MARSIC280/MARSIC300

Ship emissions measuring devices

Safely on the right course

- 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 calibration filters
- Equipped for existing and future requirements thanks to its rugged design and high level of measurement accuracy

Endress+Hauser

People for Process Automation

Safely on course

With MARSIC, the ship emissions measuring device, 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.

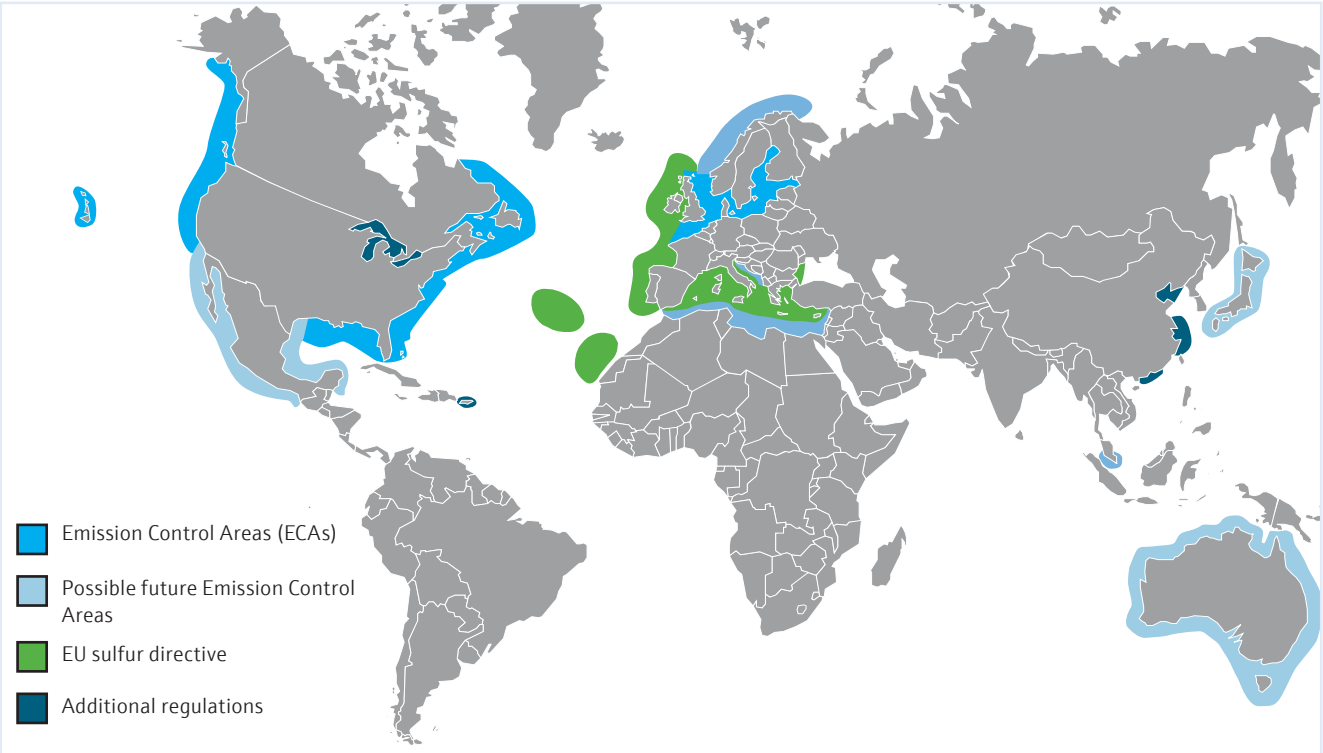
High reliability – now and in the future

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 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) and MEPC.340(77)
- Measurement of CO_2 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, we are ensuring that our services and spare parts can be accessed efficiently around the globe. To satisfy our global demand, we have established several maritime service hubs to coordinate and actively support our worldwide service activities. In addition, further training centers enable our company to pass on its detailed knowledge about the products and their peripherals to internal and external customers. Our Qualified staff 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 check from anywhere by means of remote maintenance. 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. Our 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 our 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

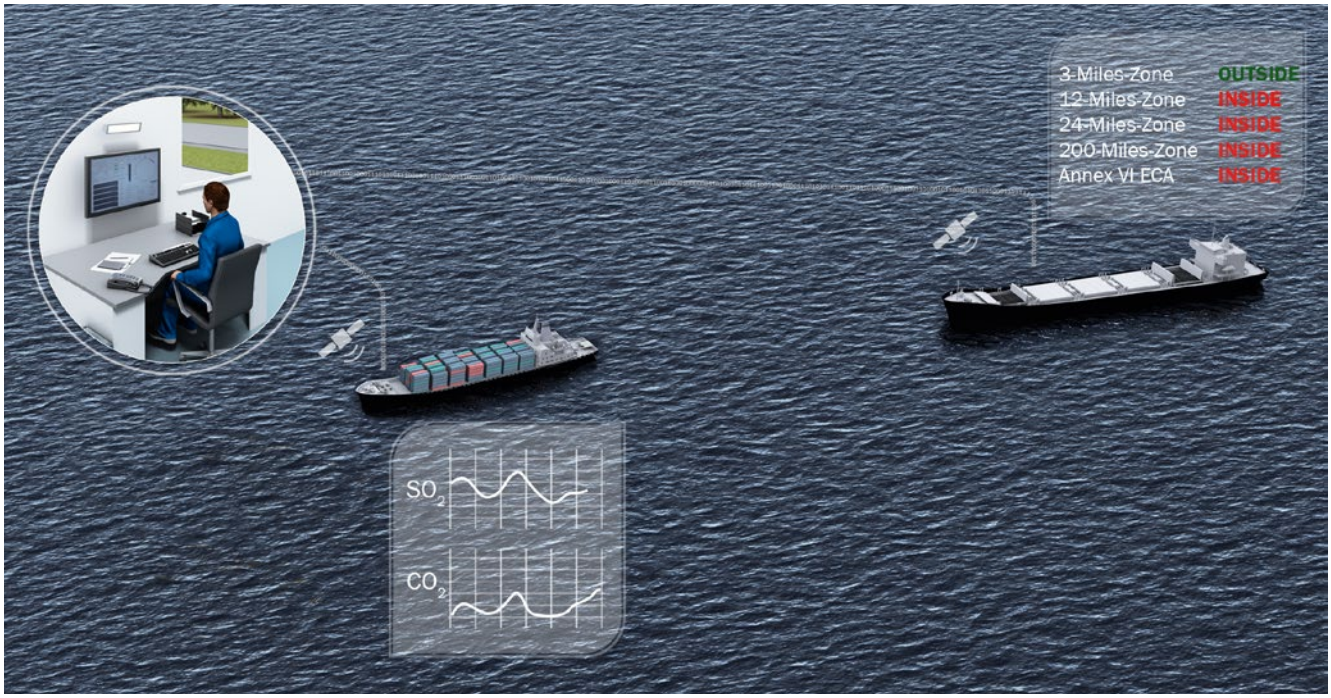
- After receiving training, customers can perform most maintenance tasks themselves
- Simple, more effective servicing thanks to modular design
- Expert help quickly available via our Remote Service

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).

We are 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, we have decades of experience in the development and integration of gas analysis and emissions measurement. Furthermore, we offer comprehensive on-board measurement systems and have a long tradition within maritime applications. MARSIC therefore comprises repeatedly proven technology, which has demonstrated its quality and reliability all over the world. We now have the largest number of ship emissions measuring devices installed worldwide and have established ourselves 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.

Specifications	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_2O	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 (T_{90})	< 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

MARSIC300: Safely on the right course

Product Description

The MARSIC300 ship emissions measuring device 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 CO_2 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 CH_4 in LNG (liquefied natural gas) and dual-fuel engines.

As a leading manufacturer of emissions measurement technology, we are 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_2 and NO_x
- Up to 8 measuring components simultaneously: SO_2, CO_2, CO, NO, NO_2, NH_3, CH_4, H_2O

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 calibration filters
- Equipped for existing and future requirements thanks to its rugged design and high level of measurement accuracy

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

CE EN 15267 EN 14181

More Information online

For more information, enter the link or scan the QR code to get direct access to technical data, operating instructions, software, application examples, and much more.
www.endress.com/marsic300

Technical data

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

MARSIC300

Measured values	CO_2, SO_2, NO, NO_2, CO, CH_4, NH_3, H_2O
Measurement principles	NDIR spectroscopy
Spectral range	2,000 nm ... 11,000 nm
Measuring distance	8.5 m (28 ft)
Gas flow rate	200 l/h ... 300 l/h
Measuring ranges	
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_2O	0 ... 40 Vol.-%
Response time (t_{90})	≤ 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 (+50 °F ... +288 °F)
Process pressure	–20 hPa ... 200 hPa, relative
Dust load	≤ 200 mg/m³
Ambient temperature	0 °C ... +50 °C (+32 °F ... +122 °F) (performance-tested up to 45 °C (113 °F)) Remark: with cooling units up to 55 °C (130 °F)
Storage temperature	–20 °C ... +70 °C (–4 °F ... +158 °F)
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 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

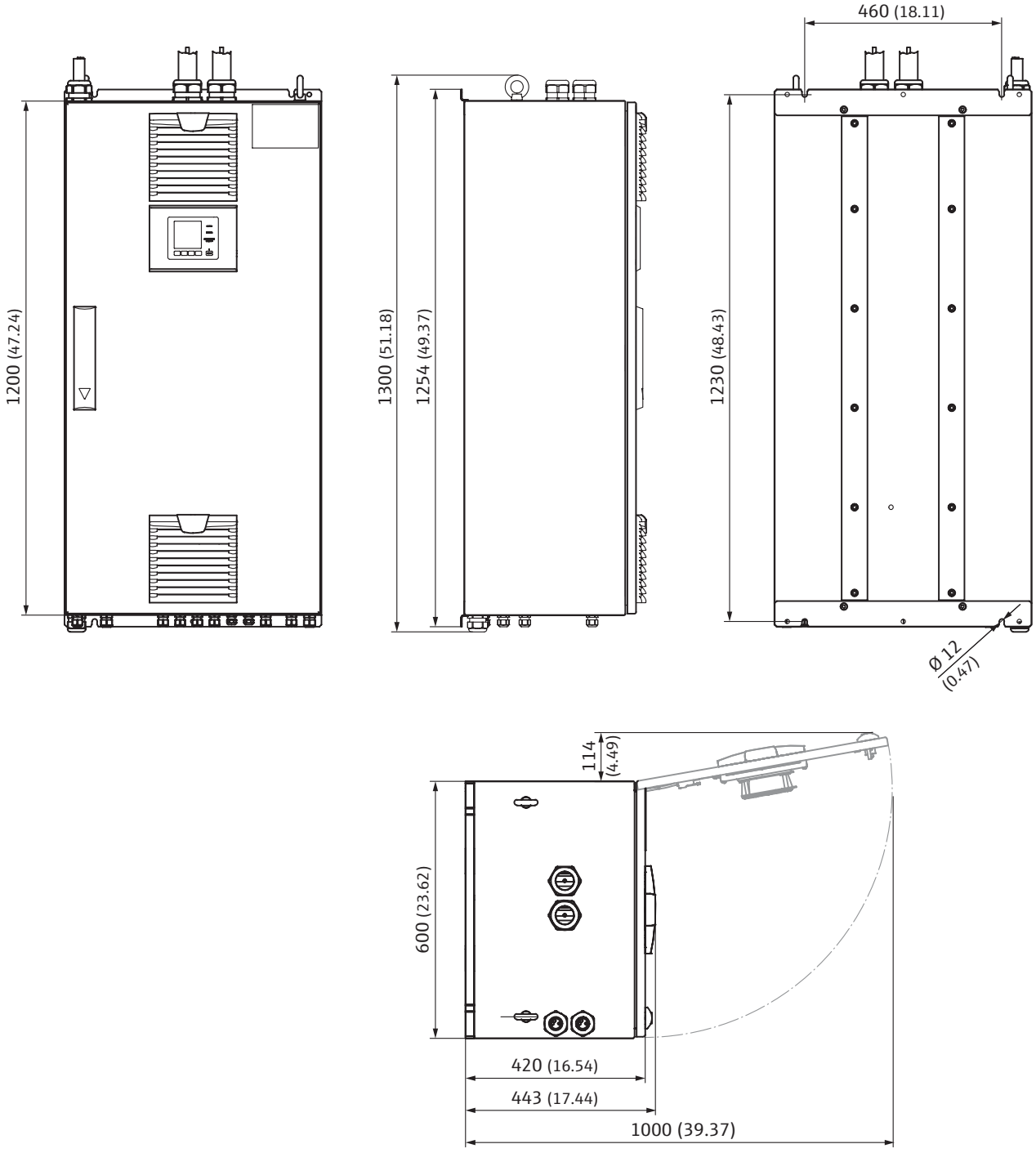
Type of fieldbus integration	TCP RS-485
Function	Connection to OPC server
Number	1
Indication	LC display
	Status LEDs: “Power,” “Maintenance,” and “Fault”
Input	Function keys
Operation	Via LC display or SOPAS ET software, multiple operating levels, password-protected
Dimensions (W x H x D)	600 mm x 1,300 mm x 434 mm (23.6" x 51.2" x 17.1") (see dimensional drawings for details)
Weight	120 kg (264.55 lbs)
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: ≤ 1,000 W Gas sampling unit: ≤ 750 W Sample gas line, heated: ≤ 90 W/m
Auxiliaries	
Compressed air:	≤ 1,300 l/h Instrument air: 5 … 7 bar; particle size max. 1 µm; oil content max. 0.1 mg/m³; pressure condensation point max. −40°C (−40 °F)
Sample gas connections	Clamping ring fitting for 6 mm (0.24") 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 (115 ft) Analyzer cabinet
Integrated components	Ejector pump Pressure sensors

Order information

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

Dimensional drawings

MARSIC300 mounting frame (dimensions in mm (inch))



MARSIC280: Safely on the right course

Product Description

The MARSIC280 from 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 SO_2 and CO_2 downstream of the scrubber. Classification organizations have type-approved the measuring device for this application. With the MARSIC280, we, a leading manufacturer of maritime emission measurement technology, have 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 SO_2 and CO_2 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

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

CE EN 15267 certified EN 14181 certified

More Information online

For more information, enter the link or scan the QR code to get direct access to technical data, operating instructions, software, application examples, and much more.
www.endress.com/marsic280

Technical data

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

MARSIC280

Measured Values	CO_2, SO_2
Measurement principles	NDIR-spectroscopy, NDUV-spectroscopy
Sample quantity	80 l/h ... 120 l/h
Measuring ranges	
CO_2	0 ... 25 Vol.-%
SO_2	0 ... 100 ppm / 0 ... 500 ppm
Response time (t_{90})	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 (+50 °F ... +288 °F)
Process pressure	–200 hPa ... 200 hPa, relative
Dust load	≤ 200 mg/m³
Ambient temperature	+5 °C ... +45 °C (+41 °F ... +113 °F)
Storage temperature	–20 °C ... +70 °C (-4 °F ... +158 °F)
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	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”

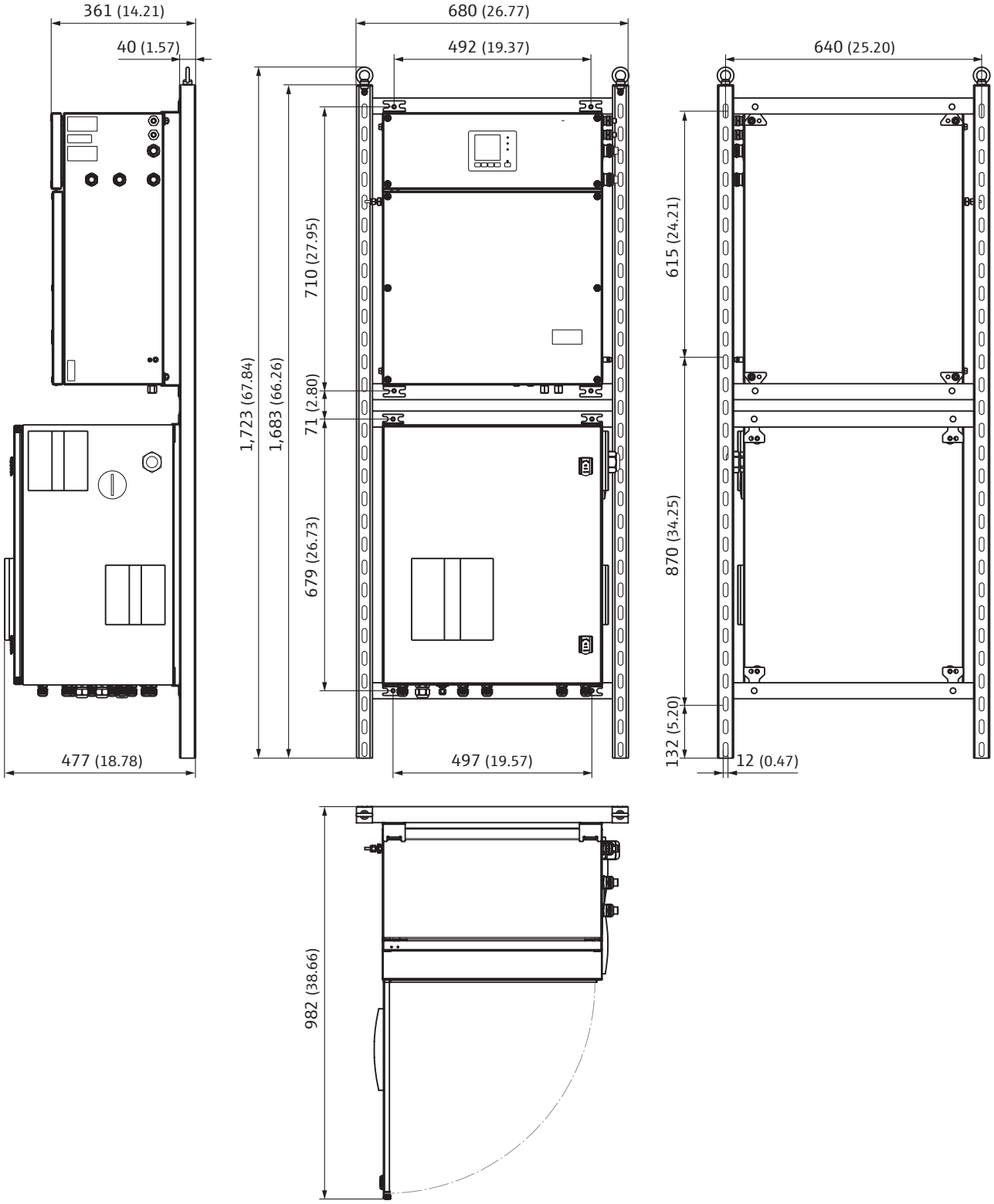
Dimensions (W x H x D)	680 mm x 1,723 mm x 477 mm (see dimensional drawings for details)
Weight	
Analyzer unit:	37 kg (82 lbs)
Sample handling + distributor unit:	52 kg (112 lbs)
Device on mounting frame:	110 kg (243 lbs)
Material in contact with media	PTFE, PVDF, FKM, stainless steel 1.4547, hastelloy, 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 N2 or instrument air, weekly
System components	Sample probe, heated, including filter unit Sample gas line, heated (max. 35 m (115 ft) Sample handling and distributor unit Analyzer unit
Integrated components	Sample gas pump pressure sensor Flow sensor

Order information

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

Dimensional drawings

MARSIC280 mounting frame (dimensions in mm (inch))



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