

TYPE APPROVAL CERTIFICATE

This is to certify:**That the Power Management System**with type designation(s)
Multi-line 300

Issued to

DEIF A/S
Skive, Midtjylland, Denmark

is found to comply with

DNV GL rules for classification – Ships, offshore units, and high speed and light craft**Application :****Product(s) approved by this certificate is/are accepted for installation on all vessels classed by DNV GL.****Location classes:****Temperature B****Humidity B****Vibration A****EMC A****Enclosure Required protection according to DNV GL Rules shall be provided upon installation on board**Issued at **Høvik** on **2019-02-12**This Certificate is valid until **2021-02-11**.DNV GL local station: **Aalborg**for **DNV GL**Approval Engineer: **Bartosz Kabak**.....
Jan Tore Grimsrud
Head of Section

This Certificate is subject to terms and conditions overleaf. Any significant change in design or construction may render this Certificate invalid. The validity date relates to the Type Approval Certificate and not to the approval of equipment/systems installed.



Place of system modules manufacture

DEIF A/S

Skive
Denmark

Product description

Multi-line 300 product line is built as modular basemounted hardware platform ranging from simple stand-alone units for generator / bus-tie / shore connection / shaft breaker protection to integrated power management systems. Flexible units can be expanded with input and output modules. The units are designed for the following applications:

GPU 300 (Generator Protection Unit) combines the following basic functions:

- Breaker trip and alarms
- Synchronization check
- Breaker close (external command)
- Breaker position detection

PPU 300 (Paralleling and Protection Unit) has in addition to GPU 300 the following basic functions:

- Breaker open and close (external command)
- Synchronization (dynamic and static) and deloading
- Diesel generator start and stop commands
- Load sharing (isochronous, over DEIF Ethernet ring network)

PPM 300 (Protection & Power Management) has in addition to PPU 300 the following basic functions:

- Load-dependent start and stop of generators
- Generators priority selection
- Automatic blackout recovery
- Heavy consumer function
- Stop of non-connected generator

The hardware building blocks for a Multi-line 300 system are the following modules:

- Power supply module PSM3.1
- Alternating current module ACM3.1
- Input output module IOM3.1 and IOM3.4
- Engine interface module EIM3.1 (PPU 300 and PPM 300 only)
- Governor and AVR module GAM3.1 and GAM3.2 (PPU 300 and PPM 300 only)
- Processor and communication module PCM3.1
- Display unit DU 300

The following alarm and protection functions as defined by ANSI are available:

Protection function	ANSI no.	Levels
Over-voltage U>, U>>	59	2
Under-voltage U<, U<<	27	2
Voltage unbalance UUB>	47	1
Over-current 3I>, 3I>>	50TD	2
Fast over-current 3I>>>	50/50TD	2
Current unbalance IUB>	46	1
Inverse time overcurrent It>	51	1
Over-frequency f>, f>>	81O	2
Under-frequency f<, f<<	81U	2
Directional power P>, P>>	32	2
Reverse power P<, P<<	32R	2
Reactive power export Q>, Q>>	40O	2
Reactive power import Q<, Q<<	40U	2
Earth inverse time over-current It>	51G	1
Synchronisation	25	n.a.

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 Revision No: **2**

Over-voltage U>, U>>	59	2
Under-voltage U<, U<<	27	2
Voltage unbalance UUB>	47	1
Over-frequency f>, f>>	81O	2
Under-frequency f<, f<<	81U	2

Software is identified by the following versions:

	GPU 300	PPU 300	PPM 300
Application software	1.0.x.x	1.0.x.x	1.0.x.x
PSM 3.1		2.0.x.x	
ACM 3.1		4.1.x.x	
IOM 3.1		N/A	
IOM 3.4		N/A	
PCM 3.1		N/A	
EIM 3.1		2.0.x.x	
GAM 3.1		2.0.x.x	
GAM 3.2		2.0.x.x	
DU 300		1.0.x.x	

Software revisions valid for this approval are placed in DEIF Software Quality Plan documents for Multi-line 300.

Project specific functions are achieved by setting limits for alarms and parameters.

Application/Limitation

1. The Type Approval is valid for systems made by production facilities listed under Place of Manufacture
2. The Type Approval covers hardware and software listed under Product description
3. The Type Approval does not cover functions implemented in CustomLogic. Any functions implemented therein shall be documented on case-by-case basis
4. For ships with additional class notations DYNPOS(AUTR), DYNPOS(AUTRO), RP(2,x)+ and RP(3,x)+, PPM 300 is suitable for open bus configurations only (closed bus configuration is not supported)
5. For high speed vessels category B (ref. Pt.4 Ch.8 Sec.2 [6]) and for ships with additional class notations DYNPOS(AUTR) or DYNPOS(AUTRO) (ref. Ship Rules Pt.6 Ch.3 Sec.2 [8.4]) the PPM 300 system must be configured so as to ensure that the power management functions are active for each busbar section when the bus-tie breaker is open. Also, the communication network between DGUs for one busbar section must not be affected by a defective communication network for the other busbar section

Product certificate

For a GPU 300 and PPU 300: as long as the delivered system is covered by this Type Approval (functions listed in product description), a product certificate according to Pt.4 Ch.9 Sec.1 is not required. If additional functions are implemented in CustomLogic, certification may be required. Correct configuration and set up for the delivery to be tested during commissioning after installation onboard.

For PPM 300 systems: each system to be certified according to Pt.4 Ch.9 Sec.1. The certification test is to be performed before the system is installed onboard at the company defined as responsible for the system, typically at the switchboard manufacturer. The product certificate must identify this Type Approval Certificate and the parameter settings for the specific project. After the certification the clause for application software control will be in force.

The following documentation of the actual application is to be submitted for approval in each case:

- Reference to this Type Approval Certificate
- System block diagram
- Power supply arrangement (may be part of the System block diagram)
- List of hardware and software modules as identified in this Type Approval Certificate

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- Functional description (for PPM 300)
- Functions implemented in CustomLogic (when applicable)
- List of implemented alarm and protection functions (ref. the ANSI list above) with proposed limits and time delays
- Software versions used in specific delivery
- Test program for the certification test (for PPM 300 and when certification is specifically required for GPU 300 and PPU 300)

Software update notification

When the type approved software is revised (affecting all future deliveries) DNV GL is to be informed by forwarding updated software version documentation. If the changes are judged to affect functionality for which rule requirements apply a new functional type test may be required and the certificate may have to be renewed to identify the new software version.

Type Approval documentation

Tests carried out

Applicable tests according to Standard for Certification No. 2.4, April 2006.

Functional Type Tests on a representative 4 generator / 2 bus-tie breakers / shaft generator / emergency generator system at DEIF's test bench on 2017-07-25 to 2017-07-26.

Functional Type Tests on a representative 2 generator / 1 shore connection at DEIF's test bench on 2018-11-21.

Network Storm test on a representative 2 generator / 1 shore connection at DEIF's test bench on 2018-11-21.

Marking of product

Each module shall be externally marked to enable identification in accordance with the documentation and be marked with the manufacturer's name.

Periodical assessment

The scope of the periodical assessment is to verify that the conditions stipulated for the type are complied with, and that no alterations are made to the product design or choice of systems, software versions, components and/or materials.

The main elements of the assessment are:

- Ensure that type approved documentation is available
- Inspection of factory samples, selected at random from the production line (where practicable)
- Review of production and inspection routines, including test records from product sample tests and control routines
- Ensuring that systems, software versions, components and/or materials used comply with type approved documents and/or referenced system, software, component and material specifications
- Review of possible changes in design of systems, software versions, components, materials and/or performance, and make sure that such changes do not affect the type approval given
- Ensuring traceability between manufacturer's product type marking and the type approval certificate

A renewal assessment will be performed at renewal of the certificate.

END OF CERTIFICATE