DEIF A/S

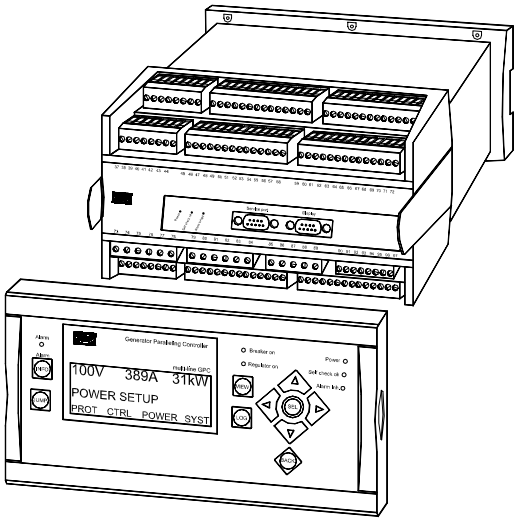
User's manual

Generator Paralleling Controller Type GPC

multi-line 2

4189340226C

Software ver. 1.3X



- *Compact system in one unit*
  - *dynamic synchronisation*
  - *load sharing*
  - *generator protection*

- *3-phase AC_{RMS} measurements*
- *Calculation of complex AC values*
- *DIN-rail unit with separate display*
- *Easy operator programming via display or PC*
- *Reliable self-monitoring system*

CE

DEIF A/S
Frisenborgvej 33, DK-7800 Skive
Denmark

Tel: (+45) 9614 9614
Fax: (+45) 9614 9615
E-mail: deif@deif.com

This document is the user's manual for the standard Deif Multi-line 2 GPC.

INDEX:

Warnings and legal information

This manual gives guidelines to installation of the DEIF Multi-line 2 generator control and protection units. It is, however, not a complete installation instruction. Therefore, even if terminal numbers are shown in the drawings, the drawings are to be used as guidance only.

Installing and operating the Multi-line 2 products implies work with dangerous currents and voltages, and therefore it should be done by qualified personnel only.

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

DEIF takes no responsibility for operation or installation of the generator set. If there is any doubt about how to install or operate the system on which the Multi-line 2 products are measuring, the company responsible for installation or operation must be contacted.

Standard functions

The GPC is a control and protection unit for a generator driven by a diesel / gas engine or a turbine. The GPC will carry out all necessary tasks to control and protect a generator, regardless of the use of the generator. This means that the GPC can be used for several application types such as:

- Stand-alone generator
- Multiple generator load sharing control
- Fixed load to mains / base load

The GPC measuring system is true RMS 3-phase measurement of generator voltage, generator current and BUS (mains) voltage.

Language

German or English language may be chosen via the system menu structure.

Control functions

- Dynamic synchronisation
    - Frequency matching
    - Voltage check
    - Breaker delay time compensation
    - Check phase sequence
- Fixed load (base load) running of the generator
- Fixed frequency running of a stand-alone generator
- Load sharing between generators with power and frequency control
- Relay outputs for speed governor
- Relay outputs to close / open generator breaker
- Adjustable ramp up/down of generator load
- Relay outputs for start / stop of next generator (high / low load)

Generator protection functions

- Reverse power
- Overcurrent (2 levels)

Protective functions can be selected to activate one of 4 configurable relays.

Optional function list

Option A and option B cannot be chosen at the same time as some functions are common for both.

Option A, mains failure supervision

- Vector jump
- Df/dt (ROCOF)
- Overvoltage (2 levels)
- Undervoltage (2 levels)
- Overfrequency (2 levels)
- Underfrequency (2 levels)

Option B, BUS protection package

- Overvoltage (2 levels)
- Undervoltage (2 levels)
- Overfrequency (2 levels)
- Underfrequency (2 levels)

Option D, Voltage/var/power factor control

The selection of which of the option D functions is active is dependent on the running mode selection (mode inputs 4,5, and 6).

Please refer to I/O list for specific connection of the inputs.

Option E, analogue governor and AVR control outputs

Selecting option E means that an additional board will be placed in slot #4 (terminals 65 to 72) where 2 analogue +/- 20 mA control outputs will be present. The outputs are galvanically separated from each other and the rest of the GPC. The outputs are active outputs (does not require external power supply).

Option F1, 2 x transducer output

Selecting option F1 means that an additional board will be placed in slot #6 (terminals 90 to 97) where 2 analogue 0(4)…20 mA outputs will be present. The outputs are galvanically separated from each other and the rest of the GPC. The outputs are active outputs (does not require external power supply). The use of the analogue outputs can be selected via the menu system or the PC programming interface.

Option G, Start / stop of next generator

If option G is selected, relay outputs terminal 61-62 (start) and 63-64 (stop) are used. Both are normally open relays.

The settings of level and timers can be carried out in the menu system or via PC interface.

Option H1, CAN-bus serial interface

If option H1 is selected, an additional communication board is mounted in slot #2 (terminals 29-36).

For technical details regarding the CAN-bus interface, please see the CAN-bus manual.

Option J1, display cable, 3 m

Cable with male / female SUB-D plugs.

Option J2, display cable, 6 m

Cable with male / female SUB-D plugs.

Hardware

The GPC unit housing is divided into board slot positions, some of which are standard (non-changeable) and some intended for options. The unit is divided like this:

Slot #1: Standard	Terminal 1-28
Slot #2:	Terminal 29-36
Slot #3:	Terminal 37-64
Slot #4:	Terminal 65-72
Slot #5: Standard	Terminal 73-89
Slot #6:	Terminal 90-97
Slot #7: Not used	Terminal 98-125
Slot #8:	Terminal 126-133

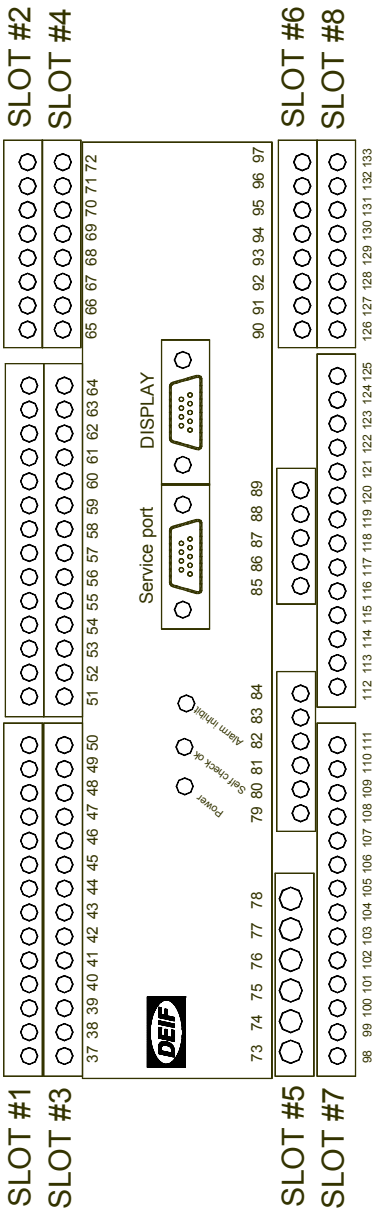
In the standard GPC, the only slots used are as standard slot #1, #3, #5 and #8. Slots #2, #4 and #6 are used for options, slot # 7 is not used.

Besides the slots, there is an additional board where the communication (RS 232 PC service port for programming of setpoints and timers etc. and display) is placed.

NOTE:
For slots #1, 3 and 5, only specific boards can be mounted.
For slots #2, 4, 6 and 8, the boards are interchangeable.

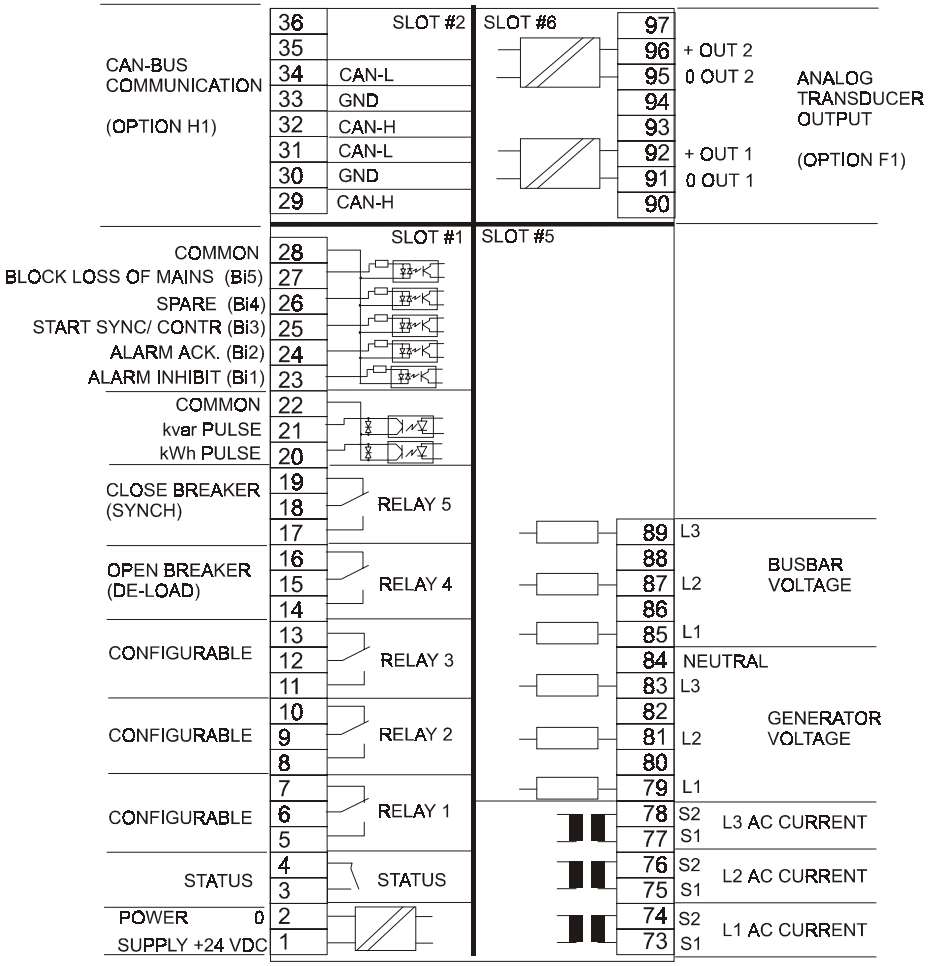
An overview of the terminals can be seen on the next page.

The slots are positioned in the unit as follows (seen from the top of the unit):

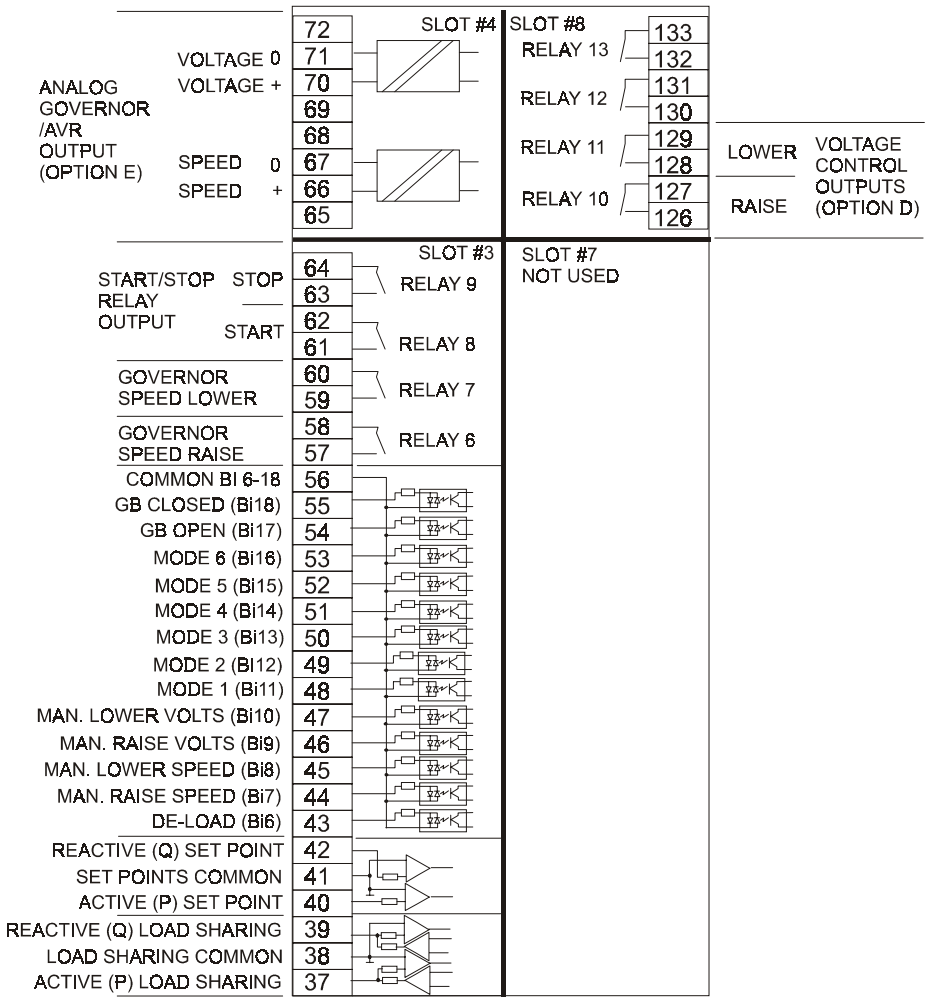


Terminal strip overview

Slots 1,2,5 and 6



Slots 3,4 and 8



Terminal strip, explanation

For the relay outputs, following terms will be used:
NO means **N**ormally **O**pen
NC means **N**ormally **C**losed
Com. means common terminal for the relay in question

Slot #1, power supply and binary I/O

Standard board (always needed):

Term	Function	Technical data	Description
1	+24V DC	24V DC +20 / - 30 %	Power supply.
2	0V DC		
3	NC	Status relay 24V / 1A	Normally closed relay, processor /power supply status supervision
4	Com		
5	NO	Relay 1, 250V AC / 8A	Configurable
6	Com.		
7	NC		
8	NO	Relay 2, 250V AC / 8A	Configurable
9	Com.		
10	NC		
11	NO	Relay 3, 250V AC / 8A	Configurable
12	Com.		
13	NC		
14	NO	Relay 4, 250V AC / 8A	Open breaker (De-load) Can be configured for tripping also.
15	Com.		
16	NC		
17	NO	Relay 5, 250V AC / 8A	Close breaker (synchronising)
18	Com.		
19	NC		
20	Open collector 1	Transistor out	Pulse output 1, kWh counter
21	Open collector 2	Transistor out	Pulse output 2, kvarh counter
22	Com.	Common	Common terminal for terminals 21 and 22
23	Digital input 1	Optocoupler	Remote alarm inhibit
24	Digital input 2	Optocoupler	Remote alarm acknowledge
25	Digital input 3	Optocoupler	Start sync. / control functions
26	Digital input 4	Optocoupler	Spare
27	Digital input 5	Optocoupler	Block loss of mains (Vector jump and df/dt (ROCOF) only) (option A)
28	Com	Common	Common for terminals 24 to 27

NOTE: If input terminal 25 (start sync./control) is not activated, all control functions are disabled. This includes the terminal 43 de-load function.

The GPC monitors the energy production of each unit and it has pulse outputs for kWh and kVARh measurement. The number of pulses depends on the nominal output of the generator as follows:

P_{nom}	< 100 kW →	1 pulse/kW
P_{nom}	100-1000 kW →	1 pulse/10 kW
P_{nom}	> 1000 kW →	1 pulse/100 kW

The pulse length is 1 s/pulse.

Slot #2, Serial communication (option H)

CAN-bus (Option H1):

Term.	Function	Description
29	CAN-H	The CAN-bus is based on CAN 2.0 B passive. The protocol is adapted for Deif use and can be provided. Contact Deif for further details.
30	GND	
31	CAN-L	
32	CAN-H	
33	GND	
34	CAN-L	
35	Not used	
36	Not used	

Slot #3, load sharing control

Term.	Function	Technical data	Description
37	-5…0…5V DC	Analogue I/O	Active load sharing line
38	Com	Common	Common for load sharing lines
39	-5…0…5V DC	Analogue I/O	Reactive load sharing
40	-10…0…10V DC	Analogue input	Frequency / Active load set-point. Passive (requires external power supply)
41	Com	Common	Common for terminals 40 and 42
42	-10…0…10V DC	Analogue input	Voltage /var/Power factor/Reactive load set-point. Passive (requires external power supply)
43	Binary input 6	Optocoupler	De-load (not possible in freq-control mode)
44	Binary input 7	Optocoupler	Manual raise speed (only active when "start sync. /reg." is OFF)
45	Binary input 8	Optocoupler	Manual lower speed (only active when "start sync. /reg." is OFF)
46	Binary input 9	Optocoupler	Manual raise voltage (only active when "start sync. /reg." is OFF)
47	Binary input 10	Optocoupler	Manual lower voltage (only active when "start sync. /reg." is OFF)
48	Binary input 11	Optocoupler	Mode 1
49	Binary input 12	Optocoupler	Mode 2
50	Binary input 13	Optocoupler	Mode 3
51	Binary input 14	Optocoupler	Mode 4
52	Binary input 15	Optocoupler	Mode 5
53	Binary input 16	Optocoupler	Mode 6
54	Binary input 17	Optocoupler	Generator breaker open
55	Binary input 18	Optocoupler	Generator breaker closed
56	Com	Common	Common for terminals 43 to 55
57	NO	Relay no. 6 250 VAC 8A	Engine speed governor: Raise speed
58	Com		
59	NO	Relay no. 7 250 VAC 8A	Engine speed governor: Lower speed
60	Com		
61	NO	Relay no. 8 250 VAC 8A	Start next generator (high load)
62	Com		
63	NO	Relay no. 9 250 VAC 8A	Stop next generator (low load)
64	Com		

NOTE: The terminal 43 de-load function will ramp the generator down and open the breaker. If the function is left ON after opening of breaker, it will prevent re-synchronisation.

Mode 1-6: These controls are only active when the breaker is closed and the "activate controls" input is ON.

Control selections with mode 1-6 inputs: See next page

Power / frequency mode selection	Mode 1	Mode 2
Fixed frequency	OFF	OFF
Base load (Fixed Power)	ON	OFF
Droop	OFF	ON
Load sharing	ON	ON

Power / frequency modes	
Internal set-point	Mode 3 OFF
External (terminals 40(signal) and 41(gnd)) set-point	Mode 3 ON

External set-point values:		
Mode	**Input**	**Value**
Fixed frequency	-10…0…+10V DC	- 5…0…+5 Hz related to nominal frequency
Base load (Fixed Power)	0…10V DC	0…100% load related to nominal power
Droop	-10…0…+10V DC	- 5…0…+5 Hz related to nominal frequency
Load sharing	-10…0…+10V DC	- 5…0…+ 5Hz related to nominal frequency

Voltage/var/power factor mode selection (option D)	Mode 4	Mode 5
Fixed voltage	OFF	OFF
Fixed var control	ON	OFF
Fixed power factor control	OFF	ON
var sharing	ON	ON

Voltage/var/power factor modes (option D)	
Internal set-point	Mode 6 OFF
External (terminals 41(signal) and 42(gnd)) set-point	Mode 6 ON

External set-point values:		
Mode	**Input**	**Value**
Fixed voltage	-10…0…+10V DC	- 10…0…+10 % related to nominal voltage
Fixed var control	0…10V DC	0…100% load related to nominal power
Fixed power factor control	0…+10V DC	Cos φ 1.0…0.6 inductive
var sharing	-10…0…+10V DC	- 10…0…+10 % voltage setting related to nominal voltage

External set point inputs are passive and require an external power source (+/- 10 VDC)

Slot #4, Analog speed governor / AVR (option E)

These outputs are **active** outputs i.e. they use the internal power supply. The outputs are galvanically separated from each other and the rest of the unit.

The current outputs can if needed be converted to voltage using a resistor across the terminals (250 Ω will convert the +/- 20 mA into +/- 5 VDC).

Term.	Function	Description
65	Not used	
66	+/- 20 mA out	Speed governor set-point output.
67	0	
68	Not used	
69	Not used	
70	+/- 20 mA out	AVR voltage set-point output.[1)]
71	0	
72	Not used	

Note1): Voltage control set-point to AVR is an option (option F).
If the combination of analogue speed governor signals and relay AVR signals (or vice versa) is needed, the analog signal is carried out using the slot #4 analogue output and relay output control is carried out with relay 6/7 (speed) or 8/9 (voltage) in slot #3.

Slot #5, AC measuring

Term.	Function	Technical description	Description
73	I L1 s1	Generator current L1	1/5 A AC input.
74	I L1 s2		
75	I L2 s1	Generator current L2	1/5 A AC input.
76	I L2 s2		
77	I L3 s1	Generator current L3	1/5 A AC input.
78	I L3 s2		
79	U L1	Generator voltage L1	Max. 690 VAC phase - phase value
80		Not used	
81	U L2	Generator voltage L2	Max. 690 VAC phase - phase value
82		Not used	
83	U L3	Generator voltage L3	Max. 690 VAC phase - phase value
84	U Neutral	Generator voltage neutral	For land-based applications only.
85	U L1	BUS voltage L1	Max. 690 VAC phase - phase value
86		Not used	
87	U L2	BUS voltage L2	Max. 690 VAC phase - phase value
88		Not used	
89	U L3	BUS voltage L3	Max. 690 VAC phase - phase value

Note: Current inputs are galvanically separated. Max. 0.3 VA per phase.

Voltage measurements are available in 4 levels:

100 to 110V AC
200 to 240V AC
380 to 480V AC
660 to 690V AC

Voltage level to be defined when ordering, but can be changed onsite.

Slot #6, analogue transducer output (option F1)

These outputs are **active** outputs i.e. they use the internal power supply. The outputs are galvanically separated from each other and the rest of the unit. The individual output can be selected (in display or via PC programming software) to represent any AC measuring value and related values (e.g. power, power factor, frequency, etc.…).

For actual selection refer to the programming manual.

Via software selection, the outputs can be selected to be 0…20 mA or 4…20 mA.

The current output can if needed be converted to voltage using a resistor across the terminals (250 Ω will convert the 0 - 20 mA into 0 - 5V DC).

The outputs can, by moving a jumper on the board, be selected to be +/- 20 mA if needed.

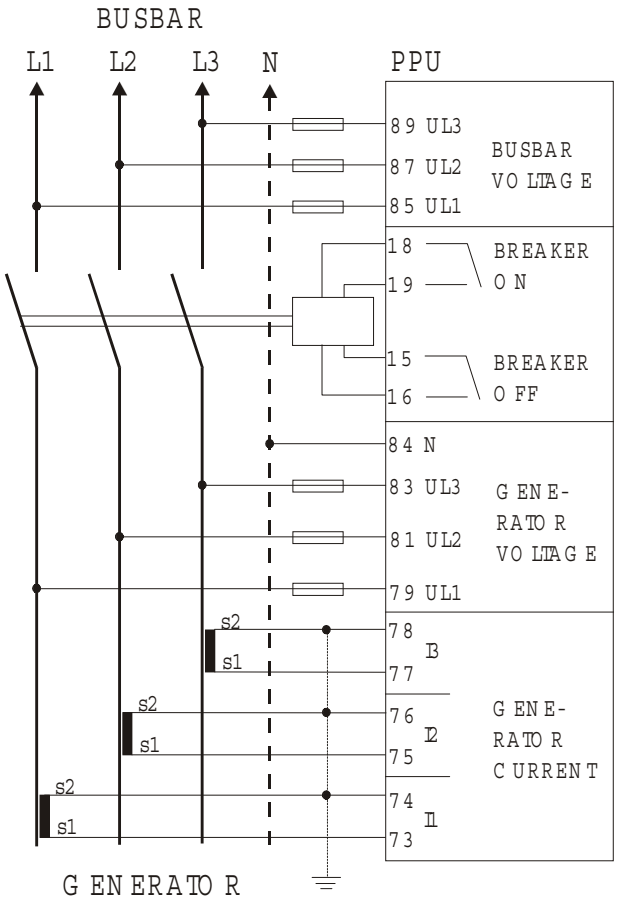
Term. Slot #6	Function	Description
90	Not used	
91	0(4) - 20 mA out	Analogue output, selectable.
92	0	
93	Not used	
94	Not used	
95	(4) - 20 mA out	Analogue output, selectable.
96	0	
97	Not used	

Slot #8, AVR control relay outputs (option D)

Term. Slot #6	Function	Technical data	Description
126	NO	Relay 10 250V AC, 8A	AVR voltage increase
127	Com		
128	NO	Relay 11 250V AC, 8A	AVR voltage decrease
129	Com		
130	Not used		
131	Not used		
132	Not used		
133	Not used		

Wirings

AC connections



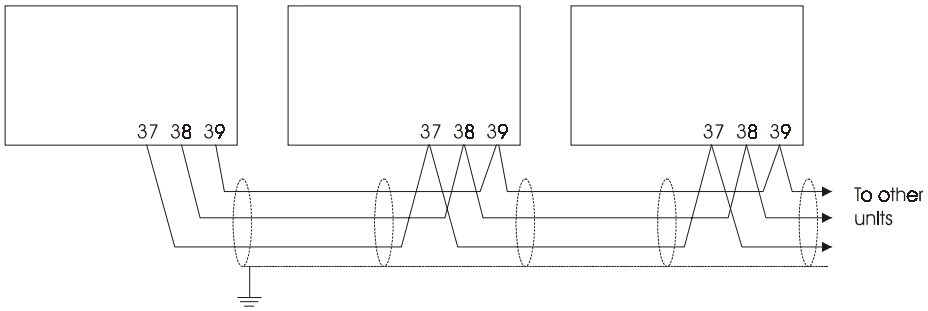
Notes: The neutral line (N) connection is not necessary for correct measurement. 3-phase without neutral is also possible.

The current transformers ground connection can be on s1 or s2 connection, whichever is preferred.

Fuses: 2A slow-blow.

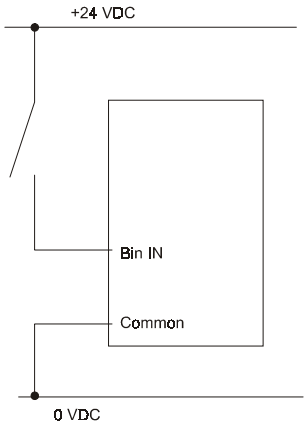
Load sharing lines

Even though screened cable is not needed, it is recommended if the cable run is longer than 5 m between units.



Binary inputs

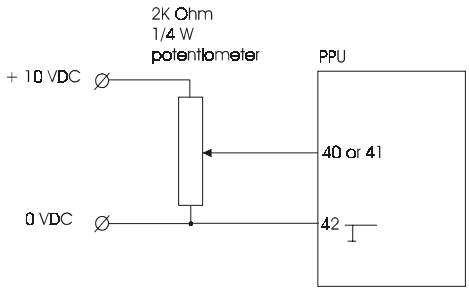
All binary inputs are 24 VDC bi-directional optocoupler. Typical input is:



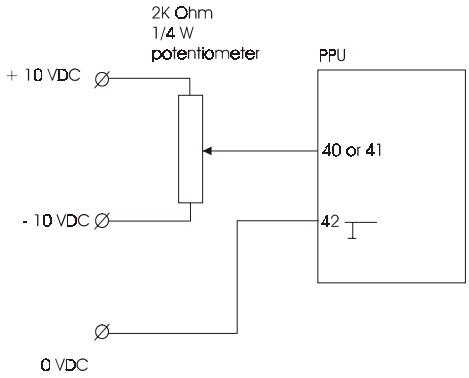
Analogue inputs (external set-points)

The set-point inputs are passive, i.e. an external power source is needed. This can be an active output from e.g. a PLC, or a potentiometer can be used.

0…10V DC input using potentiometer:

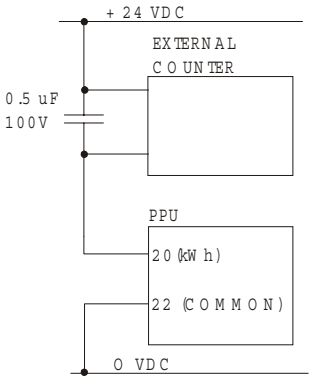


+/- 10V input using potentiometer:



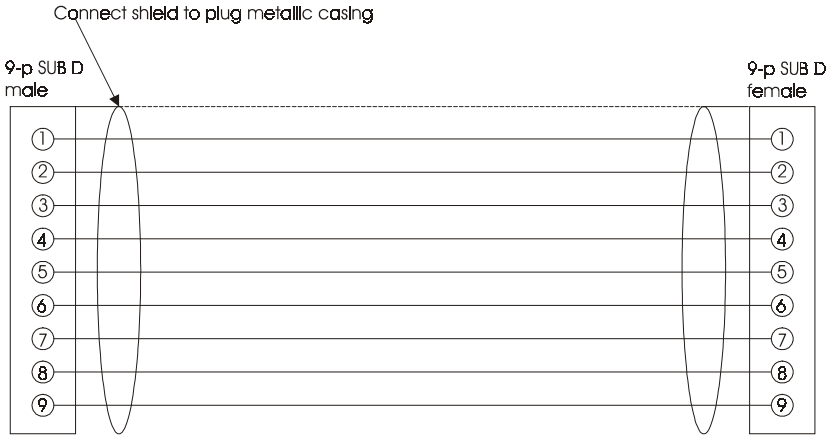
Optocoupler outputs for external counter

The kWh counter (terminals 21-23) and kvarh counter (terminals 21-22) outputs are low-power outputs. For that reason the following circuit must be applied:



Display I/F cable

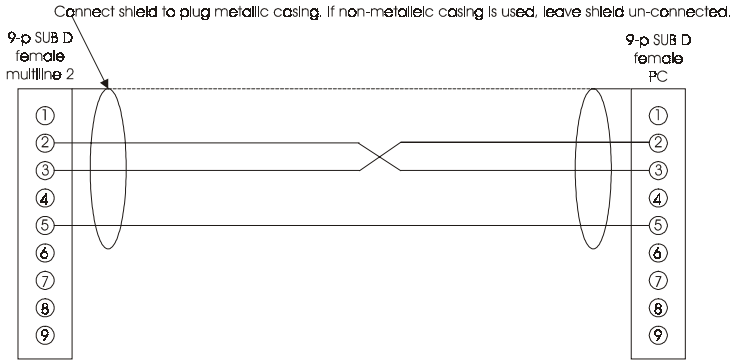
A standard computer extension cable can be used (9-pole SUB-D male / female plugs) or a cable can be tailored:



Wires min 0.22 mm^2, max cable length 3m.
Cable types: Belden 9540, BICC H8146, Brand Rex BE57540 or equivalent.

PC I/F cable

A standard computer null-modem cable can be used (9-pole SUB-D female / female plugs) or a cable can be tailored:

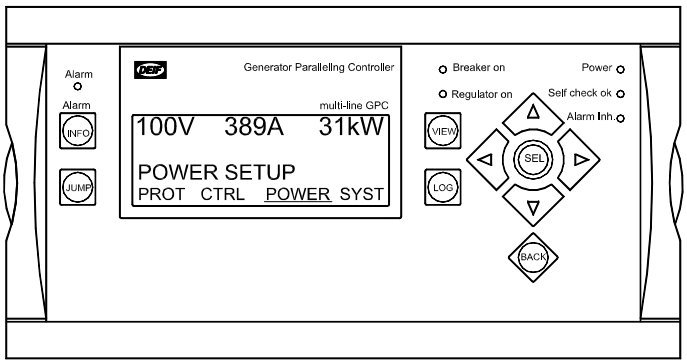


NULL-MODEM CABLE.

Display unit

The display unit used in multi-line 2 communicates and receives power supply via a 9-pole Sub-D plug. The plug fits directly onto the main unit, so the display can be mounted on the top of the main unit.

If the display is to be used as remote display, a standard computer extension cable with male / female plug can be used for the connection.



Display dimensions HxWxD = 115 x 220 x 20 mm

Push-button functions

There are 10 pushbuttons on the display unit with the following functions:

INFO: Shifts the display 3 lower lines to show the alarm list (up to 30 alarms can be in the list).

JUMP: Enters a menu number selection. All settings have a specific number attached to it. Using the JUMP button enables the user to select and display any setting without navigating all the way through the menus (see later).

VIEW: Shifts the upper line displaying. The following values can be shown:
- 3 generator voltages (phase-to-phase)
- 3 BUS voltages (phase-to-phase)
- 3 generator currents
- Generator power factor and produced power (kW)
- Generator apparent power (VA) and reactive power (kvar)
- Generator L1 frequency and voltage
- BUS L1 frequency and voltage

LOG: Shifts the display 3 lower lines to show the event and alarm list

 : Moves the cursor left for manoeuvring in the menus.

 : Increases the value of the selected set-point (in the setting menus). In the daily use display it is used for scrolling the second line displaying of generator values.

SEL: Is used to select the chosen function (underscored selection in the lower line of the display).

 : Decreases the value of the selected set-point (in the setting menus). In the daily use display it is used for scrolling the second line displaying of generator values.

ESC: Jumps backwards one step in the menu (to previous display).

 : Moves the cursor right for manoeuvring in the menus.

Display functions

First line in display (daily use display functions)

The first line is used to display generator and BUS values. Typically the line will show 2 or 3 different values at the same time The following line values can be seen:

- Generator voltage L1 L2 L3 (VAC)
- BUS voltage L1 L2 L3 (VAC)
- Generator current L1 L2 L3 (A)
- Generator Power Factor and active power (kW)
- Generator apparent power (kVA) and reactive power (kvar)
- Generator L1 frequency (Hz) and voltage (VAC)
- BUS L1 frequency (Hz) and voltage (VAC)

Second line in display (daily use display)

The second line is a service line where various values can be shown. Scrolling is done using the  and  keys. The values available are:

For generator:	For BUS:
voltage L1-N (VAC) voltage L2-N (VAC) voltage L3-N (VAC) voltage L1-L2 (VAC) voltage L2-L3 (VAC) voltage L3-L1 (VAC) voltage max. (VAC) voltage min. (VAC) 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.)	voltage L1-N (VAC) voltage L2-N (VAC) voltage L3-N (VAC) voltage L1-L2 (VAC) voltage L2-L3 (VAC) voltage L3-L1 (VAC) voltage max. (VAC) voltage min. (VAC) 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 (VDC)

Second line in display (menu system)

When entering the menu system, the second line in the display is used for information about which function (with function identifying number) is chosen.

Using the  and  keys will scroll through the settings.

Second line in display (alarm and event list)

When selecting the alarm (and event) list, the second line will display the latest alarm / event. Using the  and  keys will scroll through the list.

Third line in display (daily use display)

The third line is an indication line. If no system messages are shown (e.g. "Synchronising"), the third line contains an explanation for the lower line selection of setup.

Third line in display (parameter menu display)

In the parameter menu, the third line indicates the present setting of the function in question, and, if changes are to be made, the max. and min. possible value for the setting.

Fourth line in display (daily use display)

In the daily use display, the fourth line is the entry selection for the parameter menu. If "SEL" is pressed, the selection of menu indicated with an underscore will be entered.

Choices are:

"PROT", protection setup
"CTRL", controls setup
"POWER", power control setup
"SYST", system setup

The settings related to the setup can be seen in the paragraph "Menu overview", where the specific function numbers (related to the "JUMP" function) can be seen.

Fourth line in display (parameter menu display)

When entering the parameter menus, the first (entry) display uses the fourth line to select a sub-function for the parameter. What the selections are is dependent on the function selected.

Examples:

For protective function, the first entry shows the "BUS high volt 1" setting (provided the option is chosen). In this case the fourth line shows:

"LIM", setting of switch point
"DEL", setting of time delay
"RL", selection of which relay the function must activate.
"ACT", activate / de-activate the function.

For control functions, the first entry shows the "Sync. To BUS" function. In this case the fourth line shows:

"fMax", max. allowed positive frequency deviation when synchronising.
"fMin", min allowed negative frequency deviation when synchronising.
"Umax", max. allowed voltage deviation (positive or negative) when synchronising.
"tCB", closing time delay for generator circuit breaker.

For power setup, the first entry shows the "Load dependent start" relay output (if the option is chosen). In this case the fourth line shows:

"LIM", setting of load dependent start output activation limit.
"DEL", time delay for activating the relay.
"ACT", activate / de-activate the function.

Note that no relay selection is present. This is due to the fact that the function relates to a pre-determined relay output.

For system setup, the first entry shows the "Nominal settings". In this case the fourth line shows:

"F", nominal frequency setting.
"P", nominal generator power setting.
"PF", nominal generator power factor setting.
"U", nominal generator voltage setting.

The above settings are used by the GPC to calculate nominal apparent power and current.

Menu overview

The following is the menu structure when entering settings of the GPC. 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.

If no actions have been taken within 30 seconds, 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", "POWER", "SYST".)

Password setting

The password setting falls outside the menu structure and can only be entered via the "JUMP" pushbutton.

Select no. 4976 to enter password setting and select your own password. Use the  and the  buttons to change the setting and the "SEL" button to store the new setting. **Beware:** Write down the new password. If you forget it entering the menus will not be possible.

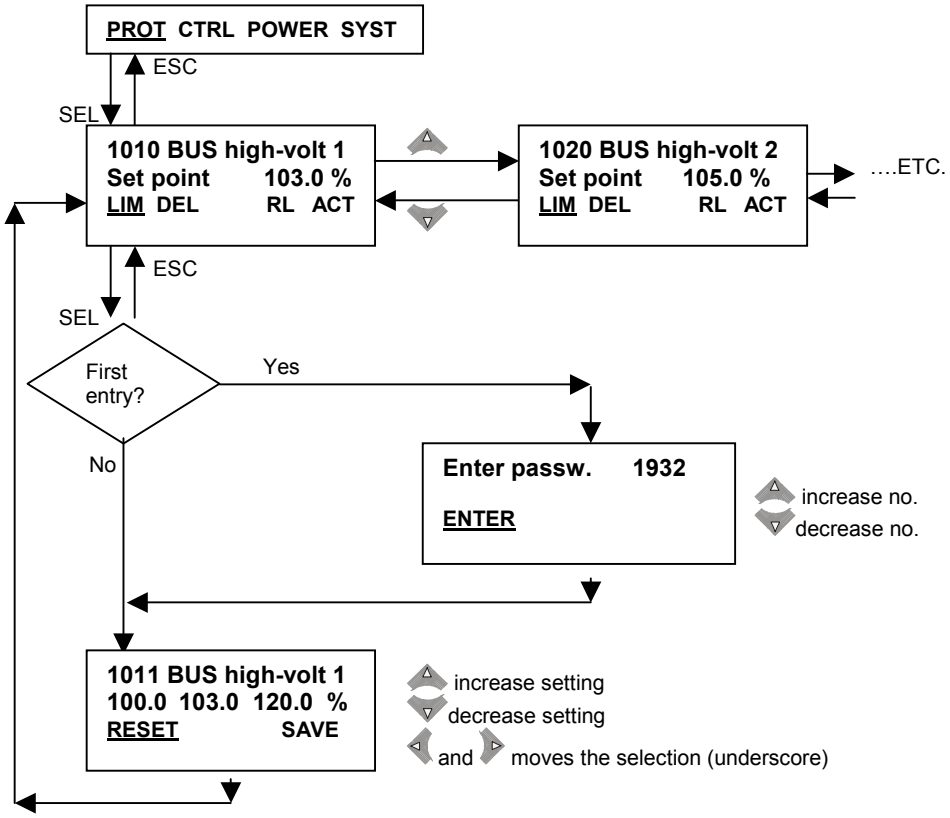
Navigating in the menus

The menu navigating starts from the daily use display fourth line and is carried out from there using the "SEL", , , , and "ESC" pushbuttons.

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 pushbuttons)



Menu set-points

The following lists are in numerical order, i.e. the set-points and timers appear acc. to the given number.

Protections

Mains/BUS voltage protection option A or B

Voltage selections relate to nominal phase – to phase voltage

No.	Setting		Min. setting	Max. setting	Factory setting
1010	BUS high volt 1	Selection display	-	-	-
1011	BUS high volt 1	Set-point	100.0%	120.0%	103.0%
1012	BUS high volt 1	Time	0.0s	100.0s	10.0s
1013	BUS high volt 1	Relay output	R0 (None)	R4 (relay 4)	R2 (relay 2)
1014	BUS high volt 1	Relay output	R0 (None)	R4 (relay 4)	R0 (None)
1015	BUS high volt 1	Enable	OFF	ON	OFF

No.	Setting		Min. setting	Max. setting	Factory setting
1020	BUS high volt 2	Selection display	-	-	-
1021	BUS high volt 2	Set-point	100.0%	120.0%	105.0%
1022	BUS high volt 2	Time	0.0s	100.0s	5.0s
1023	BUS high volt 2	Relay output	R0 (None)	R4 (relay 4)	R1 (relay 1)
1024	BUS high volt 2	Relay output	R0 (None)	R4 (relay 4)	R0 (None)
1025	BUS high volt 2	Enable	OFF	ON	OFF

No.	Setting		Min. setting	Max. setting	Factory setting
1030	BUS low volt 1	Selection display	-	-	-
1031	BUS low volt 1	Set-point	80.0%	100.0%	97.0%
1032	BUS low volt 1	Time	0.0s	100.0s	10.0s
1033	BUS low volt 1	Relay output	R0 (None)	R4 (relay 4)	R2 (relay 2)
1034	BUS low volt 1	Relay output	R0 (None)	R4 (relay 4)	R0 (None)
1035	BUS low volt 1	Enable	OFF	ON	OFF

No.	Setting		Min. setting	Max. setting	Factory setting
1040	BUS low volt 2	Selection display	-	-	-
1041	BUS low volt 2	Set-point	80.0%	100.0%	95.0%
1042	BUS low volt 2	Time	0.0s	100.0s	5.0s
1043	BUS low volt 2	Relay output	R0 (None)	R4 (relay 4)	R1 (relay 1)
1044	BUS low volt 2	Relay output	R0 (None)	R4 (relay 4)	R0 (None)
1045	BUS low volt 2	Enable	OFF	ON	OFF

Mains/BUS frequency protection option A or B

Frequency settings relate to nominal frequency setting.

No.	Setting		Min. setting	Max. setting	Factory setting
1050	BUS high freq. 1	Selection display	-	-	-
1051	BUS high freq. 1	Set-point	100.0%	110.0%	103.0%
1052	BUS high freq. 1	Time	0.0s	100.0s	10.0s
1053	BUS high freq. 1	Relay output	R0 (None)	R4 (relay 4)	R2 (relay 2)
1054	BUS high freq. 1	Relay output	R0 (None)	R4 (relay 4)	R0 (None)
1055	BUS high freq. 1	Enable	OFF	ON	OFF

No.	Setting		Min. setting	Max. setting	Factory setting
1060	BUS high freq. 2	Selection display	-	-	-
1061	BUS high freq. 2	Set-point	100.0%	110.0%	105.0%
1062	BUS high freq. 2	Time	0.0s	100.0s	5.0s
1063	BUS high freq. 2	Relay output	R0 (None)	R4 (relay 4)	R1 (relay 1)
1064	BUS high freq. 2	Relay output	R0 (None)	R4 (relay 4)	R0 (None)
1065	BUS high freq. 2	Enable	OFF	ON	OFF

No.	Setting		Min. setting	Max. setting	Factory setting
1070	BUS low freq. 1	Selection display	-	-	-
1071	BUS low freq. 1	Set-point	90.0%	100.0%	97.0%
1072	BUS low freq. 1	Time	0.0s	100.0s	10.0s
1073	BUS low freq. 1	Relay output	R0 (None)	R4 (relay 4)	R2 (relay 2)
1074	BUS low freq. 1	Relay output	R0 (None)	R4 (relay 4)	R0 (None)
1075	BUS low freq. 1	Enable	OFF	ON	OFF

No.	Setting		Min. setting	Max. setting	Factory setting
1080	BUS low freq. 2	Selection display	-	-	-
1081	BUS low freq. 2	Set-point	90.0%	100.0%	95.0%
1082	BUS low freq. 2	Time	0.0s	100.0s	5.0s
1083	BUS low freq. 2	Relay output	R0 (None)	R4 (relay 4)	R1 (relay 1)
1084	BUS low freq. 2	Relay output	R0 (None)	R4 (relay 4)	R0 (None)
1085	BUS low freq. 2	Enable	OFF	ON	OFF

Generator reverse power protection

Reverse power settings relate to nominal power setting.

No.	Setting		Min. setting	Max. setting	Factory setting
1090	Reverse power	Selection display	-	-	-
1091	Reverse power	Set-point	-50.0%	0.0%	-5.0%
1092	Reverse power	Time	0.0s	100.0s	10.0s
1093	Reverse power	Relay output	R0 (None)	R4 (relay 4)	R1 (relay 1)
1094	Reverse power	Relay output	R0 (None)	R4 (relay 4)	R0 (None)
1095	Reverse power	Enable	OFF	ON	ON

Generator overcurrent protection

Settings relate to nominal generator current.

No.	Setting		Min. setting	Max. setting	Factory setting
1100	Overcurrent 1	Selection display	-	-	-
1101	Overcurrent 1	Set-point	50.0%	200.0%	115.0%
1102	Overcurrent 1	Time	0.0s	100.0s	10.0s
1103	Overcurrent 1	Relay output	R0 (None)	R4 (relay 4)	R2 (relay 2)
1104	Overcurrent 1	Relay output	R0 (None)	R4 (relay 4)	R0 (None)
1105	Overcurrent 1	Enable	OFF	ON	ON

No.	Setting		Min. setting	Max. setting	Factory setting
1110	Overcurrent 2	Selection display	-	-	-
1111	Overcurrent 2	Set-point	50.0%	200.0%	120.0%
1112	Overcurrent 2	Time	0.0s	100.0s	5.0s
1113	Overcurrent 2	Relay output	R0 (None)	R4 (relay 4)	R1 (relay 1)
1114	Overcurrent 2	Relay output	R0 (None)	R4 (relay 4)	R0 (None)
1115	Overcurrent 2	Enable	OFF	ON	ON

Loss of mains protection option A

Df/dt (ROCOF) **NOTE:** Time delay is in periods (per)

No.	Setting		Min. setting	Max. setting	Factory setting
1260	Df/dt (ROCOF)	Selection display	-	-	-
1261	Df/dt (ROCOF)	Set-point	0.1 Hz/s	10.0 Hz/s	5.0 Hz/s
1262	Df/dt (ROCOF)	Time	0 per	99 per	6 per
1263	Df/dt (ROCOF)	Relay output	R0 (None)	R4 (relay 4)	R1 (relay 1)
1264	Df/dt (ROCOF)	Relay output	R0 (None)	R4 (relay 4)	R0 (None)
1265	Df/dt (ROCOF)	Enable	OFF	ON	OFF

Vector Jump

No.	Setting		Min. setting	Max. setting	Factory setting
1270	Vector jump	Selection display	-	-	-
1271	Vector jump	Set-point	0.0 deg.	90.0 deg.	10.0 deg.
1272	Vector jump	Time	No delay (immediate trip)		
1273	Vector jump	Relay output	R0 (None)	R4 (relay 4)	R1 (relay 1)
1274	Vector jump	Relay output	R0 (None)	R4 (relay 4)	R0 (None)
1275	Vector jump	Enable	OFF	ON	OFF

The alarm inhibit lamp is flashing in case of loss of mains.

Generator voltage protection options A and B

No.	Setting		Min. setting	Max. setting	Factory setting
1310	DG high volt 1	Selection display	-	-	-
1311	DG high volt 1	Set-point	100%	120%	103%
1312	DG high volt 1	Delay	0.0 s	100.0 s	10.0 s
1313	DG high volt 1	Relay output	R0 (None)	R4 (relay 4)	R2 (relay 2)
1314	DG high volt 1	Relay output	R0 (None)	R4 (relay 4)	R0 (None)
1315	DG high volt 1	Enable	OFF	ON	OFF

No.	Setting		Min. setting	Max. setting	Factory setting
1320	DG high volt 2	Selection display	-	-	-
1321	DG high volt 2	Set-point	100%	120%	105%
1322	DG high volt 2	Delay	0.0 s	100.0 s	5.0 s
1323	DG high volt 2	Relay output	R0 (None)	R4 (relay 4)	R1 (relay 1)
1324	DG high volt 2	Relay output	R0 (None)	R4 (relay 4)	R0 (None)
1325	DG high volt 2	Enable	OFF	ON	OFF

No.	Setting		Min. setting	Max. setting	Factory setting
1330	DG low volt 1	Selection display	-	-	-
1331	DG low volt 1	Set-point	80%	100%	97%
1332	DG low volt 1	Delay	0.0 s	100.0 s	10.0 s
1333	DG low volt 1	Relay output	R0 (None)	R4 (relay 4)	R2 (relay 2)
1334	DG low volt 1	Relay output	R0 (None)	R4 (relay 4)	R0 (None)
1335	DG low volt 1	Enable	OFF	ON	OFF

No.	Setting		Min. setting	Max. setting	Factory setting
1340	DG low volt 2	Selection display	-	-	-
1341	DG low volt 2	Set-point	80%	100%	95%
1342	DG low volt 2	Delay	0.0 s	100.0 s	5.0 s
1343	DG low volt 2	Relay output	R0 (None)	R4 (relay 4)	R1 (relay 1)
1344	DG low volt 2	Relay output	R0 (None)	R4 (relay 4)	R0 (None)
1345	DG low volt 2	Enable	OFF	ON	OFF

No.	Setting		Min. setting	Max. setting	Factory setting
1350	DG high freq. 1	Selection display	-	-	-
1351	DG high freq. 1	Set-point	100%	110%	103%
1352	DG high freq. 1	Delay	0.0 s	100.0 s	10.0 s
1353	DG high freq. 1	Relay output	R0 (None)	R4 (relay 4)	R2 (relay 2)
1354	DG high freq. 1	Relay output	R0 (None)	R4 (relay 4)	R0 (None)
1355	DG high freq. 1	Enable	OFF	ON	OFF

No.	Setting		Min. setting	Max. setting	Factory setting
1360	DG high freq. 2	Selection display	-	-	-
1361	DG high freq. 2	Set-point	100%	110%	105%
1362	DG high freq. 2	Delay	0.0 s	100.0 s	5.0 s
1363	DG high freq. 2	Relay output	R0 (None)	R4 (relay 4)	R1 (relay 1)
1364	DG high freq. 2	Relay output	R0 (None)	R4 (relay 4)	R0 (None)
1365	DG high freq. 2	Enable	OFF	ON	OFF

No.	Setting		Min. setting	Max. setting	Factory setting
1370	DG low freq. 1	Selection display	-	-	-
1371	DG low freq. 1	Set-point	90%	100%	97%
1372	DG low freq. 1	Delay	0.0 s	100.0 s	10.0 s
1373	DG low freq. 1	Relay output	R0 (None)	R4 (relay 4)	R2 (relay 2)
1374	DG low freq. 1	Relay output	R0 (None)	R4 (relay 4)	R0 (None)
1375	DG low freq. 1	Enable	OFF	ON	OFF

No.	Setting		Min. setting	Max. setting	Factory setting
1380	DG low freq. 2	Selection display	-	-	-
1381	DG low freq. 2	Set-point	90%	100%	95%
1382	DG low freq. 2	Delay	0.0 s	100.0 s	5.0 s
1383	DG low freq. 2	Relay output	R0 (None)	R4 (relay 4)	R1 (relay 1)
1384	DG low freq. 2	Relay output	R0 (None)	R4 (relay 4)	R0 (None)
1385	DG low freq. 2	Enable	OFF	ON	OFF

Control functions

Synchronisation

The "dU max." setting is related to nominal generator voltage

No.	Setting		Min. setting	Max. setting	Factory setting
2010	Synchronisation	Selection display	-	-	-
2016	Synchronisation	Df max.	0.0 Hz	0.5 Hz	0.3 Hz
2017	Synchronisation	Df min.	-0.5 Hz	0.3 Hz	0.0 Hz
2018	Synchronisation	DU max.	2%	10%	5%
2019	Synchronisation	Breaker delay	40 ms	300 ms	50 ms

Blackout closing of breaker

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

No.	Setting		Min. setting	Max. setting	Factory setting
2020	Sync. blackout	Selection display	-	-	-
2026	Sync. blackout	Df max.	0.0 Hz	5.0 Hz	3.0 Hz
2027	Sync. blackout	DU max.	2%	10%	5%
2028	Sync. blackout	Enable	OFF	ON	OFF

General failure (sync fail)

The general failure covers:

- Synchronisation time
- Breaker ON/OFF feedback fail
- Generator voltage not established
- Generator frequency not established
- Phase sequence error

No.	Setting		Min. setting	Max. setting	Factory setting
2030	General failure	Selection display	-	-	-
2036	General failure	Delay	0.0 s	120.0 s	60.0 s
2037	General failure	Relay output	R0 (None)	R4 (relay 4)	R2 (relay 2)
2038	General failure	Relay output	R0 (None)	R4 (relay 4)	R0 (None)

Frequency controller

The dead band setting relates to relay speed control outputs. If analogue speed control output (option) is used, this setting is to be set to 0.

The ON / integral time is a combined setting. If relay speed control setting is used, the setting indicates the shortest relay ON time. If the speed control setting is analogue output (option), the setting is for the PI controller integral time.

Frequency % settings relate to nominal generator frequency.

No.	Setting		Min. setting	Max. setting	Factory setting
2050	Freq. control	Selection display	-	-	-
2055	Freq. control	Droop	0.0 %	10.0 %	4.0 %
2056	Freq. control	Dead band	0.2 %	10.0 %	1.0 %
2057	Freq. control	Gain	1	100	40
2058	Freq. control	ON / Integr. Time	10 ms	3000 ms	100 ms

Power controller

The dead band setting relates to relay speed control outputs. If analogue speed control output (option) is used, this setting is set to 0.

The ON / integral time is a combined setting. If relay speed control setting is used, the setting indicates the shortest relay ON time. If the speed control setting is analogue output (option), the setting is for the PI controller integral time.

Power % settings relate to nominal generator power.

No.	Setting		Min. setting	Max. setting	Factory setting
2060	Power control	Selection display	-	-	-
2066	Power control	Dead band	0.2 %	10 %	0.2 %
2067	Power control	Gain	1	100	40
2068	Power control	ON / Integr. Time	10 ms	3000 ms	100 ms

Power ramp up

The delay point and – time is the point where the generator stops ramping after closing of breaker to pre-heat the engine before commencing to take load. The time duration of the point is determined by the delay time setting. If the delay function is not needed, set the time to 0.

Power % settings relate to nominal generator power.

No.	Setting		Min. setting	Max. setting	Factory setting
2070	Power ramp up	Selection display	-	-	-
2076	Power ramp up	Speed	1.0 %/s	20.0 %/s	2.0 %/s
2077	Power ramp up	Delay point	1 %	100 %	10 %
2078	Power ramp up	Delay time	0.0 s	180.0 s	10.0 s

Power ramp down

The breaker open point is where a relay output (relay 4) is activated to open the generator breaker before reaching 0 kW.

Power % settings relate to nominal generator power.

No.	Setting		Min. setting	Max. setting	Factory setting
2080	Power ramp down	Selection display	-	-	-
2086	Power ramp down	Speed	1.0 %/s	20.0 %/s	10.0 %/s
2087	Power ramp down	Breaker open	1 %	20 %	5 %

Power / frequency control mix factor

The mix factor determines the relation between frequency control and power control when running parallel with other generators (load sharing). The reason for the factor is that there is only one power / frequency load sharing line.

Setting the factor to 100% selects power control only, setting it to 0% selects frequency control only.

No.	Setting		Min. setting	Max. setting	Factory setting
2090	P/f contr. mix.	Selection display	-	-	-
2096	P/f contr. mix.	Mix factor	0 %	100 %	50 %

Voltage controller option D

The dead band setting relates to relay voltage control outputs. If analogue voltage control output (option) is used, this setting is disregarded.

The ON / integral time is a combined setting. If relay voltage control setting is used, the setting indicates the shortest relay ON time. If the voltage control setting is analogue output (option), the setting is for the PI controller integral time.

Voltage deadband % settings relate to nominal generator voltage.

No.	Setting		Min. setting	Max. setting	Factory setting
2100	Voltage control	Selection display	-	-	-
2106	Voltage control	Dead band	0.0 %	10 %	0.2 %
2107	Voltage control	Gain	1	100	40
2108	Voltage control	ON / Integr. Time	10 ms	3000 ms	100 ms

var controller option D

The dead band setting relates to relay var control outputs. If analogue voltage control output (option) is used, this setting is disregarded.

The ON / integral time is a combined setting. If relay var control setting is used, the setting indicates the shortest relay ON time. If the var control setting is analogue output (option), the setting is for the PI controller integral time.

Var dead band % settings relate to nominal generator power value, i.e. it is assumed that the generator var value is the same as the kW value. This is not correct but the assumption is made for control purposes only.

No.	Setting		Min. setting	Max. setting	Factory setting
2110	var control	Selection display	-	-	-
2116	var control	Dead band	0.0 %	10 %	0.2 %
2117	var control	Gain	1	100	40
2118	var control	ON / Integr. Time	10 ms	3000 ms	100 ms

var / voltage control mix factor

The mix factor determines the relation between voltage control and var control when running parallel with other generators (load sharing). The reason for the factor is that there is only one var / voltage load sharing line.

Setting the factor to 100% selects var control only, setting it to 0% selects voltage control only.

No.	Setting		Min. setting	Max. setting	Factory setting
2120	var/U contr. Mix.	Selection display	-	-	-
2126	var/U contr. Mix.	Mix factor	0 %	100 %	50 %

Power Factor (PF) controller option D

The dead band setting relates to relay PF control outputs. If analogue voltage control output (option) is used, this setting is disregarded.

The ON / integral time is a combined setting. If relay PF control setting is used, the setting indicates the shortest relay ON time. If the PF control setting is analogue output (option), the setting is for the PI controller integral time.

PF dead band is the zone (+/- value) around PF setting value where the relay output does not operate. The value is disregarded if analogue PF control output is used.

No.	Setting		Min. setting	Max. setting	Factory setting
2130	PF control	Selection display	-	-	-
2136	PF control	Dead band	0.00	0.10	0.05
2137	PF control	Gain	1	100	40
2138	PF control	ON / Integr. Time	10 ms	3000 ms	100 ms

Load dependent start/stop of next generator option G

The relay outputs for start next and stop next are placed in the optional relay output board in slot #8.

Start next generator: Relay 10, terminals 126-127, normally open.

No.	Setting		Min. setting	Max. setting	Factory setting
3010	Start next gen.	Selection display	-	-	-
3011	Start next gen.	Start point	50%	100%	80%
3012	Start next gen.	Timer	0 s	100 s	10 s
3015	Start next gen.	Enable	OFF	ON	ON

Stop next generator: Relay 11, terminals 127-128, normally open.

No.	Setting		Min. setting	Max. setting	Factory setting
3020	Stop next gen.	Selection display	-	-	-
3021	Stop next gen.	Stop point	0%	50%	20%
3022	Stop next gen.	Timer	0 s	200 s	30 s
3025	Stop next gen.	Enable	OFF	ON	ON

Nominal Settings

No.	Setting		Min. setting	Max. setting	Factory setting
4010	Nominal settings	Selection display	-	-	-
4016	Nominal settings	Frequency	48.0 Hz	62.0 Hz	60.0 Hz
4017	Nominal settings	Generator Power	10 kW	99 MW	480 kW
4018	Nominal settings	Generator current	0 A	9000 A	787 A
4019	Nominal settings	Generator volt	100 V	25000 V	440 V

Transformer

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

No.	Setting		Min. setting	Max. setting	Factory setting
4020	Transformer	Selection display	-	-	-
4026	Transformer	Volt prim.	100 V	25000 V	440 V
4027	Transformer	Volt sec.	100 V	690 V	440 V
4028	Transformer	Current prim.	5 A	9000 A	1000 A
4029	Transformer	Current sec.	1 A	5 A	5A

Controller settings

The setting values are used if external set-point or serial communication set-point is not chosen.

Power setting relates to generator nominal power (kW).
Var setting is inductive reactive power and relates to generator nominal power (kW ~kvar)
Power factor setting is inductive value.

No.	Setting		Min. setting	Max. setting	Factory setting
4030	Controller	Selection display	-	-	-
4031	Controller	Power	0 %	100%	100%
4032	Controller	var	0%	100%	30%
4033	Controller	Power factor (ind)	0.60	1.00	0.90

CAN-bus communication enables / disables control (option H1)

No.	Setting		Min. setting	Max. setting	Factory setting
4040	CAN bus control	Selection display	-	-	-
4041	CAN bus control	Power	OFF	ON	OFF
4042	CAN bus control	Frequency	OFF	ON	OFF
4043	CAN bus control	Voltage	OFF	ON	OFF
4044	CAN bus control	var	OFF	ON	OFF
4045	CAN bus control	PF	OFF	ON	OFF
4046	CAN bus control	Mode selections	OFF	ON	OFF

Note: Selecting CAN-bus control ON will overrule external and internal settings.

CAN-bus communication setup (option H1)

No.	Setting		Min. setting	Max. setting	Factory setting
4090	ID address	Selection display	-	-	-
4096	ID address	Address	1	16	1

Date and time (internal clock) setting

No.	Setting		Min. setting	Max. setting	Factory setting
4100	Date and time	Selection display	-	-	-
4101	Date and time	Year	These settings have no practical limit. Factory settings will be present date and time in Denmark when produced.		
4102	Date and time	Month			
4103	Date and time	Date			
4104	Date and time	Hour			
4105	Date and time	Minute			

Battery undervoltage alarm

No.	Setting		Min. setting	Max. setting	Factory setting
4220	Battery low V	Selection display	-	-	-
4226	Battery low V	Set-point	15.0 V	24.0 V	18.0 V
4227	Battery low V	Time	0.0s	10s	1.0s
4228	Battery low V	Relay output	R0 (None)	R4 (relay 4)	R0 (no relay)

Language

No.	Setting		Min. setting	Max. setting	Factory setting
4230	German language	Selection display	-	-	-
4231	German language	Language	OFF	ON	OFF

Analogue output option F1

The analogue output option consists of 2 independent 0(4)…20 mA outputs. Re-configured hardware can enable a –20…0…+20 mA output, but this is special.

Each of the 2 outputs can be chosen to represent any of the following values.

Power (P kW) output

No.	Setting		Min. setting	Max. setting	Factory setting
4500	Power output	Selection display	-	-	-
4501	Power output	Analogue out no.	0	2	0
4502	Power output	Type	0-20 mA	4-20 mA	4-20 mA
4503	Power output	Max. value	0 kW	99 MW	500 kW
4504	Power output	Min. value	-99 MW	99 MW	0 kW

Apparent Power (S kVA) output

No.	Setting		Min. setting	Max. setting	Factory setting
4510	S output	Selection display	-	-	-
4511	S output	Analogue out no.	0	2	0
4512	S output	Type	0-20 mA	4-20 mA	4-20 mA
4513	S output	Max. value	0 kVA	99 MVA	600 kVA
4514	S output	Min. value	-99 MVA	99 MVA	0 kVA

Reactive Power (Q kvar) output

No.	Setting		Min. setting	Max. setting	Factory setting
4520	React. power output	Selection display	-	-	-
4521	React. power output	Analogue out no.	0	2	0
4522	React. power output	Type	0-20 mA	4-20 mA	4-20 mA
4523	React. power output	Max. value	0 kvar	99 Mvar	400 kvar
4524	React. power output	Min. value	-99 Mvar	99 Mvar	0 kvar

Power factor (PF) output

No.	Setting		Min. setting	Max. setting	Factory setting
4530	Power factor output	Selection display	-	-	-
4531	Power factor output	Analogue out no.	0	2	0
4532	Power factor output	Type	0-20 mA	4-20 mA	4-20 mA
4533	Power factor output	Max. value	0.6	1	0.8
4534	Power factor output	Min. value	-0.6	1	-0.8

Frequency output

No.	Setting		Min. setting	Max. setting	Factory setting
4540	Frequency output	Selection display	-	-	-
4541	Frequency output	Analogue out no.	0	2	0
4542	Frequency output	Type	0-20 mA	4-20 mA	4-20 mA
4543	Frequency output	Max. value	0 Hz	70 Hz	55 Hz
4544	Frequency output	Min. value	0 Hz	70 Hz	45 Hz

Voltage output

The voltage output represents the L1-L2 voltage.

No.	Setting		Min. setting	Max. setting	Factory setting
4550	Voltage output	Selection display	-	-	-
4551	Voltage output	Analogue out no.	0	2	0
4552	Voltage output	Type	0-20 mA	4-20 mA	4-20 mA
4553	Voltage output	Max. value	0 V	28000 V	500 V
4554	Voltage output	Min. value	0 V	28000 V	0 V

Current output

The current output represents the L1 current

No.	Setting		Min. setting	Max. setting	Factory setting
4560	Current output	Selection display	-	-	-
4561	Current output	Analogue out no.	0	2	0
4562	Current output	Type	0-20 mA	4-20 mA	4-20 mA
4563	Current output	Max. value	0 A	9000 A	1000 A
4564	Current output	Min. value	0 A	9000 A	0 A

User password

Unlike all other settings, the user password can only be entered using the "JUMP" pushbutton.

No.	Setting		Min. setting	Max. setting	Factory setting
4976	User password	Setting	0	32000	2000

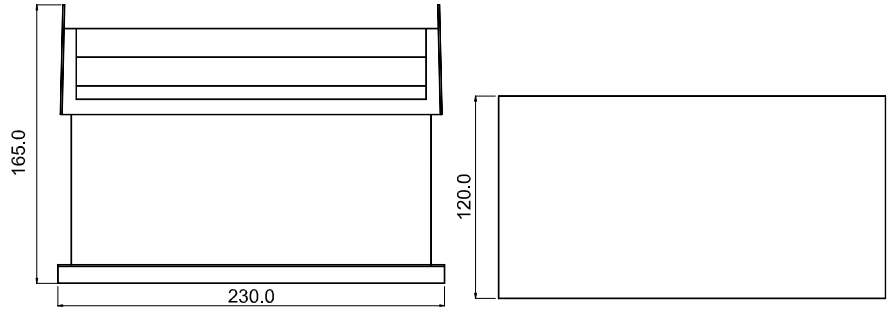
General data

Technical specifications

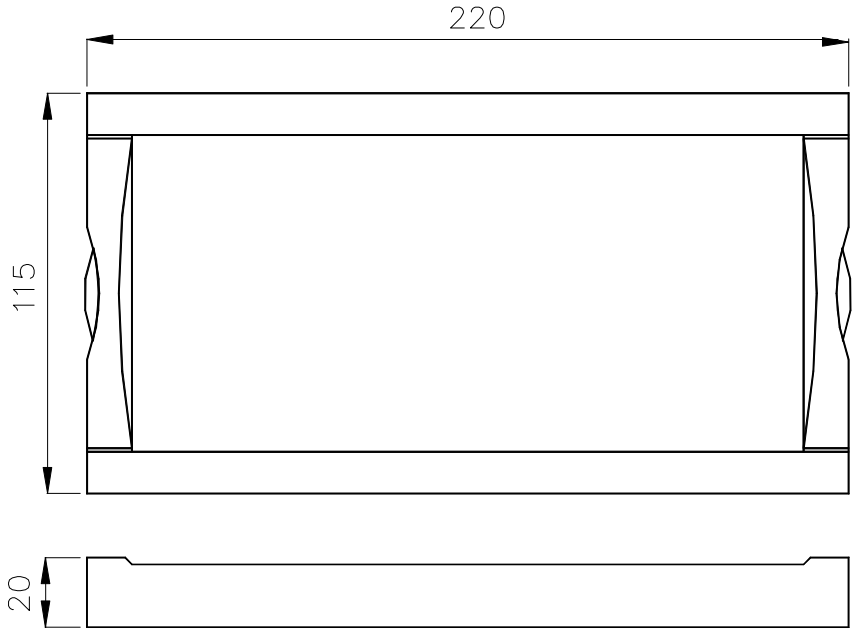
Accuracy:	Class 1.0 acc. to IEC 688
Operating temp.:	-20…70 °C
Aux. supply:	24V DC -25 / +30%
Measuring voltage:	100…690V AC
Frequency:	30…70 Hz
Measuring current:	From current transformers ../1 A or ../5A. Load max. 0.3 VA per phase.
Binary inputs:	Input voltage 12…32V DC, impedance 2.4 kΩ, bi-directional.
Open collector outputs :	Supply voltage 12…32V DC. Load max. 10 mA
Load sharing lines:	+/- 5V DC
Analog inputs:	+/- 10V DC, impedance 100 kΩ (not galvanically separated).
Relay outputs:	250V/8A or 24VDC/1A. Refer to actual description of I/O's.
Safety:	To EN 61010-1 Installation category (overvoltage category) III, 600V, pollution degree 2.
Galvanic separation:	Between AC voltage, AC current and other I/O's: 3250VAC – 50 Hz – 1 min. Between analogue outputs: 500V DC – 1 min.
EMC / CE:	Acc. to EN-50081-1/2, EN 50082-1/2, SS4361503 (PL4) and IEC 255-3.
Material:	All plastic parts are self-extinguishing to UL94 (V1).
Climate:	HSE, to DIN 40040.
Connections:	4 mm^2 multi stranded for AC currents, all others 2.5 mm^2 multi stranded.
Response times	From the setpoint is reached till output signal is active. Frequency: 70-100 ms Current: 70-100 ms Voltage: 70-100 ms Rocof: 100 ms (Rocof time delay no. 1262 = 4 periods) Vector jump: 30 ms

Protection:	Case: IP40. Terminals: IP20. Operator panel: IP 52 (IP54 when mounted with gasket). To IEC 529 and EN 60529.
Mounting:	Base mounted with six screws or DIN rail mounted.

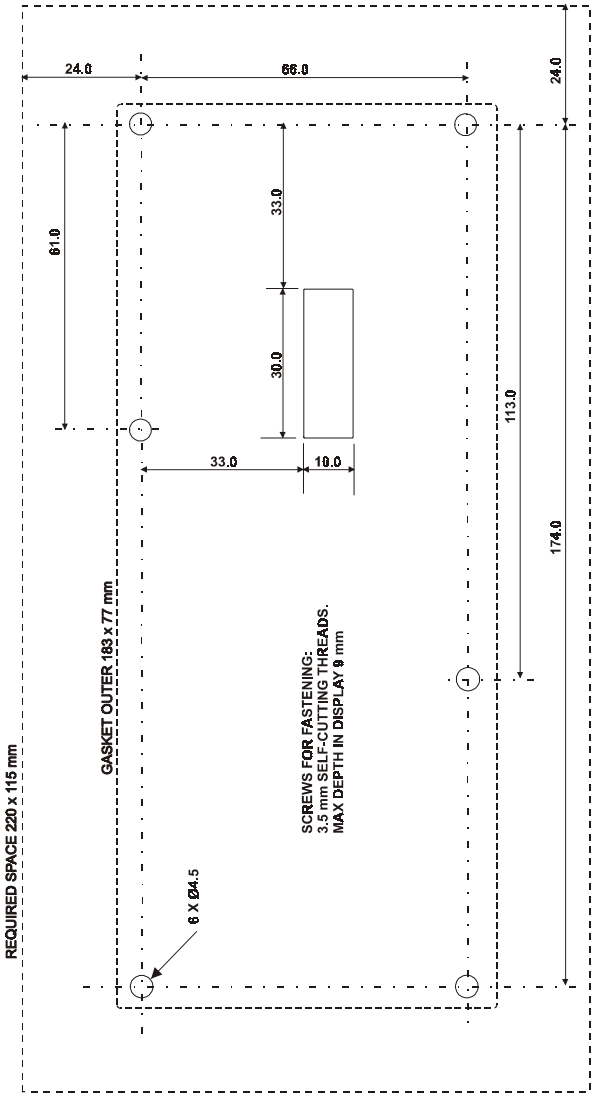
Unit Dimensions



Display dimensions



Panel cutout for display



Errors and changes excepted