# **Protection and Paralleling Unit**

#### Multi-line 2 4921240313F

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

## General

- Free PC utility software for commissioning
- Additional functions and I/Os available

## Approvals

Marine approved

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#### Application

The Paralleling and Protection Unit (PPU) 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 PPU is intended for land- or marine-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 PPU 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 contonal) serial communication.

#### Display unit

The display unit is separate and can be installed directly on the main unit of in the front of the switchboard door (require 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 PPU, 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 PPU (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 PPU 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.

## Protection and Paralleling Unit

#### 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<sup>®</sup> based PC utility software. The PC utility software can be dominaded free of charge from www.deif.com. The utility software offers additional features such as nontrol of all relevant information during complexioning, saving and downloading of settings and texnloading of software updates.



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

#### Approvals

The PPU is approved by the following societies:

Marine	Other
ABS	GOST-R
BV	UL
DNV	TÜV Nord
GL	
LR	
RINA	
RS	



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

#### Display variants

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

#### Standard delivery



#### Engine and GB control (M20)



### Single line application diagrams



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



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

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

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#### Available options

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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.

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Option	Description	Туре	Rote
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) (8) df/dt (ROCOF) (81)	Software option	
A3	Over- and undervoltage (generator and busbar/mains) (7759) Over- and underfrequency (generator and busbar/mains) (81) Vector jump (78)	Software option	
В	Generator/busbar/mains protection pickage		
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 undervaltage (generator) (27/59) Over- and undervaluency (generator) (81) Overload (32) Fast overaument (<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	<ul> <li>1 x PWM (Pulse Width Modulated) output for CAT speed governor</li> <li>1 x PWM (Pulse Width Modulated) output for droop</li> <li>+/-20mA for speed governor or AVR</li> <li>2 x relay outputs for speed governor or AVR</li> </ul>	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	llandura "	Defente 7
F1	2 transducer outputs, 0-20mA or 4-20mA	Hardware option	Reter to page 7
<u>п</u> 			
H1	CAN-open	Hardware option	Reter to page 7
H2		Hardware option	Reter to page 7
H3		Hardware option	Reter to page 7
H4		Hardware option	Reter to page 7

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Option	Description	Туре	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 GCS or ECM	Hardware option	Reler o page 7
J	Cables	1	0.5
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	Otner	
К	Documentation		÷
K1	Designer's Reference Handbook (hard copy)	Other	1
K2	CD-ROM with complete documentation	Other	
L	Display gasket for IP54	Other	Standard is IP52
M	Configurable engine control cards		1
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 VTO sensor inputs 3 x 4-20mA inputs 3 x VDO (resistor) aputs 1 x tache 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
м	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
Z	Generator nominal power		
Z1	Generator nominal power >20MW	Software option	[

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

#### Hardware overview

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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.



# Protection and Paralleling Unit

### Technical specifications

Accuracy:	Class 1.0 Class 2.0 for neg. seq. current		(UL/cUL Listed: 250V AC/24V DC, 2A resistive load)	
	To IEC/EN 60688	Analogue inputs:	-10/+10V DC Not galvanically en arated Impedance τουκΩ	
Operating temp.:	-25-70°C (-13-158°F)			
	(UL/cUL Listed: Max. surround- ing air temp.: 55°C/131°F)		4-20nA Impedance max. 50Ω, galvanically separated	
Storage temp.:	-40-70°C (-40-158°F)	i or ne	PT100: According to IEC/EN 60751	
Galvanic separation:	Between AC voltage, AC current and other I/Os: 3250V AC, 50Hz, 1 min.	red to.	VDO: Resistor inputs, internal supply max. $480\Omega$	
	Between analogue outputs and other I/Os: 500V DC, 1 min.	Mounting:	DIN-rail mount or base mount with 6 screws	
	Between binary input groups and other I/Os: 500V/DC, 1 min.		(Base mounting in marine applications)	
Meas. voltage:	100-690V AC + 20%	Climate:	97% RH to IEC 60068-2-30	
•	(UL/cal Listed: 110-480V AC prese phase)	Load sharing lines:	-5/+5V DC, impedance 23.5k $\Omega$	
Consumption:	Max. 0.25VA/phase	Analogue outputs:	0(4)-20mA	
Meas. current:	-/1 or -/5A AC		Galvanically separated Active output (internal supply)	
O	(UL/CUL LISTED: From CTS 1-5A)			
Consumption:	Max. 0.3VA/phase		output)	
Current overload:	4 x I <sub>n</sub> continuously 20 x I <sub>n</sub> , 10 sec. (max. 75A) 80 x I <sub>n</sub> , 1 sec. (max. 300A)	Safety:	To EN 61010-1, installation category (overvoltage category) III, 600V, pollution degree 2	
Meas. frequency:	30-70Hz		To UL 508 and CSA 22.2 no.	
Aux. supply:	12/24V DC (836V continuously, 6V 1 sec.)		14-05, overvoltage category III, 300V, pollution degree 2	
	Max. 8W consumption The aux. supply inputs are to be protected by a 2A slow blow	Protection:	Unit: IP20 Display: IP52 (IP54 with gaskot:	
			Option L)	
	Recommended power supply is		(UL/cUL Listed: Type Complete Device, Open Type)	
	DEIF'S DCP-2		To IEC/EN 60529	
Binary inputs:	Optocoupler, bi-directional ON: Input voltage 8-36V DC Impedance typically 4.7kΩ OFF: <2V DC	EMC/CE:	To EN 61000-6-1/2/3/4 IEC 60255-26 IEC 60533 power distr. zone IACS UR E10 power distr. zone	
Relay outputs:	250V AC/24V DC, 5A (Unit status output: 1A)			

# Protection and Paralleling Unit

Vibration:	313.2Hz 13.2100H To IEC 600 E10	: 2mmpp Hz: 0.7g )68-2-6 & IACS UR	Governors:	Multi-line 2 governors, i Barber-Colr and Cummi	interfaces to all ncluding GAC, nan, Woodward ns
	1060Hz: 0.15mmpp 60150Hz: 1g To IEC 60255-21-1 Response (class2)		Open collector	See interfact	
	10…150Hz To IEC 602 (class2)	z: 2g 255-21-1 Endurance	outputs: Weight:	Supply 8-36 Main unit: Option J1/J3	V DC, max. 10mA 1.6 kg (3.5 lbs.) 3: 0.2 kg (0.4 lbs.)
Shock (base mount	10g, 11mse To IEC 602 (class2)	ec, half sine 255-21-2 Response	Approval:	The PPU is major classi	0.4 kg (0.9 lbs.) approved by the fication societies
	30g, 11mse	ec, half sine	0	Contact DE	IF for details
	(class2)			UL/cUL List	ed to UL508
	50g, 11mse To IEC 600	ec, half sine 068-2-2	UL markings:	Wiring: Use 60/75°( only	C copper conductors
Bump:	20g, 16ma To IEC 602	e alf sine 55-21-2 (class2)		Mounting: For use on a 1 enclosure	a flat surface of type
Materiai:	An plastic r extinguishi (V1)	naterials are self- ng according to UL94		Installation: To be instal with the NF	led in accordance C (US) or the CEC
Plug connections:	AC current:4.0 mm <sup>2</sup> multi			(Canada)	
		(UL/cUL Listed: AWG28-10)	Response times: Busbar 1 and 2: Over-/undervoltage Over-/underfrequency Generator: Over-/undervoltage	voltage	<50 ms
		Tightening torque: 0.5-0.6 Nm (4.4-5.3		voltage requency requency	<50 ms
	Other:	2.5 mm <sup>2</sup> multi stranded	Over-/under Current: Rocof:		70-300 ms 100-300 ms 100 ms (4 periods) 30 ms <42 ms
		(UL/cUL Listed: AWG28-12)	Vector jump: Fast overcur	rent:	
		Tightening torque: 0.5-0.6 Nm (4.4-5.3 Ib-in)			
		(UL/cUL Listed: AWG20)			
	Display:	9-pole Sub-D female			
	PC:	9-pole Sub-D male			

**Protection and Paralleling Unit** 



Unit dimensions in mm (inches)

**Order specifications** 





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



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

Tel.: 9614 9614, Fax: 9614 9615 E-mail: deif@deif.com, URL: www.deif.com