

Highlights 2024

Products, solutions and services

Highlights 2024



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Highlights from our portfolio

An overview of products, services and suitable solutions

Endress+Hauser helps customers all around the world to improve their processes. The “People for Process Automation” drive advancements in the development and use of innovative technologies and are now involved in shaping the digital transformation of the industry, as well as its defossilization. Our services consist of a comprehensive portfolio of field instruments, system products and data managers, digital communication and software, and extensive solutions and services. Our focus is to maximize plant efficiency, while simultaneously optimizing plant safety.

Our measuring parameters for the process industry:

- Pressure
- Flow
- Liquid analysis
- Fill level
- Optical analysis
- System components
- Temperature

Discover the highlights for 2024 in terms of products, solutions and services from Endress+Hauser in this brochure!

Reliable partner for the process industry

We know that every industry has different objectives, requirements and legal obligations. We therefore offer not only expertise in process measurement, but also familiarity with each sector's specific requirements. For over 70 years, Endress+Hauser has been a reliable partner for the various sectors of the process industry. We stand by our service promise – that we are the partner for improving processes. We are synonymous with longevity and stability, we offer a comprehensive range of products and digital expertise, and we provide industry- and application-based expertise.



Life sciences

- Standardization and data consistency guarantee faster time to market
- Better control of biotechnological processes



www.endress.com/life-sciences



Chemical

- Efficient process control
- Increased plant availability
- Plant safety guaranteed



www.endress.com/chemical



Food & beverage

- Food safety guaranteed
- Increased efficiency in production
- Higher quality thanks to inline measurement



www.endress.com/food





Oil & gas

- Higher plant availability
- Improved process control
- Increased plant safety



www.endress.com/oil-gas



Mining, minerals & metals

- Increased yield, greater efficiency
- Transparency in compliance with environmental regulations
- Monitoring of critical processes



www.endress.com/primaries



Water & wastewater

- Water quality guaranteed
- Energy-efficient wastewater treatment
- Intelligent water management



www.endress.com/water-wastewater



Power & energy

- Maximum plant availability
- Safe process control
- Increased cost-effectiveness



www.endress.com/power-energy



CO₂ as a raw material

Discover this treasure in your plant

Among the measures to achieve net zero by 2050, the top priority for industries dependent on fossil carbon is to decarbonize by preventing or reducing emissions. This is to be achieved by using renewable energy and green hydrogen, as well as through efficiency gains and by strengthening the circular economy. However, this will not be enough. According to the Intergovernmental

Panel on Climate Change, global warming can only be limited if there are negative emissions – in other words, if CO₂ is permanently removed from the atmosphere. Endress+Hauser is therefore helping its customers across different industries with carbon capture, and with transporting, storing and using CO₂ as a raw material.



“Obtaining precise measured data for process control, monitoring and documentation is vital to developing efficient processes for carbon capture and to use CO₂ as a raw material. With its wide range of measuring devices, Endress+Hauser is the perfect partner on the path to achieving sustainability and net zero.”

Frederik Effenberger, Decarbonization Industry Manager, Endress+Hauser Germany



Direct air capture (DAC) is a cutting-edge technology designed to remove CO_2 directly from the air. This process involves the use of special systems that extract carbon dioxide from the ambient air using absorbent materials. Measurement technology plays a key role because precise sensors and analytical instruments monitor the success of the carbon capture process. By taking continuous measurements, efficiency gains and optimizations can be made in real time. This means that DAC is an effective and sustainable method for reducing atmospheric carbon dioxide.



Carbon capture and storage (CCS) requires state-of-the-art sensors to quantify the success of the absorption process as part of carbon capture within the process. Flowmeters are used to measure the volume of carbon captured. In order to ensure the purity of the carbon captured, gas analyzers to measure the residual moisture and the CO_2 concentration are used. Moreover, pressure and temperature sensors are vital for monitoring conditions during transportation and storage.



Carbon capture and utilization (CCU) is the downstream process of using the captured CO_2 . For example, with the addition of green hydrogen, carbon captured from the DAC process can be used to produce green methanol. This application also requires precise measuring technology to make processes as efficient as possible. Temperature sensors are used to monitor the optimal temperature conditions for the CCU reaction. In addition, flowmeters (which monitor the CO_2 flow) and gas analyzers (which monitor the process) are required in various applications to use CO_2 as a raw material.

Spotlight on topics

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 & beverage industry. Information about our gas flow portfolio can be found on pages 34-35 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 gage the situation precisely and quickly: 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.



Cloud-based level measurement – optimization of logistics chains

In the bulk solids industry, it is a challenge to maintain an overview of the mobile silos that are in use. The position is often unknown, the remaining content in the container is not obvious 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.



www.endress.com/fwr30



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 and 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



Digital expertise

How our customers can benefit from our digital expertise



Digital business Discover and use the comprehensive information and procurement platform at endress.com. Your “My Endress+Hauser account” enables you to carry out all transactions with Endress+Hauser electronically, and the combination of product information with direct request and purchase options makes your procurement process easier and more efficient than ever before.



www.endress.com/my-endress-hauser



Digital services and solutions Turn data into knowledge with our digital solutions packages. From smart sensors 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.



netilion.endress.com



Digital technologies These systems help you to gain valuable data from the field in order to optimize and monitor processes. For example, there is Ethernet-APL, a new Ethernet technology that meets the requirements of the process industry and is designed to be open, future-proof and compatible with the industrial Internet of things (IIoT). Another technology is Heartbeat Technology, which is directly integrated into sensors and assists with diagnostics, verification and monitoring functions. This makes our measuring devices even more intelligent by supplying them with reliable and extensive sensor and process data.



www.endress.com/apl



The comprehensive information and procurement platform on endress.com

My Endress+Hauser

Highlights

- Information on the complete product range, your prices and delivery times
- Access to technical documentation, CAD drawings, certificates and device documents
- Overview of all commercial transactions including order documents
- Status information on quotes, orders and delivery tracking
- Request quotes or create quotes yourself and download them directly

Application Discover the new possibilities afforded by efficient information retrieval and electronic transaction management with the My Endress+Hauser account. In your personal account on endress.com, you have access to an overview of the key functions and records (quote and order history) at all times. You will also find the contact details of your dedicated Endress+Hauser sales contact in your account. This means that you always have maximum flexibility between online and offline support.

Our online support Our online support is also available to provide further assistance. It is easy to access “Support & Service” directly under “My Endress+Hauser”.



www.endress.com/my-endress-hauser



Maximum efficiency through automation of procurement processes

B2B integration with Endress+Hauser

Highlights

- 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 and punchout catalogs, 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 – is 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



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

Managing all engineering applications in one central location

My Endress+Hauser – Projects

Highlights

- Design and configure measuring points on a single platform
- Option for importing from external engineering software via Excel
- Optional storage of an operating standard

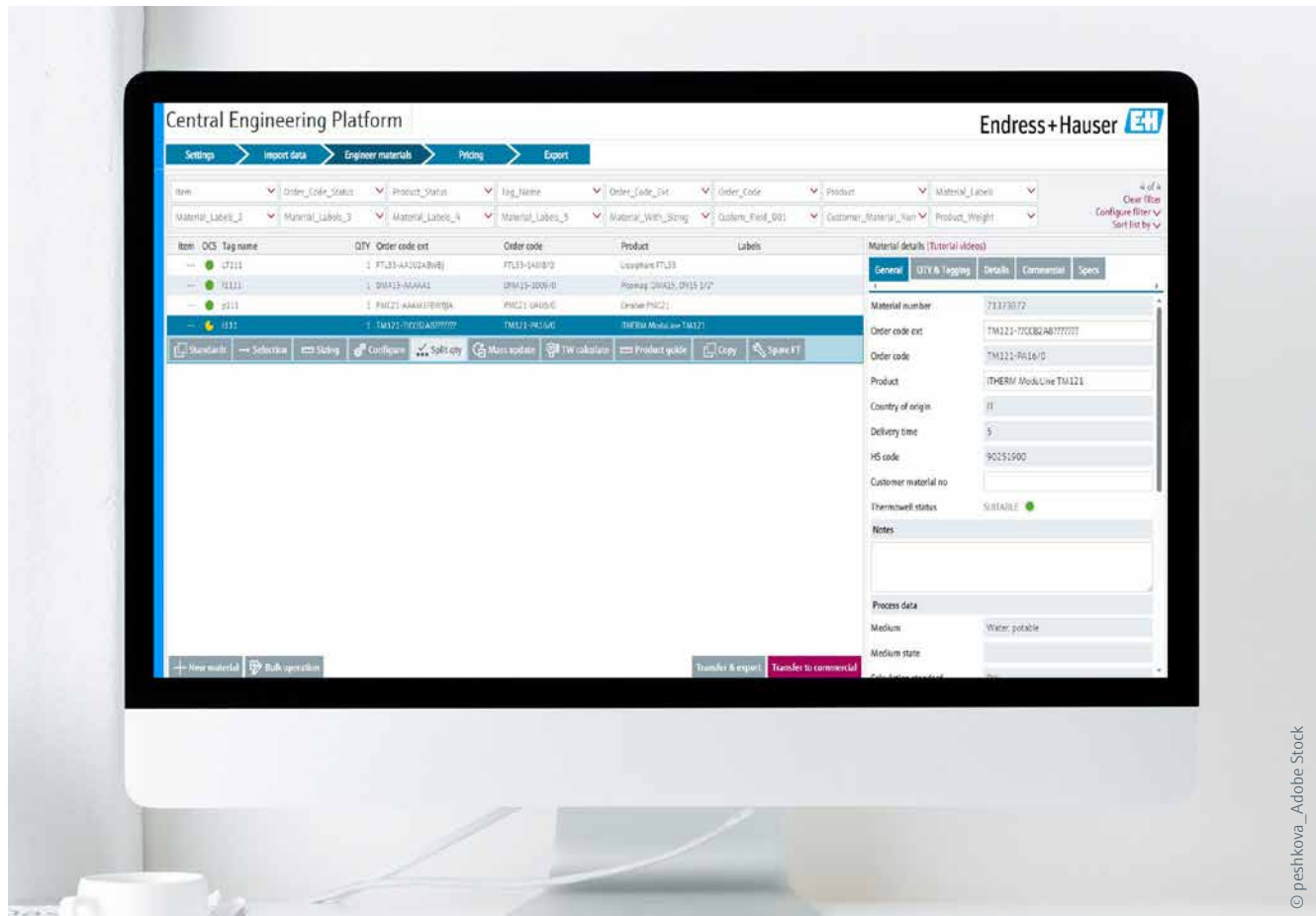
Application Improve project collaboration over the entire project life cycle, from planning to operation. Endress+Hauser's Projects brings together all of the applications you require on one platform and enables easy project development of products, increases efficiency and reduces workload, since you only have to enter data once. It is reliable, cohesive and available at all times.

In addition, Projects provides the best possible support to create and configure multiple projects in your day-to-day work.

Benefits

- Simple selection, design and configuration of products
- Quick to download technical documents in one go
- Easy access to your prices
- Rapid re-engineering of products

 www.endress.com/projects



Find the right measuring device in a single step using application data

My Endress+Hauser – Product Guide

Highlights

- Select and design measuring devices in a single step
- Simultaneously calculate and size all devices that can be used
- Design complete measuring points using process data

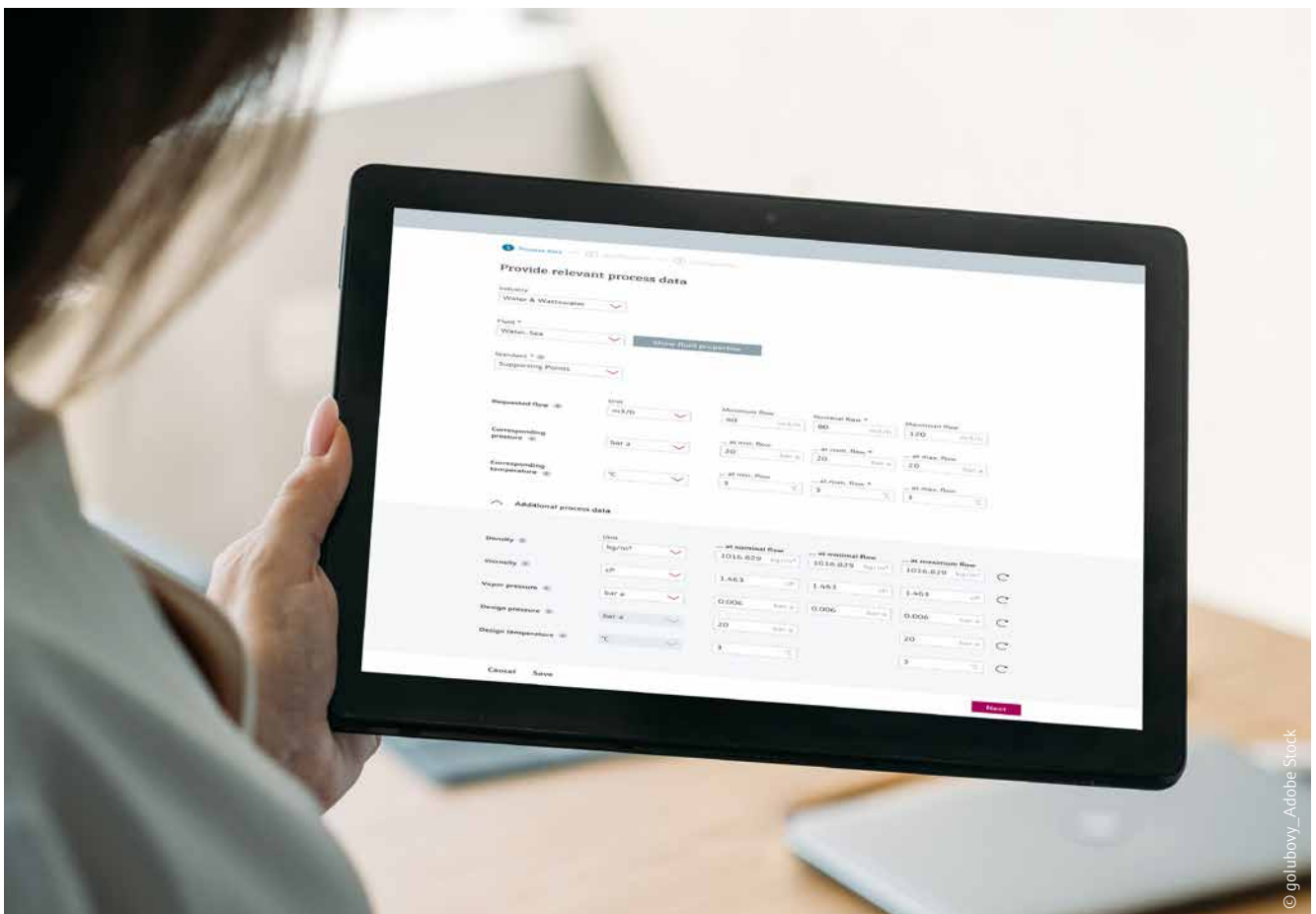
Application Applicator has been helping users to select and design measuring devices for more than 20 years. With Product Guide, Endress+Hauser is now taking the next step in providing even better support for the right product design. Newly integrated user guidance makes it considerably easier to select, design and configure measuring points and is optimized to the specific needs of applications. What makes it even more efficient is that you are taken from the application data straight to the finished measuring device. Particularly for complex measuring points that consist of multiple devices, the Product Guide offers new possibilities for creating complete

measuring points. For an analysis measuring point, this means that not only the sensor but the assembly, cable and transmitter are fully designed and configured.

Benefits

- Quick design and configuration of measuring devices
- Indication of the optimal measuring device based on process data
- Prevention of faults in complete measuring points

 cx.endress.com/productguide_en



Industrial Internet of Things – turn data into knowledge

The cloud-based Netilion IIoT ecosystem

Highlights

- 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

Application Netilion is a cloud-based industrial IoT ecosystem that is compatible across manufacturers and is designed for processes in industrial process engineering. It connects the physical and digital worlds. With Netilion, we are embracing digitalization to make knowledge accessible to our customers, to optimize processes and to enable quick decisions based on facts – anytime, anywhere. With its scalable approach and different digital offers, Netilion provides options that are precisely tailored to customer requirements.

Customized solution packages Endress+Hauser's digital solutions are provided in application-based packages. From the smart sensor to connectivity and extensive cloud applications for data analysis as well as corresponding interfaces to existing systems, 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.



Adapters and edge devices: How connectivity is created

Highlights

- Digitalization of existing or brownfield plants
- Connection without interfering with the system architecture
- Transmission of additional digital data via a second communication channel
- Simple transfer of analog networks via adapter solutions
- Immediate access to measurement and diagnostic parameters via mobile devices
- Immediate access to measurement and diagnostic parameters via smartphone app

Application 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 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 with 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.

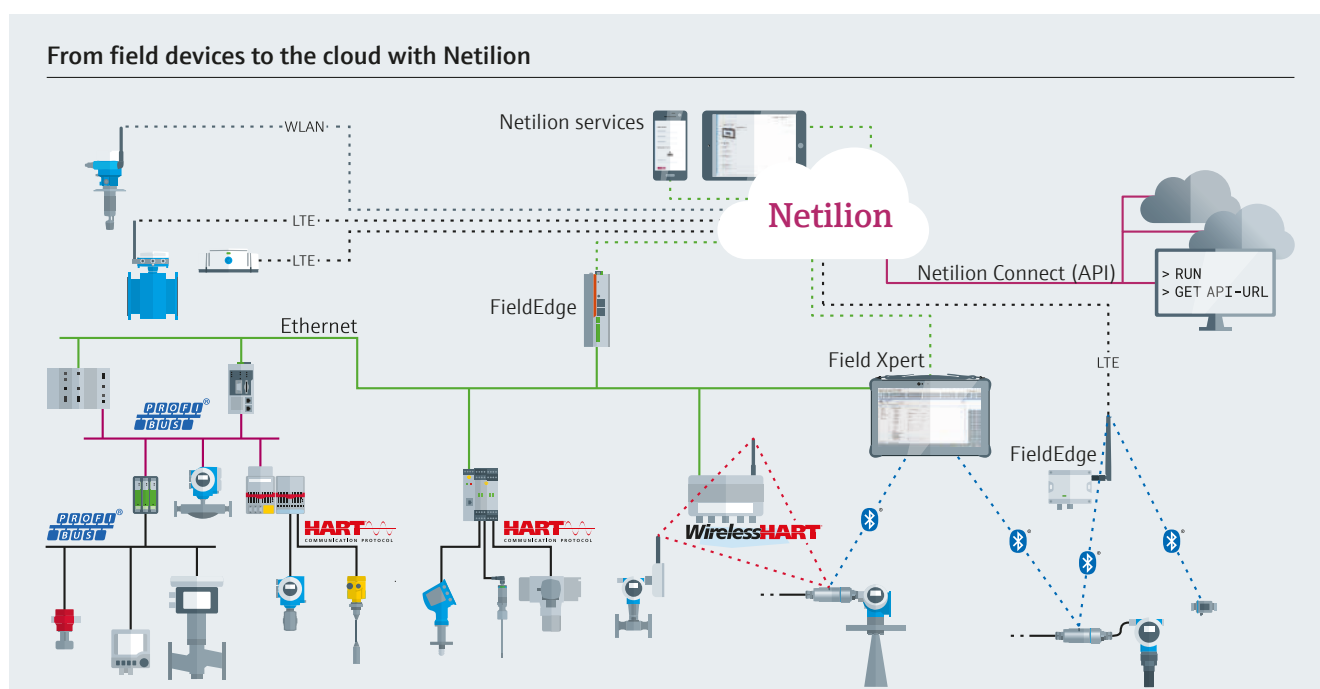
Simple adapter solution The new NOA-compliant FieldPort SWA50 adapter brings existing metrology equipment in analog networks into the cloud quickly and cost-effectively via gateways and edge devices. The wireless adapter connects existing 4 to 20 mA HART field devices to digital services by converting 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 with the measured value – even those from third-party manufacturers. Via the smartphone app, users can gain immediate access to measurement and diagnostic parameters.

➔ Our range of system components can be found from p. 62 onwards.

Quality marks and standards



 developer.netilion.endress.com






It monitors the pulse of your measurement and offers comprehensive insights

Heartbeat Technology gives you the answer

Enhance your plant's performance and ...

... increase reliability and safety	... reduce your inspection effort	... improve your process insights
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Heartbeat Technology

for diagnostics	for verification	for monitoring
		
Permanent process and device diagnostics	Documented device functionality without process interruption	Information about process optimization and predictive maintenance

Application 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 diagnostic, 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.

 www.endress.com/heartbeat



The next evolutionary stage in digital field instrumentation with Profinet-APL

Ethernet-APL: easy, quick, digital

Highlights

- Energy and data via two-wire cable
- Ethernet speed of 10 Mbit/s full-duplex
- Explosion protection with intrinsic safety for all zones and divisions
- Polarity-independent connection terminals, quick and easy to install
- Open to any type of industrial Ethernet protocol
- Easy to replace device
- Easy to integrate the device diagnostics into control and guidance systems
- Quick and easy access to all device parameters via web server
- NAMUR Open Architecture (NOA) via a second channel

Application 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 – due to a low bandwidth, a 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 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 the benefits of Ethernet into the field of process automation. Ethernet-APL enables complete digitalization in the process industry and in all life cycle phases.

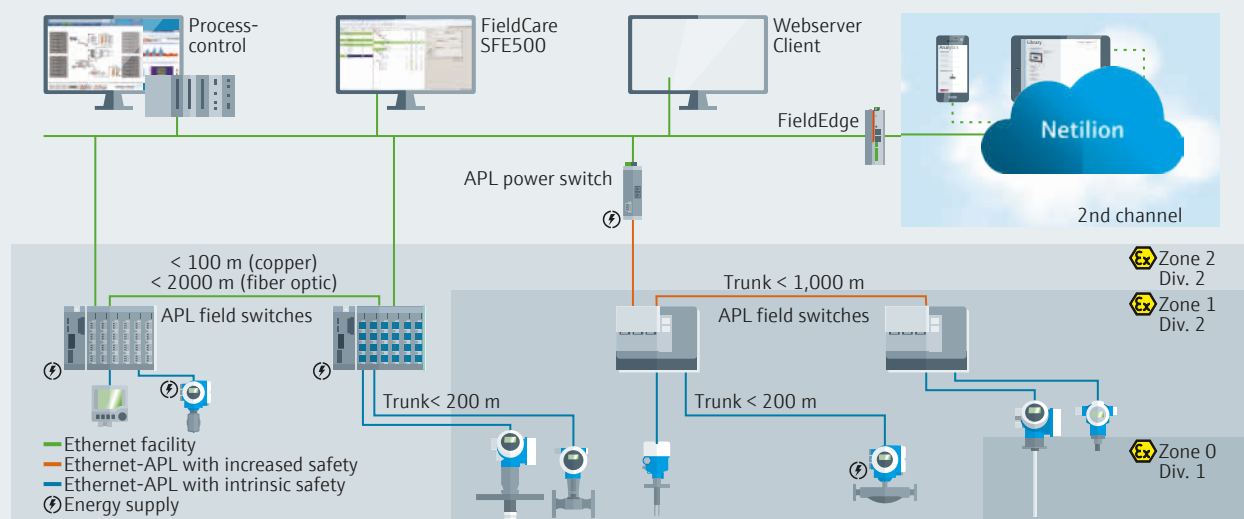


 www.endress.com/apl

 www.ethernet-apl.org



Ethernet-APL topologies



Tailor-made process solutions

Improve productivity and efficiency while also reducing your costs



At Endress+Hauser, we understand the unique challenges of your industry. The combination of our portfolio and technologies with expert consulting and requirements analysis, design and engineering capabilities, and seamless data integration with your system, means that you can rely on us to provide optimal industrial process solutions for the maximum performance of your plant. Endress+Hauser offers plant-wide process solutions that are specifically designed for your application requirements.



www.endress.com/solutions



You can find our various process solutions in this brochure on the following pages:

- 16 Digital solutions with the Netilion IIoT ecosystem
- 21 Legally certified tank gaging and flow measurement
- 22 Automated extraction solutions for process plants
- 24 SIL services for process plant operators
- 25 Solutions for ensuring compliance with water resource protection legislation (e.g. the German Federal Water Act)
- 46 Analysis panels for reliable monitoring
- 47 Analyzers and tailored measuring containers
- 61 Complete solutions for optimizing process analytics

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

Highlights

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

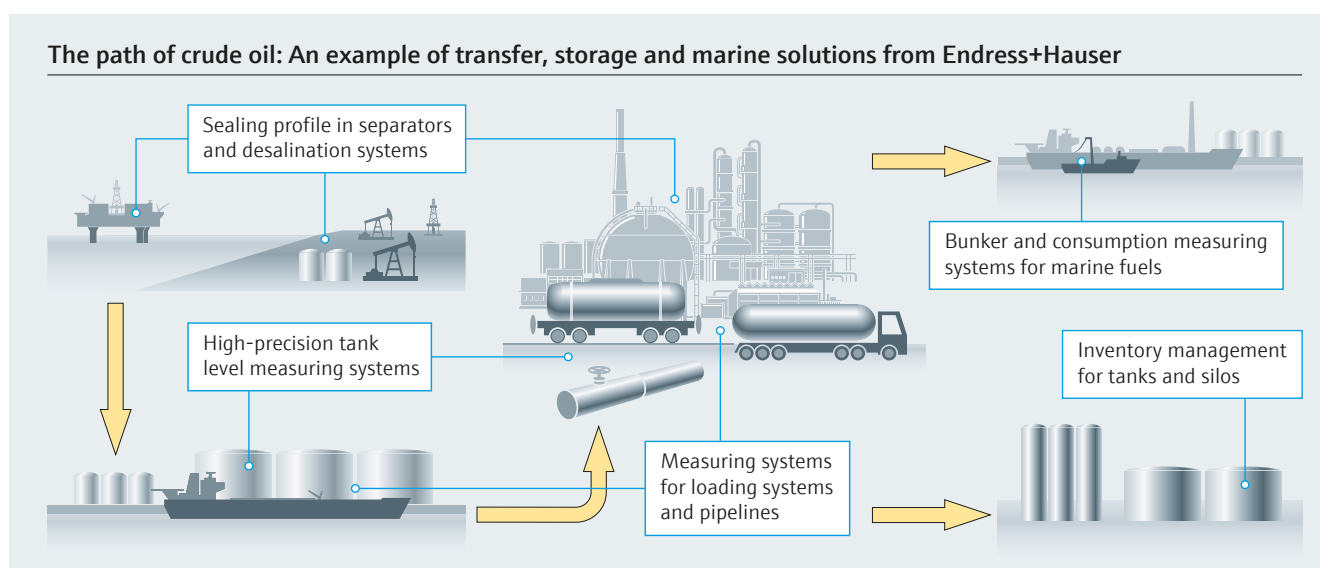
Application High-accuracy measuring systems and sensors are required wherever the storage and acceptance of raw materials in the process industry must be monitored and controlled. Endress+Hauser provides customized solutions with system approval characterized by convenient maintenance and extraordinary 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.

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

 www.endress.com/solutions



Spotlight on topics

Pressure

Flow

Liquid analysis

Level

Optical analysis

System components

Temperature

Services

From the measuring point to connecting to the ERP system: Everything from a single source

Automated extraction solutions for process plants

Highlights

- Process automation of extraction, evaporation and CIP systems
- Complete planning and delivery, from measurement technology through to commissioning and documentation
- Efficient management of mixing and dosing systems

Application Extraction covers separation processes in which one or more components are extracted from a substance mixture by adding a solvent. Usually the extract is further concentrated by means of an evaporation system. Endress+Hauser can take on the entire project management for you. In addition to hardware planning, designing components and creating circuit plans, Endress+Hauser can also provide software engineering, the automation concept and the SIL and Exi calculations.

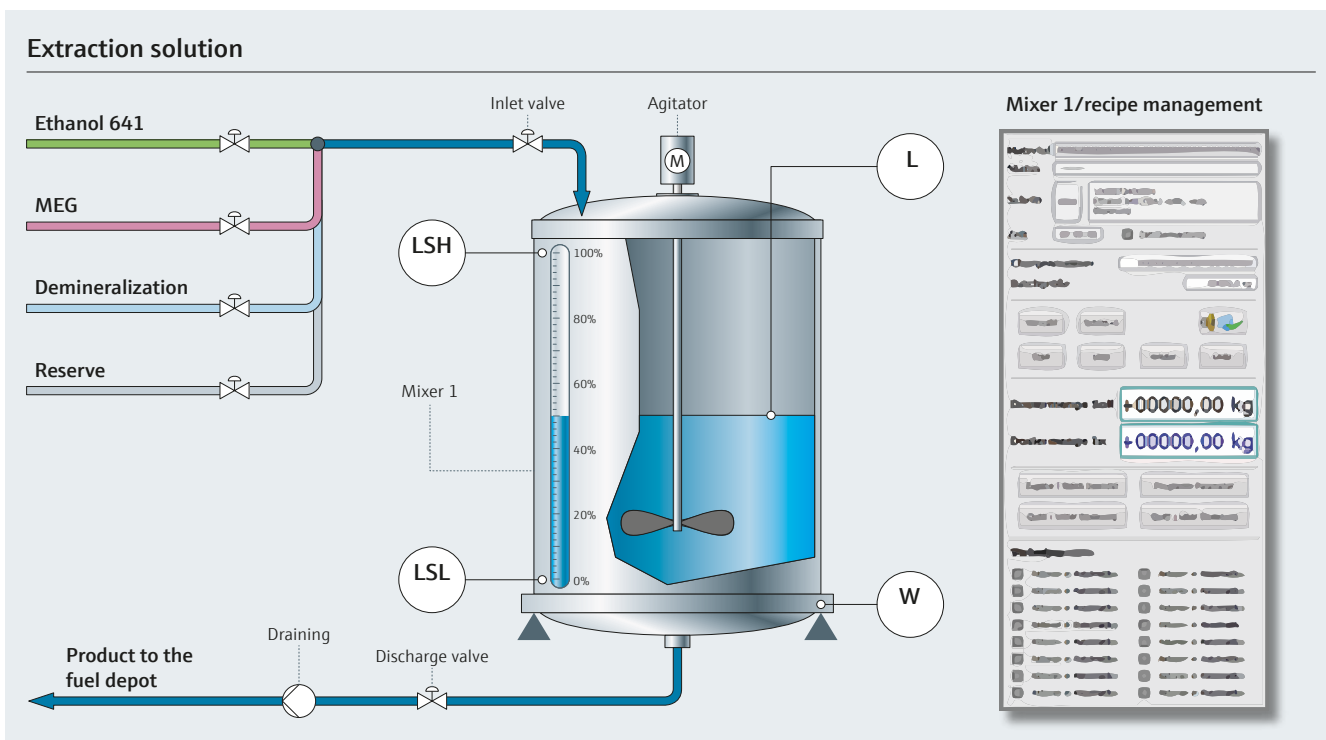
In addition, you will also be assigned a central contact partner for your next engineering project to ensure expert implementation from the outset.

Benefits

- Highly flexible recipe management (up to 1,000 different raw materials)
- High scalability and reproducibility
- Holistic planning and delivery of EI&C technology
- Induction and training for plant operators



www.endress.com/solutions



Plant safety in the process industry

Simply reliable



For production facility operators, plant safety is of great importance when it comes to minimizing risks to people, 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.



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



Quality marks and standards



Spotlight on topics

Pressure

Flow

Liquid analysis

Level

Optical analysis

System components

Temperature

Services

Safeguard protection function and optimum operation in safety devices

SIL services for process plant operators

Highlights

- 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)



Ensuring compliance with legal requirements as a specialist certified according to the WHG

Solutions and services for compliance with the WHG (German Federal Water Act), including periodic inspection

Highlights

- Customized device solutions tailored to your needs
- Services and documentation for ensuring statutory requirements
- Expert knowledge in design and recurrent inspections in accordance with the WHG

Our solutions and services for the WHG 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.

Benefits

- WHG specialist for over 25 years – certification of Endress+Hauser by the TÜV every two 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



Spotlight on topics

Pressure

Flow

Liquid analysis

Level

Optical analysis

System components

Temperature

Services

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 Endress+Hauser’s solutions. Innovations in sensor technologies, software tools and 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

 www.endress.com/aplicator-corporate

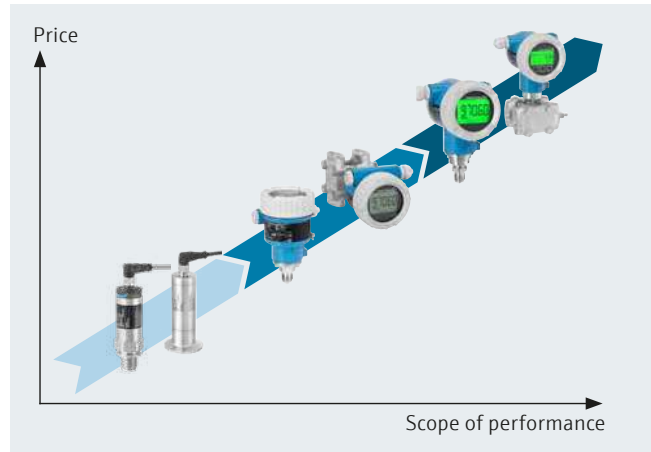


Quality marks and standards



Pressure measurement technology for every field of application

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, you only pay for what the process needs.



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

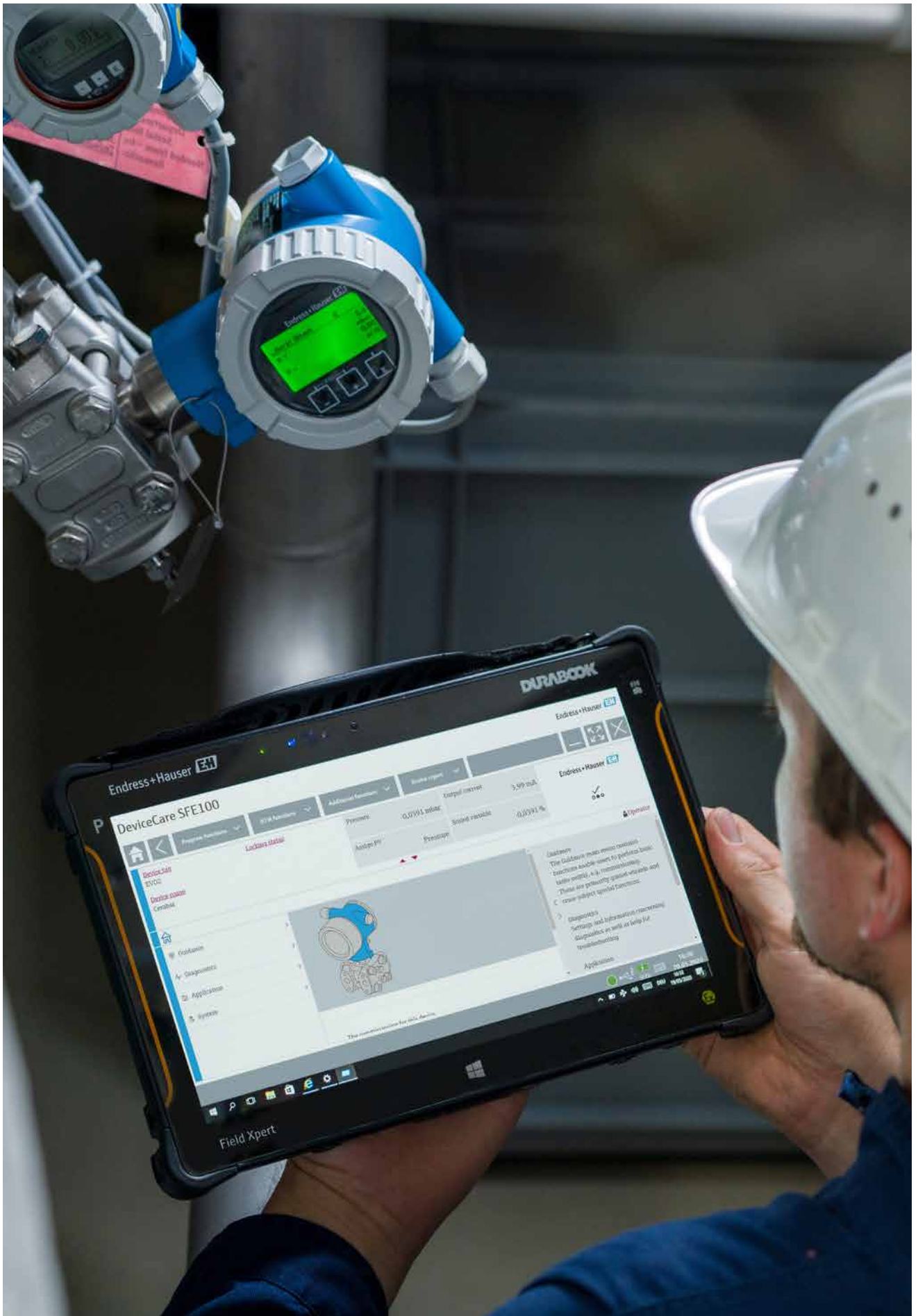
...to matching accessories...

The majority of all pressure measuring points are equipped with matching accessories, such as shut-off valves, valve blocks, flushing rings and 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 and maintenance of your pressure transmitters. Or do you need a tailor-made mechanical solution, such as a complete rack?





Spotlight on topics

Pressure

Flow

Liquid analysis

Level

Optical analysis

System components

Temperature

Services

Compact transmitters for accurate pressure measurement in liquids and gases

Cerabar PMP51B and PMC51B

Highlights

- Considerable time savings – simple and wireless configuration using a Bluetooth® interface
- Maximized process reliability – integrated undervoltage detection and development to IEC 61508 for SIL 2/3 applications
- High productivity – integrated digital assistant for simple commissioning

Application The new 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.



Cerabar PMP51B



Cerabar PMC51B

Quality marks and standards



www.endress.com/pmp51b



www.endress.com/pmc51b



Transmitter for monitoring differential pressures

Deltabar PMD55B

Highlights

- Considerable time savings – simple and wireless configuration using a Bluetooth® interface
- Maximized process reliability – integrated undervoltage detection and development to IEC 61508 for SIL 2/3 applications
- High productivity – integrated digital assistant for simple commissioning

Application Thanks to its measuring ranges of between 5 mbar and 44 bar, the new compact differential pressure transmitter can be used in a wide variety of applications: 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.



Deltabar PMD55B

Quality marks and standards



www.endress.com/pmd55b



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

Cerabar PMP71B and PMC71B

Highlights

- More productivity – Bluetooth® simplifies workflows such as commissioning or documentation
- More process reliability – development to IEC 61508 for SIL 2/3 applications and digital assistants
- More Industry 4.0 – integrated functionalities such as Heartbeat Technology

Application The new 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. Measuring ranges of between 5 mbar and 720 bar and process temperatures of between -70°C and +400°C.

Quality marks and standards



Cerabar PMC71B



Cerabar PMP71B



www.endress.com/pmp71b



www.endress.com/pmc71b



High-end differential pressure transmitters for liquids and gases

Deltabar PMD75B and PMD78B

Highlights

- More productivity – Bluetooth® simplifies workflows such as commissioning or documentation
- More process reliability – development to IEC 61508 for SIL 2/3 applications and digital assistants
- More Industry 4.0 – integrated functionalities such as Heartbeat Technology

Application Thanks to their measuring ranges of between 1 mbar and 40 bar and process temperatures of between -70°C and +400°C, the new high-end differential pressure transmitters can be used in a wide variety of applications: in conventional filter monitoring, for measuring extreme temperatures, extremely low differential pressures in towers, level measurements with the hydrostatic measuring principle or flow measurements using the differential pressure method.

Quality marks and standards



Deltabar PMD75B



Deltabar PMD78B



www.endress.com/pmd75b



www.endress.com/pmd78b



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 and 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 and 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 higher-performing and, 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

 www.endress.com/aplicator-corporate



Quality marks and standards



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

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 marks and standards



Product portfolio for gas flow measurement



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 H₂, He or O₂
- 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 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 ₂	✓		✓	✓	
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 and even compressed natural gas (CNG).



t-mass thermal mass flow measurement is the technology of preference for measuring dry and clean gases such as compressed air, nitrogen, argon and 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.



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 integrated pressure and temperature measurement, the technology offers gas analysis values, e.g. mass flow, standard volume flow and energy flow, and support for methane content detection.



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 and energy flow measurement. Thanks to its various material certificates, Prowirl can even be used in hydrogen and 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).

Electromagnetic flow measurement and its many benefits

Proline Promag with new features

Highlights

- Coating detection – identify film formation to increase plant availability
- Heartbeat Sensor Integrity (HBSI) parameter increases measurement certainty by detecting magnetic field disturbances
- Calibrated conductivity measurement integrated with calibration certificate
- Stable and cost-effective measurement without ground disk

Application The new performance characteristics enable process optimization and increase measurement certainty 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.



Promag W 300

Quality marks and standards



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

Promag 10, 300/500 and 400

Highlights

- 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 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 runs and without any pipe constriction, resulting in no pressure loss.



Promag W 400

Quality marks and standards



www.endress.com/5W4C



Single-use Coriolis with an extremely high level of accuracy and traceable calibration

Promass U 500

Highlights

- Pre-calibrated measuring tubes with, no field calibration required
- Compact design for single-use applications in the process, in the laboratory and on skids
- Heartbeat Technology enables the pre-calibrated sensor to be verified in the field

Application The new Promass U 500 Coriolis measuring device combines the highest accuracy with the repeatability of single-use technology. It enables multi-variable measurement and full compliance with all relevant requirements in the pharmaceutical industry. Integrated Heartbeat Technology automatically verifies the validity of the factory calibration during installation in the field.



Promass U 500

Quality marks and standards



www.endress.com/8U5B



Coriolis flow measurement redefined – top performance up to DN 250

Promass Q 300/500

Highlights

- 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 The measuring device 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.



Promass Q 300

Quality marks and standards



www.endress.com/8Q3B



Non-invasive flow measurement with ultrasonic clamp-on

Prosonic Flow P 500 and W 400

Highlights

- Innovative FlowDC function enables short inlet runs (up to 2 x DN) without any loss of measurement accuracy
- Easy and reliable installation thanks to integrated installation testing and status display
- Maintenance-free operation with long-term stability thanks to coupling pads

Application Ultrasonic clamp-on measuring devices mean that measuring points can be flexibly retrofitted or defective measuring devices can be replaced without interrupting the process. It is also easy to measure corrosive, abrasive and toxic media without pressure loss. Prosonic Flow is suitable for use in an extremely diverse selection of liquids, nominal diameters and pipe materials.



Prosonic Flow P 500



Prosonic Flow W 400

Quality marks and standards



www.endress.com/9P5B



www.endress.com/9W4B



Continuous inline measurement of the solids content for maximum transparency

Teqwave MW 300/500

Highlights

- Direct inline measurement enables immediate process control without laboratory analyses and saves resources
- A higher solids content in dewatered sludge reduces the transportation and disposal costs for incineration
- Efficient dosing of the flocculant according to the current solids content saves costs

Application The Teqwave MW 300/500 measuring device determines the solids content in wastewater treatment plants and in water treatment by using microwave transmission directly in the wastewater. The continuously determined measured values and the short response time enable process optimization in sludge treatment from primary sludge to dewatered sludge.



Teqwave MW 300

Quality marks and standards



www.endress.com/4W3B





Spotlight on topics

Pressure

Flow

Liquid analysis

Level

Optical analysis

System components

Temperature

Services

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 a 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 all the boxes for flexibility with easy operation and maintenance
- Comprehensive sensor portfolio for analysis parameters, e.g. pH, conductivity, oxygen, turbidity, nutrients and 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

 www.endress.com/aplicator-corporate



Quality marks and standards



Memosens 2.0 – simple, reliable and connected

Highlights

- 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 the 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



www.endress.com/memosens



Quality marks and standards



Liquiline transmitters – the right transmitter for any analysis application

Highlights

- 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

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 a 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



www.endress.com/liquiline



Quality marks and standards



Liquiline Mobile CML18



Liquiline Compact CM72/82



Liquiline CM42



Liquiline CM44x

Spectrometer for inline color measurements

Memosens Wave CKI50

Highlights

- Improved quality checks: Detect color deviations in the end product and monitor them during the process
- Improved filling checks: Reliable and fast color detection for reliable filling
- Improved phase checks: Detect phases in piping and minimize product losses

Application The Memosens Wave CKI50 process photometer boasts a compact design with a low minimum immersion depth (68 mm). It measures the color (spectrum: CIE Lab) in the process quickly and reliably, while also ensuring hygiene and material standards are met according to the specifications of the food industry. Thanks to a pre-installed color model and its connection to a Liquiline transducer, it is easy to commission and the measurements remain stable with a high degree of repeatability.

Quality marks and standards



www.endress.com/cki50



Spectrometer probe for monitoring multiple water quality parameters

Memosens Wave CAS80E

Highlights

- 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.

Quality marks and standards



www.endress.com/cas80E



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

CCS5xE digital disinfection sensors with Memosens 2.0 and Flowfit CYA27

Highlights

- Complete sensor portfolio for disinfection
- Memosens 2.0 enables predictive maintenance and extended IIoT services
- Multi-parameter measurements with modular configuration thanks to Flowfit CYA27 – more than just a sensor holder

Application Endress+Hauser has modernized and expanded its disinfection portfolio continuously 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:

- In food processing – to ensure food safety
- In coolant/cooling towers – to avoid biofilm and pathogen growth and to comply with legal requirements
- In drinking water – to ensure 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



Benefits

- Plug & play: Low installation effort thanks to pre-calibrated Memosens sensors
- Long maintenance intervals and fast polarization times save time and costs
- Reliable monitoring of chlorine absence safeguards product quality and the material thanks to sensors that are proven not to fail
- Fast response time with digital communication
- Predictive maintenance with Heartbeat Technology ensures permanently reliable disinfection monitoring
- Simple, cost-saving and space-saving – multi-parameter Flowfit CYA27 with modular configuration with a low water consumption of just 5 l/h

 www.endress.com/disinfection

 www.endress.com/cya27



Quality marks and standards



Customer-specific complete solutions for liquid analysis

Analysis panels for reliable monitoring

Highlights

- 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

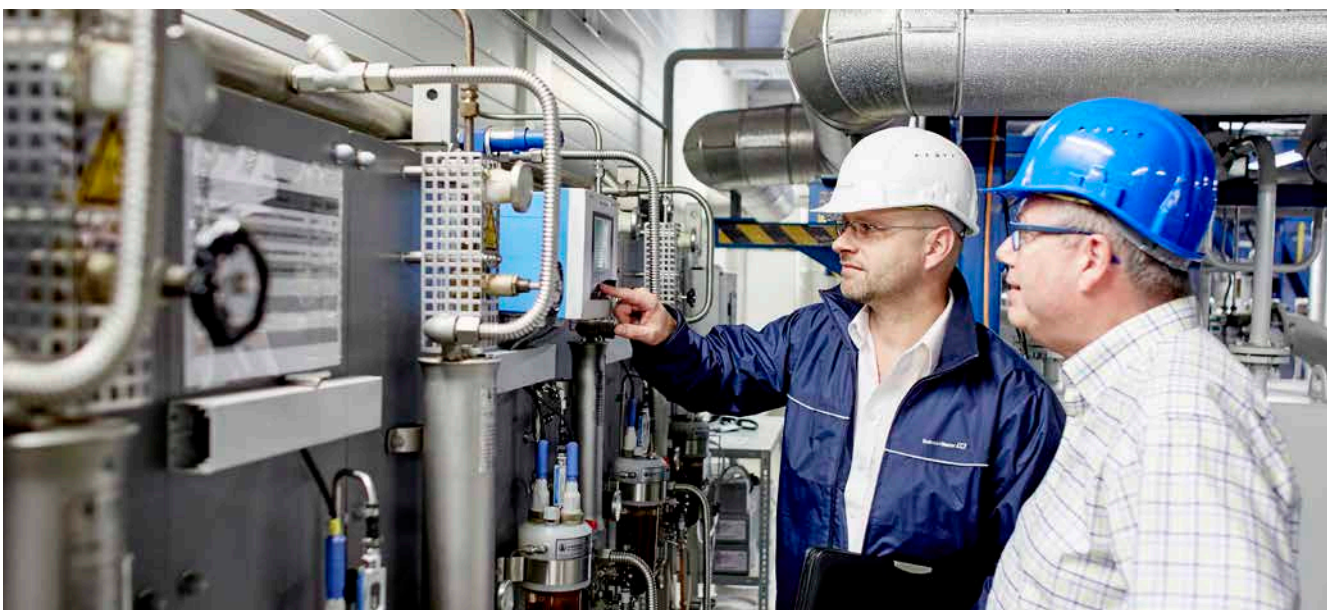
Application Whether in drinking water, process water, coolant, wastewater or water vapor circuits, the combination of the Liquiline multi-channel transmitter and digital Memosens sensor on the same panel is the optimum solution for measuring points with multiple analysis parameters. The modular build 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



Tailored measuring cabinets and containers

Highlights

- 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 expert 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



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. At 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 IEC 61508

➔ For information on solutions satisfying the German Federal Water Act (WHG), see p. 25.

 www.endress.com/level

 www.endress.com/aplicator-corporate



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, including complex mixtures, emulsions and where distinct interfaces exist, we have the optimum technology for you. Interface measurements use guided wave radar, capacitive level measuring technology and radiometry.

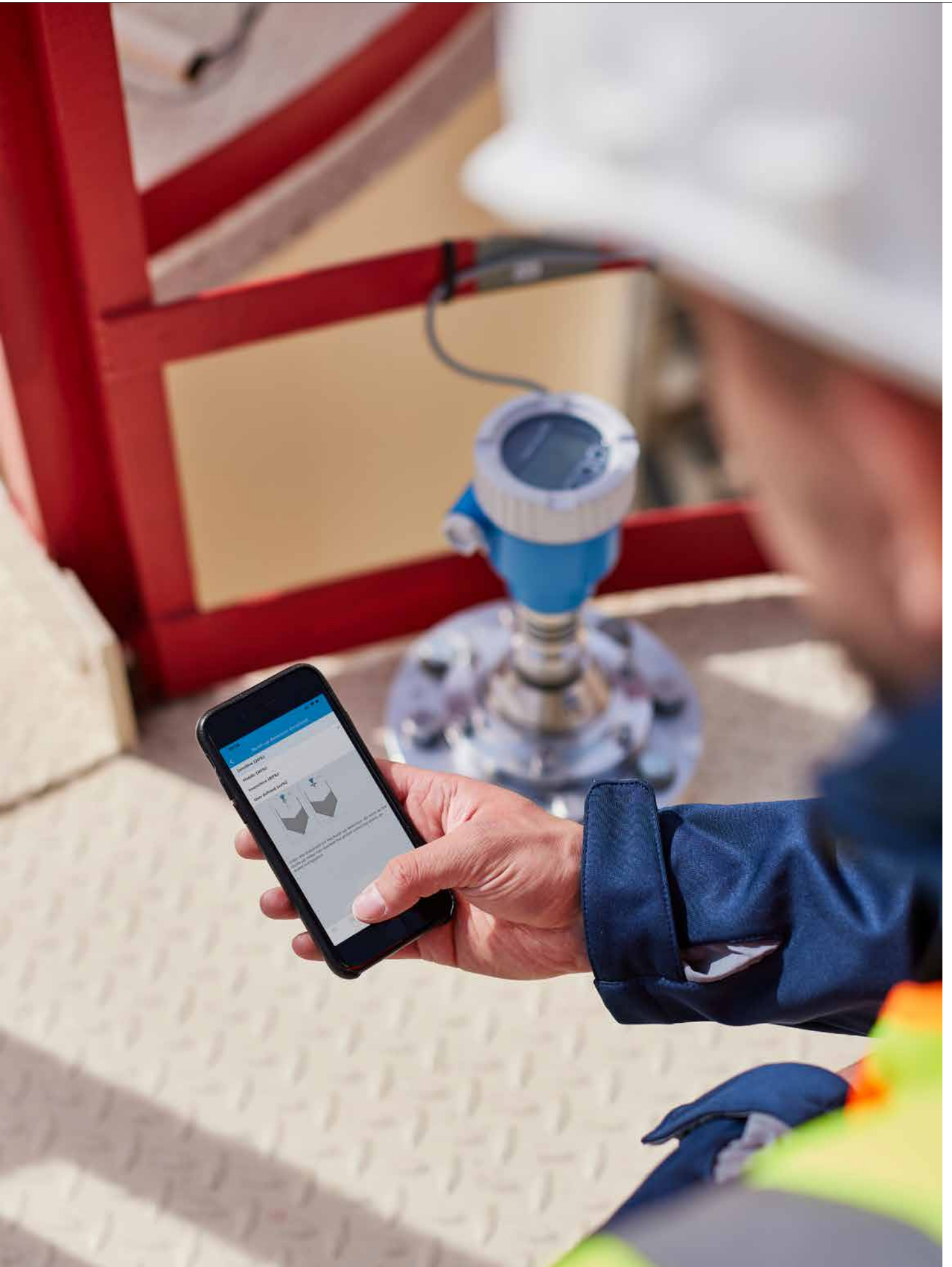
Density/concentration determination: Quality-relevant data on density and concentration can be determined by the measuring principles of vibronics, Coriolis and radiometry.

✓ 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





Spotlight on topics

Pressure

Flow

Liquid analysis

Level

Optical analysis

System components

Temperature

Services

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

Micropilot FMR6xB

Highlights

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

Application The new level transmitters combine the benefits of 80 GHz technology with the maximum device safety defined by international standard IEC 61508 for functional safety. 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.



Micropilot FMR63B



Micropilot FMR62B

Quality marks and standards



www.endress.com/micropilot-new-generation



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

Liquiphant FTL51B and Liquiphant FTL6x

Highlights

- 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. Specifically developed for the food and beverage and life sciences industries, the new Liquiphant FTL63 is compliant to all their hygienic requirements.



Liquiphant FTL51B



Liquiphant FTL63

Quality marks and standards



www.endress.com/liquiphant



Cloud-based 80 GHz radar level transmitter

Micropilot FWR30

Highlights

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

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, at 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 and cleaning agents in the food & beverage industry.



 www.endress.com/fwr30



Spotlight on topics

Pressure

Flow

Liquid analysis

Level

Optical analysis

System components

Temperature

Services

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

Soliwave FQR16/FDR16 and Solimotion FTR16

Highlights

- 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 on 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.



Soliwave FQR16



Solimotion FTR16

 www.endress.com/fdr16

 www.endress.com/ftr16



Optical analysis

Optical analysis

Qualitative and quantitative determination of chemical 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 production processes in industrial plants. When PAT is used alongside widely adopted process instrumentation, it provides a distinct increase in transparency across operations. To enhance process efficiency, accelerate development, and ensure product quality, monitoring and control with modern PAT plays a crucial role.

What we offer Endress+Hauser's analytical instruments 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 production. 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 H₂O, H₂S, CO₂, NH₃ and C₂H₂ 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, for example in the food industry.

✓ Your benefits

- Secure and improve product quality, optimize processes and increase yield with inline analysis 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 analysis
- 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

 [www.endress.com/
process-analytical-technology](http://www.endress.com/process-analytical-technology)

 [www.endress.com/
process-analytical-chemistry](http://www.endress.com/process-analytical-chemistry)



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

Raman Rxn2 analyzer

Highlights

- Suitable for use with a comprehensive range of laboratory and process probes and in any 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.



Raman Rxn2 analyzer and mobile wheeled cart

 www.endress.com/rxn2b



Molecular material properties directly from the engineered process

Raman Rxn4 analyzer

Highlights

- 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 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 Rxn-41 probe for cryogenic liquids. It also improves repeatability tenfold compared to gas chromatographs (GC) in custody transfer of LNG. Suitable for use with chemical, petrochemical, life science, and food & beverage applications.



To be installed in a standard 19" rack



Optional: User-friendly touchscreen

 www.endress.com/rxn4b



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

High-precision trace measurement of hydrogen sulfide to ensure the gas quality

JT33 TDLAS gas analyzer

Highlights

- Proven differential spectroscopy for taking measurements of H_2S in the trace range (ppm) and in the event of interference from background gas
- High availability with very low maintenance effort and without requiring on-site recalibration
- Automatic validation for time-controlled or requirement-based condition monitoring of the system

Application The JT33 analyzer offers continuous and reliable measurements in real time to monitor low H_2S concentrations in order to prevent corrosion in pipelines or unpredictable events. For example, this applies to natural gas pipelines, natural gas processing and quality control of biomethane before it is fed into the gas grid.



JT33 TDLAS gas analyzer



www.endress.com/jt33



Turnkey laser-based analysis for gas composition determination

Raman Rxn5 process analyzer

Highlights

- Analyzer for simultaneous multi-channel gas phase analysis
- 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 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.



Raman Rxn5 process analyzer



www.endress.com/rxn5b



High-accuracy trace moisture measurement for gas quality control

J22 TDLAS gas analyzer

Highlights

- Measurement of H₂O 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
- An economic total solution: features common gas sample conditioning systems in combination with other gas analyzers

Application The J22 TDLAS gas analyzer uses patented tunable diode laser absorption spectroscopy (TDLAS) technology to provide highly accurate online real-time measurements of H₂O 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.



J22 TDLAS gas analyzer



www.endress.com/j22



Reliable oxygen measurement for gas applications

OXY5500 oxygen analyzer

Highlights

- Real-time online measurements of oxygen (O₂) in gas streams from ppm to the percentage range
- Monitoring of, hydrogen or natural gas, in production and in upstream processes, 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

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 analyzer is unaffected by H₂S and other compounds that cause 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.



OXY5500 oxygen analyzer



OXY5500 oxygen analyzer including gas sample preparation



www.endress.com/oxy5500



Process analysis solutions – more than just instrument hardware

Application-specific complete solutions and services for optimizing process analytics

Highlights

- More than 30 years of experience in the development of customer-specific analysis solutions
- Matched components enable optimum commissioning with reliable analysis
- 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
- ISO 9001:2015/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 and application-oriented solutions for Raman, TDLAS and QF

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

 www.endress.com/solutions



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 tools – from the basic solution of 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

 www.endress.com/aplicator-corporate



Quality marks and standards



Interface system with central power supply and ATEX approval

RNx2x DIN rail interfaces

Highlights

- 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 can be used both as an active barrier and as a passive barrier. The device is available in a single-channel or two-channel version. 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 SIL 2 SC 3. With the RNO22 output isolating amplifier, valves or displays can be controlled. The device is also suitable for use in Ex zones. 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; the RNB22 power supply can power the system when there is no 24 VDC source available.



RNx2x



www.endress.com/rn22



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

RN42 and RLN42 DIN rail interfaces

Highlights

- 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 SIL 2 SC 3

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 as a passive barrier. The device is designed as a single-channel version and can be used very flexibly, meaning the output can be connected to passive as well as active PLC inputs. HART signals are also transmitted by the RN42 and it can be used in up to SIL 2 SC 3 applications. The RLN42 NAMUR isolating amplifier is for safely transmitting digital states from Ex zones to non-Ex zones. It is also suitable for SIL applications up to SIL 2 SC 3. Its compact design accommodates two channels on a width of 12.5 mm.



RN42



www.endress.com/rn42



www.endress.com/rln42



Universal high-performance tablet PC for mobile device configuration

Field Xpert SMTxx

Highlights

- 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.



Field Xpert SMTxx



www.endress.com/smt50



Connectivity solutions for different system architectures

Netilion edge devices and Netilion gateways

Highlights

- 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

Application 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).



FieldEdge SGC200 – Bluetooth® edge device



Fieldgate SFG500 – basic mode Ethernet gateway with integrated web server



FieldPort SWA50 adapter for data transmission via WirelessHART and Bluetooth®



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



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 – taking into account 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, SIL 2/3 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

 www.endress.com/temperature

 www.endress.com/aplicator-corporate



Quality marks and standards



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

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

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

Permanent reliability of measurements with automated self-calibration

iTHERM TrustSens TM371

Highlights

- No plant shutdown thanks to in-line self-calibration; fully automated and traceable
- Automated certificate generation and documentation – audit-proof
- Maximized process reliability and plant availability thanks to Heartbeat Technology

Application The multi award-winning, intelligent thermometer with integrated HART® transmitter and Heartbeat Technology has the world's first RTD sensor capable of fully automated in situ self-calibration. The device practically eliminates the risk of undiscovered non-conformities, reduces production downtime and increases product safety and process efficiency in plants from the beverage, food and life sciences industries. It is compliant with FDA 21 CFR Part 11 requirements and GMP guidelines and can be integrated into the cloud-based Netilion IIoT ecosystem.



www.endress.com/trustsens



Double-walled multipoint cable probe for detecting 3D or linear temperature profiles

iTHERM MultiSens TMSxx and iTHERM ProfileSens TS901

Highlights

- Measuring and recording a temperature profile in containers, reactors and distillation columns
- Extremely short response times thanks to a high number of temperature sensors
- Option of increased safety with a diagnostic chamber

Application The iTHERM MultiSens portfolio can be configured for a wide range of application scenarios in different sectors. They provide a complete temperature profile over immersion lengths of up to 32 m with just one process connection. The variants can be configured with or without a thermowell. In addition, an optional diagnostic chamber serves as an additional containment feature. Simple process integration reduces the installation effort and maximizes plant availability.



TMS01



TMS21

Quality marks and standards



www.endress.com/multisens



Groundbreaking, highly modular and intrinsically safe temperature sensor

iTHERM ModuLine TM131

Highlights

- Universal range of application
- Option of a secondary containment feature ensures reliable plant availability
- Easy, intuitive operation, including in Ex zones, with Bluetooth®

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. The secondary containment feature, which is available as an option, prevents the medium from escaping if there is a thermowell leak and sends a signal to the controller.



Quality marks and standards



www.endress.com/tm131



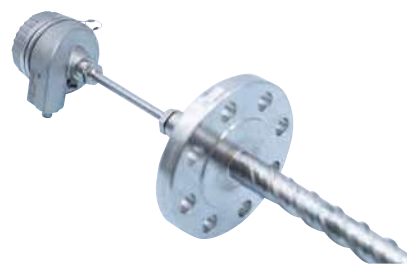
Measure temperature up to five times faster with patented thermowell technology

iTHERM ModuLine TM131/TM151

Highlights

- Fast response time thanks to the combination of the thermowell and sensor
- Heat-transfer material eliminates the air gap in the thermowell
- Reduction in vortex-induced vibrations thanks to the TwistWell TT151 thermowell

Application 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. Incorporating a heat-conducting material displaces the insulating air. This means that thermal oil does not need to be used. The patented TwistWell thermowell in the TM151 thermometer reduces vortex-induced vibrations (VIV) by over 90%, and therefore improves process reliability.



iTHERM ModuLine TM131 with TwistWell TM151



www.endress.com/quicksens



Digital temperature transmitters

iTEMP TMT71/TMT72 and TMT86

Highlights

- Digital communication to the field level, even in potentially explosive atmospheres
- High accuracy thanks to sensor-transmitter matching
- Quick and easy tool-free installation thanks to the push-in clamping technology

Application The function of temperature transmitters is to transform the sensor signal of resistance thermometers and thermocouples, as well as resistance and voltage signals, into a digital output signal. The new TMT86 head-mounted transmitter is a head-mounted transmitter featuring two sensor inputs with Ethernet-APL interface and PROFINET® communication protocol. The device is supplied by the two-core Ethernet connection. The TMT7x transmitters are Bluetooth®-capable temperature transmitters. The free-of-charge SmartBlue app can be used to control the measuring points in a user-friendly manner via Bluetooth®.



TMT72 with head transmitter display unit



TMT86 transmitter with Ethernet-APL

Quality marks and standards



www.endress.com/tmt72



www.endress.com/tmt86





Spotlight on topics

Pressure

Flow

Liquid analysis

Level

Optical analysis

System components

Temperature

Services

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 the 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 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



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 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

Plan & Startup	Help & Learn	Operate & Certify	Manage & Improve
Projects & commissioning	Support & training	Maintenance	Optimization
			
Project management	Support	Diagnostics & repair	Managed services
Engineering	Training	Calibration	Optimization service
Planning & project development		Maintenance	
Commissioning			
Digital services			

Priority support with rapid remote assistance and 24/7 access to expert knowledge

Smart Support

Highlights

- Prioritization of support queries for a faster response time
- Visual Support for rapid and efficient support from experts
- Your “My Endress+Hauser” account is straightforward to use for support queries, to view support cases and to have 24/7 access to expert knowledge

Smart Support offers you the advantages of a comprehensive support agreement exactly according to your needs. In an emergency, you can rely on the rapid assistance of our experts. Use Visual Support to allow experts to look over your shoulder during commissioning. This reduces the time and costs required for diagnostics and troubleshooting.



Remote commissioning with live video assistance

Smart Start-Up

Highlights

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

Smart Start-Up offers rapid remote support for commissioning. Ensure that your measuring devices are operating optimally from the outset and benefit from the device expertise of our specialists without having to undertake long-term planning. By talking to the technician, users can become familiar with the new measuring devices and ask individual questions about the device in the application.



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

Calibration optimization

Highlights

- Knowledge transfer of metrology and calibration expertise into the company and audit trail documentation to meet quality assurance standards
- Ideal cost/risk balance thanks to correctly determined criticality and MPE
- Reduction of “out of tolerance” calibrations as a consequence of unrealistically low MPE

Endress+Hauser is your partner for optimized calibration. You will be advised and supported by our calibration and maintenance experts with metrology, calibration and measurement technology know-how.

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.

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.

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



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



Optimization of calibration processes

Standardization of processes

Optimization of the calibration process

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.

Creation of transparency

Measuring performance analysis

We analyze calibration results, help you to identify process measuring risks and provide recommendations for necessary preventative or corrective measures.

Definition of principles

Criticality/MPE evaluation

We offer best-practice methods for determining device criticalities and MPE. Our experts will provide you with support for practical implementation of theoretical calculations.

Cost/risk balance

Calibration interval optimization

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.

Correct monitoring and reporting

Services for CO₂ emissions trading

Highlights

- 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 CO₂ emissions trading, the German Emissions Trading Authority (DEHSt) checks the uncertainty records of CO₂-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. Endress+Hauser's ISO/IEC 17025 accreditation 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.



Legal compliance with the minimal possible process interruption

Accredited calibration service and calibration testing

Highlights

- Manufacturer-independent calibration of all process parameters
- Calibration during operation or in the laboratory
- DAkkS-accredited on-site calibration service for the parameters of flow, pressure and temperature – in accordance with ISO/IEC 17025
- High-accuracy production calibration rig for flow with minimal measurement uncertainty of < 0.015%

As one of the leading manufacturers of measuring devices for the process industry, we possess the expertise gained from carrying out well over one million calibrations. From creating a calibration specification to implementing a complete calibration management solution, we support you throughout the entire process.

Calibration directly on site or in the laboratory

In Endress+Hauser's accredited calibration laboratory, we reliably calibrate every measured variable in the process industry, such as flow, pressure and temperature – irrespective of the manufacturer. 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. The sensor can

therefore be tested under real operating conditions directly at the installation location. With extensive experience in metrology, measurement technology and calibration, as well as certified calibration technicians and traceable documentation, we maximize the potential of on-site calibration without compromising safety or compliance.

Calibration testing In addition to calibration, Endress+Hauser also offers calibration testing of stationary measuring systems. The use of Coriolis mass flowmeters as a permissible working standard enables more efficient calibration testing. By looping in the compact working standard in series to the DUT, time and costs can be saved when calibrating for products such as gasoline, diesel, vegetable oil, AdBlue, beer, milk and alcohol.

Benefits

- Minimize your auditing effort with an accredited and completely traceable calibration
- Increase plant availability thanks to innovative inline calibration process
- Reduce coordination effort as only one partner is needed for all device models and makes





Spotlight on topics

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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 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.



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