Product sheet

# PPU 300 Paralleling and Protection Unit controller

## About the PPU 300

PPU 300 is a configurable controller made for the marine industry. The controller has the necessary functions to protect and control a generator and its breaker. The controller design is modular and you can replace or add hardware modules.

You can order CODESYS as an add-on for the PPU 300 and use it to increase the number of controller functions. You can also use it to make custom CODESYS projects.

PICUS is a free PC software interface to the controllers. The designer can use PICUS to make a single-line diagram for the system, and configure inputs, outputs and parameters for a controller. You can also use PICUS for system emulation, supervision, and management of permissions, backups and firmware updates.

The PPU 300 has fast protection functions because of its processors and high-speed internal communication. You can configure the network communication for the IP address settings and for the type of Ethernet port and connection node.

The colour graphic screen shows status and information messages. You can also live data and alarms. Use the display to change the controller mode, close and open the breaker, and start and stop a genset. You can also configure parameters from the display.

## Controller types

**GENSET controller:** Controls and protects an engine, a generator, and the generator breaker.

**HYBRID controller:** Controls and protects an inverter with a power source, and the inverter breaker.

**SHAFT generator controller:** Controls and protects a system that includes a shaft generator.

**SHORE connection controller:** Controls and protects a system that includes a shore connection and a shore connection breaker.

**BUS TIE breaker controller:** Each BUS TIE breaker controller controls one bus tie breaker.

## Controller functions

### All-in-one controller

- Use the PPU 300 to control, monitor and protect a genset and its breaker
- Input and output modules in a metal rack
- Automatic configuration of the network (the controller uses IPv6)
- Automatic configuration of the input and output modules

### Engine and breaker control

- Engine communication with an ECU
- Automatic synchronisation and deloading of the breaker
- Idle run start and stop. You can configure the warm-up and cool-down periods.

### Software

- Software tool that is easy to use (PICUS)
- Logic configuration tool
- Emulation and supervision

### Settings and parameter functions

- Event and alarm log, with real-time clock
- Configured control settings
- The controller has password protection. You can configure the permission levels
- Alarm handling with latch and shelve functions

### Communication

- 5 × RJ45 ports
- Access all controllers on a network through one Ethernet connection

### General functions

- Load sharing with ring communication
- 3-phase AC measurement with a maximum of 690 V AC directly, class 0.5

### Display

- A 5" graphic display in high-resolution and colour with push-buttons
- There is help available in the controller display

## Key functions

### Configurable controller
- Configurable hardware modules
- Configurable input and output functions (digital and analogue)
- A maximum of 4 sets of nominal settings
- Configurable parameters for controller functions
- The operator can use different procedures to start controller sequences

### Plug and play
- Default parameter and input/output configuration
- Automatic date/time synchronisation of controllers in a system
- NTP time synchronisation with NTP servers

### Display
- A maximum of 2 display units (with interlock) for each controller
- It is easy to start sequences with the push-buttons
- Supports many languages

### Troubleshooting
- Free PC software you can use to connect to the controllers
- Single-line diagram tool for design, configuration and broadcast
- Adjustable application drawing, multiple ring connections
- You can configure the permission levels and passwords for groups and users
- Application emulation and supervision
- I/O status
- Record the trending trace values
- Maintenance of software for the controller and the display
- Supports many languages on the controller

### CustomLogic
- Logic configuration tool
- A maximum of 20 selectable input events and 20 output commands for each controller
- Communication between the controllers. A maximum of 16 inputs and 16 outputs for each controller
- A maximum of 20 Modbus signals (inputs and/or outputs) for each controller
- CustomLogic input/output added to Flexible Modbus

### Communication
- Static Internet Protocol version 6 (IPv6)
- Configurable Internet Protocol version 4 (IPv4)
- Configurable Ethernet port settings on PCM3.1
- CAN bus communication to an Engine Control Unit (ECU)
- DEIF network
- Internal communication (extension racks)
- Network (PICUS and Modbus)
- Controllers connected in a ring for communication redundancy
- Authentication (other equipment cannot disrupt communication)
- Password protection (customisable)

### Modbus
- Supports many different Modbus protocols
- Convert data units and scaling
- Configure Modbus server settings

### CODESYS
- Increase the number of functions with CODESYS

### Control modes
- Local, remote, and switchboard control

### Breaker control
- Open and close the breaker
- Synchronisation, dynamic and static
- Allow blackout close (configurable)
- The operator can start the synchronisation and de-loading
- Breaker types: Pulse breaker, Compact breaker, Continuous breaker
- Breaker position detection and alarms

### Load control
- Communication over the DEIF network
- GENSET controllers can have equal load sharing
- GENSET controllers can synchronise/de-load SHAFT generator, SHORE connection, and BUS TIE breaker controllers
- External bus tie breaker position feedback
- Automatic detection of load sharing busbar sections (including for a ring busbar)

### Redundancy
- DEIF network or Internal communication ring connection
- Controller commands and operation using the display unit, inputs, PICUS, Modbus and/or CustomLogic or CODESYS
- Redundant breaker feedback

### AC measurement averaging
- Use averaging filters (200 ms and 800 ms) to reduce the value fluctuations from the high performance of the measurement cards
- Averaging filter can be applied selectively to different types of measurements
- AC measurement averaging affects data displayed by DU300, PICUS, trending, CustomLogic, CODESYS, and Modbus
- AC measurement averaging does not affect protections and regulation values

### Engine interface safety shutdown
- EIM3.1 can be used as a safety shutdown module
- EIM3.1 can run the engine in stand-alone mode should it no longer be able to communicate with main processor card

### Engine interface communication
- Generic J1939 protocol
- Read information and control an Engine Control Unit (ECU)

### General functions
- Power supply voltage measurement diode offset

- Relay configuration (function, coil state)
- Analogue input sensor failure (below and above range)
- Analogue input pre-configured curves, plus up to 20 customisable curves
- Analogue output pre-configured curves, plus up to 20 customisable curves
- Display unit lamp test

## Hardware

A rack is an aluminium box that contains the hardware modules. Each controller has a rack and a number of hardware modules. The hardware modules are printed circuit boards that you can replace. The boards include power supply, control, measurement and I/O interfaces. In the rack for an I/O extension unit, one of the slots includes one more blanking plate. The hardware modules in the rack communicate through the rack backplane. Each rack includes two plates for cable strain relief and a number of cable tie slots.

### Racks

- Rack 7.1
  - PSM3.1 (Power supply module) and blind modules
  - 7 hardware modules
  - Dimensions: 230.1 x 199.9 x 139.3 mm
- Rack 4.1
  - PSM3.1 (Power supply module) and blind modules
  - 4 hardware modules
  - Dimensions: 146.1 x 199.9 x 139.3 mm

### Hardware modules

- Power supply module PSM3.1
  - 12 or 24 V
- Power supply module PSM3.2
  - 12 or 24 V
- Alternating current module ACM3.1
  - used to measure breaker current and voltage
- Differential current module ACM3.2
  - used to measure generator current
- Input/output module IOM3.1
  - 4 relay outputs and 10 digital inputs (configurable)
- Input/output module IOM3.2
  - 4 relay outputs, 4 analogue multifunctional outputs (including 2 PWM outputs), 4 digital inputs, and 4 analogue multifunctional inputs (configurable)
- Input/output module IOM3.3
  - 10 analogue multifunctional inputs (configurable)
- Input/output module IOM3.4
  - 12 transistor outputs and 16 digital inputs (configurable)
- Governor and AVR module GAM3.1
  - 4 relay outputs, 2 analogue outputs, 1 PWM output and 2 analogue inputs (configurable)
- Governor and AVR module GAM3.2
  - built-in power supply, 2 analogue outputs, 1 PWM output,1 status relay output, 4 relay outputs and 5 digital inputs (configurable)
- Engine interface module EIM3.1
  - built-in power supply, 4 relay outputs, 1 tacho input, 4 digital inputs and 3 analogue inputs (configurable)
- Processor and communication module PCM3.1

### Display unit DU 300

- Dimensions: 238.0 x 178.0 x 52.4 mm

## AC protections for the source

2 x Over-voltage..... ANSI 59
2 x Under-voltage..... ANSI 27
1 x Voltage unbalance..... ANSI 47
1 x Negative sequence voltage..... ANSI 47
1 x Zero sequence voltage..... ANSI 59N
2 x Over-current..... ANSI 51
2 x Fast over-current (short circuit)..... ANSI 50/51
2 x Current unbalance..... ANSI 46
1 x Inverse time over-current..... ANSI 51
2 x Directional over-current..... ANSI 67
1 x Negative sequence current..... ANSI 46
1 x Zero sequence current..... ANSI 51N
2 x Over-frequency..... ANSI 81O
2 x Under-frequency..... ANSI 81U
2 x Overload..... ANSI 32
2 x Reverse power..... ANSI 32R
1 x Overload reverse power *..... ANSI 32R
2 x Over-excitation (Reactive power export)..... ANSI 40O
2 x Under-excitation..... ANSI 40U
(Reactive power import/loss of excitation)
1 x Stabilised differential current protection **..... ANSI 87G
1 x High set differential current protection **..... ANSI 87G
Synchronisation check (including blackout close)..... ANSI 25

** Only for the HYBRID controller when it operates in PTI mode*

*** Available with Differential Current module ACM3.2*

## AC protections for the busbar

2 x Over-voltage..... ANSI 59
2 x Under-voltage..... ANSI 27
1 x Voltage unbalance..... ANSI 47
2 x Over-frequency..... ANSI 81O
2 x Under-frequency..... ANSI 81U

## Other AC protections

1 x Lockout relay..... ANSI 86
1 x Earth inverse time over-current..... ANSI 51G
1 x Neutral inverse time over-current..... ANSI 51N

## About the specifications

**More information**
See the **PPU 300 Data sheet** for the full technical specifications. You can find the data sheet here: www.deif.com/documentation/ppu-300/

## Electrical specifications

### Safety

- EN 61010-1, CAT III, 600V, pollution degree 2
- IEC/EN 60255-27, CAT III, 600V, pollution degree 2
- UL508
- UL6200
- CSA C22.2 No. 14-13
- CSA C22.2 No. 142 M1987

### Electromagnetic compatibility (EMC)

- EN 61000-6-3 Residential, commercial and light-industrial environments
- EN 61000-6-2 Industrial environments
- IEC/EN 60255-26
- IEC 60533 power distribution zone
- IACS UR E10 power distribution zone for controller rack
- IEC 60945 for display unit

### Load dump

- ISO 7637-2 pulse 5a

## Environmental specifications

### Humidity

- 97 % relative humidity, to IEC 60068-2-30

### Operating temperature

- Rack and modules: -40 to 70 °C (-40 to 158 °F)
- Display unit: -20 to 70 °C (-4 to 158 °F)
- UL/cUL Listed: max. surrounding air temp.: 55 °C (131 °F)

### Storage temperature

- Rack and modules: -40 to 80 °C (-40 to 176 °F)
- Display unit: -30 to 80 °C (-22 to 176 °F)

### Operating altitude

- 0 to 4000 m (13,123 ft).
- Refer to the module specifications for information on altitude derating above 2,000 m (6,562 ft).

## Mechanical specifications

### Vibration

- Operation:
  - 3 to 8 Hz: 17 mm peak-to-peak
  - 8 to 100 Hz: 4 *g*
  - 100 to 500 Hz: 2 *g*
- Response:
  - 10 to 58.1 Hz: 0.15 mm peak-to-peak
  - 58.1 to 150 Hz: 1 *g*
- Endurance:
  - 58 to 150 Hz: 2 *g*
- Seismic:
  - 3 to 8.15 Hz: 15 mm peak-to-peak
  - 8.15 to 35 Hz: 2 *g*
- IEC 60068-2-6, IACS UR E10, IEC 60255-21-1 (class 2), IEC60255-21-3 (class 2)

### Shock (base mounted)

- 10 *g*, 11 ms, half sine IEC 60255-21-2 Response (class 2)
- 30 *g*, 11 ms, half sine IEC 60255-21-2 Endurance (class 2)
- 50 *g*, 11 ms, half sine IEC 60068-2-27

### Bump

- 20 *g*, 16 ms, half sine IEC 60255-21-2 (class 2)

### Material

- All plastic materials are self-extinguishing as specified by UL94 (V0)

**NOTE** *g* refers to gravitational force (g-force).

## Approvals

- CE
- UL/cUL Listed to UL508 - Industrial Control Equipment, and CSA C22.2 No. 142 M1987 - Process Control Equipment
- UL/cUL Recognised to UL6200 - Controls for stationary engine driven assemblies, and CSA C22.2 No. 14-13 - Industrial Control Equipment

## Maritime classification societies approvals

**More information**
See www.deif.com for the newest approvals.

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