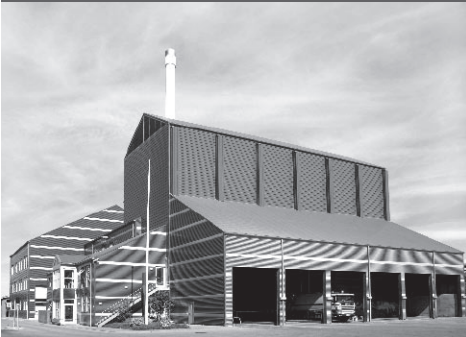




-power in control



DATA SHEET



Paralleling and Protection Unit, PPU-3

- Regulation modes
- Generator protection
- M-Logic (Micro PLC)
- Busbar protection
- Free PC utility software
- Approved by all major classification societies



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1. Contents

1.1 General information

1.1.1 Application

The Paralleling and Protection Unit, PPU-3, 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-3 is intended for marine-based applications. It is designed for the following applications (can be combined):

1. Stand-alone
2. Parallel with other generators

The PPU-3 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 digital and analogue I/Os or via serial communication.

1.1.2 Display unit

The display unit is separate and can be installed directly on the main unit or in the front of the switchboard door (3 m display cable included). Up to two additional displays can be installed within 200 m.

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

1.1.3 Regulation modes

Four different regulation modes can easily be selected through digital inputs on the standard PPU-3, and the governor will be controlled accordingly:

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

If the automatic voltage regulator is controlled by the PPU-3, the standard operation modes are extended with:

1. Fixed voltage
2. Fixed reactive power
3. Fixed power factor
4. Reactive load sharing
5. Voltage droop



AVR control requires option D1.

1.1.4 Self-test

The PPU-3 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 (status output).

1.1.5 M-Logic (Micro PLC)

This configuration tool is part of the PC utility software which is free of charge. With this tool, it is possible to customise the application to your needs. It is possible to dedicate specific functions or logical conditions to different inputs and outputs.

1.1.6 Engine control and protection

With the engine control and protection option added, the PPU-3 will control the start and stop sequences of the engine and furthermore it can be used as engine protection unit providing full backup of engine shutdown channels in case the main processor fails.

1.1.7 CANshare

Some applications require supervision of wire break and short circuit of the load sharing lines. Since the standard analogue load sharing lines do not include any supervision, it is recommended to use the optional CANshare feature (option G9) for these applications.

1.1.8 Setup

Setup is easily done via a menu structure in the display (password-protected) or via the USB 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/Download_centre. 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.

1.1.9 Options

In order to perfectly match the product solution to specific applications, the functionality of the PPU-3 can be equipped with a number of available options. The options selected by the customer will be integrated in the standard PPU-3, hereby securing the same user interface unaffected by whether the application needs a highly complex or a more basic genset controller.

Refer to the paragraph "Available options" for the options available.

1.1.10 Approvals

The PPU-3 is marine-approved by all major classification societies and is UL/cUL listed.



Refer to www.deif.com for details and certificates.

1.2 Protections

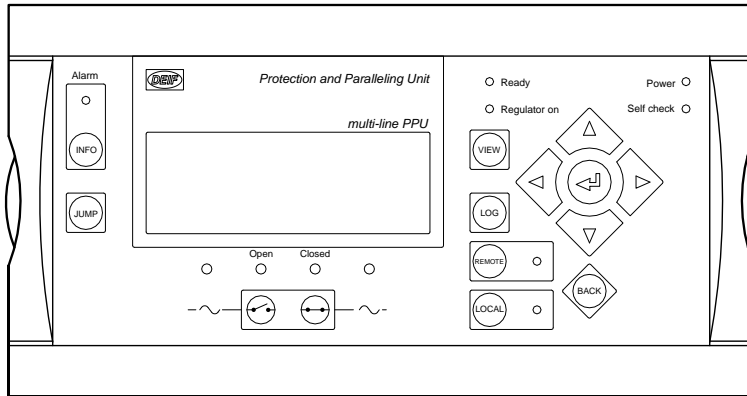
The following protection functions are included as standard functions

| Protection function | ANSI no. * | Levels |
|--------------------------------|------------|---------|
| Generator reverse power | (32) | 2 steps |
| Generator over-current | (50/51) | 6 steps |
| Voltage-dependent over-current | (51V) | 1 step |
| Inverse time over-current | (51) | 1 step |
| Generator over-voltage | (59) | 2 steps |
| Generator under-voltage | (27) | 3 steps |
| Generator over-frequency | (81) | 3 steps |
| Generator under-frequency | (81) | 3 steps |
| Busbar over-voltage | (59) | 3 steps |
| Busbar under-voltage | (27) | 4 steps |
| Busbar over-frequency | (81) | 3 steps |
| Busbar under-frequency | (81) | 4 steps |
| Busbar voltage unbalance | (60) | 1 step |
| NEL group | | 3 steps |
| Generator overload | (32) | 5 steps |
| Current unbalance | (60) | 1 step |
| Voltage unbalance | (60) | 1 step |
| Over-excitation | (40/32 RV) | 1 step |
| Loss of excitation | (40/32 RV) | 1 step |

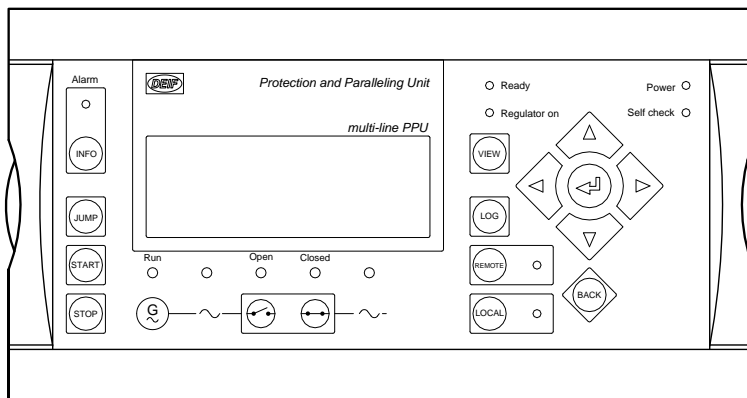
* (ANSI# as per IEEE Std. C37.2-1996 (R2001) in parenthesis).

1.3 Display layouts

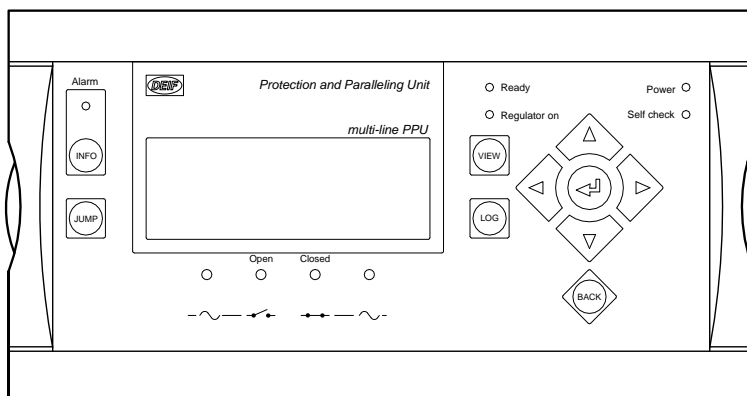
Standard delivery



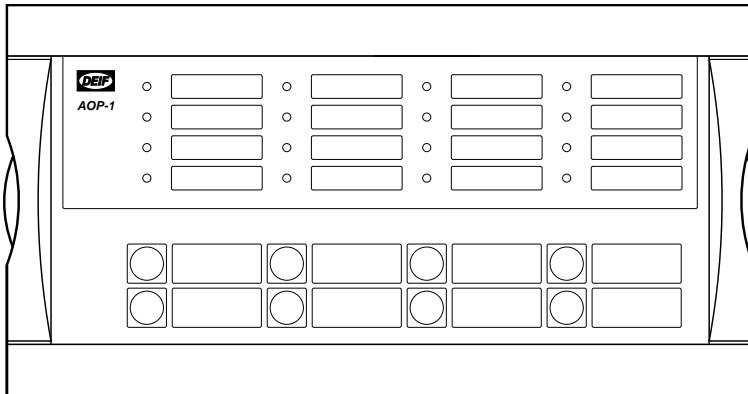
Engine and GB control (option Y1)



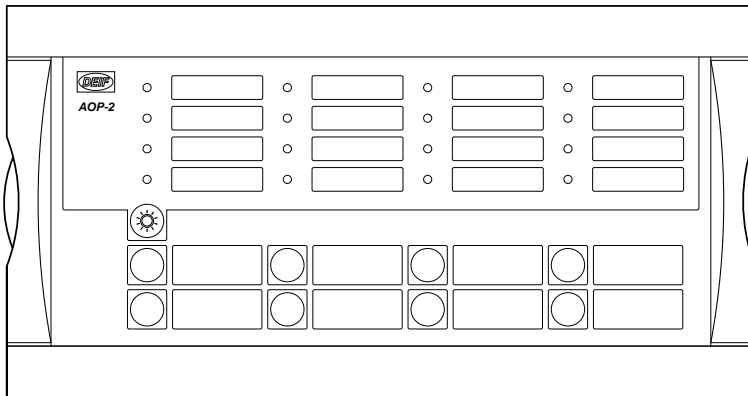
Display without Local control buttons (option Y11)



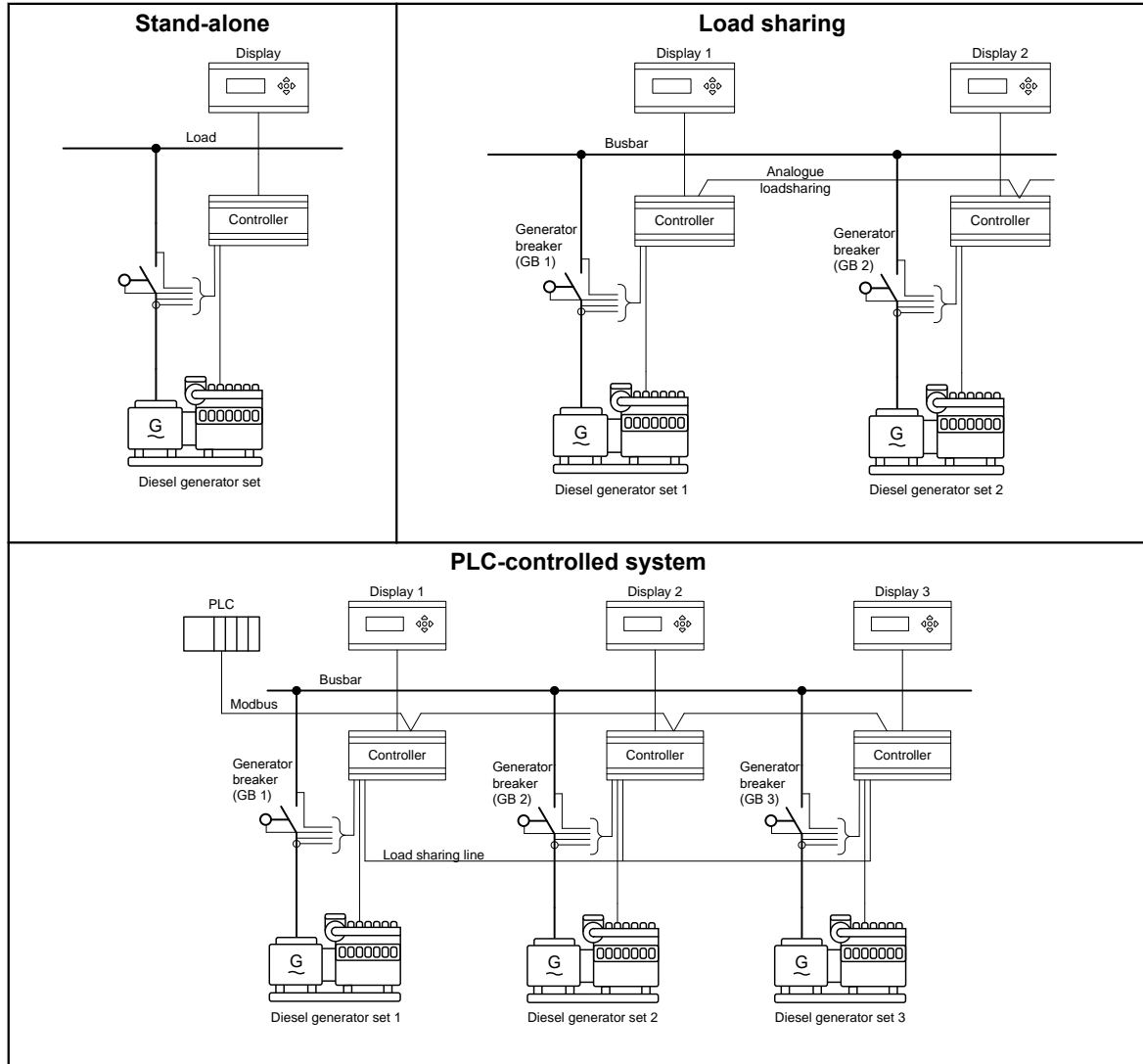
Additional operator panel - AOP-1 (option X3)



Additional operator panel - AOP-2 (option X4)



1.4 Application examples



i The PPU-3 can be used in simple or complex applications. The above shows some of the applications, but due to the flexible mode selection, the PPU-3 can be used in all applications. The PPU-3 is also designed to work with the Uni-line components such as the FAS (Full Automatic Synchroniser), should this be preferred.

1.5 Available variants

| Type | Variant no. | Description | Item no. | Note |
|--------------|-------------|-------------------------|---------------|-----------------------------------------------|
| PPU-3 Marine | 01 | PPU-3 with display | 2912210030-01 | One 3 m display cable is included as standard |
| PPU-3 Marine | 05 | PPU-3 with display + F1 | 2912210030-05 | One 3 m display cable is included as standard |
| PPU-3 Marine | 06 | PPU-3 with display + H2 | 2912210030-06 | One 3 m display cable is included as standard |
| PPU-3 Marine | 07 | PPU-3 without display | 2912210030-07 | |

1.6 Available options

| Option | Description | Slot no. | Option type | Note |
|----------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------|-------------|--------------------------------------------------------|
| A | Mains protection package | | | |
| A1 | Time-dependent under-voltage (27t) Under-voltage and reactive power low (27Q) Vector jump (78) df/dt (ROCOF) (81) | | Software | |
| A4 | Positive sequence (mains voltage low) (27) | | Software | |
| A5 | Directional over-current (67) | | Software | |
| C | Generator add-on protection package | | | |
| C2 | Negative sequence voltage high (47) Negative sequence current high (46) Zero sequence voltage high (59) Zero sequence current high (50) Power-dependent reactive power import/export (40) | | Software | |
| D | Voltage control | | | |
| D1 | Constant voltage control Constant reactive power control Constant power factor control Reactive load sharing Voltage droop | | Software | |
| E and F | Analogue controller and transducer outputs | | | |
| E1 | 2 × +/-25 mA (GOV/AVR or transducer) | 4 | Hardware | Not with E2, EF2, EF4 or EF5 AVR output requires D1 |
| E2 | 2 × 0(4) to 20 mA (GOV/AVR or transducer) | 4 | Hardware | Not with E1, EF2, EF4 or EF5 AVR output requires D1 |
| EF2 | 1 × +/-25 mA (GOV/AVR or transducer) 1 × 0(4) to 20 mA (GOV/AVR or transducer) | 4 | Hardware | Not with E1, E2, EF4 or EF5 AVR output requires D1 |
| EF4 | 1 × +/-25 mA (GOV/AVR or transducer) 2 × relay outputs (GOV/AVR or configurable) | 4 | Hardware | Not with E1, E2, EF2 or EF5 AVR output requires D1 |

| Option | Description | Slot no. | Option type | Note |
|----------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------|-------------|----------------------------------------------------------------------------|
| EF5 | 1 × PWM (Pulse Width Modulated) output for CAT GOV 1 × +/-25 mA (GOV/AVR or transducer) 2 × relay outputs (GOV/AVR or configurable) | 4 | Hardware | Not with E1, E2, EF2 or EF4 AVR output requires D1 |
| F1 | 2 × 0(4) to 20 mA (transducer) | 6 | Hardware | Not with M13.6, M14.6 or M15.6 |
| G | Load sharing | | | |
| G9 | CANshare <ul style="list-style-type: none"> Digital load sharing with cable supervision BTB pos. feedback and supervision of up to four BTBs Handling of up to five load share sections Active and reactive load share supervision Dead bus closing with first-up discrimination Emulation mode for easy test prior to commissioning | 8 | Hardware | Not with H5, H6, H8.8, M13.8, M14.8 or M15.8 |
| H | Serial communication | | | |
| H2 | Modbus RTU/ASCII (RS-485) | 2 | Hardware | Not with H3, H8.2, H9.2 or M14.2 |
| H3 | Profibus DP | 2 | Hardware | Not with H2, H8.2, H9.2 or M14.2 |
| H5 | Caterpillar Cummins CM850/570 Detroit Diesel (DDEC) Deutz (EMR) Iveco (NEF/CURSOR) John Deere (JDEC) MTU SmartConnect MTU ADEC MTU MDEC M302/M303 Perkins Scania (EMS) Scania (EMS S6) Volvo Penta (EMS) Volvo (EMS2) External I/O comm. (CAN bus J1939) to Axiomatic modules | 8 | Hardware | Not with G9, H7, H8.8, M13.8, M14.8 or M15.8 External comm. requires M4 |
| H6 | Cummins GCS | 8 | Hardware | Not with G9, H5, H7, H8.8, M13.8, M14.8 or M15.8 |

| Option | Description | Slot no. | Option type | Note |
|----------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------|-------------|---------------------------------------------------------------------------------------------------------------------------------------------------|
| H7 | Caterpillar Cummins CM850/570 Detroit Diesel (DDEC) Deutz (EMR) Iveco (NEF/CURSOR) John Deere (JDEC) MTU SmartConnect MTU ADEC Perkins Scania (EMS) Scania (EMS S6) Volvo Penta (EMS) Volvo (EMS2) External I/O comm. (CAN bus J1939) to Axiomatic modules | 7 | Software | Requires M4 Not with H5 Not all measurements are available on Caterpillar (see option H5/H7/H12/H13 manual) |
| H8.X | External I/O modules | 2, 8 | Hardware | H8.2: Not with H2, H3, H8.8, H9.2 or M14.2 H8.8: Not with G9, H5, H6, H8.2, M13.8, M14.8 or M15.8 |
| H9.2 | Modbus RTU/ASCII (RS-232) and GSM modem connection | 2 | Hardware | Not with H2, H3, H8.2 or M14.2 |
| M | Engine control, digital and analogue I/Os | | | |
| M4 | Engine control and protection (safety system) OR I/O extension | 7 | Hardware | |
| M13.X | 7 digital inputs, configurable | 6, 8 | Hardware | M13.6: Not with F1, M14.6 or M15.6 M13.8: Not with G9, H5, H6, H8.8, M14.8 or M15.8 |
| M14.X | 4 relay outputs, configurable | 2, 6, 8 | Hardware | M14.2: Not with H2, H3, H8.2, H9.2 M14.6: Not with F1, M13.6 or M15.6 M14.8: Not with G9, H5, H6, H8.8, M13.8 or M15.8 |
| M15.X | 4 analogue inputs, configurable, 4 to 20 mA | 6, 8 | Hardware | M15.6: Not with F1, M13.6 or M14.6 M15.8: Not with G9, H5, H6, H8.8, M13.8 or M14.8 |
| N | Ethernet TCP/IP communication | | | |

| Option | Description | Slot no. | Option type | Note |
|----------|---------------------------------------------------|----------|-----------------------|-----------------------------|
| N | Modbus TCP/IP EtherNet/IP SMS/e-mail alarms | | Hardware/ software | |
| Q | Measurement accuracy | | | |
| Q1 | Verified class 0.5 | | Other | |
| Y | Display layout | | | |
| Y1 | Engine and GB control | | Other | Requires M4 Not with Y11 |
| Y11 | Display without Local control buttons | | Other | Not with Y1 |

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



Four relays are available as standard in slot #4 for GOV/AVR control. If one of the options E1, E2, EF2, EF4 or EF5 is selected, these options will replace the four relays.



Notice that not all options can be selected for the same unit. Refer to the paragraph "Hardware overview" in this data sheet for further information about the location of the HW options in the unit.

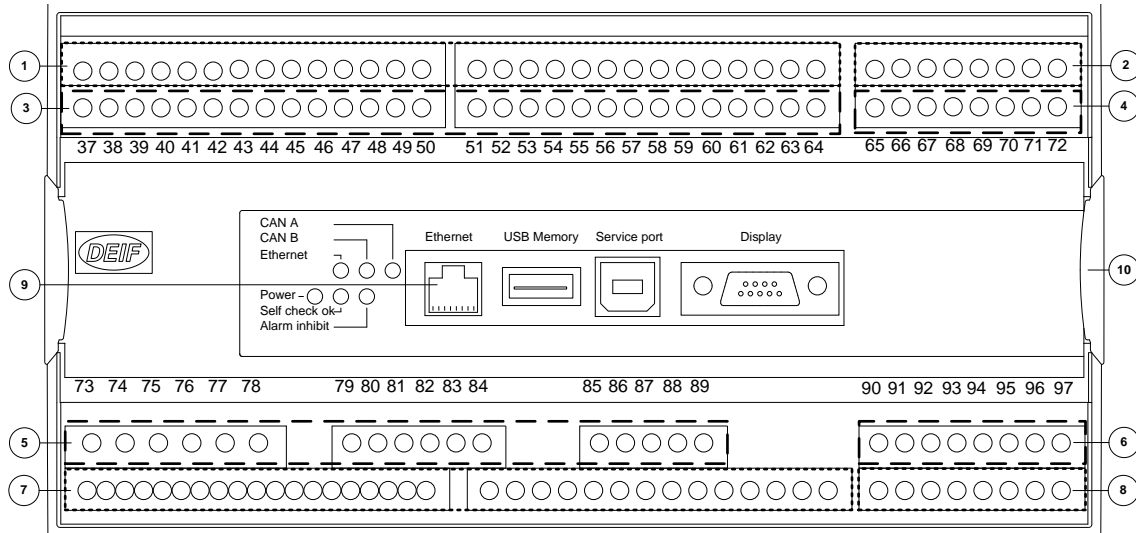
1.7 Available accessories

| Accessory | Description | Item no. | Note |
|-----------------------------------------|--------------------------------------------------------------------------------------|------------|------------------------------------------------------------------|
| Operator panels | | | |
| Standard Display Unit, DU-2 | For connection directly to base unit with display cable | 2912210050 | Specify product and folio (refer to paragraph "Display layouts") |
| Additional Display Unit, DU-2 (X2) | For CAN bus connection to the standard display | 2912890030 | Two additional displays can be used with each PPU unit |
| Additional Operator Panel, AOP-1 (X3) | 16 configurable LEDs and eight configurable push-buttons | 2912890040 | Max. one AOP-1 for each display unit |
| Additional Operator Panel, AOP-2 (X4) | 16 configurable LEDs, eight configurable buttons and one status relay. CAN bus comm. | 2912890050 | Five AOP-2 units can be used with each PPU unit |
| Display gasket for IP54 (L) | | 1134510010 | Standard is IP40 |
| Cables | | | |
| Display cable, 3 m | | 1022040076 | |
| Display cable, 6 m (J2) | | 1022040057 | |
| Display cable, 1 m (J6) | | 1022040064 | |
| USB cable, 3 m (J7) | For PC utility software | 1022040065 | |
| Ethernet cable, crossed, 3 m (J4) | For option N | 1022040055 | |
| Documentation | | | |
| Designer's Reference Handbook (K1) | | 4189340583 | |
| CD-ROM with complete documentation (K2) | | 2304230002 | |



Display gasket is required for RS-approved applications.



1.8 Hardware overview



① : The numbers in the drawing above refer to the slot numbers indicated in the table below.

| Slot # | Option/standard | Description |
|----------|-----------------|-----------------------------------------------------------------------------------------------------------------------------------|
| 1 | | Terminal 1-28, power supply |
| | Standard | 8 to 36 V DC supply, 11 W; 1 × status output relay; 5 × relay outputs; 2 × pulse outputs (kWh, kvarh); 5 × digital inputs |
| 2 | | Terminal 29-36, communication |
| | H2 | Modbus RTU (RS-485) |
| | H3 | Profibus DP |
| | H8.2 | External I/O modules |
| | H9.2 | Modbus RTU/ASCII (RS-232) |
| | M14.2 | 4 × relay outputs |
| 3 | | Terminal 37-64, load sharing |
| | Standard | 13 × digital inputs; 4 × relay outputs; 1 × P load sharing line; 1 × Q load sharing line; 2 × inputs for ext. set point (GOV/AVR) |
| 4 | | Terminal 65-72, GOV/AVR/transducer outputs |
| | Standard | 4 × relay outputs |

| Slot # | Option/standard | Description |
|-----------|-----------------|---------------------------------------------------------------------------------------------------------------|
| | E1 | 2 × +/-20 mA outputs |
| | E2 | 2 × 0(4) to 20 mA outputs |
| | EF2 | 1 × +/-20 mA output; 1 × 0(4) to 20 mA output |
| | EF4 | 1 × +/-20 mA output; 2 × relays |
| | EF5 | 1 × PWM output; 1 × +/-20 mA output; 2 × relays |
| 5 | | |
| | | Terminal 73-89, AC measuring |
| | Standard | 3 × generator voltage; 3 × generator current; 3 × busbar/mains voltage |
| 6 | | |
| | | Terminal 90-97, inputs/outputs |
| | F1 | 2 × 0(4) to 20 mA outputs |
| | M13.6 | 7 × digital inputs |
| | M14.6 | 4 × relay outputs |
| | M15.6 | 4 × 4 to 20 mA inputs |
| 7 | | |
| | | Terminal 98-125, engine I/F |
| | M4 | 8 to 36 V DC supply, 5 W; 1 × magnetic pickup (MPU); 3 × multi-inputs; 7 × digital inputs; 4 × relay outputs |
| | H7 | CAN bus J1939 (requires M4) |
| 8 | | |
| | | Terminal 126-133, engine communication, inputs/outputs |
| | G9 | CANshare |
| | H5 | MTU (MDEC) + J1939 |
| | H6 | Cummins GCS |
| | H8.8 | External I/O modules |
| | M13.8 | 7 × digital inputs |
| | M14.8 | 4 × relay outputs |
| | M15.8 | 4 × 4 to 20 mA inputs |
| 9 | | |
| | | LED I/F |
| | Standard | Display connection; service port (USB); power LED; self check LED; alarm inhibit LED; EtherNet (option N) LED |
| 10 | | |
| | | EtherNet |
| | N | - Modbus TCP/IP - EtherNet/IP - SMS/e-mail alarms |

-  There can only be one hardware option in each slot. It is for example not possible to select option H2 and option H3 at the same time, because both options require a PCB in slot #2.
-  Besides the hardware options shown above, it is possible to select the software options mentioned in the paragraph "Available options".

1.9 Technical information and dimensions

1.9.1 Technical specifications

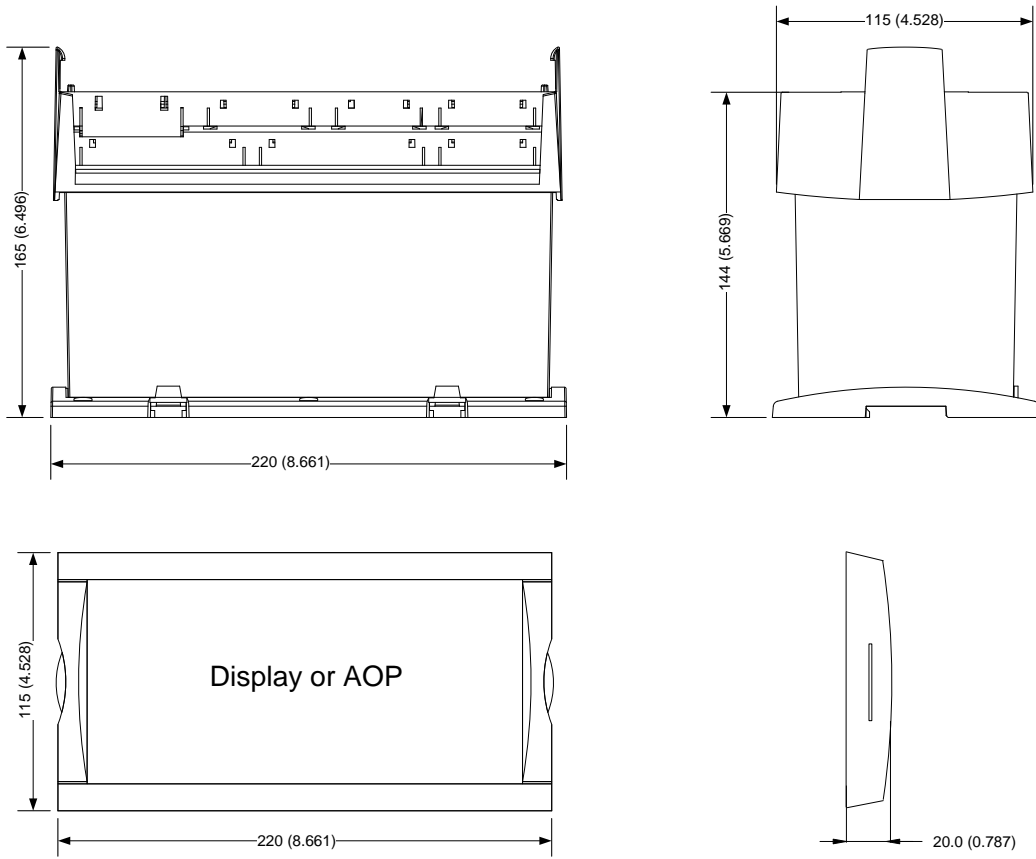
| | |
|------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Accuracy | <p>Class 1.0 -25 to 15 to 30 to 70 °C Temperature coefficient: +/-0.2 % of full scale per 10 °C</p> <p>Positive, negative and zero sequence alarms: class 1 within 5 % voltage unbalance Class 1.0 for negative sequence current Fast over-current: 3 % of 350 %*In Analogue outputs: class 1.0 according to total range Option EF4/EF5: class 4.0 according to total range To IEC/EN 60688</p> |
| Operating temperature | <p>-25 to 70 °C (-13 to 158 °F) With option N: -25 to 60 °C (-13 to 140 °F) (UL/cUL Listed: max. surrounding air temperature: 55 °C/131 °F)</p> |
| Storage temperature | -40 to 70 °C (-40 to 158 °F) |
| Climate | 97 % RH to IEC 60068-2-30 |
| Operating altitude | <p>0 to 4000 m above sea level Derating 2001 to 4000 m above sea level: Max. 480 V AC phase-phase 3W4 measuring voltage Max. 690 V AC phase-phase 3W3 measuring voltage</p> |
| Measuring voltage | <p>100 to 690 V AC +/-20 % (UL/cUL Listed: 600 V AC phase-phase) Consumption: max. 0.25 VA/phase</p> |
| Measuring current | <p>-/1 or -/5 A AC (UL/cUL Listed: from CTs 1 to 5 A) Consumption: max. 0.3 VA/phase</p> |
| Current overload | <p>4 × I_n continuously 20 × I_n, 10 s (max. 75 A) 80 × I_n, 1 s (max. 300 A)</p> |
| Measuring frequency | 30 to 70 Hz |
| Aux. supply | <p>Terminals 1 and 2: 12/24 V DC nominal (8 to 36 V DC operational). Max. 11 W consumption Battery voltage measurement accuracy: ±0.8 V within 8 to 32 V DC, ±0.5 V within 8 to 32 V DC @ 20 °C Terminals 98 and 99: 12/24 V DC nominal (8 to 36 V DC operational). Max. 5 W consumption 0 V DC for 10 ms when coming from at least 24 V DC The aux. supply inputs are to be protected by a 2 A slow-blow fuse (UL/cUL Listed: AWG 24)</p> |

| | |
|-------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Digital in-puts | Optocoupler, bi-directional ON: 8 to 36 V DC Impedance: 4.7 k Ω OFF: <2 V DC |
| Analogue inputs | 0(4) to 20 mA Impedance: 50 Ω . Not galvanically separated RPM (MPU): 2 to 70 V AC, 10 to 10000 Hz, max. 50 k Ω |
| Multi-inputs | 0(4) to 20 mA: 0 to 20 mA, +/-1 %. Not galvanically separated Binary: max. resistance for ON detection: 100 Ω . Not galvanically separated Pt100/1000: -40 to 250 $^{\circ}$ C, +/-1 %. Not galvanically separated. To IEC/EN 60751 RMI: 0 to 1700 Ω , +/-2 %. Not galvanically separated V DC: 0 to 40 V DC, +/-1 %. Not galvanically separated |
| Relay out-puts | Electrical rating: 250 V AC/30 V DC, 5 A. (UL/cUL Listed: 250 V AC/24 V DC, 2 A resistive load) Thermal rating @ 50 $^{\circ}$ C: 2 A: continuously. 4 A: t_{on} = 5 s, t_{off} = 15 s (Unit status output: 1 A) |
| Open col-lector out-puts | Supply: 8 to 36 V DC, max. 10 mA |
| Analogue outputs | 0(4) to 20 mA and +/-25 mA. Galvanically separated. Active output (internal supply). Load max. 500 Ω . (UL/cUL Listed: max. 20 mA output) Update rate: transducer output: 250 ms. Regulator output: 100 ms |
| Analogue load shar-ing lines | -5 to 0 to +5 V DC. Impedance: 23.5 k Ω |
| Galvanic separation | Between AC voltage and other I/Os: 3250 V, 50 Hz, 1 min. Between AC current and other I/Os: 2200 V, 50 Hz, 1 min. Between analogue outputs and other I/Os: 550 V, 50 Hz, 1 min. Between binary input groups and other I/Os: 550 V, 50 Hz, 1 min. |

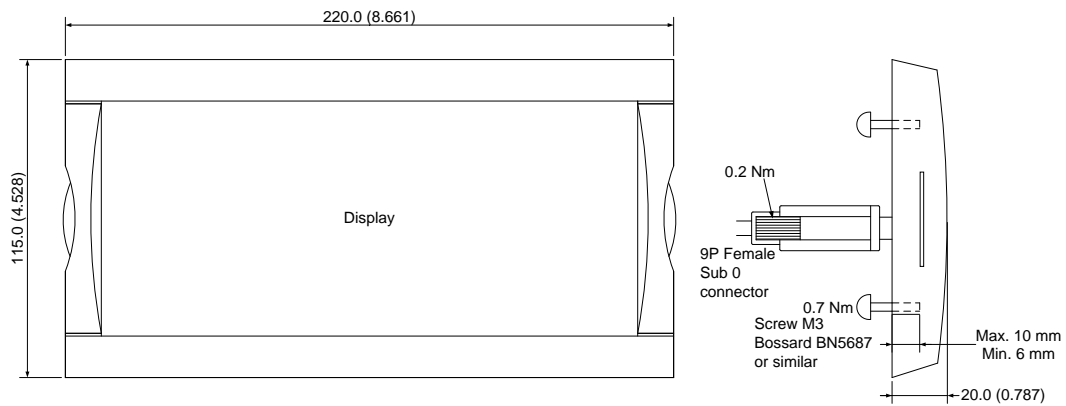
| | |
|------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <p>Response times (Delay set to min.)</p> | <p>Busbar: Over-/under-voltage: <50 ms Over-/under-frequency: <50 ms Voltage unbalance: <200 ms</p> <p>Generator: Reverse power: <200 ms Over-current: <200 ms Fast over-current: <40 ms Over-/under-voltage: <200 ms Over-/under-frequency: <300 ms Overload: <200 ms Current unbalance: <200 ms Voltage unbalance: <200 ms React. power import: <200 ms React. power export: <200 ms Overspeed: <400 ms Digital inputs: <250 ms Emergency stop: <200 ms Multi-inputs: <800 ms Wire failure: <600 ms</p> <p>Mains: df/dt (ROCOF): <130 ms (4 periods) Vector jump: <40 ms Positive sequence: <60 ms</p> |
| <p>Mounting</p> | <p>DIN-rail mount or base mount with six screws</p> |
| <p>Safety</p> | <p>To EN 61010-1, installation category (over-voltage category) III, 600 V, pollution degree 2 To UL 508 and CSA 22.2 no. 14-05, over-voltage category III, 600 V, pollution degree 2</p> |
| <p>EMC/CE</p> | <p>To EN 61000-6-2, EN 61000-6-4, IEC 60255-26. IEC 60533 Power distribution zone. IACS UR E10 Power distribution zone</p> |
| <p>Vibration</p> | <p>3 to 13.2 Hz: 2 mm_{pp}. 13.2 to 100 Hz: 0.7 g. To IEC 60068-2-6 & IACS UR E10 10 to 60 Hz: 0.15 mm_{pp}. 60 to 150 Hz: 1 g. To IEC 60255-21-1 Response (class 2) 10 to 150 Hz: 2 g. To IEC 60255-21-1 Endurance (class 2)</p> |
| <p>Shock (base mount)</p> | <p>10 g, 11 ms, half sine. To IEC 60255-21-2 Response (class 2) 30 g, 11 ms, half sine. To IEC 60255-21-2 Endurance (class 2) 50 g, 11 ms, half sine. To IEC 60068-2-27</p> |
| <p>Bump</p> | <p>20 g, 16 ms, half sine. To IEC 60255-21-2 (class 2)</p> |
| <p>Material</p> | <p>All plastic materials are self-extinguishing according to UL94 (V1)</p> |

| | |
|---------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <p>Plug connections</p> <p>Tightening torque</p> | <p>AC current: 0.2 to 4.0 mm² stranded wire. (UL/cUL Listed: AWG 18) AC voltage: 0.2 to 2.5 mm² stranded wire. (UL/cUL Listed: AWG 20) Relays: (UL/cUL Listed: AWG 22) Terminals 98 to 116: 0.2 to 1.5 mm² stranded wire. (UL/cUL Listed: AWG 24) Other: 0.2 to 2.5 mm² stranded wire. (UL/cUL Listed: AWG 24) Display: 9-pole Sub-D female Service port: USB A-B</p> <p>Refer to the "Installation Instructions"</p> |
| <p>Protection</p> | <p>Unit: IP20. Display: IP40 (IP54 with gasket: option L) Display: IP54 is required for RS-approved applications (UL/cUL Listed: Type Complete Device, Open Type). To IEC/EN 60529</p> |
| <p>Governors</p> | <p>Multi-line 2 interfaces to all governors including GAC, Barber-Colman, Woodward and Cummins. See interfacing guide at www.deif.com</p> |
| <p>Approvals</p> | <p>Marine-approved by all major classification societies UL/cUL Listed to UL508. UL/cUL Recognized to UL2200</p> |
| <p>UL markings</p> <p>Tightening torque</p> | <p>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)</p> <p>AOP-2: Maximum ambient temperature: 60 °C Wiring: use 60/75 °C copper conductors only Mounting: for use on a flat surface of type 3 (IP54) enclosure. Main disconnect must be provided by installer Installation: to be installed in accordance with the NEC (US) or the CEC (Canada)</p> <p>DC/DC converter for AOP-2: Wire size: AWG 22-14</p> <p>Refer to the "Installation Instructions"</p> |
| <p>Weight</p> | <p>Base unit: 1.6 kg (3.5 lbs.) Option J1/J3/J6: 0.2 kg (0.4 lbs.) Option J2: 0.4 kg (0.9 lbs.) Display: 0.4 kg (0.9 lbs.)</p> |

1.9.2 Unit dimensions in mm (inches)



Tightening torques



1.10 Order specifications and disclaimer

1.10.1 Order specifications

Variants

| Mandatory information | | | Additional options to the standard variant | | | | |
|-----------------------|------|-------------|--------------------------------------------|--------|--------|--------|--------|
| Item no. | Type | Variant no. | Option | Option | Option | Option | Option |
| | | | | | | | |

Example:

| Mandatory information | | | Additional options to the standard variant | | | | |
|-----------------------|--------------|-------------|--------------------------------------------|--------|--------|--------|--------|
| Item no. | Type | Variant no. | Option | Option | Option | Option | Option |
| 2912210030-05 | PPU-3 Marine | 05 | M4 | Y1 | H2 | | |

Accessories

| Mandatory information | | |
|-----------------------|------|-----------|
| Item no. | Type | Accessory |
| | | |

Example:

| Mandatory information | | |
|-----------------------|-----------------------|---------------------|
| Item no. | Type | Accessory |
| 1022040065 | Accessories for PPU-3 | USB cable, 3 m (J7) |

1.10.2 Disclaimer

DEIF A/S reserves the right to change any of the contents of this document without prior notice.

The English version of this document always contains the most recent and up-to-date information about the product. DEIF does not take responsibility for the accuracy of translations, and translations might not be updated at the same time as the English document. If there is a discrepancy, the English version prevails.