

## Highlights 2021

Measurement technology,  
services and solutions for  
process automation

New:  
Cerabar +  
Deltabar





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### Services

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## Strong partnerships endure in difficult times

Dear customers and partners,

The pandemic continues to dominate global current affairs. In light of this historic crisis, the economic situation remains very turbulent, with many companies under pressure and facing declines in orders and turnover.

In spite of all the challenges, our collaboration with our customers has proven to be stable and reliable over the past year. Indeed, a number of companies have informed us that Endress+Hauser is essential. Thanks to your efforts, our production plants have been able to continue manufacturing products, to the benefit of all involved. This example of trusting cooperation demonstrates what lies at the heart of a strong partnership – the fact that both sides can rely on each other even in difficult times. We'd like to express our thanks for this!



There are other positive aspects that can be drawn from the crisis. It has given many companies the impetus to modernize, digitalize and become even more competitive. We want to support this momentum and are willing to assist our customers with this to the best of our capabilities. Even if we can't solve all of your problems, our products, solutions and services will make your day-to-day work easier and help you to save time and to reduce costs.

Many of our highlights for 2021 presented in this brochure represent a major step on the road to Industry 4.0. In particular, the new Cerabar and Deltabar pressure equipment range sets new benchmarks for productivity and process reliability. We're also taking another big step forward in the form of our Memosens 2.0 technology for recording quality parameters in liquid analysis. In addition, our Liquiphant level limit switch has recently been made available in a high-temperature version and with various fork coatings. Likewise, smart sensors for measuring gases are now being used in flow measurement technology.

And the new developments aren't limited to process measurement technology. We also have news for you when it comes to services and automation solutions. If you need more information, please don't hesitate to contact our specialists.

Get in touch with us – we're also on digital platforms!

Best wishes

**Stefan Menschel**  
Head of Marketing

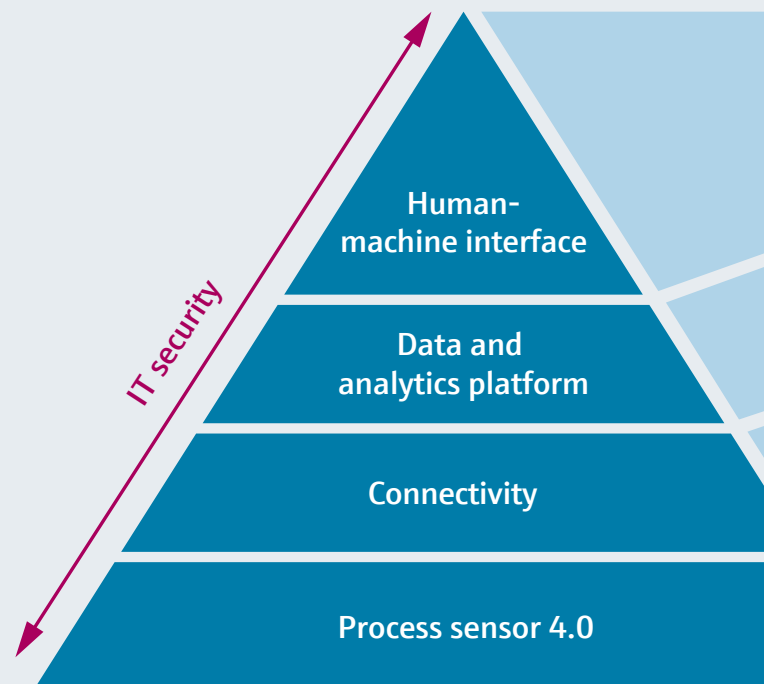
# #empowerthefield – Endress+Hauser's Industry 4.0 program

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



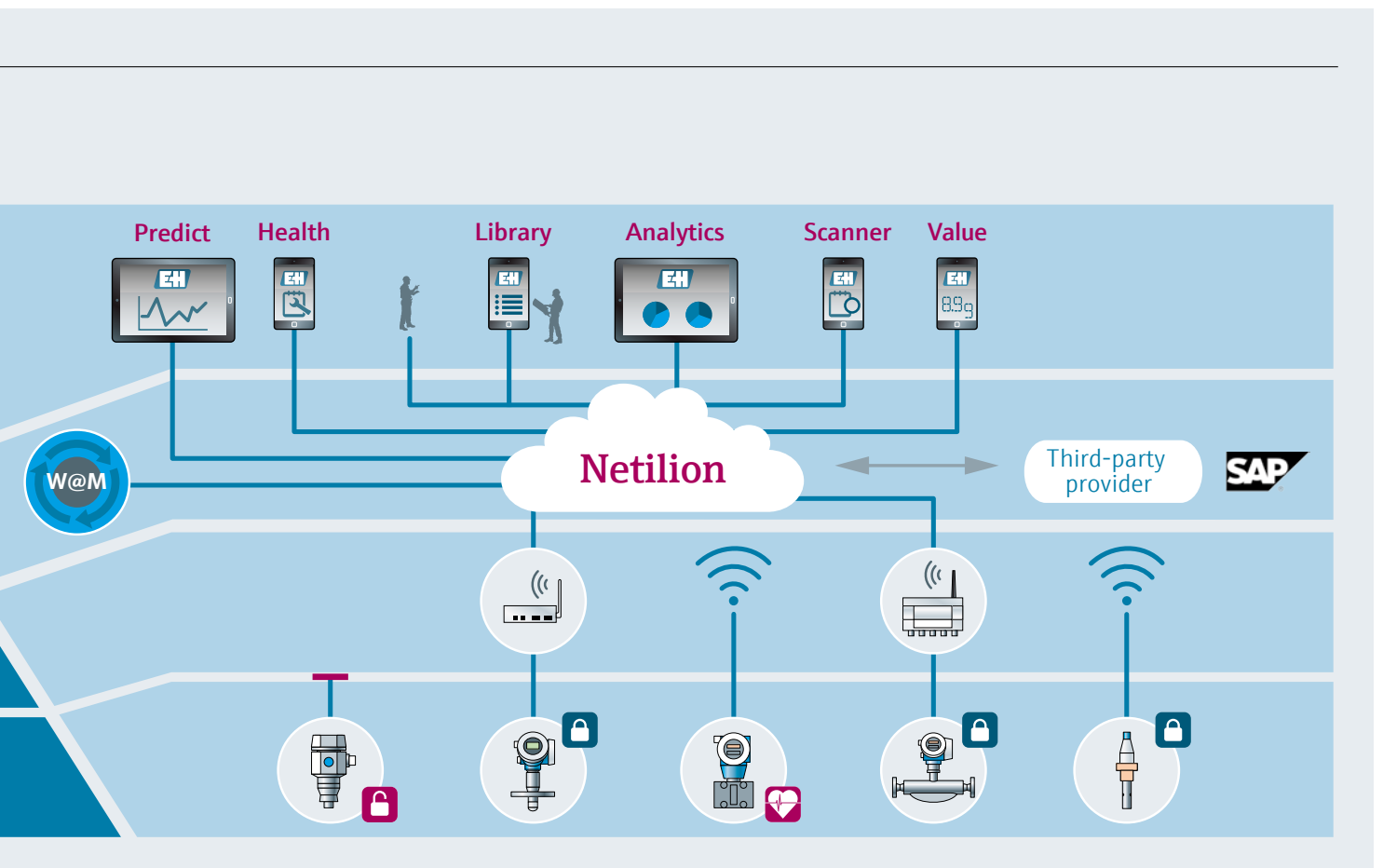
Industry 4.0 involves networking systems and machines so that they can share data with each other. However, 97% of field data is not currently used at all. Endress+Hauser's Industry 4.0 program makes this previously unused data available, whether for optimizing processes, increasing availability or driving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

## Industry 4.0 range from Endress+Hauser





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# Data revolution in the process industry

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



The Field Xpert SMT50/70/77 industry tablets mean that mobile workers always have control over the measuring instruments installed.

**Plant overview packaged solution** Customers can use these packaged solutions and their key components, the Netilion Scanner app and Netilion Analytics, to quickly record the measuring instruments that they have installed without any errors. Digital twins are created for all the measuring devices in the plant, providing completely transparent representations and reducing maintenance work. In addition, when a device reaches the end of its life cycle, Netilion even recommends the right successor product to users. This is how Industry 4.0 creates the basis for translating data and documents into economic success.



 <https://netilion.endress.com>



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



Get an overview of your plant with Netilion Health – view error messages, understand them and respond quickly.

**Predictive maintenance packaged solution** This packaged solution represents a milestone on the road to creating smart factories. Netilion Predict uses smart algorithms to analyze diagnostic data supplied by the measuring devices' smart sensory mechanisms. This means that predictive maintenance can be carried out since your assets can determine the ideal time for maintenance to be performed. This allows plant operators to lower their maintenance costs without risk, increase plant availability and guarantee process conformity. In addition, this Industry 4.0 solution opens up new opportunities for process optimization. It can also be seamlessly integrated into SAP, allowing you to measure and control its success.



Predictive maintenance helps you to determine the right time for maintenance to be performed.

### Calibration interval optimization packaged solution

This packaged solution can extend calibration intervals by using condition monitoring and predictive maintenance. As a result, this allows the digitalization of calibration process in the Industrial Internet of Things (IIoT) to become a reality. Measuring devices can be verified without interrupting the process and the test results can be reliably documented. Plant operators can therefore save time and money because maintenance routines are made simpler and calibration is required less often. At the same time, the operators improve their plants' process conformity, leading to increases in efficiency and added value.



Make the digitalization of calibration processes a reality.

### Mobile asset management packaged solution

This packaged solution makes assets' digital twins available on mobile devices – including in hazardous areas on Endress+Hauser industry tablets. This allows users to literally hold their smart factory in their hands, always keeping the on-site measuring and device data in sight. This provides mobile workers with the information crucial to success in the right place and at the right time. Plant operators can manage their assets more efficiently and see a twofold benefit from process optimizations – with reductions both in staffing and maintenance costs.



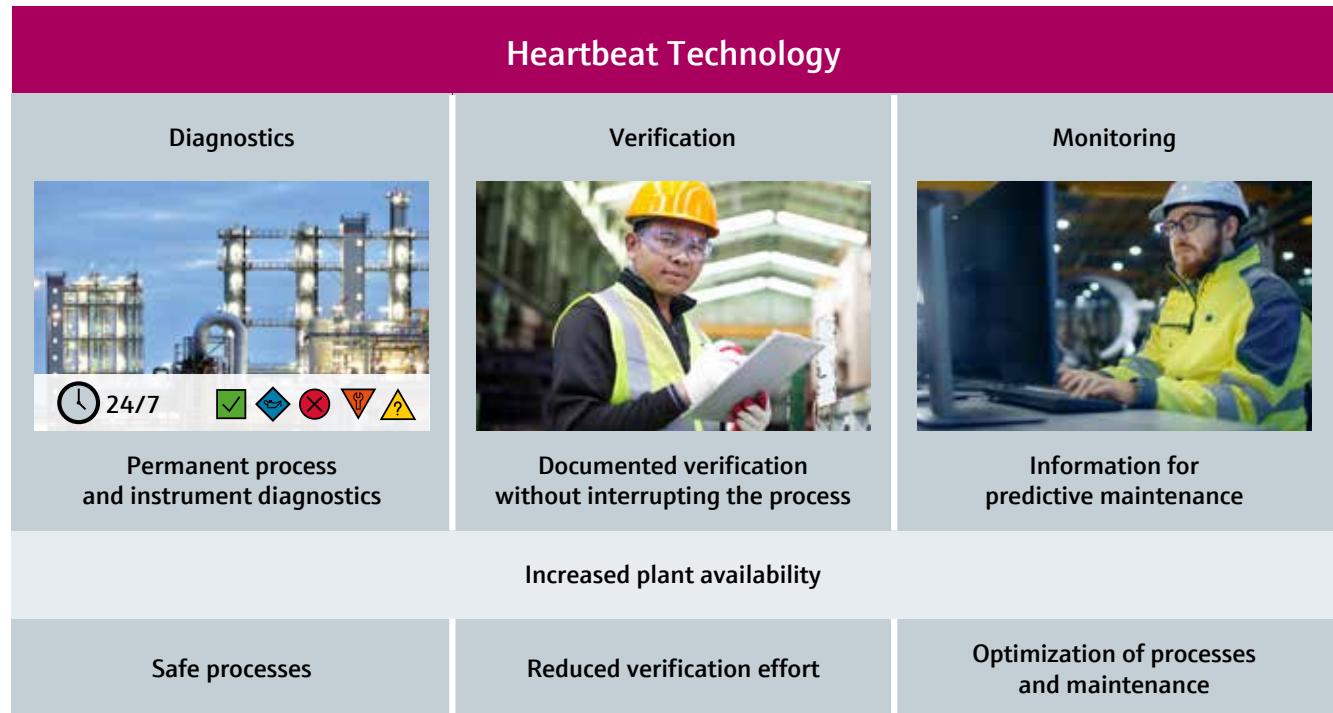
Always have all of the on-site measuring and device data to hand with mobile asset management.

# Heartbeat Technology – taking the pulse of your measurement

Smart process sensors at the heart of a successful digitalization strategy

Heartbeat Technology turns process sensors into smart sensors that provide valuable information for predictive maintenance thanks to permanent process and instrument

diagnostics. Furthermore, Heartbeat Technology enables documented field device verification without interrupting the process.



- Clear and standardized **diagnostic messages** with clear **instructions** for efficient and status-based maintenance
- **Permanent device self-diagnostics** increases operational safety and extends test cycles
- The measuring point can be **verified and documented** at any time **even when installed**
- **Clearly documented verification results** are always achieved (SIL/WHG) with a simple guided verification sequence
- The automatically generated **verification report** supports the requirement to demonstrate compliance as set down in regulations, laws and standards
- **Trends can be identified using device and process data**, thereby enabling **predictive maintenance**
- The device and process parameters can be analyzed for **specific process optimizations**

# Heartbeat Technology product overview

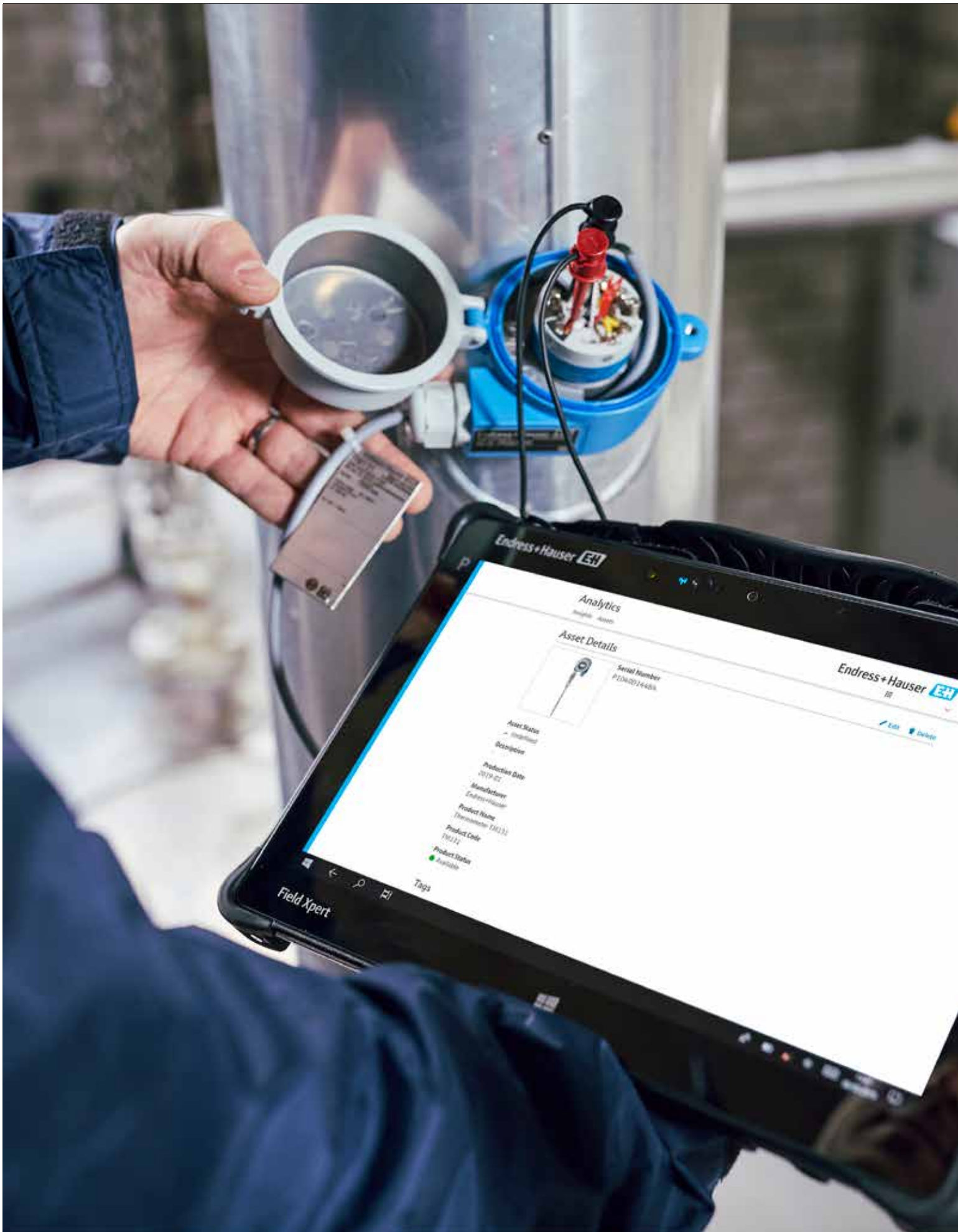
The demand for fast and easy testing is high. Ideally, testing should be of high quality, should be very detailed and should not interrupt the process. And this is precisely what Heartbeat Technology offers. A wide variety of

Endress+Hauser devices are available with Heartbeat Technology and they combine diagnostics, verification and monitoring functions for process optimization.

| Heartbeat Technology with ...             |                    |                  |   |                  |                    |          |  |  |  |
|---|--------------------|------------------|---|------------------|--------------------|----------|--|--|--|
|   | Diagnostics        | Verification     | Monitoring  |                  |                    |          |  |  |  |
| <b>Flow measurement technology</b>        |                    |                  |   |                  |                    |          |  |  |  |
| Proline 10                                | ●                  | ○                |   |                  |                    |          |  |  |  |
| Proline 100<br>Proline 300/500            | ●                  | ○                | <table border="1"> <tr> <td>Gas content/foam</td> <td>Corrosion/abrasion</td> <td>Coating</td> </tr> <tr> <td></td> <td></td> <td></td> </tr> </table>            | Gas content/foam | Corrosion/abrasion | Coating  |  |  |  |
| Gas content/foam                          | Corrosion/abrasion | Coating          |   |                  |                    |          |  |  |  |
|   |                    |                  |   |                  |                    |          |  |  |  |
| Proline 200                               | ●                  | ○                |   |                  |                    |          |  |  |  |
| Proline 400                               | ●                  | ○                | <table border="1"> <tr> <td>Gasanteil/Schaum</td> <td>Korrosion/Abrasion</td> <td>Belag</td> </tr> <tr> <td></td> <td></td> <td></td> </tr> </table>              | Gasanteil/Schaum | Korrosion/Abrasion | Belag    |  |  |  |
| Gasanteil/Schaum                          | Korrosion/Abrasion | Belag            |   |                  |                    |          |  |  |  |
|   |                    |                  |   |                  |                    |          |  |  |  |
| Proline 800                               | ●                  | ○                |   |                  |                    |          |  |  |  |
| <b>Level measurement technology</b>       |                    |                  |   |                  |                    |          |  |  |  |
| Levelflex FMP5x                           | ●                  | ○                | <table border="1"> <tr> <td>Gas content/foam</td> <td>Corrosion/abrasion</td> <td>Deposits</td> </tr> <tr> <td></td> <td></td> <td></td> </tr> </table>           | Gas content/foam | Corrosion/abrasion | Deposits |  |  |  |
| Gas content/foam                          | Corrosion/abrasion | Deposits         |   |                  |                    |          |  |  |  |
|   |                    |                  |   |                  |                    |          |  |  |  |
| Micropilot 26 GHz, FMR5x                  | ●                  | ○                |   |                  |                    |          |  |  |  |
| Micropilot 80 GHz, FMR6x                  | ●                  | ○                |   |                  |                    |          |  |  |  |
| Liquiphant FTL51B, 62, 64                 | ●                  | ○                | <table border="1"> <tr> <td>Gas content/foam</td> <td>Corrosion/abrasion</td> <td>Deposits</td> </tr> <tr> <td></td> <td></td> <td></td> </tr> </table>           | Gas content/foam | Corrosion/abrasion | Deposits |  |  |  |
| Gas content/foam                          | Corrosion/abrasion | Deposits         |   |                  |                    |          |  |  |  |
|   |                    |                  |   |                  |                    |          |  |  |  |
| Gammapilot FMG50                          | ●                  | ○                | Monitoring of radiation source operating time and the photomultiplier service life  |                  |                    |          |  |  |  |
| <b>Pressure measurement technology</b>    |                    |                  |   |                  |                    |          |  |  |  |
| Cerabar PMx71B<br>Deltabar PMD7xB         | ●                  | ○                | <ul style="list-style-type: none"> <li>■ Module: Static sensor diagnostics (SSD)</li> <li>■ Module: Loop diagnostics</li> <li>■ Module: Process window</li> </ul> |                  |                    |          |  |  |  |
| <b>Analytical measurement technology</b>  |                    |                  |   |                  |                    |          |  |  |  |
| Liquiline CM44x with Memosens 2.0         | ●                  | ○                |   |                  |                    |          |  |  |  |
| Liquiline CM44xR with Memosens 2.0        | ●                  | ○                |   |                  |                    |          |  |  |  |
| CSF48 sampler                             | ●                  | ○                |   |                  |                    |          |  |  |  |
| <b>Temperature measurement technology</b> |                    |                  |   |                  |                    |          |  |  |  |
| TrustSens TM371                           | ●                  | ●<br>Calibration |   |                  |                    |          |  |  |  |

● Standard    ○ Optional

With comprehensive diagnostics and targeted verification concepts for smart field devices, you can organize the safe and cost-effective operation of your plant throughout the entire life cycle.



# Field Xpert SMT50 – mobile industry tablet computer for rugged applications

The next generation of the Field Xpert product family

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

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

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

## Your benefits

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



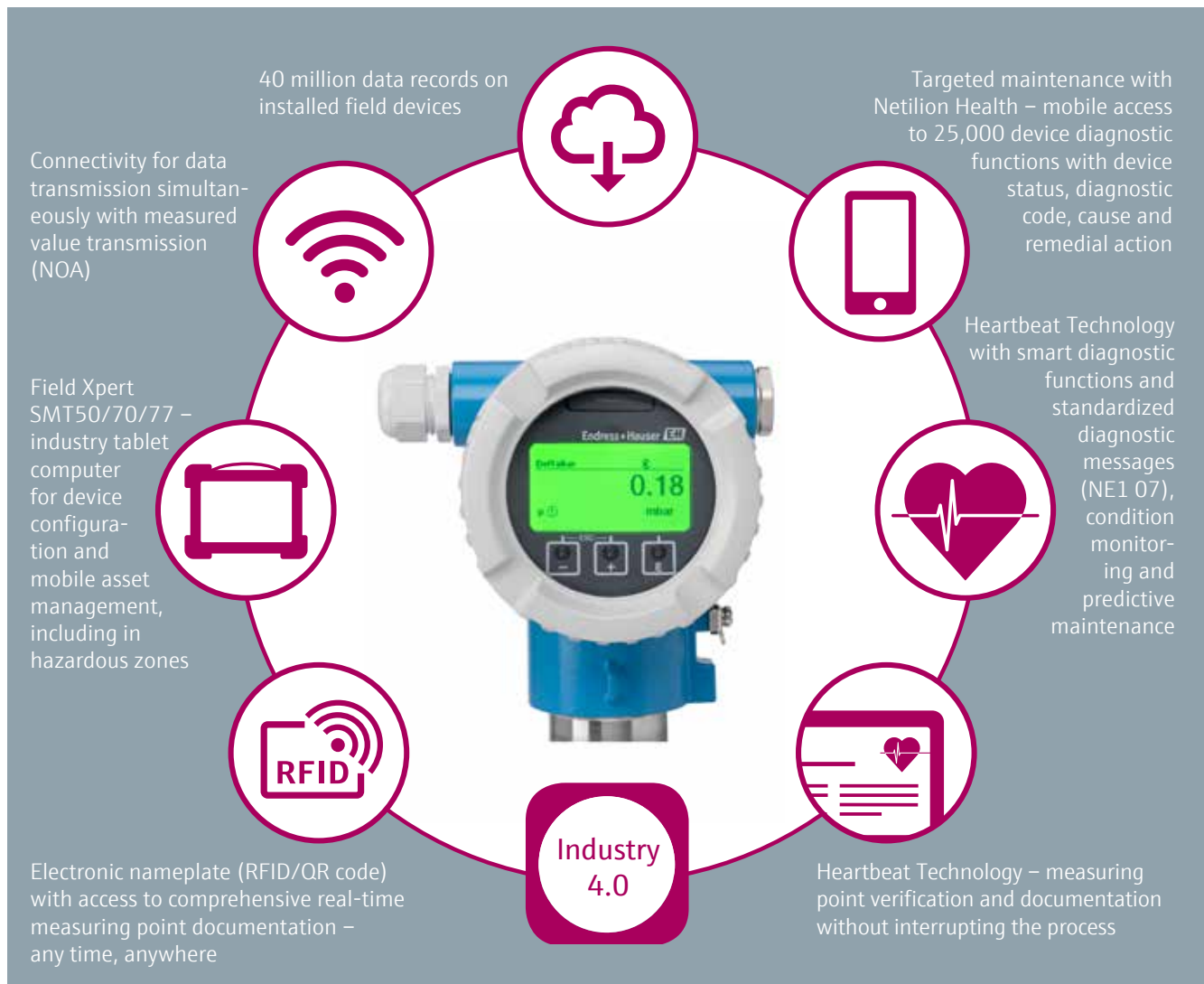
## Technical data

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

Technical data and complete documentation:  
[www.endress.com/smt50](http://www.endress.com/smt50)

# New measuring devices for Industry 4.0

Discover the smart sensors in this brochure



The clever and smart features of the re-released Cerabar and Deltabar transmitter.





Cerabar, Deltabar  
on pages 34–37



Prosonic Flow G 300/500  
on page 42



t-mass F/I 300/500  
on page 43



Prosonic Flow P 500  
on page 44



Promag W 800  
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iTHERM  
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iTHERM  
CompactLine TM311  
on page 52



iTEMP TMT71 and TMT72  
on page 53



Liquiline CM44x  
on page 58

# Guaranteed connectivity

Tapping into data from brownfield and greenfield systems and making it digitally accessible

- Simple and flexible: Connectivity solutions for different system architectures
- Safe: Netilion cloud and edge device plug-ins meet the strictest and certified security standards
- Universal usability for field devices and actuators from various manufacturers in existing (brownfield) and new (greenfield) systems

Connectivity forms the basis of all Industry 4.0 applications. Netilion Connect taps into data from brownfield and greenfield systems and makes it digitally available. It consists of edge devices, gateways and an application programming interface (API).

## Applications

Netilion edge devices

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

Netilion gateways

- SFG250: Connects HART devices to FieldEdge devices
- SFG500: Connects PROFIBUS DP/PA to FieldEdge devices
- SWG70: Connects WirelessHART networks to FieldEdge devices
- SWA50/70: Establishes a WirelessHART or Bluetooth® connection between assets and the individual gateways/FieldEdge devices; can also be retrofitted

API

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



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



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



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



Fieldgate SWG70 – intelligent WirelessHART gateway with Ethernet and RS485 interfaces.



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



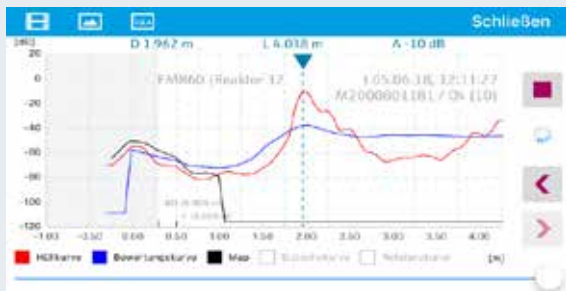
# SmartBlue-app – mobile asset management

Commission and manage assets easily and conveniently from a safe distance

With the SmartBlue-app, you can commission and manage our next generation of measuring devices easily from a safe distance of up to 20 meters. The ability to use the wireless Bluetooth® interface to connect to the device via a smartphone or tablet is particularly handy for hard-to-

reach places or hazardous areas. A separate interface driver is not required. The security of the encrypted data communication has been tested and certified by the Fraunhofer Institute.

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



Non-contact commissioning using a tablet and the SmartBlue-app.

All accessible devices and status information at a glance

The screenshot shows a list of devices under the heading 'Erreichbare Geräte'. The status bar at the top shows 'Telekom.de' and '11:14'. The list is divided into 'Verbunden mit Gerät' and 'Weitere Geräte'.  
 - Under 'Verbunden mit Gerät':  
 - MICROPILOT: PV 0,924 m (status: green checkmark)  
 - Under 'Weitere Geräte':  
 - EH\_CM82\_N6012A05G11: PV 3,56 pH, SV 23,30 °C (status: green checkmark)  
 - EH\_FMR10\_0801179: PV 0,223 m (status: green checkmark)  
 - EH\_DMA\_F619000: PV 0,000 l/min, SV 45,3 °C (status: yellow warning triangle)  
 The bottom navigation bar includes icons for signal strength, home, menu, and settings.

More information available at: [www.endress.com/smartblue](http://www.endress.com/smartblue)



# Plant safety – simply reliable

Certified product lines and processes for maximum safety and ultimate plant availability

With over 250 certified product lines, Endress+Hauser offers you a comprehensive device portfolio for Ex, SIL and WHG applications. Over 100 product lines have been certified for SIL2/3 and developed according to IEC 61508. In addition, more than 40 device lines are approved according to WHG (German Water Resources Act).

**The safety design** of our devices has been optimized over decades. Our portfolio has been improved upon continuously to meet the latest requirements, such as NAMUR. Our safety concepts are becoming increasingly efficient. For example, longer testing cycles are also possible for protection and safety equipment, which can be checked without the need to remove the equipment and shut down the plant.






**As a partner for complete solutions,** Endress+Hauser supports the process industry with a full portfolio of made-to-measure services ranging from consulting and the design of safety circuits through to documented functional testing of safety equipment.

Endress+Hauser can draw on **over 65 years of expertise** in the production of measuring instruments for the process industry. Certified safety engineers and management systems ensure a consistently high level of safety. We work with testing and certification bodies worldwide as well as national and international standardization institutes. The impressive total of 10 million devices installed in safety applications is testament to the trust our customers place in our products.

*"We help our customers increase the level of safety for people, the environment and process systems and reduce plant downtime".*

Dr. Gerold Klotz-Engmann, Department Manager for Technical Safety at Endress+Hauser, explains the brand promise for the chemical industry.

 More information available at: <http://eh.digital/plant-safety>



# My Endress+Hauser account

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

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

All of the information and purchasing functions are directly available on the website under "My Endress+Hauser". Registered users are always given an overview of the key functions in their personal area, which they can access whether they are in the office, at the plant or on the move.

**Access to all transactions** Endress+Hauser customers can access all of their transactions in their account at any time, irrespective of whether these were made online or offline. It is easy for them to save standard instruments in favorites lists and to add their own material numbers for simpler management.

Moreover, the website's search function is continuously optimized. Customers can use the serial numbers of their existing devices to directly retrieve all relevant information and to reorder complete devices or spare parts, making the process easier than ever.

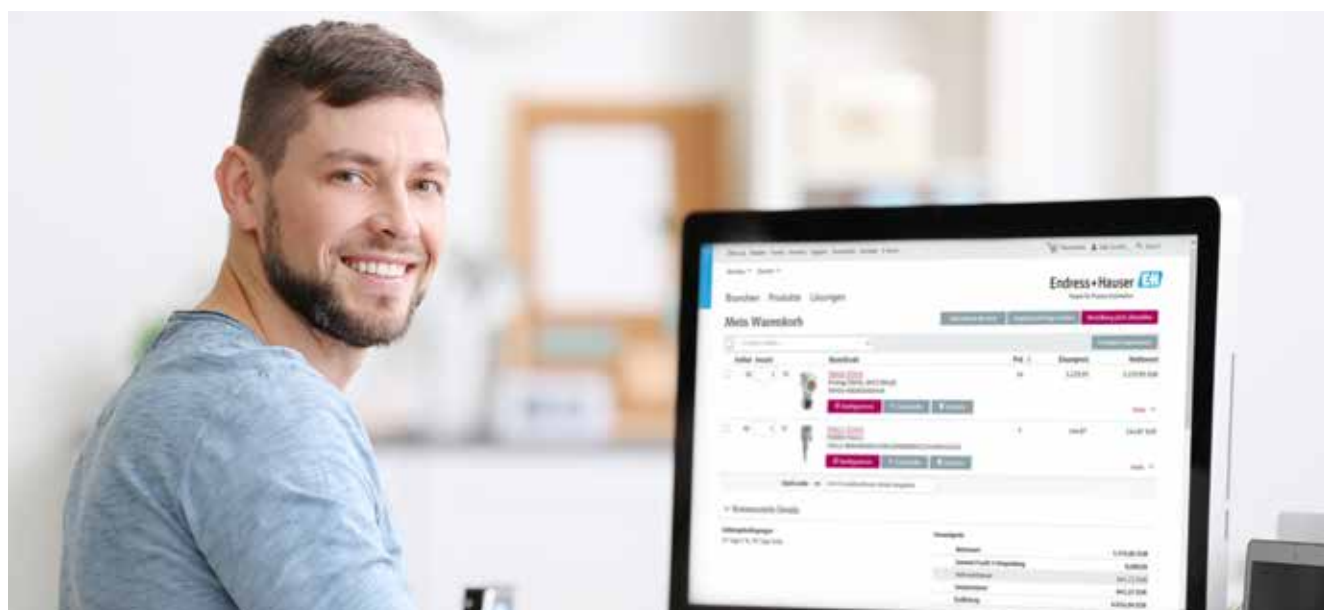
**Contact information of partners** In the event that customers require support when selecting and configuring devices, the contact information for the responsible Endress+Hauser sales staff is also saved in the account. This gives customers the flexibility to choose how they are supported by Endress+Hauser.

## Advantages

- Information about individual prices and current delivery times
- Information about quotations and orders, incl. delivery tracking
- Documentation including order confirmations, delivery notes and invoices
- Technical information and CAD data
- Easy product and spare parts search, as well as a fast ordering and quotation request process



More information available at:  
[www.endress.com/ecommerce](http://www.endress.com/ecommerce)



# Useful online tools

## Information about plant operation

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

### Endress+Hauser's Device Viewer

#### Improve processes with online access to device data

Device Viewer allows you to access current, comprehensive information on your installed Endress+Hauser devices using the 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](http://www.endress.com/deviceviewer)



### Device Viewer

Select the type of information you need and enter the required information in the corresponding fields

- Device information and technical documentation
- Device information and technical documentation incl. device-specific documents
- Selected documents for all devices per order

Serial number  ?

### 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](http://www.endress.com/operations-app)

### Spare parts search

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



More information available at:  
[www.endress.com/onlinetools](http://www.endress.com/onlinetools)

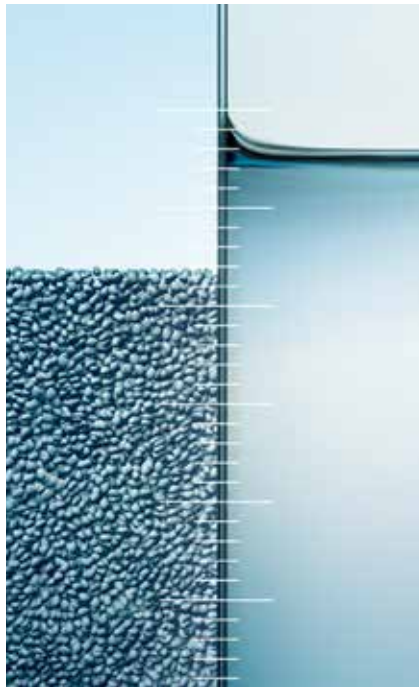
### Spare parts search

Enter the order code/product root/serial number:

?

# Level measurement

Reliable, precise, efficient – the right measuring principle for any application



## The right measuring principle for any application

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

**Application** Recording levels in liquids, pastes, bulk solids or liquefied gases, in tanks, silos, transportable containers or pipelines.

**Range** A comprehensive product range with devices in every price-performance segment allows users to make the right choice based on specific industry and application requirements.

**Digitalization** Smart process sensors support a successful digitalization strategy using modern interfaces.

### Advantages

- An ideal, cost-effective solution for every measuring task – regardless of the measuring principle
- The range is rounded off by additional solutions and services
- Industry-compliant devices with international approvals and documentation
- Simple commissioning and testing concepts for maximum safety and plant availability
- Heartbeat Technology for maximum plant availability and process optimization





## Simple, standardized solutions – from one supplier

**Level limit detection** The range covers all the technologies that are best placed to solve each measuring task and are right for every budget, from a cost-effective float switch and rotating paddle switch to a universal vibration limit switch.

**Continuous measurement** Contact and non-contact measuring principles complement each other. Whether you need a free-space radar with 6, 26 or 80 GHz, a guided radar or a radiometric measuring device, Endress+Hauser offers a tailor-made solution for every application.

**Interface measurement** The optimal technology is used and adapted to the requirements for clear interfaces, emulsions or complex mixtures.

**Determination of density/concentration** Additional quality parameters for the medium are determined using familiar measuring principles.

**Service and solutions** The Endress+Hauser range offers various services. For example, we can ensure compliance with the German Federal Water Act, develop tailor-made bypass solutions and offer various cloud services with Industry 4.0 functionality.

### Highlights

- Trendsetter in level measurement
- Wide range of devices for functional safety
- Inventor of the vibration measuring principle
- Levelflex FMP55 – multi-parameter sensor for interface measurement
- Heartbeat Technology for maximum plant availability and process optimization
- The first free-space 80 GHz radar for liquids
- The first battery-powered, free-space 80 GHz radar Micropilot FWR30 measuring device with cloud connection



Additional information is available in the brochure "Level measurement" (FA00001F)

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

# The new Liquiphant. More safety. More Industry 4.0.

A measuring device tried and tested in millions of applications for safe level limit measurement, even under extreme process conditions – and now Industry 4.0-ready

- 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 – recurrent tests according to SIL or WHG (German Water Resources Act) without removing the device, verification or interrupting the process
- Highly corrosion-resistant coatings and suitable for use in high temperatures of up to 280 °C (Liquiphant FTL62 and FTL64)

**Application** The Liquiphant family has proven to be highly successful in all industries. It can be used in storage tanks, containers and pipelines to measure the level limit of all kinds of liquids. The measuring devices of the Liquiphant family are ideal for applications in which float switches, displacers or optical sensors were previously used. The devices reliably deliver precise measurement results in areas where other measuring principles reach their limits on account of conductivity, deposits, turbulence, flow profiles or air bubbles.

**Industry 4.0-ready** In the new generation of Liquiphant measuring devices, Heartbeat Technology assists with diagnostics, verification and monitoring. This means that maintenance and repair costs can be reduced – while improving plant safety and availability.

**Liquiphant FTL51B** The device has been fully developed in accordance with IEC 61508 and is therefore suitable for direct use in SIL2 and SIL3 applications. With its international Ex certificates, WHG approval, various process connections and types of electronics, as well as an optional pipe extension, the Liquiphant FTL51B level limit switch is the all-rounder in the Liquiphant family.



**Liquiphant FTL62 with coatings and Liquiphant FTL64 for high-temperature applications** These two new members of the family offer a wider range of applications in the process industry. The Liquiphant FTL62 level limit switch can be adapted for use in aggressive media using tried-and-tested ECTFE, PFA or enamel coatings. These coatings provide good chemical and corrosion resistance and allow for high abrasion resistance and optimized non-stick properties, depending on the coating chosen. Liquiphant FTL64's special high-temperature design enables it to be used in process temperatures of between -60 °C and 280 °C. A second process seal in the form of a welded, gas-tight bushing (second line of defense) ensures maximum safety and availability, including if a sensor is damaged.

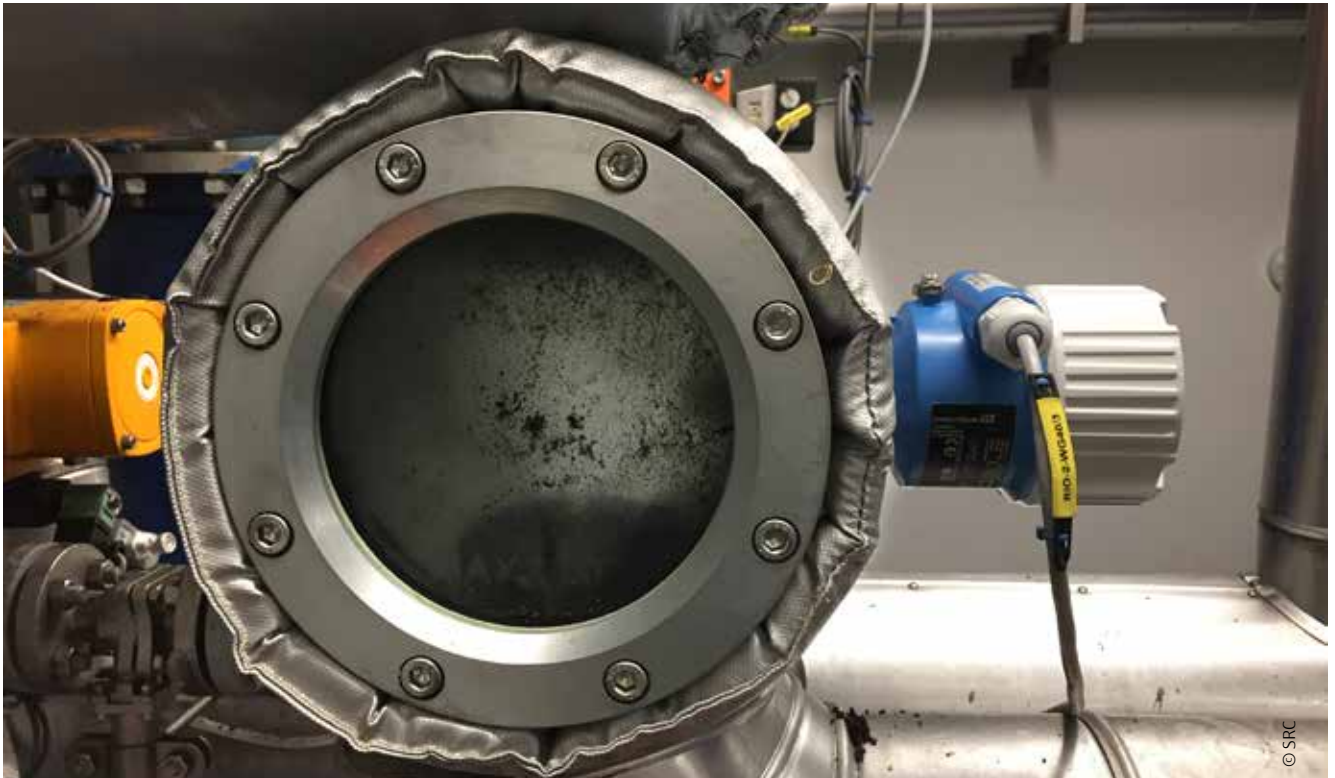


Liquiphant FTL51B



Liquiphant FTL62  
with PFA coating





Liquiphant FTL51B supports predictive maintenance via frequency monitoring

#### Advantages

- **Increased safety:** The new generation of Liquiphant devices has been developed according to IEC 61508 for use in SIL2/3 safety instrumented systems
- **Increased efficiency:** Mobile access via Bluetooth® increases the efficiency of maintenance and control processes and creates the conditions for intelligent digitalization as part of Industry 4.0 strategies
- **Minimized effort:** Once installed, the Liquiphant level limit switch can be verified at any time without interrupting the process
- **Maximized plant availability:** Heartbeat Technology enables predictive maintenance
- **Extended operating conditions with:** Tried-and-tested coating variants which protect against aggressive media. Nothing stands in the way of using the devices under extreme conditions of up to 280 °C



Liquiphant FTL64

#### Technical data

- Process temperature range:
  - FTL51B and FTL62: -50 °C to +150 °C
  - FTL64: -60 °C to +280 °C
- Process pressure: Up to 100 bar
- Viscosity: Up to 10,000 mPa·s
- Extension pipe: Up to 6 m

 More information available at:  
[www.endress.com/liquiphant](http://www.endress.com/liquiphant)

# Gammapiilot FMG50 – reliable, efficient and compact

Radiometric compact transmitter for extremely challenging measuring conditions

- 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

**Application** The radiometric Gammapiilot FMG50 compact transmitter reliably takes measurements for limit detection, continuous level, interface and density. It 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 Gammapiilot FMG50 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

- Compact two-wire device technology for savings when it comes to engineering, installation and space requirements
- Developed in accordance with IEC 61508 for SIL2 and SIL3
- Less effort required for recurrent tests (SIL) thanks to guided operation and automatic documentation
- Reliable measurement in high-temperature applications, even without water cooling
- Simple device verification and predictive maintenance with Heartbeat Technology
- Simple, guided wizard for verification and recurrent testing using the SmartBlue-app via Bluetooth®

 More information available at:  
[www.endress.com/fmg50](http://www.endress.com/fmg50)

## Technical data

- Ambient temperature: From -40 °C to +80 °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



# Micropilot FWR30 – the cloud-connected level sensor

The world's first battery-operated 80 GHz radar level measuring device for remote monitoring of levels

- Easy commissioning and installation without wiring
- Full transparency in storage and transportation of liquids and bulk solids
- Secure data transmission combined with a flexible, digital service portfolio
- Information access from anywhere, at any time

**Application** The new IIoT radar level measuring device offers simple, battery-powered and cost-effective remote monitoring of levels in mobile tanks and silos or measuring points distributed over wide areas. The 80 GHz radar sensor can be fitted on the outside of a plastic container, e.g. an intermediate bulk container (IBC) and measures reliably without any contact with the medium. It can also be installed on metal tanks or silos without any problems. Digital services Netilion Value, Netilion Inventory and SupplyCare Hosting offer simple level monitoring via a mobile end device and needs-oriented inventory control, all while ensuring maximum safety.

## Advantages

- Reliable level measuring device for inventory monitoring
- Maximum inventory transparency for optimization of the entire logistics chain
- Additional information about temperature, battery state, GPS localization and position
- Easy commissioning and installation without cabling
- IIoT platform with standardized applications, incl. visualization

 More information available at: [www.endress.com/micropilot-fwr30](http://www.endress.com/micropilot-fwr30)



Netilion

## Technical data

- 80 GHz radar technology
- Level, temperature and position measurement, location determination
- Output signal: NB-IoT, LTE-M with 2G fall-back option, LoRaWAN
- Transmission intervals: From 1 hour to up to 24 hours or event-based

# Soliwave FQR16/FDR16 and Solimotion FTR16 – microwave barrier and motion detector

Cost-effective monitoring of limit detection and transport processes for bulk solids

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

**Application** The new Soliwave FQR16/FDR16 microwave barrier is used for minimum or maximum limit detection of powdery to granular bulk solids and liquids, for instance for overflow and dry running protection. Meanwhile, the new Solimotion FTR16 bulk solids motion sensor monitors pneumatic and mechanical bulk solid transport processes efficiently and reliably. These two devices use a non-contact detecting process, which enables continuous operation without wear or maintenance. In addition, thanks to their compact design, Soliwave and Solimotion can be used in applications with hard-to-reach or confined installation conditions.

## Advantages

- Non-contact measuring principle – detection virtually independent of the process characteristics
- Universal use – can also be used in challenging applications where other measurement methods reach their limits
- Reliable detection – non-contact measurement method guarantees continuous operation without wear or maintenance
- High reliability – permanent self-diagnostics, comprehensive self-test can be performed on the device on site at any time
- Reliable – detection even when subject to changing product characteristics
- Robust design – stainless steel housing
- Very compact design – can also be used even in hard-to-reach or confined installation conditions
- Meets the requirements of EU Regulation No. 1935/2004
- Developed for dust ignition-proof applications



## **i** Technical data

- Detection range: Soliwave up to 20 m, Solimotion up to 5 m
- Process temperature: Any (non-contact installation); -40 °C to +70 °C (installed), -40 °C to +450 °C (with high-temperature adapter)
- Process pressure: Any (non-contact installation), 0.5 bar to 6.8 bar abs. (installed), 0.5 bar to 21 bar abs. (with high-pressure adapter)
- Ex approvals

# Micropilot FMR20 – efficient and innovative

Radar technology in a new compact size for bulk solids and liquids

- Easy, intuitive operation – radar sensor with Bluetooth® technology
- Minimum effort – easy to commission, operate and maintain
- Compact design – ideal for confined installation conditions

**Application** The Micropilot FMR20 continuously measures the level of bulk solids and liquids by emitting microwaves. The devices have been specially developed for the requirements of simple applications with a focus of efficiency in a wide range of industries. An example of this is measuring sand and gravel in silos. Other typical examples are in water/wastewater applications and auxiliary circuits in all industries. The devices are operated via the SmartBlue-app (Bluetooth®) or via a HART connection.

## Advantages

- Highly efficient measuring point
- Intuitive commissioning using the SmartBlue-app
- Easy, reliable and encrypted wireless remote access via Bluetooth® – ideal for difficult-to-reach installations
- Compact radar measuring device – suitable for use even in confined installation conditions
- Complete PVDF housing for maximum chemical resistance
- Hermetically sealed wiring and fully potted electronics protect the device against water and enable use under demanding environmental conditions



Technical data and complete documentation/  
additional information at:  
[www.endress.com/fmr20](http://www.endress.com/fmr20)



## **i** Technical data

- Liquids measuring range: Up to 20 m
- Bulk solids measuring range: Up to 15 m
- Process temperature: -40 °C to +80 °C
- Process pressure: -1 bar to +3 bar
- Accuracy: ±5 mm
- Degree of protection: IP66/68 / NEMA 4X/6P
- Ex approval for gas

# Waterpilot FMX11 – easy-to-use and inexpensive level probe for fresh water

Hydrostatic probe for level measurement in water applications

- Maximum simplicity – fully welded, seal-free metal diaphragm with narrow diameter of under 22 mm
- Optimized ordering processes – available online, streamlined ordering structures and short delivery times
- Robustness – protection cap supplied protects the sensor during installation

**Application** The new Waterpilot FMX11 level probe measures levels in an extremely simple and reliable way using the hydrostatic measuring principle. While this level probe is suitable for various water applications, it is perfect for fresh water and drinking water. Moreover, the Waterpilot FMX21 rounds off the low-price segment.

## Advantages

- Easy ordering processes thanks to streamlined ordering structures
- Available 24/7 online at [endress.com](http://endress.com)
- Short delivery times thanks to optimized inventory management
- Fully welded, seal-free metal diaphragm made of 316L
- Diameter of < 22 mm enables use in probe tubes as small as 1"

 Technical data and complete documentation: [www.endress.com/fmx11](http://www.endress.com/fmx11)

## Technical data

- Accuracy: 0.35% to 0.5%
- Span: 200 mbar to 2 bar relative
- Process temperature: -10 °C to +70 °C
- Approvals: ACS, NSF61, DVGW, KTW, cULus
- Output: 4 to 20 mA



# Solitrend MMP40/MMP41/MMP42 – material moisture measurement for process optimization

Precise material moisture measurement using radar technology

- Minimal effort – no need for recalibration in the process
- Excellent resistance to wear – enables long operating times
- Flexible configuration for application-specific processes

**Application** The Solitrend MMP40, MMP41 and MMP42 moisture measurement devices measure the material moisture in bulk solids with high precision. The Solitrend device should preferably be fitted underneath the silo flaps or using a slide on conveyor belts. It can also be installed in a screw conveyor. A guided radar wave propagates at almost the speed of light. In this way, the sensor measures the material "slice by slice" and layer for layer at a right angle to the sensor surface.

## Advantages

- Highly accurate measurement of material moisture
- Minimum influence of fluctuations in particle size
- No recalibration necessary if sensor head is worn
- Robust sensor construction possible in a variety of designs
- Remote display for configuration and calibration

More information available at:  
[www.endress.com/mmp40](http://www.endress.com/mmp40)  
[www.endress.com/mmp41](http://www.endress.com/mmp41)  
[www.endress.com/mmp42](http://www.endress.com/mmp42)



MMP40



MMP41



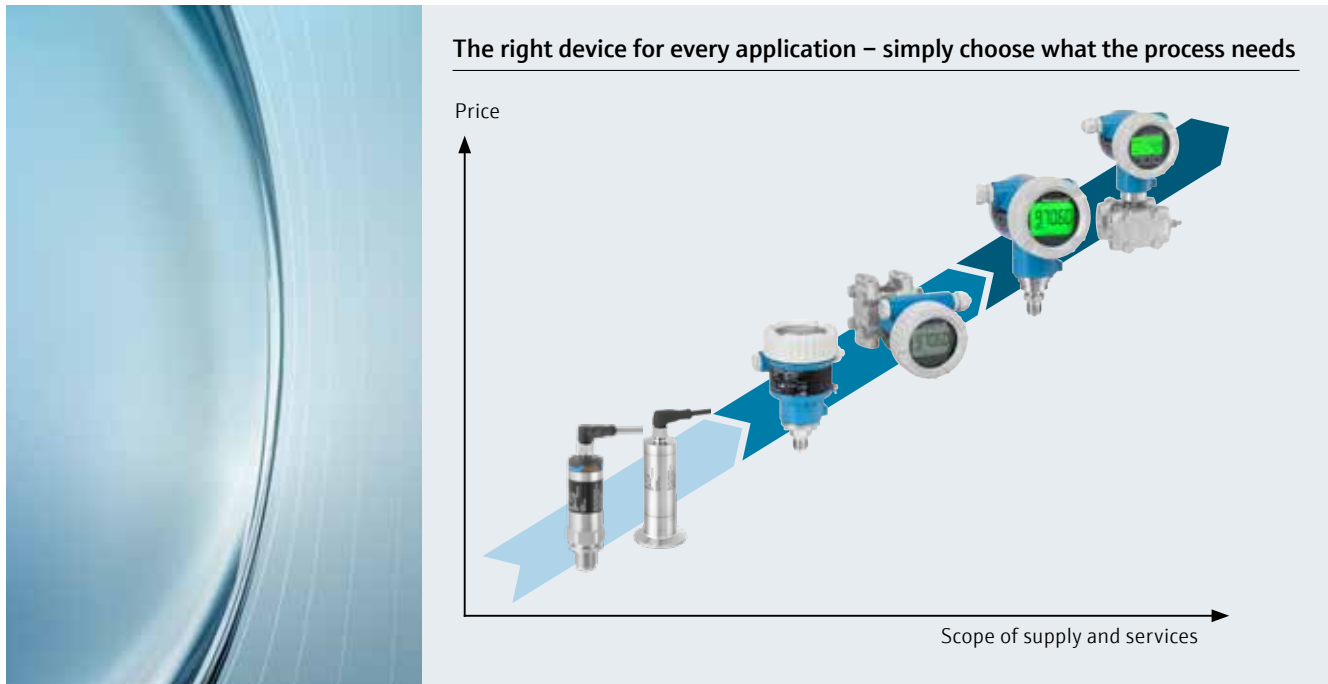
MMP42

## Technical data

- Temperature range: 0 °C to +70 °C (optional: Up to 120 °C)
- Compact design
- Degree of protection: IP67 (IP68 on sensor side)
- Measuring range: 0–100% moisture

# Pressure measurement

Innovative pressure measurement technology from a single source



For over 37 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 fields of sensor technology, operating concepts and Industry 4.0 applications 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 range is distinguished by a clear segmentation and ensures an optimal price-performance ratio. It includes high-end transmitters for the most stringent requirements, versatile compact transmitters and inexpensive transducers for standard applications.

## Applicator – simple, quick and reliable configuration

- Calculation of total accuracy and long-term stability
- Sizing/optimization of flow measurements with orifice plates, pitot tubes, venturi, etc.
- Calculation of diaphragm seal systems; determination of application limits

**Advantages** 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.

➔ Additional information is available in the brochure "Pressure measurement" (FA00004P)

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

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





## 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 diaphragms; 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 extreme 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 720 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 42 bar rel./abs.
- Temperatures  
-70 °C to +400 °C



#### Differential pressure

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



# Cerabar PMP51B and PMC51B – precise and reliable pressure measurement


Compact pressure transmitters for relative and absolute pressure measurement

- Considerable time savings – simple and wireless configuration using a Bluetooth® interface
- Maximum process reliability – integrated undervoltage detection and development according to IEC 61508 for SIL2/3 applications
- High productivity – integrated digital assistants for simple commissioning

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

## Advantages

- Newly developed connectivity thanks to optional Bluetooth® interface for simple and wireless communication, including at a safe distance
- Development according to IEC 61508 ensures improved safety and enables use in SIL2 applications and, with homogeneous redundancy, in SIL3 applications
- Undervoltage detection prevents dangerous plant conditions and the transmission of frozen current values
- Integrated digital assistants ensure fast and error-free commissioning or locking of the pressure transmitters
- Maximum scope of applications thanks to different sensory mechanisms, wide spans and a large process temperature range

 Technical data and complete documentation:  
[www.endress.com/pmp51b](http://www.endress.com/pmp51b)  
[www.endress.com/pmc51b](http://www.endress.com/pmc51b)



PMP51B



PMC51B



## Technical data

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

# Deltabar PMD55B – compact differential pressure transmitter

For monitoring very low differential pressures in towers, level measurement and flow measurement using differential pressure

- Considerable time savings – simple and wireless configuration using a Bluetooth® interface
- Maximum process reliability – integrated undervoltage detection and development according to IEC 61508 for SIL2/3 applications
- High productivity – integrated digital assistants for very simple commissioning

**Application** Thanks to its measuring range of 5 mbar to 44 bar, the new, compact Deltabar PMD55B differential pressure transmitter can be used in a wide range of differential pressure measurements. This includes filter applications, for monitoring very low differential pressures in towers, level measurement and flow measurement using differential pressure.

## Advantages

- Newly developed connectivity thanks to optional Bluetooth® interface for simple and wireless communication, including at a safe distance
- Development according to IEC 61508 ensures improved safety and enables use in SIL2 applications and, with homogeneous redundancy, in SIL3 applications
- Undervoltage detection prevents dangerous plant conditions and the transmission of frozen current values
- Integrated digital assistants ensure fast and error-free commissioning or locking of the pressure transmitters
- Accessories supplied as an option (either directly fitted or enclosed), such as valve blocks, in one delivery and precisely configured to be compatible with each other

 Technical data and complete documentation:  
[www.endress.com/pmd55b](http://www.endress.com/pmd55b)



## Technical data

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

# Cerabar PMP71B and PMC71B – high-end pressure transmitters for relative and absolute pressure measurement

Pressure measurement with an extremely high level of accuracy and maximum reliability

- More Industry 4.0 – integrated functionalities such as Heartbeat Technology enable further process optimizations in line with Industry 4.0
- Increased productivity – Bluetooth® simplifies commissioning and operation
- Improved process reliability – integrated undervoltage detection, CRC checksum, development according to IEC 61508 for SIL2/3 applications and digital assistants

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

## Advantages

- Heartbeat Technology for device verification without interrupting the process and predictive maintenance thanks to monitoring functions
- HistoROM module for quick electronics replacement using automated data management
- Connectivity thanks to optional Bluetooth® interface for simple and wireless communication, including at a safe distance
- Graphical display for operation without opening the housing, incl. color change
- Development according to IEC 61508 enables use in SIL2 applications and, with homogeneous redundancy, in SIL3 applications
- Undervoltage detection prevents dangerous plant conditions and the transmission of frozen current values

Technical data and complete documentation:

[www.endress.com/pmp71b](http://www.endress.com/pmp71b)  
[www.endress.com/pmc71b](http://www.endress.com/pmc71b)



PMC71B



PMP71B

## i Technical data

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

# Deltabar PMD75B and PMD78B – high-end differential pressure transmitters for the toughest applications


Monitoring of very low differential pressures, including in filter applications with very high pressures and at extreme process temperatures

- More Industry 4.0 – integrated functionalities such as Heartbeat Technology enable further process optimizations in line with Industry 4.0
- Increased productivity – Bluetooth® simplifies commissioning and operation
- Improved process reliability – integrated undervoltage detection, CRC checksum, development according to IEC 61508 for SIL2/3 applications and digital assistants

**Application** Thanks to their measuring range of 1 mbar to 44 bar and process temperatures of -70 °C to +400 °C, the new high-end Deltabar PMD75B and PMD78B differential pressure transmitters can be used in a wide range of differential pressure measurements, including the very toughest. They are suitable for filter applications, applications with extreme temperatures, monitoring very low pressure differentials in towers, level measurement and flow measurement using differential pressure.

## Advantages

- Heartbeat Technology for device verification without interrupting the process, and predictive maintenance thanks to monitoring functions
- HistoROM module for quick electronics replacement using automated data management
- Connectivity thanks to optional Bluetooth® interface for simple and wireless communication, including at a safe distance
- Graphical display for operation without opening the housing, incl. color change
- Development according to IEC 61508 enables use in SIL2 applications and, with homogeneous redundancy, in SIL3 applications
- Undervoltage detection prevents dangerous plant conditions and the transmission of frozen current values

 Technical data and complete documentation:

[www.endress.com/pmd75b](http://www.endress.com/pmd75b)  
[www.endress.com/pmd78b](http://www.endress.com/pmd78b)



PMD75B



PMD78B

## Technical data

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

# DA63M valves and valve blocks – accessories concept for pressure measuring points

Easy to use with transmitters for a wide range of pressure and differential pressure measuring points

- Extended life cycle – simple maintenance of the pressure gauges and additional protection
- Time and resources saved – pressure gauges and components are precisely configured to be compatible with each other and can be pre-installed as an option
- Simple operation – simple to shut off the process, can be calibrated directly at the measuring point without needing to remove the device

**Application** Endress+Hauser's accessories concept offers many options for supplementing the pressure measuring points – whether shut-off devices, valves, valve blocks, flushing rings, condensate traps and much more besides. The (DA63M) valves and valve blocks can be used for a wide range of pressure and differential pressure measuring points and make the transmitters easier to use over their entire life cycle.

## Advantages

- Efficient maintenance of the pressure and differential pressure transmitters
- On-site testing possible if test connection also ordered
- Protection against heat (e.g. condensate traps), moisture (e.g. protective casing) and blockages (flushing rings)
- Options to have valves and valve blocks pre-installed saves time and prevents errors during installation
- Delivery and coordination from a single source: pressure transmitters and accessory parts

 Technical data and complete documentation:  
[www.endress.com/pressure](http://www.endress.com/pressure)



## Technical data

- Materials: Steel, 316Ti, 316L, alloy (depending on the valve variant)
- Version: 2-way, 3-way or 5-way
- Temperatures: Up to 550 °C possible
- Addition: 3.1. Material certification, O2 application, silicone-free, etc.

# Complete pressure measurement package – with the right components for the complete measuring point

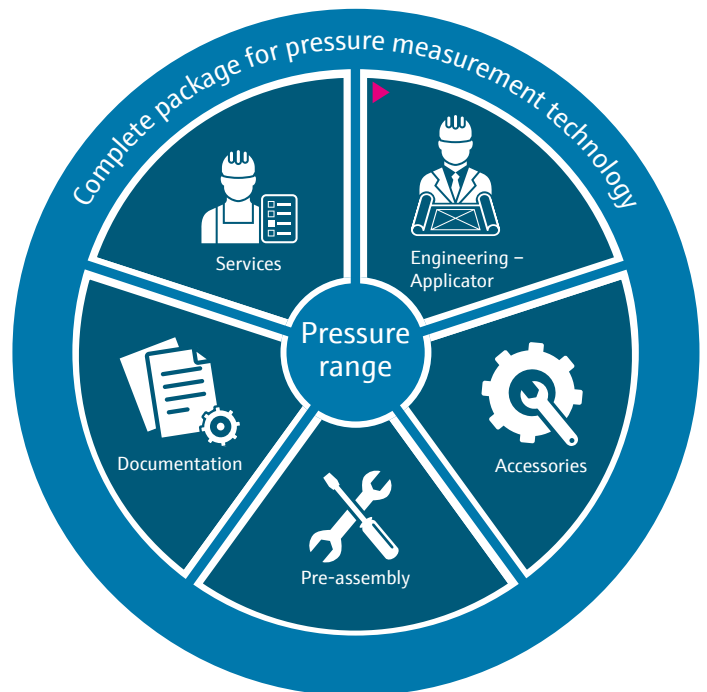
Accessories for pressure and differential pressure transmitters

- Cost – reduced inventory, fewer variants, lower processing costs
- Time and resources saved – just one point of contact ensures minimum coordination effort
- Additional process reliability – compatible, tested components

**Application** At many pressure and differential pressure measuring points, a pressure transmitter on its own does not form a complete measuring point. Prior engineering and additional accessories are required as standard. An example of this is the gas industry, where pressure and differential pressure transmitters need to be installed with the correct accessories. Moreover, in many cases, a protective casing is used to extend the service life of the transmitters. It must also be ensured that the documentation is complete.

## Advantages

- Segmented pressure range – only pay for what the process needs
- Applicator acts as an engineering aid – time-saving and safe measuring point planning
- A wide range of accessories – qualified and suitable components, such as valve blocks and protective casing
- Pre-installation – testing and assembly of the parts
- Complete documentation – customized hook-ups, 2D/3D drawings, etc.
- Established services: commissioning, calibration, maintenance, etc.



More information available at:  
[www.endress.com/pressure](http://www.endress.com/pressure)

# 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 flow measurement 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.

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

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



#### Industry 4.0-ready

Integrated WiFi connectivity, web/OPC UA server and extensive process and device data make digitalization of the plant easy.



#### HistoROM

This permanent memory prevents data loss and enables components to be replaced easily without reconfiguration.



#### Integrated industry safety

Industry-specific safety concepts such as the SIL device concept (chemical industry) or Food Safety concept (food industry) ensure the best possible process and product reliability.



#### Simply clever

The optimized device design and innovative features ensure simple and safe device handling during planning, operation and maintenance.



#### Heartbeat Technology

The benchmark for a high level of error coverage with integrated diagnostic functions, verification without needing to remove the device and clear trend monitoring based on process-independent condition parameters.



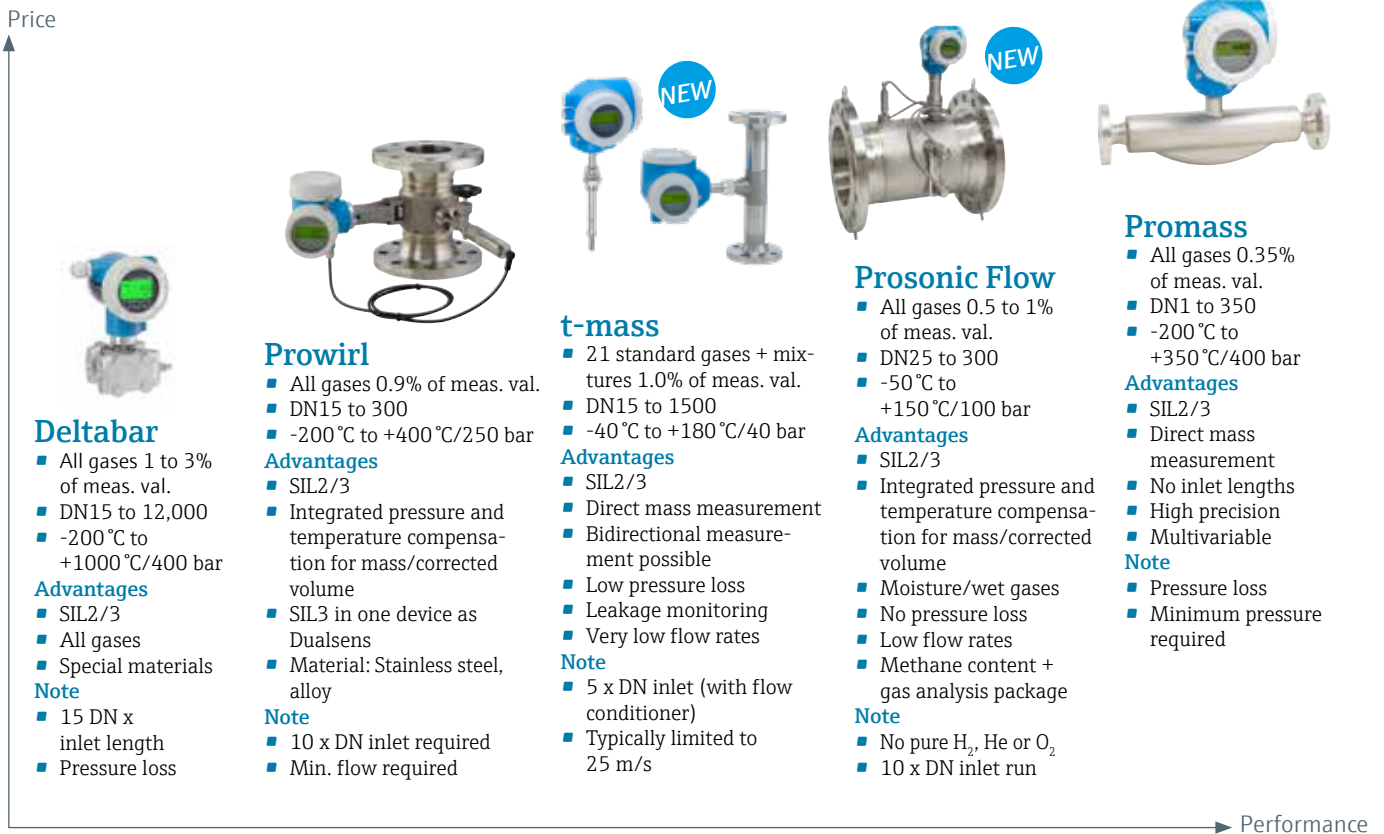
#### Unified instrumentation

Consistent standardization provides reliability in operation and reduces costs. Standardized device concept with level.



# Expertise in gas flow measurement


Extensive product portfolio for the measurement of gases



**Application** Five electrical flow measurement technologies enable gas flow measurements to be taken in all areas of use, from the smallest DN01 nominal diameter to tall exhaust stacks (DN12,000), at high pressures (up to 400 bar), high temperatures (up to 1000 °C) and with a high level of accuracy (up to 0.35% of meas. val.). They can be used for all gases and surrounding areas – whether in billing for measuring points that require calibration, process gas measurements or auxiliary circuits for natural gas or compressed air. Thanks to the advantages offered by the Proline 3 device concept, Endress+Hauser's gas flowmeters enable substantial cost savings.

## Proline 3 concept – advantages:

- Industry 4.0-ready sensors: Make the digitalization of process systems easy
- Integrated industry safety concept: Ensures maximum plant safety
- Heartbeat Technology: Enables comprehensive diagnostics, simple verification and predictive maintenance
- HistoROM memory: Ensures secure storage of data (cannot be lost) and simplifies repairs and maintenance
- "Simply clever" device concept: Simplifies the planning, operation and maintenance of devices over their life cycle

 Technical data and complete documentation/ additional information at: [www.endress.com/flow](http://www.endress.com/flow)

## Unparalleled advantages for gas flow measurement:

- Accredited in-situ calibration of gas flowmeters (Promass + Prowirl) with water
- All technologies support SIL2/3, developed according to IEC 61508
- Custody transfer gas flow measurement with Promass
- Bidirectional thermal gas flow measurement
- Ultrasonic gas flow measurement with integrated pressure and temperature compensation and integrated gas analysis
- Vortex gas flow measurement with integrated pressure and temperature compensation and gas computer

# Prosonic Flow G 300/500 – process gas measurement redefined

Simple and clever measurement and analysis of gases


- Innovative process gas measurement – simple and clever measurement and analysis of gases
- Precise measurements even in demanding processes thanks to robust industrial design
- Integrated pressure and temperature measurement for compact measurement of mass/corrected volume

**Application** High precision even at low pressures and no pressure loss are the hallmarks of ultrasonic gas flow measurement with the Prosonic Flow G 300/500. The integrated gas computer and the option of integrated pressure and temperature measurement enable the direct and compact measurement of mass flow/corrected volume flow at a measuring point. In addition, process variables, such as the methane content, energy flow and calorific value, can also be calculated. The measuring device meets the relevant industry requirements, such as NACE-compliant materials, NAMUR requirements, Ex, SIL, PED and gas factory calibration in the standard device version.

## Advantages

- Developed according to IEC 61508 and TÜV-certified, the device is suitable for use in SIL2 safety equipment (homogeneous redundancy SIL3)
- Integrated pressure and temperature measurement for compact measurement of mass flow/corrected volume flow at a measuring point
- Advanced gas analysis for determining the methane content and calculating additional process variables (energy flow, calorific value, Wobbe index, etc.)
- Also able to measure in wet gases as sensor design is unaffected by condensation
- Maximum safety in critical gas applications thanks to dual-seal design with integrated rupture disk
- Groundbreaking diagnostics, test concepts and predictive maintenance with Heartbeat Technology



 Technical data and complete documentation/ additional information at:  
[www.endress.com/9G3B](http://www.endress.com/9G3B)

## Technical data

- Nominal diameters: DN25 to DN300
- Process temperature: -50 °C to +150 °C
- Process pressure: From 0.7 bar abs. to max. PN100
- Standard measured error 1% (optionally 0.5%)
- Materials: Ultrasonic transducer made from titanium, measuring tube cast body 1.4408/1.4409 (CF3M)
- Approvals: ATEX, IECEx, cCSAUs, SIL, PED, CRN, NACE MR0175/MR0103, AGA 9

# t-mass 300/500 – thermal air and gas measurement with unique performance characteristics

The first system with bidirectional thermal mass flow measurement for gases

- Wide range of applications, ideal for low pressures
- For use in SIL2/3 safety equipment for selected gases
- Compact bidirectional measurement in a single device at a measuring point
- Heartbeat Technology: Simple verification and monitoring with drift and moisture detection

**Application** The strengths of the thermal measuring principle lie in the mass flow measurement of gaseous media at very low pressures and quantities – ideal for consumption measurement and leak detection in internal distribution networks (compressed air, natural gas, etc.) and for process gases (nitrogen, oxygen, argon, etc.). Gas properties saved in the device enable flexible use for a wide variety of gas mixtures. Highlights include development according to IEC 61508 for use in SIL safety equipment, the drift-free sensor system, bidirectional flow measurement in a single device and Heartbeat Technology.

## Advantages

- Developed according to IEC 61508, for use as per SIL2 and SIL3 (homogeneous redundancy) in selected gases (air, nitrogen, oxygen, methane, natural gas, etc.)
- Wide range of applications with integrated properties of 21 industrial gases and configurable gas mixtures ("gas engine")
- Bidirectional measurement in a single device
- Heartbeat Verification enables traceable verification of the installed device in accordance with ISO 9001 without interrupting the process (confirmed by TÜV certificate)
- Heartbeat Monitoring enables the detection of moisture and process interferences, thereby supporting the concrete implementation of predictive maintenance



Technical data and complete documentation/  
additional information at:  
[www.endress.com/t-mass](http://www.endress.com/t-mass)



## Technical data

- Nominal diameters: In-line version: DN15 to DN100, plug-in version: DN80 to DN1500
- Mass flow measured error: 1% (previous product: 1.5%)
- Process temperature: Max. 180 °C (previous product: 130 °C)
- Extremely low pressure loss: < 2 mbar
- Process pressure: Max. PN40
- Approvals: ATEX, IECEx, cCSAUs, SIL, PED, CRN

# Prosonic Flow P 500 – non-invasive flow measurement with ultrasonic clamp-on


The world's first ultrasonic clamp-on flow measurement with short inlet runs and SIL2 certification

- Innovative FlowDC function enables short inlet runs (up to 2 x DN) without any loss of measurement accuracy
- Easy and reliable installation thanks to integrated installation testing and status display
- Maintenance-free operation with long-term stability thanks to coupling pads
- Non-invasive flow measurement from outside with no pressure loss and without interrupting the process
- Wide range of applications for various liquids and nominal diameters

**Application** Ultrasonic clamp-on flowmeters enable users to take non-invasive measurements from outside. This not only means that measuring points can be flexibly retrofitted and defective measuring devices can be replaced without interrupting the process, it also makes it easy to measure corrosive, abrasive and toxic media with no pressure loss. The ultrasonic clamp-on technology is suitable for use in various liquids, such as chemicals, liquid hydrocarbons, solvents, acids, bases, water and much more besides.

## Advantages

- The world's first clamp-on flow measurement with inlet runs from 2 x DN. The flow disturbance compensation (FlowDC) ensures consistent measurement accuracy even for short inlet and outlet runs. This guarantees flexible planning and makes it easy to retrofit measuring points.
- The world's first clamp-on flowmeter developed according to IEC 61508 for use in SIL2 safety equipment
- Wide range of applications thanks to large selection of sensors
- Robust measuring system available as an offshore version made of stainless steel for operation under harsh environmental conditions
- Simple, maintenance-free operation with long-term stability during operation thanks to coupling pads
- Heartbeat Technology for reliable device and process monitoring, as well as device testing during operation

 Technical data and complete documentation/ additional information at:  
[www.endress.com/9P5B](http://www.endress.com/9P5B)



## Technical data

- Nominal diameters: DN15 to DN4000
- Sensor frequencies: 5, 2, 1, 0.5, 0.3 MHz
- Process temperature: -40 °C to +170 °C
- Measured error: 0.5% of meas. val. +1.5% of meas. val. (due to installation conditions)
- Pipe materials: Metal, plastic, GRP, lined pipes and many others
- Approval: ATEX, IECEx, cCSAUs, SIL

# Promag W 800 Index C – battery-powered flowmeter

For flexible and decentralized use in water distribution networks

- Variety of options: From battery operation with a local display to complete integration into the cloud using mobile communications systems
- Robust, maintenance-free electromagnetic sensor with long-term stability
- Simple and convenient operation via Bluetooth® and the SmartBlue-app
- All of the measured values are stored in a non-volatile data logger (up to 50,000 values)

**Application** Being able to accurately measure spring and drinking water is becoming increasingly important. This electromagnetic flowmeter is suitable for flexible and decentralized use even at locations without a mains supply, such as areas with seawater, river water or groundwater (raw water extraction), in distribution networks, at transfer points or in irrigation systems. Promag W 800 offers all options, from battery operation with a data logger to complete integration into further cloud systems, such as Netilion Water Network Insights.

## Advantages

- Battery-powered, no external power supply required
- Maximum battery life of up to 15 years
- All of the measured values are stored in a non-volatile data logger (up to 50,000 values)
- Optional external pressure measurement for leak monitoring
- Optional remote data transfer, global and encrypted, via LTE Cat M1, LTE Cat NB1, EGPRS into further cloud systems via MQTT
- Heartbeat Technology for integrated device verification without needing to remove the device or interrupting the process



Technical data and complete documentation/  
additional information at:  
[www.endress.com/5W8C](http://www.endress.com/5W8C)



## Technical data

- Nominal diameters: DN25 to DN1200
- Measured error: 0.5% of meas. val.
- Design: Compact or remote version, also available with IP68 rating
- Battery-powered: DC 3.6 V, lithium thionyl chloride high-power battery
- Approvals: KTW/W270 drinking water, PED, wireless approval
- Outputs/inputs: Pulse/switch output (3x), status input (1x), Modbus RS485, mobile communications systems

# Promass K 10 – Coriolis flow measurement


Optimized for machine and plant construction

- Optimized range of functionality in standard applications
- On-site operation using a touchscreen with automatic alignment for the first time
- Operation via Bluetooth® using the SmartBlue-app

**Application** The new Promass K 10 Coriolis meter is a new addition to the Promass range that focuses on standard applications in machine and plant construction. The compact two-pipe system also meets industry-specific requirements, such as ATEX, PED, surface roughness, etc., in the device standard version. The adjusted range of functionality offers a good price-performance ratio. The devices impress users with their simple selection options and commissioning.

## Advantages

- Touch-enabled display and automatic alignment
- Operation via Bluetooth® using the SmartBlue-app
- Wizard guides for easy commissioning
- Industry-specific versions (e.g. tri-clamp, Ra 0.8)
- No inlet/outlet runs

 Technical data and complete documentation/  
additional information at:  
[www.endress.com/8KBB](http://www.endress.com/8KBB)



## Technical data

- Compact two-tube system with nominal diameters: DN08 to DN80
- Measured error (mass): 0.5% of meas. val. (optionally 0.15%/0.2%)
- Process temperature: -40 °C to 150 °C
- Process pressure: Up to PN100
- Approvals: ATEX, CSA C/US; GP
- Outputs: 1 x 4 to 20 mA HART, 1 x pulse/frequency/status (incl. Ex-i), Modbus RS485
- Wide-range power unit 24 V DC/230 V AC

# Promag D/H/P/W 10 – electromagnetic flow measurement

Optimized for machine and plant construction

- Optimized range of functionality in standard applications
- On-site operation using a touchscreen with automatic alignment for the first time
- Operation via Bluetooth® using the SmartBlue-app

**Application** The new Promag 10 flowmeters are new additions to the Promag range that focus on standard applications in machine and plant construction. The different sensor variants are optimized for their relevant area of use. For example, Promag H meets the hygiene requirements for the food and beverage industry, while Promag W is suitable for water and wastewater applications. Moreover, Promag P is suitable for process applications thanks to its highly resistant PTFE lining and Promag D is intended for wafer mounting. The adjusted range of functionality offers a good price-performance ratio. The devices impress users with their simple selection options and commissioning.

## Advantages

- Touch-enabled display and automatic alignment
- Operation via Bluetooth® using the SmartBlue-app
- Wizard guides for easy commissioning
- Sensory mechanisms suitable for the specific industry (process/water/hygiene)
- No inlet/outlets runs with Promag W 0 x DN full bore



Technical data and complete documentation/  
additional information at:

[www.endress.com/5PBB](http://www.endress.com/5PBB) (Promag P 10)

[www.endress.com/5HBB](http://www.endress.com/5HBB) (Promag H 10)

[www.endress.com/5DBB](http://www.endress.com/5DBB) (Promag D 10)

[www.endress.com/5WBB](http://www.endress.com/5WBB) (Promag W 10)



## Technical data

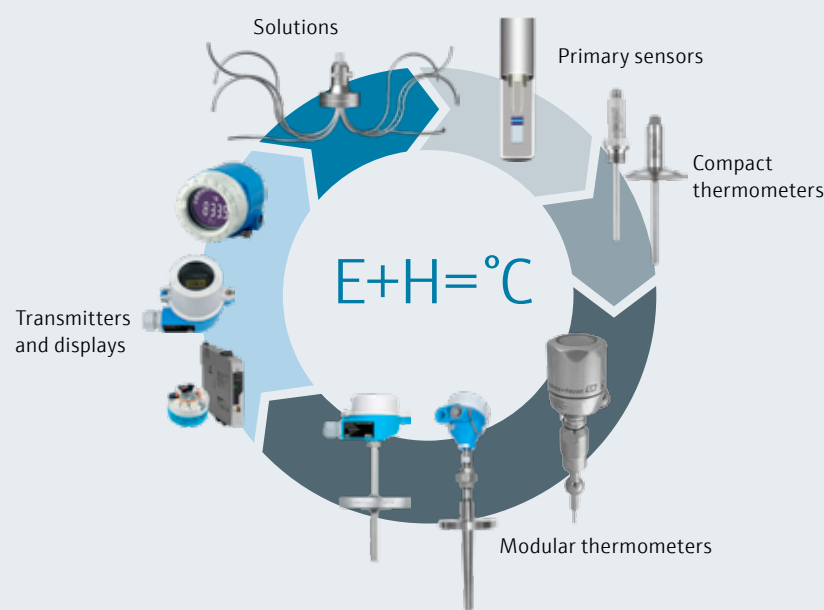
- Nominal diameters: DN02 to DN2400 (depending on sensor)
- Measured error (volume): 0.5% of meas. val.
- Approvals: ATEX (Promag P), EHEDG/3A (Promag H), drinking water (Promag D/W)
- Outputs: 1 x 4 to 20 mA HART, 1 x pulse/frequency/status (incl. Ex-i), Modbus RS485
- Wide-range power unit 24 V DC/230 V AC

# Temperature measurement

From primary sensor to customer-specific solution



The hot formula: E+H = °C



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](http://www.endress.com/temperature)



# iTHERM TrustSens TM371 – automatic self-calibration

Always measure reliably with unique sensor technology

World first

- 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

**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 guidelines. 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 guidelines (GMP – Annex 15).

## Application

- Life sciences
- Food
- Beverage industry

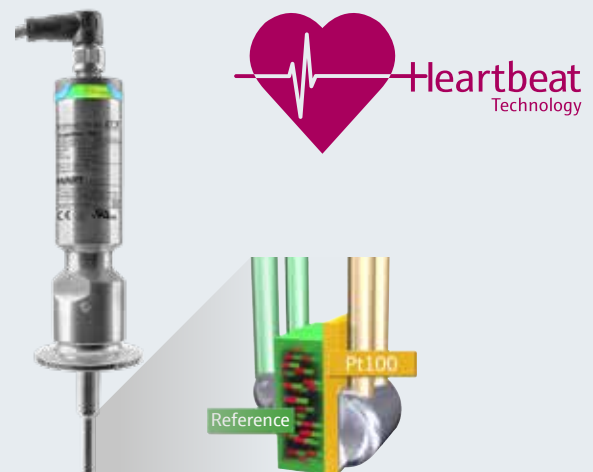
## Advantages

- 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 °C to +160 °C
- More than 50 hygienic process connections as standard

 Technical data and complete documentation:  
[www.endress.com/tm371](http://www.endress.com/tm371)

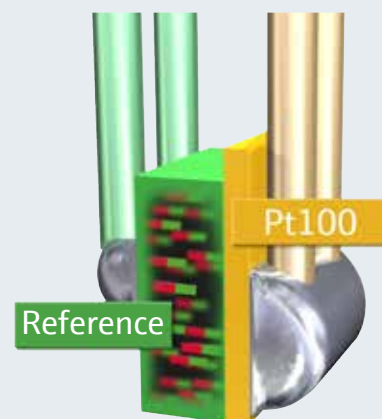
 For product design:  
[www.endress.com/applicator](http://www.endress.com/applicator)

## 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

# iTHERM ModuLine TM131 – secondary containment for temperature measurement

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

- Maximum process reliability and plant availability thanks to secondary containment
- Simple and reliable operation using Bluetooth®
- Maximum process reliability owing to response times that are five 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



## **i** 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

# iTHERM ModuLine TM131 – fast-response thermowell

Measure up to five times faster with patented thermowell technology

- Increased plant safety
- Optimum and efficient process control
- Consistently high product quality

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

#### Advantages

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



iTHERM ModuLine TM131 with fast-response thermowell

Technical data and complete documentation/  
additional information at:



<https://www.youtube.com/watch?v=u26oaNmiuL8>



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



#### Technical data

- Up to +400 °C
- For standard 6 mm insert

# iTHERM CompactLine TM311 – digital measured values and status transmission with IO-Link

A step toward Industry 4.0 with IO-Link/4 to 20 mA and PNP output

- Cost savings owing to easy integration
- Status messages for guaranteed reliability
- Digital communication via IO-Link saves time during commissioning

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

## Advantages

- Compact stainless steel design
- Fast response times
- Very accurate even with short installation lengths

 Technical data, complete documentation and additional information at:  
[www.endress.com/tm311](http://www.endress.com/tm311)



## Technical data

- Up to +400 °C
- For standard 6 mm insert

# iTEMP TMT71 and TMT72 – temperature transmitters with optional Bluetooth® control

Universal temperature transmitter with high performance characteristics and easy operation

- Improved process efficiency and plant availability thanks to accurate temperature measurement and long-term stability
- Simple commissioning thanks to integrated Bluetooth® interface and intuitive menu guidance
- Reduction of plant shutdown through advanced diagnostics such as 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

## Advantages


- Safe operation in hazardous areas 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



iTEMP TMT71  
with TID10  
display



iTEMP TMT72  
installed in  
the housing

 Technical data and complete documentation:  
[www.endress.com/tmt71](http://www.endress.com/tmt71)  
[www.endress.com/tmt72](http://www.endress.com/tmt72)

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

## Technical data

- 1 x universal input for resistance thermometer (RTD), thermocouples (TC), resistance transmitter ( $\Omega$ ) 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

# iTHERM MultiSens TMSxx – temperature profile measurement

Close monitoring of temperature profiles via just one 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  |  |  |

**Application** The iTHERM MultiSens 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 MultiSens TMS21 thermometer has been developed for use in the chemical industry, particularly in smaller test reactors in pilot plants and tube bundle reactors. The iTHERM MultiSens TMS31 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

# iTHERM ProfileSens TS901 – multipoint cable probe for iTHERM MultiSens

New, patented, double-walled multipoint cable probe for demanding process conditions

- Saves space in the reactor compared to conventional measuring elements
- Robust, durable device thanks to outer and inner tube
- Ideal for 3D temperature profile measurement

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

**Sensors and reactor fittings** of every kind play a central role in establishing contact between the catalyst and the product. Uneven liquid distribution via the catalyst can lead to channeling through the catalyst bed, which can cause excessive deactivation of the catalyst due to coking, the formation of "hot spots" and inefficient use of the catalyst.



Technical data and complete documentation/  
additional information at:

[www.endress.com/tms01](http://www.endress.com/tms01)  
[www.endress.com/tms02](http://www.endress.com/tms02)  
[www.endress.com/tms11](http://www.endress.com/tms11)  
[www.endress.com/tms12](http://www.endress.com/tms12)  
[www.endress.com/tms21](http://www.endress.com/tms21)  
[www.endress.com/tms31](http://www.endress.com/tms31)  
<https://eh.digital/TS901>



For more information, visit:  
[www.endress.com/multipoint](http://www.endress.com/multipoint)



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



## Technical data

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

# Liquid analysis

Reliable, simple, safe and cost-effective



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

## Application

- pH: Universally usable, reliable glass electrodes and glass-free 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 turbidity measurements
- Disinfection: Reliable sensors to ensure the effectiveness of disinfection tasks in drinking water, service water, coolant 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, offers unparalleled operating reliability. In addition, it has a modular design so that you can easily add to it. The new PROFINET connectivity and operation via Bluetooth® with a tablet or smartphone are groundbreaking features.

**Expertise in sensory mechanisms** No other component in a measuring point requires quite so much time and expertise to develop as the sensory mechanism does. The large vertical range of production, modular assemblies and a high level of automation guarantee absolutely reliable quality and safety, regardless of the liquid analysis parameters to be measured.

*"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 transmitters and assemblies" (FA00007C)

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





## Memosens 2.0 – simple, reliable, connected

Endress+Hauser became a trailblazer for digital measuring devices and solutions with the introduction of the first-generation Memosens sensors in 2004. Memosens technology stands for the digitization of measured values directly in the sensor head, contactless digital signal transmission and diagnosis and storage of all data relevant to the sensor directly in the sensor. Millions of these sensors have since been produced and have proven their utility in use.

### Memosens sensors are available for the following measuring parameters:

- pH/redox
- Conductivity, inductive and conductive
- Dissolved oxygen, amperometric and optic
- Turbidity
- Disinfection (chlorine, chlorine dioxide, bromine, ozone)
- Ultrasonic sludge level
- Ion-sensitive sensors for ammonium and nitrate
- UV sensors for nitrate and SAC

**After over 17 years, now is the time to start a new chapter – Memosens 2.0.** What underlies Memosens 2.0 is a future-oriented evolution of Memosens technology, which retains all recognized and proven advantages. In order to prepare for future challenges regarding digitalization and intelligent sensory mechanisms, more calibration and process data is now saved in the sensor. Of course, the new Memosens generation is fully backward compatible. This means that users of Memosens technology do not have to replace their existing measuring lines with new ones. New Memosens sensors work in the usual manner without loss, even with existing transmitters. This protects past investments.

The launch of Memosens 2.0 continues the success story and simultaneously takes the functionality of these sensors to a new level. Additional process data and diagnostic information from the new Memosens sensors facilitate, for example, precise predictions about the current state and future maintenance requirements in conjunction with the IIoT ecosystem Netilion.

### ✓ Your benefits

- Reliable signal transmission: No moisture or EMC problems thanks to inductive, digital signal transmission
- Intelligent reliability: An active indication is given in the event that there is no connection between the sensor and transmitter
- Field calibration no longer necessary – easy, reliable calibration in the laboratory is possible because the relevant data is stored in the sensor head
- Cross-parameter plug-and-play thanks to precalibrated sensors
- Quick commissioning and simple maintenance make measuring points profitable
- IIoT ready: Memosens 2.0 offers extended storage of calibration and process data, thereby enabling trends to be better determined and providing a future-proof basis for predictive maintenance and high-grade IIoT service.



More information available at:  
[www.endress.com/memosens](http://www.endress.com/memosens)  
[www.endress.com/liquiline](http://www.endress.com/liquiline)

# Liquiline transmitters – the right transmitter for any analysis application

Data consistency from the laboratory right through to the process

- Parameter-independent transmitters for when you are out and about, for the laboratory and for the process
- Fast, user-guided commissioning due to plug-and-play Memosens sensors
- Intuitive operation and application-specific communication options – for hazardous and non-hazardous applications
- Heartbeat Technology offers comprehensive self-diagnostics, simple device verification and information for predictive maintenance

**Application** Be it a handheld instrument, compact transmitter, sampler, analyzer or multi-channel functionality, the Liquiline heart is in every device. We have the right device for every application:

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

Whether it's the Liquiline CM44 with connection options for up to eight different sensors and relays or the Liquiline Compact CM82 Bluetooth®-compatible compact transmitter, we have the right transmitter for every measuring point. Thanks to the new Liquiline Mobile CML18 and Memobase laboratory software, connecting between the laboratory and process is easier than ever, facilitating seamless monitoring of analytical measurement technology.

## Advantages

- One language – data consistency from the laboratory to the process
- Fast commissioning and maintenance thanks to precalibrated Memosens sensors
- A single platform for up to 12 parameters: pH, redox, conductivity, oxygen and much more
- Easy handling because operation and communication are the same across all devices, be it an analyzer, sampler or fully automated pH measuring point
- Offers all advantages of digital Memosens technology, for example reliable sensor signal transmission and increased measuring point availability thanks to plug-and-play with precalibrated sensors

More information available at:  
[www.endress.com/liquiline](http://www.endress.com/liquiline)



Liquiline Mobile CML18



Liquiline Compact CM72/82



Liquiline CM42



Liquiline CM44x



## Technical data

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

# Liquiline Mobile CML18 – smart multi-parameter handheld instrument

Small, intelligent and reliable digital measurement technology for mobile use

- Reliable data monitoring on the go
- Simple and reliable thanks to plug-and-play with precalibrated sensors and digital data transmission
- Deviations between different measuring points such as process and laboratory are eliminated
- Mobile insights into the process sequence enable remedial measures to be taken if needed

**Application** Small, intelligent and reliable digital measurement technology that fits in your pocket: The new mobile and space-saving Liquiline Mobile CML18 handheld instrument records process parameters, such as pH value, redox potential, conductivity and oxygen content. Whether it's pH monitoring on site at the reactor for a limited time period, calibrating sensors in the laboratory or measuring the current oxygen content at a particular point in the aeration basin, the Liquiline Mobile CML18 handheld instrument, in conjunction with existing Memosens Technology, makes this possible very easily.

## Advantages

- Continuous data consistency between process, sample and laboratory measurement thanks to use of the same technology
- Storage of over 10,000 measured values with time and date stamps
- Calibration and adjustment of Memosens sensors from any location
- Certified reliable data transfer to mobile devices such as smartphones or tablets
- Easily monitor calibration events in the SmartBlue-app

 More information available at:  
[www.endress.com/cml18](http://www.endress.com/cml18)



## Technical data

- Device dimensions: 84 x 54 x 47 mm at 155 g
- Degree of protection: IP66
- Battery: Runtime of 30 hours with a switched-on display and suitable for inductive charging via Qi Baseline Power
- Sensor connection via Memosens coupling or M12 laboratory cable (up to 25 m cable length)
- Data logger with date/time stamp for over 10,000 measurements

# Disinfection – wide range of products from sensors to analytical solutions

Efficient analysis of chlorine dioxide, free available chlorine, total chlorine, free available bromine and ozone



In recent years, the disinfection product range has constantly been modernized and extended, where new sensory mechanisms combine state-of-the-art technology with the best measuring performance. Consequently, the new amperometric sensors can be used over a very wide measuring range and help in a variety of applications to reliably monitor disinfection.

A recently developed procedure ensures a high level of leak-tightness for the diaphragm, which virtually only allows gases such as chlorine dioxide or free available chlorine to pass through. This ensures specific selectivity for the relevant disinfectant. Furthermore, the measuring electrode and electrolyte are protected effectively from outside influences and dilution, which increases the maintenance interval to once annually.

## Applications

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

For more information, see the brochure "Liquid analysis – disinfection" (CP01383C)

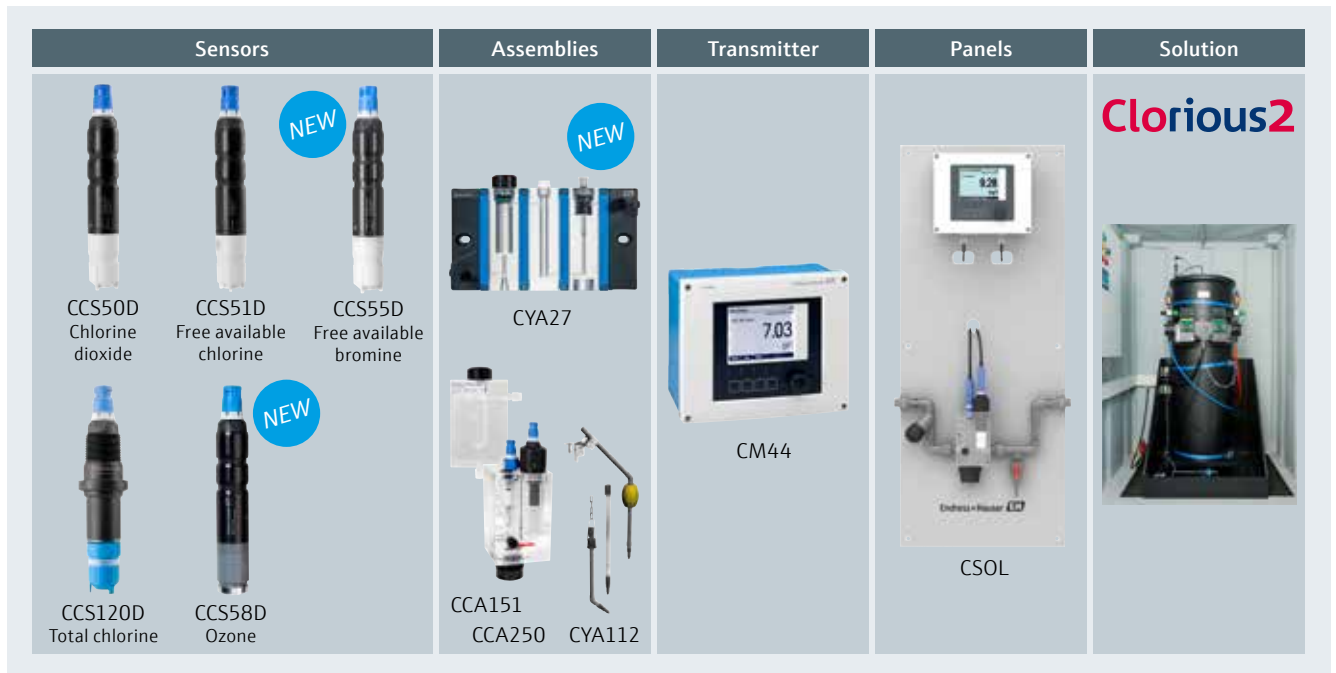
- ➔ All technical data and complete documentation, such as technical information (TI) and operating instructions (BA), as well as accessories and spare parts, can be found at:

- 🌐 [www.endress.com/ccs50d](http://www.endress.com/ccs50d)
- 🌐 [www.endress.com/ccs51d](http://www.endress.com/ccs51d)
- 🌐 [www.endress.com/ccs55d](http://www.endress.com/ccs55d)
- 🌐 [www.endress.com/ccs58d](http://www.endress.com/ccs58d)
- 🌐 [www.endress.com/ccs120d](http://www.endress.com/ccs120d)

## ✓ Your benefits

- Long maintenance intervals minimize effort and save time and costs
- Reliable monitoring to ensure chlorine-free production, which safeguards product quality and protects material thanks to a sensory mechanism that is proven not to passivate
- Plug-and-play: Easy to handle with a precalibrated sensory mechanism thanks to Memosens technology
- Fast response time with digital communication
- Predictive maintenance using Heartbeat Technology ensures consistently reliable disinfection monitoring





## From sensor to disinfection solution: Everything from a single source

A measuring point consists of far more than just the disinfection sensor. Thanks to Memosens and the Liquiline platform, a wide range of various measuring parameters can be measured concisely at one location with analysis panels that are delivered constructed.

Therefore, Endress+Hauser offers complete solutions with various assemblies: from the simple CCA151 assembly for a disinfection sensor to the CCA250 multi-parameter assembly, in which there is space for two further 120 mm sensors in addition to the disinfection sensor. The most recent addition to the assembly family is the CYA27: This assembly offers modular configuration and more than just one sensor retainer. The status illumination that can be selected, among other things, shows the user from a distance whether the measuring point is functioning properly or if there is an error. The CYA27 comes in a 5 l/h or 30 l/h version to keep water consumption as low as possible. This means, for example, that it is possible to measure free available chlorine, pH, redox, oxygen and conductivity in one single assembly at 5 l/h.

The multi-parameter panels are ideal for reliably monitoring process water, drinking water or boiler feedwater. Many different measuring points, from pH to disinfection to turbidity, are combined in one place: All of the parameter monitoring is available at a glance. This helps users gain an overview and significantly reduce maintenance requirements, since maintenance personnel know immediately where the sensors are installed.

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



[www.endress.com/cca151](http://www.endress.com/cca151)  
[www.endress.com/ccs250](http://www.endress.com/ccs250)  
[www.endress.com/cya27](http://www.endress.com/cya27)  
[www.endress.com/analytical-solutions](http://www.endress.com/analytical-solutions)  
<http://eh.digital/disinfection>

## Clorious2

The complete solution Clorious2 provides the perfect solution for reliable disinfection of drinking water, coolant and process water. Ultrapure chlorine dioxide (available in a drum or can be efficiently produced fresh on site) can be dosed as required. This provides optimum availability and safety, and ensures perfect microbial conditions.

For more information, see the brochure "Clorious2" (CP01063Z) and go to [www.de.endress.com/clorious2](http://www.de.endress.com/clorious2)



### Your benefits

- Reduced installation effort without time-consuming commissioning – turnkey solutions ready for use immediately thanks to plug-and-play
- Simple, cost-saving and space-saving – multi-parameter assembly with modular configuration at a consumption of just 5 l/h provides maximum information with minimum consumption
- Individually adaptable and everything from a single source – the Clorious2 offers a complete disinfection solution with generator/drum, measurement technology and dosing

# Memosens Wave CAS80E – in-line spectrometer for measurement of a variety of water quality parameters

Reliable measuring and efficient process monitoring

- Parameters: SAC, TOCeq, CODEq, BODEq, turbidity (TU/TSS), nitrate (NO<sub>3</sub>-N), APHA Hazen color
- Wavelength range from 200 to 800 nm
- Preconfigured application models for a variety of water/wastewater applications

**Application** Memosens Wave CAS80E is a spectrometer that permits a variety of water quality parameters to be determined in parallel in the UV and Vis range. The wavelength range from 200 to 800 nm covers the entire relevant analysis range for applications in water/wastewater. The sensor is therefore already optimally adapted to a variety of process conditions. The new, low-maintenance technology results in excellent stability and availability.

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

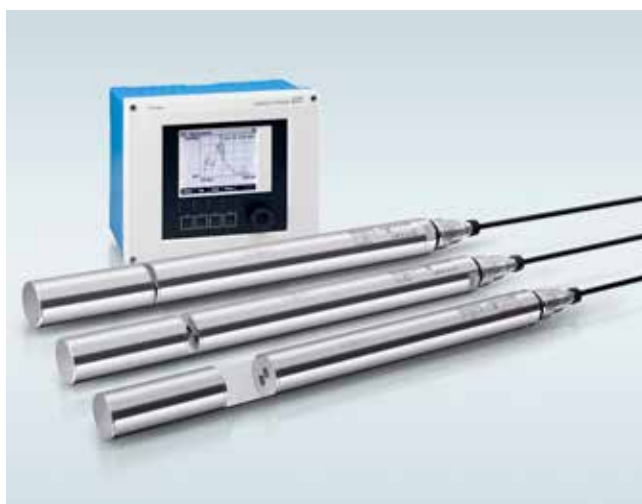
- Drinking water
- Wastewater
- Surface water

## Advantages

- Direct commissioning (plug-and-play) is possible thanks to standardized Memosens communication
- Titanium housing and sapphire glass for demanding applications
- The Liquiline transmitter makes it possible to combine the CAS80E spectrometer with other parameters for liquid analysis



More information available at:  
[www.endress.com/cas80e](http://www.endress.com/cas80e)



## Technical data

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

# Liquitrend QMW43 – coating detection

Detecting thickness and type of coatings in piping and tanks

- Continuous coating detection in piping or tanks
- For conductive and non-conductive media
- Specially for hygiene applications

**Application** Liquitrend QMW43 offers completely new options in all areas where product deposits must be prevented. In this respect, the QMW43 detects the thickness and type of coating at critical points when pipes and tanks are full or empty. Liquitrend QMW43 is suitable for optimizing CIP (cleaning in place) cleaning cycles and increasing product reliability and plant availability.

## Advantages

- Continuous coating and conductivity measurement inside tanks or piping
- Detection of deposits in the process, thereby preventing one product from carrying over into another
- Cost savings due to targeted CIP cleaning and saving of resources, such as water and cleaning agents
- Increased plant availability due to needs-based and optimized cleaning
- International certificates and approvals



More information available at:  
[www.endress.com/Liquitrend-QMW43](http://www.endress.com/Liquitrend-QMW43)

## **i** Technical data

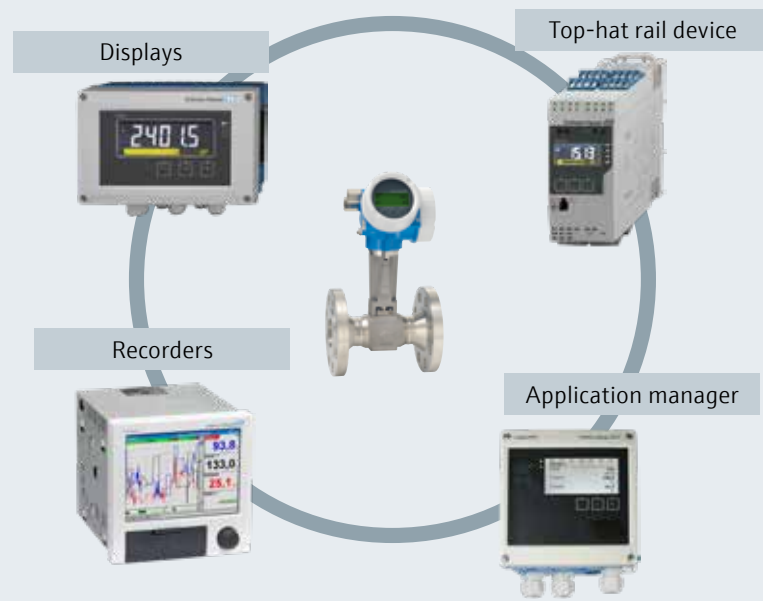
- Process temperature range: -20 °C to +100 °C
- Process pressure: -1 bar to +25 bar
- Coating thickness: 0 mm to 10 mm
- Conductivity: 0 µS/cm to 100 mS/cm

# System components

Feeding, separating, indicating, registering



## Everything you need for the complete measuring point



Endress+Hauser system components increase plant availability through integrated diagnostic functions. They 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 reliably. 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 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

Plant operators not only reduce costs in practice but also at the time of purchase because they 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](http://www.endress.com/systemcomponents)





## Solutions for completing the 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 area applications, for fieldbuses or for 4 to 20 mA loops, we have something for everyone.

**Data recording** The perfect solution for reliable 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, plant operators always have the right solution, from single-channel to multi-channel measurement.

**Analysis on the top-hat rail** Our top-hat rail devices offer a compact design with a wide range of functionalities. These devices are particularly suitable for SIL2 applications.

### Feeding, separating, indicating, registering



RIA15 display



Memograph M data manager



RMC621 energy computer



RN221N top-hat rail device



#### Your benefits

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

# RNx2x top-hat rail interfaces – system components for flexible use

Systems with a central power supply and ATEX approval

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

**The RN22 signal barrier** offers a variety of different applications. Since its signal input can be connected passively as well as actively, it can be used both as an active barrier and passive barrier. The device is available in a single-channel or two-channel version. In the two-channel version, the device can also be used as a signal doubler.

The RN22 signal barrier can be used very flexibly, meaning the output can be connected to passive as well as active PLC inputs. The device detects the type of output and behaves accordingly. HART signals are also transmitted by the RN22. Users can have access via two lugs at the analog input without interrupting the HART signal. RN22 can be used in SIL applications up to SIL2 SC3.

**The RLN22 NAMUR isolating switch repeater** reliably transmits digital statuses from the hazardous area to the non-hazardous area. It is suitable for SIL applications up to SIL2 SC3. Its compact design accommodates two channels on an overall width of 12.5 mm. The device function is easily configurable via DIP switches, with LEDs showing the switching statuses.

**With the RNO22 output isolating amplifier**, valves or displays can be controlled. The device is also suitable for use in hazardous areas. The signal is detected via the passive input and conveyed to the valve or display actively, even with the option of intrinsically safe transmission. Its compact design accommodates one or two channels on 12.5 mm.

**The RNF22 infeed and alarm module** supplies power to the top-hat rail system. It monitors the power, can switch between redundant power supplies and issues an alarm in the event of a fault.



**The RNB22 power supply** can supply power to the system if there is a 24 V DC source in the control cabinet. An RNB22 can supply power for up to 40 modules. A redundant power supply can be set up with two devices.



### Advantages

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



More information available at:

[www.endress.com/rn22](http://www.endress.com/rn22)  
[www.endress.com/rln22](http://www.endress.com/rln22)  
[www.endress.com/rno22](http://www.endress.com/rno22)  
[www.endress.com/rnf22](http://www.endress.com/rnf22)  
[www.endress.com/rnb22](http://www.endress.com/rnb22)



### Technical data

- Power supply: 24 V DC
- Overall width: 12.5 mm to 18.5 mm
- Functions: Active barrier, passive barrier, signal doubler, NAMUR isolating switch repeater, output isolating amplifier
- Transmitter supply voltage:  $\geq 16.5$  V at 20 mA (RN22)
- Ambient temperature:  $-40$  °C to  $+60$  °C
- Degree of protection: IP20

# RN42 and RLN42 interfaces – components for signal processing

Interface devices with wide-range power unit and ATEX approval for individual applications

- Universally usable thanks to wide-range power unit
- Two-channel version saves space and money
- Safe to use for hazardous area applications and applications up to SIL2 SC3

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

**The RLN42 NAMUR isolating switch repeater** reliably transmits digital statuses from the hazardous area to the non-hazardous area. It is suitable for SIL applications up to SIL2 SC3. Its compact design accommodates two channels on a width of 12.5 mm. The function is easily configurable via DIP switches, with LEDs showing the switching statuses.





### Advantages

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



More information available at:  
[www.endress.com/rn42](http://www.endress.com/rn42)  
[www.endress.com/rln42](http://www.endress.com/rln42)

### Technical data

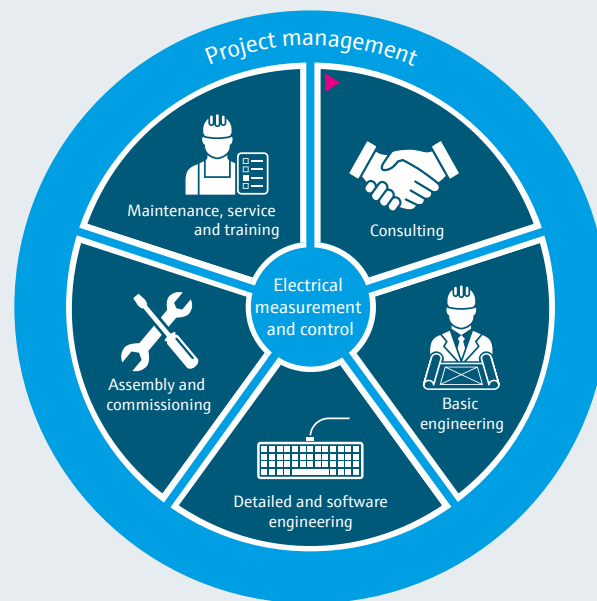
- Wide-range power unit 20–253 V AC/DC
- Transmitter power  $\leq 16.7$  V at 20 mA (RN42)
- Ambient temperature  $-40$  °C to  $+60$  °C
- Can be installed in hazardous zone 2

# 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 overflow protection 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, see the brochure "Automation? For sure!" (CP00050S)

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



## Automation services

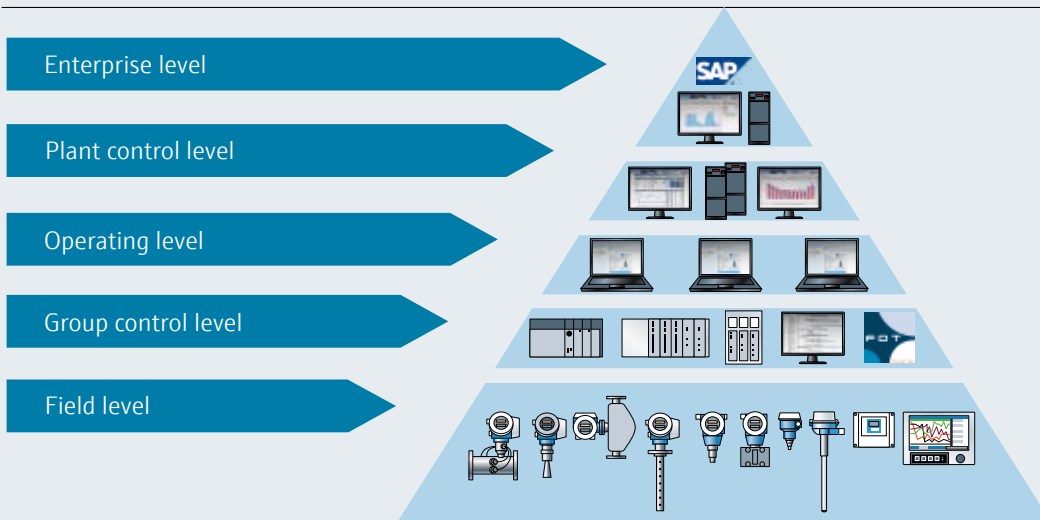
**Everything from a single source, from the field level to the business level** Normally, to implement your automation project, you will require both instrumentation and electrical components such as motors, frequency converters, control cabinets, controllers and many others.

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 ControlLogix/CompactLogix/MicroLogix, PlantPax
- Rockwell FactoryTalk View, RSView
- WAGO
- Videc atvise, Acron
- Wonderware Intouch
- ePlan P8

### Engineering across the entire automation pyramid



# Analytical solutions – complete turnkey solutions for analytical measuring tasks

Single- or multi-parameter panels as tailored solutions with a high level of standardization

- The complete solution from one supplier
- Tailored solutions for what is needed
- A full portfolio of state-of-the-art technology

Depending on the measuring task, we develop customized analytical solutions such as monitoring panels, cabinets and stations or control loops for wastewater treatment plants. Together with our partners apf and Brenntag, we are offering the first continuous chlorine dioxide generator that works according to the chlorite peroxodisulfate method for the reliable disinfection of water circuits. With all our analytical solutions, we support plant planners and operators from the conceptual development process through to implementation and commissioning. What's more, with our global support network, Endress+Hauser is a reliable partner throughout the whole life cycle of the solutions.

## Applications

Analytical solutions – analytical panels:

- Single-parameter or multi-parameter panels as a tailor-made solution with standardized process connections, measurement technology and communication interfaces
- Modular, scalable and easy to retrofit
- High plant availability, simple calibration and user-friendly maintenance thanks to Memosens technology

"Clorious2" chlorine dioxide generator – the perfect solution for the reliable disinfection of drinking water, coolant and process water:

- **Complete solution** for the generation of a chlorine dioxide solution with long-term stability as required. No degradation process after one to two days as occurs with commercially available chlorine dioxide
- **Needs-based production on site:** Minimum costs with maximum availability, no logistics problems
- **Improved workplace safety:** No need to mix the reactants by hand
- **Configurable concentration and dosing of the chlorine dioxide solution:** Appropriate concentrations available for every application



Analytical panels ensure high process quality and safety



"Clorious2" chlorine dioxide generator for the safe and reliable disinfection of drinking water, coolant and process water



More information available at:

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



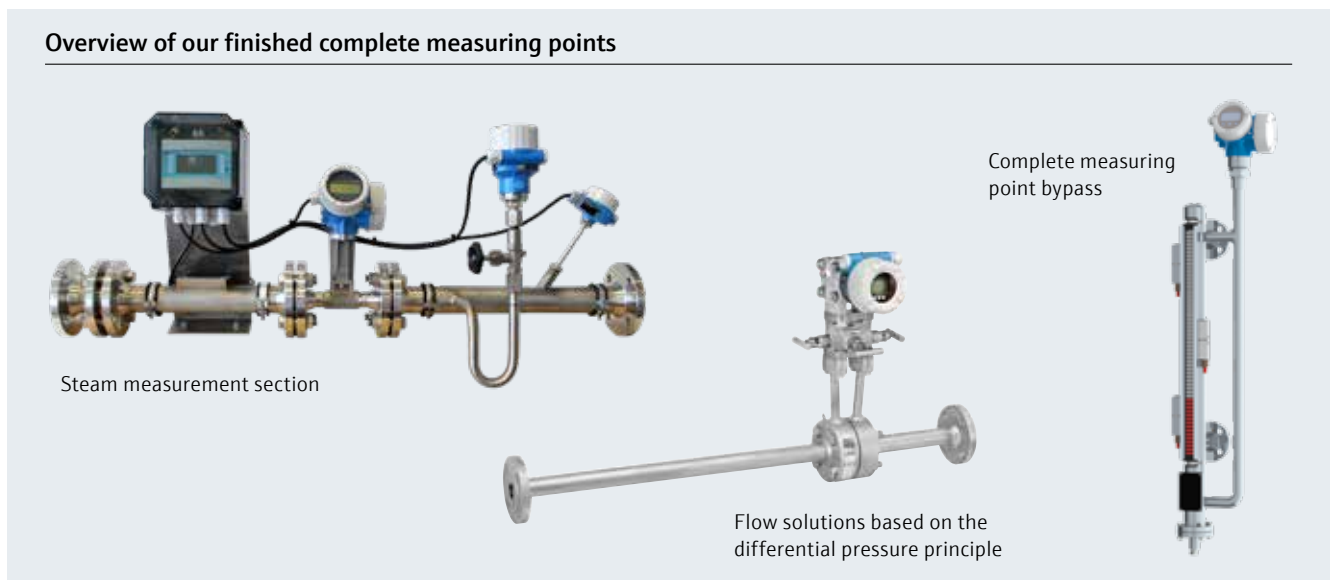
# Complete mechanical solutions – ready-to-install system units

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, they are delivered to different locations and cannot be found by the technicians or delivery is delayed. To prevent these problems from occurring and to ensure that the project is not delayed, we take charge of

engineering, ex-works pre-assembly, delivery coordination, on-site installation, construction site management, commissioning and the entire documentation. That is why many of our customers already rely on the experience of our employees to ensure that complex projects for the mechanical integration of measuring devices are implemented successfully, and with good reason: As a strong partner to industry, Endress+Hauser has a great deal of practical expertise in all sectors.

## Overview of our finished complete measuring points



### Our range of products and services

- **On-site consultation** In an initial discussion, we will explain the measuring options available and identify the requirements for the 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 regulations
- **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

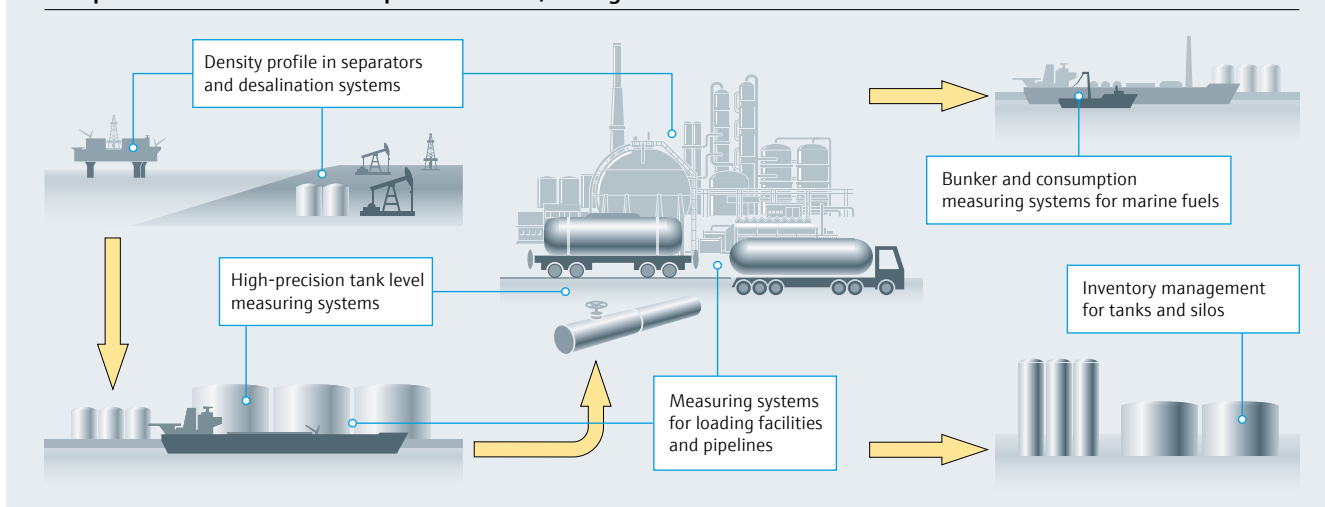
- Standardization of interfaces
- Concentrate on what matters most – we'll take care of the rest
- Delivery of pre-assembled and tested complete measuring points
- On-site assembly of the items supplied, including commissioning and documentation
- Safety: Coordinated components ensure optimal commissioning and a reliable process in the long term

# Transfer, storage and marine solutions – highly precise measurements across supply chains

Monitoring of individual tanks or complete fuel depots, as well as for measuring points relevant for invoicing

- Process optimization with continuous monitoring of inventories
- Industry-leading measurement accuracy in loading facilities – including custody transfer
- Tank gauging and consumption measurements in the shipping sector – fuel consumption and bunkering solutions

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



High-precision measuring systems and sensors are needed wherever the storage and acceptance of raw materials in the process industry must be monitored and controlled. Endress+Hauser provides customized solutions characterized by minimum maintenance and extraordinary operational safety. The measuring systems offered also meet the requirements of European legislation which must be complied with for custody transfer. In addition to the sensory mechanisms, Endress+Hauser offers complete packaged solutions comprising all the necessary components such as dosing control, pipework and inventory management software. Thanks to our many years of experience and extensive industry expertise, Endress+Hauser solutions for transfer, storage and marine applications enable significant optimization of complex processes.

### Application

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

More information available at:  
[www.endress.com/fms](http://www.endress.com/fms)  
[www.endress.com/ims](http://www.endress.com/ims)



Loading facility with Promass F

### ✓ Your benefits

- 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
- Optimum interoperability of the individual components

# Automation solutions – We measure. We automate.

Individual solutions over the entire plant life cycle

- A single partner for the entire life cycle of your plant
- Years of engineering expertise
- Extensive expertise in measuring device integration

**Application** Measurement technology, control systems and servicing: Endress+Hauser implements complete automation solutions over the entire plant life cycle. We offer comprehensive consulting, sophisticated engineering and vendor-neutral integration. We put plants into operation, take care of calibration and maintenance, and train employees. Plant operators can find out how to optimize their interfaces and reduce time, costs and risk in their automation project.

- Measurement technology, control systems and service: Innovative complete solutions from a single source
- Design of the entire automation hardware and interfaces
- Connection of components at the field and controller level
- End-to-end data transfer from the controller to the ERP system, e.g. SAP
- A strong partner with years of engineering expertise for the entire life cycle of your plant



## ✓ Our system expertise:

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

# Your expert service partner

Services for optimization of process plants and reliable operation



## For optimization of process plants and safe operation

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 maintenance tools and new, attractive services and features to optimize your process plants.

Our processes and tools are certified in accordance with OHSAS 18001 and ISO 9001.

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

- 24-hour, worldwide availability by telephone
- Short reaction times and direct access to product and application specialists for all technical questions
- 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? 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
- DAKK5-accredited calibration service in accordance with 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 employees
- Designing, planning, commissioning and recurrent testing of measurements as per the WHG (German Water Resources Act)
- Calculated SIL and intrinsic safety documentation as well as commissioning and recurrent testing of SIL safety equipment



**Optimization services – for continuous process improvement** We offer effective methods and services for optimizing business processes – from consultation through to managing maintenance work on the 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 data integration into user systems
- Metrology consultation
- Optimization of calibration intervals
- MPE (maximum permissible error) and criticality evaluation

Endress+Hauser offers users the best service package for operation and maintenance in the field of process automation. These services reduce the time and/or costs spent on maintenance so that you can fully concentrate on your core competencies in production.

➔ For more information, see the brochures:  
 "Services success factor" (CP01112H)  
 "Unparalleled calibration expertise" (CP01102H)

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

#### ✓ Your benefits

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

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

Create visibility with calibrations, optimize calibration methods and determine calibration intervals based on risk

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

We support maintenance and service personnel in carrying out calibration with optimized calibration methods, such as time-saving in-line concepts, when determining risk-based calibration intervals or discovering potential for calibration process optimization. Consequently, calibration concepts increase plant availability while also ensuring compliance and audit security. We take into account the individual requirements of our customers here.

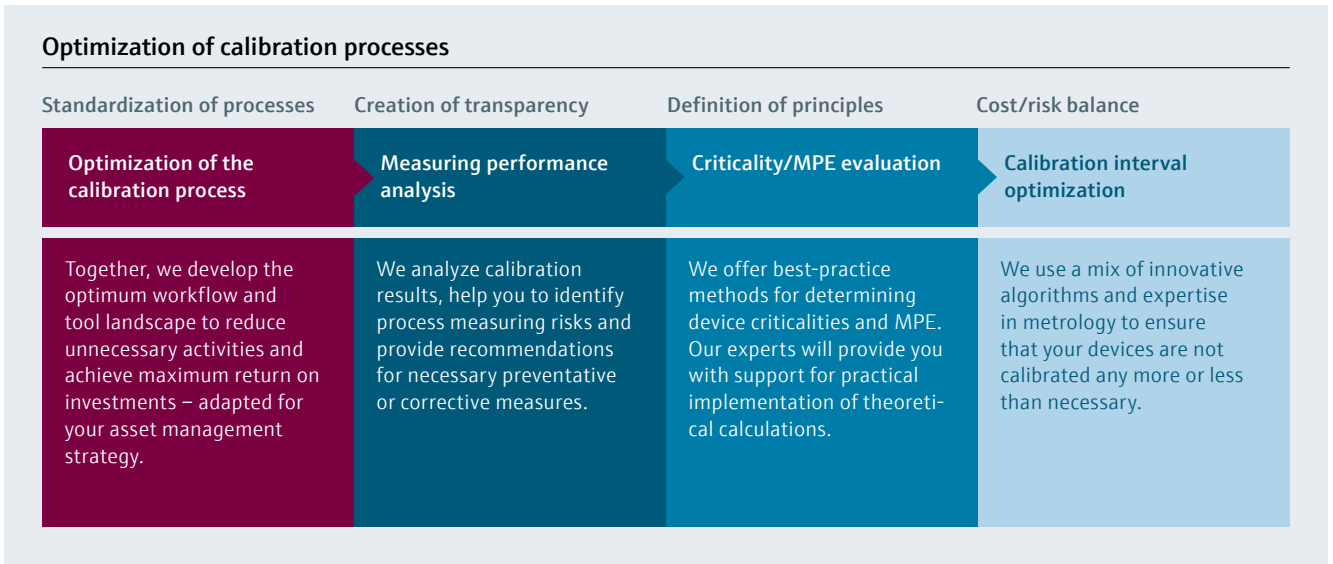
**Measuring performance analysis: Have confidence in your calibration results** Thanks to the measuring performance analysis carried out by one of our calibration consultants, users receive a transparent management overview of all calibration activities. The service includes a detailed analysis of the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

#### Advantages

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

**Criticality/MPE evaluation** Criticality and maximum permissible errors (MPE) form the foundation of high-grade and cost-effective calibration. Our product range enables users to create the necessary foundations in order to put into practice initial potential improvements, such as reducing "out of tolerance" calibrations. Furthermore, using our ISO 31010-compliant documented methods, our project managers will be in a position to justify decisions to auditors. Moreover, it is possible to use additional optimization services, such as optimization of calibration intervals.





**Advantages**

- Ideal cost/risk balance thanks to correctly determined criticality and MPE
- Risk reduction thanks to prevention of non-conformities
- Reduction of "out of tolerance" calibrations as a consequence of unrealistically low MPE

**Calibration interval optimization** We support users to determine the correct time frame in which calibration should be carried out. Plant operators no longer have to rely on random time frames (annually) or rough guides to determine the best calibration intervals. We use proven scientific models. These models take into account historic data from previous calibration results to make predictions about future behavior. We discuss intervals that change considerably with the project manager and validate all assumptions based on them. This is how important decisions are made about the interval to be used. Depending on operational conditions, such as planned plant shutdowns, intervals are then adjusted to create an optimized schedule

for carrying out calibration. Ultimately, users and plant operators benefit from an optimal balance between cost and risk.

**Advantages**

- Reduction of calibration costs when increasing intervals
- Minimization of "out of tolerance" risks when reducing intervals
- Analysis and measurement recommendations from an experienced calibration consultant



More information available at: <http://eh.digital/calibration-interval-optimization>



# Accredited calibration service in accordance with ISO/IEC 17025

Unparalleled calibration service guarantees the highest degree of accuracy for 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 a wide range of on-site inspection concepts to check measuring devices. Users decide how and to what extent they would like us to ease their 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 ISO/IEC 17025
- The best production calibration rig for flow in the world, with minimum 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 the 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, ISO 9001, HACCP, IFS Food, 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)

 For more information and documentation, go to: [www.endress.com/en/instrumentation-services/calibration-services](http://www.endress.com/en/instrumentation-services/calibration-services)





# EU Commission Regulation 601/2012 services – inspections and uncertainty calculations for CO<sub>2</sub>-relevant measuring points

Correct monitoring and reporting for approval of the German Emissions Trading Authority monitoring plans in accordance with EU Commission Regulation 601/2012

- Creation of an inspection and calibration plan, as well as training in an individual workshop
- Quality assurance for measuring devices thanks to calibration and verification in accordance with ISO/IEC 17025
- Compilation of uncertainty analyses which fulfill all requirements

In order to implement the European CO<sub>2</sub> emissions trading system, the German Emissions Trading Authority (DEHSt) inspects the evidence of uncertainty for CO<sub>2</sub>-relevant substance quantities within the scope of the approval of monitoring plans. Endress+Hauser can support users in correct monitoring and reporting.

**Consultation and workshops** Implementation of monitoring and reporting in accordance with the German Emissions Trading Authority (DEHSt) requires correct comprehension of the legal requirements and operator obligations. The required quality assurance for measuring devices requires a monitoring and calibration plan to be drawn up. Compiling evidence of uncertainty requires a solid understanding of metrological principles to calculate measuring uncertainty. We provide training on these topics and discuss them in an individual workshop with a strong emphasis on practical application.

**Quality assurance of measuring devices** We calibrate and adjust all measuring devices that undergo regular quality assurance as part of the operator's obligations as needed, if possible directly on site in the plant or alternatively in one of our calibration laboratories. For devices whose operational or installation position means that calibration is not possible, a comparison measurement or in-situ inspection using verification can be used as an alternative to increasing calibration intervals. Our ISO/IEC 17025 accreditation documents technical expertise and additionally facilitates calculation of measuring uncertainties.

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

## Advantages

- Safety thanks to technical expertise in measurement technology and metrology, creation of inspection and calibration plans, regarding legal requirements
- Quality assurance thanks to accredited on-site calibration in accordance with ISO/IEC 17025 for almost all current process parameters
- Many years of practical experience in inspecting energy and CO<sub>2</sub>-relevant measuring points
- Consideration of practice-relevant measuring uncertainty contributions when calculating measuring uncertainties and compiling evidence of uncertainty



More information available at:  
[www.endress.com/en/instrumentation-services/calibration-services](http://www.endress.com/en/instrumentation-services/calibration-services)

# Remote service – assistance from a distance

Visual assistance in commissioning and for technical support

- Access to specialist expertise for commissioning from product and application specialists with visual assistance via apps
- Device commissioning for optimal measuring performance in accordance with the specific requirements incl. documentation
- Use of visual assistance in support cases with TechSupport

**Smart Start-Up – so the process runs smoothly from the start** Smart Start-Up for visual assistance during commissioning offers users the opportunity to access specialist expertise quickly and easily when they want it. Audio-visual remote support through the SightCall Visual Support app means that plant operators can ensure optimal operation of their measuring devices and reduce process interruptions during commissioning. By talking to the technician, users can also become familiar with the new measuring devices and ask individual questions about the device in the application. In future, use of the app for technical support will also be possible in the form of service agreements. Since the expertise of Endress+Hauser technicians is available via visual support without needing to travel, users benefit from support at short notice, meaning commissioning and technical support issues are solved more quickly and efficiently.

## Advantages

- Cost-effective and time-efficient use of expertise and resources
- Increase in plant availability owing to short lead and commissioning times
- Increase in device expertise thanks to expert support when commissioning
- Device problems can be more efficiently solved with "eyes on the ground", meaning plant shutdowns can be prevented
- Faster on-site assistance via the visual support app, with less effort required for the organization and significant time savings



More information available at:  
[www.endress.com/services](http://www.endress.com/services)



# Services for plant safety – increase safety, optimize plants

WHG, SIL, hazardous areas: Fully comply with safety requirements to protect people, the environment and plants

- More safety thanks to specially trained technicians
- Superior testing quality and faster plant availability
- High-quality service documentation

Together with quality and efficiency, plant safety is one of the most important business objectives in the process industry. In light of stricter legal requirements and increasing plant complexity, having a partner with experience in the field of safety is indispensable.

We offer services that help users fully comply with even the most stringent safety requirements. These services are provided by our trained and certified service engineers and backed by our decades of experience in safety. In accordance with the WHG (German Water Resources Act), **overflow protection is mandatory on containers for water-polluting liquids**. This overflow protection monitors the level and issues an alarm well before the maximum permitted level is reached. We provide consulting, data acquisition, design, commissioning and recurrent tests according to the requirements of the WHG (German Water Resources Act).

For **SIL**, we offer calculated SIL documentation, commissioning according to SIL, and the inspection of safety equipment. This is a verification service provided directly on site to discover dangerous undetected errors in a safety-instrumented system to guarantee more safety in the plant.

When it comes to **explosion protection**, users can rely on us for calculated documentation of intrinsic safety,

suggestions for optimization, advice when selecting and designing components for safety circuits, commissioning and acceptance.

## Advantages

- Years of experience: Specialists certified according to the WHG (German Water Resources Act) for over 20 years
- Endress+Hauser service technicians are certified according to the WHG (German Water Resources Act) every two years by the TÜV
- Comprehensive SIL expertise (measurement technology and services)
- Detailed documentation of tasks and tests



# Projects platform – now online at endress.com

Easy project management: All engineering applications on one platform

- Easy project management
- All engineering tools on one platform
- Increasing efficiency: Data only has to be entered once

**Application** Endress+Hauser projects bring together all applications required on one platform and enable easy implementation of engineering projects. This leads to an increase in efficiency and reduction in duplicate work, since data only has to be entered once.

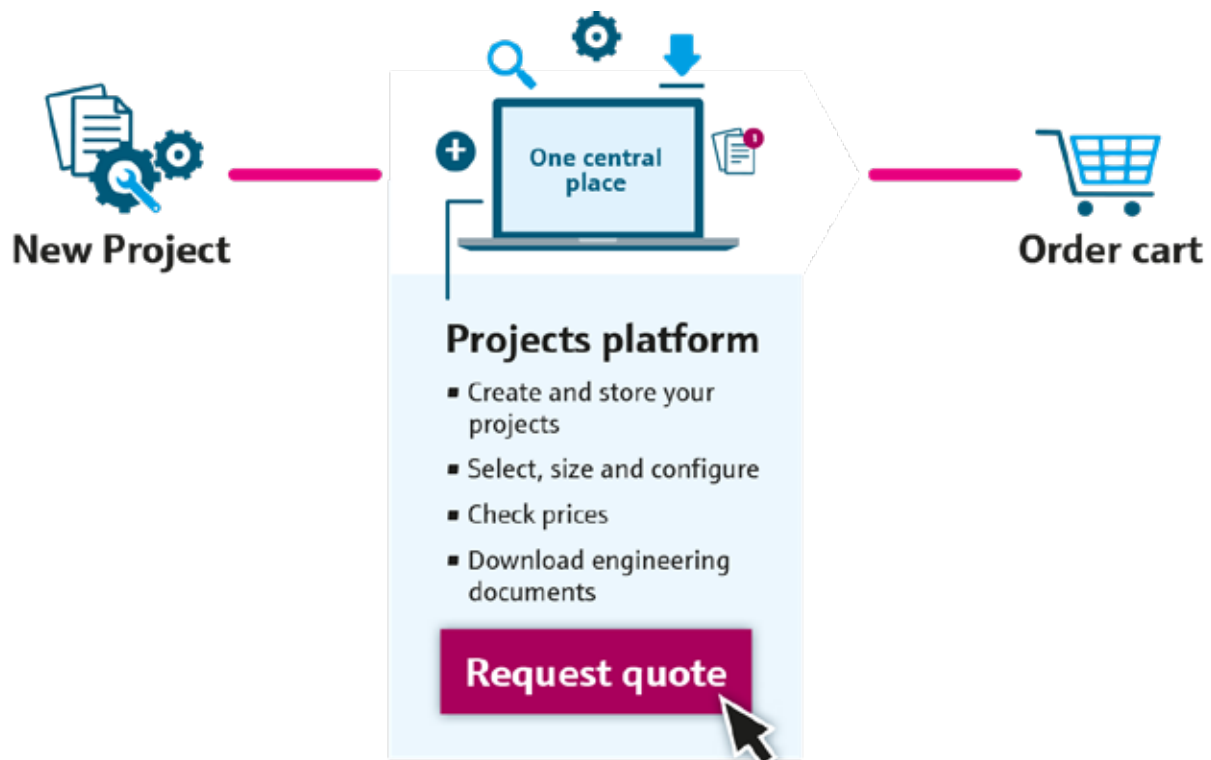
### Advantages

- Simple selection, design and configuration of products
- Easy to download all the engineering documentation in one go
- Quick overview of costs, displaying individual prices

### Options

- Create projects easily
- Easily add material
- Design and configure products
- Easily create engineering documents
- Labels and filters depending on the material

More information available at:  
[www.endress.com/projects](http://www.endress.com/projects)



# Applicator – sector-oriented application solutions

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

- Determination of the most suitable product and measuring principle for individual measuring tasks in each sector
- Support when dimensioning measuring points for future purchases
- Display, compare and download product details and device features

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

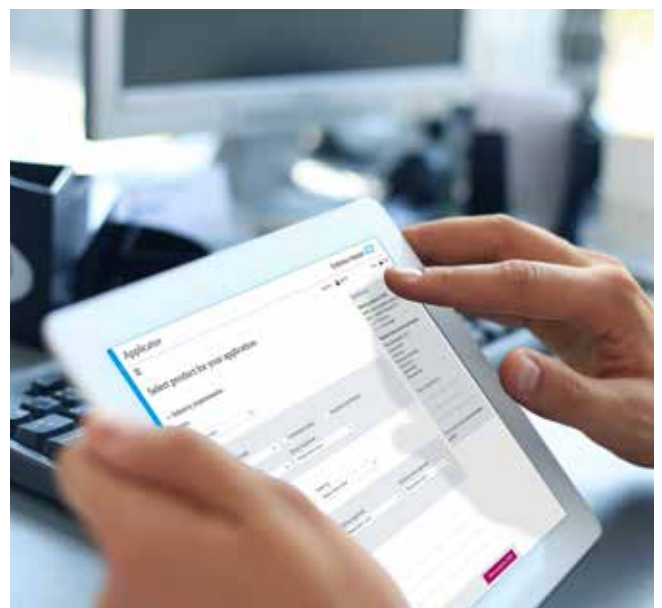
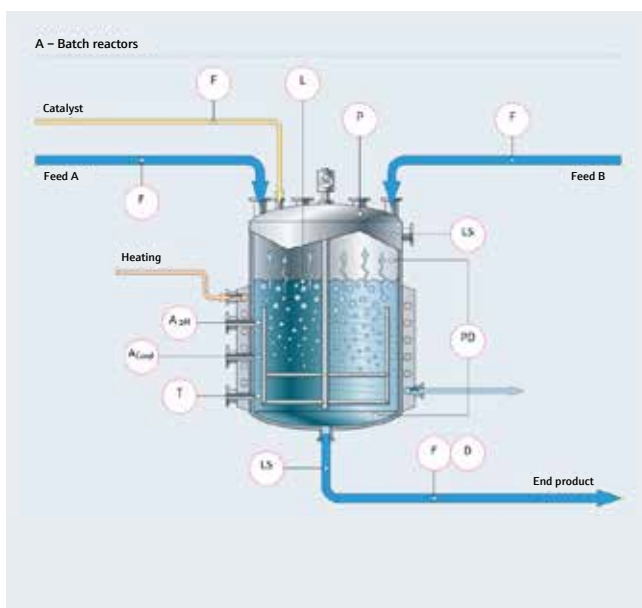
## Advantages

- Reliable recommendation of suitable devices for individual measuring tasks
- Access to the Endress+Hauser product database and up-to-date product information
- Compare products using individual process parameters, meaning a variety of requirements for various sectors are taken into account.
- Flexible planning and work processes
- Easy data transmission and purchase/procurement and operation

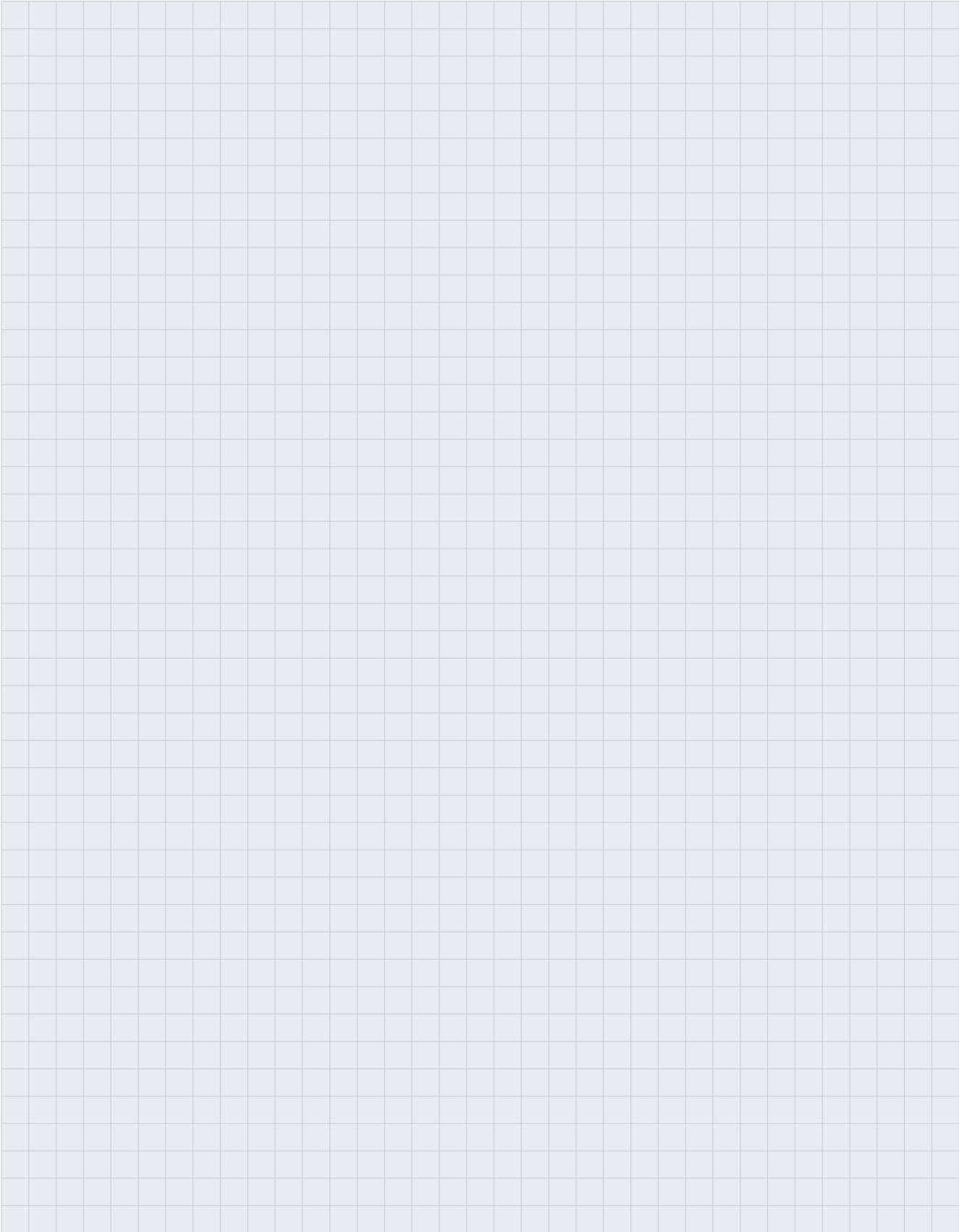
## Options

- Select products according to sector application
- Example solutions for key processes
- Branch out into engineering tools for optimal design
- Complete product selection in the configurator

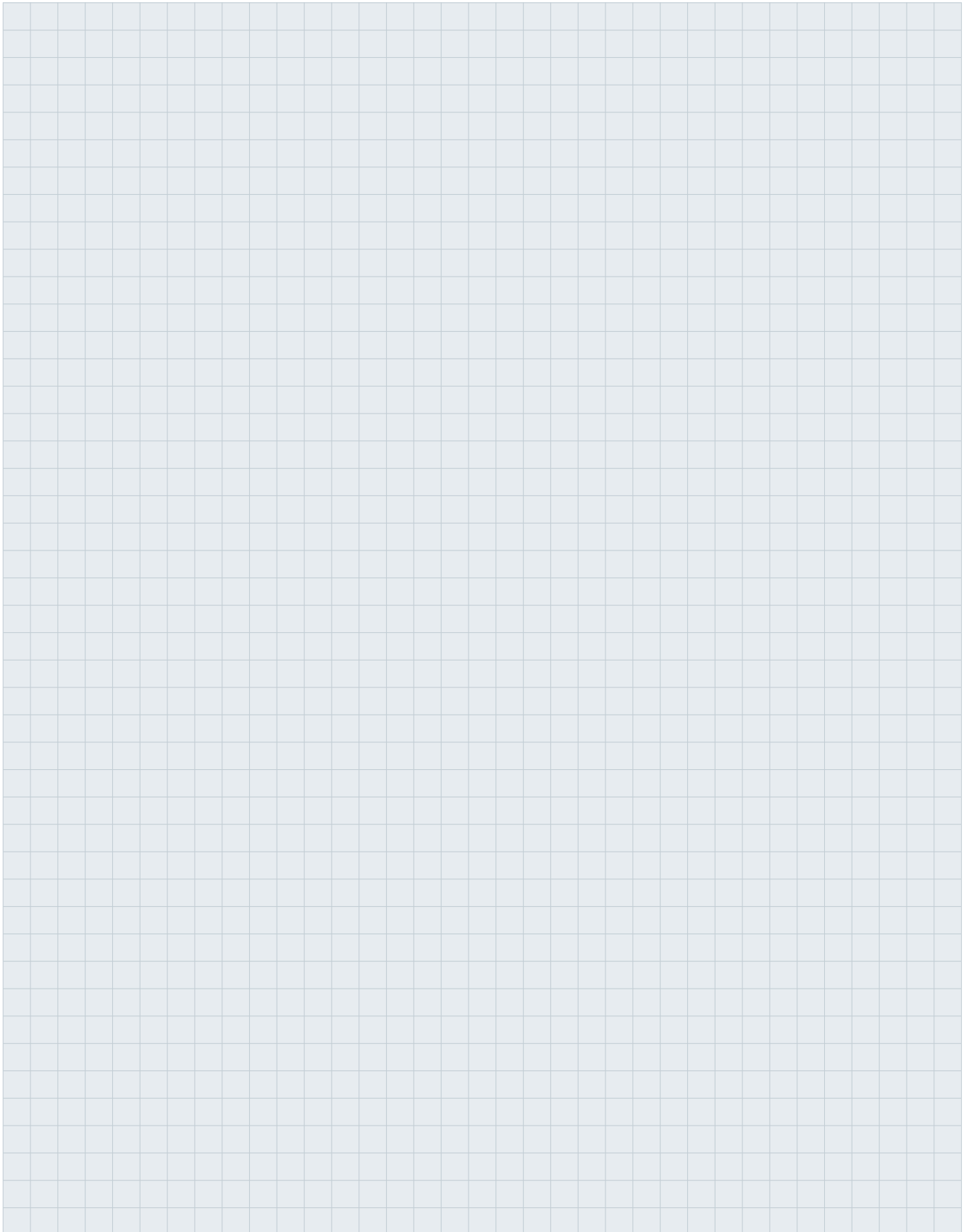
More information available at:  
[www.endress.com/applicator](http://www.endress.com/applicator)



# Notes



# Notes



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

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