

# TYPE APPROVAL CERTIFICATE

## This is to certify:

**That the Generator Automation System**

with type designation(s)  
**ECU 100 / GCU 100**

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 Required protection according to relevant rules shall be provided upon installation on board**

This Certificate is valid until **2019-02-12**.

Issued at **Høvik** on **2017-02-13**

DNV GL local station: **Aalborg**

for **DNV GL**

Approval Engineer: **Bartosz Kabak**

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**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.

## Place of system modules manufacture

### DEIF A/S

Skive  
Denmark

## Product description

The ECU 100 and GCU 100 series of products (ECU110, GCU111, GCU112, GCU113) are built for basic control, monitoring and protection of marine engines and generator sets. The variants and functions covered by this type approval are as follows:

| Function                            | ECU<br>110 | GCU<br>111 | GCU<br>112 | GCU<br>113 |
|-------------------------------------|------------|------------|------------|------------|
| Engine start/stop                   | X          | X          | X          | X          |
| Engine monitoring and protection    | X          | X          | X          | X          |
| CANbus engine communication, J1939  | X          | X          | X          | X          |
| Modbus communication, RS485         | X          | X          | X          | X          |
| Programmable logic, M-logic         | X          | X          | X          | X          |
| Remote annunciator support, AOP-2   | X          | X          | X          | X          |
| Multiple language support           | X          | X          | X          | X          |
| Event and alarm log                 | X          | X          | X          | X          |
| Integrated emulation software       | X          | X          | X          | X          |
| Generator monitoring and protection |            | X          | X          | X          |
| Breaker control                     |            |            | X          | X          |
| Emergency genset control            |            |            |            | X          |

The ECU/GCU is intended for the following engine types:

| Engine manufacturer | Engine controller / type                                             |
|---------------------|----------------------------------------------------------------------|
| Caterpillar         | ADEM III and A4/C4.4, C6.6, C9, C15, C18, C32                        |
| Cummins             | CM850/570/2150/2250, QSL, QSB5, QXL15 and 7, QSM11, QSK19, 50 and 60 |
| Detroit Diesel      | DDEC III and IV/Series 50, 60 and 2000                               |
| Deutz               | EMR3, EMR 2 (EMR)/912, 913, 914 and L2011                            |
| Iveco               | EDC7 (Bosch MS6.2)/Series NEF, CURSOR and VECTOR 8                   |
| John Deere          | JDEC/PowerTech M, E and Plus                                         |
| MTU                 | MDEC, module M.302 or M.303/Series 2000 and 4000                     |
| MTU                 | MDEC, module M.201 or M.304/Series 2000 and 4000                     |
| MTU                 | ADEC/Series 2000 and 4000 (ECU7)                                     |
| MTU                 | J1939 Smart Connect/Series 1600 (ECU8)                               |
| Perkins             | Series 1100, 1300, 2300, 2500 and 2800                               |
| Scania              | EMS                                                                  |
| Scania              | EMS S6 (KWP2000)/Dx9x, Dx12x, Dx16x                                  |
| Volvo Penta         | EDC4                                                                 |
| Volvo Penta         | EMS                                                                  |
| Volvo Penta         | EMS 2 and EDCIII/D6, D7, D9, D12 and D16 (GE and AUX variants only)  |

The following alarm and protection functions as defined by ANSI are available in the GCU units:

| Protection function       | ANSI | Levels  |
|---------------------------|------|---------|
| Generator reverse power   | 32   | 2 steps |
| Generator over-current    | 50   | 2 steps |
| Fast over-current         | 51   | 2 steps |
| Generator over-voltage    | 59   | 2 steps |
| Generator under-voltage   | 27   | 2 steps |
| Generator over-frequency  | 81   | 2 steps |
| Generator under-frequency | 81   | 2 steps |
| Busbar over-voltage       | 59B  | 2 steps |
| Busbar under-voltage      | 27B  | 2 steps |
| Busbar over-frequency     | 81B  | 2 steps |

|                        |     |         |
|------------------------|-----|---------|
| Busbar under-frequency | 81B | 2 steps |
| Generator overload     | 32  | 2 steps |
| Current unbalance      | 46  | 1 step  |
| Voltage unbalance      | 60  | 1 step  |
| Over-excitation        | 24  | 1 step  |
| Loss of excitation     | 40  | 1 step  |

Software version 1.0x.x.

### 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. For engine types different than specified in the Product description, case by case evaluation will be carried out and certification according to Pt.4 Ch.9 Sec.1 [1.2.3] may be required.
3. Rule requirements for independent prime mover safety functions are to be fulfilled. Such required safety functions are to be implemented in a separate unit or in another independent system. Single ECU/GCU unit serving both start/stop and protection functions is not fulfilling those independency requirements.
4. When GCU 100 is used for emergency generator application, factory settings for trip functions shall be modified so as to comply with requirements for protective functions of emergency generator sets in Pt.4 Ch.8 Sec.2 [3.3.2]
5. Engine alarm and monitoring points are not in scope of this Type Approval and shall be checked in each case during approval of relevant documentation for engine control and monitoring system
6. The Type Approval does not cover functionality of M-Logic. Any functions implemented in M-Logic shall be documented. If functions affect rule requirements, certification will be required according to Pt.4 Ch.9 Sec.1 [1.2.3].

#### Documentation requirement:

For each delivery where the product is included the following information related to the application system is to be submitted for approval:

- Reference to this type approval certificate
- System block diagram/single line diagram including power supply arrangement and all communication lines / interfaces to other systems/locations
- Functional description, describing overall application and functionality, any implemented M-logic, any parameter which is not according to default setting
- Project-specific list of ANSI protection functions from the table above (with proposed limits and time delays) in addition to functions provided through the AOP(s) if applicable

#### Product certificate

As long as the delivered system is covered by this type approval, a product certificate according to Pt.4 Ch.9 Sec.1 [1.2.3] is not required. Correct parameterization and functionality are to be tested during commissioning after installation on board.

#### 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.

Applicable tests according to IEC 60255-127/151.

Job Id:  
Certificate No: **TAA0000023**

Functional Type Tests on a representative system with one emergency generator/bus at DEIF's test bench during 2014.04.30.

### **Marking of product**

On front side of product, the product is marked as either "ECU 100" or "GCU 100". On rear side of product the variant is identified as "Type", e.g. GCU 113.

### **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