

# 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:**

<b>Temperature</b>	<b>B</b>
<b>Humidity</b>	<b>B</b>
<b>Vibration</b>	<b>A</b>
<b>EMC</b>	<b>A</b>
<b>Enclosure</b>	<b>Required protection according to DNV GL Rules shall be provided upon installation on board</b>

Issued at **Høvik** on **2020-09-21**

for **DNV GL**

This Certificate is valid until **2022-09-20**.

DNV GL local station: **Denmark CMC**

Approval Engineer: **Bartosz Kabak**

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**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.

LEGAL DISCLAIMER: Unless otherwise stated in the applicable contract with the holder of this document, or following from mandatory law, the liability of DNV GL AS, its parent companies and subsidiaries as well as their officers, directors and employees ("DNV GL") arising from or in connection with the services rendered for the purpose of the issuance of this document or reliance thereon, whether in contract or in tort (including negligence), shall be limited to direct losses and under any circumstance be limited to 300,000 USD.



## 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 modules ACM3.1 and ACM3.2
- Input output modules 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.

Job Id: **262.1-026589-3**  
 Certificate No: **TAA00001K7**  
 Revision No: **3**

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
Generator Differential	87G	1

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
PSM3.1		2.0.x.x	
ACM3.1		4.1.x.x	
ACM3.2		1.0.x.x	
IOM3.1		N/A	
IOM3.4		N/A	
PCM3.1		N/A	
EIM3.1		2.0.x.x	
GAM3.1		2.0.x.x	
GAM3.2		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
6. EMC in the range 2 GHz to 6 GHz according to DNVGL-CG-0339, December 2019 has not been documented. EMC up to 6 GHz must additionally be documented for installation on ships contracted for construction on or after 2022-01-01

### 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.

Job Id: **262.1-026589-3**  
Certificate No: **TAA00001K7**  
Revision No: **3**

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
- 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**

Document	Reference	Revision
GPU 300 Data sheet	4921240530	B
GPU 300 Designer's handbook	4189341032	A
PPU 300 data sheet	4921240563	F
PPU 300 designer's handbook	4189341097	A
ACM3.1	4157200505	E
EIM3.1	4157200507	H
GAM3.1	4157200508	E
IOM3.1	4157200509	E
PCM3.1	4157200504	I
PSM3.1	4157200503	I
FMEA Test Report for PPM 300	4341040195	A
PPM 300 Designer's handbook	4189341097	A
PPM 300 FAT	1.0.6.0	-
Software Quality Plan for PPM 300	1.0.7.0	-
Software Quality Plan for PPM 300	1.0.7.1	-
PPM 300 FAT (retesting to address items from punch list)	1.0.7.0	-
Control panel DU 300 Summary report IACS	IPA0331	-
PPM 300 Control Rack including DU 300 panel, Summary report IACS	IPA0331-05	-
5_Backplane_Schematic 3.1	4157200502	C
1_DU300 Schematic	4157200501	C
FMEA ML 300 BU (PPM 300 variant)	IPA0331_SFMEA	-
FMEA Hardware PPM300	IPA0331_HWFMEA	2015-03-03
PPM 300 Data sheet	4921240464	J
IEC 60255 Performance test	-	-
GAM 3.2 Data sheet	4921240558	A
IOM34 data sheet	4921240557	A
IPA 311-11 test data_1	4910211100	D
T600678 Rev. A - DANAK-1917105- DEIF AS - EMC immunity test of ML300	DANAK-19/17105	A
GAM 3.2 module design	-	1
IOM 3.4 module design	-	1
HFMEA	IPA0331_HFMEA_ML 300_180920	180910

Job Id: **262.1-026589-3**  
Certificate No: **TAA00001K7**  
Revision No: **3**

SFMES	IPA0331_SFMEA_ML 300_180920	180917
PPU 300 Witness test	2018-11-21	-
PPM 300 Witness test	2018-11-21	-
PPU300 FAT on Network Storm DNV GL	2018-11-21	-
CP according note from PPM 300	CP10202	-
Declaration of Conformity	DoC 491029010	E
4157200559D_Core_ACM32	1A2	D
4157200559D_Variant_ACM32	1A3	D
BOM-2244600150A smd	1A4	A
BOM-2244600150A leaded	1A5	A
1044600150D_ACM32_Assy_bot	1A6	D
1044600150D_ACM32_Assy_top	1A7	D
415700559_ACM32_REVD Layout	1A8	D
Test data for ACM3.2	IPA 331-26 A	A
Test data for ACM3.2	IPA 331-26 B	A
Test data for ACM3.2	IPA 331-26 C	A
Signed witness test	0897	001
PDF_ml300_auto_Loop1_Operate_characteristic__Default_curve_-_Test_40Hz_50Hz	2019-10-07	A
PDF_ml300_auto_Loop1_Operate_characteristic__Default_curve_-_Test_47,5Hz_50Hz	2019-10-08	A
PDF_ml300_auto_Loop1_Operate_characteristic__Default_curve_-_Te	2019-10-08	A
PDF_ml300_auto_Loop1_Operate_characteristic__Default_curve_-_Test_48,5Hz_60Hz	2019-10-07	A
PDF_ml300_auto_Loop1_Operate_characteristic__Default_curve_-_Test_57Hz_60Hz	2019-10-07	A
PDF_ml300_auto_Loop1_Operate_characteristic__Default_curve_-_Test_52,5Hz_50Hz	2019-10-07	A
PDF_ml300_auto_Loop1_Operate_characteristic__Middle_curve_-_T	2019-10-07	A
PDF_ml300_auto_Loop1_Operate_characteristic__Default_curve_-_Test_60Hz_60Hz	2019-10-03	A
PDF_ml300_auto_Loop1_Operate_characteristic__Default_curve_-_Test_61,25_50HzHz	2019-10-07	A
PDF_ml300_auto_Loop1_Operate_characteristic__Default_curve_-_Test_70Hz_60Hz	2019-10-08	A
PDF_ml300_auto_Loop1_Operate_characteristic__Minimum_curve_-_Test_50Hz_50Hz	2019-10-02	A
PDF_ml300_auto_Loop1_Operate_characteristic__Maximum_curve_-_Test_50Hz_50Hz	2019-10-02	A
PDF_ml300_auto_Loop1_Operate_characteristic__Middle_curve_-_Test_60Hz_60Hz	2019-10-08	A
PDF_ml300_auto_Loop1_Operate_characteristic__Minimum_curve_-_Test_60Hz_60Hz	2019-10-08	A
PDF_ml300_auto_Loop1_Operate_characteristic__Maximum_curve_-_Test_60Hz_60Hz	2019-10-03	A
PDF_ml300_auto_Loop1_Operate_characteristic__Default_curve_-_Test_50Hz_50Hz	2019-10-07	A
Verification Statement N141ZAT3-A0857277 (02B RF EM field immunity + 16A Radiated disturbance of RMV-142D)	2020-05-05	2
02B RF electromagnetic field immunity ML300	2020-05-06	A
02B RF electromagnetic field immunity DU300	2020-05-07	A
16A Radiated disturbance ML300	2020-05-11	A
16A Radiated disturbance DU300	2020-05-11	A

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### **Tests carried out**

Applicable tests according to class guideline DNVGL-CG-0339, December 2019.

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.

Functional Type Tests on representative configuration at DEIF's test bench on 2020-05-05

### **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