

TYPE APPROVAL CERTIFICATE**This is to certify:****That the Gas Detectors for Exhaust Gas Emissions**

with type designation(s)

Multigas Monitoring System G7000

Issued to

**Green Instruments A/S
Brønderslev Nordjylland, Denmark**

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.****Location classes:****Temperature A
Humidity B
Vibration A/B*
EMC A
Enclosure B, IP55
*B for Probe**Issued at **Hamburg** on **2017-12-19**This Certificate is valid until **2022-12-18**.DNV GL local station: **Aalborg**Approval Engineer: **Dariusz Lesniewski**

Digitally Signed By: Rinkel, Marco

for **DNV GL**

Location: Hamburg - On behalf of

**Joannis Papanuskas
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

The Multigas Monitoring System G7000 monitors CO₂, SO₂ and other required gases according to NO_x Technical Code 2008 and MEPC.259(68). It is an extractive system where the sample gas is transported and conditioned before entering the gas analyser. The gas measurement is carried out on a dry basis and therefore no dry-to-wet conversion factors are required.

Probes with heated hoses:

- Up to 5 sample probes each with heated hoses leading to the monitoring cabinet.
- Sample flow: 0.33-1.67 l/min
- Exhaust gas temperature 0-500°C
- Ambient temperature: 5°C to 55°C

Monitoring Cabinet:

- Enclosure: IP55
- Power Supply: 230V AC 50/60 Hz
- Communication: Modbus TCP/IP

Gas Analyzer:

- Type: ABB Uras 26
- Measurement Principle: NDIR
- Gasses: Measures CO₂ and SO₂. Other gasses available upon request.
- Measuring range: CO₂: 0-10%; freely configurable from 0-20%
SO₂: 0-200 ppm; freely configurable from 0-1000ppm
- Accuracy/Linearity: $\leq \pm 2\%$ of reading, or $\leq \pm 0,3\%$ of full scale whichever is larger
- Precision/Repeatability: $\leq \pm 1\%$ of full scale above 100ppm or $\leq \pm 2\%$ of full scale below 100 ppm
- Calibration: Zero Calibration: Automatic using compressed air
Span Calibration: Automatic using built in optical reference filters. Possibility for verification with test gasses.

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 classification of ships Pt.4 Ch.9 Control and monitoring systems.

The heated hoses for the system shall be flame retardant tested according to IEC 60092-101 /UL94 5VA, 5VB, V0 or V1. (i.e. the hose shall be fitted with a braided protection sleeving like the EXCP/V0 from Dannewitz GmbH & Co KG)". Other hoses that meet the mentioned flame retardant requirement can also be used.

In order to completely fulfil the requirements of MEPC.184(59) and MEPC.259(68) for "Continuous Emission Monitoring", the installed on board equipment (sample probes, sampling tubes, gas dryer, data recording) has to be reviewed for the individual project. Requirements of MEPC.184(59) and MEPC.259(68), chapter 6.6 and 6.7 regarding SO₂ losses have to be observed.

Functional proofs / certification to be provided for the respective application as stated in MEPC.259(68).

Tests carried out

Applicable tests according to class guideline DNVGL-CG-0339, November 2016.
Functional Performance Tests for TA.

Marking of product

The products to be marked with:
- manufacturer name

Job Id: **262.1-026363-1**
Certificate No: **TAA00001H3**

- model name
- serial number
- power supply ratings

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 after 2 years and after 3.5 years. A renewal assessment will be performed at renewal of the certificate.

END OF CERTIFICATE