DEIF A/S

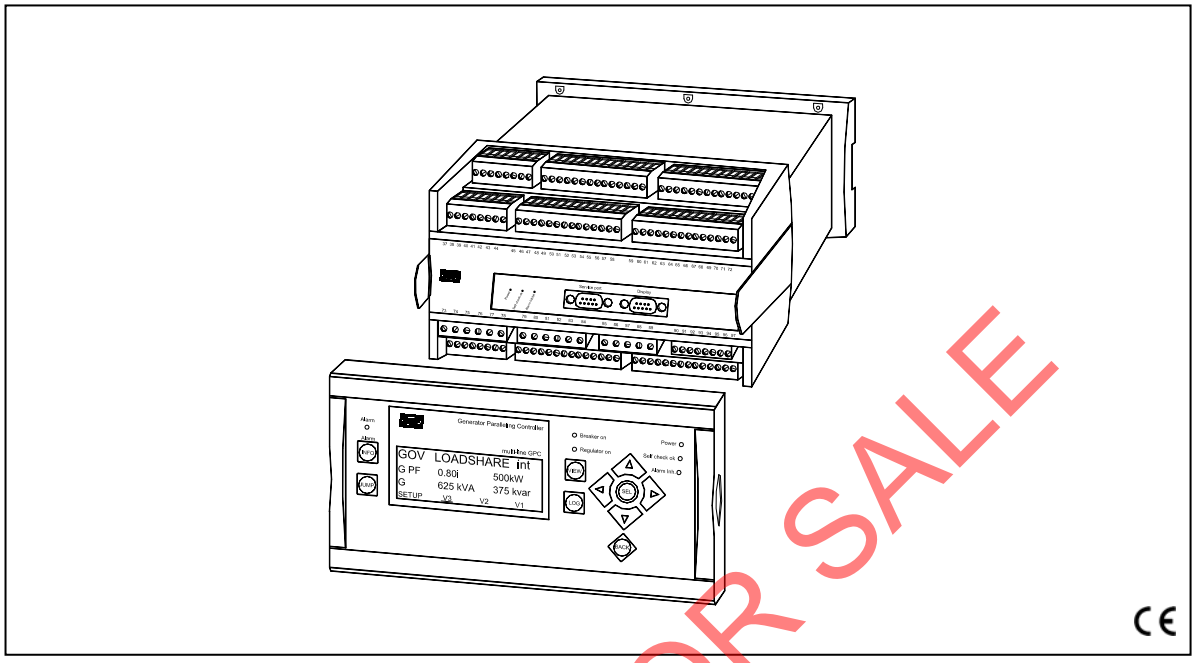
Data sheet

Generator Paralleling Controller

Multi-line 2

4921240311F

SW version 2.4X.X



Standard functions

Applications

- Stand-alone
- Parallel with other gen-sets
- Parallel with the mains

Control functions

- Synchronising
- Power and frequency controls

Operation modes

- Fixed frequency
- Fixed power (base load)
- Droop
- Load sharing

Protections (ANSI)

- Reverse power (32)
- Overcurrent, 2 levels (51)
- Overcurrent, inverse, 1 level (51)

Display

- Separate mounting
- Status texts
- Easy to read
- Programming

Measuring system

- 3-phase true RMS
- Galvanically isolated voltage and current inputs

GSM communication

- SMS messages at all alarms
- Dial up from PC utility software to control unit

Application

The Generator Paralleling Controller (GPC) is a compact *all-in-one* microprocessor-based control unit containing all necessary functions for protection and control of a synchronous/asynchronous generator. It contains all necessary galvanically separated 3-phase measuring circuits.

The GPC is intended for land-based applications. It is designed for the following applications (can be combined):

1. Stand-alone
2. Parallel with other generators
3. Parallel with the mains

The GPC can synchronise the generator and after synchronisation carry out all necessary generator control and protective functions. It is well-suited for PLC-controlled systems and the interfacing can be done via binary and analogue I/Os or via (optional) serial communication.

Display unit

The display unit is separate and can be installed directly on the main unit or in the front of the switchboard door (requires option J# - display cable).

The display unit shows all measured and calculated values as well as alarms and data from the event log.

The displayed values can be configured freely in order to match the customer or application specific requirements.

Operation modes

Four different operation modes can easily be selected through digital inputs on the standard GPC, and the governor will be controlled accordingly:

1. Fixed frequency
2. Fixed power (base load)
3. Droop
4. Load sharing

If the automatic voltage regulator is controlled by the GPC (optional) the standard operation modes are extended with:

1. Fixed voltage
2. Fixed VAr
3. Fixed power factor
4. VAr sharing

AVR control requires option D1.

Self-test

The GPC automatically carries out a cyclical self-test at start-up. If any errors are found, they will be displayed in clear text in the display and indicated with a relay output.

Setup

Setup is easily done via a menu structure in the display (password-protected) or via the RS232 PC connection and the multi-line 2 Windows® based PC utility software. The PC utility software can be downloaded free of charge from www.deif.com. The utility software offers additional features such as monitoring of all relevant information during commissioning, saving and downloading of settings and downloading of software updates.

Options

In order to perfectly match the product solution to specific applications, the functionality of the GPC can be equipped with a number of available options. The options selected by the customer will be integrated in the standard GPC, thus securing the same user interface unaffected by whether the application needs a highly complex or a more basic generator controller.

Approvals

The GPC is approved by the following societies:

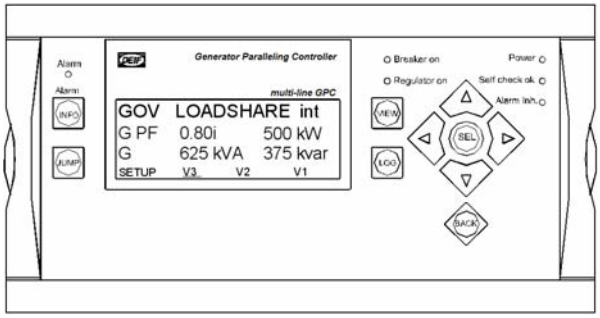
Other
GOST-R
UL
TÜV Nord

Please refer to www.deif.com for details and certificates.

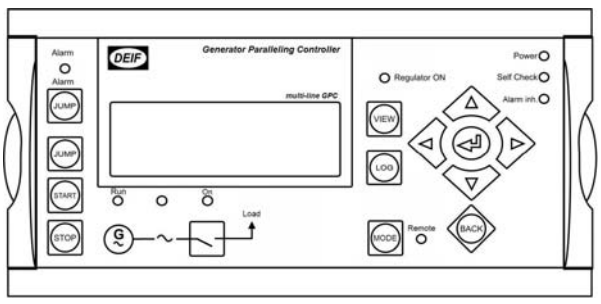
Display variants

Two display variants are available for the GPC. The display selection is depending on option M20.

Standard delivery



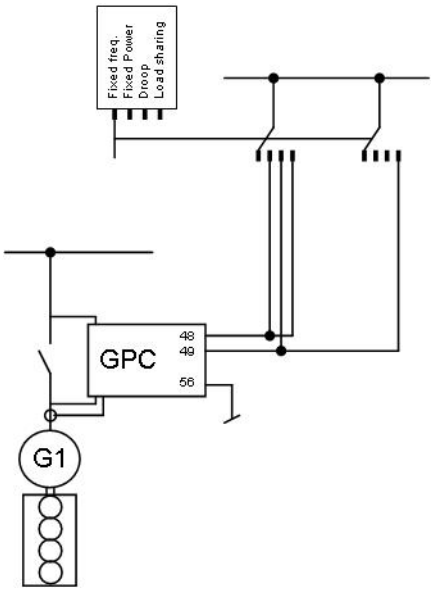
Engine and GB control (M20)



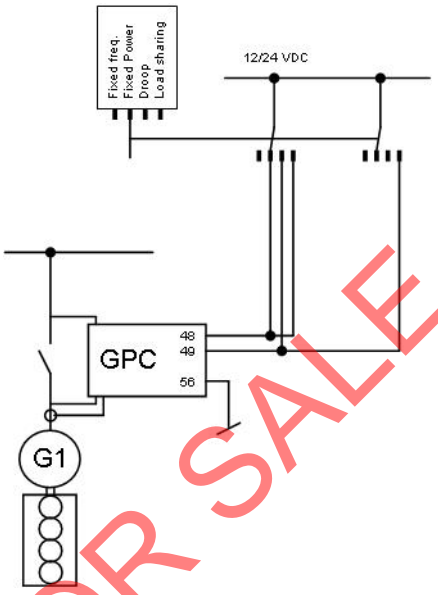
Single line application diagrams

Standard

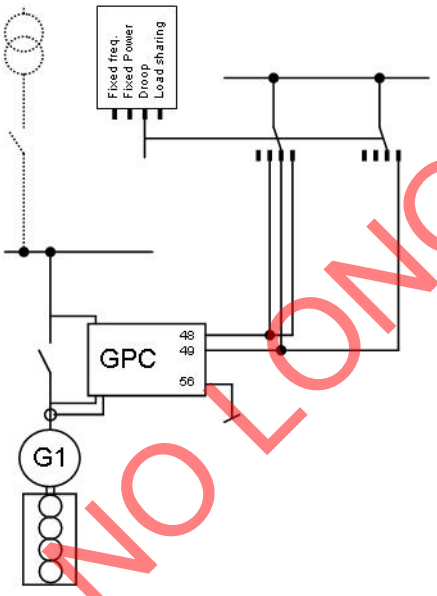
Stand-alone generator



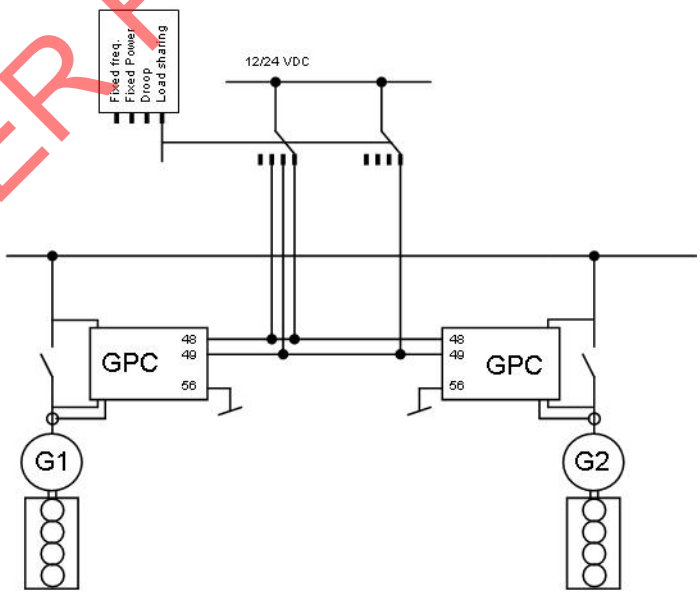
Generator parallel to mains



Droop mode



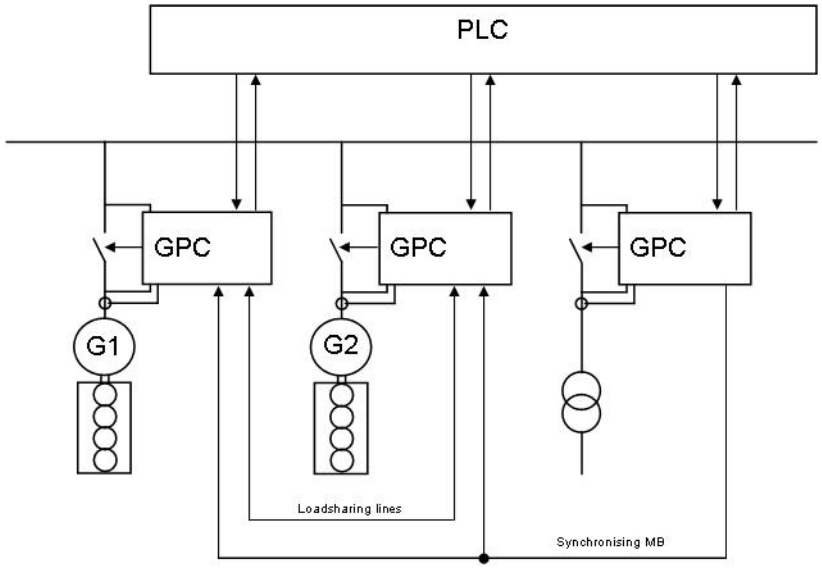
Paralleling generators



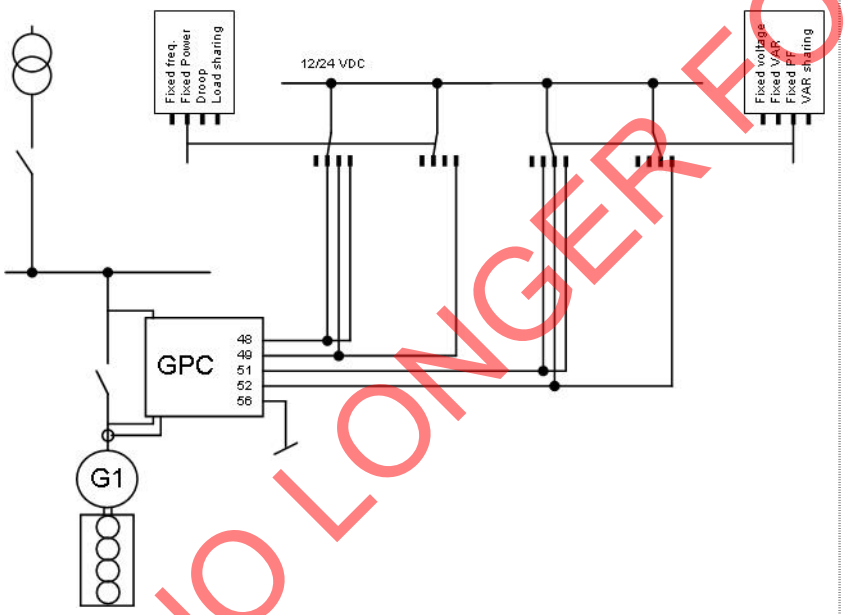
The illustrations show that the operating modes are selected on the terminals 48 and 49 or a combination of those terminals.

Optional/PLC controlled

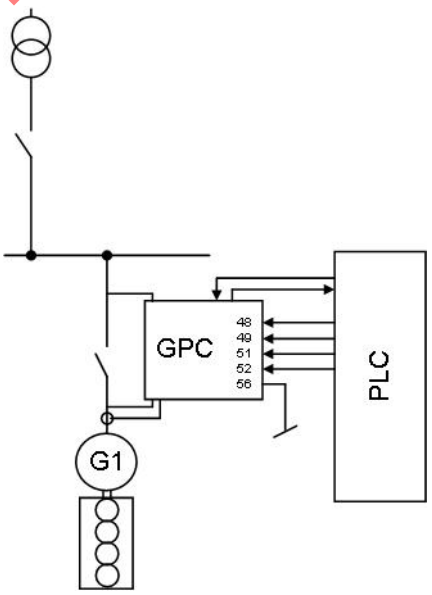
PLC controlled system



Governor and AVR control



Governor and AVR control



The GPC can be used in simple or complex applications. The above shows very simple applications only, but due to the flexible mode selection, the GPC can be used in all applications.

The GPC is also designed to work with the uni-line components such as the FAS (Full Automatic Synchroniser), should this be preferred.

Available options

Please notice that not all options can be selected for the same unit. Please refer to page 7 in this data sheet for further information about the location of the options in the unit.

Option	Description	Type	Note
A	**Loss of mains protection package**		
A1	Over- and undervoltage (generator and busbar/mains) **(27/59)** Over- and underfrequency (generator and busbar/mains) **(81)** Vector jump **(78)** df/dt (ROCOF) **(81)**	Software option	
A2	Over- and undervoltage (generator and busbar/mains) **(27/59)** Over- and underfrequency (generator and busbar/mains) **(81)** df/dt (ROCOF) **(81)**	Software option	
A3	Over- and undervoltage (generator and busbar/mains) **(27/59)** Over- and underfrequency (generator and busbar/mains) **(81)** Vector jump **(78)**	Software option	
B	**Generator/busbar/mains protection package**		
B1	Over- and undervoltage (generator and busbar/mains) **(27/59)** Over- and underfrequency (generator and busbar/mains) **(81)**	Software option	
C	**Generator add-on protection package**		
C1	Over- and undervoltage (generator) **(27/59)** Over- and underfrequency (generator) **(81)** Overload **(32)** Fast overcurrent (<42 ms, 350%, 2 levels) **(50)** Current unbalance **(46)** Voltage asymmetry **(47)** Reactive power import (excitation loss) **(40)** Reactive power export (overexcitation) **(40)**	Software option	
C2	Negative sequence voltage high **(47)** Negative sequence current high **(46)** Zero sequence voltage high **(59)** Zero sequence current high **(50)**	Software option	
D	**Voltage/VAr/PF control**		
D1	Selection between: Constant voltage control (stand-alone) Constant reactive power control (parallel with mains) Constant power factor control (parallel with mains) Reactive load sharing (island paralleling with other generators)	Software option	Not with EF2
E	**Analogue controller outputs**		
E1	+/-20mA for speed governor +/-20mA for AVR	Hardware option	AVR output is available if D1 is selected Refer to page 7
EF	**Combination outputs**		
EF2	+/-20mA for speed governor 1 x 0(4)-20mA transducer output	Hardware option	Refer to page 7
EF3	1 x PWM (Pulse Width Modulated) output for CAT speed governor 1 x PWM (Pulse Width Modulated) output for droop +/-20mA for speed governor or AVR 2 x relay outputs for speed governor or AVR	Hardware option	Refer to page 7
EF4	+/-20mA for speed governor or AVR 2 x relay outputs for speed governor or AVR	Hardware option	Refer to page 7
EF5	1 x PWM (Pulse Width Modulated) output for CAT speed governor +/-20mA for speed governor or AVR 2 x relay outputs for speed governor or AVR	Hardware option	Refer to page 7
F	**Analogue transducer outputs**		
F1	2 transducer outputs, 0-20mA or 4-20mA	Hardware option	Refer to page 7
H	**Serial communication**		
H1	CAN-open	Hardware option	Refer to page 7
H2	Modbus RTU	Hardware option	Refer to page 7
H3	Profibus DP	Hardware option	Refer to page 7
H4	CAT CCM	Hardware option	Refer to page 7

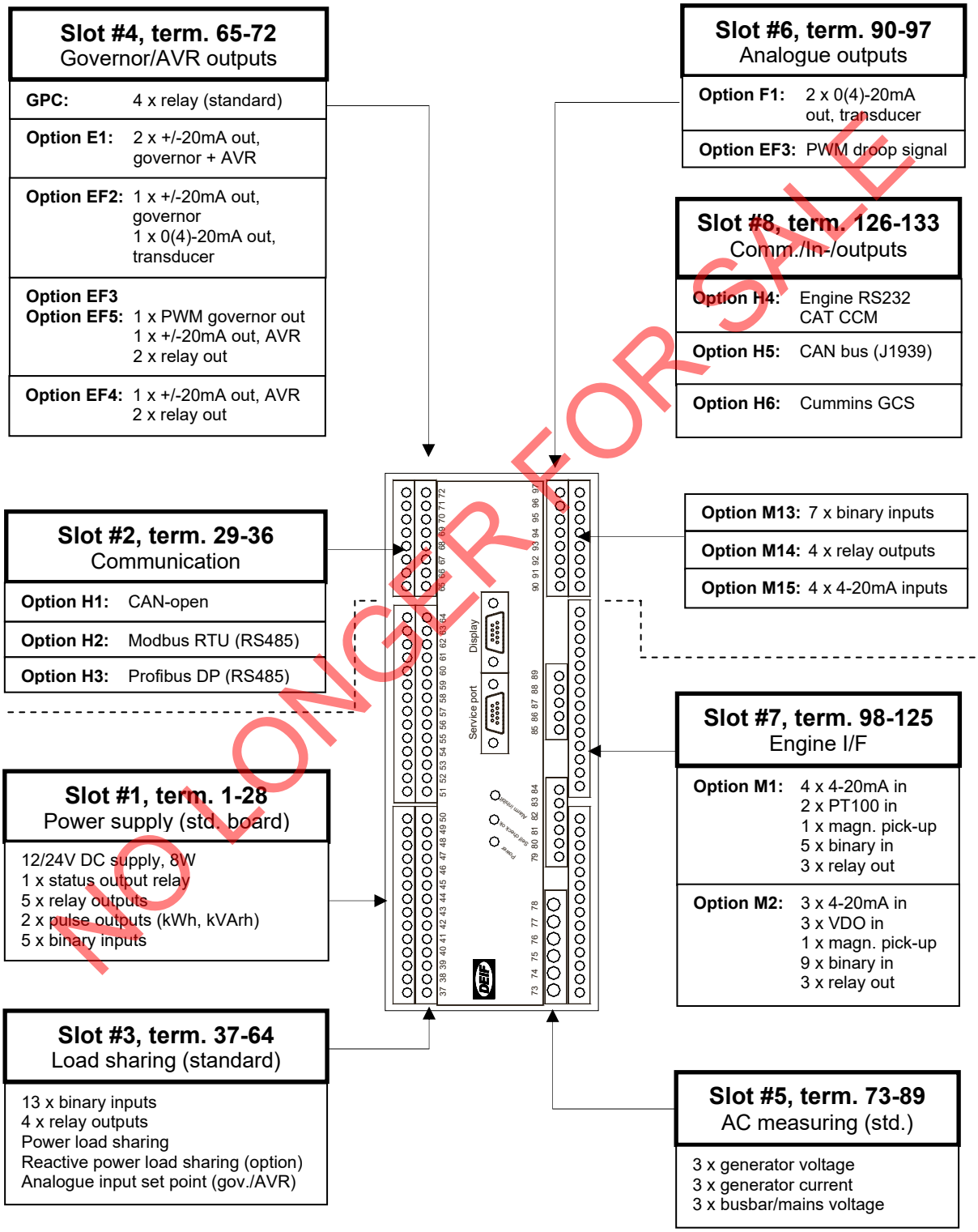
Option	Description	Type	Note
H5	**CAN bus (J1939 + MTU) engine communication for** MTU MDEC Detroit Diesel DDEC Deutz EMR John Deere JDEC Volvo Penta D12AUX	Hardware option	Refer to page 7
H6	Cummins ECM	Hardware option	Refer to page 7
J	**Cables**		
J1	Display cable with plugs, 3 m. UL94 (V1) approved	Other	
J2	Display cable with plugs, 6 m. UL94 (V1) approved	Other	
J3	PC cable for utility software (RS232). UL94 (V1) approved	Other	
J6	Display cable with plugs, 1 m. UL94 (V1) approved	Other	
K	**Documentation**		
K1	Designer's Reference Handbook (hard copy)	Other	
K2	CD-ROM with complete documentation	Other	
L	**Display gasket for IP54**	Other	Standard is IP52
M	**Configurable engine control cards**		
M1	Engine control card with PT100 sensor inputs 4 x 4-20mA inputs 2 x PT100 inputs 1 x tacho input (magnetic pick-up) 5 x binary inputs 3 x relay outputs	Hardware option	Refer to page 7 Engine start/stop logic can be switched ON/OFF
M2	Engine control card with VDO sensor inputs 3 x 4-20mA inputs 3 x VDO (resistor) inputs 1 x tacho input (magnetic pick-up) 9 x binary inputs 3 x relay outputs	Hardware option	Refer to page 7 Engine start/stop logic can be switched ON/OFF
M	**Configurable I/O extension cards**		
M13	7 binary inputs, configurable	Hardware option	Refer to page 7
M14	4 relay outputs	Hardware option	Refer to page 7
M15	4 analogue inputs, configurable, 4...20mA	Hardware option	Refer to page 7
M20	Display layout with engine and GB control (engine logic ON)	Other	Requires M1 or M2
O	**Water turbine control**		
O1	Water turbine control with integrated water level dependent power control	Hardware option	Includes M1 and M15
Z	**Generator nominal power**		
Z1	Generator nominal power >20MW	Software option	

(ANSI# as per IEEE Std C37.2-1996 (R2001) in parenthesis).

Hardware overview

Each slot can hold no more than one hardware option. For instance, it is not possible to select option H2 and option H3 at the same time because both options require a PCB in slot #2.

Apart from the hardware options shown on this page, it is possible to select the software options mentioned on page Error! Bookmark not defined. **in this data sheet. Options A, B, C and D are software options.**



Technical specifications

Accuracy: Class 1.0
Class 2.0 for neg. seq. current

To IEC/EN 60688

Operating temp.: -25-70°C (-13-158°F)

(UL/cUL Listed: Max. surrounding air temp.: 55°C/131°F)

Storage temp.: -40-70°C (-40-158°F)

Galvanic separation: Between AC voltage, AC current and other I/Os: 3250V AC, 50Hz, 1 min.

Between analogue outputs and other I/Os: 500V DC, 1 min.

Between binary input groups and other I/Os: 500V DC, 1 min.

Meas. voltage: 100-690V AC +/-20%

(UL/cUL Listed: 110-480V AC phase-phase)

Consumption: Max. 0.25VA/phase

Meas. current: -/1 or -/5A AC

(UL/cUL Listed: From CTs 1-5A)

Consumption: Max. 0.3VA/phase

Current overload: 4 x I_n continuously
20 x I_n, 10 sec. (max. 75A)
80 x I_n, 1 sec. (max. 300A)

Meas. frequency: 30-70Hz

Aux. supply: 12/24V DC (8-36V continuously, 6V 1 sec.)
Max. 8W consumption

The aux. supply inputs are to be protected by a 2A slow blow fuse

Recommended power supply is DEIF's DCP-2

(UL/cUL Listed: AWG 24)

Binary inputs: Optocoupler, bi-directional
ON: Input voltage 8-36V DC
Impedance typically 4.7kΩ
OFF: <2V DC

Relay outputs: 250V AC/24V DC, 5A
(Unit status output: 1A)

(UL/cUL Listed: 250V AC/24V DC, 2A resistive load)

Analogue inputs: -10/+10V DC
Not galvanically separated
Impedance 100kΩ

4-20mA: Impedance max 50Ω, not galvanically separated

PT100: According to IEC/EN 60751

VDO: Resistor inputs, internal supply max. 480Ω

Mounting: DIN-rail mount or base mount with 6 screws

Climate: 97% RH to IEC 60068-2-30

Load sharing lines: -5/+5V DC, impedance 23.5kΩ

Analogue outputs: 0(4)-20mA
Galvanically separated
Active output (internal supply)
Load max. 500Ω

(UL/cUL Listed: Max. 20mA output)

Safety: To EN 61010-1, installation category (overvoltage category) III, 600V, pollution degree 2

To UL 508 and CSA 22.2 no. 14-05, overvoltage category III, 300V, pollution degree 2

Protection: Unit: IP20
Display: IP52 (IP54 with gasket: Option L)

(UL/cUL Listed: Type Complete Device, Open Type)

To IEC/EN 60529

EMC/CE: To EN 61000-6-1/2/3/4
IEC 60255-26
IEC 60533 power distr. zone
IACS UR E10 power distr. zone

Vibration: 3…13.2Hz: 2mmpp
13.2…100Hz: 0.7g
To IEC 60068-2-6 & IACS UR E10

10…60Hz: 0.15mmpp
60…150Hz: 1g
To IEC 60255-21-1 Response (class2)

10…150Hz: 2g
To IEC 60255-21-1 Endurance (class2)

Shock (base mount):

10g, 11msec, half sine
To IEC 60255-21-2 Response (class2)

30g, 11msec, half sine
To IEC 60255-21-2 Endurance (class2)

50g, 11msec, half sine
To IEC 60068-2-27

Bump: 20g, 16msec, half sine
To IEC 60255-21-2 (class2)

Material: All plastic materials are self-extinguishing according to UL94 (V1)

Plug connections:

AC current:	4.0 mm^2 multi stranded
	(UL/cUL Listed: AWG28-10)
	Tightening torque: 0.5-0.6 Nm (4.4-5.3 lb-in)
Other:	2.5 mm^2 multi stranded
	(UL/cUL Listed: AWG28-12)
	Tightening torque: 0.5-0.6 Nm (4.4-5.3 lb-in)
	(UL/cUL Listed: AWG20)
Display:	9-pole Sub-D female
PC:	9-pole Sub-D male

Governors: Multi-line 2 interfaces to all governors, including GAC, Barber-Colman, Woodward and Cummins

See interfacing guide at www.deif.com

Open collector outputs: Supply 8-36V DC, max. 10mA

Weight:

Main unit:	1.6 kg (3.5 lbs.)
Option J1/J3:	0.2 kg (0.4 lbs.)
Option J2:	0.4 kg (0.9 lbs.)

Approval: UL/cUL Listed to UL508

UL markings:

Wiring:
Use 60/75°C copper conductors only

Mounting:
For use on a flat surface of type 1 enclosure

Installation:
To be installed in accordance with the NEC (US) or the CEC (Canada)

Response times:

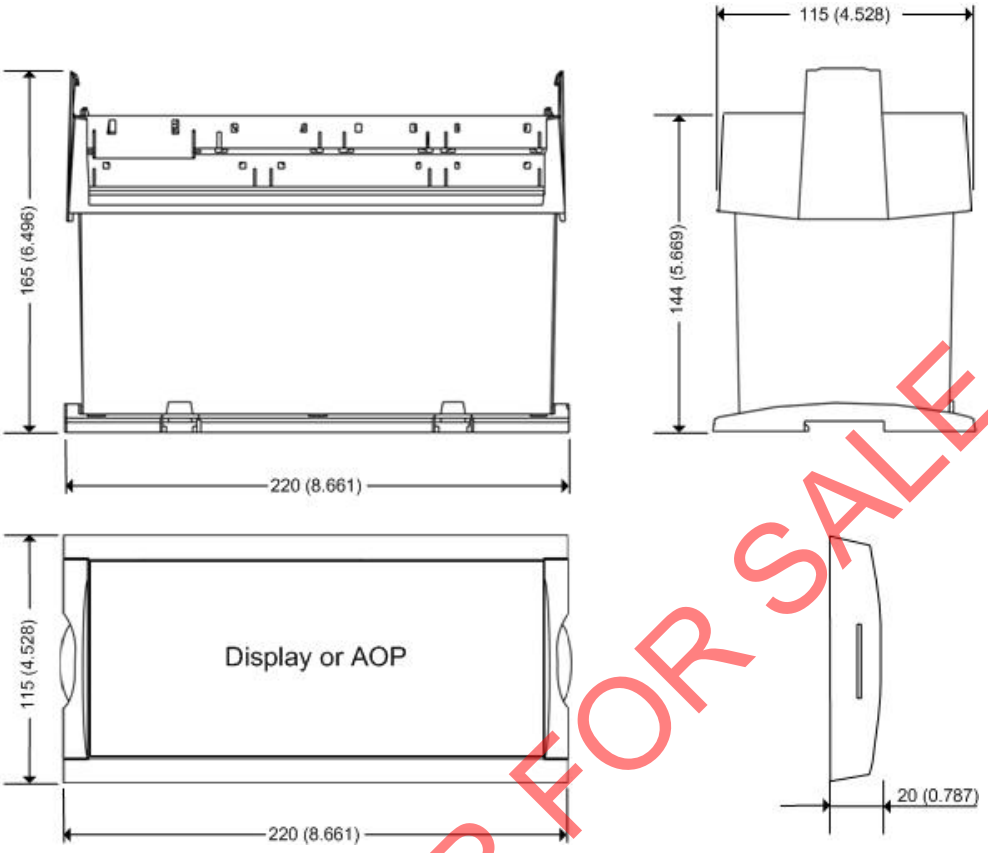
Busbar 1 and 2:

Over-/undervoltage	<50 ms
Over-/underfrequency	<50 ms

Generator:

Over-/undervoltage	70-300 ms
Over-/underfrequency	70-300 ms
Current:	100-300 ms
Rocof:	100 ms (4 periods)
Vector jump:	30 ms
Fast overcurrent:	<42 ms

Unit dimensions in mm (inches)



Panel cutout:
H x W = 10 (0.393”) x 30 (1.181”)

Order specifications

	OPTION	OPTION	OPTION	OPTION	OPTION
GPC					

Example

	OPTION	OPTION	OPTION	OPTION	OPTION
GPC	A2	C1	E1	H5	

Due to our continuous development we reserve the right to supply equipment which may vary from the described.

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