Emission Monitoring Solutions

Broad portfolio and long-standing experience

Endress+Hauser

People for Process Automation

Supporting decarbonization

Around the world, industries and regions that impact emissions are being prompted to reduce or, ideally, to prevent their generation of hazardous substances and environmental pollution. Here the focus is particularly on areas with intensive energy consumption and major urban industrial centers. They are all united by a common goal: to support effective climate protection and to preserve and restore a clean environment.

In many countries there is a legislative basis for a sustainable, environmentally compatible reduction of greenhouse gas emissions as well as laws and regulations relating to the emission of pollutants. These regulations include specifications for technology and modes of operation for systems as well as specifications detailing the permissible pollutant limits.

Industries and solutions of emission monitoring

Power plants

Power plants are subject to various requirements. These depend on the fuels used, such as coal, oil or gas. The following pollutants in particular must be continuously measured, depending on applicable local environmental regulations: CO, NO_x SO_2 and dust as well as reference parameters such as flow rate, temperature, O_2 (and H_2O, where applicable).

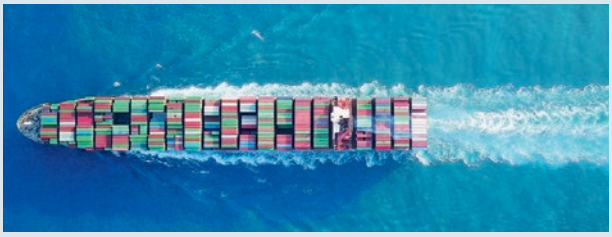
Waste and recycling

Various requirements apply, depending on the type of incineration plant, for example, household waste, industrial waste or hazardous waste. Pollutants such as HCl, HF, NO_x, SO_2, VOC (Volatile Organic Compounds) and dust load as well as O_2 and/or H_2O must be continuously measured in accordance with local environmental regulations. Increasingly, the additional parameter of total mercury Hg must also be detected continuously.

Cement production

Various pollutants are continuously measured in the chimney of plants for producing cement clinker and cement, as well as for firing and crushing lime. Depending on the local environmental regulations, these should include CO, NO_x and SO_2, as well as dust. The reference figures of flow rate, O_2 and/or H_2O are frequently measured.
When burning alternative fuels it is also necessary to measure additional components such as HCl, HF, Hg and VOC.

Marine industry



For flue and exhaust gas purification monitoring, the focus is on on-board systems on cargo and passenger ships. Typically, however, these systems are also subject to increased vibrations. In particular, these components are measured: SO_2, CO_2, NO, NO_2 and O_2, plus optionally measuring NH_3, CH_4 and H_2O, and the denitrification plants are monitored. Essential requirements are approvals such as the type approval "DNV" in accordance with MARPOL Annex VI, NO_x Technical Code 2008 and MEPC.177(58) and effective measuring point switching.

The key lies in forward-looking planning of industrial facilities and in continuous monitoring of their emissions. Targeted minimization of emissions requires them to be reliably determined and analyzed both quantitatively and qualitatively. With innovative technologies and proven measurement principles along side with digital solutions we offer future-oriented solutions – even when subjected to ever increasing environmental and safety-related requirements.

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5 Technologies and measurement principles
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Metals and mining

Plants for calcination, melting or sintering ores as well as the production of non-ferrous metals have rough environmental conditions, such as high dust loads and strong vibrations. The gases produced during the procedures are processed further and must be measured and monitored accordingly.

Chemicals, petro-chemicals and refineries

The handling of large amounts of hazardous substances, highly dynamic markets, tough worldwide competition and strict environmental standards are defining factors. Process automation has a strong influence on the profitability of a plant on many levels and throughout the entire value chain as it ensures smooth operation and maximum safety. The process analyzers in particular make a huge contribution to reducing production costs, increasing product yield and safety and complying with local emission regulations.

Glass and ceramics

Emission measurement technology is used in systems for manufacturing glass and glass fibers, for melting ceramic materials and for firing ceramic products. Typical requirements include fine silicates and borates with high abrasion potential in the flue gases.

Additional areas of application

Endress+Hauser provides emissions monitoring solutions in many other industries that are tailored to the respective measuring task. For example:

- Systems for biological treatment of waste
- Surface treatment with organic substances
- Crematories, cremation
- Mining

Technologies

In-situ gas analysis

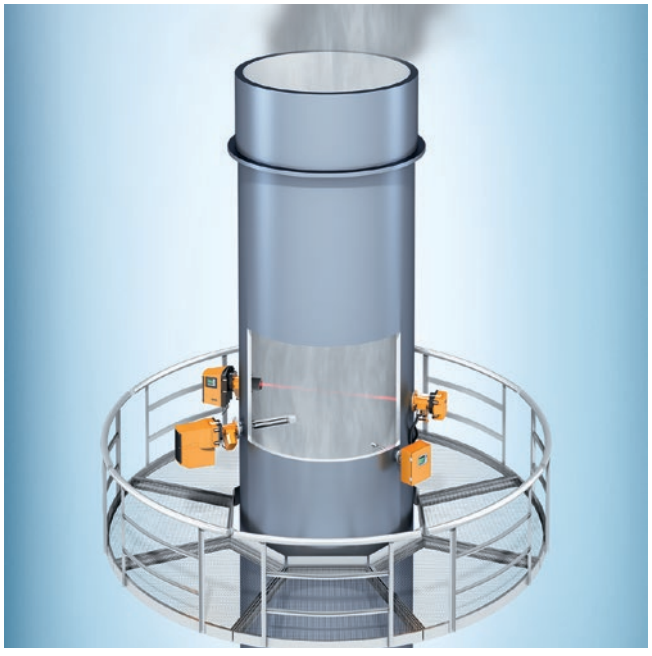
Thanks to the innovative in-situ measurement technology, the measuring devices can be mounted at the measurement location directly in the duct through which the gas flows. This device solution features minimal maintenance requirements and very short response times.

Two in-situ versions are available

- **Cross-duct version:**
  for representative measurement results across the entire duct cross-section
- **Measuring probe versions:**
  optimized for single-sided installation allowing simple integration into an extremely varied range of system conditions. For example, overpressure, wet gases or very high test gas concentrations and dust loads.

Advantages

- Continuous and direct measurement, no sampling
- Cross-duct version for representative measurement results or measuring probe version for simple installation
- GMP measuring probe with open measuring aperture or GPP gas diffusion probe



Extractive gas analysis

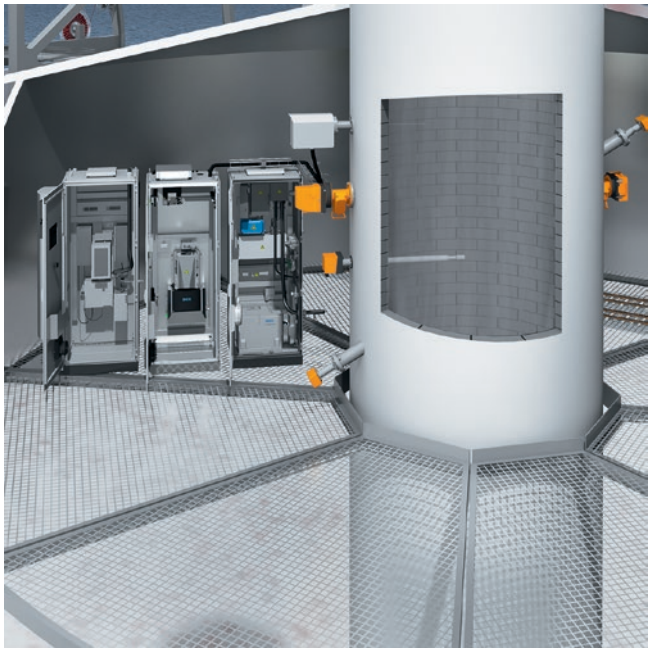
Extractive gas analyzers can be used in a broad range of applications. A partial gas flow is extracted from the gas duct through selected probes, prepared and fed to the analyzer module under constant conditions. The entire gas treatment from the extraction and processing to the analysis is optimally designed for the measurement task.

Two variants of measurement technology are available

- **Hot-extractive measurement technology:**
  All components that come into contact with the test gas are heated and kept above the dew point. The analysis is done under constantly hot measurement conditions and yields accurate results, even with very narrow measuring ranges. Ideal for detection of multiple gas components as well as water-soluble components such as HCl, HF or NH_3.
- **Cold-extractive measurement technology:**
  The gas sampling is optionally designed with a heated or unheated test gas line. Gas drying is achieved with a high-performance gas cooler. The “cold” measurement is handled by the analyzer.

Advantages

- Configurable analyzer modules for a wide applications range
- Customized solutions designed for numerous possible measuring components
- Accurate and reliable measurement results
- Detection of aggressive, corrosive or combustible gases



Measurement principles

Scattered light backward

Dust measurement via laser-based backscattering

Even if the dust concentrations are very low, the measurement principle laser-based backscattering detects the relevant values with great accuracy. A laser diode irradiates the dust particles in the measurement medium with modulated light in the visible spectrum. A highly sensitive detector detects the light scattered by the particles and transmits the measurement signal to an evaluation unit. The compensation for background radiation and ambient light, automatic checking of the zero point and reference point, as well as a check for contamination mean the system yields stable and reproducible measurement results.

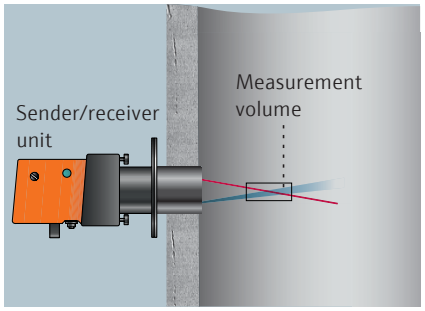
UV spectroscopy

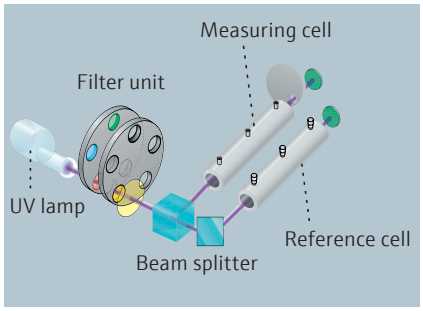
UV resonance absorption spectroscopy (UVRAS)

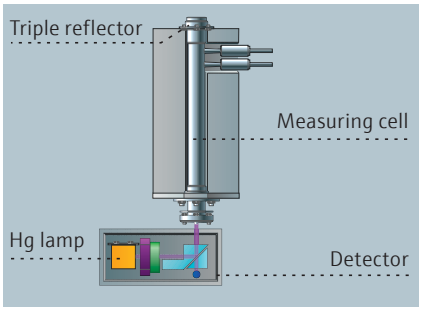
Endress+Hauser equips cold-extractive process photometers with the measurement principle of UV resonance absorption spectroscopy (UVRAS). The analyzer makes use of the fact that certain gases exhibit specific absorption characteristics in the ultraviolet spectrum. In order to achieve this, the test gas is irradiated with ultraviolet light. The concentration of a gas component can then be determined through selective use of the wavelength and measurement of the absorption. In this manner, the analyzer is able to measure gas concentrations of, for example, NO_2, NH_3, SO_2 and H_2S, by means of interference filter correlation (IFC).

ZAAS – Zeeman atomic absorption spectroscopy

An Hg-discharge lamp emits an element-specific spectrum, which enables an extremely sensitive level of mercury measurement. A magnetic field applied around the discharge lamp creates an additional reference wavelength (the Zeeman effect), which lies outside of the absorption range of Hg atoms. This compensates perfectly for cross sensitivities and lamp aging or contamination. A high-temperature converter converts the bound Hg at approximately 1,000 °C into elemental Hg. The advantages of this are that no chemicals or catalyzers are required, maintenance is minimal and there are no moving parts. The patented direct Hg measurement system makes, e. g., the MERCEM300Z into a reference device for continuous mercury analysis.







Overview of all measurement principles and evaluation methods

- Continuous and direct measurement, no sampling
- Tunable diode laser spectroscopy (TDLS)
- Electrochemical cell
- Flame ionization detection (FID)
- FTIR spectroscopy
- Gas filter correlation
- Gravimetric analysis
- Interference filter correlation
- Scattered light backward
- Scattered light forward
- NDIR spectroscopy
- NDUV spectroscopy
- Paramagnetic dumbbell principle
- Temperature: PT1000, pressure: piezoresistive
- Transmittance measurement
- Ultrasonic transit time difference measurement
- UV spectroscopy
- Thermal conductivity measurement
- Zeeman atomic absorption spectroscopy
- Zirconium dioxide sensor

Everything from stand-alone devices to complete analyzer systems

Whether cost-optimized standard systems or customized designs, Endress+Hauser provides application-related solutions and, upon request, will design complete gas analysis systems.

Measuring devices

For efficient and cost-effective system integration, the GMS800 product family has a standardized 19" housing or optimized system housing available for cabinet installation.

GMS820
Pressure-resistant encapsulated

GMS810
19" rack housing

GMS840
Wall-mounted enclosure

To measure aggressive gases, in-situ analyzers such as the GM32 can be used even in Ex areas and can be linked to analysis systems. The DUSTHUNTER family of dust measuring devices is also easy to connect to analyzer systems. In-situ gas analyzers such as GM32 or GM700 measure directly in the process.

DUSTHUNTER SP30
Probe design with measurement of scatter-light

GM32 Ex version

Wall-mounted enclosure and pressure-resistant encapsulated housing are optimized for use in Ex zones.

Multi-component analyzer systems

Compact analyzer systems with extremely straightforward handling, trouble-free installation and commissioning on site with very low maintenance requirements. Additionally equipped with state-of-the-art communication options, such as Ethernet, Modbus or Meeting Point Router MPR, these systems are suitable for remote monitoring of the entire emission monitoring system – and are thereby pre-equipped for future requirements.

Complete analyzer systems with high-quality serial modules and components that can be optimally tailored to the specific requirements thanks to their configurable design.

Multi-component analyzer systems

Ready-to-use analyzer containers — shelter solutions

Tailor-made designs including the complete range of peripheral equipment with expert application consulting and comprehensive project management. Multiple analyzers or complete analyzer systems can be housed in containers along with the required control devices and power supply units. In addition, a data acquisition system can be included, such as MEAC emission data management for acquiring, processing and evaluating measurement data. Climate-controlled containers are also available upon request of the customer.

Shelter solutions for CEMS, PGA or liquid analyzer systems

Modular multi-talents — the container types

We distinguish between three types of container:

- Shipping container, in which a standard container is permanently installed and can therefore be transported cost-effectively and safely by ship thanks to its ISO standard dimensions and CSC-certificates
- Analyzer shelter with standard dimensions of 3 to 12 meters (10 to 40 ft)
- Special shelter, which can be designed on request with special dimensions or with an explosion-proof, fireproof, earthquake-proof or corrosion-resistant design, or for particularly high wind, dust, or snow loads.

Custom engineering

Planning and engineering at Endress+Hauser is based on longtime experience with all kinds of emissions monitoring. Regardless of whether the applications are in power plants or subjected to difficult conditions of explosive environments in a refinery, our engineers plan and design tailor-made solutions suitable for your specific requirements using state-of-the-art CAD systems. All products are designed in accordance with the applicable international and national standards. An experienced project management team and global service organization support the customer to ensure reliable and sustained operation of the systems.

System expertise right from the start

- FEED consulting – “Front End Engineering and Design” competent experts
- Construction and development with a detailed design to optimize production costs
- Manufacturing – for successful implementation with us as a project partner to meet quality standards and international regulations such as ISO, DIN, ANSI and ASME certifications

Selection criteria for emission measurement systems

The selection of a continuous emission measurement system (CEMS) is complex; after all, decisions regarding significant investments and operating costs must be made in these cases.

If you take into account the entire service life of a system, a low initial investment may turn out to be the most expensive solution in the end. Additionally, individual requirements of the respective industrial facility influence the suitability and costs of the CEMS technology in question.

10 steps to a suitable emission measurement system

1 Define the process parameters, components and required measuring ranges to be monitored
The number and type of components to be monitored and recorded in accordance with the requirements of environmental authorities determine the selection of a suitable CEMS system.
- ☐ Is there a complete list of measuring components and parameters, and are the required measuring ranges and tolerances present?
- ☐ Do reference parameters such as temperature, pressure, moisture or O_2 content have to be measured?
- ☐ Do particle concentrations, opacity or mass flow have to be determined?

2 Classify the valid conformities and regulations
The respective reporting system is usually derived from national regulations or international specifications.
- ☐ What national regulations and standards apply?
- ☐ Is it necessary to take international standards such as EU directives or US EPA standards into consideration?
- ☐ Do additional specifications apply due to specific plant requirements?

3 Expect that new regulations will go into effect
Environmental legislation is forcing the trend towards a sustainable and environmentally aware economy. For this reason, it should be possible to adapt or retrofit the CEMS system for possible future requirements.
- ☐ For example, additional monitoring of HCl and mercury in the cement production industry.

4 Clarify the on-site operating conditions
Aggressive gas components can influence the operation and reliability of CEMS systems when using alternative fuels.
- ☐ What fuel is now being used or soon will be?
- ☐ When using alternative fuels, does the system meet the stringent thermal requirements for monitoring waste treatment processes?

5 Determine potential sources for critical gas components
If critical gas components are produced, such as organic compounds, NH_3, chlorine or sulfur, the CEMS system must be able to measure these components reliably, even in high concentrations.

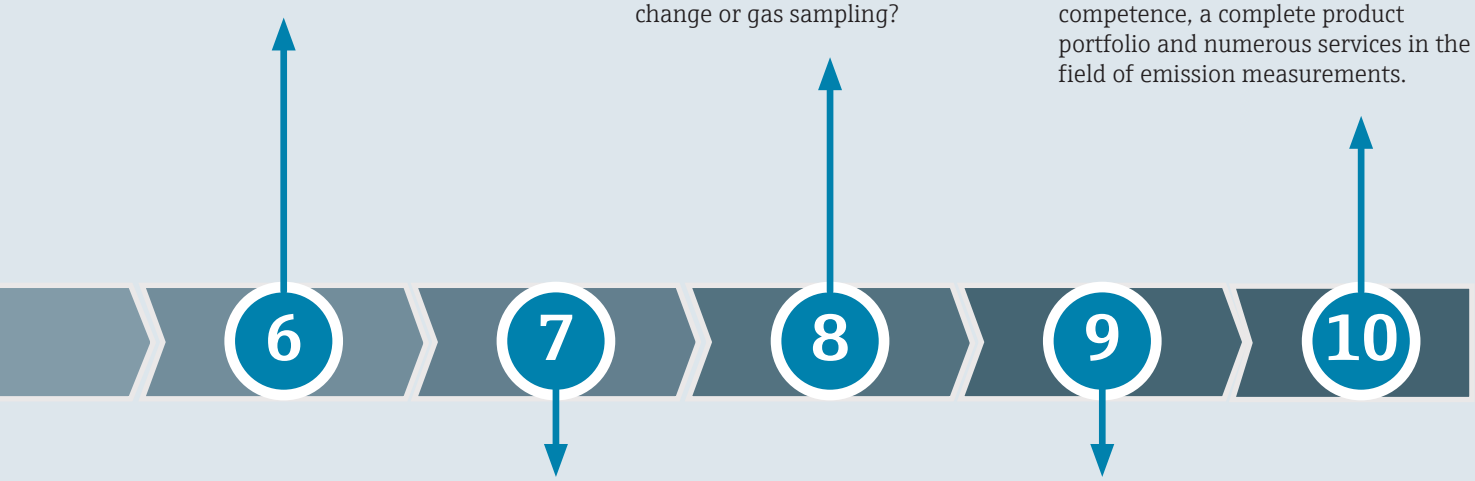
The reason for this is that production industries such as the power-supply industry or the cement industry are generally subject to defined regulations and laws governing the reduction of emissions. In the end, the operating costs over the entire service life can be an amount of up to three times the cost of the initial investment, depending on the selected measurement technology (in-situ, cold or hot extractive) and the mix of various measurement principles used.

Assess the CEMS operating conditions throughout the service life
Gas cleaning plants such as DeNO$_x$ or wet scrubbers significantly reduce the amount of pollutants. However, higher NH_3 concentrations due to the addition of ammonia or carbamide as well as deviations in temperature and moisture can significantly reduce the availability and operational lifetime of the measuring system.

Requirements for operating and maintaining the CEMS
In accordance with quality standards, the CEMS must exhibit verifiable availability of more than 95%, including all maintenance and testing cycles. Critical points include:

- ☐ Gas conditioning in the event of condensate- or acid-forming components?
- ☐ Downtime caused by filter exchange or gas sampling?

Evaluate the capacity of the provider
A supplier of CEMS systems should be able to provide effective decision-making support in finding a suitable solution. The realization of individual measurement tasks in combination with competent service should be the decisive factor, not the potentially limited range of technical options provided by a specific supplier. We are characterized by decades of proven competence, a complete product portfolio and numerous services in the field of emission measurements.



Calculate the total operating costs
The operational lifetime of a CEMS is typically more than 10 years. The actual operating costs can amount to more than triple the cost of acquisition, depending on the selected measuring technology. The following is to be taken into consideration:

- ☐ Composition of the CEMS, including gas sampling and conditioning
- ☐ Consumables / additives and spare parts
- ☐ Maintenance and service intervals thermal requirements for monitoring waste treatment processes

Clarify the on-site access conditions and ambient conditions
The availability of consumables / spare parts and additives is extremely important for industrial plants that are difficult to access (oil platforms, gas compressor stations, plants in climatically extreme areas).

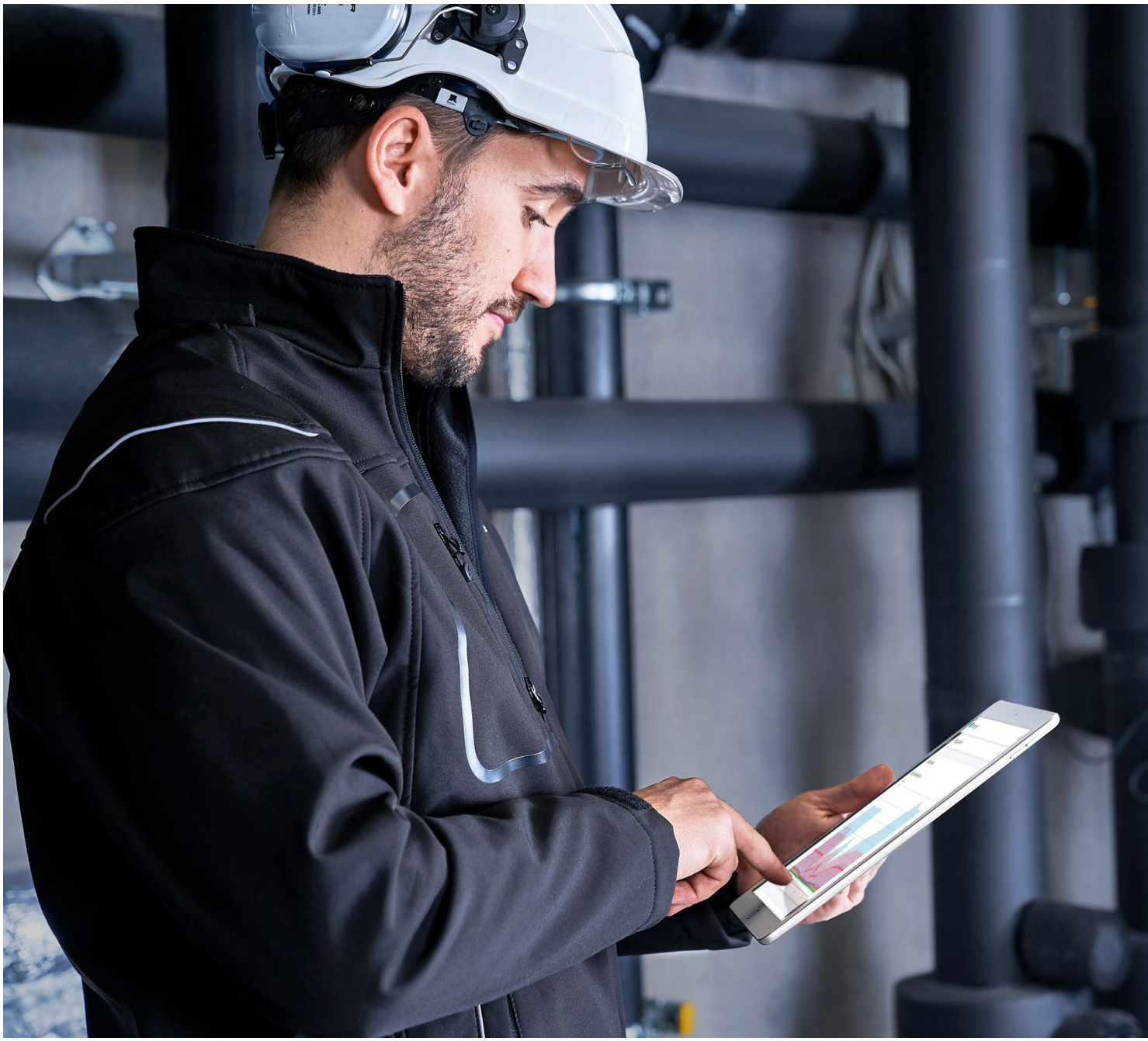
- ☐ Can diagnostics and maintenance be performed remotely via wireless communications or Internet to achieve targeted deployment of specialist personnel?
- ☐ What are the prevailing ambient conditions, for example, temperature fluctuations, etc.? Thermal requirements for monitoring waste treatment processes?

Condition monitoring and monitoring services

INDUSTRY 4.0 READY

Data transparency increases the availability through real time monitoring

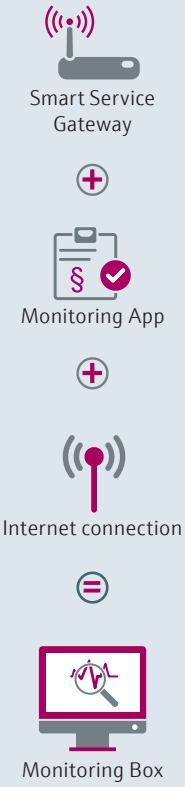
Know today what will happen tomorrow: The Monitoring Box is a digital solution for continuous monitoring of the device and plant status as well as the application itself. Its combination of historical and real time data provides transparent insights into exceeded limit values and status changes. The data are analyzed to produce diagnostics, statistics and prognoses that allow predictive and needs-based maintenance. It also enables devices and plants to be operated in the high output range and resources to be employed efficiently. As a smart extension to our existing product solutions, the Monitoring Box in combination with the digital services increases the productivity of industrial applications in a targeted manner.



Thanks to integrated Monitoring Box: effectively plan your service deployments.

With the Monitoring Box, you obtain virtual access to sensors and plants and can continuously optimize them during operation. The Monitoring Box digitally monitors all integrated devices of your company and detects any changes in the condition of sensors and plants in real time. Faults can thereby be detected early or avoided altogether. The Monitoring Box not only supports predictive maintenance. It also makes it easier to prepare for service deployments so our service technicians can be on-site in time and with the right spare parts.

Step by step to a digital overview



The devices are connected to a Smart Service Gateway via standard interfaces. The data is collected and pre-processed in the gateway.

The Smart Service Gateway is the connectionto the Endress+Hauser cloud. It encrypts the data and then uploads it.

The data is loaded from the cloud into a browser-based application (app). The app handles analysis and visualization of this data for the user.

Data analysis and trend forecasting

Diagrams present measurement data and the status of all devices in a clear and understandable way within the dashboard. This allows the data to be quickly analyzed and trends identified.

High plant availability

Analysis of condition data reduces unplanned downtimes and keeps the plant running smoothly.

Quick response

Automatic alerts in e-mails or text messages enable timely action when anomalies or deviations are detected. Solutions and recommended actions are displayed in direct form.

Predictive maintenance

Verification and evaluation of historical data make it possible to schedule maintenance work and optimize the lifetime of spare and wear parts. This saves time and money.

Service for all your system and measurement system requirements

Analyzers and measurement systems supply monitoring and control-relevant information and protect people and systems. When optimally integrated and maintained, these components and systems guarantee safe processes, constant product quality and protect people and the environment. From the outset and over many years, our Services provide suitable services for all aspects of your measurement systems and plants: from planning and conception to commissioning and ongoing operations, all the way to conversions and upgrades. Over 60 years of experience in the field and industrial expertise makes us a competent partner for the specific requirements of our customers.

Modular service contracts – flexible for every requirement

An important part of our Services is the modular service concept, which allows every business to create its own individual service contract from different service modules. We are happy to give you advice on which service components are right for you.

Performance, availability and security – efficient service through reliable remote maintenance

Providing expert assistance and fast service is a priority not only during commissioning, but also during operation. Fast, system-specific support provided by specialists is more important than ever. Complex systems and growing cost pressure require optimized maintenance costs and proactive service.

Assured productivity – at all times

As an operator with us as your experienced and competent service partner, you can fully concentrate on your core business and on increasing productivity, efficiency, and earnings.

Close to you – short distances save time and money

With over 200 service employees in more than 80 countries, we ensure that service and spare parts are available around the globe.

Selection guide for emission measuring devices

Products	Method		Certifications																	
	In-situ	Extractive	2000/76/EC (17th German Federal Emission Protection Directive)	2001/80/EC (13th German Federal Emission Protection Directive)	2010/75/EC	27th German Federal Emission Protection Directive)	30th German Federal Emission Protection Directive)	1999/13/EC (31st German Federal Emission Protection Directive)	EN 15267	EN 14181	EN 13284-1	EN 16911-2	Type examination (TUEV)	TA Luft (TA Air)	GOST	MCERTS	U.S. EPA	MARPOL Annex VI and NTC 2008 – MEPC.177(58) – MEPC.184(59)	BEP 2010, Status Index and Classification (SKK) 2012	
Gas analyzers																				
GM32	■		■	■		■			■	■					■	■	■			
GM35	■		■	■		■				■				■	■	■				
GM700	■		■			■			■	■										
GM901	■												■							
ZIRKOR series	■		■	■						■					■					
S700[2)]		■	■	■		■				■					■					
GMS800[2)]		■	■	■		■			■	■				■	■	■				
MERCEM300Z		■		■					■	■							■			
GMS800 FIDOR[1)]		■	■	■		■			■	■						■				
MARSIC300		■																■		
MCS100FT		■	■	■		■			■	■										
MCS200HW		■	■	■					■	■					■	■	■			
PowerCEMS100[3)]		■	■	■		■			■	■				■		■				
MKAS[3)]		■	■	■		■			■	■										
Particle measuring devices																				
DUSTHUNTER SB100	■		■	■	■	■			■	■				■	■	■				
DUSTHUNTER SP100	■		■	■	■	■			■	■				■	■	■	■			
DUSTHUNTER SP30	■		■	■	■	■			■	■				■	■	■	■			
DUSTHUNTER T200	■		■	■		■			■	■				■	■	■	■			
FWE200DH		■	■	■		■			■	■				■			■			
Gas flow measuring devices																				
FLOWSIC100	■		■	■		■	■		■	■		■		■	■	■				
Combiprobe CP100	■																			
Analyzer solutions																				
MEAC300			■	■		■	■	■											■	

[1)] VOC = Volatile Organic Compounds [2)] Depending on analyzer module used [3)] Depending on analyzer used

	Measured components																Protocols, remote						Page
	CO	NO	NO_2	SO_2	NH_3	CO_2	N_2O	HCl	HF	CH_4	H_2O	O_2	Hg	TOC/VOC[1]	Particle	Flow	Modbus TCP	OPC	Modbus RTU	PROFIBUS DP	Meeting Point Router MPS	SOPAS ET configuration software	
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In-situ gas analyzer

GM32

Measure aggressive gases directly and quickly — even in ATEX zones

GM35

For efficient control of combustion and drying processes

Technical data overview		
Measurement principles	Differential optical absorption spectroscopy (DOAS)	Gas filter correlation, interference filter correlation
Measuring components	NH_3, NO, NO_2, SO_2	CO, CO_2, H_2O
Performance-tested measurands	NO, SO_2	CO, CO_2, H_2O
Max. no. measuring values	4	3
Process temperature	≤ +550 °C; for gas-tested measuring probe: Higher temperatures on request	Measuring probe version: 0 °C ... +430 °C Cross-duct version: 0 °C ... +500 °C
Process pressure	Open measuring probe: −60 ... +30 hPa Gas-tested meas. probe: −120 ... +200 hPa Cross-duct version: −60 ... 30 hPa	Open measuring probe: ≤ 120 hPa Gas-tested meas. probe: −120 ... +200 hPa Cross-duct: depending on purge air supply
Ambient temperature	−20 ... +55 °C	−20 ... +50 °C
Conformities	2001/80/EC (13th BImSchV), 2000/76/EC (17th BImSchV), 27th BImSchV, German Clean Air Act, EN 15267, EN 14181, MCERTS, GOST	EN 15267, MCERTS
Enclosure rating	Standard version: IP 65/IP 69K Ex-version: IP 65/IP 69K	Sender receiver unit: IP 66 / NEMA 4x Open measuring probe: IP 66 Gas-tested measuring probe: IP 65 Reflector, connection, AWE control unit sheet steel enclosure: IP 65 Control unit cast metal enclosure: IP 67
Device version	Cross-duct and probe version, Ex-version	Cross-duct version, probe version
At a glance		
	▪ Direct, fast in-situ measurement ▪ No gas sampling, transport, conditioning ▪ Up to four measurands at the same time, plus process temperature and pressure ▪ DOAS evaluation methods ▪ Numerous independent measuring ranges ▪ Automated self-test function (QAL3) without test gases ▪ Overpressure encapsulated type for Ex-zone 2	▪ Dynamic humidity correction ▪ Fast in-situ measurement directly in the process ▪ Simultaneous determination of up to three gas components, temperature, and pressure ▪ No gas sampling and conditioning ▪ Gas testable version of measuring probe available ▪ Integrated self-test and control functions
Detailed information	www.endress.com/gm32	www.endress.com/gm35

	GM700	**GM901**	**ZIRKOR100, 200**
	Efficient process analysis – even under difficult conditions	CO measurement for emission monitoring and process control	Rapid oxygen measurement for optimization of industrial processes
	Diode laser spectroscopy (TDLS)	Gas filter correlation	Zirconium dioxide sensor
	NH_3, HF, HCl, H_2O	CO	O_2
	HF	–	O_2
	1	1	1
	Standard, probe version: ≤ +250 °C Ex version: ≤ +200 °C Gas-tested measuring probe: +130/+300 … +430 °C	Sender unit, receiver unit, open measuring probe: ≤ +250 °C With extended calibration: ≤ +430 °C Gas-tested meas. probe: ≤ +220 °C	ZIRKOR100: ≤ +400/+1,400 °C ZIRKOR200: ≤ 500/+1,400/+1,600 °C
	Cross-duct version: −60 … 30 hPa Open measuring probe: −60 … 30 hPa Gas-tested probe: −120 … 200 hPa	Cross-duct version: −60 … 30 hPa Open measuring probe: −60 … 30 hPa Gas-tested probe: −120 … 200 hPa	ZIRKOR100: – 100 … +100 hPa ZIRKOR200: −100 … 100 hPa
	−40 … +50 °C	−20 °C … +55 °C	ZIRKOR100: – 40 … +80 °C ZIRKOR200: – 40 … +80 °C
	For HF: 2001/80/EC (13th BImSchV), 2000/76/EC (17th BImSchV), 27th BImSchV, German Clean Air Act, EN 15267, EN 14181	Type examination (TUEV) Gas-tested measuring probe: U.S. EPA compliant	2001/80/EC (13th BImSchV), 2000/76/EC (17th BImSchV), 27th BImSchV, EN 14181, 30th BImSchV (ZIRKOR200)
	Sender receiver unit, gas-tested probe, cross-duct version, control unit sheet Steel enclosure: IP 65 Open measuring probe, connection unit: IP 66 Control unit cast metal encl.: IP 67	Sender unit, receiver unit: IP 65 / NEMA 4 Open measuring probe: IP 66 Gas-tested measuring probe: IP 65 Control unit: IP 65 Connection unit: IP 65 / NEMA 4	ZIRKOR100: IP 20/IP 66 ZIRKOR200: IP 65 / 66
	Cross-duct, probe version	Cross-duct version, probe version	ZIRKOR100, ZIRKOR200
	▪ High selectivity due to high spectral resolution ▪ Short response times ▪ No calibration required ▪ No moving parts: minimal wear and tear ▪ No gas sampling or conditioning required	▪ Representative measurement along the duct diameter ▪ Operation via control unit ▪ Short response times ▪ Verifiable with gas-filled cell; gas-testable probe with test gas	▪ Electrochemical cell with long service life due to innovative protection ▪ Fully automated adjustment mechanism integrated into the control unit ▪ Version for high temperatures ▪ Very short response time ▪ Suitability-tested according to EN 15267 ▪ Ex version for ATEX/IECEx, Zone 1 and Zone 21
	www.endress.com/gm700	www.endress.com/gm901	www.endress.com/zirkor200

Extractive gas analyzer

S700

Tailor-made gas analysis for process and emission monitoring

Technical data overview	
Measurement principles	NDIR spectroscopy, interference filter correlation, paramagnetic dumbbell principle, electrochemical cell, thermal conductivity measurement
Measuring components	Ar, $CBrF_3$, $CClF_3$, CCl_2F_2, CCl_3F, $CHClF_2$, $CHCl_3$, CH_2Cl_2, CH_2O, CH_3Cl, CH_3OH, $(CH_3)_2O$, CH_4, CO, CO_2, CS_2, $C_2Cl_2F_4$, $C_2Cl_3F_3$, C_2Cl_4, C_2HCl_3, C_2H_2, $C_2H_2Cl_2$, $C_2H_2F_4$, $C_2H_3Cl_3$, C_2H_4, $C_2H_4Cl_2$, C_2H_5OH, C_2H_6, C_3H_4, C_3H_6, C_3H_7OH, C_3H_8, $C_3H_8O_2$, C_4H_{10}, C_4H_6, C_4H_8, C_4H_8O, C_4H_9OH, C_5H_{12}, $C_6H_{10}O$, C_6H_{12}, C_6H_{14}, C_7H_{16}, C_7H_8, C_8H_{10}, He, H_2, H_2O, NH_3, NO, N_2O, O_2, SF_6, SO_2
Performance-tested measurands	CO, NO, SO_2, O_2
Max. no. measuring values	5
Process temperature	–
Process pressure	Hosed internal gas paths: −200 hPa ... 300 hPa Piped internal gas paths: ≤ +1.000 hPa
Ambient temperature	+5 °C ... +45 °C
Conformities	Industrial Emissions Directive (IED), CCEP, U.S. EPA conform, China's EPA compliant UNOR/MULTOR analyzer module: 2001/80/EC (13th BImSchV), German Clean Air Act, EN 14181:2004 OXOR E/P analyzer module: 2001/80/EC (13th BImSchV), 2000/76/EC (17th BImSchV), 27th BImSchV, German Clean Air Regulations, EN 14181:2004
Enclosure rating	S710, S711: IP 20 S715/715 Ex: IP 65 / NEMA 4X S720/S720 Ex, S721/S721 Ex: IP 65 / NEMA 7
Device version	19" rack enclosure, wall-mounted housing with gas-tight separate units, pressure-resistant encapsulated housing

At a glance	
	▪ Various analyzer modules are available: UNOR (NDIR), MULTOR (NDIR) OXOR-E (electrochemical O_2) OXOR-P (paramagnetic O_2) THERMOR (thermal conductivity) ▪ Over 60 measuring components to choose from ▪ Different housing variants for different fields of application ▪ Up to three analyzer modules in one housing
Detailed information	www.endress.com/s700

GMS800

Tailor-made gas analysis for process and emission monitoring

	NDIR spectroscopy, NDUV spectroscopy, UVRA spectroscopy, interference filter correlation, paramagnetic dumbbell principle, electrochemical cell, thermal conductivity measurement
	Ar, CH_4, CH_3OH, C_2H_2, $C_2H_2F_4$, C_2H_4, C_3H_6, C_3H_8, C_4H_6, Cl_2, CO, CO_2, $COCl_2$, COS, CS_2, H_2, H_2S, He, NH_3, NO, N_2O, NO_2, O_2, SF_6, SO_2, other components on request
	CH_4, CO, CO_2, NO, NO_2, O_2, SO_2
	8
	Analyzer inlet: 0 °C ... +45 °C
	Hosed internal gas paths: –200 hPa ... 300 hPa Piped internal gas paths: –200 hPa ... 1.000 hPa
	+5 °C ... +45 °C
	2001/80/EC (13th BImSchV), 2000/76/EC (17th BImSchV), 27th BImSchV, German Clean Air Act, EN 15267, EN 14181, MCERTS
	GMS810, GMS811: IP 40 GMS820P: IP 65 GMS840: IP 66/NEMA 4X
	19" rack enclosure, wall-mounted housing, pressure-resistant encapsulated housing

- 6 different analyzer modules:
  DEFOR (NDUV, UVRAS)
  UNOR (NDIR), MULTOR (NDIR)
  OXOR-E (electrochemical O2)
  OXOR-P (paramagnetic O2)
  THERMOR (thermal conductivity)
- 4 different types of enclosures
- Gas module with sample gas pump and/or control sensors
- New enclosure type for easy and quick integration in analyzer systems
- Remote diagnosis via Ethernet with SOPAS ET software

www.endress.com/gms800

Extractive gas analyzer

MERCEM300Z

Powerful measurement of mercury in flue gases

Technical data overview	
Measurement principles	Zeeman atomic absorption spectroscopy
Measuring components	Hg
Performance-tested measurands	Hg
Max. no. measuring values	1
Process temperature	≤ +1.300 °C
Process pressure	850 ... 1.100 hPa
Ambient temperature	MERCEM300Z: –20 ... +50 °C MERCEM300Z Indoor: +5 ... +35 °C
Conformities	2001/80/EC (13th BImSchV), 2000/76/EC (17th BImSchV), 27th BImSchV, German Clean Air Regulations, EN 15267, EN 14181, MCERTS
Enclosure rating	MERCEM300Z: IP 55 MERCEM300Z Indoor: IP 43
Device version	Aluminum cabinet

At a glance	
	▪ Accurate measurement of "total mercury" directly in a thermal converter (patented) ▪ Measuring operation without reagents ▪ Practically maintenance-free gas sampling using an ejector pump – no moving parts ▪ Integrated adjustment cell for automated drift checking ▪ Automated adjustment of the entire measuring system with a built-in test gas generator (optional) ▪ Completely modular system design
Detailed information	www.endress.com/mercem300z

	GMS800 FIDOR	**MARSIC300**
	Solution for continuous hydrocarbon measurements	Safely on the right course
	Flame ionization detection	NDIR spectroscopy
	C_{org}	CO, CO_2, H_2O, NH_3, NO, NO_2, SO_2
	C_{org}	–
	1	7
	≤ +230 °C	+10 °C ... +550 °C
	–120 ... 120 hPa, relative	–200 ... 200 hPa, relative
	+5 ... +40 °C	0 ... +50 °C
	2001/80/EC (13th BImSchV), 2000/76/EC (17th BImSchV), 27th BImSchV, German Clean Air Regulations, EN 15267, EN 14181, MCERTS	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
	GMS810 FIDOR: IP 40 GMS840 FIDOR: IP 54	IP 44
	19" rack enclosure, wall-mounted housing	Steel sheet enclosure, wall-mounted housing
	▪ Standard 19" enclosure for easy integration into all industry-typical systems ▪ Space-saving wall housing (stand-alone) ▪ Nearly maintenance free ejector pump Integrated catalytic converter (option) provides very clean zero gas ▪ Automatic regulation and compensation of process pressure fluctuations ▪ Protective filter at sample gas inlet ▪ High degree of linearity (≤ 2 %) for very low and high measuring ranges	▪ 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 7 measuring components at the same time ▪ Designed for measuring both SO_x and CO_2 upstream and downstream of the scrubbers, and NO_x upstream and downstream of SCR (selective catalytic reduction) plants.
	www.endress.com/gms800-fidor	www.endress.com/marsic300

Extractive gas analyzer

MCS100FT

Stay in control with proven FTIR measurement technology

MCS200HW, Ex

Proven measurement technology for flue gas monitoring

Technical data overview		
Measurement principles	FTIR spectroscopy, zirconium dioxide sensor, flame ionization detection	Gas filter correlation, interference filter correlation, zirconium dioxide sensor
Measuring components	CH_4, CO, CO_2, HCl, HF, H_2O, NH_3, NO, NO_2, N_2O, O_2, SO_2, C_{org}, NO_x, C_3H_8, C_2H_6	CH_4, CO, CO_2, C_{org}, HCl, H_2O, NH_3, NO, NO_2, N_2O, O_2, SO_2
Performance-tested measurands	CO, CO_2, SO_2, NO, NO_2, N_2O, HCl, HF, CH_4, H_2O, O_2, NH_3, C_{org}, C_2H_6	CH_4, CO, CO_2, C_{org}, HCl, H_2O, NH_3, NO, NO_2, N_2O, O_2, SO_2
Max. no. measuring values	16	12
Process temperature	Analyzer inlet: ≤ +1.300 °C	Analyzer inlet: ≤ +1.300 °C
Process pressure	900 … 1,100 hPa	850 … 1,100 hPa
Ambient temperature	Standard cabinet: +5 … +35 °C With cooling device: +5 … +50 °C	+5 °C … +40 °C
Conformities	2001/80/EC (13th BImSchV), 2000/76/EC (17th BImSchV), 27th BImSchV, German Clean Air Act, EN 15267, EN 14181, MCERTS	2001/80/EC (13th BImSchV), 2000/76/EC (17th BImSchV), 27th BImSchV, EN 15267, EN 14181
Enclosure rating	IP 43 Option: IP 54	IP 54
Device version	Steel sheet cabinet	Steel sheet cabinet, Ex version
At a glance		
	▪ Small suitability-tested HF measuring range: 0 … 3 mg/m³ ▪ Automatic spectrum adjustment via AutoVAL for reliable measured values ▪ Sample gas transport by an ejector without moving parts ▪ Suitability-tested according to EN15267 ▪ Remote control and diagnosis via SOPAS ET ▪ Automatic adjustment of the analyzer ▪ Automatic back washing and filter cleaning of the extraction unit	▪ Measurement of up to 10 IR components plus O_2 and TOC ▪ Hot/wet extractive measurement technology ▪ Wear-free gas distribution ▪ Reference point monitoring with internal calibration cells ▪ Web server for platform-independent device control ▪ Use of dry test gases for HCl and NH_3 ▪ Classification for ATEX Zone 2, IIC T3 gb
Detailed information	www.endress.com/mcs100ft	www.endress.com/mcs200hw

	PowerCEMS100	**MKAS**
	High-performance, future-proof CEMS for emission measurement	Analyzer system for process and emission-measurement applications
	NDIR spectroscopy, NDUV spectroscopy, UVRA spectroscopy, interference filter correlation, paramagnetic dumbbell principle, electrochemical cell, thermal conductivity	NDIR spectroscopy, interference filter correlation, paramagnetic dumbbell principle, electrochemical cell, thermal conductivity measurement
	O_2, CH_4, CO, CO_2, NO, NO_2, NO_x, N_2O, SO_2	Ar, $CBrF_3$, $CHCl_3$, CH_2Cl_2, CH_2O, CH_3Cl, C_7H_{16}, , He, H_2, H_2O, NH_3, NO, N_2O, O_2, SF_6, SO_2, other components on request
	CH_4, CO, CO_2, NO, NO_2, O_2, SO_2	CO, NO, O_2, SO_2, CH_4, CO, CO_2, NO, NO_2, C_{org}
	8	5
	Analyzer inlet: 0 … +200 °C Process: 0 … +900 °C Depending on sampling system	Analyzer inlet: 0 … +200 °C Process: 0 … +900 °C Depending on sampling system
	–	–
	Indoor: +5 °C … +40 °C, Indoor with cooling device: +5 … +50 °C Outdoor: –20 … +50 °C, higher temperatures on request	Standard version: +5 … +35 °C With cooling device: +5 … +50 °C Without direct sun light
	EN 15267, EN 14181, MCERTS	Depending on used analyzer (e.g. S710, GMS810)
	Indoor: IP 54 Outdoor: NEMA 3R/4	Standard version: IP 54 With cooling device: IP 34
	Steel sheet cabinet	Steel sheet cabinet, GFK cabinet
	▪ Cold/dry extractive analyzer system certified according to EN 15267 and EN 14181 ▪ Plug-and-play analyzer module with 24 V power supply ▪ Control unit for displaying all measured values and status information on one monitor ▪ External sensors can be connected via prepared interfaces	▪ Analyzers and measured parameters can be retrofitted at any time ▪ Available in a standard size or as a space-saving compact version ▪ Meets the requirements for an automated measurement system (AMS) according to EU standards ▪ Sample gas bypass for very short response times
	www.endress.com/powercems100	www.endress.com/mkas

Dust and particle measuring devices

DUSTHUNTER SB100

The approved dust monitor with scattered light backward measurement

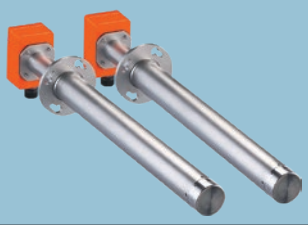
DUSTHUNTER SP100, Ex

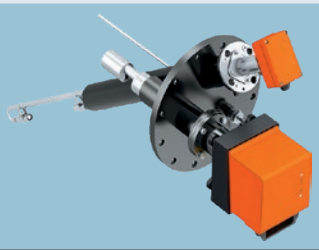
The probe version for scattered light forward measurement

Technical data overview		
Measurement principles	Scattered light backward	Scattered light forward
Measuring components	Scattered light intensity, dust concentration (after gravimetric comparison measurement)	Scattered light intensity, dust concentration (after gravimetric comparison measurement)
Performance-tested measurands	Scattered light intensity	Scattered light intensity
Max. no. measuring values	1	1
Process temperature	–40 °C ... +600 °C	Standard vers. DHSP-T2xx: –40 °C ... +220 °C High temperature version DHSP-T4xx: –40 °C ... +400 °C
Process pressure	With MCU-P: –50 hPa ... 2 hPa Other pressure ranges on request With ext. purge air unit: –50 hPa ... 30 hPa	With MCU-P: –50 hPa ... 10 hPa With ext. purge air unit: –50 hPa ... 30 hPa With instrument air: –50 hPa ... 100 hPa
Ambient temperature	Sender/receiver unit, MCU-N: –40 °C ... +60 °C MCU-P: –40 °C ... +45 °C Intake temperatures for purge air	Sender/receiver unit, MCU-N: –40 °C ... +60 °C MCU-P: –40 °C ... +45 °C Intake temperatures for purge air
Conformities	2001/80/EC (13th BImSchV), 2000/76/EC (17th BImSchV), 27th BImSchV, German Clean Air Regulations, EN 15267, EN 14181, MCERTS, 2010/75/EU	2001/80/EC (13th BImSchV), 2000/76/EC (17th BImSchV), 27th BImSchV, German Clean Air Regulations, EN 15267, EN 14181, MCERTS, 2010/75/EU, U.S. EPA PS-11 compliant
Enclosure rating	IP 66	IP 66
Device version	–	Measuring probe version
At a glance		
	▪ For very low to medium dust concentrations ▪ One-side installation ▪ Contamination check ▪ Automatic check of zero and reference point ▪ Automatic compensation of background radiation, therefore no light absorber necessary ▪ For medium to large duct diameters	▪ Installation from one side ▪ For very low to medium dust concentrations ▪ Automated check of zero and reference point ▪ Contamination check ▪ Hastelloy measuring probe available for corrosive gases ▪ For small to medium duct diameters ▪ For explosive zone 2/22 or zone 1/21
Detailed information	www.endress.com/dusthunter-sb100	www.endress.com/dusthunter-sp100

DUSTHUNTER SP30	**DUSTHUNTER T200**	**FWE200DH**
Probe version for cost-efficient solutions	The approved transmissometer with self-alignment	Reliable dust measurement in wet gases
Scattered light forward	Transmittance measurement	Scattered light forward
Scattered light intensity, dust concentration (after gravimetric comparison)	Transmittance, opacity, relative opacity, extinction, dust concentration	–
Scattered light intensity	Dust concentration	–
1	1	1
Sender/receiver unit DHSP30: –40 °C ... +220 °C Control unit MCU-N: –40 °C ... +60 °C	–40 °C ... +600 °C	PVDF probe: 0 °C ... +120 °C Hastelloy probe: 0 °C ... +220 °C
Int. purge air unit: –50 hPa ... 10 hPa Ext. purge air unit: –50 hPa ... 30 hPa With instr. air: –50 hPa ... 100 hPa	MCU-P: –50 hPa ... 2 hPa With external purge air unit: 50 hPa ... 30 hPa	SLV4 2BH1300: –20 hPa ... 20 hPa With purge air unit SLV4 2BH1400: –40 hPa ... 40 hPa
Sender/receiver unit DHSP30, MCU-N: –40 °C ... +60 °C	Sender/receiver, MCU-N: –40 °C ... +60 °C Control unit MCU-P: –40 °C ... +45 °C Intake temperatures for purge air	–20 °C ... +50 °C Intake temperatures for purge air: –20 °C ... +45 °C
TUEV type-examination	2001/80/EC (13th BImSchV), 2000/76/EC (17th BImSchV), 27th BImSchV, German Clean Air Regulations, EN 15267, EN 14181, MCERTS, 2010/75/EU, U.S. EPA PS-1 compliant	2001/80/EC (13th BImSchV), 2000/76/EC (17th BImSchV), 27th BImSchV, German Clean Air Regulations, EN 15267, EN 14181, U.S. EPA PS-11 compliant
IP 65	IP 66	System: IP 54 Electronics enclosure: IP 65
Measuring probe version	Cross-duct version	Bypass system
▪ Independent measuring device – with or without MCU control unit ▪ Automated monitoring of zero and reference point ▪ Integrated purge air unit as an option ▪ Installation on one side of a duct ▪ Rugged and compact structure ▪ No moving parts in the duct	▪ Integrated contamination check for sender/receiver and reflector unit ▪ Automatic self-alignment of the optical assembly ▪ Automatic check of zero and reference point ▪ For medium to high dust concentrations ▪ For small to large meas. distances	▪ For very low to medium dust concentrations ▪ Gas sampling and return combined in one probe ▪ Contamination check ▪ Automatic monitoring of zero and reference point ▪ Early detection of maintenance requirements
www.endress.com/dusthunter-sp30	www.endress.com/dusthunter-t200	www.endress.com/fwe200dh

Gas flow measuring devices





	FLOWSIC100	Combiprobe CP100
	Gas flow measuring devices for continuous emission monitoring (CEMS)	Combined measurement of dust, volume flow, pressure, and temperature
Technical data overview		
Measurement principles	Ultrasonic transit time difference measurement	Scattered light forward, Ultrasonic transit time difference measurement
Measuring components	Volumetric flow, a. c., volumetric flow s. c., gas velocity, sound velocity, gas temperature	Dust concentration, gas velocity, gas pressure, gas temperature
Max. no. measuring values	1	–
Process temperature	–40 °C ... +450 °C Depending on device version	4
Process pressure	–100 hPa ... 100 hPa	–20 °C ... +200 °C
Ambient temperature	FLSE100 sender/receiver units , MCU control unit: –40 °C ... +60 °C	–70 hPa ... 10 hPa
Conformities	2001/80/EC (13th BImSchV), 2000/76/EC (17th BImSchV), 27th BImSchV, 30th BImSchV, German Clean Air Regulations, EN 15267, EN 14181, EN 16911-2, MCERTS, GOST	–20 °C ... +60 °C Intake temperatures for purge air: –20 °C ... +45 °C
Enclosure rating	IP 65	DUSTHUNTER SP100: IP 66 FLOWSIC100 PR: IP 65 Pressure sensor, temperature sensor: IP 54
Device version	Cross-duct version, measuring probe version	Measuring probe version
At a glance		
	▪ Rugged titanium transducers for high durability ▪ Corrosion-resistant material for application in aggressive gases (option) ▪ Integral measurement over the duct diameter with types H, M and S ▪ Probe type PR for economic installation from one side of the duct ▪ Automatic function control with zero and span point check	▪ No need for mechanical adjustment ▪ Self-testing with the automatic control cycle ▪ Simple configuration and operation with easy-to-use software ▪ For gas temperatures up to 200 °C ▪ For funnels with an internal diameter of 0.7 m and above
Detailed information	www.endress.com/flowsic100	www.endress.com/combiprobe-cp100

Digital analyzer solutions

MEAC300

Clear and cost-efficient emissions data management

Emissions data management system	Continuous acquisition, evaluation, storage, and visualization, as well as transmission of emissions data for modern emissions data management on up to 16 different interfaces
Number of data acquisition inputs	16
Ambient temperature	Emissions-PC: +5 °C ... +30 °C Data acquisition unit DAE: −5 °C ... +50 °C Field module: −10 °C ... +50 °C
Conformities	System software MEAC300 EP: EN 14181 (QAL2) 2010/75/EU (Appendix V) System software MEAC300 EPW: EN 14181 (QAL2) 2010/75/EU (Appendix V) 2010/75/EU (Appendix VI)
Enclosure rating	IP 20
Operating system	Windows 10 Professional 64 bit
Hard disk	2 x 1 TB RAID 1 1 x 1 TB Backup
Device version	Emissions PC DAE Data acquisition unit FM field module

- Bus-capable data acquisition from measuring devices and plants
- Evaluation conforming to the Industrial Emissions Directive, EN 14181 QAL2, and optionally QAL3 (CUSUM)
- Reliable storage with automated backup
- Ergonomic display for constant monitoring of evaluation rules and device statuses
- Fast data transmission to the system control in a 5 s cycle

Detailed information	www.endress.com/meac300

www.addresses.endress.com

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People for Process Automation