Type Approval Certificate

[Gas Monitoring System]

Initial Approval	12 November 2018
Manufacturer	Green Instruments A/S Erhvervsparken 29, 9700 Brønderslev, Denmark
Product Description	Type : Multigas Monitoring System G7000 Intended for the measurement of SO2 and CO2 concentrations in exhaust gas ″ See Appendix 1″
Approval Condition	″ See Appendix 1 ″

THIS IS TO CERTIFY that the above-mentioned product has been approved in accordance with the relevant requirement of this Society's Rules and / or of the recognized standards as follows.

Pt. 6, Ch. 2, Art. 301 of the Rules for Classification, Steel Ships, MEPC.259(68)/MEPC.340(77)

This Certificate is valid until 11 November 2023

Reissued at Busan, Korea on 28 July 2022

This certificate is signed electronically in accordance with IMO FAL.5/Circ.39/Rev.2. Validation and authentication of the certificate can be confirmed from "http://e-cert.krs.co.kr" by using the tracking No(ME22021354990) and certificate No.(CPH38050-AC002).

KOREAN REGISTER

General Manager of
Marine & Ocean Equipment Team

Note : *1. This certificate will be valid subject to complying with the approval conditions described on the certificate and/or on the Rules of this Society.*
2. This certificate will be invalid from the expiry date aforementioned unless the extension or renewal has been granted to the applicant or the manufacturer.
3. Any significant modifications or changes in design or construction to the above product without approval from this Society will render this certificate invalid.
4. Should the specified rules, regulations or standards be amended during the validity of this certificate, the product is to be re-approved by this Society in accordance with the requirements as amended.

Product Description and/or Approval Condition

Date of Issue : 28 July 2022

A. Product Description

1. Product Specification

1) System Description (Type : G7000)
G7000 is a system that monitors SO2 and CO2 concentrations in exhaust gas by sampling the gas into the gas analyzer through the probes with heated hoses and the gas conditioning system.

2) Monitoring Cabinet
- Power Supply : 230VAC, 50/60Hz
- Power Consumption : 16A ~ 50A dependent on system configuration
- External Communication : Modubus TCP/IP
- Ambient Temperature : 5 ~ 55℃

3) Gas Analyzer(Type : ABB Uras 26)
- Measuring Principle : NDIR
- Measuring Range
  i) SO2 : 0 ~ 200ppm / 0 ~ 1000ppm
  ii) CO2 : 0 ~ 10% / 0 ~ 20%
- Accuracy/Linearity : ≤±2% of reading or ≤±0.3% of full scale whichever is larger
- Precision/Repeatability : ≤±1% of full scale above 100ppm or
  ≤±2% of full scale below 100ppm
- Noise : ≤±2% of full scale
- Zero Drift : ≤±2% of full scale
- Span Drift : ≤±2% of full scale
- Calibration
  i) Zero Calibration: Automatic using compressed air
  ii) Span Calibration: Automatic using built in optical filters

4) Probes and Heated Sample Lines
- Number of Probes : Up to 5 Sample Probes
- Sample Line Length : 4 ~ 25m
- Exhaust Gas Temperature : 0 ~ 500℃
- Ambient Temperature : 5 ~ 55℃

2. Approved Drawings and Documents

1) Approved Documents
- Document No.03069_ED Rev.D dated 28-04-2016
- Drawing No.05285 Rev.F dated 29-05-2018
- Drawing No.05292 Rev.C dated 29-05-2018
- Drawing No.05380 Rev.A dated 11-11-2016
- Drawing No.05577 Rev.B dated 26-01-2018
- Drawing No.05907 Rev.A dated 29-05-2018
- Drawing No.05980 Rev.B dated 13-12-2017
- Drawing No.05910 dated 15-06-2017
- Component Overview: CO for 1 stack / Dwg. No.07714 Rev.H dated 15-07-2022
- Component Overview: CO for 2 stacks / Dwg. No.05120 Rev.G dated 15-07-2022
- Component Overview: CO for 3-5 stacks / Dwg. No.05292 Rev.J dated 15-07-2022
- Installation Layout 1-2 stacks / Dwg. No.07864 Rev.L dated 15-07-2022
- Installation Layout 3-5 stacks / Dwg. No.05285 Rev.P dated 15-07-2022
- P&ID for 1 stack / Dwg. No. 07718 Rev.G dated 15-07-2022
- P&ID for 2 stacks / Dwg. No.07876 Rev.F dated 15-07-2022
- P&ID for 3 stacks / Dwg. No.07757 Rev.G dated 15-07-2022
- P&ID for 4 stacks / Dwg. No.08082 Rev.E dated 15-07-2022
- P&ID for 5 stacks / Dwg. No.05380 Rev.H dated 15-07-2022
- Electrical drawing for 1 stack / Dwg. No.03532_03908_ED Rev.M dated 07-07-2021
- Electrical drawing for 2 stacks / Dwg. No.03058_03946_ED Rev.N dated 07-07-2021
- Electrical drawing for 3-5 stacks / Dwg. No.03632_03633_03534_ED Rev.L dated 07-07-2021

2) Reference Documents
- G7000 Multigas Monitoring System Operation Manual : 03135 Rev.2.8(2021-10)
- G7000 Multigas Monitoring System Installation Manual : 03134 Rev.2.0(2020-11)

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3. Test Reports, etc.

1) Environmental Test
   - Test Report No.DANAK-19/18237 Rev.1 issued by DANAK
   - Test Report No.7P05581 dated 23-08-2017 issued by RISE AB
   - Test Report No.8312/11 dated 15-02-2011 issued by AUCOTEAM GmbH
   - Test Report No.P21-0140 dated 17-12-2021 issued by EKTOS

2) Performance Test
   - Performance Test Plan G7000 Ver.1.8 witness and signed by DNVGL(2017-09)
   - Additional Performance Test Plan G7000 Ver.1.0 witness and signed by DNVGL(2017-12)
   - Test Report No.TP/Uras26/MEPC-EN Rev.A signed by DNVGL(2015-11)
   - G7000 Multi Gas Monitoring System - Performance Test Ver.3.0(2018-10)
   - Additional Performance Test Plan G7000 witness and signed by DNVGL(2021-12)

B. Approval Condition

1. Application & Limitation

1) Unless specially directed by the Administration, this approval is not to be construed as a substitute for a flag Administration's approval.
2) This approval is granted on the basis of the approved documentation and test reports.
3) The manufacturer should inform this Society of all kinds of the equipment including software. If the changes are recognized to affect functionality of the approved equipment, type test to confirm the reliability of the revised equipment may be performed in the presence of our surveyor.
4) Installation is to be in accordance with manufacture's instruction.
5) This approval only covers hardware listed under Product description.
6) Degree of protection shall be complied with Rule Pt.6 Ch.1 Sec.2 201.2.(5).
7) When the product is used in installations intended to comply with MEPC.259(68) or MEPC.340(77), installation and performance as per requirements in Annex section 6,7,8 of MEPC.259(68) or MEPC.340(77) are to be confirmed by the Society.

2. Individual Product Cert. and Drawing Approval Requirement

1) Individual product Certification is not required.

3. Marking

1) The product or packing is to be marked with the manufacturer's name and type designation on a suitable position

4. Others

1) Test condition (IACS UR E10 Rev.8 basis)

Approved Testing	Approved location	Remark
EMC	For other than bridge and deck zone	-
Temperature	+5 ~ +55℃	-
Vibration	Acceleration ±0.7g Acceleration ±4.0g	Cabinet Probe
Degree of protection	IP55 IP54	Cabinet Probe
Salt mist	Not to be installed in weather exposed areas	-

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