



MARSIC SHIP EMISSIONS MEASURING DEVICES

SAFELY ON COURSE

Analyzer solutions

SICK
Sensor Intelligence.

Safely on course

With MARSIC, the ship emissions measuring device from SICK, you can sail fully certified across all the seas – safe in the knowledge that the measured values are reliably accessible. You can also rest assured that maintenance and calibration costs will stay low in the long term.



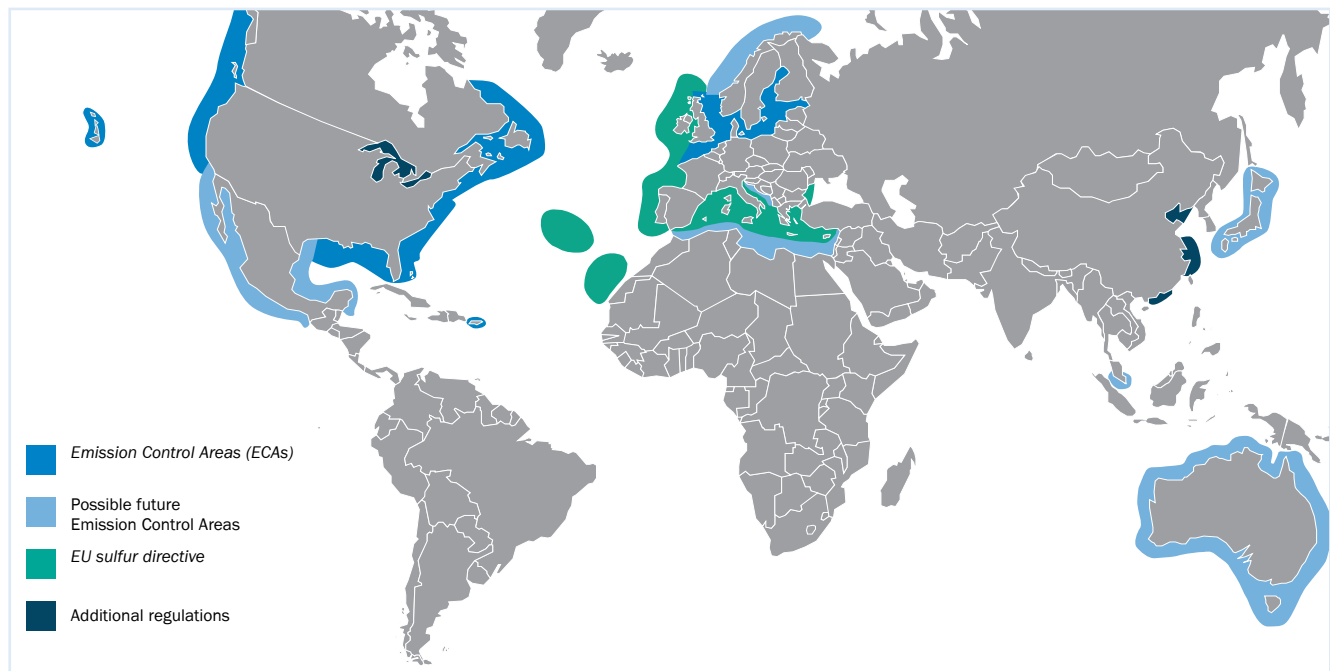
High reliability – now and in the future

Fully certified

With MARSIC ship emissions measuring devices, ship operators and scrubber manufacturers can remain on the safe side for a long time, regardless of how the limit values may change, because MARSIC offers accurate measurements and exact documentation of measured values even for future emissions requirements. The measuring devices from SICK are certified for monitoring DeSO_x and DeNO_x systems by DNV, ABS, CCS, KR, NK, LR and BV. The type approvals from these seven major classification societies, which together represent more than 90 % of the world's shipping fleet, lead to the exceptionally high market acceptance of the MARSIC measuring devices.

Efficient solution that reduces costs

With MARSIC and modern exhaust gas purification, ships can continue to be operated cost-efficiently with heavy fuel oil. With MARSIC, scrubber manufacturers are able to provide their customers with an up-to-date and good value measuring solution. The operation and maintenance costs are low since the reliable measuring technology was designed constructively for quick and simple servicing on board. The measuring devices also provide important information for the monitoring and fuel-optimized operation of the ship propulsion system.



Current regulations and guidelines

Beginning in 2020, ships will only be allowed to use low-sulfur fuels. Alternatively, exhaust gas purification systems can be implemented to reduce the sulfur dioxide emissions.

NO_x limits are also defined for ship engine emissions. The results of the exhaust gas purification must be measurable and documentable.

Measurement in accordance with the guidelines

- MARPOL Annex VI and NTC 2008
- IMO MEPC.259(68)

- Measurement of CO₂ in accordance with EU Directive 2015/757 (MRV) and IMO DCS
- Marine Equipment Directive MED 2008/67/EC and 96/98/EC



Global availability for maximum efficiency



With a global network of employees in more than 80 countries, SICK is ensuring that its services and spare parts can be accessed efficiently around the globe. To satisfy its global demand, SICK has established several maritime service hubs to coordinate and actively support its worldwide service activities. In addition, further training centers enable the company to pass on its detailed knowledge about the products and their peripherals to internal and external customers. Qualified staff from SICK and its partners are available on the main global shipping routes to provide preventive maintenance, technical support, troubleshooting, and other measurement technology related services.

The status of the measuring devices can be checked from anywhere by means of remote maintenance, for example via the SICK Meeting Point Router. This ensures the functioning of the emissions measuring devices, thereby allowing the ship to continue on its journey.

Short response times thanks to remote solutions

To ensure the highest possible availability of the emissions measuring devices, topmost priority is given not only to ensuring the high quality of the device but also in providing professional support and fast service. And this is provided not only during commissioning, but also during operation. Given the increasing cost pressures and high complexity of systems, it is necessary to optimize maintenance costs through proactive servicing. SICK Remote Service fulfills exactly this requirement: remotely located experts provide support via mouse click over a secure Internet connection, thereby eliminating expensive travel and setup costs.

Customers benefit from SICK Remote Service on several levels:

- A quicker installation phase thanks to targeted support by experts
- Analysis of the device status in the shortest possible time
- Optimization of the operating phase through time and travel cost savings
- Flexibility through modular service contracts that are tailored to customer requirements

Reduction of costs through process monitoring

MARSIC measurement technology provides important information for the monitoring and economic optimization of the ship propulsion:

- Measurement of the methane slip with LNG and dual-fuel drives
- Optimization of machine performance for more energy efficiency

High availability

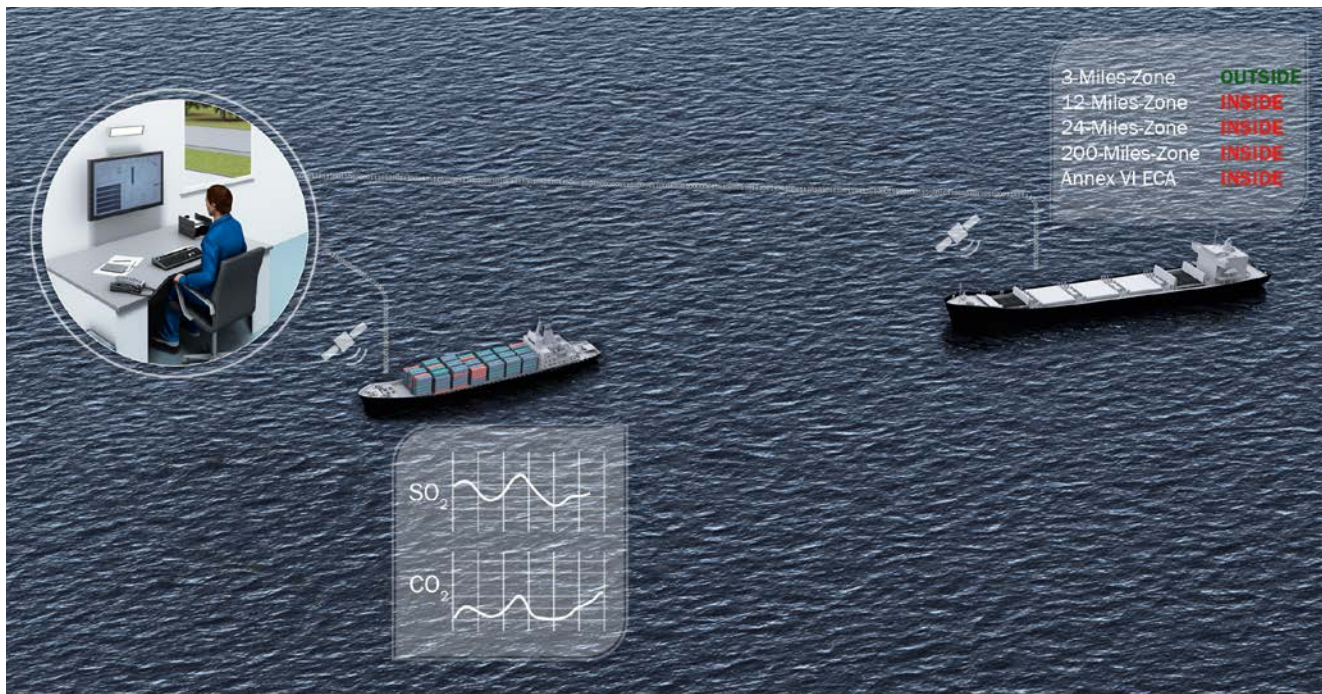
- After receiving training from SICK, customers can perform most maintenance tasks themselves
- Simple, more effective servicing thanks to modular design
- Expert help quickly available via SICK Remote Service

Low costs and minimum effort

- Minimal maintenance, few moving parts subject to wear and tear
- One analyzer can cover up to 4 or 8 measuring points (depending on the device version)
- Depending on the device, no or very little calibration gases required thanks to automatic calibration using internal filters

Never lose track

Benefit from the advantages that intelligent sensors and systems offer



The MARSIC series of ship emissions measuring devices give ship operators the safety they need. In combination with the appropriate software, MARSIC generates an emissions profile that can be linked with the current ship location. This provides enormous added value: the ship's crew can initiate the necessary measures immediately on entering an Emission Control Area (ECA).

SICK is therefore making a valuable contribution to simplifying the work procedures and reducing the workload of the ship's crew.



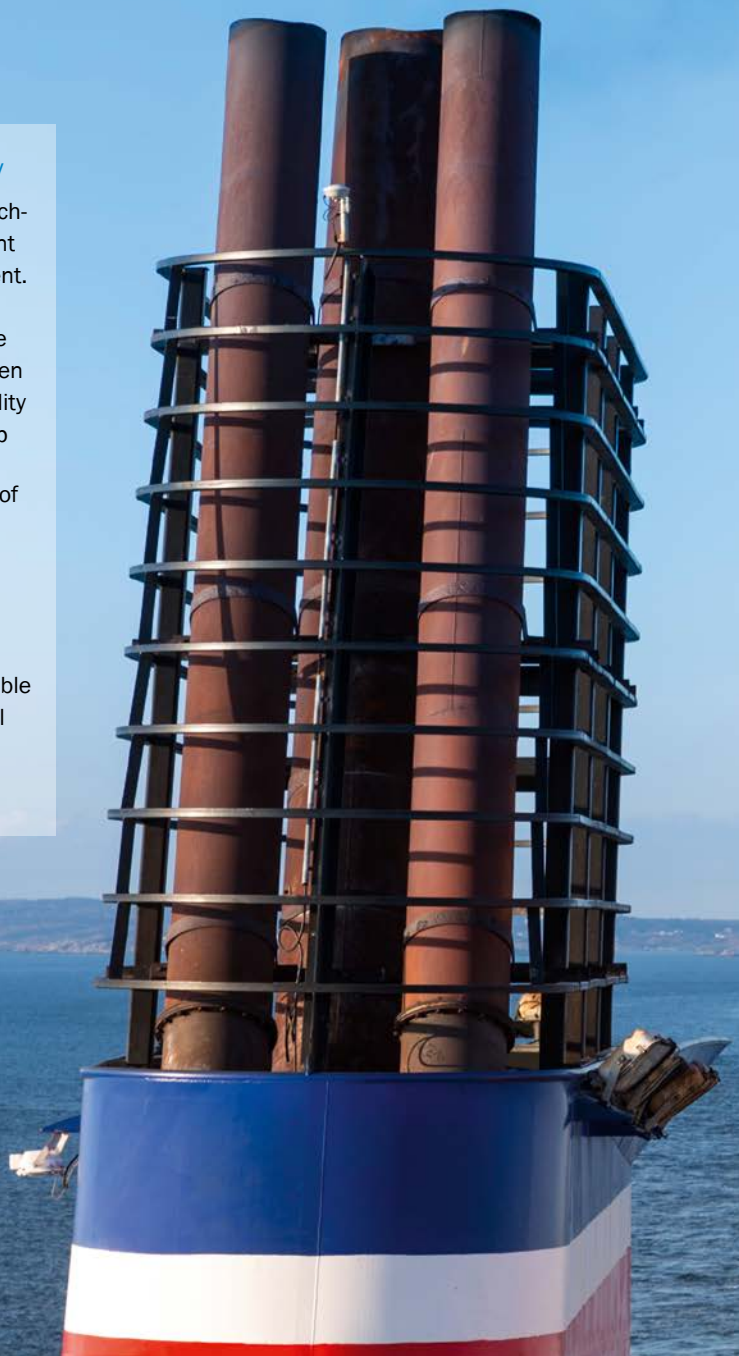
MARSIC: superior technology compared

Reliable thanks to repeatedly proven technology

As a market leader in onshore emissions measurement technology, SICK has decades of experience in the development and integration of gas analysis and emissions measurement. Furthermore, SICK offers comprehensive on-board measurement systems and has a long tradition within maritime applications. MARSIC therefore comprises repeatedly proven technology, which has demonstrated its quality and reliability all over the world. SICK now has the largest number of ship emissions measuring devices installed worldwide and has established itself as the leading manufacturer in the area of maritime emission control.

MARSIC pays for itself quickly

Thanks to MARSIC and the use of state-of-the-art exhaust gas cleaning technologies, ships can continue to operate cost-efficiently with heavy fuel oil. This results in considerable potential for savings with regard to fuel costs. The financial cost can therefore be paid off after just a short period of time.





	MARSIC300	MARSIC280
Measurement technology	Hot/wet extractive, no condensation	Cold/dry extractive via cooler
Measuring point	Measurement upstream and/or downstream of scrubber, SCR	Measurement downstream of scrubber
Number of measuring points	Up to 8	Up to 2
Simultaneous measuring components	SO ₂ , CO ₂ , CO, NO, NO ₂ , NH ₃ , CH ₄ , H ₂ O	SO ₂ , CO ₂
Sample gas lines	Maximum length: 35 m Controlled, heated sample gas line	Maximum length: 35 m Controlled, heated sample gas line
Response time (T₉₀)	< 140 s, component-specific based on certification	< 140 s, component-specific based on certification
Instrument air	Component-specific using ejector pump, approx. 1.3 m ³ /h (1,300 l/h)	Purge air only (100 l/h standby)
Power consumption (15 m sample gas line)	Approx. 3,100 VA for 1 measuring point Approx. 5,200 VA for 2 measuring points	Approx. 2,700 VA for 1 measuring point Approx. 4,800 VA for 2 measuring points
Consumable parts	Predefined replacement part set	Predefined replacement part set
Installation	1 housing, heated sample gas line	2 small housings mounted on a mounting frame, prewired
Operation, servicing	Internal calibration function with no test gases, pre-defined module for easy replacement	Few operating materials, modular housing design, pre-defined module for easy replacement

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Product description

The MARSIC300 ship emissions measuring device from SICK is an innovative solution for reliably measuring emissions on ships according to MARPOL Annex VI and IMO MEPC. The MARSIC300 is type-approved for this application by well-known classification organizations. The MARSIC300 measures both SO_x and CO₂ upstream and downstream of the scrubbers, and NO_x upstream and downstream of SCR (selective catalytic

reduction) plants. In addition, it can also be used for process gas measurements such as CH₄ in LNG (liquefied natural gas) and dual-fuel engines.

As a leading manufacturer of emissions measurement technology, SICK is offering the MARSIC300 as a compact complete system. Designed to be used on ships, the measuring device boasts extremely low maintenance costs and modules that are easy to replace.

At a glance

- Rugged design and high level of measurement accuracy
- Type-approved by well-known classification organizations in accordance with MARPOL Annex VI and IMO MEPC
- Measuring ranges adapted to low and high concentrations of SO₂ and NO_x
- Up to 8 measuring components simultaneously: SO₂, CO₂, CO, NO, NO₂, NH₃, CH₄, H₂O

Your benefits

- High levels of availability and reliability
- Modules that are easy to replace during servicing
- Low costs due to minimal maintenance requirements
- Servicing support is available globally
- Quick access to expert support with remote maintenance
- No expensive test gases thanks to its certified internal drift correction
- Equipped for existing and future requirements thanks to its rugged design and high level of measurement accuracy



More information

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→ www.sick.com/MARSIC300

For more information, simply enter the link or scan the QR code to get direct access to technical data, CAD design models, operating instructions, software, application examples, and much more.



Fields of application

- Reliable emission control on ships
- Accurate DeNO_x and DeSO_x measurements for ship engines
- Cost-efficient process monitoring upstream and downstream of the scrubber and catalytic converters

Detailed technical data

The precise device specifications and product performance data may vary and are dependent on the respective application and customer specifications.

MARSIC300 system

Measured values	CO ₂ , SO ₂ , NO, NO ₂ , CO, CH ₄ , NH ₃ , H ₂ O																
Measurement principles	NDIR spectroscopy																
Spectral range	2,000 nm ... 11,000 nm																
Measuring distance	8.5 m																
Gas flow rate	200 l/h ... 300 l/h																
Measuring ranges	<table border="0"> <tr> <td>CO₂</td> <td>0 ... 25 Vol.-%</td> </tr> <tr> <td>SO₂</td> <td>0 ... 30 ppm / 0 ... 2,000 ppm</td> </tr> <tr> <td>NO</td> <td>0 ... 300 ppm / 0 ... 2,000 ppm</td> </tr> <tr> <td>NO₂</td> <td>0 ... 200 ppm / 0 ... 500 ppm</td> </tr> <tr> <td>CO</td> <td>0 ... 200 ppm / 0 ... 2,000 ppm</td> </tr> <tr> <td>CH₄</td> <td>0 ... 500 ppm / 0 ... 10,000 ppm</td> </tr> <tr> <td>NH₃</td> <td>0 ... 50 ppm / 0 ... 500 ppm</td> </tr> <tr> <td>H₂O</td> <td>0 ... 40 Vol.-%</td> </tr> </table>	CO ₂	0 ... 25 Vol.-%	SO ₂	0 ... 30 ppm / 0 ... 2,000 ppm	NO	0 ... 300 ppm / 0 ... 2,000 ppm	NO ₂	0 ... 200 ppm / 0 ... 500 ppm	CO	0 ... 200 ppm / 0 ... 2,000 ppm	CH ₄	0 ... 500 ppm / 0 ... 10,000 ppm	NH ₃	0 ... 50 ppm / 0 ... 500 ppm	H ₂ O	0 ... 40 Vol.-%
CO ₂	0 ... 25 Vol.-%																
SO ₂	0 ... 30 ppm / 0 ... 2,000 ppm																
NO	0 ... 300 ppm / 0 ... 2,000 ppm																
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CO	0 ... 200 ppm / 0 ... 2,000 ppm																
CH ₄	0 ... 500 ppm / 0 ... 10,000 ppm																
NH ₃	0 ... 50 ppm / 0 ... 500 ppm																
H ₂ O	0 ... 40 Vol.-%																
Response time (t₉₀)	≤ 140 s, including sample gas path and gas sampling unit																
Accuracy	< 2% of the measuring range limit value																
Sensitivity drift	< 2% of measuring range full scale value per week																
Zero point drift	< 2% of measuring range full scale value per week																
Reference point drift	< 2% of measuring range full scale value per week																
Detection limit	< 2% of measuring range full scale value																
Process temperature	+10 °C ... +550 °C																
Process pressure	-20 hPa ... 200 hPa, relative																
Dust load	≤ 200 mg/m ³																
Ambient temperature	0 °C ... +50 °C (performance-tested up to 45 °C)																
Storage temperature	-20 °C ... +70 °C																
Ambient pressure	900 hPa ... 1,100 hPa																
Ambient humidity	≤ 90 %, non-condensing																
Conformities	MARPOL Annex VI and NTC 2008 – MEPC.177(58) Guidelines for exhaust gas cleaning systems – MEPC.340(77) Guidelines for SCR reduction systems – MEPC.198(62) DNV GL Rules for Type Approvals (2012) IACS E10 and Rules of major classification societies																
Electrical safety	CE, Rules of major classification societies																
Enclosure rating	IP54																
Communication interface	Modbus PROFIBUS DP Ethernet																
Remark	Option																
Type of fieldbus integration	TCP RS-485																
Function	Connection to OPC server																
Number	1																

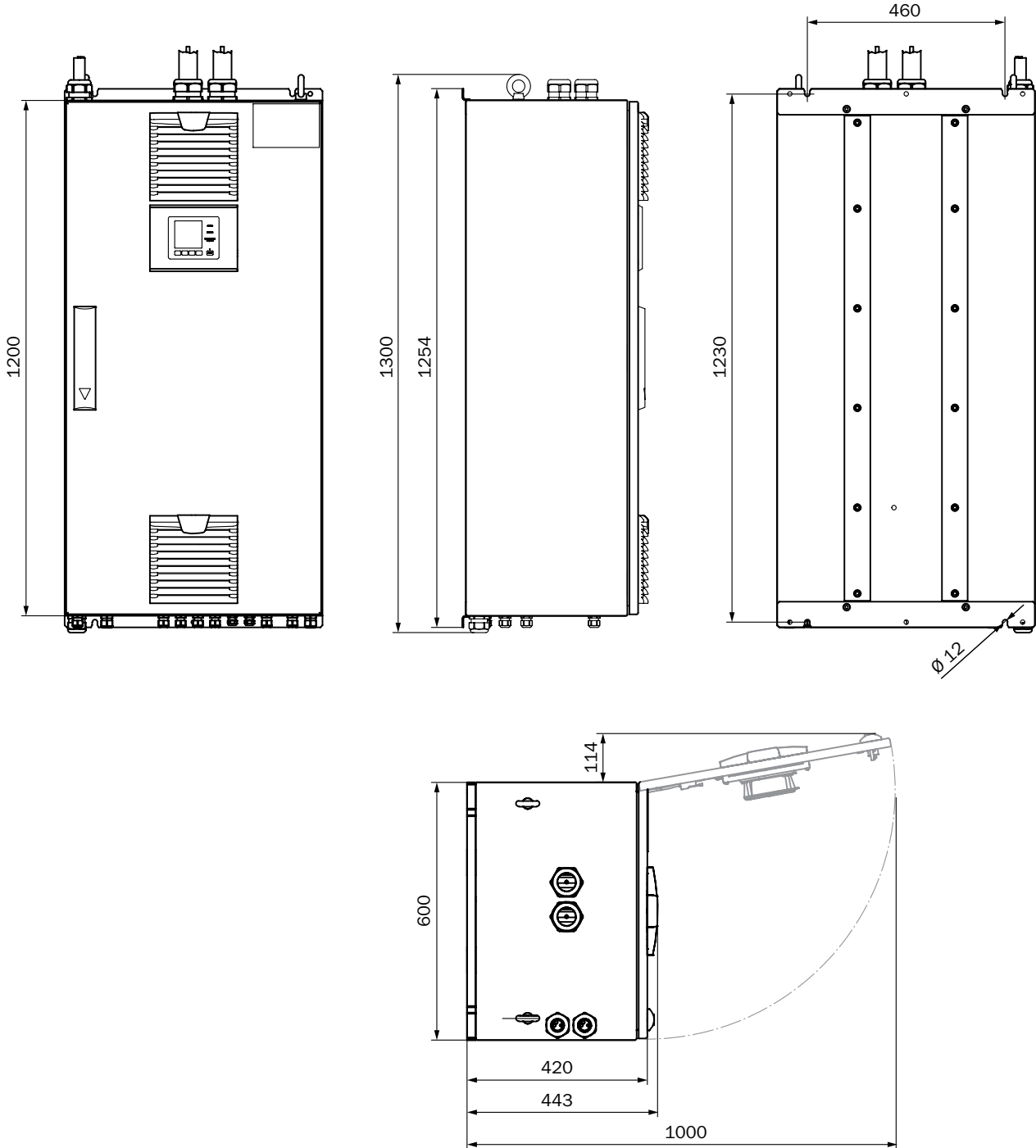
Indication	LC display Status LEDs: "Power," "Maintenance," and "Fault"
Input	Function keys
Operation	Via LC display or SOPAS ET software, multiple operating levels, password-protected
Dimensions (W x H x D)	600 mm x 1,300 mm x 434 mm (see dimensional drawings for details)
Weight	120 kg
Material in contact with media	Stainless steel 1.4547, PTFE, aluminum, coated
Mounting	Wall mounting
Power supply	
3-phase current	3-phase: 115 V, 50/60 Hz 3-phase: 208 V, 50/60 Hz 3-phase: 230 V, 50/60 Hz Special configurations with minimal equipment are also possible
Current consumption	At 230 V AC: ≤ 14 A
Power consumption	Analyzer: $\leq 1,000$ W Gas sampling unit: ≤ 750 W Sample gas line, heated: ≤ 90 W/m
Auxiliaries	
Compressed air:	$\leq 1,300$ l/h Instrument air: 5 ... 7 bar; particle size max. 1 μ m; oil content max. 0.1 mg/m ³ ; pressure condensation point max. -40°C
Sample gas connections	Clamping ring fitting for 6 mm pipes
Auxiliary gas connections	
Compressed air	Tube connector DN 6/8 and DN 8/10
Test gas	Tube connector DN 6/8
Corrective functions	Drift correction and optical monitoring function via adjustment cell Automated zero point adjustment with instrument air
System components	Gas sampling unit, heated, including filter housing Sample gas line, heated (max. 35 m) Analyzer cabinet
Integrated components	Ejector pump Pressure sensors

Ordering information

Our regional sales organization will be glad to advise you on which device configuration is best for you.

Dimensional drawings (dimensions in mm)

MARSIC300



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Product description

The MARSIC280 from SICK is a cost-optimized solution for reliably measuring emissions on ships according to MARPOL Annex VI and IMO MEPC. MARSIC280 is designed for measurement of SO₂ and CO₂ downstream of the scrubber. Classification organizations have type-approved the measuring device for this application. With the MARSIC280, SICK, a leading manufacturer of maritime emission

measurement technology, has created a solution based on many years of practical experience. It shines due to its simple mounting and minimal maintenance requirements. Components can be easily exchanged due to a replacement concept. Thanks to the use of standardized units, for example from the MARSIC300, the MARSIC280 offers flexibility and reduces the need for spare parts storage.

At a glance

- Rugged design and high level of measurement accuracy
- Type-approved by classification organizations in accordance with MARPOL Annex VI and IMO MEPC
- Optimized for SO₂ and CO₂ measurement downstream of the scrubber
- Use of field-tested MARSIC300 components

Your benefits

- Up to 2 measurement points with only one measuring device
- High levels of availability and reliability
- Modules can be exchanged easily
- Low costs due to minimal maintenance requirements
- Servicing support is available globally
- Quick access to expert support with remote maintenance
- Future-proof investment: Satisfies existing and future requirements on emission control on ships
- Saves space and costs for spare parts storage by using the same units as the MARSIC300

More information

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→ www.sick.com/MARSIC280

For more information, simply enter the link or scan the QR code to get direct access to technical data, CAD design models, operating instructions, software, application examples, and much more.



Fields of application

- Reliable emission control on ships
- DeSO_x measurements downstream of the scrubber
- Cost-efficient emission control thanks to cold/dry extractive measuring technology

Detailed technical data

The precise device specifications and product performance data may vary and are dependent on the respective application and customer specifications.

MARSIC280 system

Measured Values	CO ₂ , SO ₂										
Measurement principles	NDIR-spectroscopy, NDUV-spectroscopy										
Sample quantity	80 l/h ... 120 l/h										
Measuring ranges	<table border="0"> <tr> <td>CO₂</td> <td>0 ... 25 Vol.-%</td> </tr> <tr> <td>SO₂</td> <td>0 ... 100 ppm / 0 ... 500 ppm</td> </tr> </table>	CO ₂	0 ... 25 Vol.-%	SO ₂	0 ... 100 ppm / 0 ... 500 ppm						
CO ₂	0 ... 25 Vol.-%										
SO ₂	0 ... 100 ppm / 0 ... 500 ppm										
Response time (t₉₀)	15 s ... 30 s (including sample gas path and gas sampling unit)										
Accuracy	≤ 1 % of measuring range full scale value										
Sensitivity drift	< 2% of measuring range full scale value per week										
Zero point drift	< 2% of measuring range full scale value per week										
Reference point drift	< 2% of measuring range full scale value per week										
Detection limit	≤ 0.5 %										
Process temperature	+10 °C ... +550 °C										
Process pressure	-200 hPa ... 200 hPa, relative										
Dust load	≤ 200 mg/m ³										
Ambient temperature	+5 °C ... +45 °C										
Storage temperature	-20 °C ... +70 °C										
Ambient pressure	900 hPa ... 1,100 hPa										
Ambient humidity	≤ 90%, non-condensing										
Conformities	MARPOL Annex VI and NTC 2008 – MEPC.177(58) Guidelines for exhaust gas cleaning systems – MEPC.340(77) DNV GL Rules for Type Approvals (DNVGL-CG-0339)										
Electrical safety	CE, Rules of major classification societies										
Enclosure rating	IP54										
Analog outputs	8 outputs: 0 ... 24 mA Galvanically isolated										
Analog inputs	2 inputs: 0 ... 20 mA										
Digital outputs	16 outputs: Changeover switch, 1-pin, 3 connections										
Digital inputs	8 inputs: 42 V										
Communication interface	<table border="0"> <tr> <td></td> <td>Modbus</td> </tr> <tr> <td></td> <td>Ethernet</td> </tr> <tr> <td>Remark</td> <td>Option</td> </tr> <tr> <td>Type of fieldbus integration</td> <td>TCP</td> </tr> <tr> <td>Function</td> <td>Connection to OPC server</td> </tr> </table>		Modbus		Ethernet	Remark	Option	Type of fieldbus integration	TCP	Function	Connection to OPC server
	Modbus										
	Ethernet										
Remark	Option										
Type of fieldbus integration	TCP										
Function	Connection to OPC server										
Number	1										
Indication	LC display Status LEDs: "Power," "Maintenance," and "Fault"										
Dimensions (W x H x D)	680 mm x 1,723 mm x 477 mm (see dimensional drawings for details)										

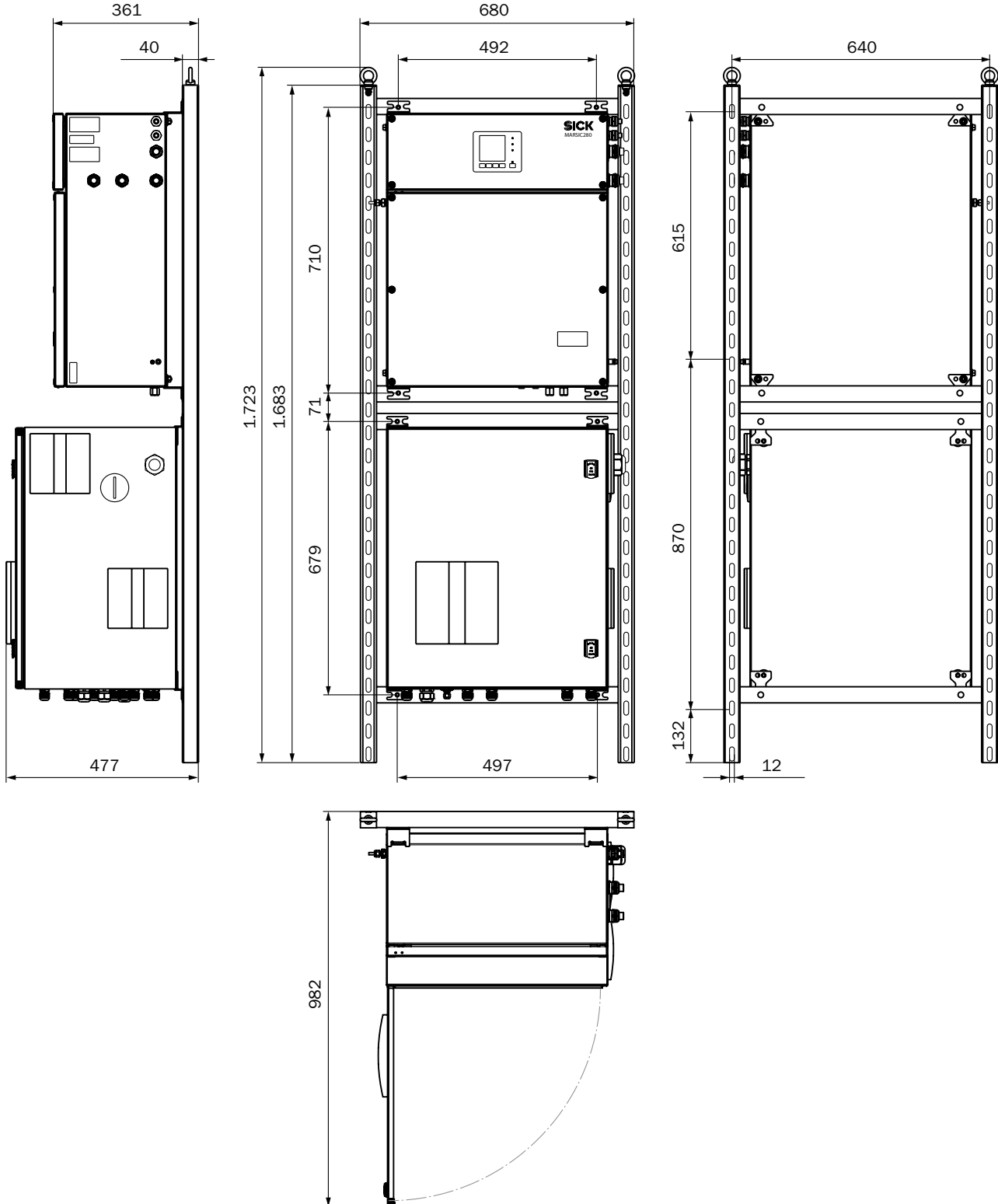
Weight	Analyzer unit:	37 kg
	Sample handling and distributor unit:	52 kg
	Complete system on mounting frame:	110 kg
Material in contact with media		PTFE, PVDF, FKM, stainless steel 1.4547, hastelloy, platinum, nickel, aluminum, calcium fluoride
Mounting		Wall mounting
Power supply	Voltage	115 V / 230 V / 400 V Can be connected to typical voltage supplies
	Frequency	50 Hz / 60 Hz
	Current consumption	At 230 V AC: ≤ 8 A, without sample gas line and filter unit
	Power consumption	Analyzer unit: ≤ 300 W Gas sampling unit: ≤ 750 W Sample gas line, heated: ≤ 90 W/m Sample handling and distributor unit: ≤ 300 W
Sample gas connections		Clamping ring fitting for 6 mm pipes
Auxiliary gas connections	Instrument air	Hose connector DN 4/6
	Test gas	Hose connector DN 4/6
Corrective functions		Automated zero point adjustment with N ₂ or instrument air, weekly
System components		Sample probe, heated, including filter unit Sample gas line, heated (max. 35 m) Sample handling and distributor unit Analyzer unit
Integrated components		Sample gas pump pressure sensor Flow sensor

Ordering information

Our regional sales organization will be glad to advise you on which device configuration is best for you.

Dimensional drawings (dimensions in mm)

MARSIC280 mounting frame



SICK AT A GLANCE

SICK is a leading manufacturer of intelligent sensors and sensor solutions for industrial applications. With more than 11,900 employees and over 50 subsidiaries and equity investments, as well as numerous international agencies, SICK is always close to its customers. An extensive range of products and services creates the ideal basis for controlling processes securely and efficiently, protecting individuals from accidents and preventing damage to the environment.

SICK has extensive experience in various industries and understands their processes and requirements. With intelligent sensors, SICK delivers exactly what the customers need. In application centers in Europe, Asia, and North America, system solutions are tested and optimized in accordance with customer specifications. All this makes SICK a reliable supplier and development partner.

Comprehensive services round out the offering: SICK LifeTime Services provide support throughout the machine life cycle and ensure safety and productivity.

That is “Sensor Intelligence.”

Worldwide presence:

Australia, Austria, Belgium, Brazil, Canada, Chile, China, Czech Republic, Denmark, Finland, France, Germany, Great Britain, Hungary, Hong Kong, India, Israel, Italy, Japan, Malaysia, Mexico, Netherlands, New Zealand, Norway, Poland, Romania, Singapore, Slovakia, Slovenia, South Africa, South Korea, Spain, Sweden, Switzerland, Taiwan, Thailand, Turkey, United Arab Emirates, USA, Vietnam.

Detailed addresses and further locations → www.sick.com