Certificate No:
TAA00003BS

TYPE APPROVAL CERTIFICATE

This is to certify:

That the Gas Detectors for Exhaust Gas Emissions

with type designation(s)
Continuous Emission Monitoring System: MES 1002

Issued to
Danfoss Ixa A/S
Kolding, **Denmark**

is found to comply with
DNV 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.

Temperature	**A**
Humidity	**B**
Vibration	**B**
EMC	**A**
Enclosure	**B / IP55**

Issued at **Høvik** on **2023-11-30**
This Certificate is valid until **2028-11-29**.
DNV local unit: **Denmark CMC**

Approval Engineer: **Frode Nygård**

for **DNV**

Frederik Tore Elter
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.

LEGAL DISCLAIMER: Unless otherwise stated in the applicable contract with the holder of this document, or following from mandatory law, the liability of DNV AS, its parent companies and their subsidiaries as well as their officers, directors and employees ("DNV") arising from or in connection with the services rendered for the purpose of the issuance of this document or reliance thereon, whether in contract or in tort (including negligence), shall be limited to direct losses and under any circumstance be limited to 300,000 USD.

Product description

The in-situ MES 1002 is an emission analyzer for the maritime market. The product measures the following gases: SO_2 and CO_2. The analyzer is mounted directly on the exhaust gas pipe from the engine downstream from the scrubber.

Supported gases:	Accuracy (when calibrated):
SO_2 0 - 200 [ppm]	±2% of reading +2% of full-scale
CO_2 0 - 15 [vol.-%]	±2% of reading +2% of full-scale

Application:	In situ CEMS for Scrubbers
Technology:	SO_2 - UV absorption spectroscopy CO_2 – IR absorption spectroscopy
Mounting flange:	Circular, bolted connection - DN125 flange, PN 16
Mounting location:	After Scrubber
Power supply:	24 VDC ±25%
Compressed air supply:	5.5 – 9 bar at all times.
Inputs / Outputs:	Digital inputs: 2 (relay controlled)
Communication interfaces:	Modbus TCP/IP, RS-422
Local Control Panel:	display, menu keys, navigation keys, operational key, status indication lights
Software version:	3.11.0

Approval conditions

The Type Approval covers hardware listed under Product description. When the hardware is used in applications to be classed by DNV, 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 rules for classification of ships Pt.4 Ch.9 Control and monitoring systems.

Software control

All changes in software are to be recorded as long as the system is in use on board. Re-test of compliance according to MEPC.340(77) maybe required. Documentation of major changes is to be forwarded to DNV for evaluation and approval before implemented on board. Certification of modified functionality may be required for the particular vessel.

Application/Limitation

The “MES 1002” is found to be suitable as a continuous emission monitoring system of SO_2 and CO_2 according to MEPC.340(77), “2021 Guidelines for exhaust gas cleaning systems”, Chapter 6 “Emission Testing”as well as with relevant requirements of Revised MARPOL Annex VI and NOx Technical Code 2008. See also DNV Statement of Compliance Certificate No.:32467697/DNV.

The “MES 1002” meets the following requirements:
- Principle of detection MEPC.340(77), 6.2
- Accuracy NTC 2008; Appendix III, 1.6
- Precision NTC 2008; Appendix III, 1.7
- Noise NTC 2008; Appendix III, 1.8
- Zero and span drift NTC 2008; Appendix III, 1.9/1.10
- Calibration curve NTC 2008; Appendix IV, 5.5.1

The “MES 1002” measures SO_2 and CO_2 on a wet basis with an in-situ system and therefore the requirement of MEPC.340(77) regarding SO_2 loss is not applicable.

According to MEPC.340(77), 6.8, both gas concentrations (SO_2 and CO_2) will be measured at the same residual water content in the sample and therefore no dry-to-wet conversion factors are required in the calculation of the SO_2/CO_2 ratio.

The “MES 1002” also complies with the "2015 Guidelines for Exhaust Gas Cleaning Systems", MEPC.259(68)

The “MES 1002” shall be installed, calibrated and operated in compliance with the manufacturer’s instructions and in accordance with the requirements of DNV Pt.4 Ch.6 and in accordance of the NOx Technical Code 2008, Chapter 5 and associated appendices.

The operating ambient temperature should be 0 - 55°C for the analyzer and the exhaust gas temperature max. 400°C at the probe (measurement will stop above 100°C).

Type Approval documentation

Tests carried out

- Applicable tests according to class guideline DNV-CG-0339, August 2021.
- MEPC.340(77), “2021 Guidelines for exhaust gas cleaning systems”, Chapter 6.

Marking of product

The products to be marked with:
- manufacturer name
- model name
- serial number

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