

TYPE APPROVAL CERTIFICATE

This is to certify:**That the Electrical Control System**

with type designation(s)

IREG Digital excitation system for synchronous machines

Issued to

**LST GmbH
Bremen, Germany**

is found to comply with

DNV GL rules for classification – Ships**Application :****Product(s) approved by this certificate is/are accepted for installation on all vessels classed by DNV GL.**

Temperature	B
Humidity	B
Vibration	A
EMC	A
Enclosure	Required protection according to the Rules shall be provided upon installation on board.

This Certificate is valid until **2021-11-29**.Issued at **Hamburg** on **2016-11-30**DNV GL local station: **Bremerhaven**Approval Engineer: **Jens Dietrich**for **DNV GL**

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Duy Nam Le
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.

Product description

Power supply: 18-36V_{DC} (rated: 24V_{DC})
6 free configurable I/O-slots for digital inputs, digital outputs, relays outputs, analog in-/outputs
24 digital inputs (24V) per board, up to 72
24 digital outputs (24V) per board, up to 72
8 digital relays outputs per board, up to 24
Configurable analog 16Bit I/O-board:
-8 channels per board, up to 24
-Options: Input, output, PT100/1000, thermocouple, counter
Machine voltage measurement (3phase, $\leq 480V_{AC}$, 16bit)
Machine current measurement (3phase, $\leq 6A_{AC}$, 16bit)
Machine frequency measurement (3phase, 5-400Hz, 16bit)
Grid voltage measurement (3phase, $\leq 480V_{AC}$, 16bit)
Grid frequency measurement (3phase, 5-400Hz, 16bit)
Communication interfaces
-Ethernet 10/100 Mbit
-USB (Type B)
-CAN-Bus, 3 channels
-Variable bus system (Profibus, Modbus TCP)

Automatic voltage regulator (AVR) with six regulation modes: Excitation current, stator voltage, reactive power (2 channels), power factor (2 channels)
Programmable logic controller (PLC)
Synchronization unit
Oscilloscope function
Configurable limiter functions: Set point, underexcitation, overexcitation, U/F (V/Hz), stator current, stator voltage
Power system stabilizer: IEEE Type PSS2A/B, PSS4B
Monitoring of rotating diodes
Touch display

Application/Limitation

The Type Approval covers hardware listed under Product description. When the hardware is used in applications to be classed by DNV GL, documentation for the actual application is to be submitted for approval by the manufacturer of the application system in each case. Reference is made to DNV GL Rules for Ships Pt.4 Ch.8, Electrical Installations.

If specified in the Rules, ref. Pt.4 Ch.8, the system in which the above listed hardware is used shall be delivered with a product certificate. For each such delivery the certification test is to be performed at the manufacturer of the application system before the system is shipped to the yard. The test shall be done according to an approved test program.

Type Approval documentation

Technical Specification rev. 21.11.2016; Test Report TREO 201-16, dated 2016-10-27; IREG Functional Test Report, dated 2016-11-04.

Tests carried out

Tests according Class Guideline DNVGL-CG-0339, Ed. Nov. 2015; Functional tests.

Marking of product

Nameplate showing company name, model type designation, FW version, serial no., power supply.

Job Id: **262.1-023627-1**
Certificate No: **TAA00000WY**

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