

# Highlights 2023

## Products, solutions and services

New  
to the gas flow  
portfolio



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# Innovations

## A glance into the future

Innovations in measurement technology have been key to advancing production methods in the process industry in recent years. They are helping to boost the efficiency and productivity of plants and make them safer. Not least, modern measuring instruments help to make production more sustainable, e.g. by making it possible to detect points of high energy consumption or to optimize production processes.

**Implementing innovative ideas** One area in which Endress+Hauser has in recent years presented important new developments and perfected its portfolio is the flow measurement of gases. The precise measurement of gas flows is – today more than ever – of central importance in various applications, whether it's in the chemical industry, energy production or in the food and beverage industry. Information about our gas flow portfolio can be found on pages 44-45 of this brochure.

**Creating new solutions** In many other fields too, there are new, creative and, above all, very real solutions that we have co-developed with customers and partners for their sometimes very specific and unusual challenges. To give you a preview and maybe even an idea or two, we would like to show you a few examples.

### **Netilion Flood Monitoring – one step ahead of the flood risk**

In severe weather or when heavy rain persists and the ground can no longer absorb water, the risk of flooding intensifies. A solution by Endress+Hauser and Okeanos helps to gauge the situation precisely and early: numerous measuring points distributed across the terrain send their data to the Netilion cloud platform. An AI algorithm collates the measured values and enriches them with further information. A prediction can then be made of how the waters in the region will develop. On smartphones and PCs, administrators can get an overview of the situation and introduce protective measures for residents and infrastructure with a decisive time advantage.



**Fermentation Monitor QWX43 – Live streaming of the fermentation process** In the brewing of beer, a multitude of parameters have to be continuously monitored. Fermentation Monitor QWX43 removes the need for on-site manual sampling. The inline measurement provides round-the-clock and highly accurate monitoring of fermentation-defining parameters, such as density, viscosity, degree of fermentation, residual extract, original gravity or alcohol content. Brewers can view the values at any time on a mobile device or a computer with internet access. They can also set up push notifications to receive immediate information on critical variances in the fermentation process.



[www.endress.com/qwx43](http://www.endress.com/qwx43)



**Cloud-based level measurement – optimization of logistics chains** In the bulk solids industry, it is a challenge to keep an overview of the mobile silos that are in use. The position is often unknown, the remaining content in the container is not transparent and, usually, there is no permanent power supply for measuring points. The cloud-based IIoT fill level sensor Micropilot FWR30 solves this challenge by combining modern measurement technology with digital services. The sensor detects the fill level, the position and further parameters and sends the values to the Netilion IIoT ecosystem. The data is processed there and made available to the user in a clear way through various tools so that genuine added value can be generated from them.



[www.endress.com/fwr30](http://www.endress.com/fwr30)



### **Linked databases: data integration into the SAP Business Network for Asset Management**

Every manufacturer in process automation builds its own IIoT applications and cloud solutions. By integrating information from the Netilion IIoT ecosystem into leading systems such as the SAP Business Network for Asset Management, Endress+Hauser provides more effective leveraging of data potential: with SAP Master Data Integration, it is possible to transfer device master data from plant assets to the SAP systems of plant operators. Immediate added value is provided through better availability of asset information, simplified spare parts management, error-free and time-saving documentation and in functions for the more complex issues in servicing and maintenance.



[www.netilion.endress.com](http://www.netilion.endress.com)





# The comprehensive information and procurement platform at endress.com

## My Endress+Hauser – transactions

### At a glance

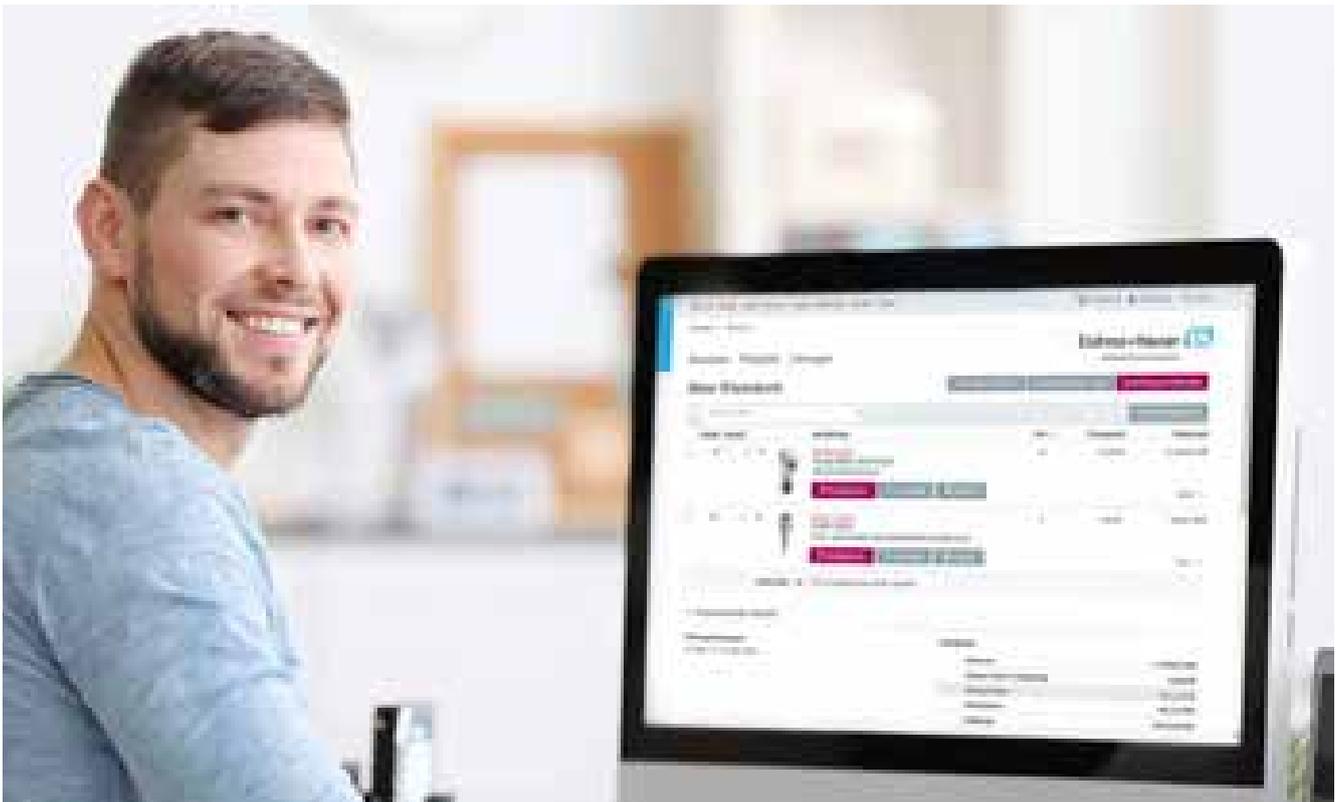
- Up-to-date information on the complete product range, your prices and delivery times
- Create a quote yourself and download it directly
- Online enquiries: quick support if configuration is unclear
- Access to all documents such as quotes, orders and invoices
- Status information on enquiries, quotes, orders and delivery tracking
- Quick access to technical information and CAD data

Discover the new possibilities afforded by comprehensive information retrieval and reap the benefits of electronic transaction management with Endress+Hauser. At endress.com, you can gather information about our products, make enquiries and place orders. The combination of product information and direct request and purchase options makes your procurement process easier and more efficient than ever before. In your personal account, you have access to an overview of the key functions and records at all times – whether you're in the office, at the plant or on the move.

**Need support?** No problem – you will also find details for your dedicated Endress+Hauser Sales contact in your account. This means that you always have maximum flexibility between online and offline support.



[www.endress.com/my-endress-hauser](http://www.endress.com/my-endress-hauser)



## Your personal My Endress+Hauser account – your options

**Create a quote yourself** In your day-to-day activities, it can be crucial to obtain a quote quickly. In your personal My Endress+Hauser account, you can create a quote yourself and download it directly. Configure your devices and select the button “Get instant quote”. Your quote will be ready in an instant.

**Quote and order history with status information** With your own account, you have access around the clock to all your documents, such as quotes, orders, delivery notes and invoices, and you can export them in their original PDF format. You'll find all your transactions, whether these were done online or offline. As soon as your order has been sent, you can also track the delivery online at any time.

**Direct search by serial number or order code** At endress.com, you can quickly and easily find your device, associated parts and information by directly entering your serial number in the search field. Any available successor devices are also displayed here. Add the necessary parts to the basket and send your order or enquiry.

**Organize favorites and regular devices** Under favorites, you can effortlessly create product lists of your regular devices and give them your own material numbers. In this way, you can search for your devices at any time using your own reference and make follow-up orders quickly and easily.

**Quote request even with incomplete configuration** If the configuration of your devices is not yet complete, you are still able to send us a quote request. A comments field enables you to add a message, and your dedicated contact in Sales will be happy to get in touch.

### Create a quote yourself



### Search by serial number or order code



### My Endress+Hauser basket



# Maximum efficiency through automation of procurement processes

## B2B integration with Endress+Hauser

### At a glance

- Optimization of the operational procurement process thanks to electronic exchange of business data
- Time and cost savings and improved data quality thanks to automated processes
- Integrated solutions tailored to your specifications and processes

**Application** For companies with a large quantity of transactions and standardized processes, it's worth digitalizing the procurement process with B2B integration. Endress+Hauser offers a broad range of digital solutions that can be adapted to the customer's procurement process. From electronic catalogs to basket interfaces, such as OCI or punchout catalog, and different kinds of ERP integration, our customers receive a tailor-made solution that exactly meets their needs and requirements. Depending on the desired type of solution, this can be implemented between the customer and supplier directly or indirectly via an electronic marketplace, e.g. SAP Ariba or Coupa.

All transaction data – from order placement, order confirmation and confirmation of dispatch to electronic invoicing – are transported and processed automatically between systems. In this way, manual input errors are reduced and cost savings in procurement are achieved. The entire procurement process becomes significantly faster and more reliable – a win for customer and supplier.

### Advantages

- Increased data quality and speed in the procurement process
- No manual record keeping in goods receiving or invoicing
- With a basket interface, you can transfer products or quotes to your system with a single click
- Professional implementation of integration solutions thanks to over 20 years of experience



[www.endress.com/B2B-Integration](http://www.endress.com/B2B-Integration)



### Added value

Implementing B2B integration with Endress+Hauser offers you tangible added value and numerous benefits:



Reduce process costs



Optimize process throughput times



Increase process quality

# Information about plant operation

## Useful online tools

**Endress+Hauser Operations app** Mobile access to specific device information – anytime, anywhere. With the Endress+Hauser Operations app, you can quickly and easily discover everything you want to know about your Endress+Hauser device. Simply enter the serial number or scan the data matrix code and you'll instantly get the information you need, such as order number, availability, spare parts, successor models, product information, operating instructions and technical details. It is available from the App Store for iPhone and iPad (universal iOS App) and from the Google Play Store for Android devices.



**Spare parts search** Find and re-order spare parts quickly. By entering the order code, product root or serial number, you can find the right spare part for your device instantly and order it directly. Furthermore, you can also find helpful installation instructions for replacing and repairing spare parts.

**Endress+Hauser Device Viewer** Improve processes with online access to device data. Device Viewer enables you to access up-to-date and comprehensive information about your installed Endress+Hauser devices using their serial numbers. In addition to product details, such as the order code, date of manufacture, product availability and successor products, you also have access to documentation such as operating instructions, technical information and certificates, including calibration or material certificates.

### Find and re-order spare parts quickly with the spare parts search



### Device Viewer: online access to device data



[www.endress.com/onlinetools](http://www.endress.com/onlinetools)



# Software tool to easily determine the appropriate measurement technology for each measuring task

Applicator – sector-oriented application solutions

## At a glance

- Select the appropriate measuring device based on the parameters of the individual measuring task
- Sizing and quantitative design of measuring points
- Display, compare and download product details and device features

**Application** Applicator is a user-friendly tool for identifying and selecting the right device for the measuring task in question. To do this, planners only need to enter the known process parameters. Applicator then determines a reliable selection of suitable measuring devices.

## Advantages

- Reliable recommendation of suitable devices for individual measuring tasks
- Access to the Endress+Hauser product database and up-to-date product information
- Compare products using individual process parameters, meaning a variety of requirements for various sectors are taken into account
- Quantitative design and sizing of measuring devices
- Access possible via industry applications

## Options

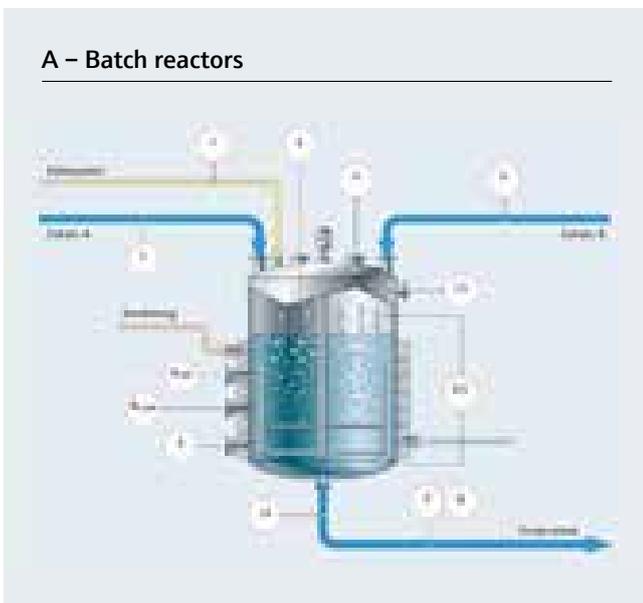
- Select products by application data or sector application
- Compare different solutions with technical data and advantages
- Quantitative design and sizing of measuring points



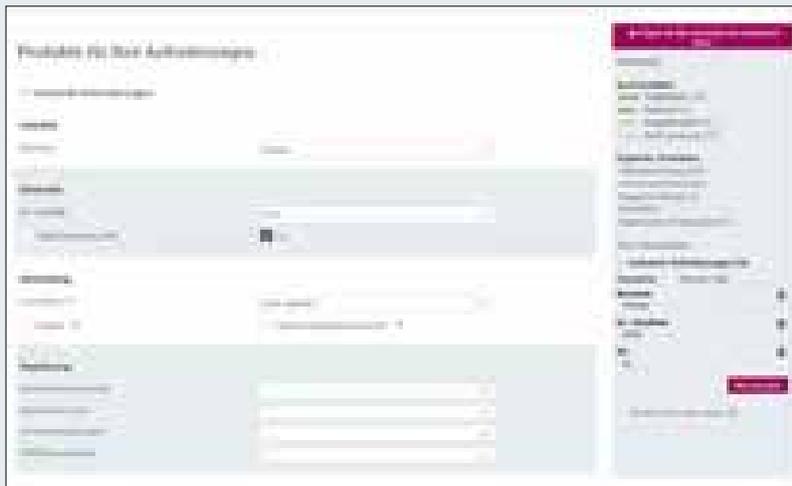
[www.endress.com/applicator](http://www.endress.com/applicator)



## A – Batch reactors



## Applicator Selection



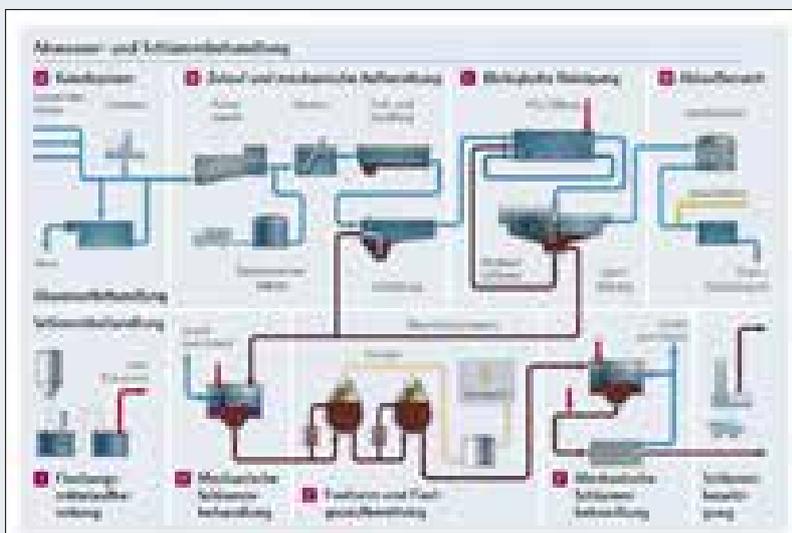
**Applicator Selection** With the Applicator Selection, users can quickly and easily find the right measuring device using their application data. Multiple options are proposed. These can be compared with each other.

## Applicator Sizing



**Applicator Sizing** After the selection, it is necessary to specify certain size parameters, e.g. nominal width in the case of flow sensors. Applicator Sizing helps to do this and selects the correct dimensions for the measuring device.

## Applicator Industries



**Applicator Industries** Applicator Industries follows a different path to the correct measuring device. In Industry Maps, the typical applications of a particular industry are presented. Once an application is selected, all the necessary measuring devices are displayed.

# Digitalization

# Endress+Hauser is turning field data into valuable information for innovative Industry 4.0 applications

#empowerthefield – the Industry 4.0 program from Endress+Hauser

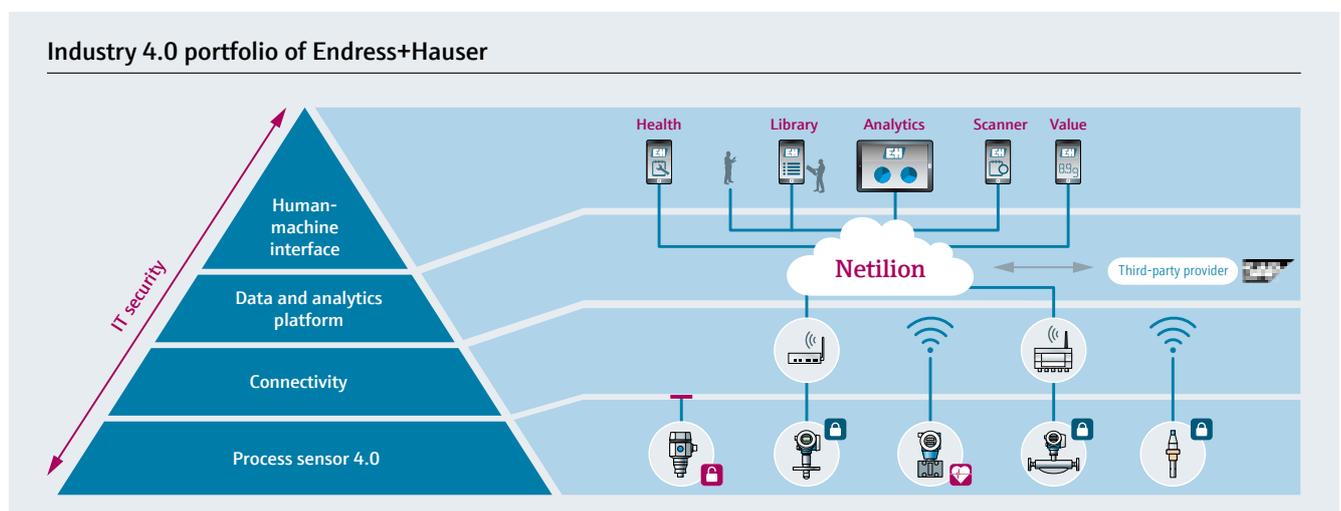
Industry 4.0 involves networking systems and machines so that they can share data with each other. However, 97% of field data is not currently used at all. Endress+Hauser's Industry 4.0 program makes this previously unused data available, whether for optimizing processes, increasing availability or driving down costs. We developed it during pilot projects in conjunction with partners from the process industry. #empowerthefield, Endress+Hauser's Industry 4.0 program, offers intelligent process sensors, cloud apps, interfaces and connectivity components which are all perfectly matched to one another in practical packaged solutions.

**Holistic solutions** The Endress+Hauser Industry 4.0 program evaluates previously unused field data to optimize your processes. The solutions are supplied to you as a practical, complete package. From the smart sensor to connectivity and extensive cloud applications for data analysis as well as corresponding interfaces to existing systems (such as SAP), all components are optimally matched to each other. As a reliable partner, we will support you before, during and after your digitalization project – in strict compliance with the latest IT and data security standards, of course.

**✓ Your benefits**

- Intelligent process sensors with extensive diagnostic functions
- Connectivity through edge devices, adapters and field gates
- Support for all established communication technologies
- Netilion cloud ecosystem for data acquisition
- Fulfillment of the strictest security standards (ISO 27001, IEC and many more)
- Numerous interfaces to ERP, MES and SCADA systems

 [go.endress.com/de/empowerthefield](https://go.endress.com/de/empowerthefield)



# Data revolution in the process industry

The Netilion IIoT ecosystem – take your first steps towards digitalization with the right packaged solution



**Plant overview packaged solution** Operators can use these packaged solutions and their core components – the Netilion Scanner app and Netilion Analytics – to quickly maintain error-free records of their installed base. Digital twins are created for all the measuring devices in the plant, providing completely transparent representations and reducing maintenance work. When a device reaches the end of its life cycle, Netilion even gives the operator a recommendation of the appropriate successor product. This is how Industry 4.0 creates the basis for translating data and documents into economic success.



**Plant monitoring packaged solution** Netilion Health makes your plant sustainably more intelligent. It allows your measuring devices to think for themselves, monitor themselves and help personnel to rectify errors by giving them precise instructions. Netilion Health can provide information and indicate the status of the installed assets anywhere and at any time. It not only displays the error codes, but also provides instructions on how to rectify the problem without having to search through extensive operating instructions. Should unexpected events occur, effective measures can be taken immediately and plant shutdowns can be minimized.



**Calibration interval optimization packaged solution** This packaged solution can extend calibration intervals by using condition monitoring and predictive maintenance. It thereby makes the digitalization of calibration processes in the industrial internet of things (IIoT) a reality. Measuring devices are verified without process interruption and the test results are reliably documented. Plant operators therefore save time and money thanks to simplified maintenance routines and less frequent calibrations. At the same time, operators improve the process conformity of their plants, which increases effectiveness and added value.



**Predictive maintenance packaged solution** This packaged solution represents a milestone on the road to creating smart factories. Netilion Predict uses smart algorithms to evaluate the diagnostics data supplied by the smart sensors of the measuring devices. Predictive maintenance is possible because the assets know when the ideal time for maintenance will be. As a result, plant operators can reduce their maintenance costs without risk, increase plant availability and ensure process conformity. In addition, this Industry 4.0 solution opens up new opportunities for process optimization. Thanks to the seamless integration into SAP, the success can be measured and controlled.



**Mobile asset management packaged solution** This packaged solution makes asset digital twins available on mobile devices – even in Ex zones using Endress+Hauser industrial tablets. For operators, this means that the smart factory is literally in their hands. All measuring and device data is always available for viewing on site. This provides mobile workers with the information crucial to success in the right place and at the right time. Asset management becomes even more efficient and plant operators see a twofold benefit: process optimizations with reduced staffing and maintenance costs.



Digitalization

Plant safety

Pressure

Flow

Moisture

Liquid analysis

Level

Optical analysis

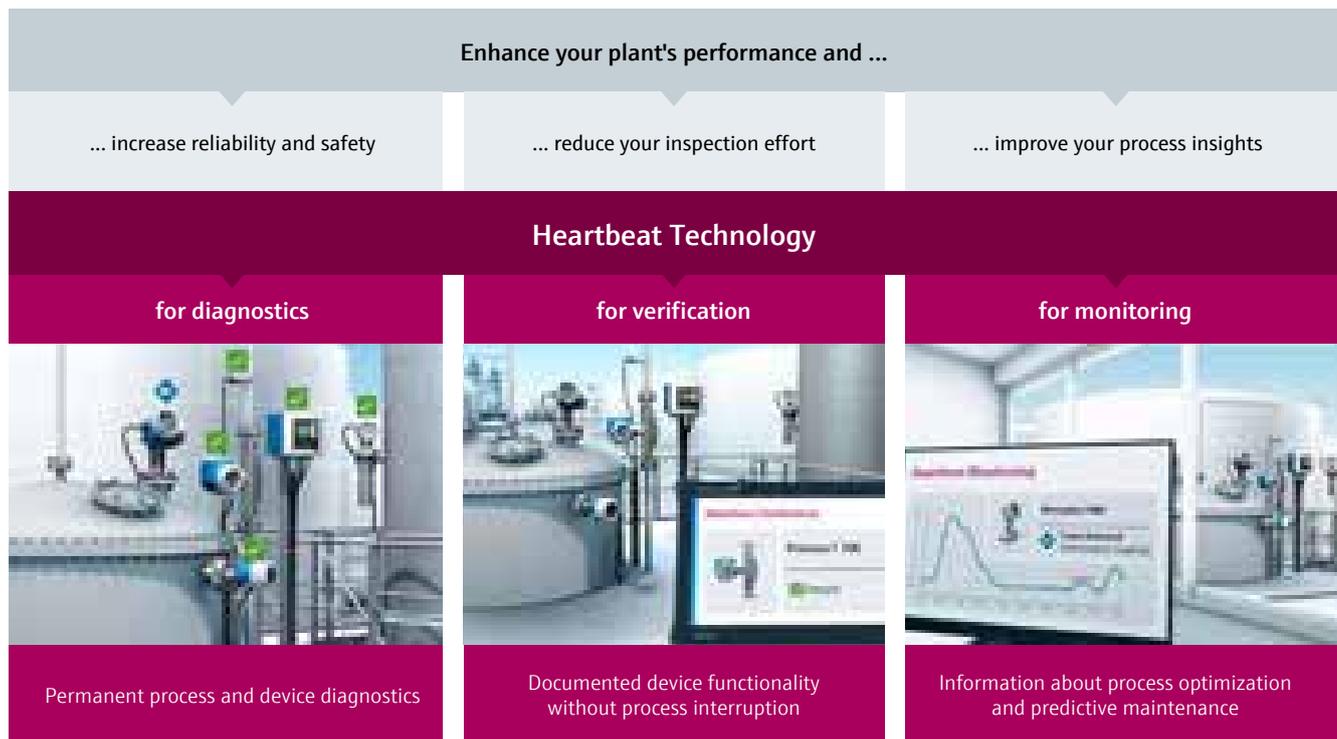
System components

Temperature

Services

# It monitors the pulse of your measurement and offers comprehensive insights

Heartbeat Technology gives you the answer



To help you, the plant operator, achieve your goals, we at Endress+Hauser have integrated Heartbeat Technology into numerous measuring devices in our product portfolio. Their unique diagnostics, verification and monitoring functions support you in your daily efforts to increase plant performance.



**Increased reliability and safety** Maximum confidence in the performance of devices thanks to outstanding diagnostic coverage and device development that conforms to international standards.

**Greater efficiency in measurement operations** Efficient processes are supported by timely, clear and standardized diagnostic messages with easy-to-implement remedial measures.

**Enhanced productivity combined with guaranteed legal conformity** Optimized calibration and test intervals thanks to traceable device verification without process interruption.

**Fewer unpleasant surprises** Improved insights into device and operating conditions make it possible to optimize the process and keep workflows stable.





Digitalization

Plant safety

Pressure

Flow

Moisture

Liquid analysis

Level

Optical analysis

System components

Temperature

Services

**Product portfolio with Heartbeat Technology**

				
Flow	Level	Pressure	Temperature	Analysis
<p><b>Mass flow</b></p> <ul style="list-style-type: none"> <li>Coriolis Promass 10/100/200/300/500</li> <li>Thermal t-mass 300/500</li> </ul> <p><b>Volume flow</b></p> <ul style="list-style-type: none"> <li>Electromagnetic Promag 10/100/200/300/400/500/800</li> <li>Ultrasonic Prosonic Flow 200/300/400/500</li> <li>Vortex Prowirl 200</li> </ul>	<p><b>Point level</b></p> <ul style="list-style-type: none"> <li>Vibronic Liquiphant FTL51B/62/64</li> <li>Radiometric Gammapilot FMG50</li> </ul> <p><b>Continuous fill level</b></p> <ul style="list-style-type: none"> <li>Free field radar Micropilot FMR5x/6x/6xB</li> <li>Guided wave radar Levelflex FMP5x</li> <li>Radiometric Gammapilot FMG50</li> </ul>	<ul style="list-style-type: none"> <li>Metal diaphragm Cerabar PMP71B</li> <li>Ceramic diaphragm Cerabar PMC71B</li> </ul> <p><b>Differential pressure</b></p> <ul style="list-style-type: none"> <li>Metal diaphragm Deltabar PMD75B/78B</li> </ul>	<ul style="list-style-type: none"> <li>Self-calibrating TrustSens TM371/372</li> </ul>	<p><b>For liquids</b></p> <ul style="list-style-type: none"> <li>Liquiline CM44x pH and ORP Dissolved oxygen Disinfection Turbidity Photometry Conductivity</li> <li>Liquistation CSF34/48 Sampler</li> </ul> <p><b>For gases</b></p> <ul style="list-style-type: none"> <li>J22 TDLAS Gas analyzer Concentration</li> </ul>

# From the field to the cloud: How connectivity is created

Adapters and edge devices make the potential of digital data from field devices accessible in existing plants too

In the latest generation of process plants, Industry 4.0 concepts are relatively easy to implement. In the digitalization of existing or brownfield plants, however, the challenge is to ensure connectivity of data from the field devices. That's because, for the successful digitalization of plants, the connectivity of the data suppliers – the sensors and actuators – is the key element. The solution: transmission of additional digital data from the field level in parallel to the measured data via a second communication channel. This means even existing plants can be made Industry 4.0-capable with little effort.

**Simultaneous data transmission** Our measuring devices already have numerous digital interfaces, e.g. 4 to 20 mA HART, PROFIBUS and PROFINET. Many sensors are also available with Bluetooth® and WiFi interfaces. With the new FieldPort SWA50 adapter, existing 4 to 20 mA sensors can be connected in accordance with the "NAMUR Open Architecture" (NOA) concept without placing any strain on existing communication channels or interfering in the system architecture. Our portfolio is supplemented with edge devices and gateways. Thanks to data transmission via a second communication channel, there is no longer anything to stand in the way of the digitalization of brownfield plants.

**Simple adapter solution** The new NOA-compliant Field-Port SWA50 adapter brings existing metrology equipment in analog networks quickly and cost-effectively into the cloud via gateways and edge devices. The wireless adapter connects existing 4 to 20 mA HART field devices to digital services easily by converting all HART signals into wireless signals. Either via Bluetooth® or WirelessHART, all HART signals from field devices can be transmitted to the cloud in parallel to the measured value – even those from third-party manufacturers. Via the smartphone app, users can gain immediate access to measurement and diagnostic parameters.

**Link to the cloud** Edge devices are literally at the boundary between the field and the cloud. They control the transmission of field data to the digital services. With the FieldEdge SGC200 edge device, Endress+Hauser offers a cost-effective and compact device that collects data via Bluetooth® and then transmits it to the cloud via the cell phone network. The FieldEdge SGC500 edge device was developed for industrial use. It makes it possible to link the field devices of industrial plants easily to the cloud. At regular intervals, it requests data from the field devices and transmits the data to the digital services via encrypted communication.



→ Our range of system components can be found on p. 84 onwards.

More information available at:  
[developer.netilion.endress.com](https://developer.netilion.endress.com)



## Quality marks and standards



EtherNet/IP

**✓ Your benefits: FieldPort SWA50**

- Easy retrofitting of 4 to 20 mA HART field devices
- Output either via Bluetooth® and/or WirelessHART (range up to 250 m)
- No separate power supply necessary (loop-powered)
- Ex approval

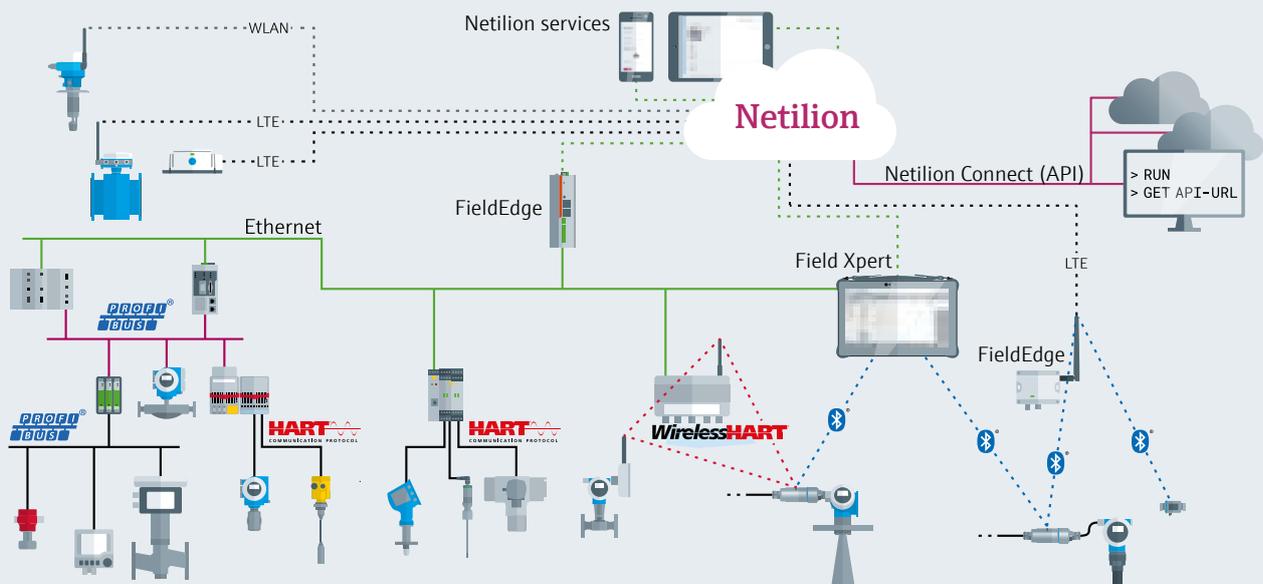


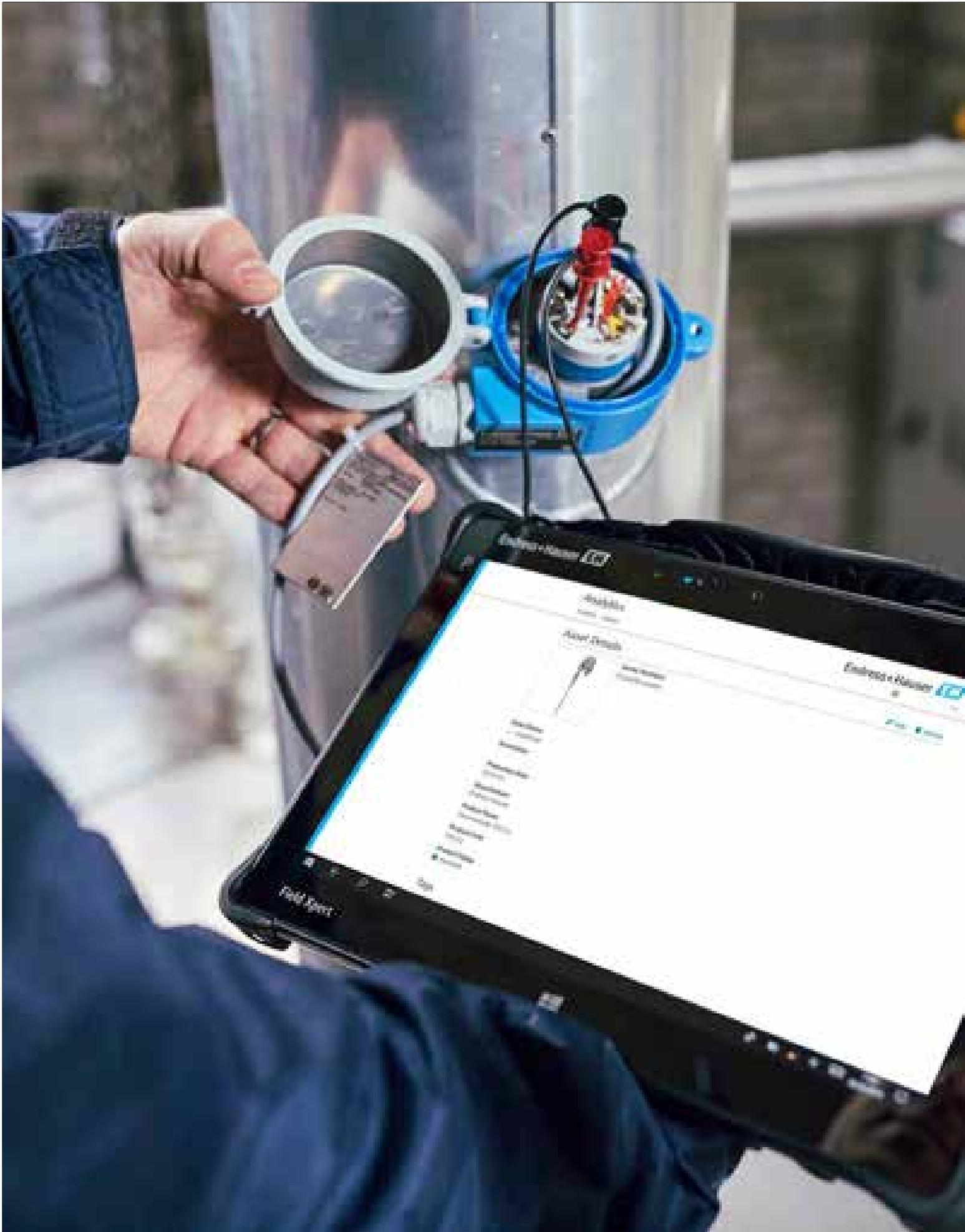
**✓ Your benefits: Edge Device SGC500**

- Field device connection to the cloud
- Secure data transmission through encrypted https communication
- Read-only access to the field level
- Easy installation and commissioning



**From field devices to the cloud: with Netilion**





# More convenient and more secure access to your devices

The SmartBlue app – mobile management of your assets

Our newest generation of measuring devices can be commissioned and managed easily and securely from a distance of up to 20 meters using the SmartBlue app. The ability to use the wireless Bluetooth® interface to connect to the device via smartphone or tablet is particularly handy

for hard-to-reach places or potentially explosive atmospheres. A separate interface driver is not required. The security of the encrypted data communication has been tested and certified by the Fraunhofer Institute.

SmartBlue: analyze, display, send – as a video or image



All accessible devices and status information at a glance

Device ID	Status	Parameter 1	Parameter 2
MICROPILOT	OK (Green checkmark)	PV 0,924 m	Wi-Fi icon
EH_CM82_N6012A05G11	OK (Green checkmark)	PV 3,56 pH	SV 23,30 °C
EH_FMR10_0601179	OK (Green checkmark)	PV 0,223 m	Wi-Fi icon
EH_DMA_F619000	Warning (Yellow triangle)	PV 0,000 l/min	SV 45,3 °C



# Data boost with Profinet for process instrumentation

## Ethernet-APL: easy, quick, digital

During planning and operation, process plant operators strive for efficient engineering and reliable production quality, rapid start-up and fast commissioning. Working with plant equipment, especially field instrumentation, built around older technologies like HART or Profibus is often a complex issue. There is increasing demand for higher data performance but also for driving down costs for devices and system integration.

**Existing technologies** With digitalization, the commonly used fieldbus technology Profibus has been pushed to its limit for some years now – low bandwidth, lack of speed and complicated protocol conversions. This is similarly the case with the even more dated analog 4 to 20 mA measurement technology with HART protocol. HART, however, is dogged by even greater performance losses as soon as the equipment is expected to produce high data rates for automation tasks. The newly introduced APL (advanced physical layer) for industrial Ethernet protocols, such as Profinet or even EtherNet/IP, has seen a kind of paradigm shift.

**The new technology** also makes it possible to use the aforementioned protocols directly in the harsh environment of process automation. Ethernet-APL is an advanced physical layer for Ethernet. The technology fulfills all requirements of process plants and as good as brings Ethernet and its benefits into the field of process automation. Ethernet-APL enables complete digitalization in the process industry and in all life-cycle phases.

### Advantages for engineers

- Designed for process and hybrid industries
- Super-modern technology that supports digitalization concepts
- Flexible and scalable design of the network topology
- No calculation of Ex zones required (2-WISE)
- High availability thanks to a multitude of redundancy mechanisms

### Advantages for operating and maintenance personnel

- Enhanced performance thanks to accurate digital process values, high-speed data transmission and easy remote access
- Optimized reliability thanks to continuous diagnostics, local and remote monitoring
- Seamless data access thanks to a homogeneous network for 2nd channel and IIoT
- Start-up records for automatic configuration in case of device replacement

**Note on availability** Endress+Hauser's first Profinet-enabled field devices with APL interface are expected to be released in the course of 2023.

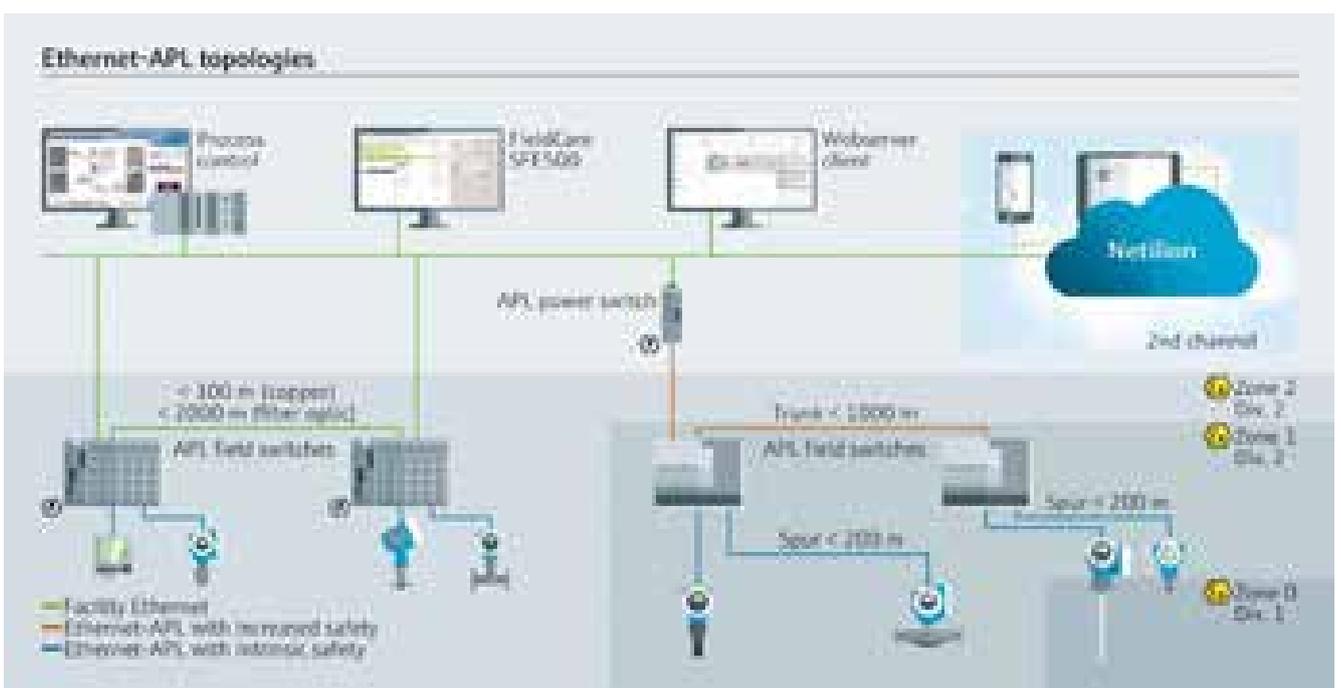


 [www.endress.com/apl](http://www.endress.com/apl)



 [www.ethernet-apl.org](http://www.ethernet-apl.org)





Digitalization

Plant safety

Pressure

Flow

Moisture

Liquid analysis

Level

Optical analysis

System components

Temperature

Services

# Smart sensors evaluate field data to optimize production processes

More than just accurate: smart measurement technology supplies valuable additional information

Smart sensors are intelligent all-rounders. They monitor fill levels remotely, measure the health of machine components or detect errors in the plant in record time. Measuring devices with digital interfaces and smart diagnostic functions supply not only precise measured values but also a whole host of valuable data from the process – and therefore the “raw material” for Industry 4.0. Using this information, it is possible to optimize processes and workflows. Maintenance can be planned predictively, so that plant downtimes become the absolute exception. Smart sensors therefore ensure faster, more flexible and more economical production processes.

**Significant added value** Heartbeat Technology gives Endress+Hauser's process sensors smart capabilities. Measuring devices equipped with smart sensors use permanent process and device diagnostics to provide valuable data to optimize processes and increase efficiency. Smart sensors even make it possible for the monitoring and verification of the field devices to be documented without process interruption. Overall, Industry 4.0-capable devices offer the user significant added value with their extended connectivity, internal diagnostics, verification and monitoring functions as well as the direct communication between the smart sensors and the cloud.

## Pressure

**Cerabar and Deltabar** These pressure transmitters detect, for example, clogged impulse lines, closed valves or changes in agitators. This is made possible by statistical sensor diagnostics integrated into Heartbeat Technology. It is based on a recording of the “noise profile” by smart pressure sensors, which occurs during dynamic processes. If this changes in the ongoing process, the pressure sensor detects the change and issues an alarm.



[www.endress.com/cerabar\\_deltabar](http://www.endress.com/cerabar_deltabar)



## Flow

**Proline series** The flowmeters of the Proline series not only supply measured values with customary precision, they also evaluate parameters to identify influences that are having a negative impact on measurement performance or production processes. These include corrosion, abrasion, film formation or gas inclusions. This information enables predictive maintenance and protects product quality. It helps to reduce costs and increases plant safety in safety-relevant or quality-critical applications.



[www.endress.com/proline-simply-clever](http://www.endress.com/proline-simply-clever)



## Liquid analysis

**Memosens 2.0** – Memosens technology is all about digitalization of measured values directly in the sensor head, contactless digital signal transmission and diagnostics and storage of all sensor-relevant data in the sensor itself. Memosens 2.0 combines ultra-modern technologies with maximum practicability. Additional process data and diagnostic information will enable precise predictions as to the current state and future maintenance requirements. The new Memosens generation is fully backward compatible.



[www.endress.com/memosens](http://www.endress.com/memosens)



## Level

**The new Liquiphant and the new generation Micropilot 80 GHz radar sensors** For increased plant availability, the integrated Bluetooth® interface and SmartBlue app enable you to fetch valid information for a process optimization or, for example, to plan predictive maintenance. For this purpose, the Micropilot FMR6xB continuous level transmitters also have further digital interfaces e.g. Ethernet-APL.



[www.endress.com/liquiphant](http://www.endress.com/liquiphant)



[www.endress.com/micropilot-new-generation](http://www.endress.com/micropilot-new-generation)



## Temperature

**iTHERM TrustSens** has the world's first RTD sensor capable of fully automated in-situ self-calibration. The device virtually eliminates the risk of undiscovered non-conformities, reduces downtimes and increases product safety and process efficiency in plants. It is compliant with FDA 21 CFR Part 11 requirements and GMP guidelines. The automatically created calibration certificates as well as the additional information from the measuring device can be used for other plant optimization scenarios.



[www.endress.com/trustsens](http://www.endress.com/trustsens)



Digitalization

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Services

# Plant safety

# Simply reliable

## Plant safety in the process industry

For production facility operators, plant safety is of great importance when it comes to minimizing risks to persons, the environment and the plant itself at the same time as optimizing productivity. Especially when it comes to SIL safety devices, potentially explosive atmospheres and plants that are subject to water resource protection legislation, lawmakers are imposing ever stricter requirements. These govern, among other things, the selection and correct quantitative design of devices for safety-related and critical installations as well as the implementation of strategies for servicing and maintenance.

**What we offer** As a partner for complete solutions, we support the process industry with a full portfolio of tailor-made services – from consulting and the quantitative design of safety circuits to the documented functional testing of safety equipment. With more than 250 certified product lines, Endress+Hauser offers a comprehensive device portfolio for Ex, SIL, PED and water resource protection applications. More than 1,000 product lines have been qualified for SIL 2/3 and developed to IEC 61508; over 40 device lines are approved in accordance with the WHG (Federal Water Act in Germany). The safety design of our devices has been optimized over decades. The portfolio has undergone continuous further development such that it meets the latest requirements, e.g. NAMUR. The safety concepts are also becoming ever more efficient. This means that safety devices can be checked with extended test cycles without removal or plant downtime – supported, among other things, by Heartbeat Technology as your smart assistant.

### Your benefits

- High plant availability and process reliability
- Minimize effort – optimize inspection cycles
- Flexible configuration for application-specific processes
- Diverse diagnostic capabilities enable detection of systematic errors

 <http://eh.digital/plant-safety>



### Quality marks and standards



# Safeguard protection function and optimum operation in safety devices

## SIL services for process plant operators

### At a glance

- Services for guaranteeing the protection function of safety instrumented systems
- Uncover systematic errors early on and reveal dangerous random errors
- Documentation for audits and as evidential record

**Our SIL services** To reduce the risk of potential hazards to personnel, the environment and the plants themselves to a tolerable level, it is necessary to implement the appropriate protective measures. SIL devices in SIL applications meet this need. As a SIL device alone is not sufficient given that optimum operation must also be guaranteed for maximum functionality and safety, Endress+Hauser offers a range of SIL services: from computerized SIL records to commissioning and recurring inspections. In this way, it is possible to avoid systematic errors, uncover any dangerous and undetected errors and ensure the optimum operation of safety functions.

### Advantages

- Undertaken by experienced and specially trained SIL service technicians
- Complete documentation to IEC 61511 for each SIL device for audits
- Comprehensive service portfolio supplementary to a broad SIL device portfolio
- Many years of experience with functional safety as manufacturer of SIL measuring devices to SIL 2/3 (IEC/DIN EN 61508)



# Support as specialists in water resource protection with over 25 years of experience

Services for compliance with water resource protection legislation

## At a glance

- Services for ensuring compliance with water resource protection legislation (e.g. the German Federal Water Act)
- Comprehensive documentation for audits
- Experts provide support from the quantitative design of overflow protection to recurring inspections in accordance with the WHG

**Our WHG services** In Germany, the Federal Water Act (WHG) is one of the most significant laws for the protection of the environment and for safety in operation. Under the WHG, containers for water-polluting liquids must be protected against overflowing. Endress+Hauser, as an accredited and certified specialist in WHG-compliance, can help you meet the requirements. Our services include consulting, quantitative designing of new overflow protection installations, WHG commissioning operations and recurring inspections in accordance with the WHG, backed by comprehensive documentation for audits.

## Advantages

- WHG specialist for over 25 years – certification of Endress+Hauser by the TÜV every 2 years
- Annual training of our WHG service technicians ensures superlative service quality
- Everything from a single source – from WHG services and measurement technology for overflow protection through to the complete WHG solution



# Pressure

# Pressure

Our offering for the measurement of process pressure, differential pressure, fill level and flow

When it comes to workflow sequencing and the quality of engineered processes, the “pressure” measuring parameter plays a decisive role in addition to temperature and concentration. For safety, too, the pressure accumulating in containers and pipework is an important factor. For this reason, pressure measuring devices must transmit the prevailing pressure precisely and reliably. This is a complex task given that there are no blanket solutions due to the wide variety of engineered processes that exist. At the same time, high quality and safety requirements allow no room for compromise.

**What we offer** To fulfill the highest demands for quality and safety, we have been driving pressure measurement technology forwards with intelligent innovations for almost 40 years. Several million measuring points installed around the world are an impressive testament to the trust that plant operators and plant engineers have in the solutions of Endress+Hauser. Innovations in sensor technologies, software tools or measurement technology design deliver lasting increases in customer value. Take as an example the high-purity ceramic measuring cell, which we incorporated into our product portfolio back in 1987. Its full strength comes to the fore in high-vacuum applications, in the presence of aggressive or abrasive media and under transient pressure surges. Customer needs are always the focus of every innovation. This also applies to the latest new addition to our pressure portfolio: the new generation of Cerabar and Deltabar pressure and differential pressure transmitters.

 **Your benefits**

- Maximum plant availability and process reliability thanks to sensors that are tailored to the application
- Cost saving: thanks to our portfolio segmentation, plant operators pay only for what their process needs
- Time saving: complete measuring point including accessories from a single source
- Additional safety: Applicator makes it easier to find the appropriate device of the correct design

 [www.endress.com/pressure](http://www.endress.com/pressure)



 [www.endress.com/applicator](http://www.endress.com/applicator)



**Quality marks and standards**



## Portfolio segmentation

**Portfolio segmentation** The product portfolio in pressure measurement technology is characterized by the distinct segmentation of products, which means that it offers an optimized price-performance ratio. From high-end transmitters for the most stringent requirements in the process industries to versatile compact transmitters and affordable pressure transmitters and switches for standard applications: only pay for what the process needs.



## Complete pressure package

### From the pressure transmitter...

The complete pressure package begins with single-purpose pressure and differential pressure transmitters for the range of applications described. Thanks to portfolio segmentation, it is possible to select the necessary transmitter optimized for a particular application. You will find detailed information on the new generation Cerabar and Deltabar on the following pages.



Example: DP transmitter



DP transmitter including 5-way valve block

### ...to matching accessories...

The majority of all pressure measuring points are equipped with matching accessories, such as shut-off valves, valve blocks, flushing rings or weather-proof covers. We supply the necessary pressure accessories directly with the product. Everything from a single source. Not only does this prolong the service life of the measuring point, it also allows any necessary operations, such as recalibration, to be carried out locally at the test port of the shut-off valve and without process interruption.

### ...to services and tailor-made mechanical solutions

In addition to providing accessories, we are also pleased to offer further services such as commissioning, calibration or maintenance of your pressure transmitters. Or do you need a tailor-made mechanical solution, such as a complete rack? Learn more about our mechanical solutions on p. 40 of this brochure.



## The new Cerabar and Deltabar – Connect your pressure measurement to the future

“Connect your pressure measurement to the future” is a deliberately phrased invitation. In addition to the decisive role described above that the pressure parameter plays in engineered processes, there are further challenges in process instrumentation and automation that need to be met today and in the future. The innovations of the next generation Cerabar and Deltabar are designed to help you overcome these challenges that lie ahead: making the leap to Industry 4.0 at the same time as coping with the gamut of data, managing with fewer specialists on site and/or shortage of time at the plant without creating major problems, and keeping up with constantly increasing safety requirements. That's why we are presenting the new Cerabar and Deltabar:

More Industry 4.0.

More productivity.

More process reliability.



**More Industry 4.0** The systematic implementation of Industry 4.0 is contingent on two variables: data and connectivity. It needs reliable and useful data and then the connectivity for receiving the data from the field in, for example, a cloud application. With the aid of Heartbeat Technology (data) and a Bluetooth® interface (connectivity), the new Cerabar and Deltabar are optimally equipped for the implementation of Industry 4.0 strategies. Plenty of potential for improvement is there: statistics show that only 3% of all available data in measuring devices is even utilized. You will find more about Endress+Hauser's digitalization strategy on pages 15-27 of this brochure.



**More productivity** On the one hand, the Bluetooth® interface opens up possibilities for connectivity. On the other hand, a Bluetooth® connection via SmartBlue app is the optimum tool for the user. Following password validation, you are given wireless access to the device configuration. Digital assistants in the operating menu of the new Cerabar and Deltabar pressure transmitters also simplify conventional operations, such as commissioning or the secure locking of a pressure or differential pressure transmitter. The ability to create PDF reports at the end minimizes time spent on preparing mandatory documentation.



**More process reliability** The pressure parameter is a safety-critical variable in process industries. For this reason, the issue of safety has also been taken to the next level as far as the new Cerabar and Deltabar pressure transmitters are concerned. Our market-leading SIL ratings underline our ambitions. This creates new possibilities in established inspection cycles. Can the cycle be extended from, for example, one year to several years with the latest measuring devices? Is it enough to carry out a partial inspection entailing little effort and still retain the safety integrity level (SIL)?

While the need for inspections does not go away, they have longer intervals and are simplified by digital assistants. For the regular inspection of a pressure measuring point, a crucial question is whether the desired device configuration has remained unchanged since the last inspection. In the new parameter “CRC device configuration”, all safety-related parameters of a pressure transmitter are bundled together. If a parameter changes, the CRC changes automatically. At a glance, you can see whether the configuration has been changed or not in the meantime.



[www.endress.com/cerabar\\_deltabar](http://www.endress.com/cerabar_deltabar)



# Compact transmitters for accurate pressure measurement in liquids and gases

## Cerabar PMP51B and PMC51B

### At a glance

- Considerable time savings – simple and wireless configuration using a Bluetooth® interface
- Maximized process reliability – integrated under-voltage detection and development to IEC61508 for SIL2/3 applications
- High productivity – integrated digital assistant for simple commissioning



Cerabar PMP51B

**Application** The new Cerabar PMP51B and PMC51B pressure transmitters measure pressures (absolute and relative) accurately and reliably. The choice between a metallic or ceramic sensor allows users to select the transmitter that is suited to their application. In addition, there is an extended scope of application thanks to measuring ranges of between 5 mbar and 420 bar and process temperatures of between -70°C and +400°C.

### Advantages

- Newly leveraged connectivity thanks to optional Bluetooth® interface for simple and wireless communication – including at a safe distance
- Development to IEC61508 ensures improved safety and enables use in SIL2 and – with homogeneous redundancy – SIL3 applications
- Undervoltage detection avoids dangerous plant conditions and the transmitting of frozen current values
- Integrated digital assistants ensure fast and error-free commissioning, locking of the pressure transmitters or easy measuring point documentation
- Maximum scope of applications thanks to different sensors, wide spans and a broad temperature range



Cerabar PMC51B

 [www.endress.com/pmp51b](http://www.endress.com/pmp51b)



 [www.endress.com/pmc51b](http://www.endress.com/pmc51b)



### Technical data

- Reference accuracy: 0.075%/up to 0.055% as an option
- Span: 5 mbar to 420 bar relative or absolute
- Process temperature: -70°C to +400°C (depending on filling oil and diaphragm seal design)
- Approvals: ATEX, CSA, EAC, NEPSI, etc.
- Communication: 4 to 20 mA analog/4 to 20 mA HART/Bluetooth®

# Transmitter for monitoring differential pressures

Deltabar PMD55B

## At a glance

- Considerable time savings – simple and wireless configuration using a Bluetooth® interface
- Maximized process reliability – integrated undervoltage detection and development to IEC61508 for SIL2/3 applications
- High productivity – integrated digital assistant for simple commissioning

**Application** Thanks to its measuring ranges of between 5 mbar and 44 bar, the new Deltabar PMD55B compact differential pressure transmitter can be used in a wide variety of differential pressure measurements: in conventional filter monitoring, for measuring extremely low differential pressures in towers, level measurements with the hydrostatic measuring principle or flow measurements using the differential pressure method.

## Advantages

- Newly leveraged connectivity thanks to optional Bluetooth® interface for simple and wireless communication – including at a safe distance
- Development to IEC61508 ensures improved safety and enables use in SIL2 and – with homogeneous redundancy – SIL3 applications
- Undervoltage detection avoids dangerous plant conditions and the transmitting of frozen current values
- Integrated digital assistants ensure fast and error-free commissioning, locking of the pressure transmitters or easy measuring point documentation
- Optionally supplied accessories (either directly fitted or enclosed), such as valve blocks, in one delivery and perfectly matched to the transmitter



[www.endress.com/pmd55b](http://www.endress.com/pmd55b)



Deltabar PMD55B

## **i** Technical data

- Reference accuracy: 0.075%/up to 0.055% as an option
- Span: 5 mbar to 44 bar differential pressure
- Process temperature: -40°C to +85°C
- Approvals: ATEX, CSA, EAC, NEPSI, etc.
- Communication: 4 to 20 mA HART/Bluetooth®

# High-end transmitters for high-accuracy pressure measurement in liquids and gases

## Cerabar PMP71B and PMC71B

### At a glance

- More productivity – Bluetooth® simplifies workflows such as commissioning or documentation of the measuring point
- More process reliability – integrated undervoltage detection, CRC checksum, development to IEC61508 for SIL2/3 applications and digital assistants
- More Industry 4.0 – integrated functionalities such as Heartbeat Technology enable further process optimizations in the context of Industry 4.0

**Application** The new Cerabar PMP71B and PMC71B high-end pressure transmitters measure pressures (absolute and relative) with superlative accuracy and maximum reliability. They can even withstand the toughest applications. The choice between a metallic or ceramic sensor allows users to select the transmitter that is optimally suited to their application. In addition, there is an extended scope of application thanks to measuring ranges of between 5 mbar and 720 bar and process temperatures of between -70°C and +400°C.

### Advantages

- Heartbeat Technology for device verification without process interruption and with predictive maintenance thanks to monitoring functions
- Fast and wireless communication by Bluetooth® for easy commissioning, locking and documentation of the transmitter
- Optical sensors in the display for user operation without opening the housing, including display color change from green to red in the event of a fault
- CRC checksum provides at a glance assurance that the device configuration is correct
- Undervoltage detection avoids dangerous plant conditions and the transmitting of frozen current values
- Development to IEC61508 enables use in SIL2 and – with homogeneous redundancy – SIL3 applications



Cerabar PMC71B



Cerabar PMP71B

### **i** Technical data

- Reference accuracy: 0.05%/up to 0.025% as an option
- Span: 5 mbar to 720 bar relative or absolute
- Process temperature: -70°C to +400°C (depending on filling oil and diaphragm seal design)
- Approvals: ATEX, CSA, EAC, NEPSI, etc.
- Communication: 4 to 20 mA HART/Ethernet-APL/Bluetooth®

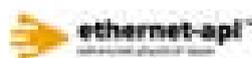
 [www.endress.com/pmp71b](http://www.endress.com/pmp71b)



 [www.endress.com/pmc71b](http://www.endress.com/pmc71b)



### Quality marks and standards



# High-end differential pressure transmitters for liquids and gases

Deltabar PMD75B and PMD78B

## At a glance

- More productivity – Bluetooth® simplifies workflows such as commissioning or documentation of the measuring point
- More process reliability – integrated undervoltage detection, CRC checksum, development to IEC61508 for SIL2/3 applications and digital assistants
- More Industry 4.0 – integrated functionalities such as Heartbeat Technology enable further process optimizations in the context of Industry 4.0

**Application** Thanks to their measuring ranges of between 1 mbar and 44 bar and process temperatures of between -70°C and +400°C, the new Deltabar PMD75B and PMD78B high-end differential pressure transmitters can be used in the most varied and toughest of differential pressure measurements: in conventional filter monitoring, in applications with extreme temperatures, for measuring extremely low differential pressures in towers, level measurements with the hydrostatic measuring principle or flow measurements using the differential pressure method.

## Advantages

- Heartbeat Technology for device verification without process interruption and with predictive maintenance thanks to monitoring functions
- Fast and wireless communication by Bluetooth® for easy commissioning, locking and documentation of the transmitter
- Optical sensors in the display for user operation without opening the housing, including display color change from green to red in the event of a fault
- CRC checksum provides at a glance assurance that the device configuration is correct
- Undervoltage detection avoids dangerous plant conditions and the transmitting of frozen current values
- Development to IEC61508 enables use in SIL2 and – with homogeneous redundancy – SIL3 applications



Deltabar PMD75B



Deltabar PMD78B

## Technical data

- Reference accuracy: 0.05%/up to 0.035% as an option
- Span: < 1 mbar to 44 bar differential pressure
- Process temperature: -70°C to +400°C (depending on filling oil and diaphragm seal design)
- Approvals: ATEX, CSA, EAC, NEPSI, etc.
- Communication: 4 to 20 mA HART/Ethernet-APL/Bluetooth®

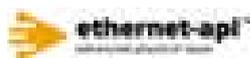
 [www.endress.com/pmd75b](http://www.endress.com/pmd75b)



 [www.endress.com/pmd78b](http://www.endress.com/pmd78b)



## Quality marks and standards



Digitalization

Plant safety

Pressure

Flow

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Liquid analysis

Level

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System components

Temperature

Services

# Devices, components and systems come pre-assembled and are precisely matched

Complete mechanical solutions – ready-to-install system units

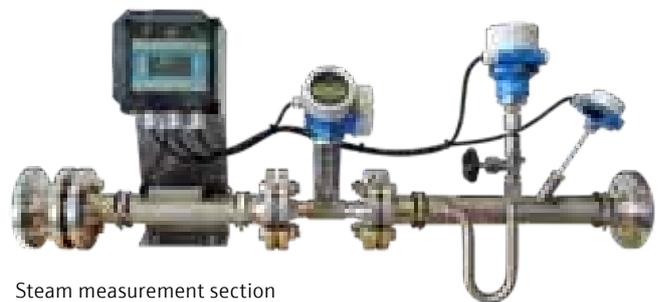
Devices, components and ready-to-install system units that save costs and time. Unexpected problems can occur on site when measurement technology and accessories are ordered. The wrong parts have been ordered, the parts are not compatible, they have been delivered to different locations and cannot be found by the technicians or they arrive at totally different times. To prevent these problems from occurring in the first place and so that the project is not delayed, we take charge of engineering, factory pre-assembly, delivery coordination, on-site installation, construction site management, commissioning and the entire documentation. That is why many of our customers already rely on the experience of our employees to ensure that complex projects for the mechanical integration of measuring devices are implemented successfully, and with good reason: As a strong partner to industry, Endress+Hauser has a wealth of practical expertise in all sectors.

## What we offer

- **On-site consultation:** In an initial discussion, we will explain the measuring options available and identify the requirements for the project
- **Project development:** Planning and designing of the measuring loop including accessories for all measuring points in accordance with the customer's process data
- **Supply:** Device measurement technology including accessories; coordination, scheduling and logistics
- **Project management:** Project management for the overall project and monitoring of the on-site installation and commissioning work
- **Assembly:** Mechanical assembly of all components in accordance with the prescribed technical regulations
- **Commissioning:** Commissioning of the complete measuring loop with associated signal test
- **Documentation:** Compilation of the device documentation (OI, TI, certificates, Ex and SIL approvals, 2D/3D drawings, etc.)

## Advantages

- Cost and time savings
- Standardization of interfaces
- Concentrate on what matters most – we'll take care of the rest
- Delivery of pre-assembled and tested complete measuring points
- On-site assembly of the items supplied, including commissioning and documentation
- Safety: Matched components ensure optimum commissioning and a permanently reliable process



Steam measurement section



Flow solutions based on the differential pressure principle



Complete bypass measuring point



[www.endress.com/solutions](http://www.endress.com/solutions)





Services

Temperature

System components

Optical analysis

Level

Liquid analysis

Moisture

Flow

Pressure

Plant safety

Digitalization

# Flow

# Flow

## Our offering for flow measurement in gases, steam and liquids

Flow measurement in all kinds of media, such as water, natural gas, steam, crude oil, chemicals or wastewater, is part and parcel of the daily activities in all industries. Ever increasing requirements for constant product quality, optimized processes, safety and environmental protection mean that industrial flow measurement is gaining further importance. Highly dynamic processes in applications such as the dosing, batching, mixing or accounting of measured substances are some of the greatest challenges. As different process and fluid properties give rise to different requirements for the measurement technology, there is an optimized measuring solution for each application. These perfectly tailored measuring solutions help to fulfill the constantly increasing requirements for automation engineering and the desire for ever higher-performing and, at the same time, more flexible plants at the lowest possible costs.

**What we offer** For the flow measurement of liquids, gases and steam, we have maintained a comprehensive product portfolio for more than 40 years, comprising six reliable, robust and proven sensor technologies. The five Proline flow technologies stand for flexibility and consistent fulfillment of all relevant industry requirements and offer innovative and standardized transmitter concepts. At the same time, they increase operational safety and help to reduce costs. Our comprehensive practical experience forms the basis for optimization of the next generation. Indeed, the experiences that we have gained from over 25 years with the Proline flow measuring device concept are streamed directly into its further development. Far-reaching homogeneity across the broad product portfolio simplifies practical operation. Innovations and future trends are already available today. For all industries and every application, we offer the optimum solution.

### ✓ Your benefits

- Industry 4.0-ready: Integrated WiFi connectivity, web servers and comprehensive process and device diagnostics enable wide-ranging process optimizations
- Integrated industry safety: Superlative product and process reliability thanks to industry-specific safety concepts, such as SIL device concept and food safety concept
- Heartbeat Technology: Efficient maintenance thanks to comprehensive integrated diagnostics, verification without removal and unambiguous process-independent monitoring parameters
- HistoROM: This captive memory module prevents data loss and enables components to be replaced easily without reconfiguration
- Simply clever: Optimized device design and innovative new features ensure simple and safe device handling during planning, operation and maintenance

 [www.endress.com/flow](http://www.endress.com/flow)



 [www.endress.com/applicator](http://www.endress.com/applicator)



### Quality marks and standards



## Reliable flow rate measurement – measuring technologies for every field of application



### Deltabar

- All gases 1 to 3% rdg
- DN15 to 12,000
- -200 to +1,000°C/400 bar

#### Advantages

- SIL 2/3
- All gases
- Special materials

#### Note

- 15 x inlet length
- Pressure loss



### Prowirl

- All gases 0.9% rdg
- DN15 to 300
- -200 to +400°C/250 bar

#### Advantages

- SIL 2/3
- Integrated pressure and temperature compensation for mass/standard volume
- SIL 3 in one device as Dualsens

- Material: stainless steel, alloy

#### Note

- 10 x DN inlet required
- Min. flow required



### t-mass

- 21 gases and mixtures 1% rdg
- DN15 to 1,500
- -40 to +180°C/40 bar

#### Advantages

- SIL 2/3
- Direct mass measurement
- Bidirectional measurement
- Low pressure loss
- Leakage monitoring
- Very low flow rates

#### Note

- 5 x DN inlet (with flow conditioner)
- Typically limited to < 25 m/s



### Prosonic Flow

- All gases 0.5 to 1% rdg
- DN25 to 300
- -50 to +150°C/100 bar

#### Advantages

- SIL 2/3
- Integrated pressure and temperature compensation for mass/standard volume
- Moisture/wet gases
- No pressure loss
- Low flow rates
- Methane content and gas analysis package

#### Note

- No pure H<sub>2</sub>, He or O<sub>2</sub>
- 10 x DN inlet



### Promass

- All gases 0.25% rdg
- DN1 to 350
- -200 to +350°C/400 bar

#### Advantages

- SIL 2/3
- Direct mass measurement
- No inlet lengths
- High accuracy
- Multivariable

#### Note

- Pressure loss
- Minimum pressure required

### The optimum measuring device for each application

Endress+Hauser's gas flowmeters, with five innovative, wear-free and electronic measuring solutions, provide exact measurement results and maximum safety even in the most demanding processes. From the smallest nominal diameters to large exhaust stacks, for high pressures up to 400 bar and high temperatures up to 1,000°C, these devices are built to meet industry requirements. The field of application ranges from gas measurements in auxiliary circuits to custody transfer billing points or challenging process gas measurements. The Proline device concept enables comprehensive cost savings thanks to quick commissioning via WiFi or web server and easy testing with Heartbeat Technology.

### Advantages

- All measuring devices are wear-free, stable in process and highly accurate
- Simple and reliable commissioning
- Accredited on-site calibration of gas flowmeters (Promass + Prowirl) with water
- All technologies are SIL 2/3-compliant and developed to IEC 61508
- Custody transfer gas flow measurement with Promass
- Bidirectional thermal gas flow measurement
- High precision even with moist gases or at low pressures
- Simple and reliable quantitative design of the gas measuring point by Applicator

### Quality mark and standard



The best solution for your requirements:

Requirement	Media (examples)	Measurement technology				
		Coriolis	Ultrasonic	Thermal	Vortex	Differential pressure
Gas flows in general	Natural gas, air, argon, nitrogen	✓	✓	✓	✓	✓
Dirty/moist gases	Biogas		✓			
Volume flow	Exhaust gases		✓		✓	✓
Mass flow measurement	CO <sub>2</sub>	✓		✓	✓	
Nominal diameters > DN400	Supply lines, pipelines			✓		✓
Operable flow range > 30:1			✓	✓		
Low pressure loss	Air		✓	✓	✓	
Process temperature > 200°C	Exhaust gases				✓	✓
Process pressure > 100 bar	Compressed natural gas	✓			✓	
Custody metering	Natural gas	✓				



**Promass Coriolis mass flow measurement** is very often used in process gas and custody transfer applications. The direct mass measurement without pressure and temperature compensation delivers highly accurate measurement results under adequate process pressure conditions. Promass impresses with its ease of installation without inlet and outlet runs and its maintenance-free design. Typical applications include oxygen, helium, ethylene, cryogenic gases, hydrogen or even compressed natural gas (CNG).



**Prosonic Flow ultrasonic flow measurement** is the preferred solution for natural gas or biogas. Prosonic Flow enables an exact gas measurement without pressure loss even under difficult process conditions, such as wet gases or extremely low flow velocities or process pressures. With an optionally available gas analysis package and the integrated pressure and temperature measurement, the operator additionally has access to gas analysis values, e.g. mass flow, standard volume flow or energy flow, and support for methane content detection.



**t-mass thermal mass flow measurement** is the technology of preference for measuring dry and clean gases such as compressed air, nitrogen, argon or mixed gases of known composition. It enables an exact measurement without additional pressure and temperature compensation. t-mass also detects extremely low flow rates, which is why it is often tasked with leak detection in compressed air networks.



**Prowirl Vortex flow measurement** enables the cost-effective and highly robust measurement of all process gases. The optional pressure and temperature compensation with integrated gas computer also supports mass, standard volume or energy flow measurement. Thanks to its various material certificates, Prowirl can even be used in hydrogen or oxygen.



**Deltabar differential pressure measuring systems** are suitable for use even under extreme application conditions thanks to the diverse selection of available materials. These conditions range from extremely high process pressures or process temperatures to gas flow measurements in large exhaust stacks (Pitot tubes).

Digitalization

Plant safety

Pressure

Flow

Moisture

Liquid analysis

Level

Optical analysis

System components

Temperature

Services

# Electromagnetic flow measurement and its many benefits

Proline Promag with new features (from firmware 1.06.xx)

## At a glance

- Coating detection – identify film formation to increase plant availability and shorten cleaning processes
- HBSI – The new Heartbeat Sensor Integrity parameter increases measurement certainty by detecting and reporting magnetic field disturbances and damage to the measuring system
- Calibrated conductivity measurement – Integrated conductivity measurement with 10% measurement error as standard, and optionally with 5% calibration and calibration certificate
- Ungrounded measuring – Enables a stable and cost-effective measurement without ground disks in coated or plastic piping systems



Promag W 300

**Application** The new performance characteristics of the Promag electromagnetic flowmeter enable process optimizations and increase measurement certainty even in critical fields of application. Coating detection helps to shorten flush cycles for film-forming fluids thanks to the unambiguous detection of residual coating on the measuring tube. The optional calibrated conductivity measurement detects cleaning agent residues, e.g. during CIP cleaning in food processing plants. The ungrounded measuring option helps to avoid galvanic corrosion in coated or plastic piping systems.

## Current availability of new features in device models

Device model and sensor	0 x DN full bore	Coating detection	Calibrated conductivity measurement	HBSI	Ungrounded measuring
Promag 10	W	–	–	–	W/P/H
Promag 100	–	–	P/H	–	–
Promag 300	W/P	W/P/H	W/P/H	W/P/H	W/P/H
Promag 400	W	W	W	–	–

## Quality mark and standard



# Full bore electromagnetic flow measurement without inlet runs (0 x DN)

Promag 10, 300/500 and 400

## At a glance

- The world's first full bore electromagnetic flowmeter with no inlet and outlet runs (0 x DN) and therefore no pressure loss
- Highly accurate and particularly stable measured values thanks to innovative signal analysis and processing
- Installation directly after pipe bends and T-fittings, perfect for confined conditions and in skids

**Application** In the water and wastewater industry, high measurement accuracy is indispensable for optimal process control. Influences such as a close-knit pipeline network or obstacles in the pipe cause flow turbulences that negatively affect accuracy. With the "0 x DN Full Bore" option, Promag offers the only solution of its kind in the world: maximum measuring performance even without inlet and outlet run and without any pipe constriction, resulting in no pressure loss. This is achieved by use of multiple measuring electrodes, a high-accuracy measurement and compensation of the flow profile.

## Advantages

- Perfectly suited for installation in tight spaces, e.g. directly after 90° pipe bends or T-fittings
- Flexible engineering – sensors with fixed flange or lap joint flange
- Convenient device configuration in the field thanks to the latest web server and WiFi technology for time-saving user operation
- HistoROM: High plant availability thanks to automatic data storage
- Heartbeat Technology enables traceable device verification without process interruption in accordance with ISO 9001 (confirmed by TÜV certificate)
- Numerous communication interfaces (HART, PROFIBUS DP, Modbus RS485, EtherNet/IP, PROFINET)

 [www.endress.com/5W4C](http://www.endress.com/5W4C)



Promag W 400

## Technical data

- Nominal diameters: DN25 to DN2400
- Process connections: fixed flange (polyurethane, hard rubber), lap joint flange (PTFE)
- Maximum measurement error: 0.5% rdg at 0 x DN inlet/outlet
- International drinking water approvals: KTW/W270, ACS, NFS61, WRAS

# Twisted pair Ethernet for easy digitalization of field level

Promass/Promag 300/500 and Prowirl 200 with Ethernet-APL

## At a glance

- New standardized network connection for the process industry
- Enables high transmission rates of up to 10 Mbit/s
- Easy implementation of Industry 4.0 to field device possible, even in Ex zones

**Application** The new APL (advanced physical layer) combines the benefits of the intrinsically safe twisted pair connection of field devices and enables the implementation of Ethernet-based communications technologies such as EtherNet/IP, Modbus TCP and OPC UA. The field devices are therefore ready for implementation of the NAMUR Open Architecture (NOA). APL also enables fast implementation of optimization and monitoring systems thanks to data transparency and access to large data volumes in real time.

## Advantages

- Implementation of Industry 4.0 with safe and easy digitalization in the field level
- Methods for efficient device and network commissioning, e.g. bulk device configuration, web server access and automatic network validation
- Safe and easy configuration with standardized device drivers with FDI (field device integration) technology
- Flexible and scalable network topologies with seamless integration thanks to IP communication
- Easy validation without calculation of intrinsic safety
- Increased plant availability, e.g. thanks to comprehensive use of Endress+Hauser Heartbeat Technology and a variety of network redundancy mechanisms



Promass F 300



Prowirl F 200



Promag P 300

➔ For further information on Ethernet-APL, see p. 24.

 [www.endress.com/8F3B](http://www.endress.com/8F3B)



 [www.endress.com/apl](http://www.endress.com/apl)



## Quality mark and standard



## Technical data

- Available for all Promass/Promag 300/500 devices and all Prowirl 200 devices
- Network 10 Mbit/s, full duplex, switched
- Standards: IEEE802.3 (10BASE-T1L) and IEC 60079
- Output power: up to 60 W
- All Ex zones and "divisions", intrinsic safety at the device
- Trunk line length: up to 1,000 m, branch line length up to 200 m

# Coriolis flow measurement redefined – top performance up to DN 250

Promass Q 300/500

## At a glance

- Superlative accuracy for flow (0.05% rdg) and density (0.2 g/l)
- Highly accurate even under temperature and pressure fluctuations
- Multi-Frequency Technology (MFT) for active compensation of homogeneous gas bubbles in liquids
- High turndown with low pressure loss

**Application** Promass Q makes it possible to measure the most problematic media, such as highly viscous media with gas pockets or products aerated with gas (e.g. ice cream). It provides superlative accuracy and reliability in the case of challenging measuring points, now up to DN 250.

## Advantages

- Multiparameter measurement (mass, density, volume, temperature, concentration, gas contents and much more)
- Industry-relevant approvals, e.g. 3A and EHEDG for food applications
- For oil, gas and chemicals: MI-005, OIML R117, ATEX, AD2000, NACE MR0175, NACE MR0103
- SIL 2/3 as per IEC 61508
- Wide selection of I/O variants offered by Proline 300/500 electronics (e.g. 4 to 20 mA, PFS, Profibus PA/DP, FF, PROFINET, Ethernet/IP)
- Complete solution for measuring the degree of aeration in foamed products up to DN 250 (ice cream, cream cheese, etc.)



[www.endress.com/8Q3B](http://www.endress.com/8Q3B)



Promass Q 300

## **i** Technical data

- Nominal diameters DN 25 to DN 250
- Measurement error: 0.05% rdg
- Measuring tube material: 1.4404 (316L)
- Max. pressure: PN 100
- Process temperature: -196°C to +205°C
- ATEX: Zone 1 (Zone 0 in the measuring tube)

# Transfer, storage and marine solutions – high-accuracy measurements across supply chains

Monitoring of individual tanks, complete fuel depots and loading facilities for liquids and gases, including custody transfer measuring points

## At a glance

- Solution for process optimization through continuous monitoring of inventories
- Industry-leading accuracy in loading facilities – also in custody transfer
- Tank gaging and consumption measurements in the shipping sector – fuel consumption and bunkering solutions

## Advantages

- Time and cost savings in implementation and operation
- From engineering to custody transfer approval – everything from a single source
- Certified measuring solutions in accordance with PTB, NMI, OIML R85 and R117 with system approval
- Superlative accuracy and safety for greater control
- Optimum interoperability of the individual components

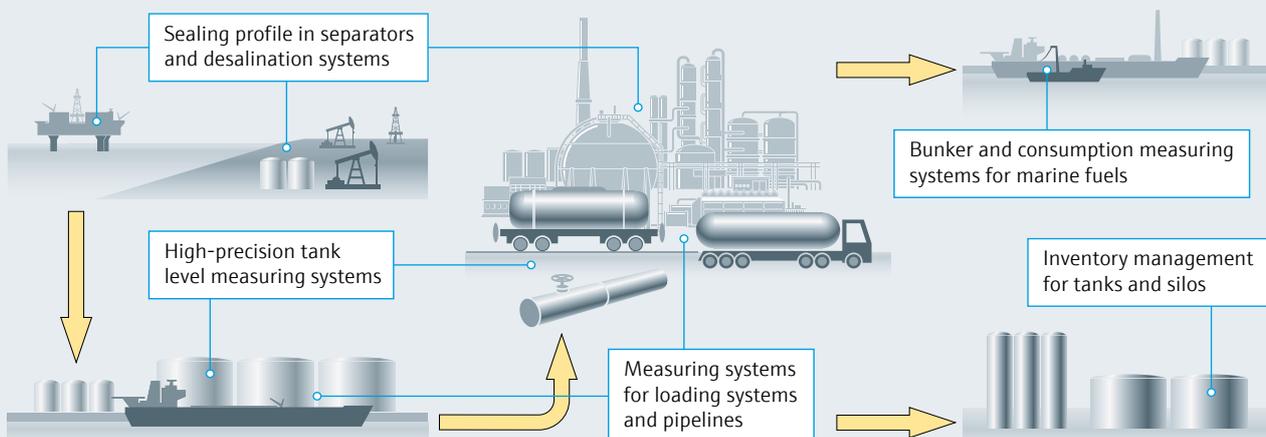
**Application** High-accuracy measuring systems and sensors are required wherever the storage and acceptance of raw materials in the process industry must be monitored and controlled. Endress+Hauser provides customized solutions with system approval characterized by convenient maintenance and extraordinary operational safety. The measuring systems that we offer also meet all requirements of European legislation that must be fulfilled for custody transfer. In addition to the sensor technologies, Endress+Hauser also offers complete packaged solutions comprising all the necessary components such as dosing control, pipework and inventory management software. Thanks to our many years of experience and extensive industry expertise, Endress+Hauser solutions for transfer, storage and marine applications enable significant optimization of complex processes.



[www.endress.com/solutions](http://www.endress.com/solutions)



## The path of crude oil: An example of transfer, storage and marine solutions from Endress+Hauser





Services

Temperature

System components

Optical analysis

Level

Liquid analysis

Moisture

Flow

Pressure

Plant safety

Digitalization

# Moisture

# Moisture

## Our offering for continuous moisture measurement in bulk solids

In the primaries, energy and food industries, material moisture in bulk solids is an important parameter for process monitoring and energy efficiency control. The moisture of bulk solids can vary considerably before and during operation. Too much material moisture can precipitate as increased process costs. A reliable moisture measurement in the medium helps to reduce energy use and costs and increase product quality. It also enables a high degree of reproducibility across batches of bulk solids.

**What we offer** As a complete provider for industrial metrology equipment, we offer a comprehensive sensor portfolio for continuous material moisture measurement in bulk solids and the necessary application expertise. The Solitrend MMP20/40/41/42/44/60 radar moisture measuring devices deliver the right solution for every field of application – products vary by moisture range, electrical conductivity, wear and mechanical installation. The moisture sensors are also optimally placed to meet the needs of individual installation and process situations.

### Your benefits

- Resource savings by removing the need for laboratory tests
- Continuous product monitoring 24/7
- Reproducible product quality
- Wide measuring range of 0-100% moisture

# Radar sensor technologies for process moisture measurement

## Solitrend MMPxx

### At a glance

- Moisture measurement makes it possible to increase energy efficiency through process optimization and by ensuring product quality in the ongoing process
- Excellent resistance to wear enables long operating times
- Minimal effort – no need for recalibration in the process

**Application** Solitrend MMPxx moisture sensors are of the TDR type (time domain reflectometry) designed for scanning bulk solids. Example applications include sand, gravel, woodchips and grain. The sensors are suitable for installation positions under silo flaps, in screw conveyors or on conveyor belts.

### Advantages

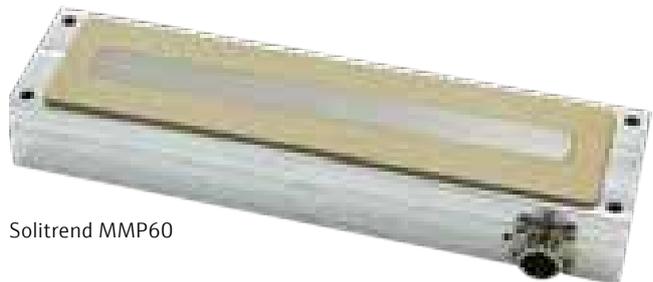
- Continuous and reproducible moisture monitoring (24/7)
- No recalibration necessary
- Low maintenance
- Robust housing and various builds for every application requirement
- Remote display for configuration and calibration



Solitrend MMP20



Solitrend MMP41



Solitrend MMP60

 [www.endress.com/mmp20](http://www.endress.com/mmp20)



 [www.endress.com/mmp41](http://www.endress.com/mmp41)

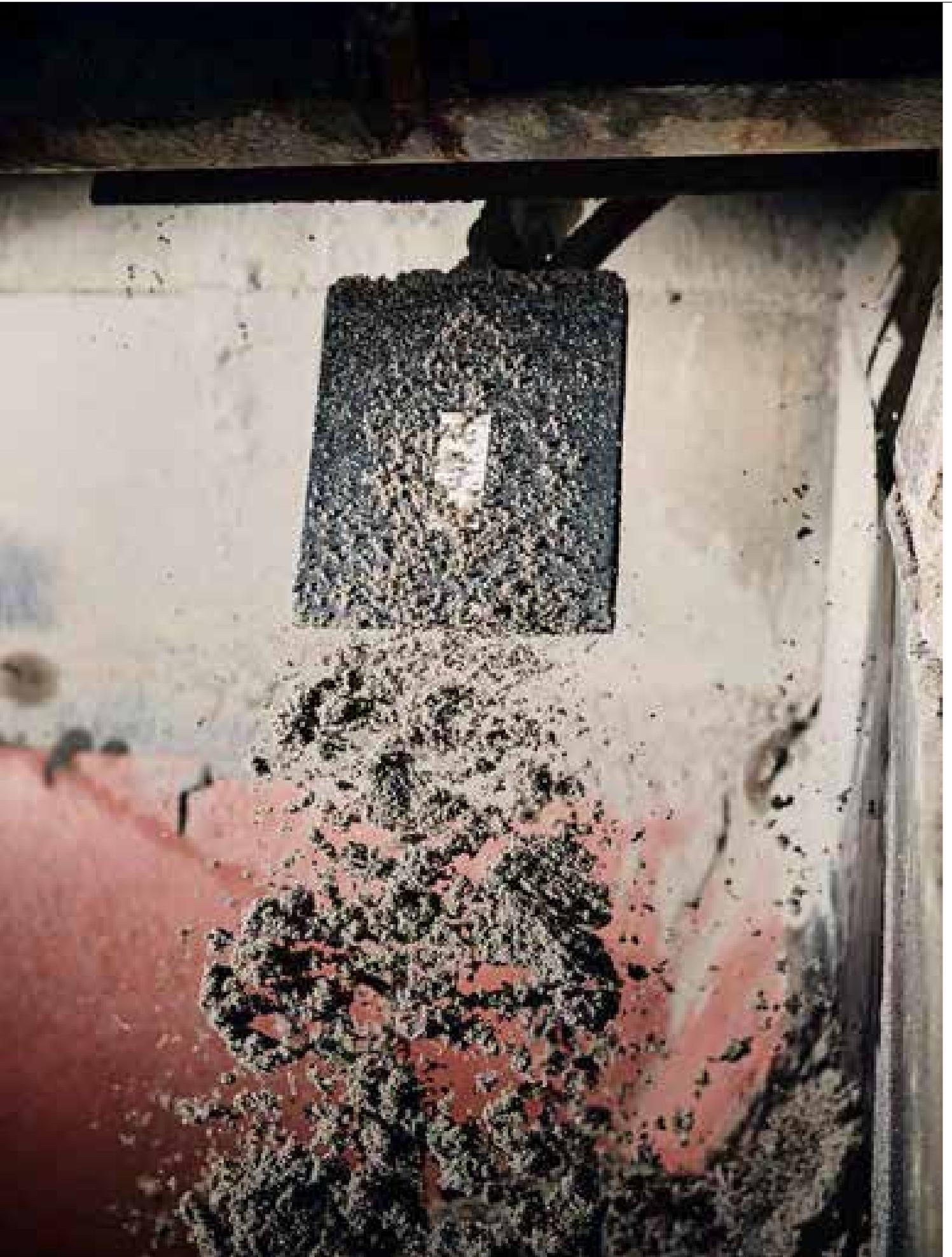


 [www.endress.com/mmp60](http://www.endress.com/mmp60)



### Technical data

- Measuring range 0–100% moisture
- Media with bulk solids density of 0.3 kg/dm<sup>3</sup> to 3.0 kg/dm<sup>3</sup>
- Media with conductivity of up to 20 mS/cm
- Temperature range: 0°C to +70°C (optionally up to 120°C)
- Dust Ex ATEX II 2D Ex tb IIIC
- Degree of protection: IP67 (IP68 on sensor side)



Services

Temperature

System components

Optical analysis

Level

Liquid analysis

Moisture

Flow

Pressure

Plant safety

Digitalization

# Liquid analysis

# Liquid analysis

Our offering for all parameters in liquid analysis

To keep product quality at a consistently high level, liquids such as water, beverages, dairy products, chemicals and pharmaceuticals need to be analyzed day in, day out. At the same time, liquid analysis is indispensable to process optimization and compliance with environmental protection and safety legislation. Thanks to smart, highly flexible solutions, those error-prone manual measurement and documentation tasks are consigned to the past. Intelligent analysis measurement technology makes the operation of measuring points easier, more reliable and more economical.

**What we offer** We offer a complete portfolio and comprehensive expertise in sensor technologies: from the basic measuring point to the high-end multi-channel platform with direct connection to digital systems. The reliable analytical systems of Endress+Hauser are characterized by their easy and standardized user operation. With the versatile Liquiline transmitter platform, there is a suitable transmitter for all common liquid analysis parameters. The platform is modular in design, making it straightforward to upscale. The new PROFINET connectivity and operation via Bluetooth® with a tablet or smartphone are groundbreaking features. Our entire portfolio for liquid analysis impresses with considerable in-house production depth, modular assemblies and high degree of automation. In this way, we help to ensure reliable quality and sound process reliability – regardless of which parameter is being measured.

## ✓ Your benefits

- The Liquiline transmitter platform ticks the box for superlative flexibility with easy operation and maintenance
- Comprehensive sensor portfolio for analysis parameters, e.g. pH, conductivity, oxygen, turbidity, nutrients or disinfection
- Broad possibilities for scaling out measuring points lead to a considerable reduction in servicing and maintenance costs
- Intuitive user interface, genuine plug and play with precalibrated Memosens sensors and standardized modules for all parameters

 [www.endress.com/analysis](http://www.endress.com/analysis)



 [www.endress.com/applicator](http://www.endress.com/applicator)



Quality mark and standard



## Memosens 2.0 – simple, reliable and connected

### At a glance

- Digitalization of the measured values directly in the sensor head for contactless digital signal transmission and the diagnostics and storage of all sensor-relevant data directly in the sensor
- Storage of calibration and process data in the sensor: ready for Industry 4.0
- For the following measuring parameters: pH/redox, conductivity (inductive and conductive), dissolved oxygen amperometric and optical, turbidity, disinfection (chlorine, chlorine dioxide, bromine, ozone), ultrasonic sludge level, ion-sensitive sensors for ammonium and nitrate, UV sensors for nitrate and SAC

**Application** Memosens technology is already in use in all industries. With Memosens 2.0, a new chapter of the proven Memosens concept has begun. Memosens 2.0 is built on the future-proof evolution of Memosens technology while retaining all renowned and proven benefits. As preparation for future requirements in digitalization and intelligent sensor systems, further calibration and process data is now being stored in the sensor. Of course, the new Memosens generation is fully backward compatible. This means that users of Memosens technology do not have to replace their existing measuring lines with new ones. New Memosens sensors work in the usual manner without loss, even with existing transmitters. This protects past investments.

### Advantages

- Reliable signal transmission: no moisture or EMC problems thanks to inductive, digital signal transmission
- Intelligent safety: active indication of a dropout between the sensor and transmitter
- Field calibration no longer necessary – easy, safe calibration in the laboratory possible thanks to storage of relevant data in the sensor head
- Cross-parameter plug and play thanks to precalibrated sensors
- IIoT-ready: trend detection as future-proof basis for predictive maintenance and IIoT services



## Liquiline transmitters – the right transmitter for any analysis application

### At a glance

- Parameter-independent transmitter for measurement on the move, in the laboratory and in the process
- Quick, user-guided commissioning by plug and play Memosens sensors
- Intuitive operation and application-specific communication options – for Ex and non-Ex applications
- Heartbeat Technology offers comprehensive self-diagnostics, simple device verification and information for predictive maintenance



Liquiline Mobile CML18



Liquiline Compact CM72/82

**Application** Be it a handheld instrument, compact transmitter, sampler, analyzer or multi-channel functionality. Liquiline is at the heart of every device. We have the right device for every industry and every application. Whether it's the Liquiline CM44 with connection options for up to eight different sensors and relays or the Liquiline Compact CM82 Bluetooth®-compatible compact transmitter, we have the right transmitter for every measuring point. Thanks to the new Liquiline Mobile CML18 and Memobase laboratory software, connecting between the laboratory and process is easier than ever before and helps to ensure frictionless traceability of the analysis metrology equipment.

### Advantages

- One language – data consistency from the laboratory to the process
- Fast commissioning and maintenance thanks to precalibrated Memosens sensors
- A single platform for more than 20 parameters: pH, redox, conductivity, oxygen and many more
- Offers all the advantages of digital Memosens technology, such as secure sensor signal transmission and increased measuring point availability thanks to plug and play with precalibrated sensors



Liquiline CM42



Liquiline CM44x

### Technical data

- For all digital (Memosens) sensors
- Sensor cable length: up to 100 m
- Various communication options: 4 to 20 mA, Bluetooth®, HART, PROFIBUS, PROFINET and many more

 [www.endress.com/liquiline](http://www.endress.com/liquiline)



### Quality marks and standards



Digitalization

Plant safety

Pressure

Flow

Moisture

Liquid analysis

Level

Optical analysis

System components

Temperature

Services

# Non-glass pH electrodes

pH-ISFET electrodes CPS47E, CPS77E, CPS97E

## At a glance

- Maximum product safety thanks to non-glass and unbreakable pH measurement
- Seamless integration into sterile processes thanks to certified, hygienic sensor design
- Long service life and 10-fold greater CIP stability

## Application

**CPS47E** – highest accuracy for the chemical, food and life sciences industries

- Reference filled with KCl liquid electrolyte, ceramic junction and KCl filler connection
- Measurement of media with a high organic solvent content
- Measurement of media that cause blockages

**CPS77E** – product safety for the food and life sciences industries

- Gel electrolyte with bacteria-proof, microporous ceramic junction
- Meets the most stringent hygienic requirements

**CPS97E** – for heavily clogging media in the chemical and paper industries

- Open junction and specially hardened, chemically stable reference gel
- Measurement in dispersions, precipitation reactions and media with a high solids content and clogging potential

## Advantages

- CIP stability up to 10 times higher compared with conventional ISFET pH sensors
- Best for ease of cleaning thanks to new sensor design and larger sensor surface
- Non-glass pH sensor and robust plastic stem (high-purity PEEK)
- Full certification to EHEDG, 3-A, EU1935/2004, FDA, USP87/88 class VI, USP381/661 and use of FDA-compliant and TSE/BSE-free materials

## Quality mark and standard



CPS47E



CPS77E



CPS97E



[www.endress.com/cps47E](http://www.endress.com/cps47E)



[www.endress.com/cps77E](http://www.endress.com/cps77E)



[www.endress.com/cps97E](http://www.endress.com/cps97E)



## Technical data

- Measuring range: 0 to 14 pH
- Temperatures: -15°C to +13°C or 110°C (CPS97D)
- Process pressure: 0.8 to 11 bar<sub>abs</sub>
- Measuring principle: ion-sensitive field effect transistor (ISFET)

# Spectrometer probe for monitoring multiple water quality parameters

Memosens Wave CAS80E

## At a glance

- Multiple parameters in one sensor: SAC, TOC, CSB, turbidity, nitrate, color
- Checks the elimination of organic substances; automatic cleaning available
- Four preset application models for a variety of water/wastewater applications

**Application** Memosens Wave CAS80E is a spectrometer permitting simultaneous determination of various water quality parameters in both the UV and Vis range. The wavelength band of 200 to 800 nm covers the entire relevant analysis range for applications in water/wastewater, making the sensor optimally preconfigured for different process conditions. The new, low-maintenance technology results in excellent stability and availability.

**The parameters are:** SAC, TOC<sub>eq</sub>, COD<sub>eq</sub>, BOD<sub>eq</sub>, turbidity (TU/TSS), nitrate (NO<sub>3</sub>-N), APHA Hazen color. The spectrometer ensures reliable measurements and efficient process monitoring in the following areas:

- Potable water
- Wastewater
- Surface water

## Advantages

- Direct commissioning (plug and play) is possible thanks to standardized Memosens communication
- Reduced maintenance effort thanks to xenon strobe lamp and wiper-free cleaning concept
- Titanium housing and sapphire windows for demanding applications
- The Liquiline transmitter supports combining the CAS80E Wave spectrometer with further parameters for liquid analysis



CAS80E

 [www.endress.com/cas80e](http://www.endress.com/cas80e)



Quality mark and standard



## Technical data

- Process temperature: 5°C to 50°C
- Process pressure: 0.5 to 10 bar<sub>abs</sub>
- Measurement method: UV/Vis absorption at 200 to 800 nm
- Measuring range:
  - TOC<sub>eq</sub>: 0 mg/l to 400 mg/l
  - CSB<sub>eq</sub>: 0 mg/l to 20,000 mg/l
  - NO<sub>3</sub>-N: 0 mg/l to 500 mg/l
  - TU: 0 FAU to 800 FAU

# Analysis of chlorine dioxide, free chlorine, total chlorine, free bromine and ozone

Disinfection – from sensor to analysis solution

## At a glance

- Complete sensor portfolio for disinfection
- Analysis panels for simultaneous measurement of different parameters
- Clorious2: Fully automatic disinfection solution with chlorine dioxide

Endress+Hauser has continuously modernized and expanded its disinfection portfolio in recent years. This new sensor concept optimally combines state-of-the-art technology with superlative measuring performance. The new amperometric sensors can therefore be used across a very wide measuring range and help to provide reliable disinfection monitoring in a variety of applications. A newly developed procedure ensures maximized leak-tightness of the diaphragm, which allows almost only gases like chlorine dioxide or free available chlorine to pass through; this ensures specific selectivity for the relevant disinfectant. In addition, the measuring electrode and electrolyte have effective protection against outside influences and dilution. At the same time, this results in a significant maintenance interval extension up to once a year.

## The sensors are used:

- In food processing – to guarantee food safety
- In coolant/cooling towers – to avoid biofilm and pathogen growth and to comply with legal requirements
- In drinking water – to guarantee reliable disinfection in accordance with directives
- Across different industries – to use chemicals in a way that minimizes impact on the environment and resources
- In the beverage industry – to guarantee chlorine-free beverage manufacture
- In swimming pools – to maintain consistently clean water quality

## Advantages

- Long maintenance intervals save time and costs
- Reliable monitoring of chlorine absence safeguards product quality and protects the material thanks to a sensor concept that is proven not to go blind
- Plug and play: easy to handle with a precalibrated sensor concept thanks to Memosens technology
- Fast response time with digital communication
- Predictive maintenance using Heartbeat Technology ensures permanently reliable disinfection monitoring



→ All technical data and the complete documentation, such as technical information (TI) and operating instructions (BA), as well as accessories and spare parts can be found at:

 [www.endress.com/ccs50d](http://www.endress.com/ccs50d)



 [www.endress.com/ccs51d](http://www.endress.com/ccs51d)



 [www.endress.com/ccs55d](http://www.endress.com/ccs55d)



 [www.endress.com/ccs58d](http://www.endress.com/ccs58d)

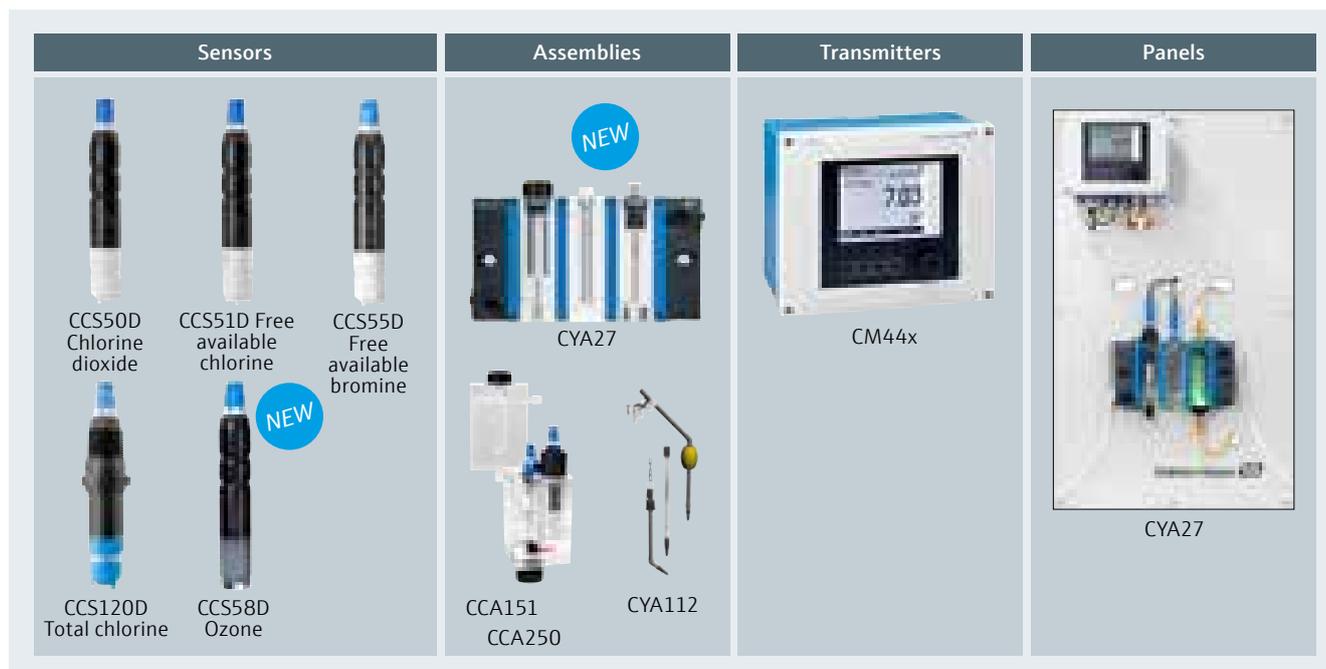


 [www.endress.com/ccs120d](http://www.endress.com/ccs120d)



## Quality mark and standard





### The disinfection sensor is but one part of a measuring point

Thanks to Memosens and the Liquiline platform, our panels can be used to measure a variety of different measuring parameters compactly in a single location. For this reason, Endress+Hauser offers complete solutions with various assemblies. The most recent addition to the assembly family is the CYA27: offering modular configuration, it is more than just a sensor holder. The selectable status illumination, for example, tells you from a distance whether the measuring point is running reliably or is experiencing a fault. The CYA27 is available as a 30 l/h or a 5 l/h variant to keep water consumption as low as possible. Why not measure free available chlorine, pH, redox, oxygen and conductivity at 5 l/h in a single assembly? For safe monitoring of the process water, drinking water or boiler feedwater, the multi-parameter panels are ideal. Many different measuring points, from pH to disinfection to turbidity, are combined in a single location: see all your monitored parameters in one place. This helps to maintain an overview and significantly reduce maintenance effort because you know immediately where the sensors are installed.

➔ All technical data and the complete documentation, such as technical information (TI) and operating instructions (BA), as well as accessories and spare parts, can be found at:

 [www.endress.com/cya27](http://www.endress.com/cya27)



 [www.endress.com/disinfection](http://www.endress.com/disinfection)



#### ✓ Your benefits

- Low installation effort without time-consuming commissioning – turnkey solutions immediately ready for use thanks to plug and play
- Simple, cost-saving and space-saving – multi-parameter assembly with modular configuration at a consumption of just 5 l/h provides maximum information with minimum consumption
- Customizable and everything from a single source

# Customer-specific complete solutions for liquid analysis

## Analysis panels for reliable monitoring

### At a glance

- Modular measuring panels for water monitoring in all sectors
- Delivered with customer-specific configuration and ready for connection
- Multiple parameters combined in one location for ease of operation and maintenance

**Application** Whether in drinking water, process water, coolant, wastewater or water vapor circuits, the combination of the Liquiline multi-channel transmitter and digital Memosens sensor on the same panel is the optimum solution for measuring points with multiple analysis parameters. The modular build of the panels gives users flexibility: they can swap out or add individual modules at any time and, if necessary, house them in an enclosure for protection. We support users in the quantitative design, installation and commissioning of customer-specific panels. This includes local data storage and remote transfer as well as the implementation of hydraulic parameters such as flow or pressure.

### Advantages

- Plug and play solution, preconfigured, immediately ready for use
- Optimized and compact design, modular build
- Water- and energy-saving thanks to optimum arrangement of sensors
- Quick commissioning thanks to function-tested pre-assembled analysis measurement technology



[www.endress.com/solutions](http://www.endress.com/solutions)



## Tailored measuring cabinets and containers

### At a glance

- Complete solutions for water, wastewater or water body monitoring
- Customized exactly to the specific need
- Turnkey delivery from a single source

**Application** Room for everything in need of protection: for the measuring task at hand, Endress+Hauser designs and delivers customer-specific turnkey analytical solutions that have been individually tailored to the technical requirements, environmental conditions and communication and service requirements of plant operators. Whether it's a measuring cabinet or a fully climate-controlled container of custom size, our project team provides competent advice throughout the entire project and develops the best solution for the given circumstances. Our offering includes all components from sample preparation and measurement technology (sensors and analyzers) through to data transfer to superordinate systems. This ensures ease of installation, use and operation.

### Advantages

- Complete project implementation from application advice to final acceptance
- Frictionless process integration because solutions are co-designed with the operator
- Protection of the measurement technology from heat, cold, rain, dust, unauthorized access and vandalism

### Typical applications

- River and water body monitoring
- Precipitant dosing and limit value monitoring in municipal wastewater treatment plants
- Wastewater monitoring in all sectors (chemical, food, metal, oil & gas, etc.)
- Monitoring of coolant circuits in power stations
- Process water and effluent monitoring

 [www.endress.com/solutions](http://www.endress.com/solutions)



# Level

# Level

## Our offering for level measurement and point level detection in liquids and bulk solids

In all process industries, the fill levels of liquids, pastes, bulk solids or liquefied gases in tanks, silos or transportable containers need to be precisely measured. Measured fill level values are used to ensure constant product quality, plant safety and economic efficiency of production. The various media and processes place different requirements on level measurement and point level detection. For this reason, choosing the right technology for the purpose at hand is of major importance. When used in safety instrumented systems (SIL) or in systems under the scope of the German Federal Water Act (WHG), the measuring devices often have safety-critical status.

**What we offer** To cover all requirements, we offer a comprehensive sensor portfolio for continuous level measurement and for point level detection in liquids or bulk solids. Some of the measuring principles are ones that we developed ourselves. The Liquiphant vibronic point level switch and the Levelflex guided wave radar level transmitter, for example, have set new standards. The latest devices are ready for Industry 4.0. In the field level, relevant and high-quality data is constantly being generated that provides information for continuous improvements in efficiency, quality and safety. Sensors supply field data from which it is possible to derive recommendations on how to increase plant availability, for example. As appropriate to specific industry and application requirements, the ideal choice of sensor can be found in our comprehensive product portfolio.

### ✓ Your benefits

- Save costs with sensors adapted to the requirements of the respective application
- One contact for all measurement methods saves time
- High level of safety thanks to sensors developed to state-of-the-art standards and in accordance with IEC61508

➔ For information on solutions satisfying the German Federal Water Act (WHG), see p. 31.

 [www.endress.com/level](http://www.endress.com/level)



 [www.endress.com/applicator](http://www.endress.com/applicator)



### Quality marks and standards



## Precise, efficient, reliable – the right measuring principle for any application

The right measuring principle for any application				
	Point level detection	Continuous measurement	Interface measurement	Density/concentration determination
Liquids	Vibronic Conductive Capacitive Float switch Radiometric	Radar Guided wave radar Ultrasonic Hydrostatic Capacitive Radiometric	Guided wave radar Capacitive Radiometric	Vibronic Coriolis Radiometric
Bulk solids	Vibronic Capacitive Rotating paddle Microwave barrier Radiometric	Guided wave radar Radar Ultrasonic Plumb bob system Radiometric	Vibronic (solids under water) Radiometric	

**Continuous measurement, interface and density measurement or point level detection:** Endress+Hauser offers the complete portfolio of level measurement technologies to provide every operator with the best solution to their specific challenges. Our experts make the difference in personalized consulting.

**Point level detection:** Point level switches are used for overflow protection, dry running protection or leak detection. Depending on the measuring task and your budget, our universal vibronic limit switches or economical float switches can be relied on to perform their function.

**Continuous measurement:** For continuous level measurement, suitable solutions are guided wave and through-air radar technology, the radiometric measuring principle and ultrasound technology.

**Interface measurement:** For every challenge, whether complex mixtures, emulsions or where distinct interfaces exist, we have the optimum technology for you. Interface measurements use guided wave radar, capacitive level measuring technology and radiometry.

**Density/concentration determination:** Quality-relevant data on density and concentration can be determined by the measuring principles of vibronics, Coriolis and radiometry.

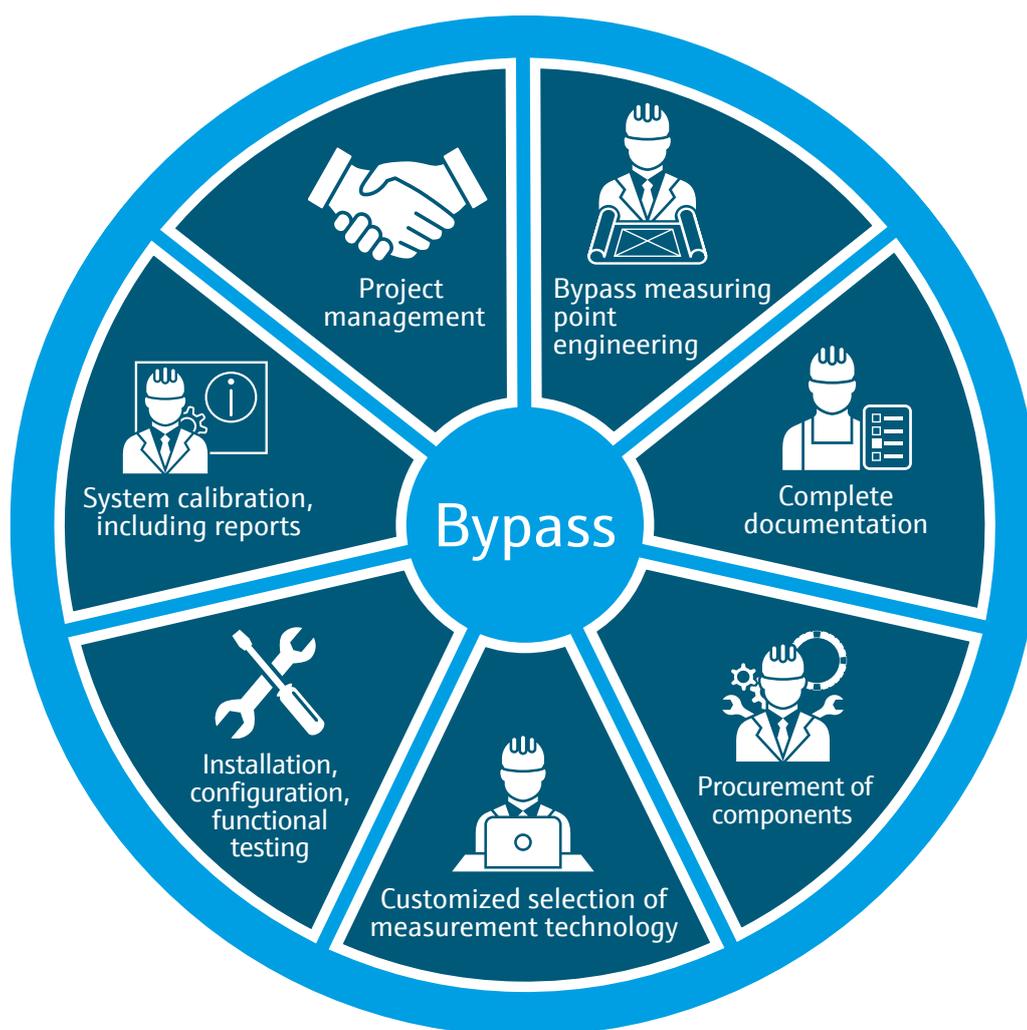
### Your benefits

- Suitable for all sectors
- Wide selection of devices for every measuring task
- Millions of proven measuring devices – Industry 4.0-ready
- Heartbeat Technology for maximum plant availability and process optimization
- Easy commissioning and test concepts without process interruption for maximum plant availability and safety

 [www.endress.com/level](http://www.endress.com/level)



## Complete bypass measuring point for level measurement: Everything from a single source – Industry 4.0-ready



The complete project development for a bypass measuring point for level measurement requires a great deal of expertise and experience. Important considerations here are not only optimum device selection, device sizing and layout and harmonious functioning of all components with each other, but also the complete and exhaustive documentation of the measuring solution.

**Complete solution** Endress+Hauser offers plant operators a comprehensively coordinated total solution for level measurements involving a bypass. Not only do they benefit from the correct design of the measuring point, they are also rewarded with optimized plant and process availability

as well as maximum safety. The solution contains the very latest Industry 4.0-capable metrology equipment, such as the Levelflex FMP5x guided wave radar level transmitter with Heartbeat Technology, and a high-quality bypass chamber. A range of further services, such as commissioning, installation and regular maintenance, is also offered.

# Easy, safe and even smarter – the new generation of 80 GHz radar sensors

## Micropilot FMR6xB

### At a glance

- Simplicity – intuitive user operation
- Smart safety – wizard-led commissioning
- Increased productivity – thanks to Heartbeat Technology

**Application** The new level transmitters of the Micropilot family combine the benefits of 80 GHz technology with the maximum device safety defined by international standard IEC61508 for functional safety. A new, innovative radar chip developed in accordance with SIL requirements (IEC61508) improves dynamic performance. In addition to the proven Profibus PA and HART interfaces, the new Ethernet-APL interface provides easy device access. New device variants make it possible to cater for process temperatures from -196°C to +450°C, which opens up new applications for the proven 80 GHz technology.

### Advantages

- Sharp focus with 3° beam angle
- Low interference by installed components
- Small process connections from 3/4"
- Communication variants with Ethernet-APL, Profibus PA, HART
- Hygienic single chamber housing



[www.endress.com/micropilot-new-generation](http://www.endress.com/micropilot-new-generation)



Micropilot FMR60B



Micropilot FMR62B



Micropilot FMR63B

### **i** Technical data

- Process temperature: -196°C to +450°C
- Process pressure: -1 bar to 160 bar
- Accuracy: ±1 mm
- Beam angle: up to 3°
- Measuring range: > 100 m

### Quality marks and standards



# Proven in the millions: measuring device for safe point level measurement

Liquiphant FTL51B and Liquiphant FTL6x

## At a glance

- Vibronics: established and universal measuring principle for use in all liquids
- Simple commissioning – no need to calibrate to media
- Superlative safety thanks to permanent self-monitoring and Heartbeat Technology

**Application** The Liquiphant family has proven to be highly successful in all industries. It can be used in storage tanks, containers and pipelines to measure the level limit of all kinds of liquids. The measuring devices of the Liquiphant family are ideal for applications in which float switches, displacers or optical sensors were previously used. The new 8/16 mA HART electronics enables online access to the device. The HART parameters can be used to cyclically transmit additional information, carry out trend analyses and simplify repeat testing.

## Advantages

- Industry 4.0-ready – easy device access via Bluetooth® or 8/16 mA HART
- Heartbeat Technology helps with diagnostics, verification and monitoring without process interruption
- Simplified repeat testing at the press of a button, including documentation
- Coated sensors for corrosive media and high-temperature versions are available

 [www.endress.com/liquiphant](http://www.endress.com/liquiphant)



Liquiphant FTL51B



Liquiphant FTL64

## Technical data

- Process temperature range: -50°C to +150°C or -60°C to +280°C (Liquiphant FTL64)
- Process pressure: up to 100 bar
- Viscosity: up to 10,000 mPa·s
- Extension pipe: up to 6 m

## Quality marks and standards



# Cloud-based 80 GHz radar level transmitter

## Micropilot FWR30

### At a glance

- Intelligent IIoT radar – high-end technology in a cost-effective sensor
- Access to important information from anywhere, anytime
- Full transparency of inventories for optimization of the entire logistics chain
- Secure data transmission combined with the right digital service



Micropilot FWR30

**Application** The IIoT radar is an intelligent level transmitter and brings high-end technology to a cost-effective sensor. In combination with the Netilion or SupplyCare Hosting digital services, the 80 GHz radar sensor offers a solution for accessing important inventory management and localization information from anywhere, anytime. Micropilot FWR30 can be used for a whole range of level measurement applications, e.g. liquid additives in plastic and metal tanks, bulk solids in the construction industry or cleaning agents in the food and beverage industry.

### Advantages

- Battery-powered sensor with mobile communication and 80 GHz technology
- Easy commissioning and installation without wiring
- Full transparency in storage and transportation of liquids and solids
- Access to relevant information from anywhere, anytime
- Certified cloud service meets the strictest security and data protection requirements
- New application possibilities in metal tanks with 1-1/2" process connection



[www.endress.com/fwr30](http://www.endress.com/fwr30)



### **i** Technical data

- Output signal: wireless – mobile communication with NB-IoT, LTE-M or 2G (fallback)
- Power supply: battery-powered
- Measuring principle: 80 GHz radar technology
- Measuring range: up to 15 m
- Process temperature: -20°C to +60°C
- Temperature, position measurement and ge positioning via GPS

# Cost-effective monitoring of level limits and transport processes for bulk solids

Soliwave FQR16/FDR16 and Solimotion FTR16

## At a glance

- Quick and easy installation – connected via a plug-in connector
- Function check – on-site with LED indicator
- Ultra-compact design – ideal for confined installation conditions

**Application** The new Soliwave FQR16/FDR16 microwave barrier is used for minimum or maximum limit detection of powdery to granular bulk solids and liquids, e.g. for overflow and dry running protection. With the new Solimotion FTR16 bulk solids motion sensor, it is possible to monitor pneumatic and mechanical bulk solid transport processes efficiently and reliably. Both devices operate based a non-contact detection principle, enabling wear- and maintenance-free continuous operation. Thanks to their compact design, Soliwave and Solimotion can also be used in applications with hard-to-reach or confined installation conditions.

## Advantages

- Non-contact measuring principle – detection virtually independent of the process characteristics
- Universal use – can also be used in challenging applications where other measurement methods reach their limits
- Safe detection – non-contact measurement method guarantees wear- and maintenance-free continuous operation
- High safety – permanent self-diagnostics, comprehensive self-test can be performed on the device on site at any time
- Reliable – detection even when subject to changing product characteristics
- Robust design – stainless steel housing
- Ultra-compact design – can also be used even in hard-to-reach or confined installation conditions
- Meets the requirements of EU Regulation No. 1935/2004
- Developed for dust ignition-proof applications

 [www.endress.com/fdr16](http://www.endress.com/fdr16)



 [www.endress.com/ftr16](http://www.endress.com/ftr16)



Soliwave FQR16/FDR16



Solimotion FTR16

## Technical data

- Detection range: Soliwave up to 20 m, Solimotion up to 5 m
- Process temperature: any (non-contact installation); -40°C to +70°C (installed); -40°C to +450°C (with high-temperature adapter)
- Process pressure: any (non-contact installation); 0.5 bar to 6.8 bar abs. (installed); 0.5 bar to 2.1 bar abs. (with high-pressure adapter)
- Ex approvals

# Optical analysis

# Optical analysis

Qualitative and quantitative determination of material properties for solids, liquids and gases

Process analytical technology (PAT) has been gaining ever more importance in recent years due to industry- and technology-shaping trends and the resulting high requirements for the production processes in the plants of the process industries. Where PAT is employed in addition to widely adopted process instrumentation, it provides a distinct increase in transparency across processes. To improve the efficiency of production processes, to accelerate process development and to safeguard process reliability or product quality, the monitoring and control of processes with modern PAT plays a crucial role.

**What we offer** The analytical instruments of Endress+Hauser help operators to optimize their processes. With a comprehensive portfolio of analytical systems for laboratory and process applications, Endress+Hauser supports its customers' engineered processes from the laboratory to the process.

Key technologies in the portfolio include Raman spectroscopy, TDLAS (tunable diode laser absorption spectroscopy) and QF (quenched fluorescence).

The Raman analytical systems based on Kaiser Raman technology make it possible to analyze the chemical composition of a material without removing, conditioning or destroying the sample. TDLAS and QF analyzers based on SpectraSensors technology provide accurate concentration determination of H<sub>2</sub>O, H<sub>2</sub>S, CO<sub>2</sub>, NH<sub>3</sub> and C<sub>2</sub>H<sub>2</sub> in process gases – online and in real time.

Over 2,000 installed Raman and 10,000 TDLAS analytical systems are the basis on which Endress+Hauser has gained more than 30 years of experience. These modern, laser-based technologies are characterized by extraordinary reliability and ease of maintenance.

## ✓ Your benefits

- Quality and reliability: Accurate monitoring of quality parameters with repeatable and accurate measurements
- Inline measurements in real time boost the efficiency of plants and processes
- Raman systems use a scalable technology that enables an easy transition of the created analysis methods from the R&D lab to production
- Robust, process-optimized and low-maintenance gas analysis solutions for reliable long-term operation
- Precise and rapid gas analysis: "Data in real time" enables continuous and optimized process monitoring 24/7

 [www.endress.com/optical-analysis-product-overview](https://www.endress.com/optical-analysis-product-overview)



## Quality marks and standards



## Monitoring and reaction control with Raman spectroscopy inline and in real time, 24/7



Raman analytical systems from Endress+Hauser are proven and reliable for use in a wide spectrum of applications to monitor, optimize and control chemical and biotechnological processes.

**What we offer** Chemical and, above all, biopharmaceutical manufacturing processes are complex and time-consuming, yet Raman systems support a data-driven and safe transition from laboratory conditions to process plants. Raman spectroscopy from Endress+Hauser enables inline and real-time measurements, paving the way for the use of process analytical technology (PAT) and the application of QbD principles. The scalability of Raman solutions from Endress+Hauser makes it easier for manufacturers to develop their products faster from the laboratory stage to the manufacturing process and to improve the quality control of their products.

Raman spectroscopy is therefore a staple in the chemical and biopharmaceutical industries. It can be used profitably in both upstream and downstream processes as well as in other applications, such as the food industry.

### ✓ Your benefits

- Secure and improve product quality, optimize processes and increase yield with inline analyses for reaction process monitoring in real time
- Fast analysis times, from several hours or days to just a few minutes
- Closed-loop control systems enable advanced process control (APC)
- Time savings between batches to increase productivity and save energy by reducing stirring and heating time compared to offline laboratory analyses
- Inline measurements are more hygienic and avoid the operator and handling errors associated with offline sampling
- Shorten product and process development times (time to market) through faster analysis times, scalability of data and consistency of systems used

## Gas analysis solutions based on more than 30 years' application experience with over 10,000 gas analyzers installed worldwide



An enormous energy transition is underway, with natural gas, biogas, liquefied natural gas (LNG) and hydrogen playing an increasingly important role in achieving net zero carbon dioxide targets. Changes in gas composition and network infrastructure, as well as advances in process automation, will increase the need for online gas analysis in the future to ensure safety, process control and gas quality.

**What we offer** Endress+Hauser's analyzers incorporate the powerful measurement technologies of tunable diode laser absorption spectroscopy (TDLAS), quenched fluorescence (QF) and Raman spectroscopy. These systems feature a unique product design based on decades of application experience. TDLAS technology reliably detects and measures the concentration of individual gas molecules in  $H_2O$ ,  $H_2S$ ,  $CO_2$ ,  $NH_3$  and  $C_2H_2$  process gas streams within a concentration range of a few ppm. QF is used for accurate and reliable measurement of oxygen concentration in gas streams. Raman spectroscopy can be used to determine the composition of process gases with high accuracy. This includes, for example, determining the composition of hydrogen-rich natural gas mixtures in power station turbines or the calorific value or Wobbe index in liquefied natural gas (LNG) applications.

### ✓ Your benefits

- Non-contact, extractive measurement (TDLAS) enables quick and easy integration into existing plants
- Non-destructive in-situ Raman analysis minimizes risks and reduces waste
- Robust, process-optimized and low-maintenance gas analysis solutions for reliable long-term operation
- Very short response times: "data in real time" enables optimized process control without delay
- Precise and rapid gas analysis enables continuous process monitoring 24/7
- Better proven repeatability compared to legacy measurement technologies used in gas applications

# Raman analytical instrumentation – seamless scalability from the laboratory to the process

## Raman Rxn2 analyzer

### At a glance

- Suitable for use with a comprehensive range of laboratory and process probes
- Seamlessly operable in every use phase and installation environment, inline, online or atline
- Data-driven process R&D supports faster overall “time to market” development
- Compatibility with the BioPAT® Spectro platform by Sartorius

**Application** Developed for the laboratory or pilot plant, the Raman Rxn2 analyzer is used for routine sample determinations, in support of R&D projects, for early process development and for in situ analysis. With self-monitoring, diagnostic and self-calibration capabilities, the validity of each measurement is guaranteed. Integration into Ambr® systems enables Quality by Design (QbD) methods for simpler, faster, more affordable and more robust model building, scalable to all sizes of Biostat STR® single-use bioreactors. Suitable for use with chemical, pharmaceutical, biopharmaceutical and food & beverage applications:

- Up- and downstream
- PAT/QbD
- cGLP/cGMP
- Polymorphism
- Reaction chemistry
- Crystallization
- Blending, drying and granulation
- Single-use applications

### Advantages

- Reliable in situ analysis in real time but also with contactless, non-invasive and non-destructive sampling
- Available on a mobile cart or as a benchtop version, offering free site selection and mobility for process development laboratories
- Base unit configurable with up to four probes (1 or 4 channels)
- Intuitive embedded Raman RunTime software (touchscreen or web interface), with multivariate predictors for detailed process insight



Raman Rxn2 analyzer

### **i** Technical data

- Laser wavelength: 532 nm, 785 nm or 993 nm
- Channels: 1 channel (standard), optionally 4 channels
- Approvals: ATEX, CSA, IECEx
- Probe material: Wide range of laboratory and process probes in, for example, Grade 2 titanium, Hastelloy C276, SS316L, high-purity sapphire windows or other FDA listed materials
- Ambient conditions (temperature/pressure): -196°C to 300°C, depending on the selected probe, accordingly for pressure range
- Interfaces: OPC, Modbus, HTTPS



# Molecular material properties directly from the engineered process

## Raman Rxn4 analyzer

### At a glance

- Continuous inline, online or atline process measurement
- Use of standard communication protocols, such as PEAXACT, SIMCA®, GRAMS IQ™ and Unscrambler, for end-to-end data integrity
- Equipped with a unique self-monitoring system, Raman analyzers guarantee the validity of each measurement through self-calibration, self-diagnostics and spectral correction methods

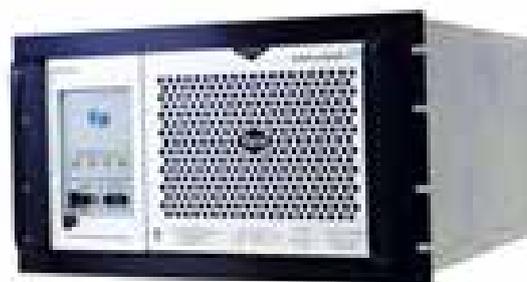
**Application** Ruggedness, versatility and reliability are the hallmarks of the Raman Rxn4 analyzer. Developed for use in production and process environments, it enables high-resolution in situ process measurement and control in real time. In addition to traditional process applications, it is excellent for determining composition and energy content in liquefied natural gas (LNG) applications when combined with the Raman Rxn41 probe for cryogenic liquids. Ten-fold better proven repeatability compared to gas chromatographs (GC) in custody transfer of LNG.

Suitable for use with chemical and petrochemical applications:

- Reaction chemistry
- Crystallization
- Polymorphism
- Polymerization, e.g. PE or artificial rubber
- Catalysis investigation
- Urea production
- Dosing of additives
- LNG composition
- Hydrogen management in refineries
- P-I-O-N-A\* measurement for optimization of naphtha crackers

### Advantages

- Scalable, extendable and compatible with pilot plants
- Reliable in situ analysis in real time with contactless, non-invasive and non-destructive sampling
- Base unit configurable with up to four probes (1 or 4 channels)
- Sequential operation for fast analysis and configurable interrogation of 1 or 4 channels of individual probes
- Intuitive embedded Raman RunTime software (touchscreen or web interface), with multivariate predictors for detailed process insight



Raman Rxn4 analyzer for installation in a standard 19" rack in process and production conditions



Optional: user-friendly touchscreen



[www.endress.com/rxn4b](http://www.endress.com/rxn4b)



### Technical data

- Laser wavelength: 532 nm, 785 nm or 993 nm
- Channels: 1 channel (standard), optionally 4 channels
- Approvals: ATEX, CSA, IECEx
- Installation options: 19" rack installation (NEMA 4X housing also available)
- Probe material: Wide range of laboratory and process probes in, for example, Grade 2 titanium, Hastelloy C276, SS316L, high-purity sapphire windows or other FDA listed materials
- Ambient conditions (temperature/pressure): -196°C to 300°C, depending on the selected probe, accordingly for pressure range
- Interfaces: OPC, Modbus, HTTP

# Turnkey laser-based analysis for gas composition determination

## Raman Rxn5 process analyzer

### At a glance

- Analyzer for simultaneous multi-channel gas phase analysis
- Reliability and low operating costs
- No moving parts, such as valves, separation columns or heating elements
- Requires no carrier gas or routine calibration unlike gas chromatographs (GCs)
- Use of simple univariate methods for composition measurement

**Application** The Raman Rxn5 analyzer is a turnkey laser-based unit for applications in the chemical, petrochemical and gas industries and for analyzing the hydrogen admixture for natural gas-fueled turbines. Its ease of installation and connection offers significant cost savings compared to traditional GC or mass spectrometers (MS) and associated sampling systems. The robust design meets customer requirements for ease of maintenance and compatibility with utilities.

### Advantages

- Replaces conventional methods, such as GC, MS and photometers, with cutting edge laser-based Raman technology for gas phase analysis
- Pairs with process-safe glass fiber-optic probes for direct mounting in the pipeline
- No switching between streams, with short analysis times thanks to simultaneous multi-channel gas phase analysis of up to four streams
- Requires little technical knowledge for operation and maintenance, for use and operation in harsh environments
- Only minor atline and compact sample conditioning necessary thanks to process-optimized Raman probes for high line pressures (69 bar/1000 psig) and temperatures (150°C/302°F)
- No moving critical parts or consumables, and minimal spare parts required



Raman Rxn5 process analyzer

 [www.endress.com/rxn5b](http://www.endress.com/rxn5b)



### Technical data

- Gas composition analysis of gas mixtures between 0.1 and 100% by volume: H<sub>2</sub>, N<sub>2</sub>, O<sub>2</sub>, CO, CO<sub>2</sub>, H<sub>2</sub>S, CH<sub>4</sub>, C<sub>2</sub>H<sub>4</sub>, C<sub>2</sub>H<sub>6</sub>, Cl<sub>2</sub>, F<sub>2</sub>, HF, BF<sub>3</sub>, SO<sub>2</sub>, CO<sub>2</sub>
- Number of probes: up to four (one laser per probe enables simultaneous operation)
- Approvals: ATEX, CSA, IECEx

# High-accuracy trace moisture measurement for gas quality control

## J22 TDLAS gas analyzer

### At a glance

- Measurement of H<sub>2</sub>O in natural gas, hydrogen and other process gases
- Avoids corrosion and increases safety
- Real-time measurements to avoid shutdowns, flaring or interruptions in the gas supply
- Features a common gas sample conditioning system in combination with other gas analyzers, for an economical and space-saving total solution from a single source

**Application** The J22 TDLAS gas analyzer uses patented tunable diode laser absorption spectroscopy (TDLAS) technology to provide highly accurate online real-time measurements of H<sub>2</sub>O in gas streams. In the production, transport, storage and distribution of natural gas, hydrogen or process gases, maximized availability is guaranteed without direct contact with the gas streams. Network operators and suppliers can meet gas quality specifications, prevent corrosion in pipelines and prevent hydrate formation to ensure plant safety and integrity.

### Advantages

- NIST\*-traceable calibration for the highest accuracy and repeatability
- Rugged design for quick and easy installation, commissioning and maintenance
- Extremely compact build guarantees space-saving installation, e.g. in analysis containers
- Avoidance of system downtimes thanks to maintenance-friendly components that are replaced directly in the field
- Integrated diagnostics and verification with Heartbeat Technology
- Automatic storage of historical data and spectrum logging
- User-friendly interface with intuitive menu navigation and web server software

 [www.endress.com/j22](http://www.endress.com/j22)



J22 TDLAS gas analyzer

### Technical data

- Measuring ranges H<sub>2</sub>O: 0-500 to 0-6,000 ppm (0-24 to 0-284 lb/mmscf)
- Moisture dew point calculation using selectable ASTM D1142 or ISO 18453 methods
- Reproducibility ±1 ppmv or ±1% of the reading (whichever is greater)
- Accuracy ±2 ppmv plus 2% of the reading
- Outputs and communication: I/O 1: Modbus RTU over RS485 or Modbus TCP over Ethernet; I/O2 and I/O3: software configurable; settable as relay output, analog input; (4 to 20 mA), analog output (4 to 20 mA) or digital/status output
- Approvals: ATEX/IECEX/UKEx Zone 1; PESO/KTL/CML Zone 1; INMETRO Zone 1; CSA Class I, Division 1; CSA Class I, Zone 1

### Quality mark and standard



\*NIST: National Institute of Standards and Technology guarantees accredited, traceable factory calibration

# Reliable oxygen measurement for gas applications

## OXY5500 oxygen analyzer

### At a glance

- Real-time online measurement of oxygen (O<sub>2</sub>) in gas streams from ppm to the percentage range
- Measurement and monitoring of, for example, hydrogen or natural gas in production and in processes upstream of production, and at facilities for production, storage, transportation and distribution
- Features a common gas sample conditioning system in combination with other gas analyzers, for an economical and space-saving total solution from a single source

**Application** The OXY5500 oxygen analyzer operates based on the principle of quenched fluorescence (QF). As a compact, single channel “standalone” analyzer, it is an extremely reliable choice for measuring the oxygen content in natural gas, hydrogen or in process applications in the gas industry. The OXY5500 is unaffected by H<sub>2</sub>S and other compounds that cause malfunctions and measurement errors in electrochemical oxygen sensors.

A sensor probe is inserted into the process stream and connected to the detector via an optical fiber. The technology is well established among companies in the gas industry and is used in a wide variety of applications.

### Advantages

- Optical measurement with fast, continuous response time
- Not affected by H<sub>2</sub>S, no H<sub>2</sub>S scrubber necessary
- No moving parts, user-friendly
- Excellent long-term stability and ease of maintenance
- Small optical sensor without membrane or consumable chemicals
- Simple menu navigation via LCD display
- Data storage over 30 days



OXY5500 oxygen analyzer



OXY5500 oxygen analyzer including gas sample preparation

 [www.endress.com/oxy5500](http://www.endress.com/oxy5500)



### Technical data

- Measuring range 0-10 ppmv to 0-20%
- Ambient temperature range -20°C to 50°C
- Communication: 2x 4 to 20 mA outputs, 1x 4 to 20 mA input (sample pressure), RS-232C, RS-485 and Ethernet 10/100 with Modbus, 4 GB internal memory with data logger
- Approvals ATEX/IECEX - Zone 2, CSA Class I, Division 2

# Process analysis solutions – more than just instrument hardware

Application-specific complete solutions and services for optimizing process analytics

## At a glance

- More than 30 years of experience in the development of customer-specific analysis solutions
- Matched components enable optimum commissioning with reliable analyses
- Smart Support with fast response times and spare parts availability thanks to Endress+Hauser's German and European service network

**Application** The use of process analytics in engineered processes requires a high level of expertise, which is why turnkey and proven solutions are needed. Endress+Hauser meets this customer requirement and has created important resources for this purpose.

## Advantages

- Support in all project phases from conceptual design to operation
- Project management to Endress+Hauser standards
- Project-specific documentation, 2D/3D drawings
- ISO9001:2015/ISO 14001 certified infrastructure, with integration and test facilities
- ATEX-IECEX certified complete solutions
- NIST\* traceable, accredited calibration
- Third-party certifications (DNV-GL, Bureau Veritas, ABS, etc.)
- Flexible hire and leasing options and training programs
- Raman-based solutions
  - Feasibility studies and sampling in our application laboratory
  - Individual chemometric model development
  - IQ/OQ service for cGMP applications
  - Interchangeable fittings for Raman probes and automated cleaning control
- TDLAS/QF-based solutions
  - Customized sample conditioning with customer-specific material and protection requirements
  - System integration including full incorporation of third-party technologies, such as process gas chromatographs



Tailor-made, application-oriented and turnkey analysis solutions for Raman, TDLAS and QF

\*NIST: National Institute of Standards and Technology guarantees accredited, traceable factory calibration



# System components

# System components

Our offering for system components and data managers

Many applications require additional devices with specific functions to supplement the process instrumentation. Measuring devices have to be supplied with power and protected from overvoltage, the measured value has to be displayed or processed, limits must be derived and monitored and data safely recorded. System components are also employed in the field or in the control cabinet to support functions such as communication with superordinate systems (e.g. with cloud services like the Netilion IIoT ecosystem) and enable the retrofitting of measuring devices with wireless communication capabilities (e.g. WirelessHART) or user-friendly operation of the metrology equipment on site.

**What we offer** With our display units, plant operators can see every measured value at all times – whether for field installation or panel mounting, for Ex and non-Ex applications, for fieldbuses or for 4 to 20 mA loops. For safe data logging too, we have the right tool – from the basic solution with Ecograph T to the Memograph M universal data manager, which even meets the high requirements of the FDA for data recording. In view of high energy prices, energy conservation is more important than ever before. Our energy computers offer the matching solution for energy metering. For evaluations on the DIN (top-hat) rail, we have mountable devices that are particularly suited to SIL2 applications. Easy access to field device and network data is provided by our choice of gateways. They offer a parallel network access point, e.g. for our Netilion cloud service. Tablets can be used to configure and maintain field devices.

## ✓ Your benefits

- Complete portfolio around the measuring point from a single source
- Easy installation and user-friendly operation
- Proactive diagnostics and protection of measuring devices increase plant availability

 [www.endress.com/systemcomponents](http://www.endress.com/systemcomponents)



 [www.endress.com/applicator](http://www.endress.com/applicator)



## Quality marks and standards



# Interface system with central power supply and ATEX approval

## RNx2x DIN rail interfaces

### At a glance

- Low wiring requirements thanks to a central power supply
- Save time and costs with a universally usable system with five different functional components
- Reliable thanks to the option for a redundant power supply

**Application** The RN22 signal barrier covers a variety of possible applications. Since its signal input can be connected passively as well as actively, it can be used both as an active barrier and passive barrier. The device is available in a single-channel or two-channel version. In the two-channel version, the device can also be used as a signal doubler. The RN22 signal barrier can be used very flexibly, meaning the output can be connected to passive as well as active PLC inputs. The device detects the type of output and behaves accordingly. HART signals are also transmitted by the RN22. Operators can access the HART signal without loop interruption via two lugs on the analog input. RN22 can be used in SIL applications up to SIL2 SC3.

**The RLN22 NAMUR isolating amplifier** is for the safe transmission of digital states from Ex zones to non-Ex zones. It is suitable for SIL applications up to SIL2 SC3. Its compact design accommodates two channels on an installed width of 12.5 mm. The function of the device is easily configurable via DIP switches, with LEDs showing the switching states.

**With the RNO22 output isolating amplifier,** valves or displays can be controlled. The device is also suitable for use in Ex zones. The signal is detected via the passive input and actively forwarded to the valve or display. An intrinsically safe variant is also available as an option. Its compact design accommodates one or two channels on 12.5 mm.

**The RNF22 infeed and alarm module** is designed to power the DIN rail system when a 24 V power source is present in the control cabinet. It monitors the voltage, can switch between redundant power supplies and issues an alarm in the event of a fault.



RNx2x

**The RNB22 power supply** can power the system when there is no 24 VDC source available in the control cabinet. An RNB22 can supply power for up to 40 modules. A redundant power supply can be set up with two devices.

### Advantages

- One system with five functions
- Compact design
- Single- or two-channel devices
- Central supply via the DIN rail
- Active/passive output (RN22)
- HART communication without opening the current loop (RN22)



 [www.endress.com/rn22](http://www.endress.com/rn22)



 [www.endress.com/rln22](http://www.endress.com/rln22)



 [www.endress.com/rno22](http://www.endress.com/rno22)



### Technical data

- Power supply: 24 V DC
- Installed width: 12.5 mm to 18.5 mm
- Functions: active barrier, passive barrier, signal doubler, NAMUR isolating amplifier, output isolating amplifier
- Transmitter supply voltage:  $\geq 16.5$  V at 20 mA (RN22)
- Ambient temperature:  $-40^{\circ}\text{C}$  to  $+60^{\circ}\text{C}$
- Degree of protection: IP20

# Interface devices with universal power supply unit and ATEX approval for individual applications

## RN42 and RLN42 DIN rail interfaces

### At a glance

- Universally usable thanks to universal power supply unit
- Two-channel version saves space and money
- Safe to use for Ex zone applications and applications up to SIL2 SC3

**Application** The RN42 barrier offers various possible applications. Since its input can be connected passively as well as actively, it can be used both as an active barrier and passive barrier. The device is designed as a single-channel version. The RN42 can be used very flexibly, meaning the output can be connected to passive as well as active PLC inputs. The device detects the type of output and adapts its function accordingly. HART signals are also transmitted by the RN42. Operators can access the HART signal without loop interruption via two lugs in the front. The RN42 can be used in SIL applications up to SIL2 SC3.

The RLN42 NAMUR isolating amplifier is for safely transmitting digital states from Ex zones to non-Ex zones. It is suitable for SIL applications up to SIL2 SC3. Its compact design accommodates two channels on a width of 12.5 mm. The function is easily configurable via DIP switches, with LEDs showing the switching states.

### Advantages

- Universal PSU – a single device for all applications
- Compact design: 12.5 or 17.5 mm
- Passive/active output (automatic detection with RN42)
- ATEX approval
- For SIL applications up to SIL2 SC3

 [www.endress.com/rn42](http://www.endress.com/rn42)



 [www.endress.com/rln42](http://www.endress.com/rln42)



RLN42



### **i** Technical data

- Universal PSU 20–253 V AC/DC
- Transmitter power  $\leq 16.7$  V at 20 mA (RN42)
- Ambient temperature  $-40^{\circ}\text{C}$  to  $+60^{\circ}\text{C}$
- Can be installed in Ex zone 2

# Universal high-performance tablet PC for mobile device configuration

## Field Xpert SMTxx

### At a glance

- Unpack, get started – mobile access to all intelligent field devices for commissioning and documentation purposes
- Full-fledged high-performance Windows 10 tablet, also ideal for other software applications
- Directly integrated interfaces for establishing a connection with field devices via HART, Bluetooth® and WiFi

**Application** The two established industrial tablets Field Xpert SMT70 for Ex zone 2 and SMT77 for zone 1 have been joined by the SMT50, a new affordable member of the Field Xpert tablet family. This mobile aid is the first choice for all users who work in maintenance and operations with the main task of supporting workflows in paperless and digital form. Just like its two “bigger brothers”, the new Field Xpert SMT50 tablet comes with the tried-and-tested and intuitive Field Xpert software. This latest release already supports all Endress+Hauser field devices, which can be directly operated via the Bluetooth® interface. A particularly useful feature is the tablet's ability to synchronize any type of generated data records with the Endress+Hauser cloud and to access these records in the field using Netilion Library. An update mechanism created specially for the Field Xpert SMT50 tablet ensures that the individual device drivers and their configuration software are always kept up to date. This means that driver and software updates can run fully automatically in the background without requiring any additional steps.

- Unpack, get started: completely pre-installed operating system and software
- All of the communication protocols from the process industry and the world of automation are supported: HART, Profinet, PROFIBUS, FOUNDATION Fieldbus, Modbus, IO-Link, Endress+Hauser service interfaces, Bluetooth®, WiFi, LTE
- It supports a range of gateways and remote I/Os from various manufacturers
- Regular software updates (one year free, then available as an option for up to five years)



Field Xpert SMTxx

### Advantages

- One tool for all devices – the simple aid for mobile asset management in the harsh industrial environment
- Digital documentation always available on site thanks to storage options in the cloud-based Netilion Library
- A perfect fit for Endress+Hauser field devices with wireless interfaces, such as Bluetooth® or WiFi



[www.endress.com/smt50](http://www.endress.com/smt50)



### Technical data

- Windows 10 tablet with 12.2" multi-touch, high-resolution display, 1.5 kg, IP65
- Intel® Sky Lake Core™ m3-7Y30, 4 GB RAM/128 GB SSD
- USB, Bluetooth®, WiFi, WWAN LTE 4G, camera
- IP65, -20°C ≤ Ta ≤ +60°C
- Optional HART modems (e.g. also including Bluetooth® variants)

# Connectivity solutions for different system architectures

## Netilion edge devices and Netilion gateways

### At a glance

- Tap into data from brownfield and greenfield plants and make them digitally accessible
- Secure: Netilion cloud and edge device plug-ins meet the strictest and certified security standards
- Universal usability for field devices and actuators from various manufacturers in existing (brownfield) and new (greenfield) plants

Connectivity forms the basis of all Industry 4.0 applications. Netilion Connect provides digital access to data in brownfield and greenfield plants and encompasses a portfolio of edge devices, gateways and an application programming interface (API).

### Applications

Netilion edge devices:

- FieldEdge SGC200/400/500: connects assets to Netilion (cloud) via a parallel, secure data channel (NOA concept)

Netilion gateways:

- SFG250: connects HART devices to FieldEdge devices
- SFG500: connects PROFIBUS DP/PA to FieldEdge devices
- SWA50/70: establishes a WirelessHART or Bluetooth® connection between assets and the individual gateways/FieldEdge devices, can also be retrofitted

### API

An API data exchange format based on the REST/JSON standard is available for cloud-to-cloud connection of Netilion to user-specific applications (clouds, ERP systems).

➔ For further information, see p 20:  
From the field to the cloud: How connectivity is created

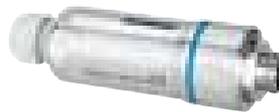
 <https://developer.netilion.endress.com/netilion-connect>



FieldEdge SGC200 – Bluetooth® edge device for connecting measurement technology to the Netilion cloud.



Fieldgate SFG500 – basic mode Ethernet gateway with integrated web server and adaptive PROFIBUS Master Class 2 for communication with PROFIBUS devices.



FieldPort SWA50 adapter for data transmission via WirelessHART and Bluetooth®: Ex-i intrinsically safe, loop-powered, can be retrofitted to all HART devices.

# Temperature

# Temperature

## Our offering for temperature measurement in all sectors of the process industry

As it is so highly relevant to quality and safety, temperature is the most measured parameter in the process industry. The challenge is to measure the process temperature accurately and in a reproducible way – under consideration of different sectors and applications. In particular, the thermowell – as the part of the thermometer in contact with the process – must be able to withstand process conditions.

**What we offer** As a partner you can rely on, Endress+Hauser leverages its wealth of product and solutions expertise to develop innovative products that generate outstanding customer value. These include the world's first self-calibrating thermometer: iTHERM TrustSens. It simultaneously reduces costs and increases process reliability. Alternatively, iTHERM QuickSens delivers the fastest response time, making it possible to increase process efficiency even more accurately and improve the quality of products. For maximized process control and longevity, Endress+Hauser offers the iTHERM StrongSens with unrivaled vibration resistance. In addition, the outstanding transmitter portfolio offers communication interfaces such as 4 to 20 mA, HART, Ethernet-APL, Foundation Fieldbus, Profibus, SIL2/3 and the first transmitter to feature Bluetooth®-enabled configuration. iTHERM MultiSens (Engineered Solutions) is suitable for sophisticated applications, such as the creation of temperature profiles.

Endress+Hauser supports invasive temperature measurement, which requires utmost safety, with a load capacity calculation for the thermowell in accordance with ASME/DIN. Last but not least, we offer digital tools that help with the configuration of the thermometer, e.g. with 2D/3D drawings.

### ✓ Your benefits

- Complete product range for all applications
- Unique sensor technology ensures high long-term stability and process reliability
- iTHERM QuickNeck technology enables quick and easy recalibration
- Reduced process risks and costs with the world's first self-calibrating thermometer

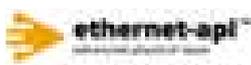
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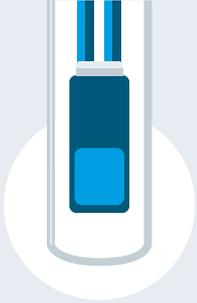
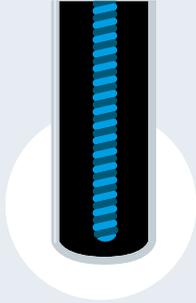
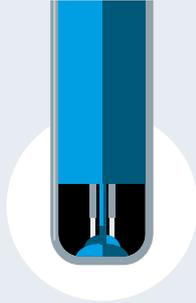
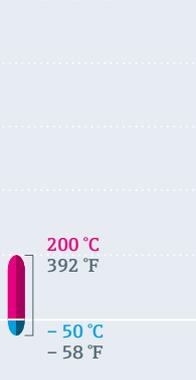
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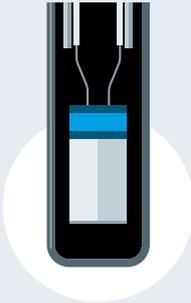
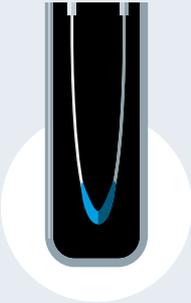
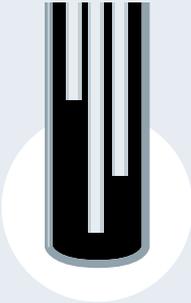
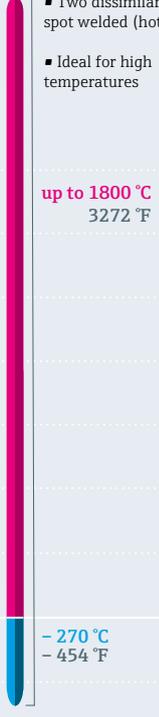
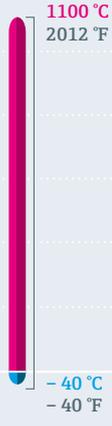


### Quality marks and standards



## Sensor technology for thermometers – the right solution for every measuring task

			
<p><b>Basic thinfilm Pt100 (RTD)</b></p>	<p><b>Standard thinfilm Pt100 (RTD)</b></p>	<p><b>Wirewound Pt100 (RTD)</b></p>	<p><b>iTHERM QuickSens Pt100 (RTD)</b></p>
<ul style="list-style-type: none"> <li>Thinfilm sensor consisting of ceramic substrate with vapor-deposited platinum</li> <li>Sensing element and wiring in stainless steel sheath</li> </ul>	<ul style="list-style-type: none"> <li>Small sensor consisting of ceramic substrate with vapor-deposited platinum</li> <li>Embedded in mineral isolated stainless steel sheath</li> </ul>	<ul style="list-style-type: none"> <li>Ultrapure platinum wire wound around a ceramic core</li> <li>Embedded in mineral isolated stainless steel sheath</li> </ul>	<ul style="list-style-type: none"> <li>Pt100 thinfilm sensor with the world's fastest response time</li> <li>Sensor-on-tip technology for short immersion length</li> <li>Better process control and product quality, optimized efficiency</li> <li>Highest accuracy</li> </ul>
<p>Measurement range</p>			
 <p>200 °C 392 °F</p> <p>-50 °C -58 °F</p>	 <p>400 °C 752 °F</p> <p>-50 °C -58 °F</p>	 <p>600 °C 1112 °F</p> <p>-200 °C -328 °F</p>	 <p>200 °C 392 °F</p> <p>-50 °C -58 °F</p>
<p>Properties</p>			
<ul style="list-style-type: none"> <li>+ Measurement performance sufficient for most support processes</li> <li>- Limited measurement range</li> </ul>	<ul style="list-style-type: none"> <li>+ Long-term stability</li> <li>+ Vibration resistance</li> <li>- Limited measurement range</li> </ul>	<ul style="list-style-type: none"> <li>+ Long-term stability</li> <li>+ High measurement repeatability</li> <li>- Relative cost</li> <li>- Susceptible to mechanical stress</li> </ul>	<ul style="list-style-type: none"> <li>+ World's fastest response time</li> <li>+ Maximum process safety</li> <li>- Limited measurement range</li> </ul>

			
<b>iTHERM StrongSens Pt100 (RTD)</b>	<b>iTHERM TrustSens Pt100 (RTD)</b>	<b>Thermocouple (TC)</b>	<b>iTHERM ProfileSens Thermocouple (TC)</b>
<ul style="list-style-type: none"> <li>▪ Ceramic-encapsulated Pt100 thinfilm RTD with unmatched robustness</li> <li>▪ Vibration resistance up to 60g (2,116 oz) for lower life cycle cost</li> <li>▪ High long-term stability, high plant availability</li> </ul>	<ul style="list-style-type: none"> <li>▪ Self-calibrating sensor unit</li> <li>▪ Pt100 sensor and integrated fixed point reference</li> <li>▪ Higher product quality and safety</li> <li>▪ Lower risk, cost and effort</li> </ul> 	<ul style="list-style-type: none"> <li>▪ Two dissimilar metals spot welded (hot junction)</li> <li>▪ Ideal for high temperatures</li> </ul>	<ul style="list-style-type: none"> <li>▪ Minimally invasive multipoint cable sensor profiling system</li> <li>▪ Up to six individual thermocouple sensors per probe</li> <li>▪ MI cable mineral insulated (MgO powder)</li> <li>▪ Robust design with double metal sheathing technology</li> </ul>
			
<ul style="list-style-type: none"> <li>+ World's highest vibration resistance</li> <li>+ Robust</li> <li>+ Long lifetime and plant availability</li> <li>- Limited measurement range</li> </ul>	<ul style="list-style-type: none"> <li>+ Self-calibrating</li> <li>+ High accuracy</li> <li>+ Reliability</li> <li>+ High degree of automation</li> <li>+ Risk reduction</li> <li>- Limited measurement range</li> </ul>	<ul style="list-style-type: none"> <li>+ Measurement range</li> <li>+ Ideal for high temperatures</li> <li>- Long-term stability</li> <li>- Limited accuracy</li> </ul>	<ul style="list-style-type: none"> <li>+ Robust and reliable</li> <li>+ For high temperatures, pressure, aggressive media</li> <li>+ Increased plant safety</li> <li>- Limited accuracy (compared to RTD)</li> </ul>

Digitalization

Plant safety

Pressure

Flow

Moisture

Liquid analysis

Level

Optical analysis

System components

Temperature

Services

# Permanent reliability of measurements with automated self-calibration

iTHERM TrustSens TM371

## At a glance

- Inline self-calibration without plant shutdown, fully automated and traceable
- Automated certificate generation and documentation – audit-proof
- Optionally with ATEX/IECEX explosion protection and increased measuring range up to 190°C

**Application** At the heart of this compact transmitter is the reference sensor with physical fixed point. The new iTHERM TrustSens thermometer is designed for users in the pharmaceutical and food and beverage industry who require end-to-end compliance with GMP guidelines. This product eliminates the risk of non-conformities during production. The iTHERM TrustSens distinguishes itself from other thermometers with its fully automated and effortless inline calibration prior to every batch. This results in high product reliability and increases plant capacity utilization. Inline monitoring is already recommended in the Good Manufacturing Practice guidelines (GMP – Annex 15).

## Advantages

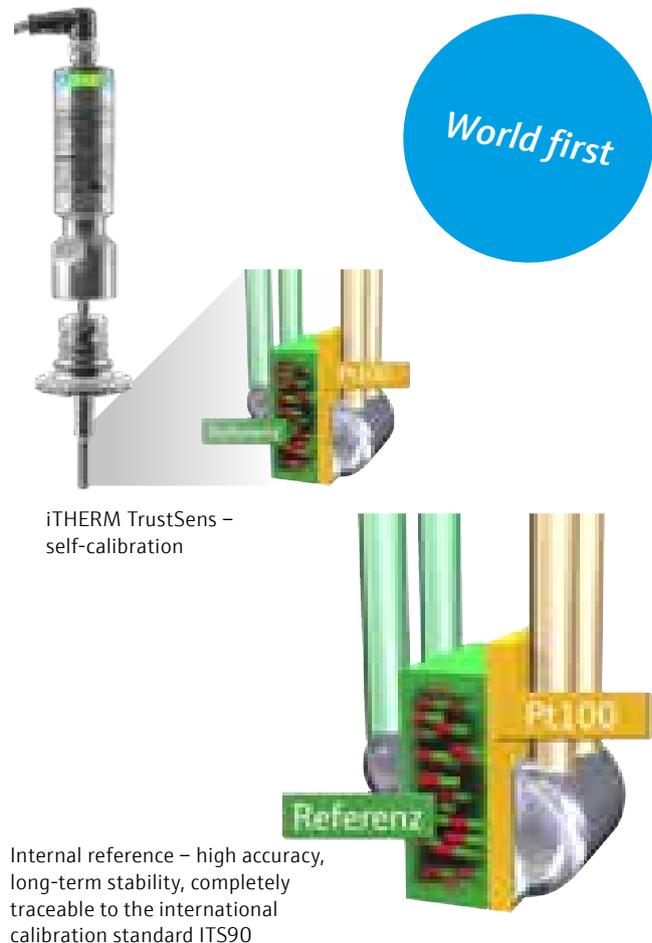
- Maximized process reliability and plant availability thanks to Heartbeat Technology
- Maximized measurement accuracy thanks to characteristic curve adaptation (sensor-transmitter matching)



[www.endress.com/trustsens](http://www.endress.com/trustsens)



## Quality marks and standards



iTHERM TrustSens – self-calibration

Internal reference – high accuracy, long-term stability, completely traceable to the international calibration standard ITS90



## Technical data

- International certificates and approvals: EHEDG, ASME BPE, FDA, 3A, 1935/2004, 2023/2006 (GMP), 10/2011 CE CRN, CSA GPus
- Explosion protection, e.g. ATEX/IECEX
- Measuring range -40°C to +160°C, optional 190°C
- More than 50 hygienic process connections as standard

# Digital readings and status transmission by IO-Link/4 to 20 mA and PNP output

iTHERM CompactLine TM311

## At a glance

- Cost savings from easy integration
- Status messages for added safety
- Digital communication via IO-Link saves time during commissioning

**Application** The iTHERM TM311 compact thermometer has been designed for universal use in the food and life sciences industries and as the standard for machine and plant construction. The compact thermometer measures the process temperature with a Pt100 (Class A 4-wire). The optional integrated transmitter converts the Pt100 signal. The transmitter automatically detects the type of output: IO-Link, 4 to 20 mA or switch.

## Advantages

- Compact stainless steel design
- Fast response times
- High accuracy even with short installation lengths



[www.endress.com/tm311](http://www.endress.com/tm311)



iTHERM CompactLine TM311

Quality mark and standard



## **i** Technical data

- Measuring range: -50°C to +200°C
- Pressure range: up to 50 bar
- Degree of protection: IP69
- Device safety to EN610101-1 and CSA C/US

# Safe sealing of the process side, even if a thermowell with DualSeal breaks

## iTHERM ModuLine TM131

### At a glance

- Reliable plant availability thanks to secondary containment
- Maximized process safety for people and the environment
- In the event of a leak in the thermowell, an escape of medium is prevented and, at the same time, a signal is transmitted to the controller

**Application** The new iTHERM ModuLine TM1xx portfolio consists of modular temperature assemblies for both basic and challenging applications. It can be used wherever reliable, accurate and stable temperature measurement is required, and where valuable additional information needs to be generated and used. The aim is always to improve process monitoring, extend the operating time of the temperature measuring point and therefore increase plant safety and reliability. The secondary containment feature, for example, prevents the medium from escaping if there is a thermowell leak and sends a signal to the controller. In the event of a fault, the temperature signal is maintained.

### Advantages

- Reliable detection of a pressure rise in a thermowell without signal interruption thanks to DUAL-SEAL
- Easy, intuitive operation, including in Ex zones, with Bluetooth®
- Maximum process reliability thanks to fast-response thermowell



iTHERM ModuLine TM131



[www.endress.com/tm131](http://www.endress.com/tm131)



### Technical data

- Secondary containment
- TMT71/72 head transmitter, with Bluetooth® configuration via app
- Fast-response thermowell up to +400°C
- SIL for the entire thermometer
- MID, GL, CRN, custody transfer approval
- Global approvals

### Quality marks and standards



# Measure temperature up to five times faster with patented thermowell technology

## iTHERM ModuLine TM131

### At a glance

- Maximum process monitoring and efficiency thanks to innovative thermowell design
- Increased plant safety
- Consistently high product quality

**Application** Thermometers with the fastest possible response times are needed for optimum temperature control. With the new fast-response thermowell in the iTHERM ModuLine TM131 thermometer line, response times when using a thermowell can be effectively reduced five-fold. Using a patented method, a thermally conductive material is introduced between the insert and the thermowell to drive out the air that would otherwise have an insulating effect. The thermally conductive material ensures an optimum thermal connection with the process.

### Advantages

- Standard 6 mm insert can be replaced at any time
- Permanently effective up to +400°C
- No thermal oil used
- Response time up to five times faster



[www.endress.com/quicksens](http://www.endress.com/quicksens)



iTHERM ModuLine TM131 with fast-response thermowell



### Technical data

- For standard 6 mm insert
- Configuration via app
- Thermowell up to +400°C
- Global approvals

# Digital temperature transmitter with Ethernet-APL

## iTEMP TMT86

### At a glance

- Easy commissioning via web server
- Ethernet-APL: smart, quick, digital. The two-wire superhighway for endless possibilities
- Improved process efficiency and plant availability thanks to accurate temperature measurements and long-term stability
- Reduction in plant downtime through advanced diagnostics, e.g. undervoltage detection

**Application** The new iTEMP TMT86 temperature transmitter is a head-mounted transmitter featuring two sensor inputs with Ethernet-APL interface that communicates via the PROFINET® protocol. The device is supplied by the two-core Ethernet connection and can be installed as an intrinsically safe component in zone 1 of potentially explosive atmospheres. iTEMP TMT86 is used chiefly in the process industry. The transmitter is also integrated in all widely used thermometers.

### Advantages

- Digital communication to the field level, even in potentially explosive atmospheres
- Simple and standardized system integration via PROFINET® Profile 4
- Ease of engineering, commissioning and maintenance thanks to integrated web server
- High measuring point accuracy thanks to sensor-transmitter matching
- Reliable measuring operation thanks to sensor monitoring and device hardware fault detection
- Diagnostics in accordance with NAMUR NE107
- Fast and tool-free wiring thanks to push-in terminal design, optional
- Plug-in measured value display, optional



iTEMP TMT86



[www.endress.com/tmt86](http://www.endress.com/tmt86)



[www.endress.com/apl](http://www.endress.com/apl)



### Quality marks and standards



### Technical data

- Two independent universal inputs for resistance temperature detectors (RTD), thermocouples (TC), resistance and voltage transmitters (ohms, mV)
- Ethernet-APL: two-core Ethernet to IEEE 802.3cg 10BASE-T1L
- Industrial Ethernet protocol: PROFINET®
- Optimum system integration in widely established systems with FDI packages and GSD files

# Patented double-walled multipoint cable probe for detecting 3D or linear temperature profiles

iTHERM MultiSens TMSxx and iTHERM ProfileSens TS901

## At a glance

- Safety and efficiency thanks to close temperature monitoring (e.g. in fixed-bed reactors)
- Maximized plant availability thanks to unique safety concept with up to three process barriers
- Saves space in the reactor compared to conventional measuring elements
- Robust, durable device thanks to outer and inner tube
- Ideal for 3D temperature profile measurement

**Application** The new revolutionary TS901 multipoint sensor has been specially developed to measure temperature profiles in the most demanding applications in the oil and gas industry (e.g. in distillation units, cracking and hydrotreating reactors). High temperatures, high pressure and corrosion need to be considered. The new iTHERM ProfileSens TS901 sensor is not only insulated by mineral insulated powder but also by an internal metal sheath for every single sensor. Even if the outer tube is defective, the thermocouples are not damaged and all measurements continue to be performed without any restrictions.

## Advantages

- Radical reduction in process invasiveness
- More efficient processes thanks to fewer measuring elements in the reactor
- Higher safety thanks to double-sheathed measuring inserts
- Application-specific adjustments are possible
- Complete engineering of the measuring chain



[www.endress.com/multisens](http://www.endress.com/multisens)



## Quality marks and standards



iTHERM ProfileSens TS901

## Technical data

- Resistance thermometer/thermocouple
- Design: straight multipoint, 3D multipoint
- Ex approvals
- Compliance with Pressure Equipment Directive 97/23/EC
- Output signal depends on the transmitter selected (4 to 20 mA, HART®, PROFIBUS® PA or FOUNDATION Fieldbus™)

# Services

# Services

## Our services for optimum process plant operation

Optimizing processes and increasing plant performance are challenging aspects of the process industry. To safeguard product quality continuously and ensure smooth, safe and efficient plant operation throughout its entire life cycle, measuring devices must perform impeccably from the start. For this, operators need a competent aftersales partner who can deliver all the necessary services and who has comprehensive expert knowledge of the process instrumentation in the industry concerned. To comply with legal requirements and quality standards, regular inspections of the metrology equipment used are also indispensable.

**What we offer** As one of the leading manufacturers of measuring devices and automation solutions for the process industry, we offer a comprehensive range of services for the operation and maintenance of metrology equipment in process plants. To safeguard device performance from the start, our experts deliver tailored services to provide support early on in project development and with the commissioning of instruments. An extensive on-site service supports operators in all phases of the plant's life cycle – from commissioning to maintenance and regular calibration in accordance with ISO/IEC 17025. To avoid plant shutdowns, numerous maintenance tools are available as well as industry-specific technical support for rapid troubleshooting – even remotely with audiovisual assistance, if necessary. Services to optimize business processes – from consulting to the management of maintenance tasks – complete the services portfolio.

### Your benefits

- Reduced costs for plant operation, maintenance and storage
- Maximized plant safety thanks to compliance with quality and safety standards
- Documented traceability in line with the requirements to produce supporting documentation
- Optimized plant efficiency by avoiding plant shutdowns and wastage

 [www.endress.com/service](http://www.endress.com/service)



### Quality marks and standards





## One partner for all your needs – and a lifetime of cost-efficient support for your plant



**Services for planning, project development and commissioning** The service offering begins early on with plant planning and engineering. Endress+Hauser supports planners with the appropriate software for identifying the correct design and configuration of the metrology equipment and for plant planning. Boasting an extensive on-site service and with over 1,200 highly qualified technicians around the world, Endress+Hauser helps to ensure quick and correct device commissioning at the point of need. As an alternative to commissioning on site, commissioning can even be supported remotely.

**Training and support** Experienced instructors offer comprehensive training in instrumentation so that plant personnel can broaden and deepen their knowledge of how to operate and maintain equipment. Technical support for each and every measuring device technology, software and automation solution keeps production interruptions to a minimum in the event of a fault. Our support services are tailored to individual requirements:

- Short response times and expert and experienced product and application specialists
- Service Portal with knowledge base and visual support for rapid assistance
- 24-hour telephone availability

**Operation and maintenance** To ensure smooth operation and the necessary maintenance in the long term, Endress+Hauser offers a unique range of services:

- Workshop service for repair and diagnostics
- On-demand maintenance services
- DAkkS-accredited calibration service to ISO/IEC 17025 – on-site or in-lab
- Inline verification for checking safety equipment
- WHG and SIL services
- Online tools for searching for serial numbers and spare parts and for plant management
- Worldwide service network

**Optimization services** Endress+Hauser offers effective methods and services for optimizing business processes in all aspects of the installed measurement and control equipment – continuous process improvements, efficiency gains and support in strategic maintenance decisions:

- Calibration management and control of monitoring and measuring resources
- Maintenance management
- Manufacturer-independent device management
- Advice on standardization and inventory reduction
- Data management and data integration into user systems
- Metrology consultation
- Risk-based optimization of calibration intervals
- MPE (maximum permissible error) and criticality evaluation

# Rapid video assistance during measurement technology commissioning

## Smart Start-Up

### At a glance

- Rapid remote support for commissioning in the chosen time slot
- Device commissioning for optimum measuring performance in accordance with the specific requirements
- Access to the expertise of product and application specialists

Smart Start-Up with live video assistance offers users a quick and easy way to access our experts' knowledge for remote commissioning support in a chosen time slot. This enables plant operators to ensure optimum operation of their measuring devices. By talking to the technician, users can also become familiar with the new measuring devices and ask tailored questions about the device in the application.

### Advantages

- Increase in plant availability owing to short lead and commissioning times
- Faster support via video call, with less organizational effort and significant time savings
- Increase in device knowledge thanks to expert support when commissioning



# Priority support and faster response time for rapid problem-solving

## Smart Support

### At a glance

- Prioritization of support queries for a faster response time
- Use of visual support during support queries for faster clarification
- Lodge and manage support queries quickly and easily online at "My Endress+Hauser Services"
- 24/7 access to a growing knowledge base – the expertise of our application specialists – at "My Endress+Hauser Services"

Smart Support offers a faster response time including priority callback, visual support via live video call and access to "My Endress+Hauser Service". Three service packages are available – tailored to the requirements concerned. Smart Support ensures that support queries are solved in a timely fashion, which means that time and costs for diagnostics, troubleshooting and support queries are reduced and process availability is improved.

The "My Endress+Hauser Service" service portal augments the support service with the knowledge base and easy creation of support queries. "My Endress+Hauser Service" gives 24/7 access to the documented expertise of product and application specialists. After you have registered free of charge, the growing knowledge base can be used quickly and easily for support queries. If you don't happen to find the answer you are looking for, it is possible to lodge a support request there and then for the attention of the product and application specialists. It can then be viewed and managed as necessary.

### Advantages

- Faster response to support queries, which means reduced device downtimes
- With "eyes on the ground", device problems can be solved more efficiently and plant downtimes can be reduced as a result
- Cost-effective and time-efficient use of expertise and resources

My Endress+Hauser Services:



[www.services.endress.com](http://www.services.endress.com)

instantly available at

My Endress+Hauser after registration



### Smart Support offers faster response times



# Optimization services for calibration processes – reduce costs, increase safety and quality

## Calibration optimization

### At a glance

- Services for compliance with the requirements of internal and external regulations and audit-proof documentation to meet quality assurance standards
- Continuous identification of potential for improvement (CIP)
- Increased process efficiency by regular measurement of all maintenance and calibration activities performed using KPIs
- Improvement of the cost/risk ratio thanks to optimization of calibration intervals

Endress+Hauser supports maintenance and service personnel in carrying out calibration with optimized calibration methods (e.g. time-saving inline concepts), in defining risk-based calibration intervals or discovering potential for calibration process optimization. As a result, efficient calibration concepts increase plant availability at the same time as ensuring compliance and audit security. Individual requirements are also taken into consideration.

**Measuring performance analysis: Have confidence in your calibration results** Thanks to the measuring performance analysis carried out by one of our calibration consultants, users receive a transparent management overview of all calibration activities. The service includes a detailed analysis of the metrological status of the installed base for all instruments in the analysis.

### Advantages

- The calibration consultant converts calibration data into a transparent management overview
- Audit trail documentation to meet quality assurance standards
- Knowledge transfer of metrology and calibration expertise into the company

**Criticality/MPE evaluation** Criticality and the maximum permissible error (MPE) form the foundation for high-quality and cost-effective calibration. The offering enables users to lay the necessary foundations for realizing initial potential for improvements, such as reducing “out of tolerance” calibrations. Furthermore, using ISO 31010-compliant documented methods, project managers will be in a position to justify decisions to auditors. In addition, it is possible to take up further optimization services, such as optimization of calibration intervals.

### Advantages

- Ideal cost/risk balance thanks to correctly determined criticality and MPE
- Risk minimization by avoiding non-conformities
- Reduction of “out of tolerance” calibrations as a consequence of unrealistically low MPE

**Calibration interval optimization** Endress+Hauser helps users to determine the correct time frame in which calibration should be carried out. Plant operators no longer



### Optimization of calibration processes

Standardization of processes	Creation of transparency	Definition of principles	Cost/risk balance
<b>Optimization of the calibration process</b>	<b>Measuring performance analysis</b>	<b>Criticality/MPE evaluation</b>	<b>Calibration interval optimization</b>
Together, we develop the optimum workflow and tool landscape to reduce unnecessary activities and achieve maximum return on investments – adapted for your asset management strategy.	We analyze calibration results, help you to identify process measuring risks and provide recommendations for necessary preventative or corrective measures.	We offer best-practice methods for determining device criticalities and MPE. Our experts will provide you with support for practical implementation of theoretical calculations.	We use a mix of innovative algorithms and expertise in metrology to ensure that your devices are not calibrated any more or less than necessary.

have to rely on indiscriminate time frames (once a year) or rules of thumb to determine the optimum timings of calibration intervals. Proven scientific models are used for this purpose. These models take into account historic data from previous calibration results to make predictions about future behavior. Where intervals change significantly, these are discussed with the project manager and all assumptions based on them undergo validation. In this way, sound decisions can be made about the calibration interval to be used. Depending on operational conditions, such as planned plant shutdowns, intervals are then adjusted to create an optimized schedule for carrying out calibration. Ultimately, users and plant operators benefit from an optimal balance between cost and risk.

#### Advantages

- Reduced calibration costs with extended intervals
- Minimization of “out of tolerance” risks when reducing intervals
- Analysis and action recommendations from an experienced calibration consultant



 <http://eh.digital/calibration-interval-optimization>



# Correct monitoring and reporting

## Services for CO<sub>2</sub> emissions trading

### At a glance

- Conceptual design of an inspection and calibration plan as well as training in a tailored workshop
- Quality assurance for measuring devices thanks to calibration and verification in accordance with ISO IEC 17025
- Creation of uncertainty analyses that fulfill all requirements

In order to implement European CO<sub>2</sub> emissions trading, the German Emissions Trading Authority (DEHSt) checks the uncertainty records of CO<sub>2</sub>-relevant substance quantities as part of its approval of monitoring plans. Endress+Hauser can support users in correct monitoring and reporting.

**Consultation and workshops** DEHSt-compliant implementation of monitoring and reporting requires a correct understanding of the legal requirements and operator obligations. The quality assurance required for measuring devices means that an inspection and calibration plan must be devised. Compiling evidence of uncertainty requires a solid understanding of metrological principles to calculate measuring uncertainty. Endress+Hauser provides training in these matters and will discuss them with responsibility holders in a tailored workshop that places strong emphasis on practical application. Where the required uncertainties are not achieved with existing measuring devices given tier requirements, the quantitative design and selection of new, more accurate measuring devices will be required.

**Quality assurance of measuring devices** Endress+Hauser calibrates and adjusts as necessary all measuring devices that are subject to regular quality assurance as part of the operator's obligations. This is done directly on site in the plant if possible or, alternatively, in a calibration laboratory. For devices that cannot undergo calibration due to their operating or installation situation, a comparison measurement or in-situ inspection using verification offers an alternative to extending calibration intervals. The ISO/IEC 17025 accreditation of Endress+Hauser documents technical expertise and additionally facilitates the calculation of measurement uncertainties.



**Individual uncertainty calculations** Measurement uncertainty declarations in technical information and factory calibration certificates provide operators with an initial basis for creating uncertainty analyses. Furthermore, support for the individual uncertainty calculation of measuring devices is possible, which meets all the requirements for consideration of relevant input variables.

### Advantages

- Safety thanks to technical expertise in measurement technology and metrology, conceptual design of inspection and calibration plans, and consulting on legal requirements
- Quality assurance thanks to accredited on-site calibration in accordance with ISO/IEC 17025 for almost all common process parameters
- Many years of practical experience in inspecting energy and CO<sub>2</sub>-relevant measuring points
- Consideration of real-world measurement uncertainty contributions in the calculation of measurement uncertainties and creation of uncertainty records

# Legal compliance with the minimal possible process interruption

Accredited ISO/IEC 17025 calibration service on site or in the laboratory

## At a glance

- Manufacturer-independent calibration of all process parameters
- Calibration during operation or in the laboratory
- DAkkS-accredited on-site calibration service for the flow, pressure and temperature parameters
- High-accuracy production calibration rig for flow with minimal measurement uncertainty of < 0.015%

**Our calibration service** From creating a calibration specification to implementing a complete calibration management solution, Endress+Hauser supports plant operators throughout the entire process. As one of the leading manufacturers of measuring devices for the process industry, Endress+Hauser has the expertise gained from carrying out over one million calibrations. In addition to high-precision calibration to ISO/IEC 17025 in the laboratory, it is often advisable to carry out calibration while operation is in progress, e.g. in the case of test benches and stationary measuring equipment. In this way, the sensor can be tested under real operating conditions directly at the installation location.

## Advantages

- Minimize your auditing effort with an accredited and completely traceable calibration
- Increase in plant availability thanks to innovative inline calibration process
- Reduced coordination effort as only one partner is needed for all device models and makes
- Early detection of quality- and process-relevant setpoint deviations



Digitalization

Plant safety

Pressure

Flow

Moisture

Liquid analysis

Level

Optical analysis

System components

Temperature

Services

# Glossary

## Quality marks and standards



**Bluetooth®**  
Bluetooth® is an industry standard developed in the 1990s by the Bluetooth Special Interest Group for wireless data transmission between devices over a short distance.



**EX**  
Explosion protection falls under safety engineering and is intended to prevent physical harm and material damage.



**CE**  
With the CE mark, the manufacturer declares conformity with the directives in force in Europe.



**Foundation Fieldbus**  
Foundation Fieldbus is a fully digital, serial and bidirectional communication system used as the basic network in an automation environment.



**CSA**  
The CSA Group (formerly Canadian Standards Association) is an independent standards organization and accredited certifier for the North American and global market.



**HART** The HART protocol is a digital communication protocol for field devices.



**DIN**  
Deutsches Institut für Normung e. V. is the independent platform for industrial and national standardization in Germany.



**Heartbeat Technology**  
Endress+Hauser's Heartbeat Technology is a tool for internal device diagnostics, verification and monitoring.



**Ethernet-APL**  
Ethernet Advanced Physical Layer describes a physical layer for Ethernet communication, based to some extent on single-pair Ethernet and developed specifically for the requirements of the process industry.



**Hermes Award**  
First granted in 2004, the Hermes Award is the technology innovation award of the Hannover Messe (Hanover trade fair).



**EtherNet/IP**  
EtherNet/IP is a real-time Ethernet used mainly in automation engineering.



**IECEX**  
IECEX is the IEC system for certifying devices for use in potentially explosive atmospheres around the world.



#### IO-Link

IO-Link is a communication system for connecting intelligent sensors and actuators to an automation system in standard IEC 61131-9.



#### VDE

Originally founded in 1893, the VDE (Verband der Elektrotechnik Elektronik Informationstechnik e. V.) is the German association for electrical, electronic and information technologies.



#### Memosens

Memosens is a watertight and safe pluggable system for liquid analysis.



#### VDI

The Verein Deutscher Ingenieure e. V. is a non-profit engineers' association founded in Germany in 1856.



#### NAMUR

NAMUR is an international association of users of automation engineering and digitalization in the process industry.



#### WHG

The Federal Water Act is the main part of water legislation in Germany.



#### PROFIBUS

PROFIBUS is a protocol standard for fieldbus communication in automation engineering.



#### ZVEI

ZVEI e. V. (Verband der Elektro- und Digitalindustrie) represents the economical, technological and environmental policy interests of the German electrical, electronics and digital industry.



#### PROFINET

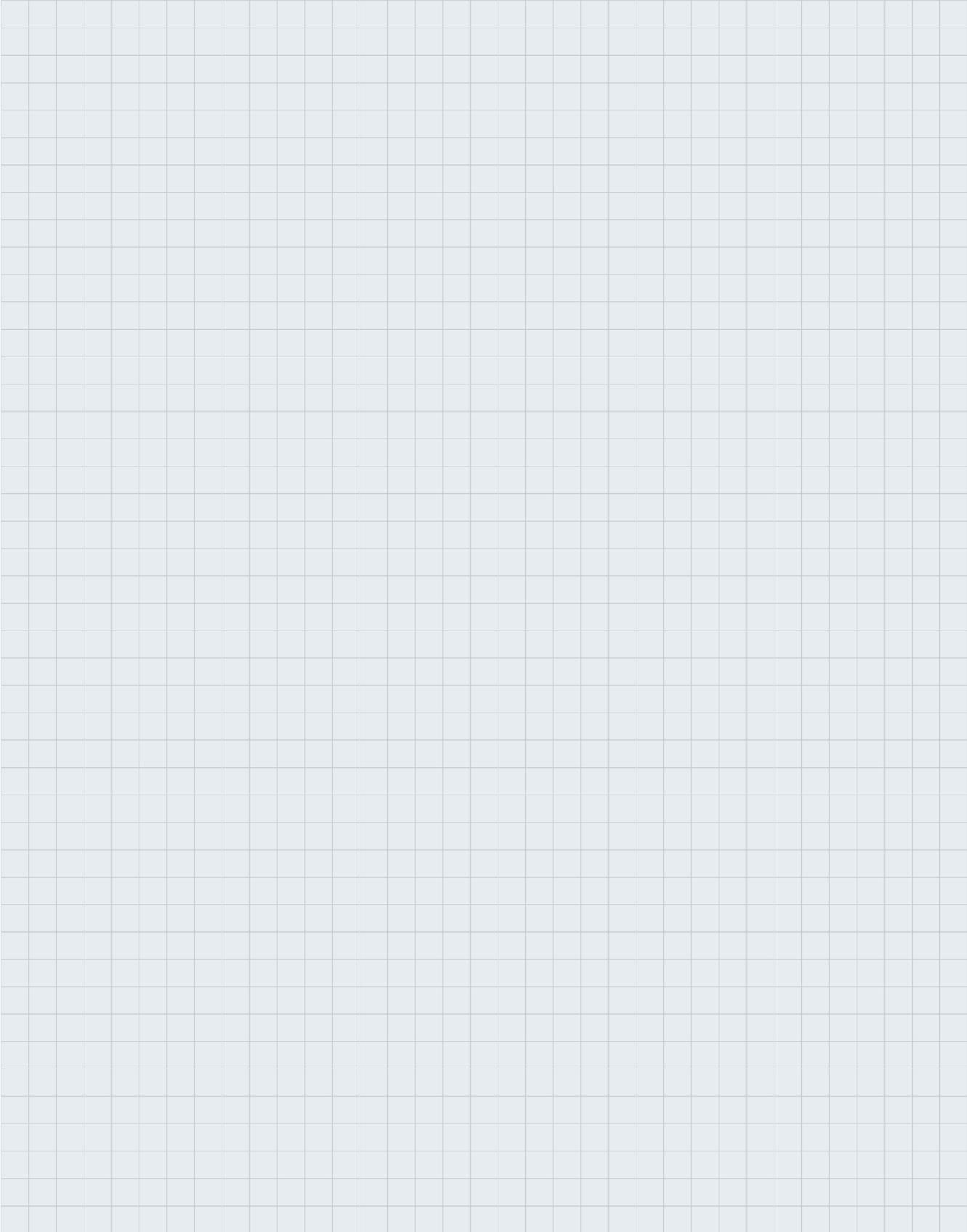
PROFINET is a communication standard based on Industrial Ethernet.



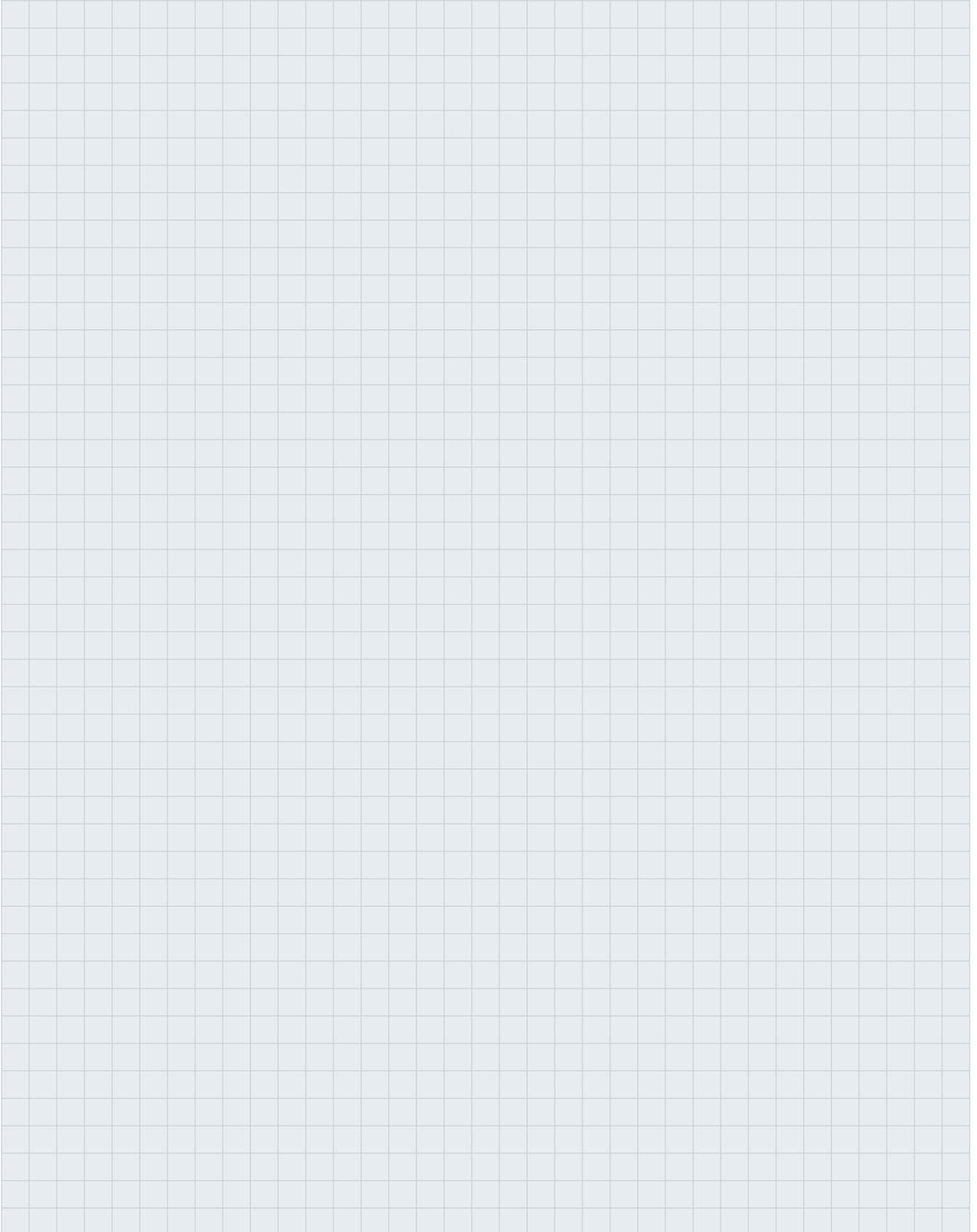
#### SIL

Safety integrity level is a term associated with functional safety and is defined in international standards IEC 61508/IEC 61511.

# Notes



# Notes



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