DNV·GL

Certificate No:
TAA00001CN

TYPE APPROVAL CERTIFICATE

This is to certify:

That the Peripheral Equipment

with type designation(s)
Exhaust gas measuring and monitoring device MARSIC300

Issued to
Sick AG
Waldkirch, Germany

is found to comply with
DNV GL rules for classification – 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	**A**
Humidity	**B**
Vibration	**A / B***
EMC	**A**
Enclosure	**B (IP 54 attested)**

Issued at **Hamburg** on **2017-08-30**
This Certificate is valid until **2021-02-02**.
DNV GL local station: **Augsburg**

Approval Engineer: **Klaus-Peter Schröder**

for **DNV GL**

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.

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Product description

MARSIC300 is an analyser system for the measurement of exhaust gas concentration of diesel engines of the following gas components: SO2, CO2, NO, NO2, O2, H2O, CO, NH3 and CH4.

Component / Sensor type	Smallest range	Highest range
SO2 / NDIR	0-30 ppm	0-2000 ppm
CO2 / NDIR	-	0-25 vol.-%
NO2 / NDIR	0-200 ppm	0-500 ppm
NO / NDIR	0-300 ppm	0-2000 ppm
O2 / ZrO2	-	0-21 vol.-%
CO / NDIR	0-200ppm	0-2000ppm
NH3 / NDIR	0-50ppm	0-500ppm
CH4 / NDIR	0-500ppm	0-10000ppm

Power supply: 230V AC and 115V AC at 50/60Hz
Firmware version: 1.0.xx (Id-No. 9220790)

The exhaust gas analyser "MARSIC300" is found to be suitable as a component of a continuous monitoring system of NOX- and SOX emissions to comply with the requirements of MEPC.259(68) as well as with relevant requirements of Revised MARPOL Annex VI and NTC 2008.

The "MARSIC300", in combination with other equipment, may be used in the context of:

- Simplified measurement method (Chapter 6.3; NTC 2008),
- Direct Measurement and monitoring method (Chapter 6.4; NTC 2008),
- Continues monitoring of SOX emissions (Chapter 6; MEPC.259(68)
- Confirmation test for Scheme A and Scheme B for an engine system fitted with SCR acc. to MEPC.198(62) except HC
- Emission measurement on a test bed (Chapter 5; NTC2008) except HC

The "MARSIC300" meets the following requirements:

- Principle of detection for SO2 (MEPC.259(68), 6.2)
- Principle of detection for CO2 (MEPC.259(68), 6.2 and NTC 2008, Appendix III, 3)
- Principle of detection for O2 (NTC 2008, Appendix III, 3)
- Principle of detection for CO (NTC 2008, Appendix III, 3)
- Analyser Performance for SO2, CO2, CO, NO, NO2 and O2:
  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 and 1.10)
  Calibration curve (NTC 2008, Appendix IV, 5.5.1)
  Interference effect (NTC 2008, Appendix IV, 9)
  The analyser performance has not been tested for H2O, NH3 and CH4 as these components are not required for fulfilling a.-m guidelines.
- The equivalence of the alternative sensors for NOX (NO + NO2) have been demonstrated under surveillance and to the satisfaction of DNV GL in accordance with ISO 8178:2006 Part 1, Annex D.

The "MARSIC300" shall be installed, calibrated and operated in compliance with the manufacturer's instructions and in accordance with the requirements and intervals as specified in Revised MARPOL Annex VI and NTC 2008.

According to MEPC.259(68), Appendix I, 6(e), both gas concentrations (CO2 and SO2) will be measured at the same residual water content in the sample (wet) and therefore no conversion factors are required in the calculation of the CO2/SO2 ratio.

This is to Note

1. In order to completely fulfil the requirements for NOX- and/or SOX monitoring additional equipment (e.g. data recording, engine performance measurements) will have to be installed.

2. In case ambient temperature is above 45°C the "MARSIC300" may only be operated in an air conditioned cabinet.
3. The "MARSIC300" shall be installed, calibrated and operated in compliance with the manufacturer's instructions.
4. The calibration of the "MARSIC300" can use the internal calibration filters for the components as listed above (except O2, which is calibrated with instrument air).
   The calibration Interval is defined as follows:
   - Zero point calibration will be done on daily base with instrument air automatically.
   - End point calibration will be done with internal filters on a monthly base automatically.
   The calibration needs to be checked with calibration gas latest after measurement relevant parts of the "MARSIC 300" have been replaced.
5. For simplified measurement method (Chapter 6.3; NTC 2008), direct Measurement and monitoring method (Chapter 6.4; NTC 2008) the "MARSIC 300" must be operated and calibrated in accordance with the requirements and intervals specified in NOX Technical Code 2008.

Following system variants are subject to the Type Approval

	Identification number	Specification
Sample tube	2058125	Unheated 0.25m
	2083525	Unheated 0.5m
	2083527	Unheated 0.8m
	2071307	Heated 0.5m 230V AC
	2071577	Heated 0.5m 115V AC
	2025125	Heated 0.8m 230V AC
	2028706	Heated 0.8m 115V AC
Gas sample probe	2058208	SFU-BF NI GL
Bundle of pipes	6058993	Up to 40m
Heated sample line	Type AW 6031101 to 6031135	Heiz.-SHL. 230 ELH/AW 6/8 1H 1M N.LSP (1m) to 35M N.LSP (35m)
	Type AW 6061201 to 6061270	Heiz.-SHL. 230 ELH/AW-LC 6/8 1M N.LSP (1m) to 35M N.LSP (35m)
	Type AD 6028701 to 6028735	Heiz.-SHL. 230 ELH/ADW 6/8 1H 1M N.LSP (1m) to 35M N.LSP (35m)
Analyser	1076531	DeSOx (SO2, CO2)
	1076532	DeNOx (NO, NO2)
	1076530	Emission complete (SO2, CO2, NO, NO2, O2, H2O, CH4, NH3, CO)

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 RU SHIP Pt.4 Ch.9 Sec. 1.

Vibration test location class B*:
Sample tubes 0.5m and 0.8m and sample probe were vibration testes with 4g
Sample tube 0.25m unheated was vibration tested with 10g

Type Approval documentation

Tests carried out

Applicable tests according to Class Guideline DNVGL-CG-0339, Edition November 2016,
Revised MARPOL 73/78 Annex VI and Nox Technical Code 2008 and MEPC.259(68).

Marking of product

- manufacturer name
- device 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 at least every second year and at renewal of this certificate.
END OF CERTIFICATE