Highlights 2019

Measurement technology, services and solutions for process automation

Endress+Hauser
People for Process Automation

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Product highlights for 2019

Dear customers and partners of Endress+Hauser,

We have finally and undeniably entered the era of Industry 4.0. Data is regarded as the new oil, but with a crucial difference – rather than being finite, it is a resource that can be used over and over again.

Field devices in industrial process plants supply important data that helps to control processes and implement genuine predictive maintenance strategies. Read page 14 to find out where the journey with our latest Industry 4.0 solutions will take us!

Endress+Hauser's brand promise is to help you, our customers, improve your processes. We have been delivering on our promise for more than 65 years by continually redesigning and expanding both our product range and our solutions and service portfolio to meet your needs. In this brochure, we are presenting our highlights for 2019. Heartbeat Technology for process measurement technology is a highlight for Endress+Hauser. This technology equips our devices with diagnostics, verification and monitoring functions and helps you gain transparency about the status of your plant and implement genuine predictive maintenance strategies.

We will also be presenting the successor product to our bestseller, the Liquiphant. The further improved classic is now available with Heartbeat Technology. As a result, it offers benefits including an interactively guided series of tests for WHG and SIL applications.

What challenges lie ahead for you in 2019?
Contact us to let us know!

Best wishes

Stefan Menschel
Head of Marketing

One partner for everything – and the world of process automation is complete

Endress+Hauser is one of the world's leading providers of measurement technology services and automation solutions, with the widest product range on the market

Increasing competitive pressure, high plant efficiency and low overall operating costs – these are the factors that define the everyday routines of your company. To meet these requirements today and in the future, you need reliable partners with innovative and useful solutions.

Endress+Hauser stands for

- Over 65 years of experience in process automation
- A solid, financially strong and independently run family company
- A global partner with an international sales and service network as well as production sites all over the world
- Fairness, reliability and long-term business partnerships
- Top-quality products and consultation services
- Innovation and technological leadership

What Endress+Hauser has to offer

- Endress+Hauser offers you the most comprehensive range of process measurement technology.
- With this range of field devices and our standardized and uniform platforms, you can significantly reduce the variety of devices used and optimize your processes.
- Beyond the field level, we implement complete automation solutions and integrate actuators and control technology, regardless of manufacturer.
- A wide range of services, including complete life cycle management solutions, guarantee the availability of your plants as well as preserving their value.

Specific expertise in your industry too Our employees' experience and expertise covers a wide spectrum; they are familiar with the special requirements of many industries.

Simply everything. Everything simple. Your reliable partner in process automation provides you with high plant availability, far-reaching potential savings and maximum safety for people, the environment and processes.

Simply reliable – plant reliability

Our expertise guarantees safety and reliability for you and maximum availability of your plant

Over 250 certified product lines

- Extensive range of devices for hazardous area, SIL and WHG applications (suitable for Zone 0 applications)
- Over 100 SIL 2/3-certified product lines developed in accordance with IEC 61508
- Used homogeneously and redundantly in safety equipment up to SIL 3
- More than 40 device lines approved in accordance with the WHG (German Water Resources Act)

Leading device design

- The device portfolio is continually undergoing further development in line with the latest requirements
- The safety design of the devices has been optimized over decades
- Requirements in terms of the WHG (German Water Resources Act), functional safety, explosion protection and pressure equipment are met and application-specific requirements, such as those from NAMUR, are implemented

Trend-setting test concepts
- Time-saving testing of safety equipment without needing to remove any equipment or shut the plant down
- Intelligent test concepts allow for greater flexibility and extended test cycles
- Test concepts, such as the Liquiphant FailSafe or Heartbeat Technology for flow and level, allow for straightforward implementation in practice

The complete range of services – made-to-measure services and solutions
- Comprehensive advice, auxiliary tools and a large selection of seminars and informative events to choose from
- Safety circuits designed for explosion protection and functional safety (SIL)
- Documented functional testing of WHG (German Water Resources Act) equipment and safety equipment

Experience and expertise
- Drawing on more than 65 years of experience, Endress+Hauser develops and produces measuring devices for the process industry
- Expertise in plant safety that comes from certified safety engineers and management systems
- Collaboration with international test and certification centers, as well as standards organizations
- More than 10 million devices used for international safety applications

"The German Water Resources Act (WHG), explosion protection and SIL are particular requirements for us and our customers. We have come to rely on the expert consultation, extensive range of measurement technology and product quality of Endress+Hauser."

Tina Lenting
Design Management and Managing Director
LEFA Ölsysteme GmbH

Explosion protection
- The most comprehensive measuring device portfolio for explosion protection has something to offer for virtually all measuring tasks and applications in real-life industry scenarios
- The standardized, intrinsically safe Ex-ia two-wire device concept for flow and level improves safety and reliability in real-life scenarios
- Certificates for Europe (ATEX), Asia (NEPSI, TIIS, KOSHA) and America (CSA, FM) together with international certificates (IECEx) ensure maximum safety in use worldwide

Functional safety
- The SIL measuring device range comprises more than 100 certified device models
- The majority of the devices have been developed in accordance with IEC 61508
- Maximum safety for safety equipment thanks to an intelligent commissioning and locking system
- The new SIL device concept for safety equipment guarantees prevention of systematic errors from planning through to proof-testing

Overfill prevention system in accordance with the WHG (German Water Resources Act)
- Wide-ranging device approvals in accordance with the WHG (German Water Resources Act)
- Design, planning, on-site commissioning and documentation of the entire overfill prevention system
- Proof-testing in accordance with the German Water Resources Act (WHG)

Pressure Equipment Directive
- Full implementation of the requirements of the AD 2000 regulation
- Individual pressure testing as standard
- Extensive weld and material testing

www.endress.com/process_safety

Standardized device concepts

Invaluable advantages

The most comprehensive and technologically advanced range of field devices With Endress+Hauser, you will benefit from the best possible expertise at field level. This means:

- Over 350 product lines for all measuring parameters
- Innovation leadership through permanent redevelopment of measurement technologies in close collaboration with the customer
- More than 600 employees involved in research and development
- More than 7,000 current patents and patent applications
- More than 250 new applications every year

Perfect standardization Standardized device platforms and continuous field instrumentation increase safety and reliability and reduce costs for:

- Planning
- Procurement
- Operation

The following are standardized and also comply with industry standards:

- Device operation and documentation
- Status and error diagnostics
- Components and spare parts

Standardized device concepts across all measuring parameters create invaluable benefits in terms of reducing complexity.

"We think it's excellent that Endress+Hauser has now introduced the operating philosophy first used in the successful Levelflex for other level measuring devices and flowmeters too. This makes for much easierinstallation and maintenance."

Ralf Schlachter
Production Engineering Manager
Brennet GmbH & Co. KG

Innovative field instrumentation for all measurement parameters Endress+Hauser has continuously set benchmarks in process measurement technology and offers a suitable solution for every requirement:

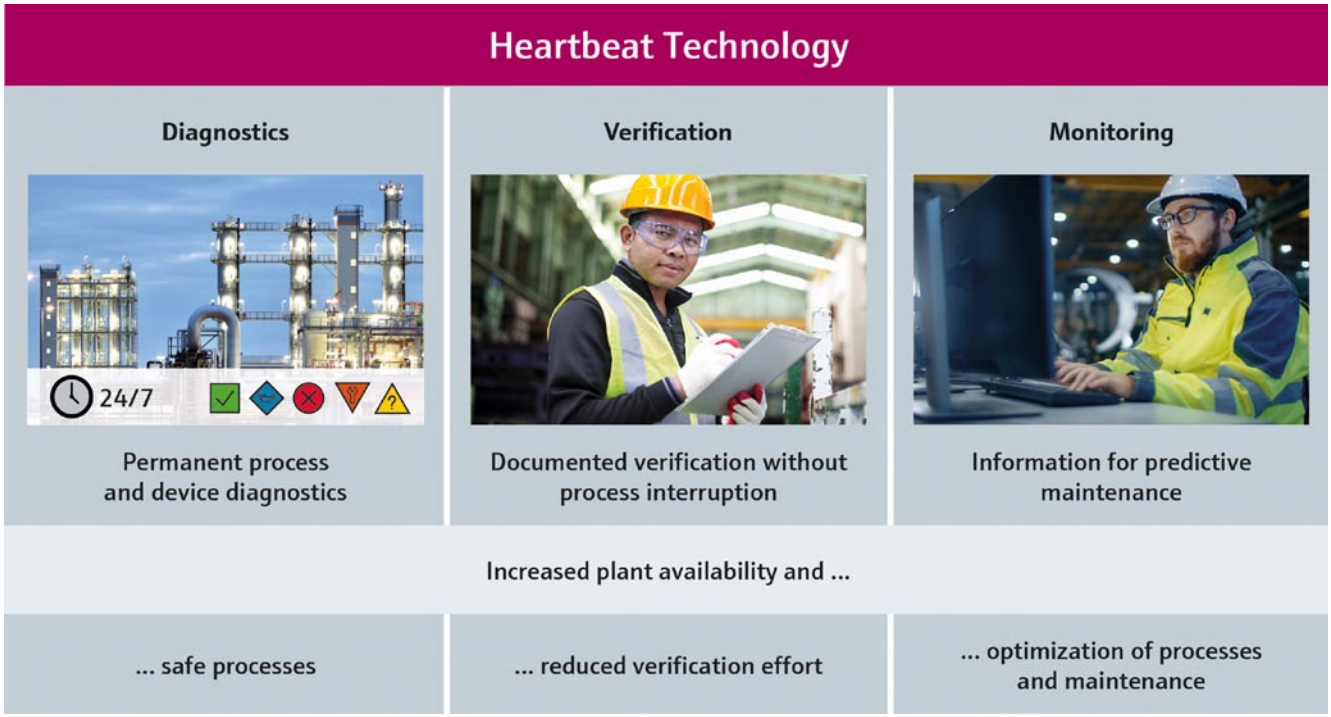
- Level limit detection – inventor of the vibration measuring principle and tuning fork
- Continuous level measurement – inventor of the Levelflex FMP55 multi-parameter sensor – guided radar and capacitance in one sensor
- Flow measurement – only provider of Coriolis two-wire technology in 4 to 20 mA
- Temperature measurement – iTHERM TrustSens TM371 self-calibrating thermometer
- Temperature measurement – introduction of the iTHERM QuickNeck
- Pressure measurement – industrial distribution of pressure measurement technology with ceramic cells
- Analytical measurement technology – inventor of Memosens with contactless data transmission
- First vortex flowmeter with additional wet steam proportion measurement
- Groundbreaking diagnostics and test concepts with Heartbeat Technology
- Proline 300/500 with integrated web server and WiFi connection
- Industry 4.0-ready devices

Very few other providers can boast such a broad and in-depth command of the field with a completely uniform platform concept.

More information available at:
www.endress.com

Heartbeat Technology

Taking the pulse of your measurement



Imagine if your measuring devices had their own pulse. This would indicate to you how reliably they are running and what you could do to improve the performance of your processes. Heartbeat Technology brings devices to life: It provides you with diagnostics, verifies the performance of your devices and monitors all process data for the purposes of predictive maintenance and process optimization.

Our engineers pay close attention in order to understand your mindset. Their task is to identify the products with Heartbeat Technology that best suit your specific needs and thereby improve your plant availability.

Heartbeat Technology for level measurement

Taking the pulse of your measurement

The latest generation (HART7 and more recent) of the Liquiphant FTL51b, Micropilot FMR5x, FMR6x and Levelflex FMP5x level transmitters features diagnostics, verification and monitoring functions, enabling constant process and device diagnostics with maximum error detection. In addition, the sensors developed in accordance with IEC 61508 can be verified or proof-tested in accordance with SIL/WHG (German Water Resources Act) while installed IEC 61508 – without interrupting processes and with automatic documentation generation.

Diagnostics Continuous self-monitoring of the level transmitters and output of standardized diagnostics messages with clear instructions for recommended courses of action ensure reliable processes. This ensures that information regarding the device status is available promptly and is processed quickly, enabling status-based maintenance to be performed. The status signals are classified in accordance with VDI/VDE 2650 and NAMUR recommendation NE 107, and contain information regarding the cause of the error and the measures for rectifying it.

Verification Simple verification or testing of the measuring device while installed, including automatically generated documentation. Verification of the measuring device is carried out in simple guided steps. This makes it possible to determine whether maintenance should be planned without interrupting ongoing measurements. Proof-testing of SIL/WHG measuring points is also possible while the device is installed, and the documentation of proof-testing is equally simple.

Monitoring Level transmitters do not just measure the level. The Heartbeat Monitoring function enables other process and device data to be provided and used for determining trends. Measured variables such as the signal strength are shown by the measuring device via the second current output and can be used to detect foam or buildup without requiring in-depth user expertise. This information can be used to anticipate when measures such as cleaning or maintenance need to be planned.

Heartbeat Technology for flow measurement

Taking the pulse of your measurement

Diagnostics, verification and monitoring functions in flow measurement

Heartbeat Technology

The third generation of Proline transmitters (100, 200, 300/500 and 400) enables permanent monitoring of flowmeters directly in the process. All tests carried out with Heartbeat Technology, self-diagnostics, verification or monitoring, reference the fixed factory status saved in the device and are automatically saved. Up to eight tests can be saved consecutively on the device.

Diagnostics The constant process and instrument diagnostics function monitors all testing and diagnosis parameters compared to set limit values with a high level of diagnostic coverage. Any deviations from the target status are categorized in accordance with NE 107 and output as warnings or alarms. The clear instructions for recommended courses of action minimize the need for plant shutdowns.

Verification The Heartbeat testing function enables the device to be tested without removing it. The benefits of this include easy and cost-effective proof-testing of the devices, enabling time-consuming recalibration cycles to be extended. The test is unambiguously documented as passed/not passed.

Monitoring The Heartbeat Monitoring function makes it possible to provide groundbreaking device-specific trend parameters, enabling true predictive maintenance to be implemented. This enables targeted planning and implementation of suitable maintenance measures for the first time.

The Heartbeat Technology portfolio

Promass 100/200/300/500
Coriolis mass flow measurement

Prowirl 200
Vortex flow measurement

Liquiphant FTL51B
Limit level measurement of liquids

Promag 100/200/300/500/400
Electromagnetic flow measurement

Prosonic Flow B200
Ultrasonic flow measurement

Micropilot FMR5x, FMR6x
Free field radar for continuous level measurement in liquids and bulk solids

iTHERM TrustSens TM371
Self-calibrating thermometer

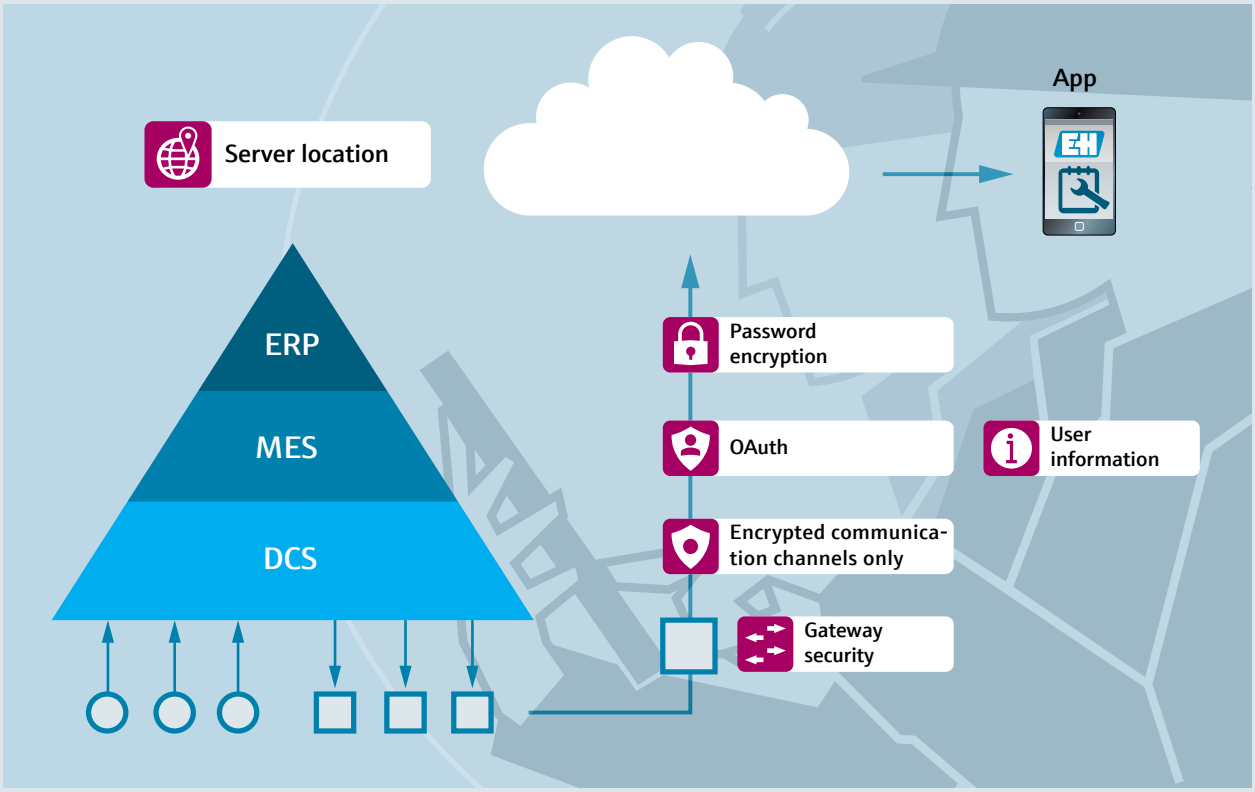
Liquiline CM44x
Memosens technology

Levelflex FMP5x
Guided radar for continuous level measurement/interface measurement in liquids and bulk solids

Industry 4.0

Increased plant availability thanks to optimal management and maintenance of field devices

Certified access to diagnostic and monitoring data from field devices



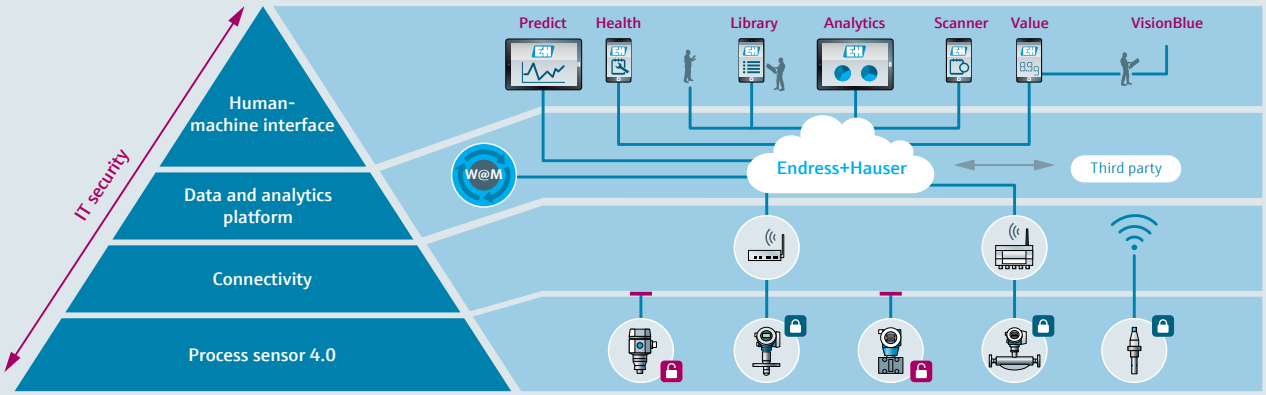
Endress+Hauser makes Process Industry 4.0 accessible as our online services and apps already enable you to optimize and maintain your field devices. This way, you can unlock the potential of the field level in just a few steps and reduce your plant shutdown.

As a complete provider for process sensory mechanisms, we have accumulated decades of expertise with a strong range of solutions and services. Our new online services enable us to link this expertise with relevant field data. This becomes particularly beneficial thanks to our Heartbeat Technology, as it generates additional diagnostic and monitoring information about the sensor and process, for example sensor wear and tear or deposits in the pipe. To unlock this potential, all that is missing is the data highway from the field devices to online services.

The technical implementation of the data highway is individually tailored to the customer's infrastructure. In doing so, we focus on the NOA (NAMUR Open Architecture) concept, so that relevant field data can be supplied in parallel to the control circuit with a second communication channel. The data highway is certified by the EuroCloud organization in accordance with the "StarAudit" certificate, so that data is linked and used securely.

Since we have been constantly expanding our digital range since 1997, you are already able to equip more than 90% of field devices with digital interfaces. With these digital field devices and our retrofittable adapters, there are limitless possibilities for unlocking the potential of the field. Early investments in technologies such as the Advanced Physical Layer (APL) will make linking the data to online services even simpler in future.

Industry 4.0 range from Endress+Hauser



As an independent technological pioneer, we want to take a step towards Process Industry 4.0 together with you. To do so, we have given our digitalization portfolio a modular design. The portfolio consists of sensory mechanisms and connectivity components, as well as applications such as online services and apps. Our portfolio allows you to choose which specific applications you require to manage and maintain the installed base and the end device on which you would like to use these applications. For instance, you can access online services in any area of the plant with our industrial tablet "FieldXpert", which is suitable for use in hazardous areas. We are also trialing data glasses such as HoloLens, so that you can follow our recommendations while leaving both your hands free. In short, our toolbox for Process Industry 4.0 already enables you to make your management and maintenance processes more efficient and simple.

Our efforts have already paid off as we won the German Innovation Award 2018 for our first Industry 4.0 flagship projects. The project gave rise to an impressive Industry 4.0 application for predictive maintenance of measuring points. The implementation of this type of digitalization project requires skills and expertise spanning different domains, which makes constructive collaboration between industry parties indispensable.

GERMAN INNOVATION AWARD '18 WINNER

Close collaboration as part of the flagship project also gave rise to a strategically important partnership between SAP and Endress+Hauser. We collaborate to achieve integration of Endress+Hauser sensors and algorithms in SAP AIN in order to implement standardized solutions throughout your SAP workflow. After registering the sensor in SAP AIN, all relevant information is automatically integrated in the form of a digital twin and kept up to date. With digital twins for over 30 million installed measuring devices, we already have all the information ready for integration in SAP AIN. Endress+Hauser's embedded solutions eliminate the need for many manual and error-prone activities, and your processes, including the maintenance process, will be optimized.

With innovative technologies and the right partnerships, Endress+Hauser is paving the way towards Process Industry 4.0. We can strike out on new digital paths together with you.

Find out for yourself what's behind Industry 4.0:
iiot.endress.com

Level measurement

Reliable, precise, efficient

The right measuring principle for any application

	Level limit detection	Continuous measurement	Interface measurement	Density/concentration determination
Liquids	Vibronic Conductive Capacitive Float switch Radiometry	Radar Guided radar Ultrasonic Hydrostatic Capacitive Radiometry	Guided radar Capacitive Radiometry	Vibronic Coriolis Radiometry
Bulk solids	Vibronic Capacitive Rotating paddle Microwave barrier Radiometry	Guided radar Radar Ultrasonic Level system Radiometry	Vibronic (solids under water) Radiometry	

Reliable, precise, efficient: In order to perform all specific measuring tasks to the highest standard, both technically and in terms of optimal cost-effectiveness, Endress+Hauser gives you a choice of 14 different measurement methods.

Application Levels in liquids, pastes, bulk solids or liquefied gases are often recorded in tanks, silos, transportable containers or pipelines and are divided into four measuring tasks:
continuous measurement, level limit detection, density and interface measurement.

Benefits The customer is provided with the optimal solution for their specific measuring task. Endress+Hauser has over 65 years of experience in level measurement, punctuated with a large number of innovations:

- The most comprehensive product range in the world
- Inventors of the vibration measuring principle
- First dust ignition-proof approval in the world
- Inventors of the guided radar measuring principle
- First envelope curve on the display
- First PROFIBUS PA installations
- First devices with SIL locking sequence
- Heartbeat Technology – taking the pulse of your measurement

Plant safety and reliability with Endress+Hauser devices

Heartbeat Technology

For more information, see from page 10 of this brochure and the brochure "Level measurement" (FA00001F)

www.endress.com/level

The right measuring principle for any application

Level limit detection The task is to prevent overfilling or excessive emptying of containers or to protect pumps against running dry. Level limit detection is essentially concerned with quick, reliable functioning and good reproducibility.

Continuous measurement This is the continuous measurement of the level of a medium. In addition to direct measurement of the level in meters, the fill volume in a container can also be determined indirectly. This is done based on the container geometry and the properties of the medium.

Interface measurement Liquid mixtures are the focus here. There is a suitable measuring principle for clear interfaces or emulsions and for complex mixtures with solids.

Determination of density/concentration With familiar measuring principles, it is not the level, but the quality of the medium that is determined. By recording the density/concentration, other measured variables can also be calculated. Reproduction and quality are the buzzwords here.

Standardized two-wire device concept

- Perfectly standardized for level and flow rate
- Maximum plant safety while ensuring high plant availability

More information is available on page 8 and at:
www.endress.com

The Wizard: Your personal assistant

Your benefits

- Assistant provides a step-by-step guide to commissioning of the Levelflex FMP5x, Micropilot FMR5x and FMR6x radar level transmitters
- Simple verification or testing of the measuring device while installed and during operation in accordance with SIL/WHG (German Water Resources Act), including automatically generated documentation

More information is available at:
www.endress.com/commissioning-wizard-tof

Optimum device design for fill level measurement technology – now also available in digital format

Find the right solution for your measuring point

Online version also available:
www.yourlevelexperts.com/selection-guide

Measuring technology uses many measurement methods and principles From limit detection to continuous measurement, the right choice of instrumentation can be a challenging undertaking. Which measuring principle meets your requirements? With more than 65 years of experience in level measurement technology, we help you make the right choice in the latest edition of our device selection guide.

For product design:
www.yourlevelexperts.com/selection-guide

Advantages

- Overview of complete measuring principles
- Choice of measuring principle with application reference
- Choice of measuring device with application reference

113 GHz + Your Wavelength

113 GHz: The right frequency for any application

- Solution optimized for your application using guided or free-space radar
- Cost-effective, customized selection of measurement technology
- A point of contact for all radar technology questions

Application Consistent product quality, plant safety and cost-effectiveness: These are important aspects to consider when fitting equipment to any measuring point. Thanks to the wide range of measuring principles now available, it is possible to find a tailor-made solution for any task. No principle is equally suitable for all applications. It is therefore important, for instance, to select radar sensors that work reliably in application-specific conditions in liquids and bulk solids yet also measure up to the economic considerations of tomorrow.

Advantages

- **1 GHz** with Levelflex FMP5x guided radar: foam, low dielectric constant, interface measurement, gas phase compensation and bypass
- **6 GHz** with Micropilot FMR54 free-space radar: high level of condensate formation and turbulence, shaft applications, stilling wells
- **26 GHz** with Micropilot FMR50, 51, 52, 56, 57 free-space radar: good focusing, turbulence
- **80 GHz** with Micropilot FMR6x free-space radar: excellent focusing at 3°, measuring range up to 125 m in bulk solids, accuracy of 0.5 mm and suitable for custody transfer measurement with Micropilot NMR81
- **NEW:** Bluetooth for wireless commissioning and maintenance

Technical data and complete documentation:
www.endress.com/80GHz
www.yourlevelexperts.com/113ghz

For product design:
www.endress.com/applicator

Technical data

- Process temperature: −196 °C to +450 °C (Proservo)
- Process pressure: −1 bar to +400 bar
- Accuracy: 0.5 mm, suitable for custody transfer measurement
- Measuring range: up to 125 m

SmartBlue App

Wireless commissioning and maintenance of field devices

Operating field devices from the level, flow and liquid analysis fields The range covers measuring parameters from the flow, level and liquid analysis fields and is being continually extended. The SmartBlue App is available free of charge from the Google Play Store or Apple App Store. The range already includes field devices from the flow, analysis and level fields. In 2018, the portfolio was extended by the addition of the Picomag electromagnetic flow sensor and the Liquiline CM82 compact transmitter for measuring pH, ORP, conductivity, oxygen and chlorine/chlorine dioxide.

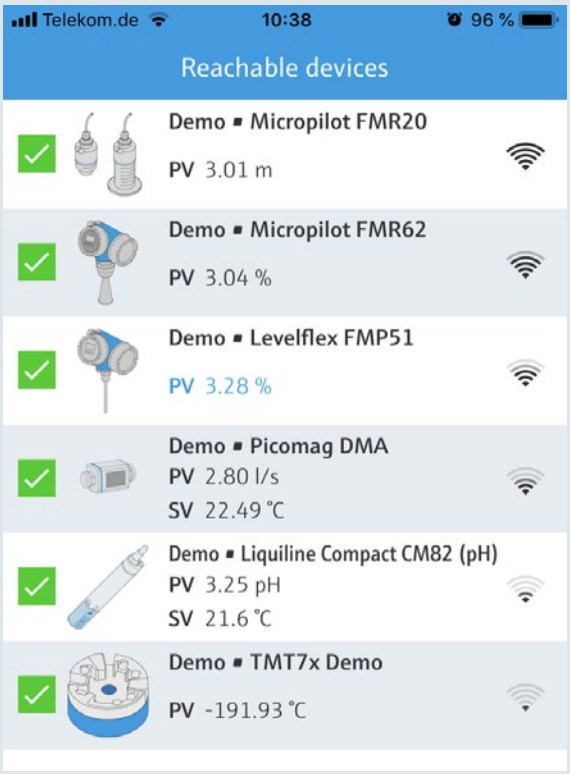
New: An easy to retrofit, inexpensive Bluetooth module is now available for radar measuring devices. This enables simple, wireless field device configuration using the SmartBlue App. Simply insert the Bluetooth module into the CDI port provided on your electronics (behind the display).

To retrofit a radar measuring device, you need:
- A radar measuring device with HART-7 electronics
- The BT 10 Bluetooth module
- A mobile end device with the latest version of the SmartBlue App

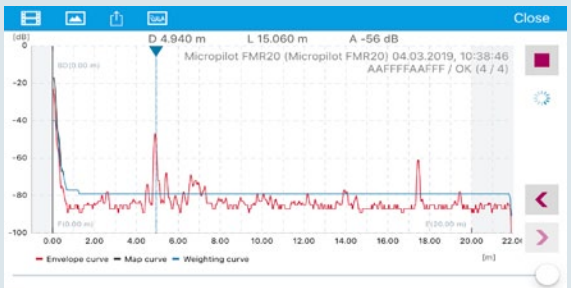
If a sensor has to be commissioned in a difficult-to-reach or hazardous area, wireless field device configuration via the SmartBlue App is the solution. In the live list, the user sees at-a-glance measuring parameters of the devices that can currently be set and maintained via Bluetooth. The diagnostic message in accordance with NAMUR standard NE 107 makes the sensor's status immediately visible. The connection to the device is established using a password-protected process that is certified by the Fraunhofer Institute.

www.endress.com/bluetooth

Our current Bluetooth range: all accessible device and status information at a glance



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



Technical data

- Time-saving mobile access to device, diagnostic and process information, including in hazardous areas
- Secure data transmission for fast and reliable configuration and inspection
- Efficient maintenance thanks to status information relating to the various devices in a live list
- Avoids the need for anyone to be in hazardous or difficult-to-reach areas thanks to remote commissioning

Radartechnology – in a new compact size

Micropilot FMR10/FMR20 – efficient and innovative

- Easy to use – radar with Bluetooth LE technology
- Minimal effort – easy to commission, operate and maintain
- Compact design – ideal for confined installation conditions

Application The new Micropilot FMR10 and FMR20 continuously measure the level of liquids by emitting microwaves. The devices have been specially developed for the requirements of the water and wastewater industry and for applications in utilities across a wide range of industries, particularly for carrying out measurements in storage tanks, open basins, pump shafts or canal systems. These devices are operated via Bluetooth LE using an Endress+Hauser App or via a HART connection.

Advantages

- Highly efficient measuring point thanks to innovative high-frequency technology
- Price segmentation in the field of current ultrasonic measurement technology
- Unaffected by environmental conditions such as temperature, gas phases or wind
- Easy, reliable and encrypted wireless remote access via Bluetooth LE – ideal for difficult-to-reach installations, even in hazardous areas
- The most compact radar measurement device in its class – suitable for use even in extremely limited installation conditions
- Complete PVDF housing for maximum chemical resistance – ensuring a long operating life
- Hermetically sealed wiring and fully potted electronics protect the device against water and enable use under demanding environmental conditions

NEW: Modbus interface for Micropilot FMR20

- Micropilot FMR20 with Modbus interface enables simple connection to gateways (e.g. FXA30B) for remote data transmission
- Application: energy-efficient, battery-powered sewer and surface water monitoring
- Commissioning using Modbus RTU or wirelessly using the SmartBlue App (Bluetooth)

E direct
High Quality – Low Price!

FMR10

FMR20

Technical data and complete documentation:
www.endress.com/fmr10
www.endress.com/fmr20

For product design:
www.endress.com/applicator

Technical data

- Process temperature: –40 to +80 °C
- Process pressure: –1 to +3 bar
- Accuracy: up to +/– 2 mm
- Degree of protection up to IP68/Nema6P
- Measuring range: FMR10 up to 8 m, FMR20 up to 20 m

Capacitive level measurement – limit switch for powdery and fine-grained bulk solids

FTI26 – robust and efficient

- Easy commissioning – thanks to pre-calibration at the factory
- Function check – on-site with LED indicator
- Compact design – ideal for confined installation conditions

Application Reliable minimum or maximum detection in silos with free-flowing powdery or fine-grained bulk solids. The Nivector's sensor surface evaluates the different dielectric values of air and the bulk solid. If the bulk solid comes into contact with the sensor surface, the electronics change the switch status, which is signaled by a light emitting diode. A guard electrode prevents disturbances resulting, for example, from the vessel wall or possible product buildup. Typical application examples: plastic granules, detergent, cereals, sugar, spices, farina, animal feed.

- Compact design enables easy installation, even in hard-to-reach or confined areas
- Also suitable for use in foods
- For use in hazardous atmospheres caused by combustible dust, Zone 20
- Can be used in process temperatures of −20 to +80 °C (−4 to +176 °F)

Advantages

- On-site function check by means of an LED indicator
- Robust stainless steel housing, optionally available with M12x1 connector with IP69K protection
- Simple and cost-effective commissioning: pre-calibration at the factory (plug-and-play)
- Hygienic design, 3A and EHEDG certificates
- DC-PNP output and IO-Link communication
- Suitable for various media, e.g. powdered foods

Technical data and complete documentation:
www.endress.com/fti26

For product design:
www.endress.com/applicator

Technical data

- Dielectric constant (DC): ≥ 1.3
- Particle size: ≤ 10 mm
- Process temperature: −25 to +80 °C
- Process pressure: −1 to +6 bar

Successful, reliable and easy to use

The new Liquiphant FTL51B is setting new standards

- Established and universal measuring principle – for use in all liquids
- Simple commissioning – no need to calibrate to media
- Highest safety thanks to permanent self-monitoring for corrosion or deposits, for example
- Minimized effort – proof-testing without removing the device or interrupting the process

Application Ideally, the Liquiphant should be used in storage tanks, containers and pipelines for limit level measurement of liquids. It is ideal for applications in which float switches or optical sensors were previously used. The Liquiphant works in areas in which other measuring principles cannot be used due to conductivity, deposits, turbulence, flows or air bubbles. There is no need to calibrate to the medium or carry out time-consuming adjustment of the electronics.

Advantages

- Developed in accordance with IEC 61508 SIL2 and SIL3 with homogeneous redundancy
- Heartbeat Technology (diagnostics and verification) for increased safety in ongoing operation and less effort required for proof-testing (SIL/WHG)
- Simple, intuitive and guided wizard for testing using the Endress+Hauser SmartBlue App via Bluetooth
- Testing is also possible at the touch of a button from the control room or at the Liquiphant itself
- Bluetooth connection via mobile end device for identification, determining the status and access to appropriate documentation and information about the device

Technical data and complete documentation:
www.endress.com/liquiphant

For product design:
www.endress.com/applicator

Technical data

- Process temperature: –60 °C to +150 °C
- Process pressure: up to 100 bar
- Ambient temperature: –60 °C to +70 °C
- Viscosities: up to 10,000 mm2/s (cSt)
- Extension pipe: up to 6 m (20 ft)

Reliable, efficient and compact

The FMG50 Gammapilot is the first 4 to 20 mA two-wire detector for use in any application

- Compact transmitter: All measuring tasks can be completed with just a single two-wire device
- Greatest availability, reliability and safety, even in extreme process and environmental conditions
- Minimized effort for installation and commissioning
- Verification and diagnostics including documentation without interrupting the process

Application The FMG50 Gammapilot is used where other measuring principles reach their limits, e.g. in applications involving high pressure, high temperature, corrosiveness, toxicity or abrasion.
Without coming into contact with the medium, the FMG50 Gammapilot reliably takes measurements from outside, through the wall of all kinds of process containers, e.g. reactors, autoclaves, separators, acid cisterns, mixers, cyclones and cupola furnaces.

Advantages

- Developed in accordance with IEC 61508 SIL2 and SIL3 with homogeneous redundancy
- Reliable measurement in high-temperature applications even without water cooling and with the patented gamma FHG65 modulator, including during extraneous radiation involved in non-destructive testing
- Heartbeat Technology offers increased safety and reliability in ongoing operation, less effort required for proof-testing (SIL) and essential data for predictive maintenance
- Simple, guided wizard for testing using the Endress+Hauser SmartBlue App via Bluetooth
- Bluetooth connection via mobile end device for identification, determining the status and access to appropriate documentation and information about the device
- Efficient two-wire device technology for reduced energy requirements and savings when it comes to engineering, installation and space requirements

Technical data and complete documentation:
www.endress.com/gammapilot

For product design:
www.endress.com/applicator

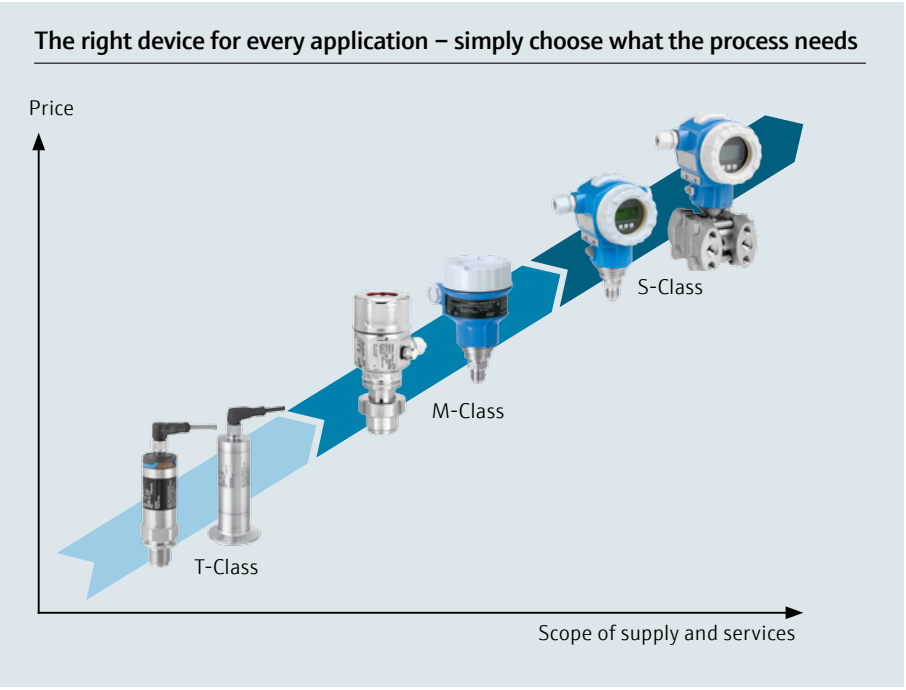
Technical data

- Temperature range: –40 °C to +85 °C
- Detector length: up to 3 m
- Developed in accordance with IEC 61508 SIL2 and SIL3 with homogeneous redundancy
- Compact design
- 4 to 20 mA two-wire detector


SKINTOP
Endress+Hauser
Liquiphant
Made in Germany,
D-79689 Maulburg
Order code: FTL51B-1170/0
Ext. ord. cd.: FTL51B-BBA8ABAAA3B
FEL68
8.2 V DC ±20 % NA
0.45...1 mA / 2.2...3.8
L: Compact
Switch
-40 °C ≤ Ta ≤ +70 °C
FW: 01.00.00 HW: 01.00.00
0044

Pressure measurement

Innovative pressure measurement technology from a single source



For over 30 years, Endress+Hauser has been promoting pressure measurement technology with intelligent innovations. The several million measuring points installed around the world are an impressive testament to the fact that more and more end customers and plant builders are placing their trust in Endress+Hauser's pressure measurement technology. Sustainable benefits are offered by innovations in the field of sensor technology, operating and spare parts concepts through to software tools for measurement technology design. Customer requirements are always the focus of these innovations.

Application

- Relative and absolute pressure measurement in gases, steam and liquids
- Level, volume and mass measurement of liquids in containers
- Level measurement by means of rod or rope probes
- Flow measurement in conjunction with differential pressure sensors (e.g. pitot tubes, orifice plates, Venturi or ISA nozzles)
- Differential pressure monitoring of filters and pumps

Pressure measurement technology and everything that goes with it Our product families (T-M-S) always ensure an optimal price/performance ratio.

- S-Class: the utmost precision and maximum reliability
- M-Class: versatile in the face of high demands
- T-Class: low-cost devices for standard applications

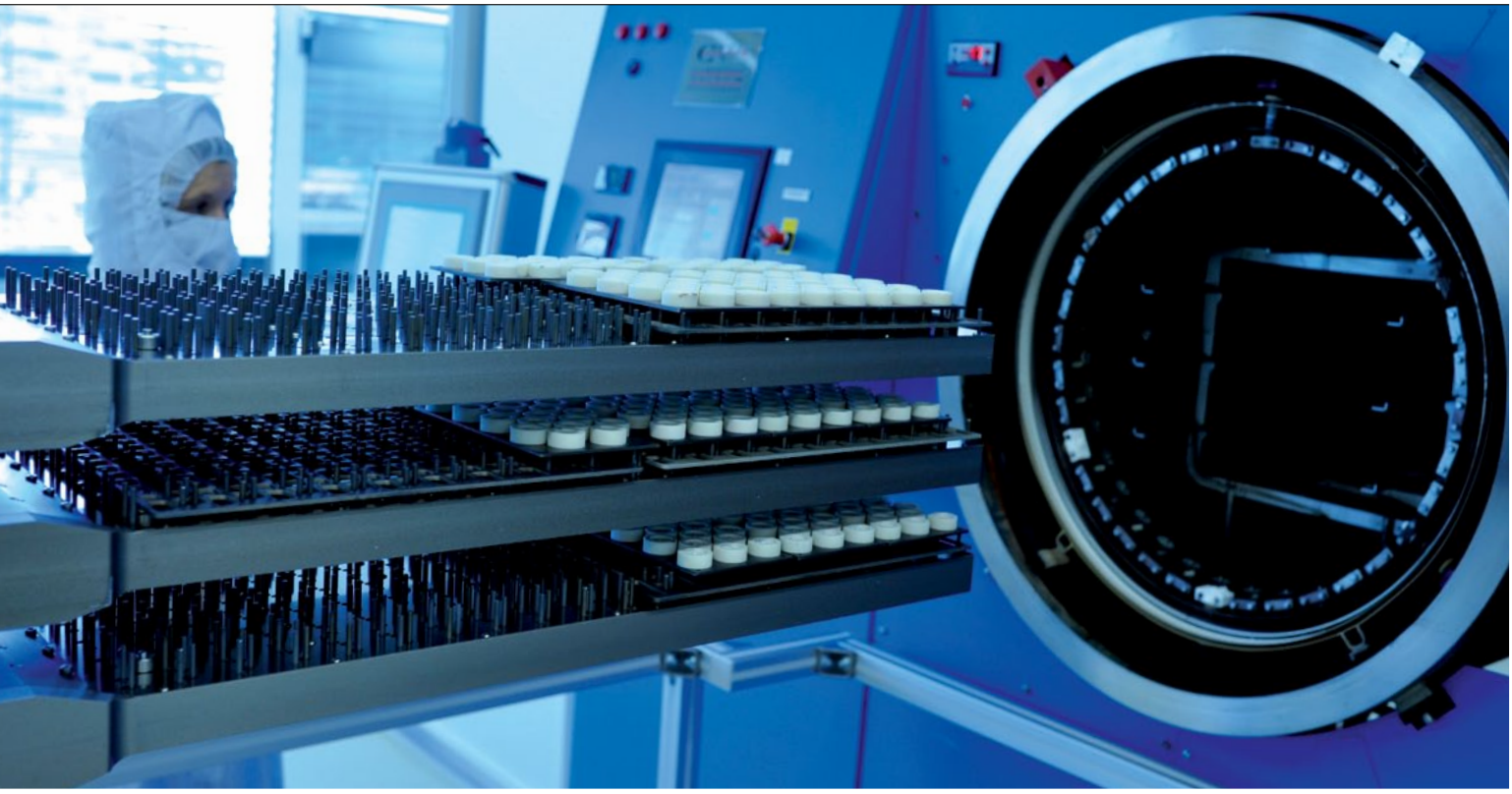
Applicator – simple, quick and reliable configuration

- Applicator Selection: select the right device
- Applicator Sizing Flow: design/optimization of flow measurements
- Applicator Sizing Diaphragm Seal: calculation of diaphragm seal systems; determination of application limits

Benefits Intelligent pressure measurement technology with beneficial innovations. Adapted sensors that are customized to the application. Clear product segmentation – only pay for what the process actually requires.

For more information, see the brochure "Pressure measurement" (FA00004P)

www.endress.com/pressure



Five sensor technologies – countless advantages

Five sensor technologies ensure optimal adaptation to the process

- Ceraphire oil-free capacitive ceramic sensor: extremely robust and fully vacuum-tight. With diaphragm break detection. Also suitable for condensate applications
- Piezoresistive measuring cell with metal welded process isolating diaphragm: seal-free, small flush-mounted process connections. Optionally available with approval in accordance with the Measuring Instruments Directive
- Unique, hermetically sealed CONTITE measuring cell: optimized for cold applications. Minimum influence from temperature shocks
- Fully welded diaphragm seals with or without a capillary; several diaphragm materials and filling oils are available depending on the application. For use in aggressive media or at high temperatures
- Monitored differential pressure measuring cell with overload-resistant middle diaphragm: measure very low differential pressures even when one or both sides are overloaded

Your benefits

- Costs under control: only pay for what the process actually needs
- High plant availability and process reliability thanks to sensors that are customized to the application
- Cost saving: complete measuring point, including accessories, from a single source
- Time saving thanks to intelligent software tools that make it easier to select the right device

Ceraphire sensor with ceramic diaphragm

- Pressures 0 mbar to 42 bar rel./abs.
- Temperatures up to +150 °C

Silicon sensor with metal diaphragm

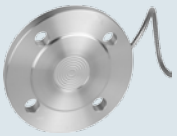
- Pressures up to 770 bar rel./abs.
- Temperatures up to +150 °C

CONTITE sensor with Hastelloy diaphragm

- Pressures -990 mbar to 10.5 bar rel.
- Temperatures up to +100 °C or +135 °C/1 h

Silicon sensor with added diaphragm seal

- Pressures up to 400 bar rel./abs.
- Temperatures –70 to +400 °C



Differential pressure

- Differential pressures <1 mbar to 44 bar
- Pressure rating up to PN420

With us as your partner, you have access to all aspects of pressure measurement technology

A complete measuring point consists of far more than just the sensor

Endress+Hauser offers a complete range of services for pressure measurement technology – from engineering and project management to measuring devices and accessories through to pre-assembled solutions and attractive life cycle management.

Advantages

- Engineering tools such as Applicator help planners to quickly and reliably select the ideal products for their needs.
- A contact person will be available to support you for all questions concerning pressure measurement technology and compatible accessories, as well as in planning, selection, offers and ordering. This enables you to work quickly and save time.
- Solutions can be delivered pre-assembled in a single package on request, which saves you the time-consuming task of collecting all the compatible parts and makes the overall process of assembly during operation significantly easier.

Your benefits

Cost-efficiency
- Processing costs reduced by up to 30%
- Standardized products in the plant reduce training requirements
- Reduced inventory
- Fewer variants

Reduced time requirements and resource use
- Less coordination required with just one point of contact
- Concentrate on the project instead of coordinating suppliers
- Assembly on-site is made significantly easier

Plants and operational safety
- Components are perfectly compatible
- Elements are certified by Endress+Hauser
- Qualified suppliers

Complete package

Pressure portfolio

Clear product segmentation – only pay for what the process actually requires.
Our product families (T-M-S) always ensure an optimal price/performance ratio.
- S-Class: the utmost precision and maximum reliability
- M-Class: versatile in the face of high demands
- T-Class: low-cost devices for standard applications

Engineering – Applicator

Applicator is a unique selection and sizing program that saves you time and ensures correct measuring point planning for process measurement technology.
- Designing the measurement technology
- Calculating the measuring range to be configured
- Determining the anticipated deviations
- Calculating the response time
- Checking the installation

Accessories

- Valve blocks
- Shutoff valves
- Flushing rings
- Monoflanges
- Flange adapters
- Oval flange adapters
- Siphons
- Protective covers and boxes
- Differential pressure sensors
- Standard orifice plates
- Pitot tubes
- Venturi/ISA nozzles

All devices, components and systems are pre-assembled on
We will support you through the entire life cycle of your system – from correct selection of the

For more information, see the brochure
"Pressure measurement" (FA00004P)

Pressure measurement technology

Pre-assembly

- Relevant accessories provided
- Assembly and testing of all parts carried out by Endress+Hauser
- Product delivered in a pre-assembled complete package

Customer-specific documentation

- Hook-ups
- Technical information
- Easy installation thanks to detailed description of measuring points
- Common Equipment Record (CER)
- 2D/3D drawings
- Operating instructions
- Approvals/certificates

Services

- Calibration
- Commissioning
- Maintenance
- Life cycle management

request and are precisely configured to be compatible with each other.
measurement to complete assembly with all required documentation through to regular calibration.

Pressure measurement – maximum precision with maximum safety and reliability

Cerabar S, Deltabar S, Deltapilot S

- Consistent range of devices with standardized components reduces the device variety and storage costs by up to 30%
- Easy, intuitive operation saves time and reduces costs
- Developed in accordance with IEC 61508, SIL 2/3 for maximum process reliability

Application

- Relative and absolute pressure measurement in gases, steam and liquids
- Level, volume and mass measurement of liquids in containers
- Flow measurement in conjunction with differential pressure sensors (e.g. pitot tubes, orifice plates, Venturi or ISA nozzles)
- Differential pressure monitoring of filters and pumps

Advantages

- By selecting the best possible sensor, you can optimize the plant in terms of cost-effectiveness, availability and safety
- Increased plant availability thanks to HistoROM: storage of device parameters and process data such as process pressure, temperature and error messages
- Secondary containment protects operating personnel in the event of a fault
- Versatile uses due to large selection of suitable process connections and international certificates
- Optimized diaphragm seal systems – increased vacuum resistance and unparalleled precision thanks to cutting-edge filling processes

Technical data and complete documentation:
www.endress.com/fmb70
www.endress.com/fmd77
www.endress.com/pmd75
www.endress.com/pmp71
www.endress.com/pmp75

For product design:
www.endress.com/applicator

Technical data

- Reference precision: up to ±0.05%/0.025%
- Measuring range: 0 mbar to 770 bar rel./abs
- Developed in accordance with SIL 2/3 IEC 61508
- Process temperature: 0 to +400 °C, depending on sensor, filling oil and capillary

TempC – new, unique diaphragm seal

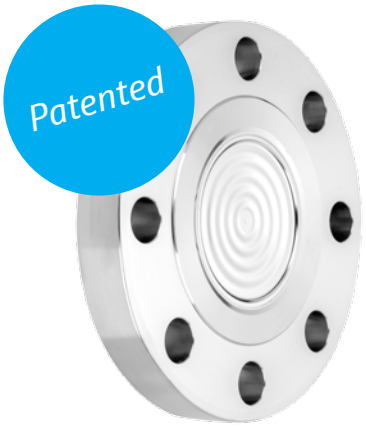
Cerabar M PMP55, Cerabar S PMP75, Deltabar S FMD77/78

- Up to five times more accurate: improved quality in production
- Use of smaller process connections translates to greater cost savings
- Greater process safety as no capillaries or impulse lines used

Application Diaphragm seal systems are used wherever it is necessary to separate the process and the measuring device, e.g. in the case of extreme process temperatures. To get even more accurate measurement results in extreme conditions, and therefore increase process safety, Endress+Hauser has developed the TempC membrane, which is based on a completely revolutionary technology and offers unparalleled performance.

Advantages

- Increased accuracy and process safety in diaphragm seal applications thanks to the very low temperature effect of the TempC membrane
- Smaller instrumentation dimensions save money: e.g. DN50 instead of DN80 without any reduction in accuracy
  - Reduces the size and variety of all measuring points (including valves or pipes)
  - Smaller inventories mean lower costs
  - Less space required, enabling a more compact plant design
- Protected TempC membrane. Design minimizes accidental damage during device installation
- Fully flush-mounted process connections available for food and pharmaceutical applications
- Highest accuracy and process safety guaranteed even for very long sterilization and cleaning cycles (SIP/CIP)



Technical data and complete documentation:
www.endress.com/tempc-membrane

For product design:
www.endress.com/applicator

Want to learn more?
Watch the video here:

Technical data

- Membrane available for the following transmitters:
  Pressure: PMP55, PMP75
  Differential pressure: FMD77, FMD78
- Available for the following process connections:
  - EN 1092-1 flanges; DN25/DN50/DN80, PN10–40
  - ASME B16.5 flanges; NPS 1"/2"/3" Cl.150 – Cl.300
  - Hygienic process connections
- Process temperature: –40 °C to +400 °C

Flow rate measurement

Proline – continuous redevelopment of tried-and-tested technology

Proline flowmeters have exemplified reliable and robust sensor technology with innovative and standardized transmitter concepts for more than two decades. With these products, Endress+Hauser has repeatedly extended and redefined the boundaries of cutting-edge flowmeter technology. Proline flowmeters increase operational safety and help reduce costs throughout the entire life cycle of your system. We use the experience we gain from each existing device generation to inform the development of the next generation, providing substantial improvements across the entire range of devices.

Evolution instead of revolution – innovative transmitters and device concepts

- Our comprehensive practical experience forms the basis for optimization of the next generation
- Consistent extension of standardization results in outstanding simplification in real-life operations across our wide product portfolio
- Integrating innovation continually provides new opportunities for savings and improves process reliability
- The features required to take advantage of current and future trends are available today

Continual improvements to tried-and-tested sensors The experience gained from more than three million applications and continual further development of tried-and-tested sensor technologies guarantee maximum quality and measuring performance. The leading technological position of Proline sensors is based on the continuous integration of new requirements, mostly driven by increasing safety standards or new industry requirements. Throughout all these changes, the tried-and-tested sensor design ensures that the high level of robustness, stability of measured values and service life is maintained.

Market launch
1993

Proline 1st generation

Electronics

1993–2001

- Promag 30/33/35
- Promass 60/63/64
- Prowirl 70/77
- Prosonic Flow DMU93
- t-mass 671

Properties

- Standardized operation
- Partly uniform components
- Shared design tool (Applicator)
- Shared operating tool (Fieldtool)

Sensors

For more information, see the brochure "Flow rate measurement technology for liquids, gases and steam" (CP01095D)

www.endress.com/flow

2000

Proline 2nd generation

2000–today
- Promag 10/23/50/53/55
- Promass 40/80/83/84
- Prowirl 72/73
- Prosonic Flow 90/91/92/93
- t-mass 65

Properties
- Simple, standardized operation
- Modular device concept for 5x, 8x, 9x
- Uniform components
- A single design tool (Applicator)
- A single operating tool (FieldCare)
- A single testing tool (Fieldcheck)
- First two-wire technologies

2012

Proline 3rd generation

2012–tomorrow
- Promag 5x (Proline 100, 200, 300/500, 400, 800)
- Promass 8x (Proline 100, 200, 300/500)
- Prowirl 7x (Proline 200)
- Prosonic Flow 9x (Proline 200)
- t-mass 6x (Proline 150)

Properties
- Transmitters optimized for industrial use
- Simple, standardized operation (Endress+Hauser HMI)
- Uniform components and spare parts
- Industry 4.0-ready, Integrated Industry Safety
- HistoROM data concept
- Integrated web server, WiFi
- Applicator, FieldCare, Heartbeat Technology
- Complete uniform two-wire device product portfolio (Proline 200)

Promag W/P/H/L/S/D

Promass E/F/H/I/A/S/P/O/X/C/Q

Prowirl W/F/R/S/D

t-mass F/I/A/B/T

Prosonic Flow W/P/F/T/B/E

The specialist for water and wastewater applications in a compact version

Proline Promag W 300

- Web server and WiFi integrated for simple device operation and configuration
- International drinking water approvals (KTW/W270, ACS, NFS 61, WRAS BS6920)
- Reliable measurement – precise measured values even with 0 x DN inlet run thanks to inserted sensor
- Verification without the need for removal with Heartbeat Technology

Application Plant operators in the water and wastewater industry require robust and high-grade flowmeters that guarantee reliable operation around the clock. Promag meets these exact requirements without compromise. Promag sensors have shown their strengths in a wide range of applications for over 35 years.

Advantages

- Flexible engineering – sensors with fixed flanges or lap joint flanges
- Convenient device configuration in the field thanks to the latest web server and WiFi technology for saving time during operation
- HistoROM: high plant availability thanks to automatic data storage
- Heartbeat Technology enables traceable device verification in accordance with DIN EN ISO 9001 without interrupting the process (confirmed by TÜV certificate)
- Traceable measurement results as each measuring device is calibrated on accredited calibration rigs (DIN EN ISO/IEC 17025)
- Numerous communication interfaces (HART, PROFIBUS PA/DP, Modbus RS485, Ethernet/IP, PROFINET)
- Configurable I/O modules – flexibility enables simplified inventory management
- Optional protective cover

Technical data and complete documentation:
www.endress.com/5W3B

For product design:
www.endress.com/applicator

Technical data

- Measured error: ±0.2%/0.5%
- Lining: PU, hard rubber, PTFE
- Process temperature: dependent on lining, max. 90 °C
- Electrode material: stainless steel, alloy, tantalum
- Flange material: carbon steel or stainless steel

The specialist for water and wastewater applications with remote transmitter

Proline Promag W 500

- Web server and WiFi integrated for simple device operation and configuration
- International drinking water approvals (KTW/W270, ACS, NFS 61, WRAS BS6920)
- Reliable measurement – precise measured values even with 0 x DN inlet with inserted sensor
- Verification without the need for removal with Heartbeat Technology

Application Plant operators in the water and wastewater industry require robust and high-grade flowmeters that guarantee reliable operation around the clock. Promag meets these exact requirements without compromise. Promag sensors have shown their strengths in a wide range of applications for over 35 years.

Advantages

- Promag 500 digital: just one standard cable between the sensor and transmitter
- Degree of protection IP68: corrosion protection in accordance with EN ISO 12944 for direct underground installation or continuous use underwater
- Flexible engineering – sensors with fixed flanges or lap joint flanges
- Convenient device configuration in the field thanks to the latest web server and WiFi technology for saving time during operation
- HistoROM: high plant availability thanks to automatic data storage
- Heartbeat Technology enables traceable device verification in accordance with DIN EN ISO 9001 without interrupting the process (confirmed by TÜV certificate)
- Traceable measurement results as each measuring device is calibrated on accredited calibration rigs (DIN EN ISO/IEC 17025)
- Numerous communication interfaces (HART, PROFIBUS PA/DP, Modbus RS485, Ethernet/IP, PROFINET)
- Configurable I/O modules – flexibility enables simplified inventory management
- Optional protective cover or pipe installation set

Promag 500 digital


Promag W

Promag 500

Technical data and complete documentation:
www.endress.com/5W5B

For product design:
www.endress.com/applicator

Technical data

- Measured error: ±0.2%/0.5%
- Lining: PU, hard rubber, PTFE
- Process temperature: dependent on lining, max. 90 °C
- Electrode material: stainless steel, alloy, tantalum
- Flange material: carbon steel or stainless steel

Coriolis flow measurement redefined

Proline Promass Q 300/500

- Highest accuracy for flow (0.05% o.r.) and density (0.2 g/l)
- Precision in practice – highly accurate, even under the impact of temperature and pressure
- Patented Multi-Frequency Technology (MFT) for active compensation of gas bubbles in the medium
- High turndown with minimal pressure loss

Application Promass Q for maximum accuracy and reliability in the case of challenging measuring points

Advantages

- Measurement of difficult media, such as highly viscous media with gas pockets or products aerated with gas (e.g. ice cream)
- Typical Coriolis multiparameter measurement (mass, density, volume, temperature, concentration, etc.)
- Industry-relevant approvals, e.g. 3A and EHEDG for food applications
- For oil, gas and chemicals: MI-005; OIML R117; ATEX, AD2000, NACE MR0175; NACE MR0103
- SIL 2/3 as per IEC 61508
- Wide selection of I/O versions offered by Proline 300/500 electronic (e.g. 4 to 20 mA, PFS, PROFIBUS PA/DP, FF, PROFINET, Ethernet/IP)
- **NEW:** Complete solution for measuring the degree of product aeration (ice cream, cream cheese, etc.)

Technical data and complete documentation:
www.endress.com/8Q3B

For product design:
www.endress.com/applicator

Technical data

- Nominal diameters: DN25 to DN100
- Measured error: ±0.05%
- Measuring tube material: 1.4404 (316L)
- Max. pressure: PN 100
- Process temperature: −196 °C to +205 °C
- ATEX: Zone 1 (Zone 0 in the measuring tube)
- Secondary containment with PN100

The highly accurate specialist for measuring low flow rates

Proline Promass A 200/300/500

- Compact and robust Promass design for small nominal diameters from DN01 to DN04 with a 50% weight reduction
- Reduced pressure loss, better zero point stability and increased operable flow range
- Highly accurate, offering long-term stability in the process

Application The new Proline Promass A is the next progression of Endress+Hauser's Coriolis mass measurement system for low flow rates, which has been proven in use in countless applications. The focus here was to develop a product that offered full compliance with all industrial requirements, even for hygienic applications. Outstanding features of the Proline Promass A are its lightweight design and compact size. As customers can choose from a host of different measuring tube materials and a vast array of process connections, the Proline Promass A can be used in a wide variety of applications. The clever measuring tube design enables complete draining and low pressure loss with an increased measuring range in all available line sizes.

Promass A200

Advantages

- Available with four-wire or loop-powered technology
- Typical Coriolis multiparameter measurement (mass, density, volume, temperature, concentration, etc.)
- Process stability and high precision for very low flow rates
- Self-draining design in all available line sizes
- Welded process connections

Technical data and complete documentation:
www.endress.com/8A2B
www.endress.com/8A3C

For product design:
www.endress.com/applicator

Promass A300

Technical data

- Measured error: ±0.1%
- Max. pressure: 430.9 bar
- Process temperature: +205 °C
- Materials: stainless steel 316L (904), alloy C22
- Protective housing: stainless steel 316L (304)

High-precision mass flow measurement of steam and gas

Prowirl 200 – the reliable all-rounder

- Integrated temperature and pressure measurement, as well as steam and gas calculator function
- Improved performance and sensitivity (flat spec. from Re=10,000)
- Modular system for easy adaptation to individual installation conditions
- Traceable device verification without interrupting the process in accordance with DIN EN ISO 9001 using Heartbeat Technology, confirmed by TÜV certificate

Application Prowirl for the highest accuracy and reliability in steam and gas measurement

Advantages

- Integrated temperature and pressure sensor as well as flow computer function
- Calculation of mass, corrected volume and energy as well as condensate flow, steam quality, etc.
- Compact device that can be very flexibly adapted to installation conditions thanks to modular fixtures
- Complete verification with Heartbeat Technology
- Available for Prowirl F/R/O 200 sensors
- Pressure measuring cells up to 160 bar
- Standard-compliant and robust pressure line in accordance with BS ISO 2186
- Genuine loop-powered device (Prowirl powers the pressure sensor)
- Extension of wet steam detection option for nominal diameters and process pressure (steam quality limit value)

Technical data and complete documentation:
www.endress.com/7F2C

For product design:
www.endress.com/applicator

Technical data

- Prowirl F: DN25 to 300
- Prowirl R (reducer): DN40 to 250
- Prowirl O (160 bar): DN25 to 300
- Measuring tube, flanges and DCS sensor: stainless steel or alloy
- Process temperature: –200 to +400 °C
- Process pressure: up to 160 bar
- Max. measured error: < 0.65% o.r. for liquid mass; < 1.4% o.r. for steam/gas mass; 0.5% o.r. for pressure; < 1 °C temperature

Ultra-compact and optimized for utilities

Picomag – the smart pocket-sized flowmeter

- Simple, cost-effective flow measurement of water and water-like media
- Bluetooth operation and IO-Link connectivity
- Temperature measurement always integrated
- Conductivity used as a measured variable for monitoring media

Application The smart and robust electromagnetic flowmeter for water and water-like conductive fluids. Particularly suitable for utilities and water measurement in plant and machine construction.

Advantages

- Multi-variable measurement: flow, totalizer, conductivity or temperature displayed (selectable)
- User-friendly color display: automatic display alignment
- Intuitive operation: wireless access via Bluetooth and SmartBlue App
- Robust compact housing: stainless steel (IP65/67), high shock and vibration resistance
- Fast and reliable diagnostics: clear, unambiguous display of warnings and alarms (e.g. empty pipe yes/no)
- Simple installation: via standard external thread or adapter for Tri-Clamp, Victaulic and other threaded connections, with M12 connector as standard
- **NEW:** Conductivity used as a measured variable for monitoring media
- **NEW:** Increased accuracy ± 0.8% o.r. + 0.2% o.f.s.v.
- **NEW:** SmartBlue App makes it possible to import and export device configurations simply and quickly and to save the configuration as a PDF

Technical data and complete documentation:
www.endress.com/DMA

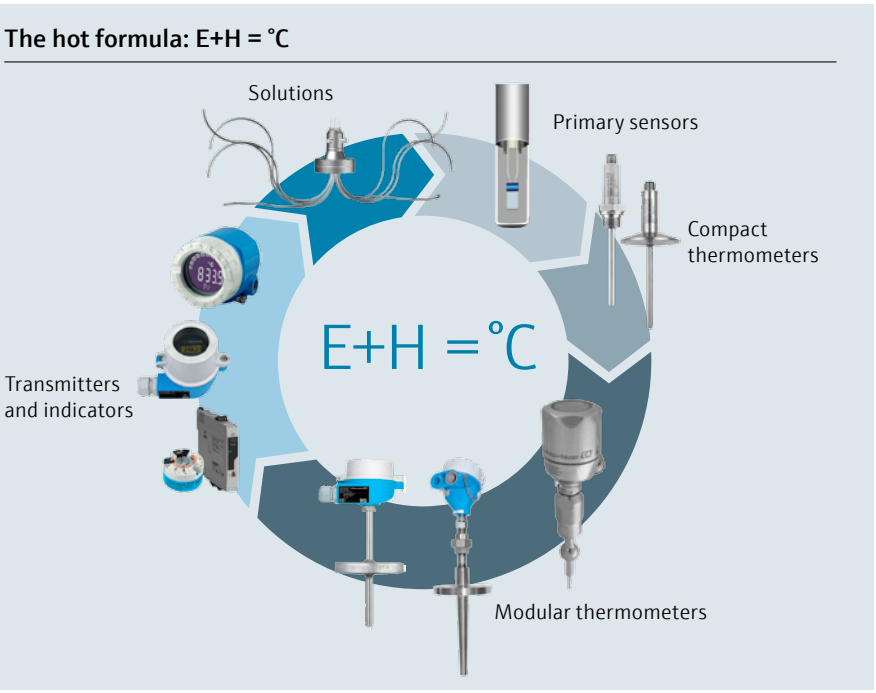
For product design:
www.endress.com/applicator

Technical data

- Nominal diameters: DN15 to 50
- Flexible adjustment of outputs and inputs: IO-Link, two current outputs (4 to 20 mA), pulse/switch output, voltage output (2 to 10 V), two switch inputs (e.g. to reset the counter)
- Flow: ±0.8% o.r. + 0.2% o.f.s.v. and temperature: ±2.5 °C
- Process temperature: −10 to +70 °C
- Process pressure: up to 16 bar

Temperature measurement

From primary sensors to customer-specific solutions



Temperature measurement technology is the oldest measuring principle with a correspondingly long history. Over time, over 50 important standards have been established worldwide, which must be adhered to in the process industries. These standards ensure that the individual parts of a temperature measuring point, such as inserts, thermowells, terminal heads and transmitters, can be freely combined, meaning that the equipment is easy to install.

Application Endress+Hauser is a complete provider of compact thermometers, modular thermometers, thermowells, inserts, temperature transmitters and accessories for all sectors of the process industry such as oil and gas, chemicals, food, life sciences, metals, primaries and energy generation. Temperature measurement technology determines quality and safety in processes.

Advantages

- Unique sensor technology for high long-term stability and process reliability
- The right components for the entire measuring chain allow for reliable planning
- International approvals/certificates
- Large number of different services and calibrations as standard
- Industry-specific product portfolio
- Production technologies to the highest quality standards
- Graphical configuration software ensures reliable and time-saving product selection
- Easy procurement via the Online Shop
- Global presence with production sites and services across the world

For more information, see the brochure "Temperature measurement" (FA00006T)

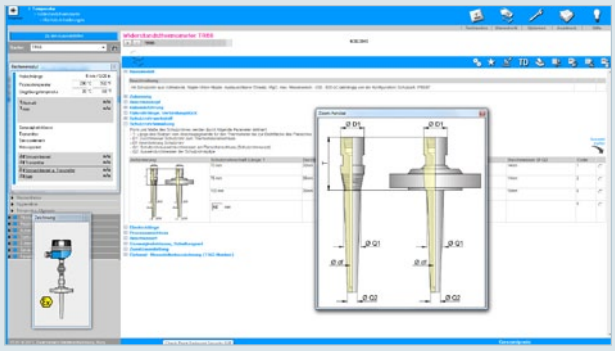
www.endress.com/temperature

Simple and reliable measuring point configuration

From the process data to the right product In many cases, extensive investigation and analysis is required in order to select the right thermometer. In addition to application-specific product selection, the Applicator Selection Tool offers the user a thermowell calculation program. This enables highly reliable planning.

Support software The integrated +Temperature graphical configuration tool is a software program that provides graphical support for configuring the selected thermometer type. This software takes the user through the step-by-step process of putting together the selected thermometer in detail. An extensive knowledge base is available to provide data for the configuration.

Graphical configurator+Temperature



Your benefits

- Fast and reliable configuration of a measuring point using the product structure
- Knowledge transfer during planning
- Graphic display of the configuration steps
- Transparent spare parts procurement
- Thermowell calculation and optimization for the application in accordance with DIN 43722 and ASME PTC 19.3
- Individual product data sheet with device illustration as the result of the configuration

Temperature measurement – thermometers

Sensor technology

- Unique, fully automated manufacturing process ensures consistently top-class quality
- Maximum process reliability and plant availability due to vibration resistance
- Highly accurate, rapid temperature measurement ensures optimal process monitoring and reliability

The core component of the thermometer is crucial

The core component of any measuring device is the primary sensor, which takes the form of an insert. This constitutes the central component of the temperature measuring point.

The manufacture of inserts has now been revolutionized. This fully automated production process is the only one of its kind in the world and ensures maximum reproducibility as well as full traceability of the installed components in accordance with the BS EN IEC 60751 standard.

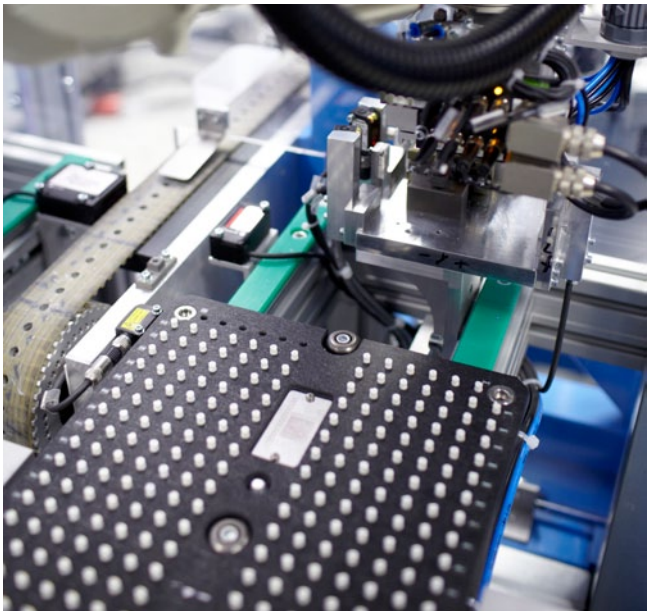
Application

- Chemicals/petrochemicals
- Food industry/life sciences
- Primaries/metal industry
- Energy sector

Advantages

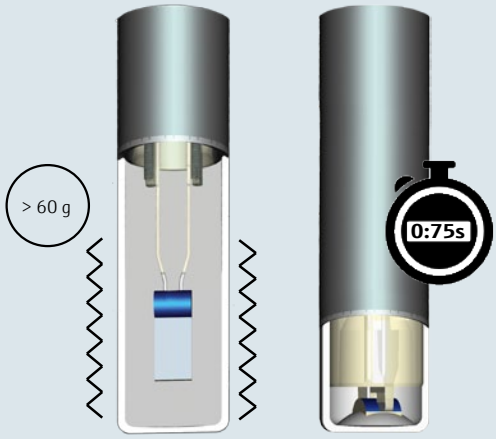
- iTHERM TS11x – a fully automated sensor production process that is the only one of its kind in the world, providing full traceability and top quality
- iTHERM StrongSens – ultimate vibration resistance (> 60 g) to ensure maximum plant reliability
- iTHERM QuickSens – very fast response times (T90 ≤ 0.75 s) for optimum process control
- The only provider on the market with a manufacturer's declaration regarding long-term stability under process conditions

More information available at:
www.endress.com/temperature



Fully automatic iTHERM sensor production with robotic technology

iTHERM sensors



iTHERM StrongSens – unparalleled vibration resistance (left) and iTHERM QuickSens – fastest response time (right)

Temperature measurement – self-calibration

Unique sensor technology with iTHERM TrustSens TM37x self-calibration function

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

World first

The core component of the thermometer is crucially important The core component of the compact transmitter is the reference sensor with physical fixed point. Our new iTHERM TrustSens thermometer is designed for users in the pharmaceutical and food and beverage industries who require absolute compliance with GMP regulations. This product eliminates the risk of non-compliance during production. The iTHERM TrustSens stands out from other thermometers with its fully automated in-line calibration prior to every batch, requiring no additional effort. This results in high product reliability and increases plant capacity. In-line monitoring is already recommended in the Good Manufacturing Practice regulations (GMP – Annex 15).

Application

- Life sciences
- Food
- Beverage industry

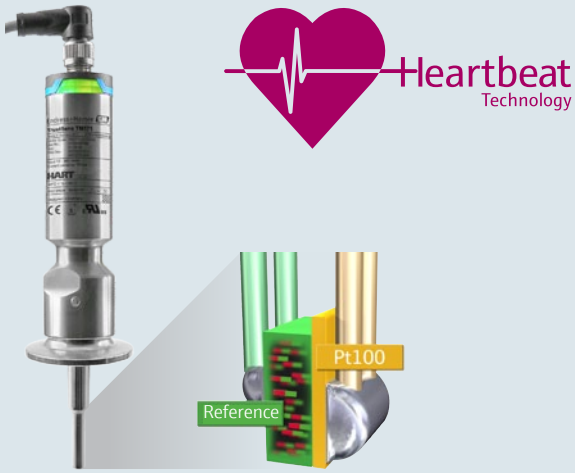
Advantages

- High process reliability and plant availability thanks to Heartbeat Technology
- No plant shutdown due to in-line self-calibration; fully automated and traceable
- Automated certificate generation and documentation – audit-proof
- Maximum measurement accuracy thanks to adjustment to match characteristic curves (sensor-transmitter matching)
- International certificates and approvals
  - EHEDG, ASME BPE, FDA, 3A, 1935/2004, 2023/2006 (GMP), 10/2011
  - CE CRN, CSA GPus
- Measuring range –40 to +160 °C
- More than 50 hygienic process connections as standard

Technical data and complete documentation:
www.endress.com/tm371

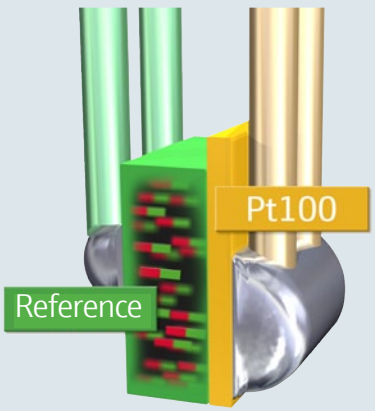
For product design:
www.endress.com/applicator

iTHERM TrustSens TM37x



iTHERM TrustSens – self-calibration

iTHERM TrustSens core component



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

Temperature measurement – resistance thermometers

Reduce costs with the TM4xx hygiene line

- Reduction of calibration cycles
- Highly accurate, rapid temperature measurement thanks to iTHERM QuickSens: optimized process monitoring and reliability
- Quick and easy recalibration thanks to iTHERM QuickNeck

Only provider on the market with a manufacturer's declaration regarding long-term stability under process conditions. The unique sensor design and the world's first automatic production process for the iTHERM QuickSens and iTHERM StrongSens, which are used as inserts in the TM4xx hygiene line, have resulted in significantly improved long-term stability up to 2.5 years (Class AA).

The long-term stability was tested on a fermentation plant that is sterilized two to three times a week and operates around the clock, 365 days a year. The test was conducted over a period of 2,000 hours and approximately 377 cycles.

Application

- Food industry
- Life sciences industry

Advantages

- Manufacturer's declaration with regard to long-term stability under realistic process conditions
- Cost savings as a result of reduced calibration requirements
- High measurement accuracy in the Class AA range
- Consistent product quality
- High level of traceability
- High level of process stability and reliability
- Reduced life cycle costs

More information available at:
www.endress.com/temperature

Calibration of the resistance thermometer TM411

Cost saving based on the example of a fermentation plant

Based on calibration costs of €120 per measuring point and 500 thermometers that need to be calibrated, and given a 50 percent reduction in calibration requirements, a cost saving of €30,000 per year can be made.

Sterilization cycles	2–3 weeks
Sterilization cycle time for CIP/SIP	5.3 h
Sterilization cycles/year	156 cycles (3 sterilization cycles x 52 weeks)
Total hours of sterilization cycles/year	826 h (156 cycles/year x 5.3 h cycle time for CIP/SIP)
Laboratory test time (QuickSens/StrongSens)	2,000 h (constantly kept within Class AA ≤ ±0.1 K at 0 °C)
Corresponding operating time in years	2.5 years (2,000 h/826 h=2.42 years)
Endress+Hauser manufacturer's certificate for cycles/2.5 years	377 cycles (156 cycles/year x 2.42 years)

Temperature measurement – transmitters

Intelligent signal analysis

- Rapid no-tools wiring thanks to spring terminal technology
- Segmented portfolio from standard to high performance
- Maximum plant safety and reliability thanks to SIL 2/3 IEC 61508:2010

The function of transmitters is transforming the primary sensor signal into a stable, standardized signal. The transmitters can be configured and support numerous types of resistance sensors, thermocouples, resistance transmitters and voltage transmitters. Stored linearization characteristics ensure a high level of measurement accuracy.

Transmitters are sold in three typical housing forms:
- As a head transmitter for direct installation in a thermometer terminal head
- As a DIN rail device for installation in a control cabinet
- As a field transmitter for direct use in the process environment

Application
- For temperature measurement with resistance sensors, e.g. Pt100 or thermocouples

Advantages
- Fully automated production process ensures high product quality
- Versatile thanks to varying designs and communication methods, e.g. 4 to 20 mA/HART/FOUNDATION Fieldbus™ /PROFIBUS PA
- Single-channel/two-channel for maximum process reliability
- International approvals and certificates
- SIL 2/3 in accordance with IEC 61508:2010; maximum process reliability and simplified approval procedures (TMT82)
- Reliable operation due to sensor monitoring for more efficient production processes and higher product quality
- Diagnostic information as per NE 107
- Breakdown information as per NE 43
- Simplified proof-testing is possible with the TID10 plug-in display

More information available at:
www.endress.com/temperature

Segmented portfolio from standard to high performance

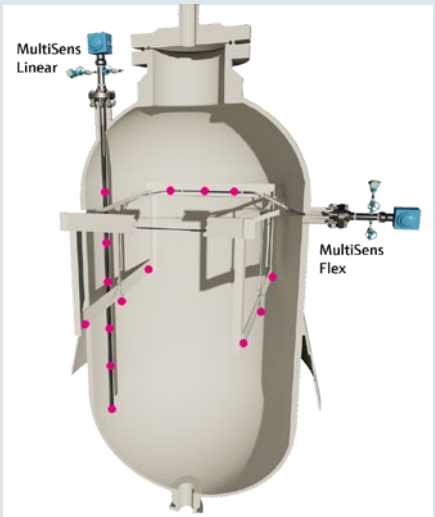
Technical data
- Universal inputs: Pt100, TC, resistance transmitter (Ω), voltage transmitter (mV)
- Installation in flat face terminal head, top-hat rail mounting, field housing
- Safe operation in hazardous areas
- International approvals such as FM, CSA, NEPSI, IEC Ex, GOST and others

Measuring temperature profiles with iTHERM MultiSens

The new iTHERM MultiSens models make it possible to continuously monitor temperature profiles using just a single process connection

- Safety and efficiency thanks to close temperature monitoring (e.g. in fixed-bed reactors)
- Simplified multipoint measurement design using standard models
- Free positioning of measuring points and high number of measuring points despite confined installation conditions
- Maximum plant availability thanks to unique safety concept with up to three process barriers
- Project support from specification to installation

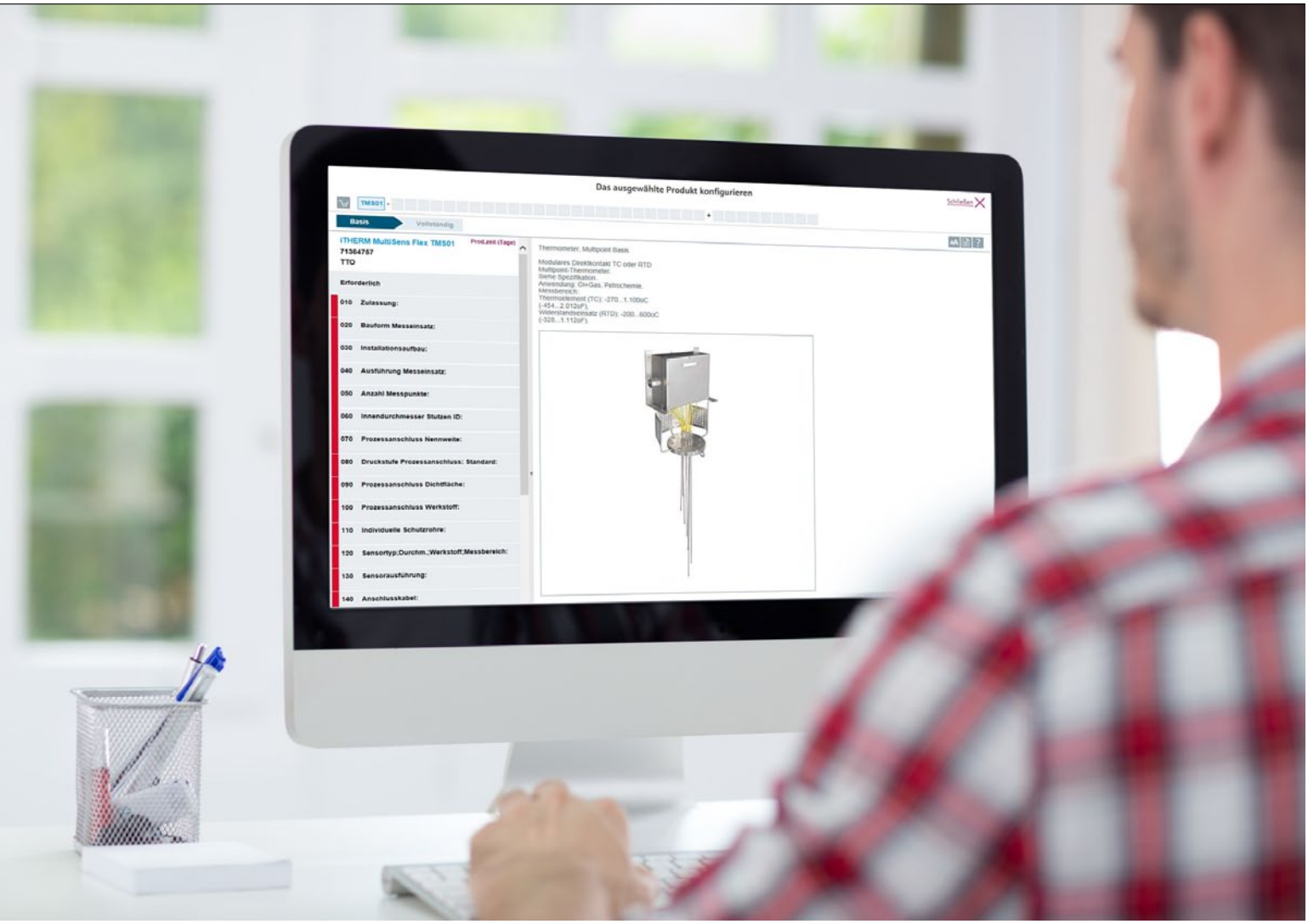
Multipoint standard models



	MultiSens Flex	MultiSens Linear	MultiSens Slim	MultiSens Bundle
				
Without diagnostic chamber	TMS01	TMS11	TMS21	TMS31
With diagnostic chamber	TMS02	TMS12		

Customized solutions The development of the optimal multipoint thermometer for an extremely wide range of processes is the result of many years of experience, both from the operator and from the measurement technology supplier. Endress+Hauser offers made-to-measure solutions in this area, which demonstrate the company's expertise in, and passion for, each sector. Pre-configured standard models can be used for many applications.

Application The MultiSens iTHERM TMS0x and TMS1x thermometers are specially designed for the requirements of refinery and petrochemical processes. Areas of use include fixed-bed reactors, fluidized bed reactors, distillation columns and storage containers. A version with diagnostic chamber, which provides an additional process barrier, is also available. The iTHERM TMS21 MultiSens thermometer has been developed for use in the chemical industry, particularly in smaller test reactors in pilot plants and tube bundle reactors. The iTHERM TMS31 MultiSens thermometer has been developed for temperature monitoring in silos, specifically for the primaries and food sectors.



Advantages

- Linear or three-dimensional distribution of measuring points
- Optimal use of available process connections
- Application-specific adjustments are possible
- Inserts that can be replaced depending on version
- Complete engineering of the measuring chain
- 2D or 3D drawing
- Trained experts for installing and commissioning

Technical data and complete documentation:
www.endress.com/tms01
www.endress.com/tms02
www.endress.com/tms11
www.endress.com/tms12
www.endress.com/tms21

More information available at:
www.endress.com/multipoint

For product design:
www.endress.com/applicator

Design a device that is tailored to your needs using our online configurator at
www.endress.com/applicator

Technical data

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

Temperature measurement – temperature transmitters with optional Bluetooth control

iTEMP TMT71 and TMT72 universal temperature transmitter – high accuracy, simple operation

- Improved process efficiency and plant availability thanks to accurate temperature measurements and long-term stability
- Simple commissioning thanks to integrated Bluetooth interface and intuitive menu guidance
- Reduction of plant shutdown through advanced diagnostics including undervoltage detection

Application

- The new iTEMP TMT71 and TMT72 temperature transmitters are single-channel temperature transmitters with 4 to 20 mA and HART7 communication for converting various input signals into a scalable 4 to 20 mA output signal.
- The optionally integrated Bluetooth interface for wireless display of measured values and configuration via the Endress+Hauser SmartBlue App makes commissioning extremely simple.

TMT71 with TID10 display

Advantages

- Safe operation in hazardous locations due to international approvals
- Reliable operation thanks to sensor and device monitoring
- Diagnostic information in accordance with NAMUR NE 107
- Optional TID10 plug-in measured value display
- Optional integrated Bluetooth interface for wireless display of measured values and configuration via the Endress+Hauser SmartBlue App

TMT72 installed in the housing

Technical data and complete documentation:
www.endress.com/temperature

For product design:
www.endress.com/temperature

Technical data

- 1 x universal input for resistance temperature detector (RTD), thermocouples (TC), resistance transmitter (Ω) or voltage transmitter (mV)
- Output 1 x 4 to 20 mA (TMT71) + 1 HART protocol (TMT72)
- Optimal system integration in existing communication systems – DD, FDT/DM
- Diagnostics in accordance with NAMUR NE 107

Temperature measurement – secondary containment

DUAL-SEAL: Reliable sealing of the process side, even if a thermowell breaks: iTHERM ModuLine TM1xx

- Maximum process reliability and plant availability thanks to secondary containment
- Simple, reliable operation using Bluetooth
- Maximum process reliability and response times that are four times faster thanks to innovative thermowell design

The new iTHERM ModuLine TM1xx portfolio consists of modular temperature assemblies for both basic and challenging applications. It can be used wherever reliable, accurate and stable temperature measurement is required, and where valuable additional information needs to be generated and used. The aim is always to improve process monitoring, extend the operating time of the temperature measuring point and therefore increase plant safety and reliability. The secondary containment feature, for example, prevents the medium escaping if there is a leak in the thermowell, while sending a signal to the controller. In the event of a fault, the temperature signal is maintained. The fast-response thermowell up to +400 °C is another innovation.

Application

- Chemicals
- Oil and gas
- Energy

Advantages

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

More information available at:
www.endress.com/moduline

Technical data

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

Liquid analysis

Reliable, simple, safe, cost-effective

Endress+Hauser develops and produces all components for analytical measurement technology and makes operation of your measuring point easier, more reliable and more cost-effective.

Application

- pH: universally usable and reliable glass and non-glass electrodes (0–14 pH)
- Conductivity: from ultrapure water to acid measurement – cost-effective range of sensors for all applications
- Oxygen: simple, optical and amperometric sensors for reliable oxygen measurement
- Turbidity: from ultrapure water to sewage sludge applications – cost-effective solutions for your measurements
- Chlorine measurement: reliable chlorine sensors to guarantee the disinfection functions in drinking water, service water and swimming pool water
- Transmitters: simple operation, automatic sensor detection

User-friendly transmitters From simple transmitters to high-end multi-channel transmitters – the reliable transmitters produced by Endress+Hauser are notable for their simple and standardized operation. The Liquiline platform, in particular, uses a navigator to give it unparalleled operating reliability. In addition, it has a modular design so that you can easily add to it.

Sensor technology expertise No other component in a measuring point requires quite so much time and expertise to develop as the sensor system does. The large vertical production range, modular assemblies and a high level of automation guarantee absolutely reliable quality and safety, regardless of the liquid analysis parameters that you want to measure.

"Endress+Hauser provides better support for customers in the area of liquid analysis than any other provider. With Memosens, Endress+Hauser has established an industry standard."

Frost & Sullivan

For more information, see the brochure "Sensors, transmitters, compact devices and assemblies" (FA00007C)

www.endress.com/analysis

In 2017, Telekom and WirtschaftsWoche presented the Digital Champions Award to Endress+Hauser for their Memosens technology.

The perfect combination – over 10 years of Memosens technology and Liquiline transmitters

Digital technology well established in the market
Memosens technology – the inductive and digital transmission of measured values from the sensor to the transmitter – has been firmly anchored in the market for 14 years now, with well over a million of these analytical sensors produced so far and demonstrating their benefits in use. Memosens stands for the digitization of the measured values directly in the sensor head, the non-contact digital signal transmission and the diagnosis and storage of all data relevant to the sensor directly in the sensor.

Memosens sensors are available for the following measuring parameters:
- pH/ORP
- Conductivity, inductive and conductive
- Dissolved oxygen, amperometric and optic
- Turbidity
- Chlorine
- Ultrasonic sludge level
- Ion-sensitive sensors for ammonium and nitrate
- UV sensors for nitrate and SAC

With all the sensors now speaking the same language thanks to Memosens technology, we have been able to develop a completely new transmitter platform with the Liquiline devices. The devices are optimized for the use of digital Memosens sensors.

Liquiline transmitters simplify operation The standout features of the Liquiline devices include their intuitive operation and their ability to easily connect new sensors and automatically detect the sensor connected. The measuring parameter is detected by the device and the corresponding software is activated. Within half a minute, the system is ready to measure with the relevant parameter. The sensor parameters are also copied automatically, thus preventing parameterization errors. This means that, regardless of the measuring parameter, only one transmitter type is required. Storage costs are reduced and the ordering process is simplified.

Your benefits

- Reliable signal transmission: no moisture or EMC problems thanks to inductive digital signal transmission
- Intelligent safety: an active indication is given in the event that there is no connection between the sensor and transmitter
- Simplified installation guaranteed thanks to longer distance of up to 100 m between the sensor and transmitter
- Memosens sensors can also be used in hazardous areas
- Field calibration no longer necessary – easy, reliable calibration in the laboratory is possible because the relevant data is stored in the sensor head
- Quick commissioning and simple maintenance make your measuring point profitable

More information available at:
www.endress.com/memosens
www.endress.com/liquiline

Liquid analysis – pH

pH ISFET CPS47D/77D/97D electrodes

- New hygienic sensor design
- Unbreakable PEEK sensor shaft
- Three different reference systems

Application

CPS47D – highest accuracy for the chemical, food and life sciences industries
- Reference filled with potassium chloride liquid electrolyte, ceramic junction and potassium chloride filler connection
- Measurement of media with a high organic solvent content
- Measurement of media that cause blockages

CPS77D – product safety for the food and life sciences industry
- Gel electrolyte with bacteria-proof, microporous ceramic junction
- Meets the most stringent hygienic requirements

CPS97D – for heavily contaminating media in the chemical and paper industry
- Open junction and specially hardened, chemically stable reference gel
- Measurement in dispersions, precipitation reactions and media with a high solids content and contamination potential

Advantages

- Five times higher CIP stability than conventional ISFET pH sensors
- Extremely easy to clean thanks to new design and larger measuring surface
- Glass-free pH sensor; unbreakable PEEK shaft
- Meet all food-related requirements in accordance with EHEDG, 3-A, EU1935/2004 and FDA, comply with USP87, USP88 Class VI, USP381, USP661 and are TSE/BSE-free
- Can be used in all insertable and retractable assemblies from Endress+Hauser

CPS47D CPS77D CPS97D

Technical data and complete documentation:
www.endress.com/cps47d
www.endress.com/cps77ds
www.endress.com/cps97d

For product design:
www.endress.com/applicator

Technical data

- Measuring range: 0 to 14 pH
- Temperatures: −15 to +140 °C
- Process pressure: max. 0.8 to 11 bar
- Measuring principle: ion-sensitive field-effect transistors (ISFET)

Liquid analysis – transmitters

Field devices: Liquiline CM442, CM444, CM448, CM44P
Top-hat rail: Liquiline CM442R, CM444R, CM448R, CM44P

- Reduces installation costs: a single transmitter for up to 12 measuring parameters
- Fast, user-guided commissioning due to plug-and-play Memosens sensors
- Heartbeat Technology offers comprehensive self-diagnostics, simple device verification and information for predictive maintenance

Application Liquiline CM44x multi-parameter transmitter for monitoring and controlling industrial and environmental processes with up to eight measuring channels, based on digital Memosens technology

- Chemical and life sciences industry
- Water and wastewater applications
- Food technology
- Power plants
- Plant engineering and construction

Liquiline CM44x

Advantages

- Fast commissioning and maintenance thanks to pre-calibrated Memosens sensors
- Modular design guarantees rapid adjustment to new measuring tasks
- Highly flexible, even for communication with higher-level systems: 0/4 to 20 mA, HART, Modbus, Ethernet, PROFIBUS DP (3.02) web server
- Minimal inventory management thanks to the modular concept
- Very simple installation on a DIN rail; also with optional display
- **NEW:** CM44P for connecting process photometers

Liquiline CM44xR

Technical data and complete documentation:
www.endress.com/cm442
www.endress.com/cm444
www.endress.com/cm448
www.endress.com/cm442r
www.endress.com/cm444r
www.endress.com/cm448r
www.endress.com/cm44p

For product design:
www.endress.com/applicator

Technical data

- For all digital (Memosens) sensors
- Sensor cable length: up to 100 m
- Logbook functions: data, calibration, operating and diagnostics logbook
- CM44P: for connecting up to two process photometers and up to four Memosens sensors

Liquid analysis – disinfection

CCS50D chlorine dioxide sensor
CCS51D chlorine sensor (free active chlorine)

- Sensors for reliable and low-maintenance disinfection monitoring and wet scrubbers (mandatory since August 2017)
- Extremely long calibration intervals and fast response times (t90 < 25 s)
- Sensor for monitoring compliance of evaporative cooling plants and wet scrubbers with the 42nd regulation of the German Emissions Control Act (42. BImSchV)

Application From trace measurement to concentration measurement, the CCS50D and CCS51D chlorine dioxide and chlorine sensors cover the entire scope of possible disinfection applications. The sensors' fields of application include drinking water treatment and the monitoring of cooling water plants for biofilm and pathogen growth (in accordance with the 42nd regulation of the German Emissions Control Act [42. BImSchV], binding since August 2017). Furthermore, the disinfection sensors can also be used for safety monitoring in the food industry.

The sensors are used in the following applications:
- Coolant/cooling towers – to prevent the growth of biofilms and pathogens (legionella)
- Drinking water – to guarantee reliable disinfection in accordance with directives
- Food processing – to guarantee food safety

Advantages
- The right sensor for any application: from trace measurement through to concentrations of 200 mg/l
- The fast response time (t90 < 25 s) provides a clear view of the process and enables immediate responses in order to react to changes
- Flexible installation: can be installed in the CCA151, CCA250 flow cell and in immersion assemblies
- Easily combined with other relevant liquid analysis parameters (Liquiline)

CCS50D

CCS51D

Technical data and complete documentation:
www.endress.com/ccs50d
www.endress.com/ccs51d

For product design:
www.endress.com/applicator

Technical data
- Measuring range: 0 to 200 mg/l ClO2; free available chlorine
- Temperatures: 0 to +55 °C
- Process pressure: max. 1 bar
- Measuring principle: amperometric

Liquid analysis – transmitters

Liquiline compact transmitter CM82

- Reduced installation effort – direct connection to PLC via 4 to 20 mA or HART
- Maximum reliability and safety thanks to time-tested Memosens technology
- Simple Bluetooth operation via Endress+Hauser SmartBlue App with smartphone or tablet
- Superior data security owing to certified security concept

Application

- Life sciences
- Chemical industry
- Water and wastewater

Advantages

- Saves space: extremely compact design – the focus is on the measuring task alone
- Uncomplicated installation: directly connected to the PLC/DCS (Scada system)
- Maximum system safety
- Proven-in-use Memosens technology
- Standardized operating concept across all devices in the Liquiline platform
- Quick commissioning and maintenance
- Memosens: laboratory-calibrated hot plug-and-play sensors
- Pre-configured Liquiline compact transmitter via HART or Bluetooth
- Minimum inventory management: cross-platform concept for all Memosens sensors
- ATEX (1) 2G

Technical data and complete documentation:
www.endress.com/cm82

For product design:
www.endress.com/applicator

Technical data

- For digital Memosens sensors for pH/ORP, oxygen and conductivity
- Ambient temperature: –20 to +85 °C
- Fits all Endress+Hauser standard assemblies

Liquid analysis – turbidity

CUS50D absorption sensor for turbidity and solids measurement

- Turbidity measurement based on the light attenuation principle (transmission method)
- In accordance with ISO 7027
- Glass-free sensor head made from dirt-repellent Teflon has two path lengths
- Monitoring the course of the measuring signal with automatic adaptation of the measuring range

Application Turbimax CUS50D ensures reliable measurements and efficient process monitoring, even in aggressive media:

- Industrial wastewater and utilities:
  - Measurement of the solids content in process and wastewater sludge
  - Monitoring of flocculant dosing
  - Concentration measurement of milk products in wastewater
- Process media:
  Concentration measurement in the product, e.g. in titanium dioxide
- Highly absorptive media:
  Concentration measurement in extremely dark media, e.g. activated carbon concentration in the fourth cleaning step of wastewater treatment plants

Advantages

- Sensor head made from dirt-repellent Teflon derivative is easy to keep clean using the air purification unit.
- Turbidity measurement based on the light attenuation principle in accordance with ISO 7027
- Sensor is pre-calibrated ex-works and includes various application models
- Easily combined with other relevant liquid analysis parameters (Liquiline)

Technical data and complete documentation:
www.endress.com/cus50d

For product design:
www.endress.com/applicator

Technical data

- Measuring range: 40 to 4,000 FAU/0.000 to 5,000 AU
- Temperatures: –20 to +85 °C
- Process pressure: max. 4.5 bar
- Measuring principle: transmission method in accordance with ISO 7027

Liquid analysis – total phosphorous and phosphate

CA80PH/CA80TP Liquiline system with sample conditioning/CAT8x0

- Colorimetric analyzers for reliable set point monitoring
- Long operating times and low operating costs thanks to new dosing and measuring system
- Reliable control at low concentrations thanks to molybdenum blue method

Application

- Monitoring and optimization of the phosphorus elimination of municipal and industrial wastewater treatment plants
- Control of the flocculating agent dosing
- Control for optimization of the biological treatment
- Monitoring of the wastewater treatment plant outlet

Advantages

- On a par with laboratory analytical methods based on the colorimetric measuring principle using molybdenum blue derived from DIN EN 1189
- Not affected by fluctuating wastewater coloration
- Reliable measurement in the extremely low concentration range
- One device for all measuring ranges with the new kind of multi-range photometer
- Reduced maintenance and operating costs
- Complete integration into the Liquiline and Memosens platform – standardized design, simple operation
- Simple connection and reliable monitoring of the sample preparation
- Measuring station can be expanded by connecting up to four Memosens sensors
- Full integration into higher-order systems by means of bus communication

CA80

Technical data and complete documentation:
www.endress.com/ca80ph
www.endress.com/cat810
www.endress.com/cat820
www.endress.com/cat860
www.endress.com/ca80tp

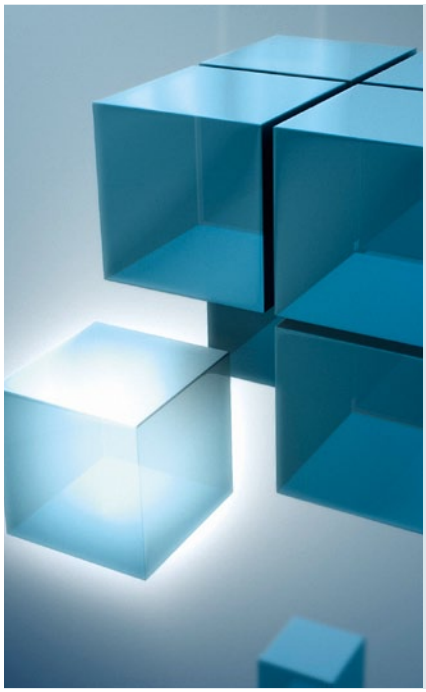
For product design:
www.endress.com/applicator

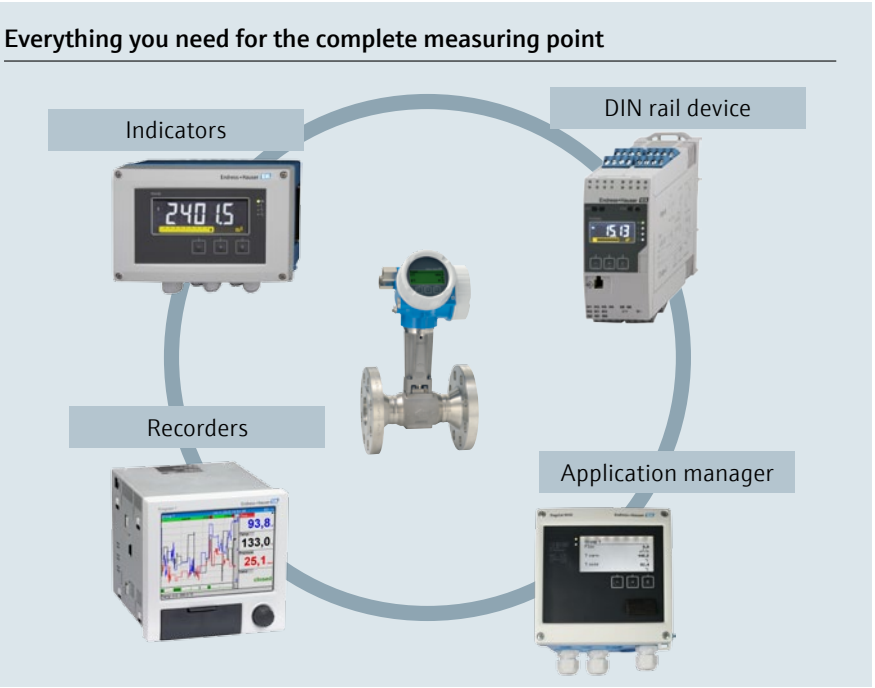
Technical data

- Measuring range: 0.05 to 50 mg/l PO4-P (Pges)
- Repeatability: ±2% of the measured value ±0.01 mg/l PO4-P and Pges
- Single-channel or two-channel (CA80PH)
- Up to four Memosens sensors can be connected

System components

Feeding, separating, indicating, registering





Endress+Hauser system components increase plant availability through integrated diagnostic functions. The system components optimize the control process directly at field level or manage energy consumption with advanced calculation methods.

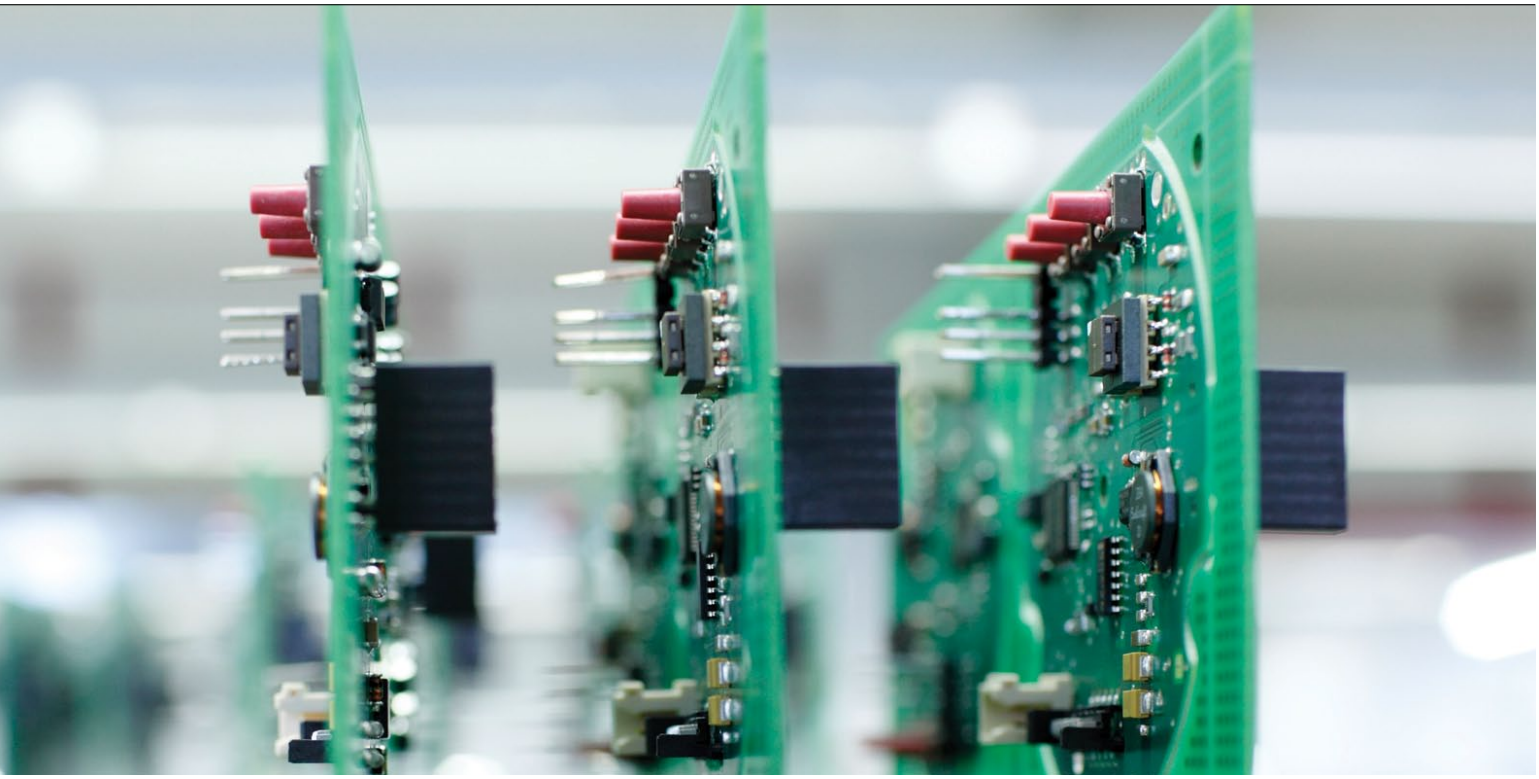
Application In addition to measurement technology, additional functionality is required in most applications. Measurement devices have to be supplied and protected, the measured value displayed or processed, limits derived and monitored, and data recorded securely. And all this is done by system components that offer the right solutions for control cabinets or in the field.

Advantages Endress+Hauser components help you to save time and money:
- Easy installation and commissioning saves time
- Simple configuration of ready-to-use solutions reduces costs for time-consuming programming
- Time saving through easy integration of the devices via fieldbuses or via OPC servers during commissioning

You not only reduce costs in practice but also at the time of purchase because you receive the complete solution from one source with just one order.

For more information, see the brochure "System components and data managers" (FA00016K)

www.endress.com/systemcomponents



Solutions for complete measuring points

Displays Have a clear view of the measured value with Endress+Hauser displays: Whether for installation in the field or in a control panel, for hazardous or non-hazardous applications, for fieldbuses or for 4 to 20 mA loops, we offer something for everyone.

Data recording The perfect solution for secure data recording. From a simple solution with the Ecograph T to the Memograph M universal data manager, which meets even the high data recording requirements of the FDA, we have the right device for every application.

Energy computers The basis for energy savings is measuring energy. With Endress+Hauser energy computers, you always have the right solution, from single-channel to multi-channel measurement.

Analysis on the DIN rail Our DIN rail devices offer compact design with a wide range of functionalities. These devices are particularly well suited to SIL 2 applications.

Feeding, separating, indicating, registering

RIA15 indicator

Memograph M data manager

RMC621 energy computer

RN221N DIN rail device

Your benefits

- Quick and easy to use
- Integration into higher-order systems
- High plant availability thanks to coordinated devices

Easy data integration on DIN rail

Memograph M RSG45 DIN RAIL automation component

- Full data access as far as sensor level via HART input card
- Can transmit up to 40 process values via HART or bus interfaces
- For compact, cost-effective mounting on the DIN rail and simple, time-saving operation via web server

Application The Memograph RSG45 is now available exclusively as a DIN rail device without a display. In addition to the data logging function, Memograph M RSG45 also allows the digital integration of HART sensors into higher-level systems. Not only is the full digital transmission of measured values supported, but measuring device error messages or warnings can also be retrieved online via the gateway functionality. The calibration reports can be saved and visualized together with the TrustSens TM371 thermometer. The new web server offers the option of online trending, transferring the screen functionality to the PC.

Advantages

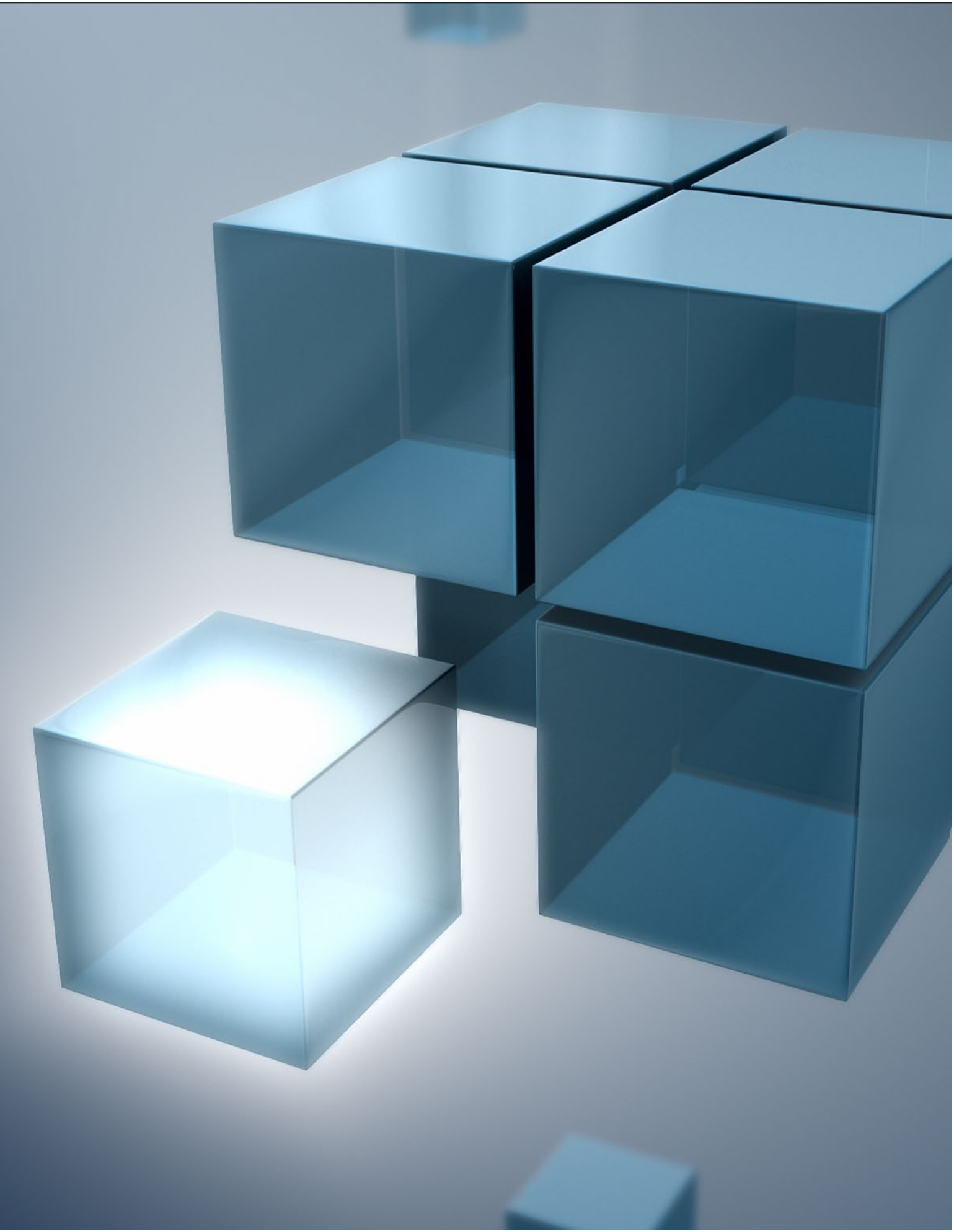
- Digital communication from the sensor to the control system
- Integration as slave into a variety of bus systems
- Easy DIN rail mounting; easy operation via web server
- Tamper-proof data logging

Technical data and complete documentation:
www.endress.com/rsg45

For product design:
www.endress.com/applicator

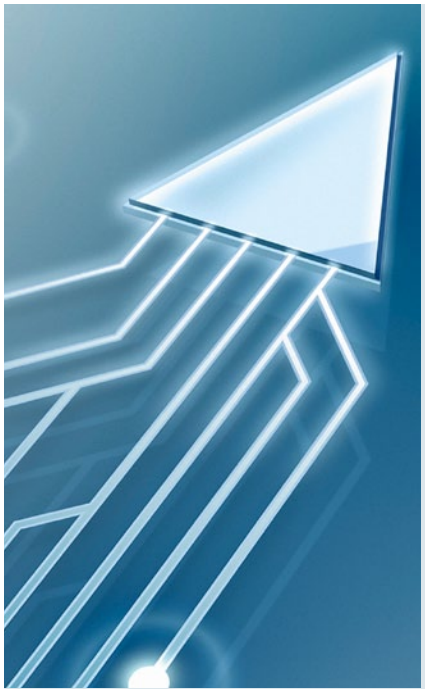
Technical data

- Up to 20 HART or universal inputs
- Various bus connections such as PROFINET, PROFIBUS DP, Ethernet/IP, Modbus RTU/TCP
- With HART input cards, full access to the sensor via Ethernet with the HART gateway functionality
- Secure data logging; FDA compliance also possible

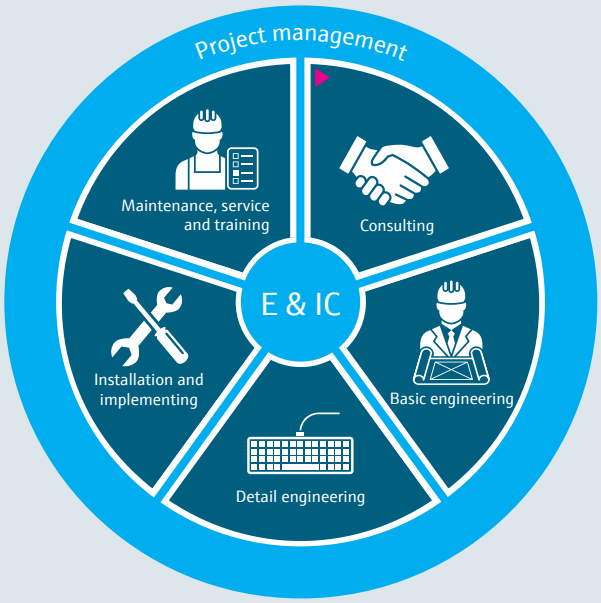


Intelligent process automation

Responsibly making projects a success



Complete range of services for your automation project



For over 65 years, Endress+Hauser has manufactured high-precision measurement technology for the process industry. From digital bus systems to complex measurement methods through to official requirements for processes in which our technology is used – with Endress+Hauser solutions, you can benefit from our many years of experience in these areas.

Application

- Complete solutions for measuring tasks
- Loading liquids and gases (except for water)
- Quality monitoring of liquids
- Complete solution for overfill prevention systems in accordance with the WHG (German Water Resources Act)
- Customer-specific automation solutions

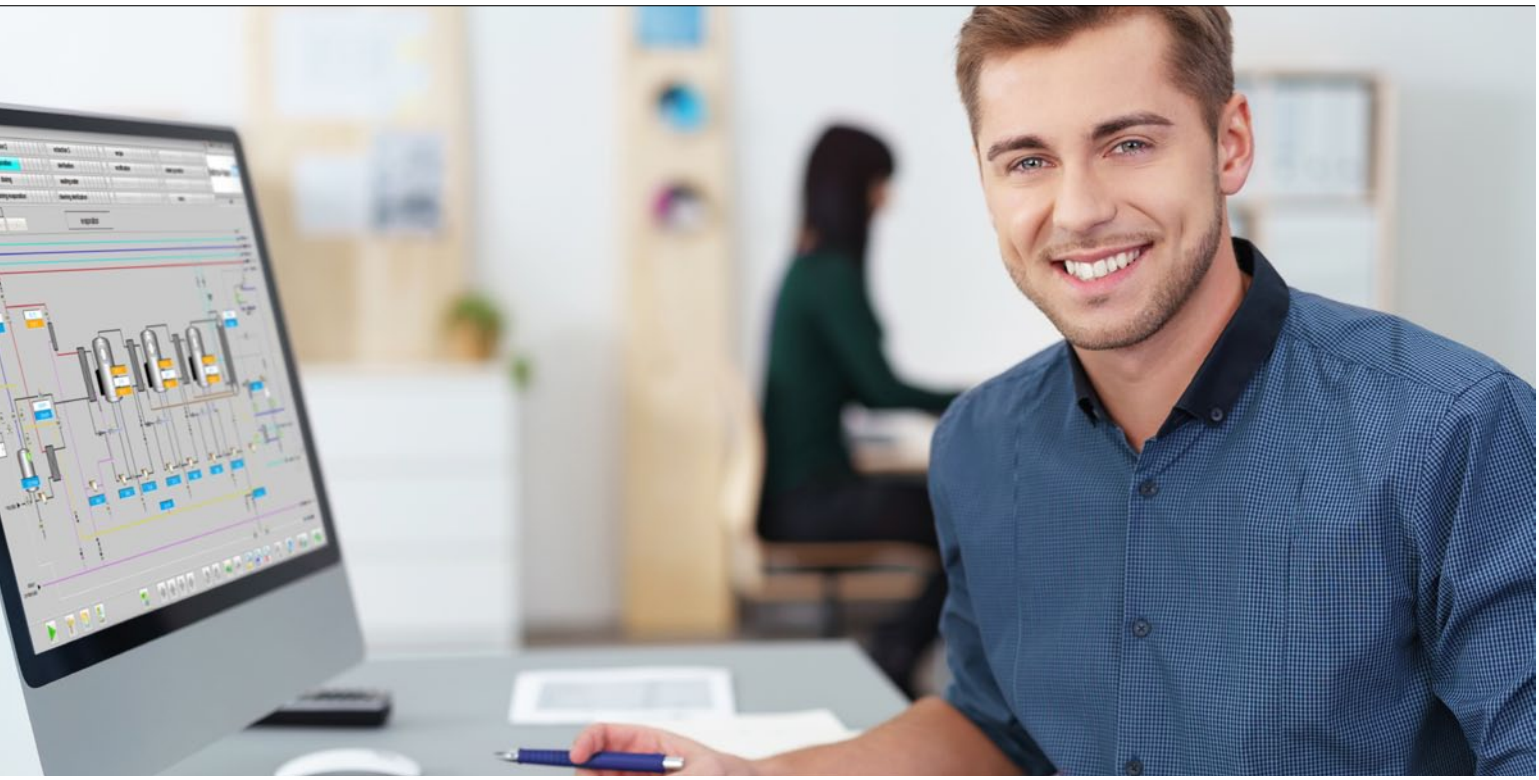
Advantages

- Local and international presence – wherever your plant is, Endress+Hauser is on site with you
- A single partner for the entire life cycle of your plant
- Broad industry expertise – Endress+Hauser knows your requirements and speaks your language
- Safety and stability of a financially independent family-owned company

Your benefits

Our many years of experience in process automation ensure smooth operation of your plant.

For more information, available at:
www.endress.com/solutions



Automation services

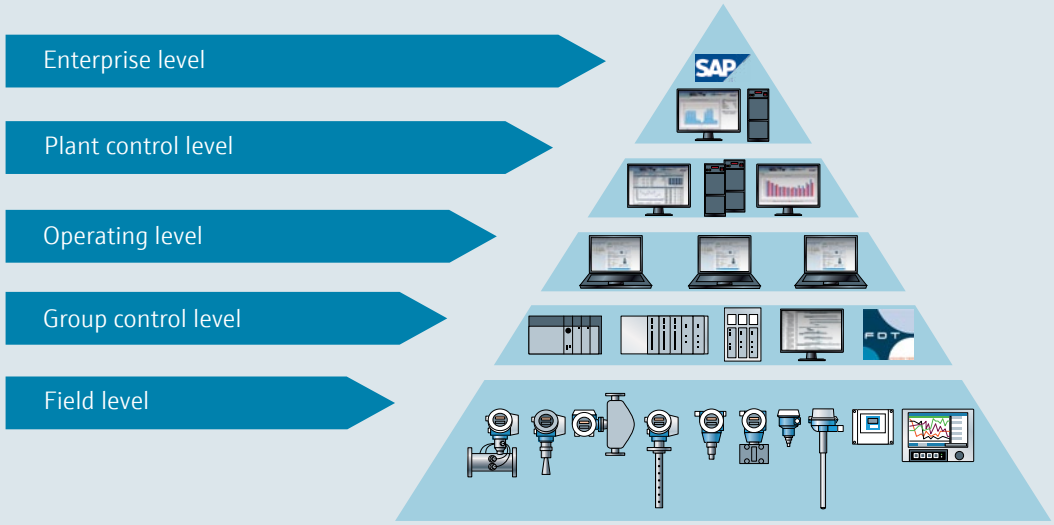
Everything from a single source, from the field level to the business level Normally, to implement your automation project, you will require both instrumentation and electrical components such as motors, frequency converters, control cabinets, controllers and many others.

Endress+Hauser offers planning and programming services and provides tailor-made automation solutions for all aspects of EI&C technology.

Our system expertise:

- Siemens S5, S7, PCS7
- Siemens WinCC, WinCC flexible
- Rockwell Control/Compact/MicroLogix, PlantPax
- Rockwell FactoryTalk View, RSView
- WAGO
- Videc atvise, Acron
- Wonderware Intouch
- ePlan P8

Engineering across the entire automation pyramid



Cooling circuit disinfection and the 42nd regulation of the German Emissions Control Act (42. BImSchV)

The generator is the first continuous chlorine dioxide generator to employ the chlorite peroxodisulfate process

The 42nd regulation of the German Emissions Control Act (42. BImSchV) entered into force in August 2017. The regulation applies to all open evaporative cooling plants, cooling towers and wet scrubbers, where water is evaporated for cooling purposes, then comes into contact with ambient air in the form of aerosols and can therefore be breathed in.

The regulation lays down requirements for the equipment and its condition and, in particular, describes detailed specifications for monitoring the operation of approximately 50,000 existing plants. This also includes precautions required for regular monitoring of physical and chemical parameters, for example, with the recommendation to have the most important water parameters, such as temperature, conductivity and pH, monitored online. The aim of regular plant checks is to immediately detect the accumulation of pathogens even in the water guided in the inlet and circuit. An action program taking place over several stages with permitted limit values is intended to prevent further outbreaks of legionellosis in future.

Endress+Hauser helps you comply with the 42nd regulation of the German Emissions Control Act (42. BImSchV) through low-maintenance, reliable measurement technology for recording water parameters as well as, in particular, a reliable solution for the successful use of chlorine dioxide. Together with Brenntag and a.p.f., we are using the first continuous chlorine dioxide generator to employ the chlorite peroxodisulfate process. The patented production method guarantees complete conversion of the raw materials supplied. This conversion does not require reagents that are used in other processes, such as hydrochloric acid or free available chlorine, which entail high requirements for workplace safety and storage. This produces a stable, ultrapure chlorine dioxide solution which is suitable for immediate use or storage and enables the chlorine dioxide dosing to be perfectly adapted to the current on-site requirements.

Application

- Remove/prevent biofilms, deposits and microbial contamination in open and closed cooling circuits, cooling towers, air washers and condensers
- Sanitization of wastewater
- Disinfection of drinking water
- Applications in the food and beverage industry, e.g. in CIP systems, bottle cleaning systems, etc.

For more information, see the brochure “Clorious2” (CP01327Z)

The Clorious2 generator

Three different sizes of reactor (5, 25 or 100 liters)

When used in conjunction with Endress+Hauser's chlorine dioxide panel, it is also possible to fit all sensors that may be required for water treatment. In addition to the ORP probe and pH electrode, a CCS50D chlorine dioxide sensor can also be installed.

Your benefits

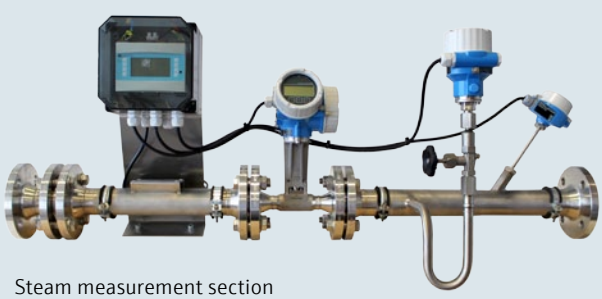
- Variable production capacity
- Concentration of chlorine dioxide is fully adjustable
- Unpressurized operation
- No aggressive gas phase
- No corrosion in the water phase
- Pumps do not come into contact with chlorine dioxide
- Precision digital membrane dosing pumps
- Does not rely on extraneous water
- Choice of continuous, batch or pulse dosing
- Fully automated, self-monitoring reactor operation

Complete mechanical solutions for your measurement technology

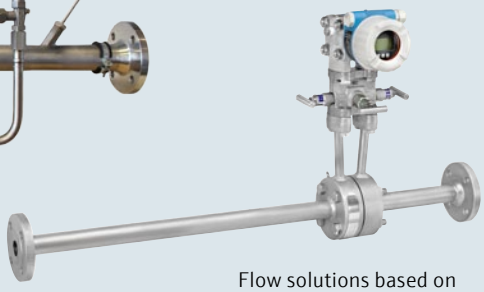
Devices, components and systems are pre-assembled and precisely configured to be compatible with each other

Finished complete measuring points and instrumentation projects Ready-to-install devices, components and system units save costs and time. Unexpected problems can occur on-site when measurement technology and accessories are ordered. The wrong parts have been ordered, the parts are not compatible, are delivered to different locations and cannot be found by the technicians or delivery is delayed. To prevent these problems from occurring in the first place and so that your project is not delayed, we take charge of engineering, ex-works preassembly, delivery coordination, on-site installation, construction site management, commissioning and the entire documentation. For this reason, many of our customers currently rely on the experience of our employees to ensure that complex projects for the mechanical integration of measuring devices are implemented successfully, and with good reason: As a strong partner to industry, Endress+Hauser has a great deal of practical expertise in all sectors.

Overview of our finished complete measuring points

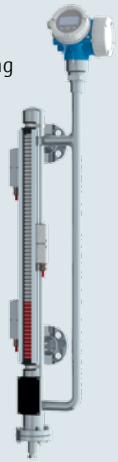


Steam measurement section



Flow solutions based on the differential pressure principle

Complete measuring point bypass



Our range of products and services

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

Your benefits

Cost and time savings

- Standardization of interfaces
- Concentrate on what matters most to you – we'll take care of the rest
- Delivery of pre-assembled and tested complete measuring points
- On-site assembly of the items supplied, including commissioning and documentation

Safety

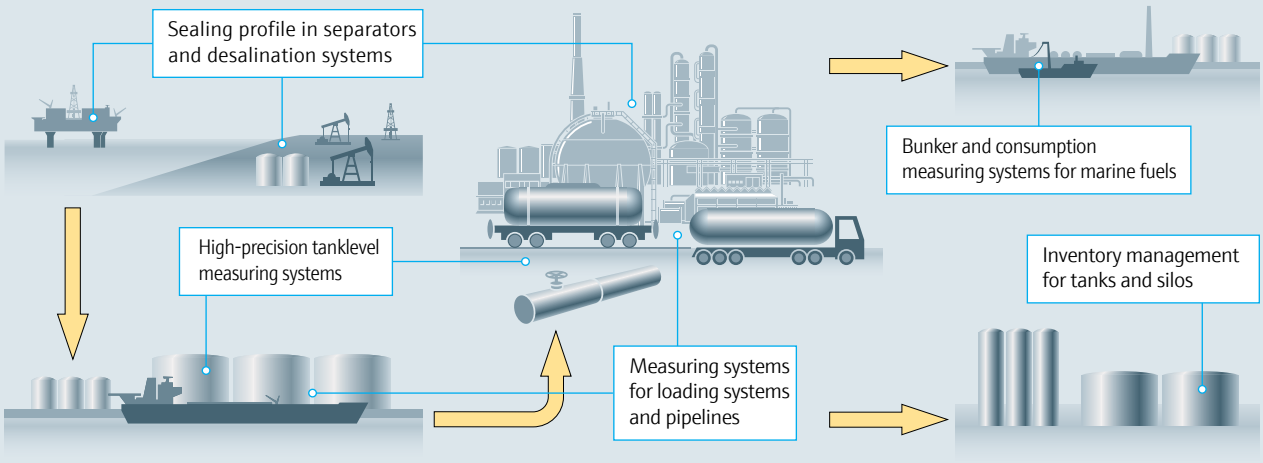
- Coordinated components ensure optimal commissioning and a reliable process in the long term

High-precision measurements beyond supply chains

Transfer, storage and marine solutions

- Simple monitoring and visualization of tanks and silos through to complex supply chain systems
- Optimization of tank storage operations, from precise measurement of various liquids to greater tank utilization and improved logistics
- Measuring systems and solutions for loading and storing liquids (except for water) and gases
- Accurate measurement of crude oil density, even in challenging process conditions, with Promass Q

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



Raw materials and end products are accepted, stored and delivered in virtually all industrial processes. Storage capacity, supply of raw materials and calculation of the end products depend on how accurate and fail-safe the required measuring systems are. Ideally, they require no maintenance and are flexible with regard to the media to be recorded. For custody transfer measuring systems, the entire system must also fulfill all current requirements of European legislation by means of a system approval.
Crude oil is often the starting raw material for many processes. The exact quantity has to be calculated as early as when the crude oil is accepted. As an addition to the range of successful Coriolis thermal mass flowmeters, Endress+Hauser's Promass Q even measures the density of the existing crude oil mixture with high precision. For loading, Endress+Hauser offers not only mass flow measurement but also a complete solution approved in accordance with modules B and F. Each step in the further processing of crude oil results in numerous other challenges with particular requirements for the measuring task itself and for consumer protection. From loading and storage in tanks through to the optimization of logistics processes, Endress+Hauser supplies measuring systems and solutions with the highest accuracy in line with the relevant directives and laws.

Application

- Sealing profiles in separators and desalination systems
- High-precision tank level measuring systems
- Measuring systems for loading and pipelines
- Bunker and consumption measuring systems for marine fuels
- Inventory management for tanks and silos

Advantages

- Time and cost savings during development and in operation
- From engineering to custody transfer approval – everything from a single source
- Certified measuring solutions in accordance with PTB, NMi, OIML R85 and R117
- Highest accuracy and safety for greater control
- Full functionality thanks to coordinated components

More information available at:
www.endress.com/flow-metering-solutions

Mobile industrial tablet computer for hazardous Zone 1

The new SMT77 from the FieldXpert range can be used in Zone 1

- Unpack, get started – completely pre-installed device drivers for all intelligent field devices
- Mobile access to field devices in hazardous areas in Zone 1 without the need for a document granting authorization to access a measuring point in a hazardous area
- Directly integrated interfaces for establishing a connection with the field devices via HART, Bluetooth and WiFi

Application The SMT70 already made a name for itself in the process industries last year and is proving to be extremely popular among users looking for a mobile end device for Zone 2. With the new SMT77, there is a now also a version that can be used in Zone 1. This device is the mobile aid for all users who work in maintenance and operations with the main task of supporting workflows in paperless and digital form. The development process for the device operating software on the tablet focused on the simple, intuitive user interface in particular. It has a self-explanatory design and the latest version is also capable of synchronizing data read from the equipment with a cloud-based data landscape. This means that all data records created from the field device are always accessible at a central storage location, where they are kept up to date and can be viewed by individuals with the requisite access authorization. An update mechanism created specially for the SMT70 and SMT77 ensures that the individual device drivers and their configuration software are always kept up to date. Driver and software updates run fully automatically in the background without any additional steps required.

- Integrated NFC RFID reader for on-site device identification
- All process industry communication protocols are supported (HART, Profinet, Profibus, FOUNDATION Fieldbus™, Modbus, Endress+Hauser service interfaces)
- Can be used in combination with Profinet directly or ET200 SP Profinet remote I/O for remote access
- Online application support service (one year free, then optionally available)

Advantages

- One tool for all devices – the mobile "set-up tool" for mobile asset management directly in the field
- Digital documentation always available on-site thanks to storage options in the cloud-based library
- Can be modularly extended: Mobile SMT70/77 clients can be expanded and linked to a central server

More information available at:
www.endress.com/smt77

Technical data

- Hazardous Zone 1 Windows 10 tablet with 10.1" multi-touch, high-resolution display, 2.3 kg, IP65
- Intel N3710 1.6 GHz, 8 GB DDR3L/128 GB SSD
- USB, Bluetooth, WiFi, WWAN LTE 4G, camera
- IP65, Class I, Zone 1, AEx ia IIC T4 Gb, −20 °C ≤ Ta ≤ +50 °C
- Optional HART add-on module (integrated HART modem)

Your expert service partner

For optimized process plants and reliable operation

For safe operation and optimized process plants For more than 65 years, we have supported our customers with all aspects of process plant operations, from planning equipment through to performing maintenance. In so doing, our entire product portfolio is focused on providing outstanding quality and reliability. This is also true for our service range: industry-specific, expert technical support, on-site service wherever you are, unparalleled calibration expertise, helpful commissioning tools and new, attractive services and features to optimize your process plants.
Our processes and tools are certified in accordance with OHSAS 18001 and DIN EN ISO 9001.

Technical support – for quick help Our technical support for all measuring device technologies, software and automation solutions guarantees minimal interruption in production in the event of a fault. Our support services are tailored to your individual requirements:

- 24-hour, worldwide availability by telephone, in German
- Fast reaction time and direct access to technical experts
- Remote access to your plant components
- Workshop service for repair, diagnostics and calibration with short processing times

Expert services for smooth plant operation Do you wish to commission your measuring devices quickly? Maintain the value of your plants over the entire life cycle? Continuously guarantee the quality of your products and relieve the burden on your repair team? To make sure you can achieve all this, we offer an on-site service that is available wherever you are and will support you throughout all the phases of your plant's life cycle. From commissioning through to regular calibration and maintenance:

- Worldwide service network
- Approvals for industry-specific maintenance work
- On-site presence, project and installation site management
- DAkkS-accredited calibration service in accordance with DIN EN ISO/IEC 17025 for pressure, temperature, flow and other parameters
- Calibration of all device types and makes, irrespective of manufacturer
- In-line verification for checking safety equipment
- Online tools for searching for serial numbers and spare parts and for plant management
- Seminars and training sessions to train your employees
- Proof-testing of SIL safety equipment
- Designing, planning, commissioning and proof-testing of measurements as per the German Water Resources Act (WHG)
- Calculated SIL and intrinsic safety documentation as well as commissioning and recurrent function testing of SIL measurements

Optimization services – for continuous process improvement We offer effective methods and services for optimizing your business processes – from consultation through to managing maintenance work on your installed measurement and control systems. The focus here is on continual process improvements, increased efficiency and support for strategic business decisions:

- Calibration management and test equipment monitoring
- Maintenance management for the coordination and organization of maintenance measures
- Device management irrespective of manufacturer: data capture, analysis and optimization of the installed measurement and control systems
- Advice on standardization and inventory reduction
- Data management and integration of data into your systems
- Metrology consultation

Endress+Hauser offers you the best service package for operation and maintenance in the field of process automation. Let us help you reduce your maintenance work so that you are free to concentrate completely on your core competences in production.

More information available at:
www.endress.com/services

Your benefits

- Optimized plant efficiency by preventing plant shutdown and waste
- Maximum plant safety resulting from compliance with quality and safety standards
- Documented traceability in line with the requirements to produce supporting documentation
- Reduction in plant operation, maintenance and inventory management costs

Accredited calibration service in accordance with DIN EN ISO/IEC 17025

Unparalleled calibration service guarantees the highest degree of accuracy for your measuring devices

- Reduction in auditing and coordination costs
- Increase in plant availability
- Completely traceable calibration certificates in accordance with ISO/IEC 17025

Our range of services As one of the leading manufacturers of measuring devices for the process industry, we can call on experience gained from more than one million calibrations – from on-site calibration to high-precision laboratory calibration. In addition, we offer you a wide range of on-site inspection concepts to check your measuring devices. You alone decide how and to what extent you would like us to ease your burden.

- Calibration of all device types and makes
- Global calibration concept with globally identical high-tech plants
- All calibration rigs are accredited in accordance with DIN EN ISO/IEC 17025
- The best production calibration rig for flow in the world, with minimal measuring uncertainty of < 0.015% (PremiumCal)
- DAkkS-accredited on-site calibration service for flow, pressure and temperature parameters
- Patent-pending processes for high-precision density, viscosity and level calibration directly in your plant
- Industry-specific trained and experienced calibration technicians

Advantages

- Early detection of set point deviations affecting quality and processes
- Compliance with documentation requirements as part of quality assurance systems (e.g. IATF 16949, DIN EN ISO 9001, HACCP, IFS Food, DIN EN ISO 50001, GMP, FDA)
- Minimization of your auditing effort through an accredited, completely traceable calibration service
- Increase in plant availability thanks to innovative in-line calibration process (short calibration times)

More information available at:
www.endress.com/services

DAkkS
Deutsche Akkreditierungsstelle
D-K-19095-01-00

Analysis of measuring performance

Systematic efficiency measurement of maintenance and calibration processes

- Increased process efficiency by regularly measuring the performance of all maintenance and calibration activities using KPIs
- Continuous identification of potential for improvement (CIP)
- Compliance with the requirements of internal and external regulations and audit trail documentation to meet quality assurance standards

Our range of services Analysis of measuring performance involves the use of KPIs to continuously measure calibration activities with the goal of increasing process efficiency. We continuously identify potential for improvement (CIP) that can be implemented in the client's business process. The results of the analysis are presented in client workshops, and actions based on these results are identified and implemented together with the client. Reporting is in the form of analysis reports, which contain general overviews of all the calibrations performed in a calibration campaign.

Advantages

- Clear data analysis of the accuracy and deviation of all tested or calibrated measuring points
- Optimization of the maintenance and calibration process with balanced cost/risk exposure
- Definition of important KPIs to assess the maintenance and calibration process
- Central documentation management platform always available online

More information available at:
www.endress.com/services

Optimization of calibration intervals

The perfect balance between costs and risk

- Extend your calibration intervals to reduce your costs
- Reduce your risk of being outside the tolerance range by shortening your calibration intervals

Our range of services Each year, Endress+Hauser calibrates more than one million measuring devices around the world, proving our expertise and skills on a global scale. In addition to these calibration tasks, Endress+Hauser can help you determine when your measuring devices need to be calibrated. In future, you will no longer have to depend on randomly selected intervals or "rules of thumb". The new calibration interval optimization service from Endress+Hauser calculates the optimal calibration intervals using established scientific models, with an optimum cost/risk balance in mind. These patented models assess previous calibration results in order to predict the future performance of the calibrated measuring devices.

- Kickoff meeting
- Determining the optimal calibration intervals for calibrations performed by Endress+Hauser for all devices, including those from other manufacturers, within the framework of a calibration contract
- Application and coordination of the optimized calibration intervals with operational specifications

Advantages

- Our "calibration interval optimization" service has more to offer than just calculated calibration intervals. We discuss significant changes to intervals with you and review underlying assumptions to allow you to make the best possible decision for your calibration intervals.
- Then the set intervals are incorporated into your maintenance specifications, including planned plant shutdown, to create an optimal calibration schedule.
- Ultimately, you benefit from a reduction in calibration costs as well as a reduced risk of being outside the measuring device tolerance range.

More information available at:
www.endress.com/services

Calibration testing with Coriolis mass flow measurement

Simple testing and calibration of stationary measuring systems

- Save time and money by carrying out calibration during ongoing loading operations
- Reuse of the testing medium avoids disposal costs
- High-precision comparison measurement via the use of tried-and-tested Coriolis technology

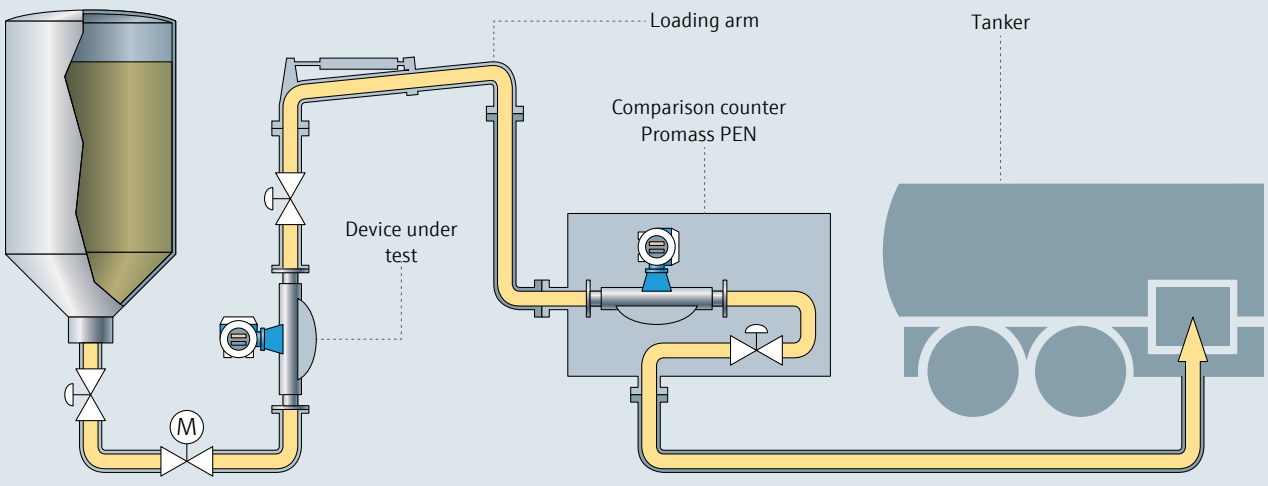
Our range of services The use of Coriolis mass flowmeters as a working standard enables efficient calibration testing of loading systems. Systems can be tested for measuring low viscosity mineral oils, ethanol, biodiesel and aqueous solutions. Calibration can be carried out during normal loading operations. To do so, the working standard is simply installed between the loading system to be tested and a tanker, for instance. The flow rates measured during loading are then compared with each other, enabling calculation of the measuring uncertainty of the device under test. This enables the system to be calibrated without requiring a significant amount of time or product loss.

These products have a wide range of possible custody transfer applications in the oil and gas sector and in the chemicals industry:
- Measuring systems for low viscosity mineral oils (fuels, heating oil) and aqueous solutions
- In-house measuring systems
- Tanker truck loading systems
- Airfield refueling systems
- Tank car and ship loading systems
- Veneering systems

Advantages
- Preventing emissions ensures compliance with increasingly stringent environmental requirements
- Direct mass value, density and temperature display
- Short testing times enable multiple loading systems to be calibrated within a very short time
- The comparison counter is tested and calibrated on accredited in-house calibration rigs
- The planning, organization and implementation of calibration testing is carried out via an ISO/IEC 17025-accredited calibration service

More information available at:
www.endress.com/services

Easy calibration during loading operations



Specialists certified according to the German Water Resources Act (WHG)

Endress+Hauser supports plant operators for all issues concerning the WHG (German Water Resources Act)

- More safety provided by external service technicians with many years of experience with issues concerning the WHG (German Water Resources Act)
- No internal certification costs
- High-quality, permanently available service documentation

In accordance with the German Water Resources Act (WHG), overfill prevention systems are mandatory on containers for water-polluting liquids. These monitor the level and issue an alarm well before the maximum permitted level is reached. The WHG is one of the most significant laws for protection of the environment and safety in operation. The application of and compliance with this law is monitored by approved inspection bodies such as the TÜV.

As overfill prevention systems can consist of multiple approved and non-approved plant units, operational safety (safety-related availability) must be verified by appropriate tests. These tests are an essential part of the safety philosophy of overfill prevention systems. All parts of the overfill prevention systems must be constantly monitored to ensure proper working condition and operational safety. For this reason, the overfill protection system must be subject to recurrent testing **at least once a year.**

As a recognized and certified specialist in accordance with the WHG, Endress+Hauser can help you to comply with these legal directives and test the operational safety of your overfill prevention systems, without needing to develop your own resources for this purpose.

Advantages

- Certified service technicians with more than 20 years of experience with issues relating to the WHG
- Endress+Hauser service technicians are certified every two years by the TÜV
- Detailed documentation of tasks and tests
- Support in meeting the requirements for overfill prevention systems under the new German Ordinance on Installations for the Handling of Substances Hazardous to Water (AwSV), which has applied since August 2017
- Everything from a single source – from design of the overfill measurement technology to certified proof-testing through to the complete solution in accordance with the WHG

Inspection of SIL protective circuits

Endress+Hauser – your first point of contact for plant safety

- Improved safety thanks to the two-man rule with external SIL specialists
- Faster plant availability
- Maximum testing quality

Our range of services Inspection is a verification service provided directly on-site in order to discover dangerous undetected errors in a safety-instrumented system (SIS). Inspection is carried out in accordance with predefined customer inspection processes and typically comprises the following tasks:

- Kickoff meeting
- Detailed inspection of the instrument
- Functional test in accordance with the agreed-upon test procedure
- Preparation of the documentation for verification of proper operation

The results of the functional test are documented in a report that contains the following:

- Checklists and comments on process activities
- Output results at predefined set points
- Overall result of the functional test as "passed"/"not passed"
- Parameters of the procedure
- Measures and comments for all sub-systems in the application
- Comments regarding all errors, deviations or interference during the functional test

Advantages

- Comprehensive SIL expertise (measurement technology, services and training)
- High-quality service documentation that can be individually tailored where necessary
- Recommendations in terms of the results of the functional test, including all necessary measures

More information available at:
www.endress.com/SIL

New possibilities, new experiences – digital and personal

www.endress.com – the comprehensive information and procurement platform

- Up-to-date information on the complete product range, your prices and delivery times
- Restocking has never been so easy

Discover the new possibilities afforded by comprehensive information collection and efficient transaction management with Endress+Hauser, without having to forgo person-to-person contact.

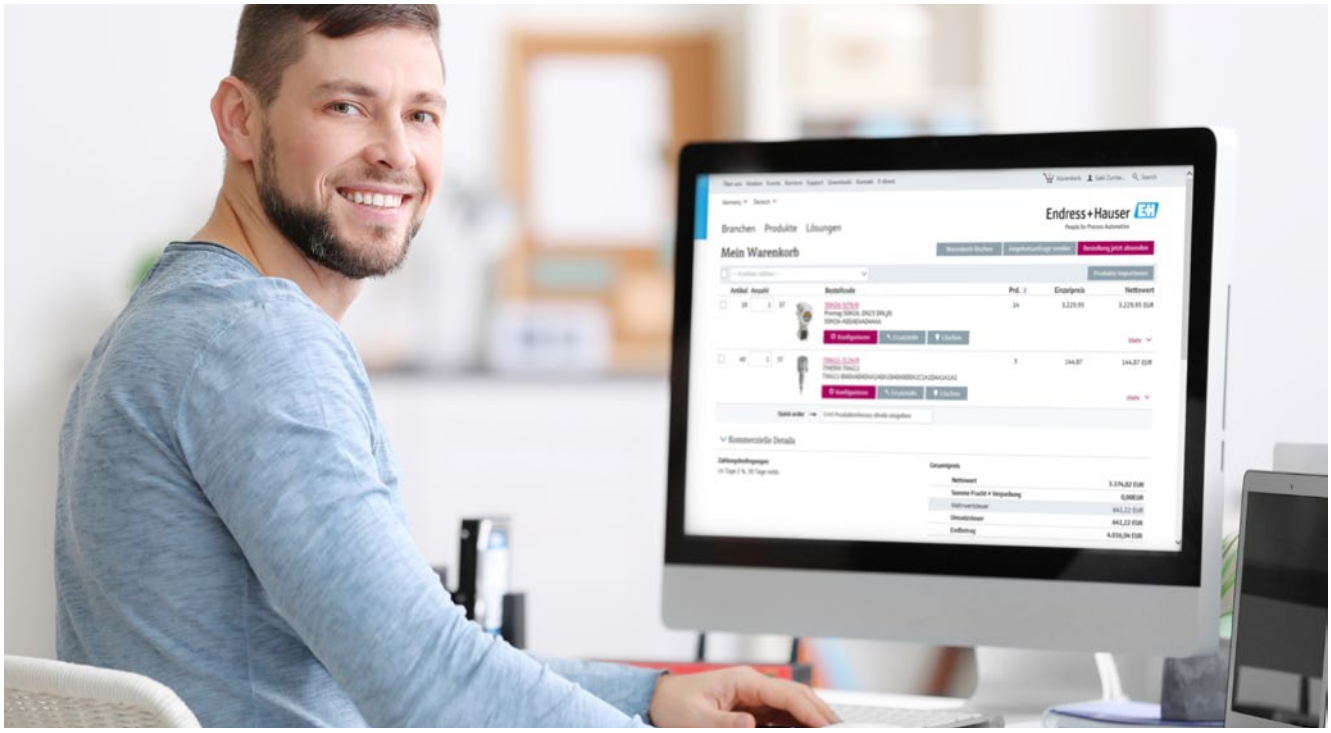
With e-Commerce functions integrated into the Endress+Hauser website, you can gather extensive information on our products and order products directly online. Optimized functionalities, such as the ability to access all business transactions with Endress+Hauser – performed both online and offline – help you optimize your procurement processes and give you a better purchasing experience.

The combination of product information and direct request and purchase options makes your procurement process easier and more efficient than ever before.

Advantages

- All your transactions, including detailed status information on requests, offers, orders and invoices
- Search for devices and spare parts simply using the serial number/order code/material number
- Simply save and manage your standard devices
- Your contacts at Endress+Hauser at a glance

See for yourself – sign up at:
www.endress.com



Useful online tools

Information about plant operation

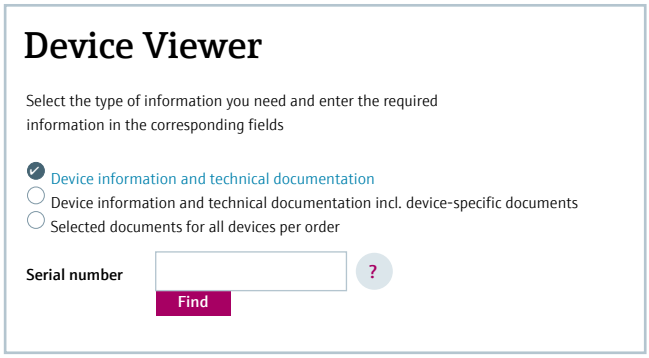
- Find the right device information – at any time
- Reduced procurement effort

Endress+Hauser Device Viewer

Improve processes with online access to device data

Device Viewer allows you to access current, comprehensive information on your installed Endress+Hauser base using the instrument serial numbers. In addition to product details, such as the order code, date of manufacture, product availability and successor products, you can also access documentation such as operating instructions, technical information and certificates.

More information available at:
www.endress.com/deviceviewer



Endress+Hauser Operations app

Mobile access to specific device information – anytime, anywhere The free Operations app allows you mobile access to device-specific information and documentation. Simply scan the QR code and download the Endress+Hauser Operations app from the App Store or the Google Play Store.

More information available at:
www.endress.com/operations-app

Spare parts search

Find and re-order spare parts quickly

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

More information available at:
www.endress.com/onlinetools

Notes

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Endress+Hauser

People for Process Automation