	Relay output B	R0 Option dep.	R0 (none)			
4185	4-20mA 102.1	Enable	ON OFF	OFF			
4186	4-20mA 102.1	Fail class	F1..F8	Warning (1)			
4191	4-20mA 102.2	Set point	-9999 9999	10		II ch. 4, 5	Configurable analogue input.
4192	4-20mA 102.2	Timer	0.2 s 100.0 s	10			
4193	4-20mA 102.2	Relay output A	R0 Option dep.	R0 (none)			

No.	Setting		Min. Max.	Factory setting	Notes	Ref.	Description
4194	4-20mA 102.2	Relay output B	R0 Option dep.	R0 (none)			
4195	4-20mA 102.2	Enable	ON OFF	OFF			
4196	4-20mA 102.2	Fail class	F1..F8	Warning (1)			
4201	Wire fault no. 102	Timer	0.2 s 100.0 s	1.0 s		II ch. 5, 6, 7	Terminal 102 has a cable supervision based on a 100 Ohm resistor. If the measured resistance is over 220 Ohm, the wire fault alarm is activated.
4202	Wire fault no. 102	Relay output A	R0 Option dep.	R0 (none)			
4203	Wire fault no. 102	Relay output B	R0 Option dep.	R0 (none)			
4204	Wire fault no. 102	Enable	ON OFF	OFF			
4205	Wire fault no. 102	Fail class	F1..F8	Warning (1)			
4481	Wire fault no. 104	Timer	0.2 s 100.0 s	1.0 s		II ch. 5, 6, 7	Terminal 104 has a cable supervision based on a 100 Ohm resistor. If the measured resistance is over 220 Ohm, the wire fault alarm is activated.
4482	Wire fault no. 104	Relay output A	R0 Option dep.	R0 (none)			
4483	Wire fault no. 104	Relay output B	R0 Option dep.	R0 (none)			
4484	Wire fault no. 104	Enable	ON OFF	OFF			
4485	Wire fault no. 104	Fail class	F1..F8	Warning (1)			
4611	Wire fault no. 105	Timer	0.2 s 100.0 s	1.0 s		II ch. 5, 6, 7	Terminal 105 has a cable supervision based on a 100 Ohm resistor. If the measured resistance is over 220 Ohm, the wire fault alarm is activated.
4612	Wire fault no. 105	Relay output A	R0 Option dep.	R0 (none)			
4613	Wire fault no. 105	Relay output B	R0 Option dep.	R0 (none)			
4614	Wire fault no. 105	Enable	ON OFF	OFF			
4615	Wire fault no. 105	Fail class	F1..F8	Warning (1)			
4741	Wire fault no. 106	Timer	0.2 s 100.0 s	1.0 s		II ch. 5, 6, 7	Terminal 106 has a cable supervision based on a 100 Ohm resistor. If the measured resistance is over 220 Ohm, the wire fault alarm is activated.
4742	Wire fault no. 106	Relay output A	R0 Option dep.	R0 (none)			
4743	Wire fault no. 106	Relay output B	R0 Option dep.	R0 (none)			

No.	Setting		Min. Max.	Factory setting	Notes	Ref.	Description
4744	Wire fault no. 106	Enable	ON OFF	OFF			
4745	Wire fault no. 106	Fail class	F1..F8	Warning (1)			
4751	Overspeed 1	Set point	0 RPM 4000 RPM	1600 RPM		DRH ch. 5	The overspeed alarm relates to the measured value from the pick-up.
4752	Overspeed 1	Timer	0.2 s 100.0 s	0.5 s			
4753	Overspeed 1	Relay output A	R0 Option dep.	R0 (none)			
4754	Overspeed 1	Relay output B	R0 Option dep.	R0 (none)			
4755	Overspeed 1	Enable	ON OFF	OFF			
4756	Overspeed 1	Fail class	F1..F8	Shutdown (6)			
4761	Overspeed 2	Set point	0 RPM 4000 RPM	1600 RPM		DRH ch. 5	The overspeed alarm relates to the measured value from the pick-up.
4762	Overspeed 2	Timer	0.2 s 100.0 s	0.5 s			
4763	Overspeed 2	Relay output A	R0 Option dep.	R0 (none)			
4764	Overspeed 2	Relay output B	R0 Option dep.	R0 (none)			
4765	Overspeed 2	Enable	ON OFF	OFF			
4766	Overspeed 2	Fail class	F1..F8	Shutdown (6)			
4941	Battery low V	Set point	8.0 V 32.0 V	18.0 V			Supervision of the supply voltage to the controller.
4942	Battery low V	Timer	0.0 s 10.0 s	1.0 s			
4943	Battery low V	Relay output A	R0 Option dep.	R0 (none)			
4944	Battery low V	Relay output B	R0 Option dep.	R0 (none)			
4945	Battery low V	Enable	ON OFF	ON			
4946	Battery low V	Fail class	F1..F8	Warning (1)			
4951	Battery high V	Set point	12.0 V 36.0 V	30.0 V			Supervision of the supply voltage to the

No.	Setting		Min. Max.	Factory setting	Notes	Ref.	Description
4952	Battery high V	Timer	0.0 s 10.0 s	2.0 s			controller.
4953	Battery high V	Relay output A	R0 Option dep.	R0 (none)			
4954	Battery high V	Relay output B	R0 Option dep.	R0 (none)			
4955	Battery high V	Enable	ON OFF	ON			
4956	Battery high V	Fail class	F1..F8	Warning (1)			

Category General:

No.	Setting		Min. Max.	Factory setting	Notes	Ref.	Description
6143	Tacho failure	Set point	ON OFF	ON		-	The tacho failure alarm can be enabled or disabled.
6161	Start attempts	Set point	1 10	3		DRH ch. 5	If the engine is not started after the selected number of start attempts, the next available generator will be started.
6162	Start attempts	Relay output A	R0 Option dep.	R0 (none)			
6163	Start attempts	Relay output B	R0 Option dep.	R0 (none)			
6164	Start attempts	Enable	ON OFF	ON			
6165	Start attempts	Fail class	F1..F8	Warning (1)			
6181	f/U failure	Timer	1.0 s 99.0 s	10.0 s		DRH ch. 5	The f/U failure timer will start when the controller gets a running feedback. If the voltage or frequency has not been able to get within the window before the timer runs out, this function can be used to start the next generator.
6182	f/U failure	Relay output A	R0 Option dep.	R0 (none)			
6183	f/U failure	Relay output B	R0 Option dep.	R0 (none)			
6184	f/U failure	Fail class	F1..F8	Warning (1)			
6201	Stop failure	Timer	10.0 s 120.0 s	30.0 s		DRH ch. 5	The stop failure timer is activated by the stop command. If the running feedback does not disappear before the timer runs out, the stop failure alarm is activated.
6202	Stop failure	Relay output A	R0 Option dep.	R0 (none)			
6203	Stop failure	Relay output B	R0 Option dep.	R0 (none)			
6204	Stop failure	Enable	ON OFF	ON			

Category System:

No.	Setting		Min. Max.	Factory setting	Notes	Ref.	Description
7521	Ext. comm. error	Timer	1.0 s 100.0 s	10.0 s		-	Supervision of the external communication. Only available when option H2 is activated.
7522	Ext. comm. error	Relay output A	R0 Option dep.	R0 (none)		-	
7523	Ext. comm. error	Relay output B	R0 Option dep.	R0 (none)		-	
7524	Ext. comm. error	Enable	ON OFF	OFF		-	

5. Parameter list

The abbreviation DRH refers to the Designer's Reference Handbook.
The abbreviation II refers to the Installation Instructions.

Category Synchronisation:

No.	Setting		Min. Max.	Factory setting	Notes	Ref.	Description
2001	Static sync.	Enable	ON OFF	OFF		DRH ch. 5, 6, 7	It is possible to choose either dynamic or static synchronisation. Only the parameters for the selected type of synchronisation will be used.
2021	Dynamic f_{MAX}	Max. slip freq.	0.0Hz 0.5Hz	0.3Hz			
2022	Dynamic f_{MIN}	Min. slip freq.	-0.5Hz 0.3Hz	0.0Hz			
2023	Dynamic U_{MAX}	Max. ΔV	2% 10%	5%			
2024	t_{CB}	CB close time	40 ms 300 ms	50 ms			
2031	Static sync.	Maximum Δf	0.00Hz 0.25Hz	0.10Hz			
2032	Static sync.	Maximum ΔV	2% 10%	5%			
2033	Static sync.	Close window	0.1 deg 20.0 deg	10.0 deg			
2051	Static phase reg.	Phase Kp	0 1000	10		DRH ch. 5, 6, 7	If static synchronising is selected.
2052	Static phase reg.	Phase Ki	0 1000	160			
2091	Sync. blackout	Maximum Δf	0.0Hz 5.0Hz	3.0Hz		DRH ch. 5, 6, 7	The settings determine when the generator voltage and frequency are close enough to the nominal settings, in order to close the CB on a dead busbar.
2092	Sync. blackout	Maximum ΔV	2% 10%	5%			
2101	Sync. window	Set point	2% 20%	15%			Area where the synchronisation will take place.
2102	Sync. window	Timer	0.1 s 2.0 s	0.5 s			
2103	Sync. window	Relay output A	R0 Option dep.	R0 (none)			
2104	Sync. window	Relay output B	R0 Option dep.	R0 (none)			
2105	Sync. window	Enable	ON OFF	OFF			

Category Regulation:

No.	Setting		Min. Max.	Factory setting	Notes	Ref.	Description
2511	Freq. control	Dead band	0.2% 10.0%	0.5%		DRH ch. 5	The dead band is a band around the nominal set point where no regulation will take place. Kp and Ki are regulation parameters.
2512	Freq. control	F K_P	0 1000	100			
2513	Freq. control	F K_I	0 1000	50			
2521	Power control	Dead band	0.2% 10.0%	2.0%		DRH ch. 5	The dead band is a band around the nominal set point where no regulation will take place. Kp and Ki are regulation parameters.
2522	Power control	F K_P	0 1000	100			
2523	Power control	F K_I	0 1000	50			
2541	Power ramp down	Speed	0.1%/s 20.0%/s	10.0%/s		DRH ch. 5	The power ramp down is only used during deload of the generator. When the power on the generator is under the breaker open point, a CB open command is transmitted.
2542	Power ramp down point	Lim	1% 20%	5%			
2621	GOV relay	GOV ON time	10 ms 6500 ms	100 ms		DRH ch. 5	The GOV ON time determines the minimum time the relay is closed. The period time is the time for one regulation cycle.
2622	GOV relay	GOV per time	250 ms 32500 ms	2500 ms			
2631	AVR relay	AVR ON time	10 ms 6500 ms	100 ms		DRH ch. 5	The AVR ON time determines the minimum time the relay is closed. The period time is the time for one regulation cycle.
2632	AVR relay	AVR per time	250 ms 32500 ms	500 ms			
2672	Delay regulation	Timer	0.0 s 9900.0 s	0.0 s		DRH ch. 5	Delay time for the regulation. The timer starts running when the frequency reaches 32Hz. If the regulation delay is not wanted, set the time to 0.0.
2673	Delay regulation	Relay output A	R0 Option dep.	R0 (none)			
2674	Delay regulation	Relay output B	R0 Option dep.	R0 (none)			
2675	Delay regulation	Enable	ON OFF	OFF			

Category Relay outputs:

No.	Setting		Min. Max.	Factory setting	Notes	Ref.	Description
5001	Relay 0 virtual	Set point	Alarm sync. block	Alarm		DRH ch. 4	Relay 0 virtual is the internal alarm relay, e.g. it activates the alarm horn output. The timer is an off delay.
5002	Relay 0 virtual	Timer	0.0 s 999.9 s	5.0 s			
5011	Relay 1	Set point	Alarm A/Sync. block Limit Alarm/Reset Sync. block/R	Alarm		DRH ch. 4	If the relay has been selected as relay output A or B, it is possible to select which function will be performed as long as the relay is activated. The number of relays is option dependent.
5012	Relay 1	Timer	0.0 s 999.9 s	5.0 s			
5021	Relay 2	Set point	Alarm A/Sync. block Limit Alarm/Reset Sync. block/R	Alarm		DRH ch. 4	If the relay has been selected as relay output A or B, it is possible to select which function will be performed as long as the relay is activated. The number of relays is option dependent.
5022	Relay 2	Timer	0.0 s 999.9 s	5.0 s			
5031	Relay 3	Set point	Alarm A/Sync. block Limit Alarm/Reset Sync. block/R	Alarm		DRH ch. 4	If the relay has been selected as relay output A or B it is possible to select which function will be performed as long as the relay is activated. The number of relays is option dependent.
5032	Relay 3	Timer	0.0 s 999.9 s	5.0 s			
5041	Relay 4	Set point	Alarm A/Sync. block Limit Alarm/Reset Sync. block/R	Alarm		DRH ch. 4	If the relay has been selected as relay output A or B it is possible to select which function will be performed as long as the relay is activated. The number of relays is option dependent.
5042	Relay 4	Timer	0.0 s 999.9 s	5.0 s			
5051	Relay 5	Set point	Alarm A/Sync. block Limit Alarm/Reset Sync. block/R	Alarm		DRH ch. 4	If the relay has been selected as relay output A or B it is possible to select which function will be performed as long as the relay is activated. The number of relays is option dependent.
5052	Relay 5	Timer	0.0 s 999.9 s	5.0 s			
5061	Relay 6	Set point	Alarm A/Sync. block Limit Alarm/Reset Sync. block/R	Alarm		DRH ch. 4	If the relay has been selected as relay output A or B it is possible to select which function will be performed as long as the relay is activated. The number of relays is option dependent.
5062	Relay 6	Timer	0.0 s 999.9 s	5.0 s			
5071	Relay 7	Set point	Alarm A/Sync. block Limit Alarm/Reset Sync. block/R	Alarm		DRH ch. 4	If the relay has been selected as relay output A or B it is possible to select which function will be performed as long as the

No.	Setting		Min. Max.	Factory setting	Notes	Ref.	Description
5072	Relay 7	Timer	0.0 s 999.9 s	5.0 s			relay is activated. The number of relays is option dependent.
5081	Relay 8	Set point	Alarm A/Sync. block Limit Alarm/Reset Sync. block/R	Alarm		DRH ch. 4	If the relay has been selected as relay output A or B it is possible to select which function will be performed as long as the relay is activated. The number of relays is option dependent.
5082	Relay 8	Timer	0.0 s 999.9 s	5.0 s			
5091	Relay 9	Set point	Alarm A/Sync. block Limit Alarm/Reset Sync. block/R	Alarm		DRH ch. 4	If the relay has been selected as relay output A or B it is possible to select which function will be performed as long as the relay is activated. The number of relays is option dependent.
5092	Relay 9	Timer	0.0 s 999.9 s	5.0 s			
5141	Relay 14	Set point	Alarm A/Sync. block Limit Alarm/Reset Sync. block/R	Alarm		DRH ch. 4	If the relay has been selected as relay output A or B it is possible to select which function will be performed as long as the relay is activated. The number of relays is option dependent.
5142	Relay 14	Timer	0.0 s 999.9 s	5.0 s			
5151	Relay 15	Set point	Alarm A/Sync. block Limit Alarm/Reset Sync. block/R	Alarm		DRH ch. 4	If the relay has been selected as relay output A or B it is possible to select which function will be performed as long as the relay is activated. The number of relays is option dependent.
5152	Relay 15	Timer	0.0 s 999.9 s	5.0 s			
5161	Relay 16	Set point	Alarm A/Sync. block Limit Alarm/Reset Sync. block/R	Alarm		DRH ch. 4	If the relay has been selected as relay output A or B it is possible to select which function will be performed as long as the relay is activated. The number of relays is option dependent.
5162	Relay 16	Timer	0.0 s 999.9 s	5.0 s			
5171	Relay 17	Set point	Alarm A/Sync. block Limit Alarm/Reset Sync. block/R	Alarm		DRH ch. 4	If the relay has been selected as relay output A or B it is possible to select which function will be performed as long as the relay is activated. The number of relays is option dependent.
5172	Relay 17	Timer	0.0 s 999.9 s	5.0 s			
5181	Relay 18	Set point	Alarm A/Sync. block Limit Alarm/Reset Sync. block/R	Alarm		DRH ch. 4	If the relay has been selected as relay output A or B it is possible to select which function will be performed as long as the relay is activated. The number of relays is option dependent.
5182	Relay 18	Timer	0.0 s 999.9 s	5.0 s			

No.	Setting		Min. Max.	Factory setting	Notes	Ref.	Description
5191	Relay 19	Set point	Alarm A/Sync. block Limit Alarm/Reset Sync. block/R	Alarm		DRH ch. 4	If the relay has been selected as relay output A or B it is possible to select which function will be performed as long as the relay is activated. The number of relays is option dependent.
5192	Relay 19	Timer	0.0 s 999.9 s	5.0 s			
5201	Relay 20	Set point	Alarm A/Sync. block Limit Alarm/Reset Sync. block/R	Alarm		DRH ch. 4	If the relay has been selected as relay output A or B it is possible to select which function will be performed as long as the relay is activated. The number of relays is option dependent.
5202	Relay 20	Timer	0.0 s 999.9 s	5.0 s			

Category Analogue outputs:

No.	Setting		Min. Max.	Factory setting	Notes	Ref.	Description
5861	P output	Type	0-20mA 4-20mA	4-20mA		DRH ch. 4	If option F1 is present, 2 analogue outputs are available. The analogue outputs are galvanically separated from each other and the rest of the unit. The output is an active output, so no power supply is needed. When set to output 0, no output is selected.
5862	P output	Output A	Output 1 Output 2	Output 0			
5863	P output	Output B	Output 1 Output 2	Output 0			
5864	P output	Max.	0 kW 20000 kW	500 kW			
5865	P output	Min.	-9999 kW 20000 kW	0 kW			
5871	S output	Type	0-20mA 4-20mA	4-20mA		DRH ch. 4	If option F1 is present, 2 analogue outputs are available. The analogue outputs are galvanically separated from each other and the rest of the unit. The output is an active output, so no power supply is needed. When set to output 0, no output is selected.
5872	S output	Output A	Output 1 Output 2	Output 0			
5873	S output	Output B	Output 1 Output 2	Output 0			
5874	S output	Max.	0 kVA 20000 kVA	600 kVA			
5875	S output	Min.	-9999 kVA 20000 kVA	0 kVA			
5881	Q output	Type	0-20mA 4-20mA	4-20mA		DRH ch. 4	If option F1 is present, 2 analogue outputs are available. The analogue outputs are galvanically separated from each other and the rest of the unit. The output is an active output, so no power supply is needed. When set to output 0, no output is selected.
5882	Q output	Output A	Output 1 Output 2	Output 0			
5883	Q output	Output B	Output 1 Output 2	Output 0			
5884	Q output	Max.	0 kVAr 16000 kVAr	400 kVAr			
5885	Q output	Min.	-8000 kVAr 16000 kVAr	0 kVAr			
5891	PF output	Type	0-20mA 4-20mA	4-20mA		DRH ch. 4	If option F1 is present, 2 analogue outputs are available. The analogue outputs are galvanically separated from each other and the rest of the unit. The output is an active output, so no power supply is needed. When set to output 0, no output is selected.
5892	PF output	Output A	Output 1 Output 2	Output 0			
5893	PF output	Output B	Output 1 Output 2	Output 0			
5894	PF output	Max.	0.5 1	0.8			
5895	PF output	Min.	-0.5 -1	-0.8			
5901	f output	Type	0-20mA 4-20mA	4-20mA		DRH ch. 4	If option F1 is present, 2 analogue outputs are available. The analogue outputs are galvanically separated from each other and the rest of the unit. The output is an active output, so no power supply is needed. When set to output 0, no output is selected.
5902	f output	Output A	Output 1 Output 2	Output 0			
5903	f output	Output B	Output 1 Output 2	Output 0			
5904	f output	Max.	0Hz 70Hz	55Hz			
5905	f output	Min.	0Hz 70Hz	45Hz			
5911	U output	Type	0-20mA 4-20mA	4-20mA		DRH ch. 4	If option F1 is present, 2 analogue outputs are

No.	Setting		Min. Max.	Factory setting	Notes	Ref.	Description
5912	U output	Output A	Output 1 Output 2	Output 0			available. The analogue outputs are galvanically separated from each other and the rest of the unit. The output is an active output, so no power supply is needed. When set to output 0, no output is selected.
5913	U output	Output B	Output 1 Output 2	Output 0			
5914	U output	Max.	0 V 28000 V	500 V			
5915	U output	Min.	0 V 28000 V	0 V			
5921	I output	Type	0-20mA 4-20mA	4-20mA		DRH ch. 4	If option F1 is present, 2 analogue outputs are available. The analogue outputs are galvanically separated from each other and the rest of the unit. The output is an active output, so no power supply is needed. When set to output 0, no output is selected.
5922	I output	Output A	Output 1 Output 2	Output 0			
5923	I output	Output B	Output 1 Output 2	Output 0			
5924	I output	Max.	0 A 9000 A	1000 A			
5925	I output	Min.	0 A 9000 A	0 A			
5891	P available	Type	0-20mA 4-20mA	4-20mA		DRH ch. 4	If option F1 is present, 2 analogue outputs are available. The analogue outputs are galvanically separated from each other and the rest of the unit. The output is an active output, so no power supply is needed. When set to output 0, no output is selected.
5892	P available	Output A	Output 1 Output 2	Output 0			
5893	P available	Output B	Output 1 Output 2	Output 0			
5894	P available	Max.	0 kW 20000 kW	3000 kW			
5895	P available	Min.	0 kW 20000 kW	0 kW			
5991	P consumed	Type	0-20mA 4-20mA	4-20mA		DRH ch. 4	If option F1 is present, 2 analogue outputs are available. The analogue outputs are galvanically separated from each other and the rest of the unit. The output is an active output, so no power supply is needed. When set to output 0, no output is selected.
5992	P consumed	Output A	Output 1 Output 2	Output 0			
5993	P consumed	Output B	Output 1 Output 2	Output 0			
5994	P consumed	Max.	0 kW 20000 kW	3000 kW			
5995	P consumed	Min.	0 kW 20000 kW	0 kW			

Category General:

No.	Setting		Min. Max.	Factory setting	Notes	Ref.	Description
6001	Nom. frequency	Set point	48.0Hz 62.0Hz	50.0Hz		DRH ch. 4	These settings are the nominal settings for the generator. All voltage, power, current and frequency are in percentage of these settings.
6002	Nom. power	Set point	10 kW 20000 kW	1000 kW			
6003	Nom. current	Set point	0 A 9000 A	1904 A			
6004	Nom. voltage	Set point	100 V 25000 V	400 V			
6021	VT gen. prim.	Set point	100 V 25000 V	400 V		DRH ch. 4	Voltage and current transformer ratio for the generator. If voltage transformers are not used, the same values are entered as primary and secondary in order to have the ratio: 1.
6022	VT gen. sec.	Set point	100 V 690 V	400 V			
6023	CT prim.	Set point	0 A 9000 A	2000 A			
6024	CT sec.	Set point	1 A 5 A	1 A			
6031	VT bus. prim.	Set point	100 V 25000 V	400 V		DRH ch. 4	Voltage transformer ratio for the busbar. If voltage transformers are not used, the same values are entered as primary and secondary in order to have the ratio: 1.
6032	VT bus. sec.	Set point	100 V 690 V	400 V			
6061	Language	Set point	English Deutsch Français Español Italiano	English		DRH ch. 4	Language selection.
6071	Date and time	Year	2001 2100	2001		DRH ch. 4	The system clock can also be synchronised from the utility software. Here the PC time is transmitted to the controller, ensuring that the time is identical in all controllers.
6072		Month	1…12	1			
6073		Day	1...07	6			
6074		Hour	0…24	0			
6075		Minute	0…60	0			
6081	Counters	Run time	0 h 32535 h	0 h		DRH ch. 4	The run time and CB close counters are for presetting a value from an old engine in the controller.
6082	Counters	CB close	0 32535	0			
6081	Counters	kWh reset	OFF ON	OFF			
6131	Run status	Timer	0.0 s 60.0 s	0.5 s		DRH ch. 4	Run status is just a possibility to get a status output from the controller. The generator is considered as running, if one of the running feedbacks is active.
6132	Run status	Relay output A	R0 Option dep.	R0 (none)			
6133	Run status	Relay output B	R0 Option dep.	R0 (none)			
6134	Run status	Enable	ON OFF	ON			
6141	Tacho config.	Limit	1 RPM 2000 RPM	300 RPM		DRH ch. 5	The tacho limit is the set point where the generator is

No.	Setting		Min. Max.	Factory setting	Notes	Ref.	Description
6142	Tacho config.	Teeth	0 400	0			considered running and the starter is withdrawn. The number of teeth is the actual number of teeth on the flywheel. When it is 0, the tacho measurement is disabled.
6151	Start prepare	Timer	0.0 s 600.0 s	0.0 s		DRH ch. 5	The start ON timer is automatically reset when the running detection detects that the generator is running. The stop timer is initialised after every start attempt.
6152	Start ON	Timer	1.0 s 180.0 s	5.0 s			
6153	Start OFF	Timer	1.0 s 99.0 s	5.0 s			
6161	Start attempts	Set point	1 10	3		DRH ch. 5	Number of start attempts.
6162	Start attempts	Relay output A	R0 Option dep.	R0 (none)			
6163	Start attempts	Relay output B	R0 Option dep.	R0 (none)			
6164	Start attempts	Enable	ON OFF	ON			
6171	f/U OK	Timer	1.0 s 99.0 s	2.0 s		DRH ch. 5	The f/U OK is used to detect when a started generator is ready for synchronisation. When the voltage and the frequency are within the window defined by blackout synchronisation settings (menu 2091 and 2092), the timer for f/U OK will start.
6172	f/U OK	Relay output A	R0 Option dep.	R0 (none)			
6173	f/U OK	Relay output B	R0 Option dep.	R0 (none)			
6174	f/U OK	Enable	ON OFF	OFF			
6191	Cool down	Timer	0.0 s 990.0 s	180.0 s		DRH ch. 5	The extended stop timer starts when the running feedback disappears. When the timer is active it is not possible to start the engine again, as it is still rotating.
6192	Extended stop	Timer	1.0 s 99.0 s	10.0 s			
6193	Coil type	Set point	Stop solenoid Run solenoid	Stop solenoid			
6341	Load share Out	Set point	1V 5 V	5 V		-	The voltage level for the analogue load share line.
6351	L. Sharing Type	Set point	DEIF Selco T4800 Adjustable	Adjustable		-	The PPM unit can loadshare with any other unit that uses an analogue loadshare line.

Category System:

No.	Setting		Min. Max.	Factory setting	Notes	Ref.	Description
7511	Ext. comm. ID	Set point	1 247	1		DRH ch. 10	When the option H2 is installed, the external communication ID can be adjusted for each unit.
7512	Ext. comm. speed	Set point	9600 Baud 19200 Baud	19200 Baud		-	The speed for the external communication can be adjusted.
7513	Ext. comm. mode	Set point	RTU mode ASCII mode	RTU mode		-	The ext. communication mode can be selected.
7531	Int. comm. ID	Set point	1…10	1		DRH ch. 8	The internal communication ID number is used to identify the controller to the other controllers on the internal CAN bus.
7541	Enable ID 1	Set point	ON OFF	ON		DRH ch. 8	The internal communication lines have an auto detect function. When a unit receives a telegram from another ID number, this ID number is automatically enabled. If a controller is removed from the internal communication line, the ID is missing at the other units, and the removed ID number has to be disabled manually in all other controllers.
7542	Enable ID 2	Set point	ON OFF	OFF			
7543	Enable ID 3	Set point	ON OFF	OFF			
7544	Enable ID 4	Set point	ON OFF	OFF			
7545	Enable ID 5	Set point	ON OFF	OFF			
7551	Enable ID 6	Set point	ON OFF	ON		DRH ch. 8	The internal communication lines have an auto detect function. When a unit receives a telegram from another ID number, this ID number is automatically enabled. If a controller is removed from the internal communication line, the ID is missing at the other units, and the removed ID number has to be disabled manually in all other controllers.
7552	Enable ID 7	Set point	ON OFF	OFF			
7553	Enable ID 8	Set point	ON OFF	OFF			
7554	Enable ID 9	Set point	ON OFF	OFF			
7555	Enable ID 10	Set point	ON OFF	OFF			

Category Power management:

No.	Setting		Min. Max.	Factory setting	Notes	Ref.	Description
8001	Number of DGs	Set point	2 8	3		DRH ch. 8	Enter the total number of diesel generators in the system.
8002	System type no.	Set point	1 3	3		DRH ch. 8	Select the system type for your application.
8011	kW/kVA	Set point	Power (P) - Apparent power (S)	Power (P)		DRH ch. 8	For the load dependent start/stop it can be selected, if the calculation will be based on the active power or the apparent power. At the same time it can be selected, if the start/stop limit is to be based on the selected value (kW/kVA) or in percentage of the total consumed power.
8012	Val/%	Set point	Value - percentage	%		DRH ch. 8	
8021	Start limit P	Set point	10 kW 9999 kW	100 kW		DRH ch. 8	Dependent on the set point used for the load dependent start/stop in menu 8011 and 8012, the start limit will be activated for kW, kVA or percentage. The start delay timer is active independently of the above selected parameter.
8022	Start limit S	Set point	10 kVA 9999 kVA	100 kVA			
8023	Start limit %	Set point	0% 100%	90%			
8024	Ld. start delay	Timer	1.0 s 99.0 s	10.0 s			
8031	Stop limit P	Set point	10 kW 9999 kW	200 kW		DRH ch. 8	Dependent on the set point used for the load dependent start/stop in menu 8011 and 8012, the stop limit will be activated for kW, kVA or percentage. The stop delay timer is active independently of the above selected parameter. The block of load dependent stop function will block any load dependent stop, if any Heavy Consumers are connected.
8032	Stop limit S	Set point	10 kVA 9999 kVA	200 kVA			
8033	Stop limit %	Set point	0% 100%	70%			
8034	Ld. stop delay	Timer	1.0 s 99.0 s	30.0 s			
8035	Ld. stop block	Set point	0 1	0			
8041	Sel. DG amount	Set point	1 2	1		DRH ch. 8	The DG number selects how many generators will be started during a blackout. The plant mode selection allows to define to which plant mode the system will change during a blackout. If selected attempts allow one generator to close on a black busbar, the binary input short circuit is activated.
8042	Sel. Pl mode	Set point	Semi-auto Auto	0			
8043	Sel. attempts	Set point	0 1	0			

No.	Setting		Min. Max.	Factory setting	Notes	Ref.	Description
8051	Transmit	Set point	ON OFF	OFF		DRH ch. 8	Selection of start priority. When the priority has been changed, the transmit has to be set to ON in order to transmit the settings to the other units. The ON setting will automatically return to OFF when the new settings have been distributed to the other controllers.
8052	1st prior. DG no.	Set point	1…8	1			Selection of start priority. When the priority has been changed, the transmit has to be set to ON in order to transmit the settings to the other units. The ON setting will automatically return to OFF when the new settings have been distributed to the other controllers.
8053	2nd prior. DG no.	Set point	1…8	2			
8054	3rd prior. DG no.	Set point	1…8	3			
8055	4th prior. DG no.	Set point	1…8	4			
8056	5th prior. DG no.	Set point	1…8	5			
8052	6th prior. DG no.	Set point	1…8	6			
8053	7th prior. DG no.	Set point	1…8	7			
8054	8th prior. DG no.	Set point	1…8	8			
8071	Base ld. ON/OFF	Set point	(OFF) (ON)	0		DRH ch. 8	If the total load drops down to a value where the generator running base load is not able to maintain the required load, the base load function is cancelled and the generator will perform normal load sharing.
8072	Base load value	Set point	10% 130%	70%			
8073	Cancel delay	Timer	1.0 s 30.0 s	5.0 s			
8081	PROG1 pulse time	Timer	1.0 s 99.0 s	5.0 s		DRH ch. 8	Relay close time when the PROG push-button has been activated at the operator's panel.
8082	PROG2 pulse time	Timer	1.0 s 99.0 s	5.0 s			
8091	Select ON/OFF	Set point	(OFF) (ON)	0		DRH ch. 8	With this set point, the auto priority function can be activated.
8092	Select interval	Set point	1 h 32000 h	100 h		DRH ch. 8	Time interval for changing the first start priority. The DG with the lowest number of running hours will get the 1st priority.
8201	HC 1 Max. power	Set point	0 kW 9000 kW	400 kW		DRH ch. 8	Settings for Heavy Consumer no. 1.
8202	HC 1 Load type	Set point	Fixed load Variable load	Fixed load			
8203	HC 1 Ack. type	Set point	Steady ack. Pulse ack.	Steady			
8211	HC 2 Max. power	Set point	0 kW 9000 kW	400 kW		DRH ch. 8	Settings for Heavy Consumer no. 2.
8212	HC 2 Load type	Set point	Fixed load Variable load	Fixed load			
8213	HC 2 Ack. type	Set point	Steady ack. Pulse ack.	Steady			

6. Failure mode and effect analysis

Failure	Failure cause	Local effect	End effect	Failure detection	System corrective actions	Remarks
CAN interface loss	CAN I/F board failure Loose connections	The missing unit is no longer under PM control		System fault indication: CAN ID x missing	ALL units in switchboard control Power/frequency (voltage/var) control lost	Generator protections still active Generators stay on line, provided speed (and voltage droop) is present
Loss of power supply	24V DC failure Power supply failure Loose connections	No control of generator, protections lost	Generator not available	System fault indication: CAN ID x missing	ALL units in switchboard control Power/frequency (voltage/var) control lost	Works only if generator governors and AVRs are in droop
Generator breaker sync. fail	Breaker fail Loose connections	Cannot close generator breaker Protections active		Alarm on unit: Breaker close fail	Failed generator does not participate in load dependent start/stop Next generator start signal set	
Generator breaker feedback fail	Wire break or short circuit	Generator breaker position unknown Protections active	Generator not available	Feedbacks both ON or both OFF	Failed generator does not participate in load dependent start/stop Next generator start signal set	
Generator AC protection trip	Any AC limit trip	Open breaker command set Protections active	Generator not available	Generator PMS alarm	Failed generator does not participate in load dependent start/stop Next generator start signal set	May cause overload
Generator engine warning	Engine pre-shutdown alarm	Ramp down, open breaker, normal stop of engine (after next generator is on line)	Generator not available	Generator PMS alarm	Failed generator does not participate in load dependent start/stop Next generator start signal set	
Generator engine shutdown	Engine shutdown alarm	GB trip, shutdown of engine	Generator not available	Generator PMS alarm	Failed generator does not participate in load dependent start/stop Next generator start signal set	May cause overload

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