

TYPE APPROVAL CERTIFICATE

Certificate No. **Initial Approval**: 18th February, 2008 : CPH06107-AC004

Product : Power Management and Protection System

Manufacturer : DEIF A/S

Frisenborgvej 33, DK-7800 Skive, Denmark

Product Description: Type Power Management and Protection System (PPM & PPM-3)

Paralleling and Protection Unit (PPU-3) Generator Protection Unit (GPU-3)

"See Appendix 1 ~ 3 "

Approval Condition: 1. In case where this system is installed on board, the system drawings for individual vessel are to be approved by this Society.

2. Individual Product Certification is not required in case when the device based on this type approval certificate is assembled into a switchboard or another product to be delivered to a shipyard.

THIS IS TO CERTIFY that the above-mentioned product has been approved in accordance with the relevant requirement of this Society's Rules and / or of the recognized standards as follows and entered in the "List of Approved Manufacturers and Type Approved Equipment".

Pt. 6, Ch. 2, Art. 301 of the Rules for Classification, Steel Ships.

This Certificate is valid until 17th February, 2023 Issued at Busan, Korea on 27th February, 2018

AN REGISTER OF SHIPPING

General Manager o Marine & Ocean Equipment Team

Note: 1. This certificate will be valid subject to complying with the approval conditions described on the certificate and/or on the Rules of this Society.

2. This certificate will be invalid from the expiry date aforementioned unless the extension or renewal has been granted to the applicant or the manufacturer.

3. Any significant modifications or changes in design or construction to the above product without approval from this Society will render this certificate invalid.

4. Should the specified rules, regulations or standards be amended during the validity of this certificate, the product is to be re-approved by this Society in accordance with the requirements as amended.

Appendix 1

Product Description and/or Approval Condition

Certificate No: CPH06107-AC004 Date of Issue: 27th February, 2018

Product Description ;

- 1. PPU Power management (PPM)
 - 1) Basic function:
 - Power management, Generator/Busbar protection and Engine control
 - 2) PPM consisting of:
 - Main unit consists of a number of PCBs mounted in numbered slots.

Slot #2 External Comm. (option) Slot #4 Outputs for governor/AVR Slot #1 Power supply board Slot #3 Load sharing and I/O board

Slot #5 : AC measuring
Slot #7 : Engine interface board
J-2 : Operation and display panel Slot #6 1/0 board (option) Slot #8 | Internal CAN bus

- DU-2

- AOP, AOP-2: Additional operation and display panel
- 3) Possible configuration as following:
 system1: Min.;
 2 Diesel Generators
 Max:
 8 Diesel Generators 8 Diesel Generators Max.;
 - system2: Min.; 2 Diesel Generators, 1 Shaft Generator
 - Max.; 8 Diesel Generators, 1 Shaft Generator, 1 bus tie breaker

 system3: Min.; 2 Diesel Generators, 1 Shaft Generator, 1 bus tie breaker

 Max.; 8 Diesel Generators, 1 Shaft Generator, 1 bus tie breaker
- 4) Software:
 - Image. Ver.: 1.01.2, H8. Ver.: 2.52.0, Webarm. Ver.: 1.02.0
- 5) Documents and drawings:

Data Sheet No. 4921240291

Designer's Reference Handbook No. 4189340408 Installation Instructions No. 4189340409

Appendix 2

Product Description and/or Approval Condition

Certificate No: CPH06107-AC004 Date of Issue: 27th February, 2018

- 2. Protection Power Management (PPM-3)
 - 1) Basic function:
 - All breakers can be synchronised by choice
 - Load-dependent start/stop operation
 - Priority selection of gen-sets
 - Redundant communication between the controllers
 - Plant divided into sections for individual functionality
 - Load transfer
 - Heavy consumer management
 - Multi-master system
 - 2) The plant operational modes supported by the power management options are:
 - Diesel generator operation
 - Shaft generator operation
 - Shore connection operation
 - Split busbar(s) operation
 - Emergency/harbour generator operation
 - * The PPM is a power management system able to handle applications with up to 8 bus tie breakers (BTB), 16 diesel generators (DG), 1 emergency generator (EDG), 2 shaft generators (SHAFT), 2 shore connections (SHORE)

 - 3) Signal Interface:
 Slot #1: Power supply
 - Slot #2 External Comm.
 - Slot #2 External comm.
 Slot #3 Load sharing, in-/outputs
 Slot #4 Governor, AVR, in-/outputs
 Slot #5 AC measuring
 Slot #6 In-/outputs
 Slot #7 Engine I/F

 - Slot #8 : Engine comm., in-/outputs
 Ethernet : TCP/IP Modbus comm.
 LED I/F : Display connection

 - * Additional operator panel : AOP-1, AOP-2
 - 4) Software version 3.0x.x
 - 5) Documents and drawings:

DEIF type certificate PPM-3 : 4124030053C

Document No. : 4921240337A, 4189340447B, 4189340557A, 4189340559A, 4189340460A

Type Test Report : IPA 0272-1

< To be continued >

Appendix 3

Product Description and/or Approval Condition

Certificate No: CPH06107-AC004 Date of Issue: 27th February, 2018

- 3. Paralleling and Protection Unit (PPU-3)
 - 1) Basic function & descriptions :
 - Generator Protection, Synchronization and Governor Regulation
 - Engine Control and Protection (Option) - Same Multi-line 2 hardware as PPM-3
 - 2) Technical specifications
 - Measuring Voltage : 100/110 V AC $^{\sim}$ 690 V AC (\pm 20 %) Auxiliaary Supply Voltage : 12/24 V DC (8 $^{\sim}$ 36 V DC)
 - 3) Regulation modes
 - Fixed Frequency
 - Fixed Power
 - Frequency Droop
 - Load Sharing
 - 4) Software version 3.1x.x
 - 5) Optaional fucntion

 - Load sharing on CAN-bus (Slot #8, Option G9)
 Documents: FMEA file no. FMEA PPU-3 jst20111201
 Witness Test Report no. EPC0458-02/03/04 Data sheet no. 4921240354E Spec no. PPU/GPU-3 V3.06.0
- 4. Generator Protection Unit (GPU-3)
 - 1) Basic function & Descriptions :
 - Generator Protection
 - Engine Control and Protection (Option)
 - Same Multi-line 2 hardware as PPM-3
 - 2) Technical specifications
 - Measuring Voltage : 100/110 V AC $^{\sim}$ 690 V AC (± 20 %) Auxiliaary Supply Voltage : 12/24 V DC (8 $^{\sim}$ 36 V DC)
 - 3) Software version 3.1x.x
 - 4) Documents and Drawings (GPU-3 & PPU-3):
 - Document No. : 4921240354, 4124030042, 4189340583, 4189340621 for PPU-3,
 - 4921240352, 4124030048, 4189340584, 4189340620 for GOU-3

 - Shared document No. : 4189340149, 4189340556, 4189340451, 4189340582, 1000000341uk, 4189340579, 4189340582, 4910290040, 20100108 : IPA0272-1, IPA0272-3, IPA0275, 4A-200909024, 13B-200909024, 15B-200909024, 16B-200909024, 2A-20091013, 12A-20091013, 14A-20091013, 16A-20091013, 1B-20091013, 2B-20091013, 20091013, 20091013, 5B0-PPU-3, 6A0-PPU-3, 6B0-PPU-3, 7B0-PPU-3, 9A0-PPU-3, 14A0-PPU-3, 15A0-PPU-3

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