



# MARSIC SHIP EMISSIONS MEASURING DEVICES

SAFELY ON THE RIGHT COURSE

Analyzer solutions

**SICK**  
Sensor Intelligence.

## RELIABLY ON THE RIGHT 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.



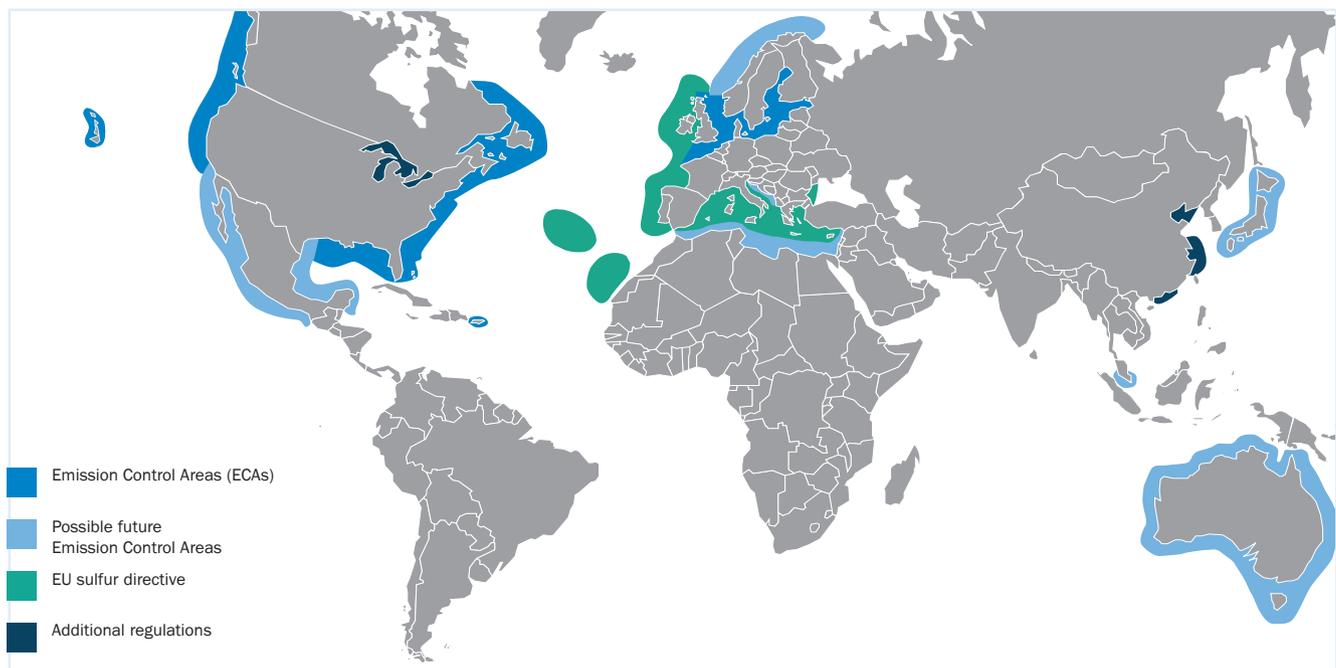
## HIGH RELIABILITY – NOW AND IN THE FUTURE

### 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 are certified for monitoring DeSO<sub>x</sub> and DeNO<sub>x</sub> systems by DNV GL, 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 ship emissions 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<sub>x</sub> 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 CO<sub>2</sub> 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

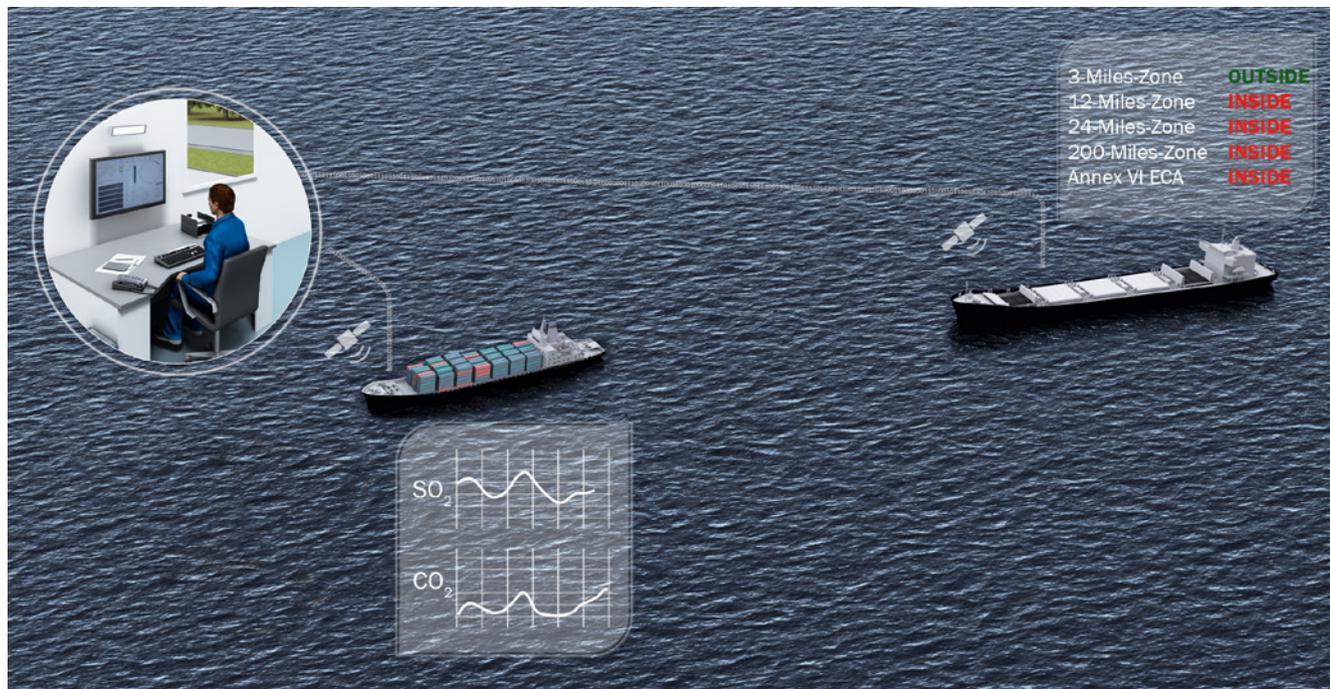
- After receiving training from SICK, customers can perform most maintenance tasks themselves
- Simple, more effective servicing thanks to modular design
- Expert help quickly available via SICK Remote Service

### 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.



# MARSIC200 AND MARSIC300: SUPERIOR TECHNOLOGY IN COMPARISON

## Reliable thanks to repeatedly proven technology

As an market leader in onshore emissions measurement technology, SICK has decades of experience in the development and integration of gas analyzers and emissions measurement. Furthermore, SICK offers comprehensive on-board measurement systems and has a long tradition within maritime applications. MARSIC therefore comprises a thousandfold proven technology that has demonstrated its quality and reliability all over the world, which is why SICK now has the largest number of ship emissions measuring devices installed in the world.

## 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.

Measurement technology

Measuring point

Number of measuring points

Simultaneous measuring components

Sample gas lines

Adjustment time ( $T_{90}$ )

Instrument air

Power consumption

Consumable parts

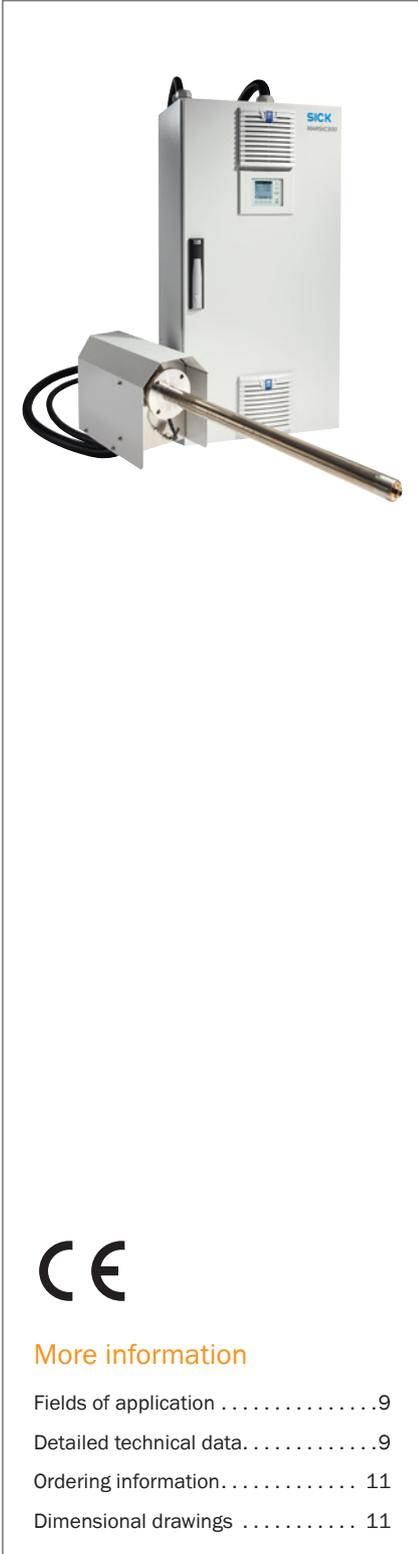
Installation

Operation, servicing



MARSIC200	MARSIC300
Cold/dry extractive via cooler	Hot/wet extractive, no condensation
Measurement downstream of scrubber and upstream and/or downstream of SCR	Measurement upstream and/or downstream of scrubber, SCR
Up to 4	Up to 8
SO <sub>2</sub> , CO <sub>2</sub> , NO, NO <sub>2</sub> , O <sub>2</sub>	SO <sub>2</sub> , CO <sub>2</sub> , CO, NO, NO <sub>2</sub> , NH <sub>3</sub> , CH <sub>4</sub> , H <sub>2</sub> O
Maximum length: 50 m Short distance with self-regulating, heated sample gas line Long distance with unheated sample gas line	Maximum length: 35 m Controlled, heated sample gas line
15 s ... 30 s	< 140 s, component-specific based on certification
Purge air only (60 l/h standby)	Component-specific using ejector pump, approx. 1.3 m <sup>3</sup> /h (1,300 l/h)
Approx. 1,150 W for 1 measuring point Approx. 3,480 W for 4 measuring points	Approx. 3,100 W for 1 measuring point Approx. 5,200 W for 2 measuring points
Predefined replacement part set	Predefined replacement part set
3 small/light housings, long unheated sample gas line section	1 housing, heated sample gas line
Few operating materials, modular housing design, pre-defined module for easy replacement	Internal calibration function with no test gases, pre-defined module for easy replacement

# SAFELY ON THE RIGHT COURSE



## 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<sub>x</sub> and CO<sub>2</sub> upstream and downstream of the scrubbers, and NO<sub>x</sub> upstream and downstream of SCR (selective catalytic

reduction) plants. In addition, it can also be used for process gas measurements such as CH<sub>4</sub> 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 SO<sub>2</sub> and NO<sub>x</sub>
- Up to 9 measuring components simultaneously: SO<sub>2</sub>, CO<sub>2</sub>, CO, NO, NO<sub>2</sub>, NH<sub>3</sub>, CH<sub>4</sub> and H<sub>2</sub>O

## Your benefits

- Low costs due to minimal maintenance requirements
- No expensive test gases thanks to its certified internal drift correction
- Up to 8 measurement points with only one analyzer
- High levels of availability and reliability
- Assemblies that are easy to replace during servicing
- Servicing support is available globally
- Quick support provided by experts via remote maintenance
- 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](http://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 monitoring on ships
- Accurate DeNO<sub>x</sub> and DeSO<sub>x</sub> 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

<b>Measured values</b>	CO <sub>2</sub> , SO <sub>2</sub> , NO, NO <sub>2</sub> , CO, CH <sub>4</sub> , NH <sub>3</sub> , H <sub>2</sub> O
<b>Measurement principles</b>	NDIR-spectroscopy
<b>Spectral range</b>	2,000 nm ... 11,000 nm
<b>Length of measuring path</b>	8.5 m
<b>Sample quantity</b>	200 l/h ... 300 l/h
<b>Measuring ranges</b>	
	CO <sub>2</sub> 0 ... 25% by vol.
	SO <sub>2</sub> 0 ... 30 ppm / 0 ... 2,000 ppm
	NO 0 ... 300 ppm / 0 ... 2,000 ppm
	NO <sub>2</sub> 0 ... 200 ppm / 0 ... 500 ppm
	CO 0 ... 200 ppm / 0 ... 2,000 ppm
	CH <sub>4</sub> 0 ... 500 ppm / 0 ... 10,000 ppm
	NH <sub>3</sub> 0 ... 50 ppm / 0 ... 500 ppm
	H <sub>2</sub> O 0 ... 40% by vol.
<b>Adjustment time (t<sub>90</sub>)</b>	≤ 140 s including sample gas path and gas sampling probe
<b>Accuracy</b>	< 2% of measuring range full scale value
<b>Sensitivity drift</b>	< 2% of measuring range full scale value per week
<b>Zero point drift</b>	< 2% of measuring range full scale value per week
<b>Reference point drift</b>	< 2% of measuring range full scale value per week
<b>Detection limit</b>	< 2% of measuring range full scale value
<b>Process temperature</b>	+10 °C ... +550 °C
<b>Process pressure</b>	-20 hPa ... 200 hPa relative
<b>Dust load</b>	≤ 200 mg/m <sup>3</sup>
<b>Ambient temperature</b>	0 °C ... +45 °C
<b>Storage temperature</b>	-20 °C ... +70 °C
<b>Ambient pressure</b>	900 hPa ... 1,100 hPa
<b>Ambient humidity</b>	≤ 90% non-condensing
<b>Conformities</b>	MARPOL Annex VI und NTC 2008 – MEPC.177(58) Guidelines for exhaust gas cleaning systems – MEPC.259(68) Guidelines for SCR reduction systems – MEPC.198(62) DNV GL Rules for Type Approvals (2012) IACS E10 and Rules of major classification societies
<b>Electrical safety</b>	CE, Rules of major classification societies
<b>Enclosure rating</b>	IP54
<b>Modbus</b>	✓
Type of fieldbus integration	TCP
<b>PROFIBUS DP</b>	✓
Note	Option
Type of fieldbus integration	RS-485
<b>Ethernet</b>	✓
Function	Connection to OPC server

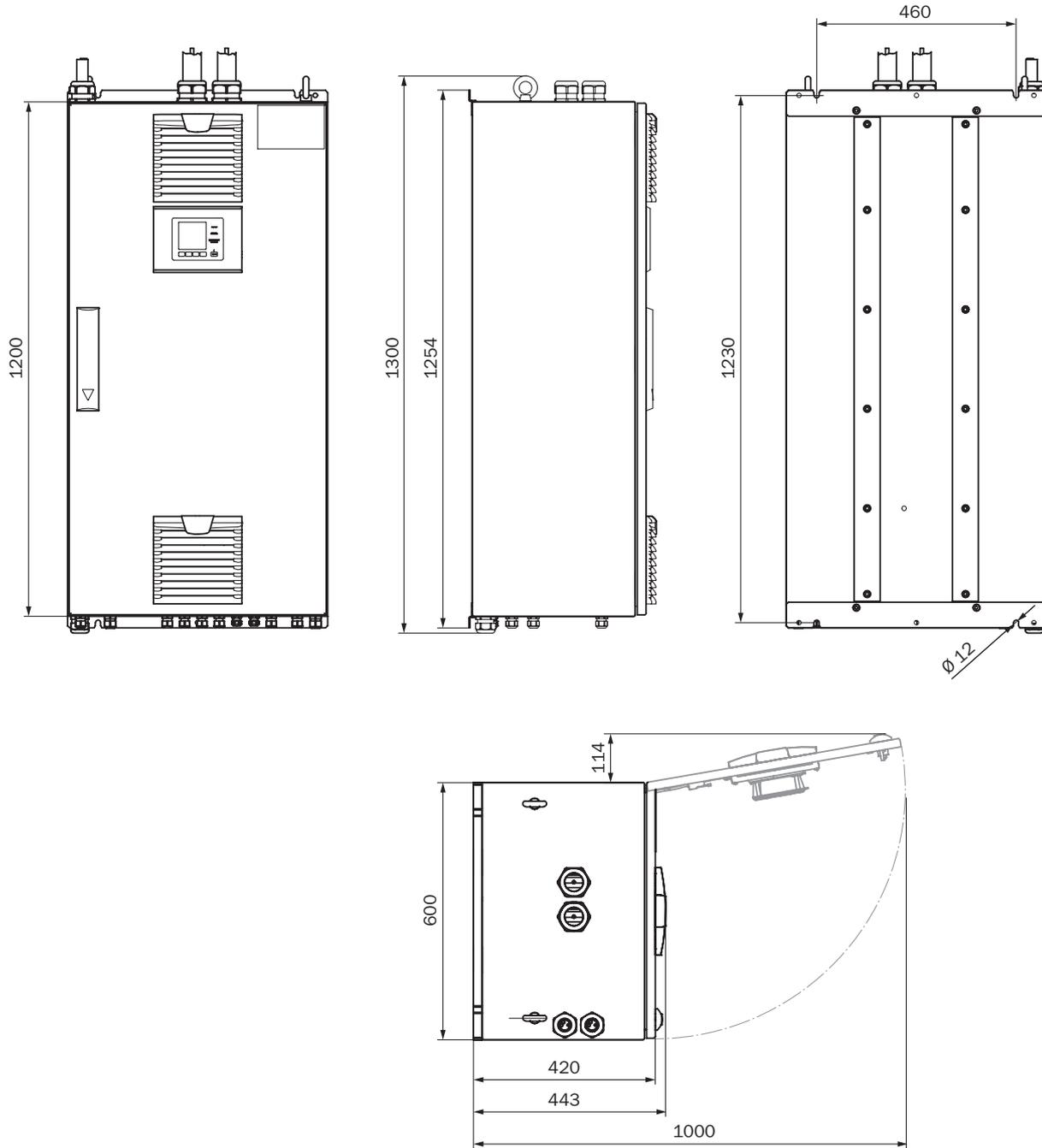
<b>Display</b>	LC display Status LEDs: "Power," "Maintenance," and "Fault"
<b>Input</b>	Function buttons
<b>Operation</b>	Via LC display or SOPAS ET software, multiple operating levels, password-protected
<b>Dimensions (W x H x D)</b>	600 mm x 1,300 mm x 434 mm
<b>Weight</b>	120 kg
<b>Material in contact with media</b>	Stainless steel 1.4571, PTFE, aluminum, coated
<b>Mounting</b>	Wall mounting
<b>Power supply</b>	
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: ≤ 1,000 W Gas sampling probe: ≤ 750 W Sample gas line, heated: ≤ 90 W/m
<b>Auxiliaries</b>	
Compressed air:	≤ 1,300 l/h Instrument air: 5 ... 7 bar; particle size max. 1 µm; oil content max. 0.1 mg/m <sup>3</sup> ; pressure condensation point max. -40 °C
<b>Sample connections</b>	Swagelok DN 4/6
<b>Auxiliary connections</b>	
Compressed air	Tube connector DN 6/8 and DN 8/10
Test gas	Tube connector DN 6/8
<b>Corrective functions</b>	Drift correction and optical monitoring function via adjustment cell Automated zero point adjustment with instrument air
<b>System components</b>	Sample probe, heated, including filter unit Sample gas line, heated (max. 35 m) Analyzer
<b>Integrated components</b>	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



# SAFELY ON THE RIGHT COURSE



### Product description

The MARSIC200 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 MARSIC200 is type-approved for this application by several classification organizations. The MARSIC200 measures both SO<sub>x</sub> and CO<sub>2</sub> downstream of the scrubbers, and NO<sub>x</sub> upstream and downstream of SCR

(selective catalytic reduction) plants. As a leading manufacturer of emissions measurement technology, SICK is offering the MARSIC200 as a modular housing concept. 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 several classification organizations in accordance with MARPOL Annex VI and IMO MEPC
- Measuring ranges adapted to low and high concentrations of SO<sub>2</sub> and NO<sub>x</sub>
- Up to 5 measuring components at the same time: SO<sub>2</sub>, CO<sub>2</sub>, NO, NO<sub>2</sub> and O<sub>2</sub>

### Your benefits

- Low costs due to minimal maintenance requirements
- Up to 4 measurement points with only one analyzer
- High levels of availability and reliability
- Assemblies that are easy to replace during servicing
- Servicing support is available globally
- Quick support provided by experts via remote maintenance
- 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/MARSIC200](http://www.sick.com/MARSIC200)

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 monitoring on ships
- Accurate DeNO<sub>x</sub> and DeSO<sub>x</sub> measurements for ship engines
- Cost-efficient process monitoring 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.

### MARSIC200 system

<b>Measured values</b>	CO <sub>2</sub> , SO <sub>2</sub> , NO, NO <sub>2</sub> , O <sub>2</sub>										
<b>Measurement principles</b>	NDIR-spectroscopy, NDUV-spectroscopy, electromagnetic cell										
<b>Sample quantity</b>	60 l/h ... 100 l/h										
<b>Measuring ranges</b>	<table border="0"> <tr> <td>CO<sub>2</sub></td> <td>0 ... 25% by vol.</td> </tr> <tr> <td>SO<sub>2</sub></td> <td>0 ... 100 ppm / 0 ... 500 ppm</td> </tr> <tr> <td>NO</td> <td>0 ... 300 ppm / 0 ... 1,500 ppm</td> </tr> <tr> <td>NO<sub>2</sub></td> <td>0 ... 200 ppm / 0 ... 500 ppm</td> </tr> <tr> <td>O<sub>2</sub></td> <td>0 ... 21% by vol.</td> </tr> </table>	CO <sub>2</sub>	0 ... 25% by vol.	SO <sub>2</sub>	0 ... 100 ppm / 0 ... 500 ppm	NO	0 ... 300 ppm / 0 ... 1,500 ppm	NO <sub>2</sub>	0 ... 200 ppm / 0 ... 500 ppm	O <sub>2</sub>	0 ... 21% by vol.
CO <sub>2</sub>	0 ... 25% by vol.										
SO <sub>2</sub>	0 ... 100 ppm / 0 ... 500 ppm										
NO	0 ... 300 ppm / 0 ... 1,500 ppm										
NO <sub>2</sub>	0 ... 200 ppm / 0 ... 500 ppm										
O <sub>2</sub>	0 ... 21% by vol.										
<b>Adjustment time (t<sub>90</sub>)</b>	15 s ... 30 s including sample gas path and gas sampling probe										
<b>Accuracy</b>	< 1% of measuring range full scale value										
<b>Sensitivity drift</b>	< 2% of measuring range full scale value per week										
<b>Zero point drift</b>	< 2% of measuring range full scale value per week										
<b>Reference point drift</b>	< 2% of measuring range full scale value per week										
<b>Detection limit</b>	≤ 0.5%										
<b>Process temperature</b>	+10 °C ... +550 °C										
<b>Process pressure</b>	-90 hPa ... 200 hPa Relative										
<b>Dust load</b>	≤ 200 mg/m <sup>3</sup>										
<b>Ambient temperature</b>	+5 °C ... +45 °C										
<b>Storage temperature</b>	-20 °C ... +70 °C										
<b>Ambient pressure</b>	900 hPa ... 1,100 hPa										
<b>Ambient humidity</b>	≤ 90% non-condensing										
<b>Conformities</b>	MARPOL Annex VI und NTC 2008 – MEPC.177(58) Guidelines for exhaust gas cleaning systems – MEPC.259(68) Guidelines for SCR reduction systems – MEPC.198(62) DNV GL Rules for Type Approvals (2012) IACS E10 and Rules of several classification societies										
<b>Electrical safety</b>	CE, Rules of several classification societies										
<b>Enclosure rating</b>	IP54										
<b>Analog outputs</b>	8 outputs: 0 ... 24 mA Galvanically isolated										
<b>Analog inputs</b>	2 inputs: 0 ... 20 mA										
<b>Digital outputs</b>	16 outputs: Changeover switch, 1-pin, 3 connections										
<b>Digital inputs</b>	8 inputs: +42 V										
<b>Modbus</b>	✓										
Type of fieldbus integration	TCP										

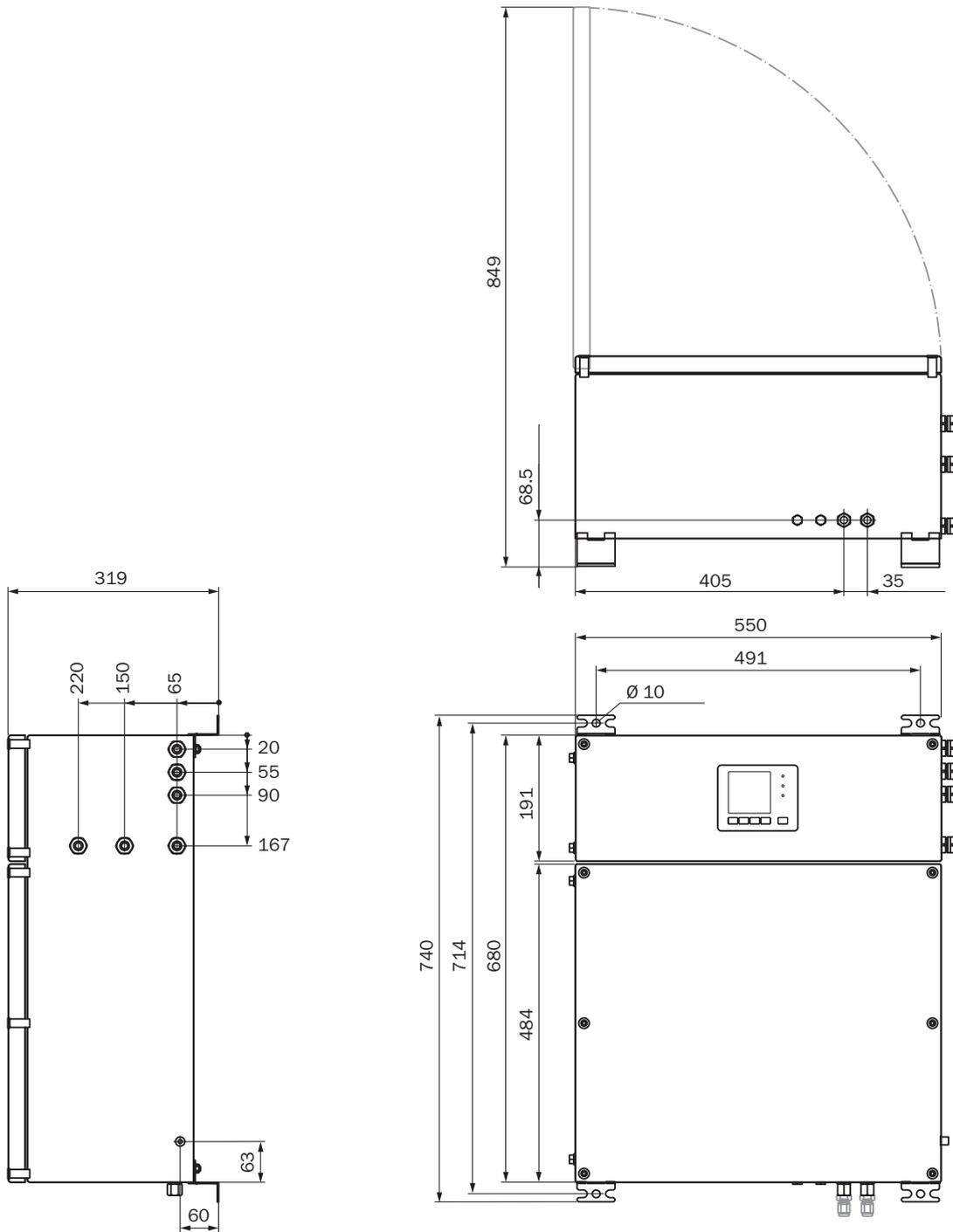
<b>Ethernet</b>	Function	✓ Connection to OPC server
<b>Display</b>		LC display Status LEDs: “Power,” “Maintenance,” and “Fault”
<b>Input</b>		Function buttons
<b>Operation</b>		Via LC display or SOPAS ET software, multiple operating levels, password-protected
<b>Performed by</b>		Sheet metal housing
<b>Dimensions (W x H x D)</b>		
	Sample conditioning	500 mm x 560 mm x 210 mm
	Distribution unit	600 mm x 660 mm x 210 mm
	Analyzer	550 mm x 740 mm x 319 mm
<b>Weight</b>		
	Sample conditioning:	27 kg
	Distribution unit:	30 kg
	Analyzer:	37 kg
<b>Material in contact with media</b>		PTFE, Viton B, PVDF, stainless steel 1.4571, platinum, nickel, aluminum, CaF <sub>2</sub> , Hastelloy
<b>Mounting</b>		Wall mounting
<b>Power supply</b>		
	Voltage	115 V / 230 V Different power supply via upstream transformer
	Frequency	50 Hz / 60 Hz
	Current consumption	At 230 V AC: ≤ 8 A
	Power consumption	Analyzer: ≤ 300 W Gas sampling probe: ≤ 400 W Sample gas line, heated: ≤ 60 W/m Sample conditioning: ≤ 150 W
<b>Auxiliaries</b>		
	Compressed air:	≤ 100 l/h Instrument air: 0.5 ... 1 bar; oil content max. 0.1 mg/m <sup>3</sup>
<b>Sample connections</b>		Swagelok DN 4/6
<b>Auxiliary connections</b>		
	Compressed air	Tube connector DN 4/6
	Test gas	Tube connector DN 4/6
<b>Corrective functions</b>		Automated zero point adjustment with N <sub>2</sub> , weekly
<b>System components</b>		Sample probe, heated, including filter unit Sample gas line, partially heated Sample conditioning MARSIC200 Distribution Unit Analyzer
<b>Integrated components</b>		Measurement gas pump Pressure sensor Flow sensor

**Ordering information**

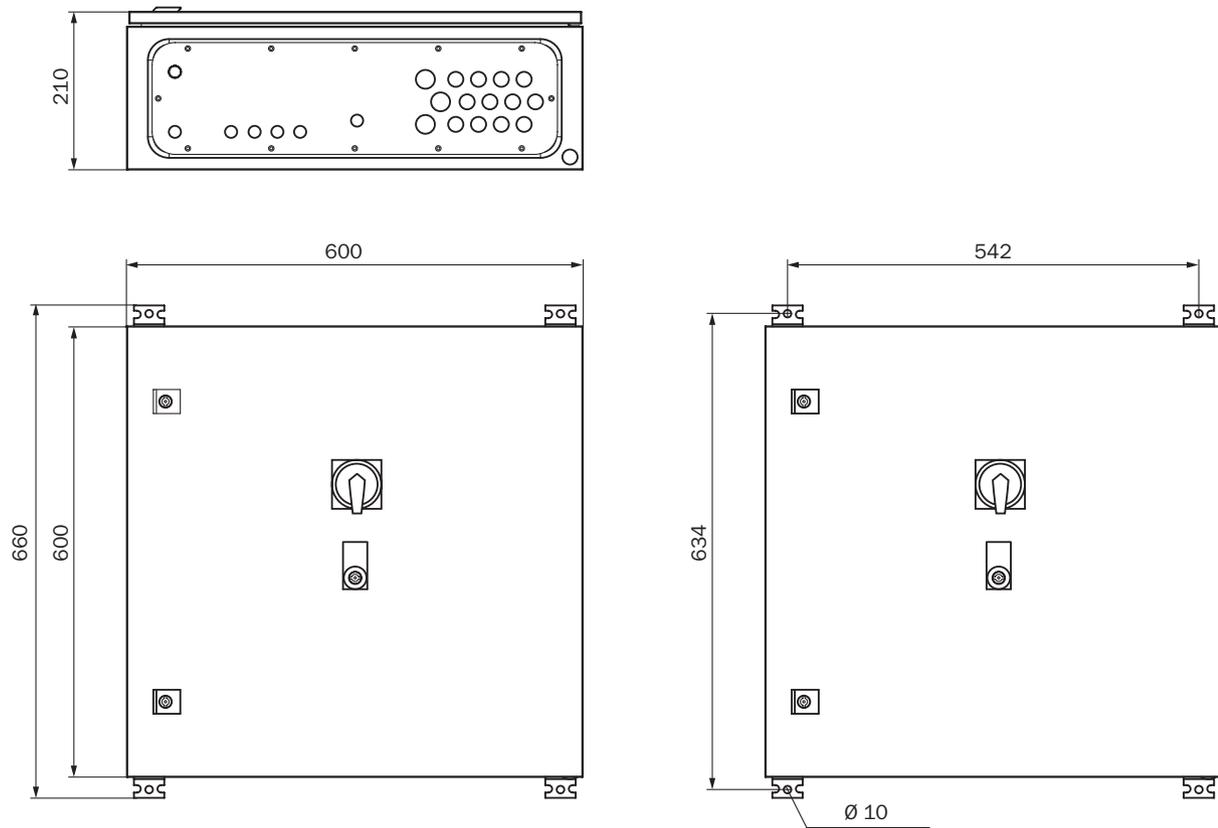
Our regional sales organization will be glad to advise you on which device configuration is best for you.

**Dimensional drawings** (dimensions in mm)

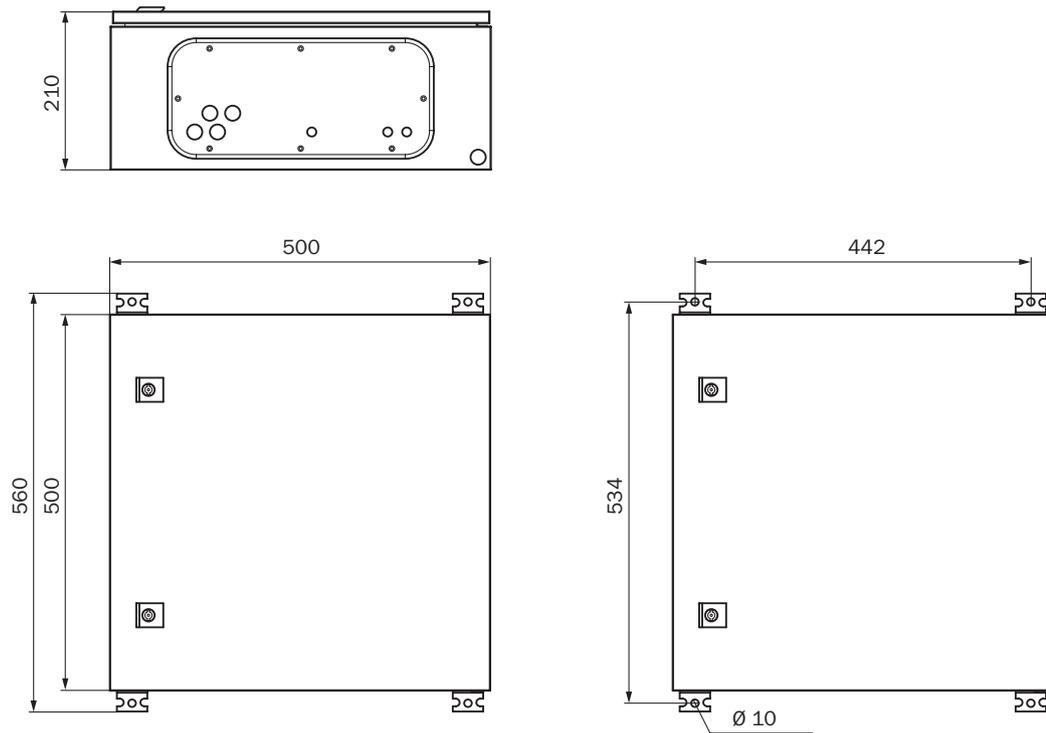
MARSIC200 Analyzer



MARSIC200 Distribution Unit



MARSIC200 Sample Conditioning







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## SERVICES FOR MACHINES AND SYSTEMS: SICK LifeTime Services

The sophisticated and versatile LifeTime Services perfectly complement SICK's comprehensive product range. Services range from product-independent consulting to traditional product services.



- 
**Consulting and design**  
 Secure and professional
- 
**Product and system support**  
 Reliable, fast, and on-site
- 
**Verification and optimization**  
 Safe and regularly tested
- 
**Upgrade and retrofits**  
 Simple, safe, and economical
- 
**Training and education**  
 Practical, focused, and professional

## SICK AT A GLANCE

SICK is a leading manufacturer of intelligent sensors and sensor solutions for industrial applications. With more than 9,700 employees and over 50 subsidiaries and equity investments as well as numerous agencies worldwide, SICK is always close to its customers. A unique range of products and services creates the perfect 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, Russia, 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](http://www.sick.com)