DNV·GL

Certificate No:
TAA00000VH

TYPE APPROVAL CERTIFICATE

This is to certify:

That the Power Management System

with type designation(s)
Delomatic 4

Issued to
DEIF A/S
SKIVE, 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	**B***

*** for display and operation panels only,**
for mounting rack and PCB-modules required protection according to the Rules to be provided upon installation on board

This Certificate is valid until **2018-11-28**.

Issued at **Høvik** on **2016-11-29**

for **DNV GL**

DNV GL local station: **Aalborg**

Approval Engineer: **Bartosz Kabak**

Odd Magne Nesvåg
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.

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Job Id:
Certificate No: **TAA00000VH**

Place of system modules manufacture

DEIF A/S
Skive
Denmark

Product description

The Delomatic 4 system is based on the following hardware modules:

- PCM 4-1 and PCM 4-5, power supply, control and communication i/f module
- IOM, input /output module with 16 AI/DI, 12 RO and 2 AO
- SCM 4-1 and SCM 4-2, synchronising, control and 3-phase AC measuring module, and optionally (SCM 4-2) outputs for control of governor and AVR
- DU, operation and display panel with LCD and pushbuttons
- AOP, additional operation and display panel, with LEDs and pushbuttons (AOP-1 mounted next to the DU, AOP-2 up to 500 m away)

The display/operation units (DU/AOP) are for flush-mounting in panel fronts. The other modules are mounted in DGU-racks. Four different rack-sizes are available to match the number of IOMs/SCMs (up to 4 SCMs per rack). Maximum number of DGU-racks per system is 15.

The same project specific software is installed in all PCMs. The software is identified by project, version and revision numbers. These numbers together with the download date and time can be displayed in the DU. The software is uniquely identified by project and version.

A system will include one or more of the following functions:

- multifunction circuit protection
- voltage and frequency monitoring for generators and busbars
- diesel engine protection
- AC metering
- power management including load dependent start/stop with priority, auto-synchronising, symmetrical/asymmetrical load sharing, trip of non-essential consumers, blackout restoration sequence, heavy consumer control, etc.

The following software modules are covered by the Type Approval:

1.1 Internal System Supervision – Basic Arcnet Feature
1.2 Internal System Supervision – Split Arcnet Feature
2.1 Power Management Functions Basic Plant Mode
2.2 Power Management Functions Split Plant Mode
2.3 Power Management Functions Thruster Control
2.4 Power Management Functions Heavy Consumer
3.1 Diesel Generator Control Functions
3.2 Diesel Generator Protection Functions
4.1 Tie Breaker Control Functions
4.2 Tie Breaker Protection Functions
5.1 Shaft Generator/Shore Connection Control Functions
5.2 Shaft Generator/Shore Connection Protection Functions
6.1 Aux. Tie Breaker Control Functions
6.2 Man. Tie Breaker Supervision Functions
6.3 Shore Connection Breaker Supervision Functions
6.4 Aux. Circuit Breaker Supervision Functions
7.1 Emergency/Harbour Generator Control Functions
7.2 Emergency/Harbour Generator Protection Functions
8.1 User Interface Functions - Display Units and Additional Operation Panels AOP’s
9.1 Alarm Handling Functions
10.1 Data Communications Interface Functions – Modbus Communication
10.2 Data Communications Interface Functions – CAN Open Communication
10.3 Data Communications Interface Functions – Engine Communication

10.4 Project Specific Data Communications Interface Functions

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

Protection function	**ANSI no.**	**Levels**
Speed supervision device	(15)	1 step
Overexcitation	(24)	2 steps
Synchronous check device	(25)	1 step
Automatic synchronizing	(25 A)	
Generator undervoltage	(27)	1 step
Busbar undervoltage	(27 B)	2 steps
Generator overload	(32)	2 steps
Generator reverse power	(32_R)	2 steps
Loss of excitation	(40)	2 steps
Current unbalance	(46)	1 steps
Phase sequence voltage	(47)	1 step
Circuit breaker failure	(50BF)	1 step
Generator overcurrent	(50)	4 steps
Overcurrent, def. time, IDMT	(51)	
Voltage-dependent overcurrent	(51V)	1 curve
Generator overvoltage	(59)	2 steps
Busbar overvoltage	(59 B)	2 steps
Voltage unbalance	(60)	1 steps
Number of start	(66)	
Blocking (engine start/synchronisation)	(68)	1 step
Auto reclosing	(79)	
Generator overfrequency	(81)	2 steps
Generator underfrequency	(81)	2 steps
Busbar overfrequency	(81 B)	2 steps
Busbar underfrequency	(81 B)	2 steps
Locking-out relays, electronic	(86)	Several
Speed, frequency and active load control device	(90)	
Volt and reactive load control device	(90)	
Tripping relay	(94)	
Advanced generator protection: - Engine, governor or fuel failure - Generator or AVR failure	(95)	

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 possibility of protecting more than one circuit by a single DGU is not to be used when the separation requirements in Pt.4 Ch.8 Sec.2 [7.2.1] a) to c) applies: "Each separate circuit shall be protected against overcurrent and short circuit (Interpretation of SOLAS Ch. II-1/45.6.1).
4. For high speed vessels category B (ref. Pt.4 Ch.8 Sec.2 [6]) the Delomatic-4 system must be configured so as to ensure that the power management functions are active for each busbar section when the bustie 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.

Documentation requirement:
For each delivery where the product is included (typically a switchboard) the following information related to the Delomatic-4 system is to be submitted for approval:

- 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 including functions provided through AOP(s) if provided
- Project specific list of control and monitoring points (I/O list)
- List of implemented alarm and protection functions (ref. the ANSI list above) with proposed limits and time delays
- Test program for test at DEIF, the switchboard maker or onboard as applicable

Product certificate
Each delivery of the application system is to be certified according to Pt.4 Ch.9 Sec.1. The certification test is to be performed before the system is shipped to the yard, that is, at the manufacturer of the application system or at the switchboard manufacturer if agreed and adequate system competence and test facilities are available here. If certified together with the switchboard a combined control system and switchboard certificate may be issued. The certificate must identify this Type Approval Certificate plus the firmware by versions and date. After the certification the clause for application software control will be in force:

Clause for application function control
All changes in software are to be recorded as long as the system is in use on board. The records of all changes are to be forwarded to DNV GL for evaluation and approval. Major changes in the software are to be approved before being installed in the computer. Certification of Application Functions may be required.

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 Certification Notes 2.4, May 1995.
Functional Type Tests on a representative 4 generator / single bustie breaker system at DEIF's test bench during 2007.03.27-28.

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

Periodical assessment is to be performed at least every second year and at renewal of this certificate.

END OF CERTIFICATE