Verband Deutscher Reeder

VDR WORKSHOP “ABGASNACHBEHANDLUNG”

FROM REGULATION TO EQUIPMENT

SICK
Sensor Intelligence.

Jens Bechu

Mai 2016

Hamburg / Leer

NEED FOR MORE THAN AN ANALYZER

WHAT ELSE IS NEEDED

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- You bought the best scrubber on the market, now you only need an analyzer?

How is about,

- Performance, delivery times for device and spare parts?
- Need for maintenance?
- World wide service availability?
- Accuracy, low measuring ranges and noise?
- Calibration without span gases?
- Background information about upcoming regulations and legislation?

MORE THEN SALES
INFORMATION PARTNERSHIP

SICK
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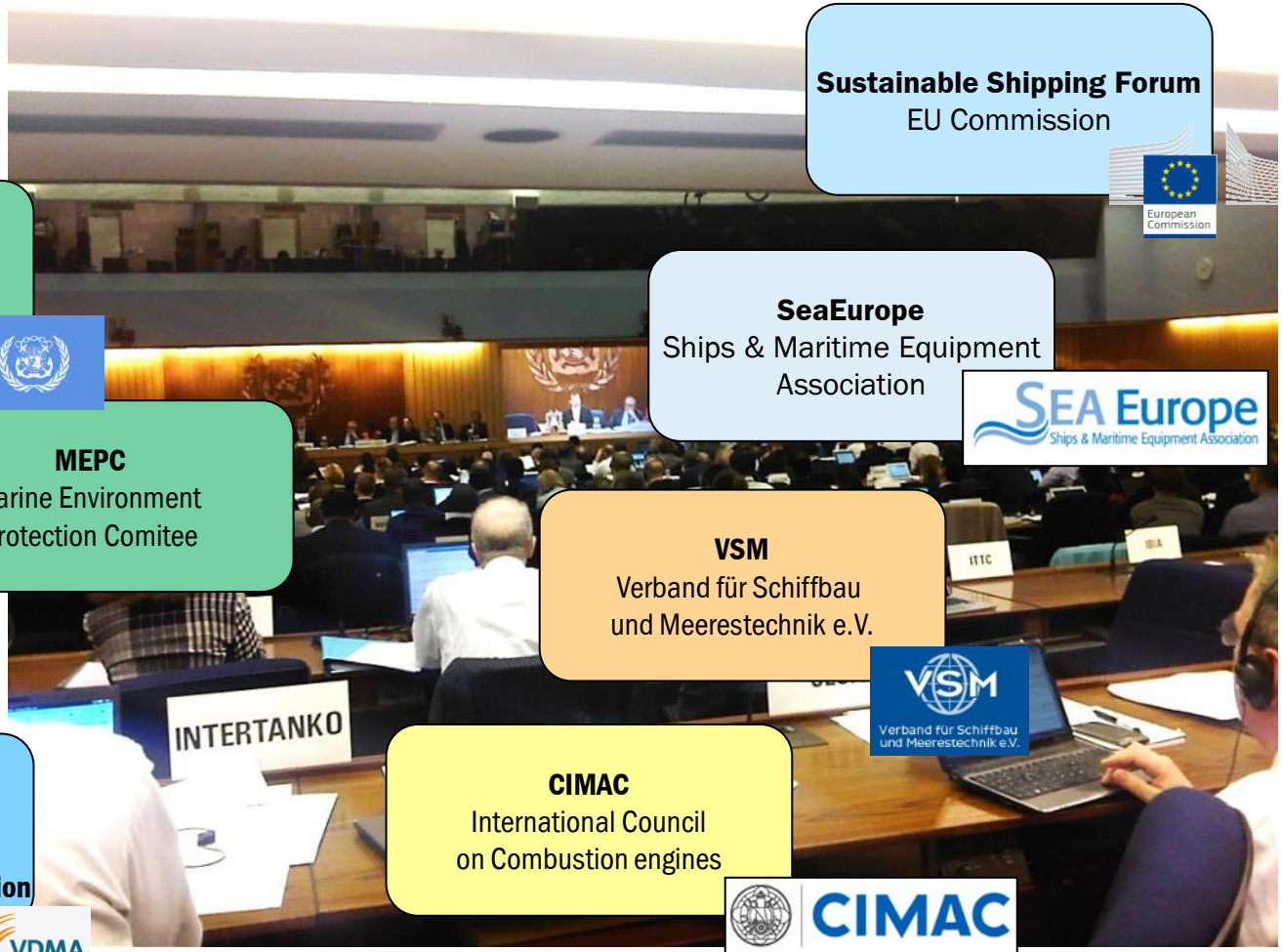
Lets start with the last point.

SICK participates in:



Sustainable Shipping Forum
EU Commission

IMO Meetings
Intern. Maritime Organisation

SeaEurope
Ships & Maritime Equipment Association

PPR
Pollution Prevention and Response

MEPC
Marine Environment Protection Comitee

VSM
Verband für Schiffbau und Meerestechnik e.V.

VDMA
Verband Deutscher Maschinen- und Anlagenbau
German Engineering Federation

CIMAC
International Council on Combustion engines

Engines and Systems
Association

Marine Equipment and Systems
Working Group

MEPC 259 (68)

GUIDELINES FOR EXHAUST GAS CLEANING SYSTEMS

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MEPC 184 (59) is now MEPC 259 (68)

Guidelines for Exhaust Gas Cleaning Systems

2.1 Purpose

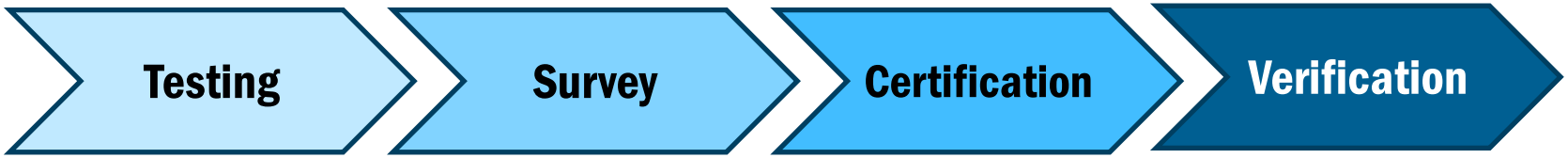
2.1.1 The purpose of these Guidelines is to specify the requirements for the testing, survey certification and verification of exhaust gas cleaning (EGC) systems under regulation 4 to ensure

that they provide effective equivalence to requirements of regulations 14.1 and 14.4 of Annex VI

of MARPOL 73/78.

2.2 Application

2.2.1 These Guidelines apply to any EGC unit as fitted to fuel oil combustion machinery, excluding shipboard incinerators, installed on board a ship.



CERTIFICATION OF SCRUBBER ACC.

GUIDELINES FOR EXHAUST GAS CLEANING SYSTEMS

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Scheme A:
unit certification with parameter and emission checks

- **Unit approval**
  for serial manufactured scrubber
- Continuous washwater monitoring and recording pH, PAHs, turbidity, etc.
- EGC Technical Manual (**ETM-A**)
  all parameters, flows, temperatures, limits
- On Board Monitoring Manual (**OMM**)
- In service surveys
  (installation, Initial, Annual, Intermediate and Renewal surveys)
- Port State Control (PSC)

Scheme B:
continuous emission monitoring with parameter checks

- **system approval**
  for Continuous emission monitoring
- Continuous washwater monitoring and recording pH, PAHs, turbidity, etc.
- EGC Technical Manual (**ETM-B**)
  Basic parameter
- On Board Monitoring Manual (**OMM**)
- In service surveys
  (installation, Initial, Annual, Intermediate and Renewal surveys)
- Port State Control (PSC)

CERTIFICATION OF SCRUBBER ACC.

GUIDELINES FOR EXHAUST GAS CLEANING SYSTEMS

SICK
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Scheme A:
unit certification with parameter and emission checks

Scheme B:
continuous emission monitoring with parameter checks

4.4.8 Under Scheme A, if a continuous exhaust gas monitoring system is not fitted, it is recommended that **a daily spot check** of the exhaust gas quality in terms of SO2 (ppm)/CO2 (%) ratio, is used to verify compliance in conjunction with parameter checks stipulated in 4.4.7. ....

4.4.8.... If a continuous exhaust gas monitoring system is fitted, only daily spot checks of the parameters listed in paragraph 4.4.7 would be needed to verify proper operation of the EGC unit.

95% of all scrubbers are certified according scheme B

For a daily spot check you have to

- calibrate the analyzer before use
- Measure
- Recalibrate the analyzer

The analyzer is the heart of the system!
When the analyzer does not work,
your system is **not** in compliance.

TYPE APPROVAL CERTIFICATE

MORE THEN A HEADER

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Does your equipment has a TYPE APPROVAL?

Of course!

TYPE APPROVAL CERTIFICATE DNV·GL

This is to certify that the undernoted product(s) has/have been tested in accordance with the relevant requirements of the DNV GL Type Approval System.

Certificate No.	**42 334 - 16 HH**
Company	**Sick AG** **Erwin-Sick-Str. 1** **79183 Waldkirch, GERMANY**
Product Description	**Exhaust gas measuring and monitoring device**

You should read more then the header!

SAFETY AND PERFORMANCE

INTERNATIONAL AND EUROPEAN RULES AND LEGISLATION

SICK
Sensor Intelligence.

- Classes check the equipment for

Safety

International regulations

- **IMO rules and directives**
- **SOLAS….**

EU regulations, as a <u>notified body</u>

- **Marine Equipment Directive (MED),**
- **Electromagnetic Compatibility Directive (EMC),**
- **Low Voltage Directive (LVD),**
- **Radio and telecommunications terminal equipment (R&TTE)**
- **Explosive Atmospheres Directive (ATEX)….**

Performance

IMO MEPC Directives

- **MARPOL Annex VI**
- **NTC2008**
- **MEPC 259 (68)…**

TEST SPECIFICATION FROM THE CLASS
SIMILAR FOR ALL IACS CLASSES

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DNV·GL

CLASS GUIDELINE

DNVGL-CG-0339 Edition November 2015

Environmental test specification for electrical, electronic and programmable equipment and systems

ENVIRONMENTAL CONDITIONS

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Environment

- Location and purpose
- closed area or open deck
- Temperatures
- Humidity
- Vibration

Analyzer

Table 3.33 Required test conditions for the defined environmental categories

Environmental Category	Environmental Conditions						Test Conditions						Comments
	Closed Area			Open Deck Area			Temperature		Climate				
	Temperature	Relative Humidity	Vibrations	Temperature	Relative Humidity	Vibrations	Dry Heat	Cold	Temperature	Relative Humidity	Salt mist	Vibrations	The short sign of the location EMC 1/ EMC 2 where the equipment is installed according to test 18, 21 and 22 should be added to the short sign of the environmental category.
A	0 °C to 45 °C	up to 100 %	0,7 g				55 °C	5 °C	55 °C	95 %	–	0,7 g	For general applications
B	0 °C to 45 °C	up to 100 %	4 g				55 °C	5 °C	55 °C	95 %	–	4 g	Has to withstand a high level of vibration strain, e. g. in steering gear compartment.
C	0 °C to 55 °C	up to 100 %	0,7 g				70 °C	5 °C	55 °C	95 %	–	0,7 g	Has to withstand a high degree of heat, e. g. for equipment to be mounted in consoles, housings.
D	0 °C to 55 °C	up to 100 %	4 g				70 °C	5 °C	55 °C	95 %	–	4 g	Has to withstand a high degree of heat and a high level of vibration strain, e. g. for equipment to be mounted on combustion engines and compressors.
E	0 °C to 40 °C	up to 80 %	0,7 g				55 °C	5 °C	55 °C	80 %	–	0,7 g	For use in air-conditioned areas. With GL's special consent only.
F				-25 °C to +45 °C	up to 100 %	0,7 g	70 °C	-25 °C	55 °C	95 %	Test required	0,7 g	Has to withstand the additional influences of salt mist and temporary inundation, e. g. on open deck.
G				-25 °C to +45 °C	up to 100 %	2,3 g	70 °C	-25 °C	55 °C	95 %	Test required	2,3 g	For use on masts, with the additional influence of salt mist.
H	according to manufacturer's specification only in combination with environmental categories A-G												The provisions contained in the certificates shall be observed.

MULTI COMPONENT ANALYZER

ONBOARD AN LNG CARRIER

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Analyzer is type approved by Germanischer Lloyd.

It is installed together with Flow and Dust measurement.

ENVIRONMENTAL CONDITIONS

TEMPERATURES, HUMIDITY, VIBRATIONS

SICK
Sensor Intelligence.

Environment

- Location and purpose
- closed area or open deck
- Temperatures
- Humidity
- Vibration

Probe

Table 3.33 Required test conditions for the defined environmental categories

Environmental Category	Environmental Conditions						Test Conditions						Comments
	Closed Area			Open Deck Area			Temperature		Climate				
	Temperature	Relative Humidity	Vibrations	Temperature	Relative Humidity	Vibrations	Dry Heat	Cold	Temperature	Relative Humidity	Salt mist	Vibrations	The short sign of the location EMC 1/ EMC 2 where the equipment is installed according to test 18, 21 and 22 should be added to the short sign of the environmental category.
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B	0 °C to 45 °C	up to 100 %	4 g				55 °C	5 °C	55 °C	95 %	–	4 g	Has to withstand a high level of vibration strain, e. g. in steering gear compartment.
C	0 °C to 55 °C	up to 100 %	0,7 g				70 °C	5 °C	55 °C	95 %	–	0,7 g	Has to withstand a high degree of heat, e. g. for equipment to be mounted in consoles, housings.
D	0 °C to 55 °C	up to 100 %	4 g				70 °C	5 °C	55 °C	95 %	–	4 g	Has to withstand a high degree of heat and a high level of vibration strain, e. g. for equipment to be mounted on combustion engines and compressors.
E	0 °C to 40 °C	up to 80 %	0,7 g				55 °C	5 °C	55 °C	80 %	–	0,7 g	For use in air-conditioned areas. With GL's special consent only.
F				-25 °C to +45 °C	up to 100 %	0,7 g	70 °C	-25 °C	55 °C	95 %	Test required	0,7 g	Has to withstand the additional influences of salt mist and temporary inundation, e. g. on open deck.
G				-25 °C to +45 °C	up to 100 %	2,3 g	70 °C	-25 °C	55 °C	95 %	Test required	2,3 g	For use on masts, with the additional influence of salt mist.
H	according to manufacturer's specification only in combination with environmental categories A-G												The provisions contained in the certificates shall be observed.

LOCATION ON BOARD
SPACE ON A CRUISE SHIP

SICK
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VIBRATION TESTS
THREE DIFFERENT VALUES

SICK
Sensor Intelligence.

- Vibration resistance is a challenge

Table 3.15 General vibration strain (characteristic curve 1)

Vibration strain (Fig. 3.4)		
	Displacement	Acceleration
2 (+ 3 / – 0) Hz up to 13,2 Hz	± 1,0 mm	
13,2 Hz up to 100 Hz		0,7 g
Sweep rate	max. 1 oktave / minute	

General 0,7 g

Table 3.16 High vibration strain (characteristic curve 2)

Vibration strain (Fig. 3.4)		
	Displacement	Acceleration
2 (+ 3 / – 0) Hz up to 25 Hz	± 1,6 mm	
25 Hz up to 100 Hz		4 g
Sweep rate	max. 1 oktave / minute	

at stack 4 g

Table 3.17 Extreme vibration strain (characteristic curve 3)

Vibration strain (Fig. 3.4)		
	Temperature	Acceleration
40 Hz up to 2000 Hz	600 °C	10,0 g
Sweep rate	max. 1 oktave/ minute	

near engine 10 g

If even more severe vibration strain is expected at the location in question, the latter shall be considered for the test.

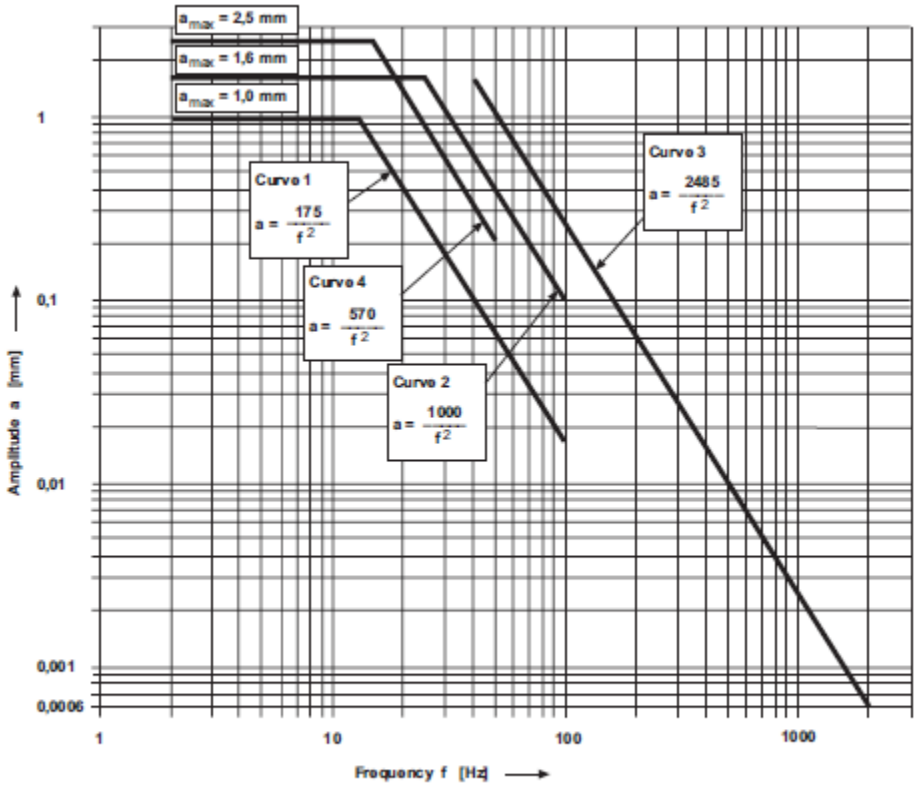

Fig. 3.4 Vibration curve

VIBRATION TEST

INSITU ANALYZER, 1G, 10 – 160 HZ

CERTIFICATE
TO BE CHECKED CAREFULLY

SICK
Sensor Intelligence.

TYPE APPROVAL CERTIFICATE DNV·GL

This is to certify that the undernoted product(s) has/have been tested in accordance with the relevant requirements of the DNV GL Type Approval System.

Certificate No. **42 334 - 16 HH**

Company **Sick AG**

Erwin-Sick-Str. 1
79183 Waldkirch, GERMANY

Product Description **Exhaust gas measuring and monitoring device**

Type

Environmental Ca

Technical Data / Range of Application **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**

Environmental category

measuring components and ranges

Component / Sensor type	Smallest range	Highest range
NO / NDIR	0-500 ppm	0-2000 ppm
O2 / ZrO2	-	0-21 vol.-%
CO / NDIR		0-2000ppm
NH3 / NDIR		0-500ppm
CH4 / NDIR		0-10000ppm

Power supply: 230V AC and 115V AC at 50/60Hz

Firmware version: 1.0.xx (Id-No. 9220790)

Environmental Category "D*"
Sample tubes 0.5m and 0.8m and sample probe were vibration testes with 4g (curve 2b)
Environmental Category "H"
Sample tube 0.25m unheated was vibration tested with 10g (curve 3)

Test Standard **GL Guidelines for the Performance of Type Approvals VI-7-2 Edition 2012, Revised MARPOL 73/78 Annex VI and Nox Technical Code 2008 and MEPC.259(68)**

Documents **Report no. MAGDE717 2015.139, Rev. 1.0 (02.02.2016)**

Remarks **Product(s) approved by this certificate is/are accepted for installation on all vessels classed by DNV GL.**

Valid until **2021-02-02**
Page **1** of **4**
File No. **I.A.02**
Hamburg, 2016-02-03

Type Approval Symbol GL

Marco Rinkel Klaus-Peter Schröder

DNV GL

www.dnvgl.com

TYPE APPROVAL CERTIFICATE DNV·GL

This is to certify that the undernoted product(s) has/have been tested in accordance with the relevant requirements of the DNV GL Type Approval System.

Certificate No. **42 334 - 16 HH**

The exhaust gas analyser "MARSIC300" is found to be suitable as a component of a continuous monitoring system of NO_x- and SO_x 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 me**
- **Direct Measur**
- **Continues monitoring of SO_x 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**

where it can be used

The "MARSIC300" meets the following requirements:

- **Principle of detection for SO_x (MEPC.259(68), 6.2)**
- **Princ**
- **Princ**
- **Principle of detection for CO (NTC 2008, Appendix III, 3)**

principle of measurement

- **Accuracy (NTC 2008, Appendix III, 1.6)**
- **Precision (NTC 2008, Appendix III, 1.7)**
- **Noise**
- **Zero and**
- **Calibratio**
- **Interference effect (NTC 2008, Appendix IV, 9)**

performance fulfilled

The analyser performance has not been tested for H_2O, NH_3 and CH_4 as these components are not required for fulfilling a gas guidelines.

- **The ... ler sur ... nex D.**

Equivalence to CLD for NOx

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 73/78 Annex VI and NTC 2008.

According to MEPC.259(68), Appendix I, 6(e), both gas concentrations (CO_2 and SO_2) 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 CO_2/SO_2 ratio.

Valid until **2021-02-02**
Page **2** of **4**
File No. **I.A.02**
Hamburg, 2016-02-03

Type Approval Symbol GL

Marco Rinkel Klaus-Peter Schröder

DNV GL

www.dnvgl.com

CERTIFICATE
TO BE CHECKED CAREFULLY

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TYPE APPROVAL CERTIFICATE DNV·GL

This is to certify that the undernoted product(s) has/have been tested in accordance with the relevant requirements of the DNV GL Type Approval System.

Certificate No. **42 334 - 16 HH**

This is to Note

1. **In order to completely fulfil the requirements for NO_x- and/or SO_x 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 O_2, which is calibrated with instrument air).**

   The calibr
   - Zero poin
   - End point

   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 NO_X Technical Code 2008.**

alternative calibration

Valid until **2021-02-02**
Page **3** of 4
File No. **I.A.02**
Hamburg, 2016-02-03

Type Approval Symbol GL

Marco Rinkel i.A. Klaus-Peter Schröder

DNV GL

www.dnvgl.com

TYPE APPROVAL CERTIFICATE DNV·GL

This is to certify that the undernoted product(s) has/have been tested in accordance with the relevant requirements of the DNV GL Type Approval System.

Certificate No. **42 334 - 16 HH**

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 prob		
Bundle of pipes		
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 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)

details of equipment

Valid until **2021-02-02**
Page **4** of 4
File No. **I.A.02**
Hamburg, 2016-02-03

Type Approval Symbol GL

Marco Rinkel i.A. Klaus-Peter Schröder

DNV GL

www.dnvgl.com

TYPE APPROVAL
WITH RESTRICTIONS

SICK
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- It is type approved
- But has some restrictions
- Limitation in water content, max 5% H2O
- Limitation to 0.4 Vol% CO_2 !

Could not be used after scrubber

NOx could not be measured from engines

manufactured by:

[redacted]

has been assessed by Sira Certification Service
and for the conditions stated on this certificate complies with:

MCERTS Performance Standards for Continuous Emission

Certification Ranges :

CO	0 to 200 ppm	0 to 700 ppm	0 to 3500 ppm
SO_2	0 to 200 ppm	0 to 700 ppm	0 to 2500 ppm
NO	0 to 300 ppm	0 to 1000 ppm	0 to 3500 ppm
N_2O*	0 to 300 ppm	0 to 5000 ppm	
NO_2*	0 to 300 ppm	0 to 5000 ppm	
CO_2	0 to 15% vol	0 to 25% vol	
H_2O	0 to 25% vol		

(*maximum H_2O vapour 5%, maximum CO_2 4000 ppm)

TYPE APPROVAL
WITHOUT COMPLIANCE

SICK
Sensor Intelligence.

- It is type approved
- But only for safety reasons

- You are responsible for the compliance according MARPOL, NOx Technical Code 2008 or MEPC 259(68)

Compliance is not considered

with type designation(s)
[redacted]Compact NOx Gas Analyser, [redacted] Gas Analyser System

Manufactured by
[redacted]

is found to comply with
Det Norske Veritas' Rules for Classification of Ships, High Speed & Light Craft and Det Norske Veritas' Offshore Standards

Application/Limitation

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 Ships Pt.4 Ch.9 Control and Monitoring Systems.

The Type Approval covers only DNV Rules for environmental conditions. Compliance with MARPOL Annex VI and/or NOx Technical Code 2008 has not been considered. Fiber optic cable between receiver and analyser shall follow specification as provided by [redacted]

TYPE APPROVAL
WITH WRONG RANGES

SICK
Sensor Intelligence.

- It is type approved
- But has wrong range
- Range for SO_2 is too high!

Need to be around 75 – 150 ppm

This is to Certify that a representative of this Bureau did, at the request of
[redacted] - [redacted]

Components:
[redacted] Enclosure, P/N: [redacted]
Particulate Matter (PM) Sensor, P/N: [redacted]
PM Range: 0-1000 mg/m3
[redacted] Gas Sensor, P/N: [redacted]
NO Range 0-2000 ppm
NO2 Range 0-300 ppm
CO2 Range 0-10%
SO2 Range 0-1750 ppm

MEPC 259 (68)

GUIDELINES FOR EXHAUST GAS CLEANING SYSTEMS

SICK
Sensor Intelligence.

MEPC 259(68): Guidelines for Exhaust Gas Cleaning Systems
replaces MEPC 184(59)

- An Exhaust Gas Cleaning System (EGC) is an alternative method to comply with Regulation 14.1. and 14.4 of Revised MARPOL Annex VI
- It reduces Sulphur oxides (SOx) and particulate matter
- Compliance demonstrated on basis of SO_2/CO_2 ratio as an equivalence to fuel oil sulphur content

Fuel Oil Sulphur Content (% m/m)	Ratio Emission SO_2 (ppm)/CO_2(% v/v)
4.5	195.0
3.5	151.7
1.5	65.0
1.0	43.3
0.5	21.7
0.1	4.3

DOES THE RANGE FIT?

MAXIMAL SO_2 RANGE

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Sensor Intelligence.

Exhaust is cleaned for equivalent to 0.1 Vol% Sulphur

According to MEPC 259(68) Table 1.

Ratio from SO_2 ppm / CO_2 Vol% is max 4.3

$$\frac{SO_2\ ppm}{CO_2\ Vol\%} < 4.3$$

$$SO_2\ ppm < 4.3 * CO_2\ Vol\%$$

$$SO_2\ ppm < 4.3 * 5.5\ CO_2\ Vol\%$$

max 23.6 ppm SO_2 allowed

NTC2008 Appendix VIII Pt. 2.2.2

The analyzer range should be such that the measured emission value is within 15% - 100% of the range used.

$$\frac{23.6\ ppm\ SO_2 * 100\%}{15\ \%} \approx 160\ ppm\ SO_2$$ ***max measuring range***

$$\frac{5\ ppm\ SO_2 * 100\%}{15\ \%} \approx 33\ ppm\ SO_2$$ ***max measuring range***

Real measuring value and corresponding range

NEW GENERATION OF ANALYZERS

SMALL SIZE, LOW MAINTENANCE

SICK
Sensor Intelligence.

MARSIC200

NEW

Sample preparation: 500 x 560 x 210 mm
Distribution unit: 600 x 660 x 210 mm
Analyzer: 550 x 740 x 319 mm

MARSIC100

More then 50 on ships

Analyzer:
2100 x 800 x 600 mm

MARSIC300

NEW

Analyzer: 600 x 1,300 x 434 mm

MARSIC200 + MARSIC300

TWO ANALYZERS FOR HIGH PERFORMANCE

SICK
Sensor Intelligence.

Especially designed for the use aboard.

- ✓ MARSIC is designed for the special situation aboard a vessel
- ✓ Modular design, easy to maintain & servicing (only changing defined modules)
- ✓ Service can be performed aboard by board engineer
- ✓ Anytime and anywhere **showing compliance without span-gas** (MARSIC300)

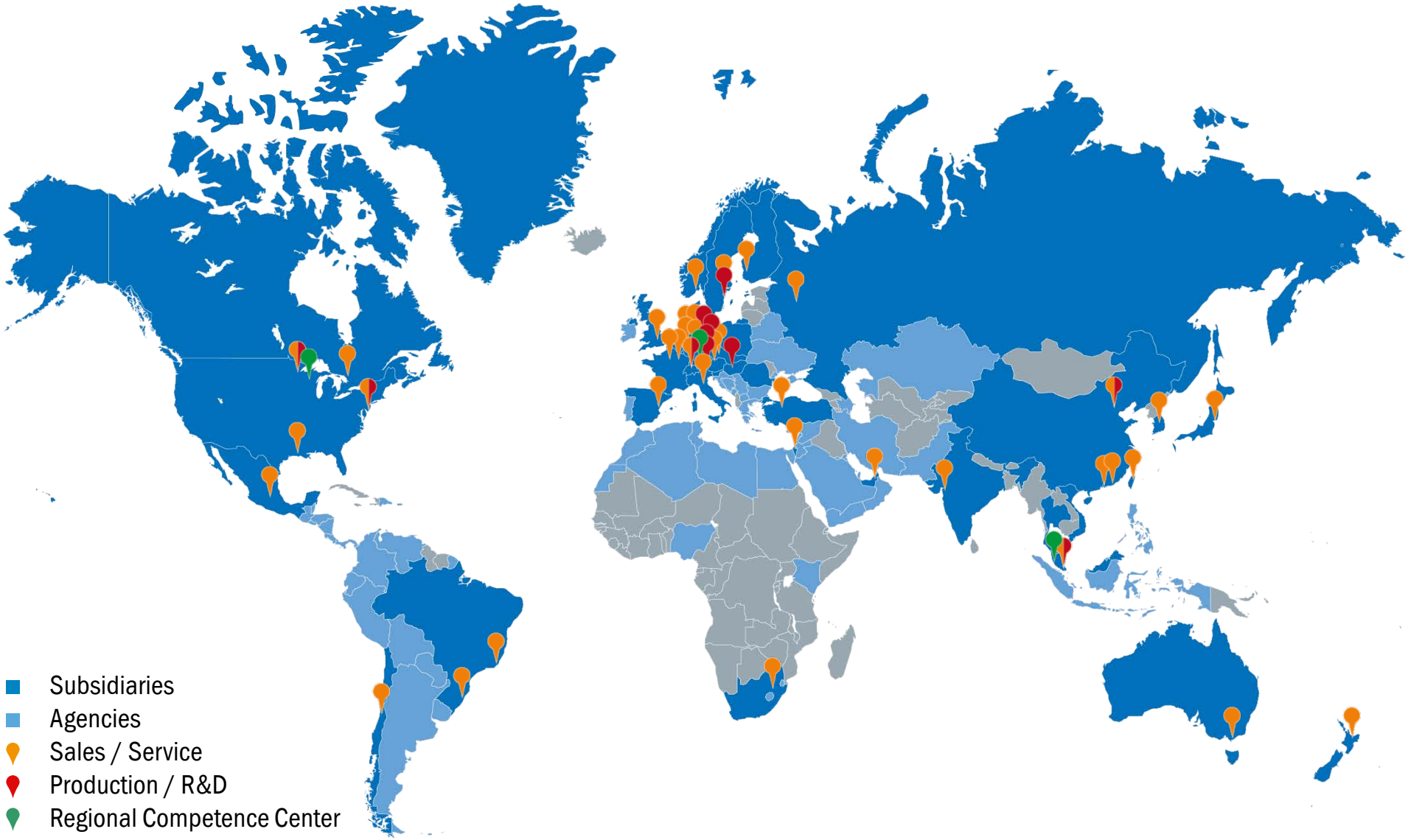
Best solution due to low Cost & Effort .

- ✓ Up to four sampling points covered by only one analyzer means less invest and service effort (MARSIC200) (In-situ solution means one analyzer for each sampling point, high invest and service & maintenance effort)
- ✓ Minimized regular wear- and moving parts e.g. ejector pump keeps service-, maintenance and total costs of ownership (TCO) down
- ✓ Internal calibration filters (MARSIC300) save huge amount of money over the lifetime of the analyzer
- ✓ Maintenance interval of 4 years for UV-Lamp at MARSIC200 keeps TCO down
- ✓ Easiest Installation due to compact system design incl. bundled tubes (MARSIC300)

ALWAYS CLOSE TO YOU

SHORT DISTANCES SAVE YOU TIME AND MONEY

SICK
Sensor Intelligence.



THANK YOU FOR YOUR ATTENTION!

SICK
Sensor Intelligence.

Jens Bechu

Strategic Industry Manager Maritime

CERTIFICATE CHECKLIST

SICK
Sensor Intelligence.

- Environment conditions according to your needs?
- Measuring range meet requirement?
- Any restrictions mentioned?
- Accuracy, precision, noise, zero drift, span drift in accordance to NTC2008 Appendix III Pt. 1.6 ff?
- Equivalence test carried out and certified?
- Actual version of norms and rules used?
- Scheme A and/or B certified?
- Is the certificate from the same class as the ship? If not, does your class accept this certificate?

DOCUMENTS NEEDED

SICK
Sensor Intelligence.

Documents needed acc. to MEPC 184(59) Scheme A+B

SECP
(SOx Emission Compliance Plan)
- Ship name
- Main engine
- Auxiliary engines
- Oil-fired boilers
- Ref. to statutory documents
- Procedure for compliance

By shipowner, shipyard, contractor
Approved by Administration

OMM
(Onboard Monitoring Manual)
- Instrumentation issues
- Gas and water monitoring
- Device list (sensors, analysers)
- Device positions
- Service requirements
- Maintenance, calibration
- Survey procedures

By manufacturer
Approved by Administration

SECC (A)
(SOx Emission Compliance Certificate)
- Make
- type
- serial number
- ETM number

By Administration

"Exhaust Gas Declaration" Engine
- Make, type, power, rpm
- Exhaust gas data (e.g. EIAPP cert.)

By engine maker or designer
Approved by Administration

ETM
(EGC SOx Technical Manual)
- ETM number
- Make, type, serial number
- Capacity
- SOx-reduction (A)
- Installation requirements
- Operational requirements
- Maintenance requirements (A)
- Survey procedures
- Wash water characteristics

By manufacturer
Approved by Administration

EGC Record Book
- Log book for service and maintenance as per ETM & OMM
- Possibly in vessel PMS

By manufacturer
Form approved by Administration

"Flue Gas Declaration" Oil-fired boiler
- Make, type, capacity, pressure
- Flue gas data

By boiler maker or designer
Approved by Administration

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NTC2008
ANALYZER SPECIFICATION

SICK
Sensor Intelligence.

NTC2008 NO_x Technical Code

General regulation related to NO_x

MEPC 177(58)

Appendix III

Specifications for Analyzers to be used in the determination of gaseous components of marine diesel engine emissions

1.6 Accuracy

±2% of the reading over the whole measuring range

or ±0.3% of full scale, whichever is larger

1.7 Precision

2.5 times the standard deviation of 10 repetitive responses

Not greater than ±1% of full scale for each range above 100 ppm

And not greater than ±2% of full scale for each range below 100 ppm

SICK
Sensor Intelligence.

1.8 Noise

Peak to peak response in a 10 second period, shall not bigger then 2% of the full scale. Checked for Zero and Span gas.

1.9 Zero drift

Zero Response is defined as the response, including noise, in a 30 second time interval.

The drift in a one hour period shall be less than ±2% of full scale for the lowest range used.

1.10 Spandrift

Span Response is defined as the response, including noise, in a 30 second time interval.

The drift in a one hour period shall be less than ±2% of full scale for the lowest range used.

2 % in one hour > 48% in 24 hours

> 480% in 10 days! (Why do you measure??)