

Metrological components in water and wastewater applications

Indicate – Record – Control



Contents

- 3 Water is our life
- 5 Clean drinking water is one of life's essentials
- 9 Wastewater treatment safely mastered
- 16 Measuring points relevant to the WHG (German Water Resources Act)
- 17 A contribution to ensuring plant availability
- 22 Energy optimization for your wastewater treatment plant
- 24 Overview of data managers
- 25 Overview of interface devices
- 26 Overview of process indicators
- 28 Energy and application managers
- 30 Multifunctional electrical energy meters
- 31 Overview of overvoltage protection



Water is our life


Water is a vital resource, and one that we need to manage carefully. Major trends such as climate change, water scarcity and industrialization encourage investments and technological development. It is likely that new requirements in terms of parameters and technologies will be driven by trends emerging specifically in this sector. Rising demand for standalone measuring points in networks, unmanned system parts, or even new technologies such as trace substance elimination and phosphorus recovery, are just some examples.

Rely on a partner that offers the best measuring devices and solutions, assists you with technical support on-site and has an accurate knowledge of the requirements in the water and wastewater industry.


Endress+Hauser's comprehensive product range for the industrial and municipal water supply and wastewater disposal sector covers all relevant measuring tasks in this sector. The strength of the range is also demonstrated in the availability of various technologies for a single measuring task. For example, Endress+Hauser's product range features seven technologies just for level measurement. This gives us unrivaled flexibility in advising our customers on the solution for a specific application.

**The reliable calculation:
Component + measuring device = metrological solution**

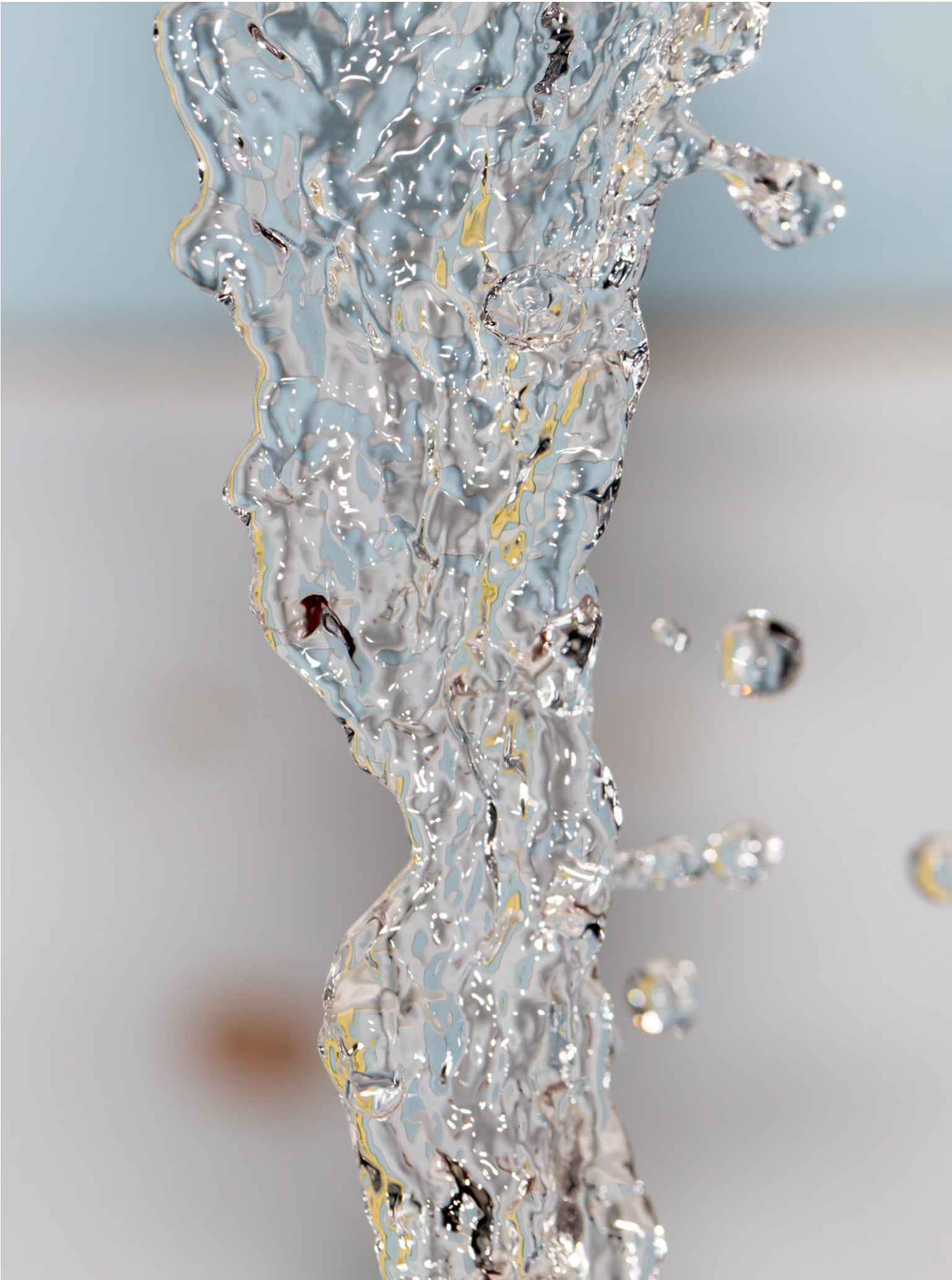
This flexibility is further complemented by a wide range of our own components, such as active barriers, overvoltage protection, indicators or data managers, which are connected intelligently with a measuring device to produce a solution very quickly. These components thereby enable technologically consistent completion of measuring points and offer – as demonstrated by the surge arresters, for example – increased plant safety.

 **Water is our life** Endress+Hauser is a partner you can depend on to optimize your water processes

- Our modern portfolio of measuring devices makes it possible to find the best solutions for your applications.
- We support our customers with a wide range of services; for instance, we help them to optimize their maintenance costs or train their maintenance staff.
- We offer turnkey solutions; for example, we can supply fully equipped measuring containers or optimize aeration in the biological treatment stage with a control system.
- We have a strong network of industry experts in our sales companies. This means that we offer a great deal of on-site expertise around the world, in both sales and service, and can support our customers from selection and design of the measuring device, as well as installation and commissioning, through to operation and maintenance.

 See the "Water is our life" brochure
www.endress.com





Clean drinking water is one of life's essentials

Reliable access to clean drinking water is still one of the world's greatest challenges. Each individual step of the process has its own influence on the product safety of the drinking water, as well as the cost efficiency of the entire process. This means that even peripheral system parts such as wells, raw water supply pipes or even high-level tanks and distribution networks are increasingly coming into focus. The desire for improved monitoring and redundant, locally organized data storage, as well as remote alarm signaling, are typical tasks for which the combination of measuring devices with components can present a smart metrological solution for plant operators.

Example

Well monitoring with pump control

Technical solution:

Hydrostatic level measurement with Waterpilot FMX21 and RIA452 process indicator

For well monitoring, hydrostatic level measurement is required. The pumps are activated depending on level and raw water requirements.

Monitoring of well fields with Ecograph T

The Ecograph T RSG35 is a modern data manager that can record multiple items of data and can also be used flexibly for visualization, reporting and alarm signaling. The Ecograph T RSG35 is therefore particularly well suited to smaller water works as an alternative to full integration of peripheral well fields into the control system.

✓ **The RIA452 is a smart indicator** with its own functionalities that go beyond simply displaying measured values on-site:

- Measured value display with arbitrary scaling; inverted scaling also possible, e.g. for displaying the distance from the water level to the well head
- Measuring device power supply
- Control of up to eight pumps with the possible integration of individual pumps in an alternating pump control system



Pump control with RIA452

When using the pump control function on the RIA452, an assignment of the limit value (level) to a specific relay is canceled. When a limit value is reached, the RIA452 switches the relay with the shortest switch time. If several limit values are set, the same procedure applies. If a value falls below the limit value, the relay with the longest operating time is switched off. This process makes it possible to achieve a uniform operating time and to utilize the full capacity of pumps with advantages in terms of maintenance planning and costs.

✓ **Universal Data Manager Ecograph T RSG35**

Besides tamper-proof recording of all relevant well data (various measured values, pump values), the Ecograph T RSG35 carries out additional functions such as

- Measuring and storing further data such as total quantities of water processed per day, month or year
- E-mail report about faults sent to the employee responsible and additional documentation of the faults
- Attractive visualization of the data on-site
- It is possible to transmit data to the control room via GPRS

The Field Data Manager software supports with further visualization, analysis and storage in the control room, where a reporting tool makes it easier to create pre-configured reports.



Example**Monitoring of high-level tanks****Technical solution:**

Compact, non-contact level measurement with separate display: Ultrasonic Prosonic M or FMR20 radar, coupled with RIA15 indicator and RN221N active barrier

In drinking water distribution, high-level tanks or other reservoirs must be fitted with level measurement systems to guarantee the required quantity distribution and stock. The most compact measuring sensors possible are often sufficient. Endress+Hauser offers various metrological solutions for level measurement (e.g. ultrasonic, radar or hydrostatic).

In addition, an easy-to-read on-site display is desirable. The RIA15 loop-powered process indicator is the ideal solution for on-site display of measuring devices that are compact and/or difficult to access.



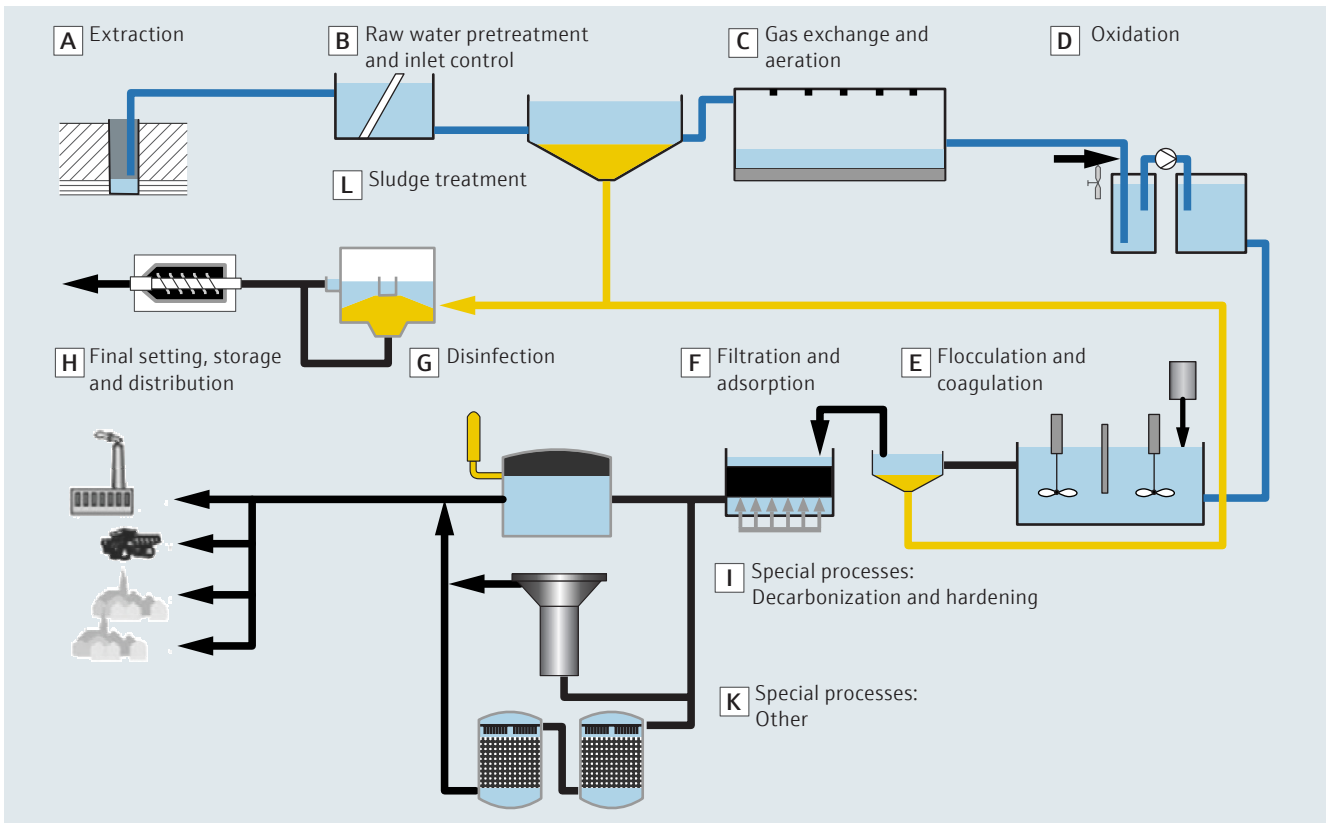
The perfect match – the most compact radar measuring device FMR20 with RIA15. In this combination, the measuring device's basic settings can be configured on the RIA15 via HART®.

**RIA15 process indicator**

Loop-powered indicator in the field or panel housing

- Improved process insight through visualization of the 4 to 20 mA signal or all 4 HART® values of a sensor
- Finds room in any application thanks to the compact design and still offers an excellently readable display with large digits
- Diagnostic tool for HART® networks through easy signal analyses





Technical solution:

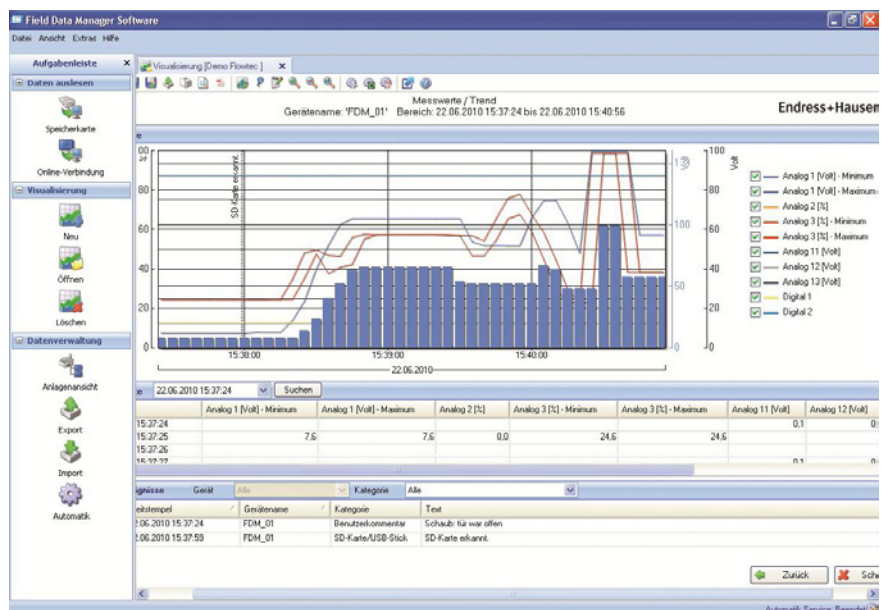
Smart product-specific solution for display, alarm signaling and increased data security through redundancy: Level measurement (ultrasonic, radar, hydrostatic) with Ecograph T RSG35 including e-mail function and GPRS modem.

For those who want more than just an on-site display and are looking for a compact solution for display, alarm signaling, remote transmission and local data storage, e.g. as a back-up, the Ecograph T RSG35 offers many options.

With up to 12 universal inputs, the Ecograph T enables connection not only to measuring devices, but also, of course, to further parameters such as those provided by pumps. It goes without saying that alarm signaling via e-mail functions in the event of an error and the option of remote data transmission are possible.

Visualization with Field Data Manager software

The visualization function in the Field Data Manager software is advantageous for small water works in particular: It enables data from the Ecographs of several external stations to be displayed in the central control room.



Application examples

Monitoring of limit values based on individual measuring points

Often, only one relay needs to be actuated to control certain processes, e.g. open sand filters, pressure filters, bio filters or membrane filters. The objective is long filter times, but also reliable detection of when a filter needs to be flushed. Here are two examples, representing a number of comparable applications:

Example

Filter back flush based on the level

Technical solution:

Prosonic T + RIA45

Open sand filters are generally fitted with level measurement. Increasing filter blocking can be detected through a change in the exceptional water level.

The RIA45 process indicator supplies the level sensor, which can also be installed in hazardous areas, with power and makes it possible to monitor the level with a limit function. If the set limit value is reached, the filter back flush is activated via a relay.

RIA45 process indicator with control unit



- One or two universal inputs with integrated loop power supply
- Two optional relays for monitoring limit values
- Mathematics channels for simple calculations such as total or difference, linearization with up to 32 support points
- Easy-to-read display with color change in the event of an error

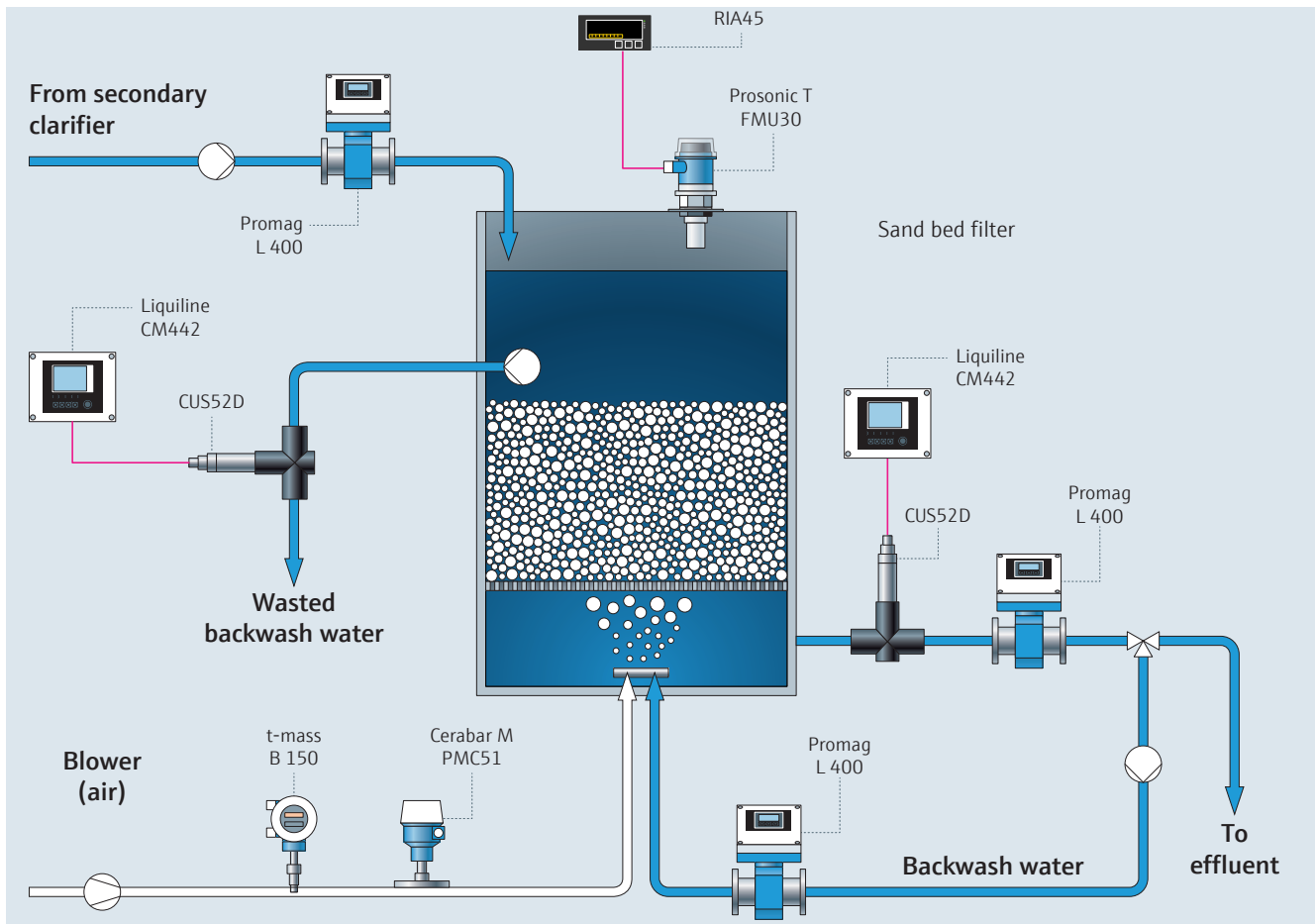
Example

Differential pressure in pressure filters

Technical Solution

Deltabar M + RIA45

The flush cycles of pressurized filters are often time-controlled, although it is practical to use the differential pressure measurement as additional information in order to guarantee reliable and efficient operation of the filter. The RIA45 process indicator supplies both pressure sensors with power and calculates the pressure difference using the integrated mathematics channels. A limit value can then be used to activate the flush. The upstream pressure is also monitored. Both the upstream pressure and the differential pressure can be forwarded to higher-order systems via the RIA45's analog outputs.



Application example: Filter back flush based on the level

Wastewater treatment safely mastered

Plant operation begins before the point of entry

Optimum use must be made of available storage chambers to accommodate possible heavy downpours. In many countries, there are also requirements relating to documentation of storage chamber incidents, for example. Channeling wastewater safely out of the sewer, where possible avoiding runoffs into the drainage canal, is the task of the sewerage company. Small metrological solutions can be implemented here by combining suitable components with the level transmitter and can offer great benefits to the operator.



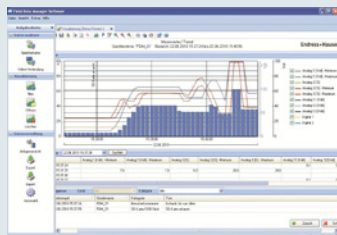
Example Storm water overflow tank Technical solution:

Prosonic S (a sensor for level and flow rate) plus Memograph M RSG45 with wastewater software for documentation. With complete reporting for the Administrative District Office from the Field Data Manager Software.

The Memograph M RSG45 is a modern data manager that not only records data, but can also be used flexibly for controlling and monitoring the storm water overflow tank as well as for complete reporting and alarm signaling. This makes the Memograph M RSG45 particularly well suited to all storm water overflow tanks with an existing power supply. The Memograph M RSG45 is used for recording all relevant data from the storm water overflow tank in such a way that it cannot be manipulated, such as impoundment depth, duration and frequency as well as overflow duration, quantity and frequency. Alarms are reported to the employee responsible via e-mail or SMS functions, and also documented. If the alarm is not acknowledged, more people can be alerted.

The on-site data visualization is easy for the operating personnel to read by means of a process screen, and data transmission to the central room is possible via GPRS. The Field Data Manager software calls up the data and stores it in an SQL database where it is protected against manipulation. The data is automatically assigned to the individual external branches. Using the new reporting system, the report required by the Administrative District Office can be produced directly.

Field Data Manager



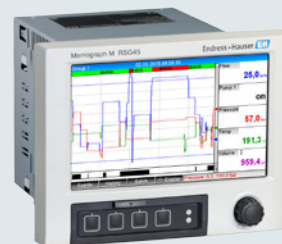
Field Data Manager (FDM) is a software package offering central data management and visualization of stored data.

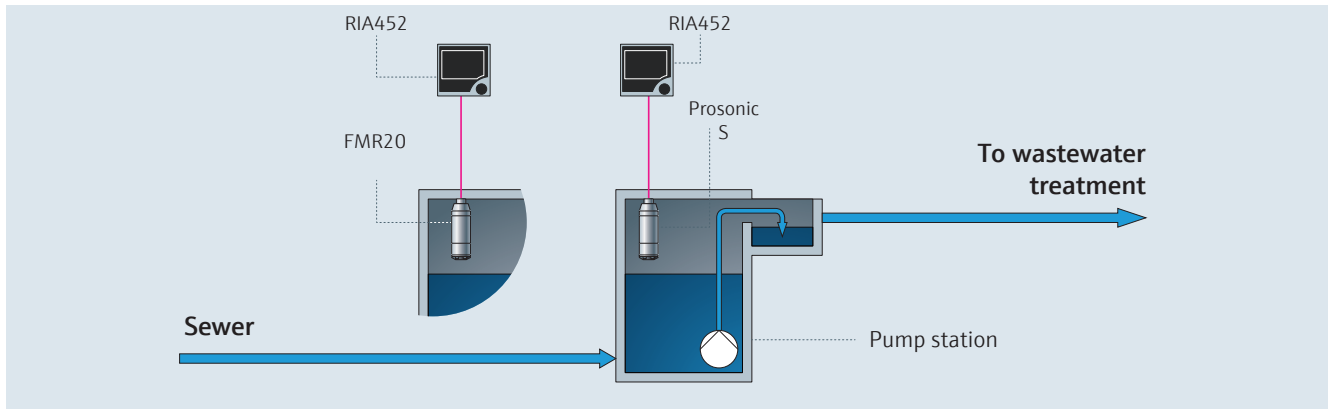
This allows complete documentation of the data from a measuring point, e.g.:

- Measurement values
- Diagnostics events
- Protocols
- Secure management and visualization of historical process data
- Automatic services for easy data handling
- Visualization of instantaneous values

Advanced Data Manager Memograph M RSG45

- Tamper-proof storage and personalized access authorization with electronic signature
- 7" TFT display for a clear presentation of the measured values
- Integrated web server: Remote access to device operation and visualization for reduced maintenance costs
- Simple device upgrade with up to 20 universal/HART® inputs and 14 digital inputs or 12 relay outputs
- Support of common fieldbuses (Modbus, Profibus DP, PROFINET, EtherNet/IP) for fast integration into different systems
- Standard interfaces: Connection of a USB keyboard or mouse to save time inputting data on a screen





Application example: Pump station



Example Pump stations/lift stations Technical solution:

Level e.g. FMR20 or Prosonic S plus RIA452.

The RIA452 is a smart process indicator with its own functionalities that go beyond simply displaying measured values on-site:

- Measured value display with bar graph and arbitrary scaling
- Connected measuring device power supply
- Control of up to eight pumps with the possible integration of individual pumps in an alternating pump control system
- Digital status monitoring for up to four pumps



Application description of pump control with RIA452

see page 5

Metrological solutions with system components for operating wastewater treatment plants

Particularly in mechanical pre-cleaning, there are applications that can be carried out easily and safely through the use of suitable system components. Last but not least, wastewater treatment plants – regardless as to whether industrial or municipal – have a long-lasting influence on water quality as a result of their performance. The monitoring and documentation of all required parameters must be performed for these discharge points. This affects not only direct discharge into bodies of water, but also indirect discharge points of industrial wastewater into sewage systems.



Example Open channel measurement Technical solution:

FMR20 and RIA452 or Prosonic S.

For open channels, the flow rate in weirs or, for example, Khafagi Venturi channels can be determined using the level. The RIA452 calculates the flow rate using formulas that are already stored in the process indicator, depending on the shape of the channel. This is displayed and output as an analog signal. In addition, the flow rate can also be added up in the internal totalizer.

Alternatively, Endress+Hauser offers a further intelligent solution with the Prosonic S ultrasonic level transmitter. Prosonic S calculates the flow rate using formulas stored in the device depending on the shape of the channel, and outputs it as an analog value.

Example Rake control

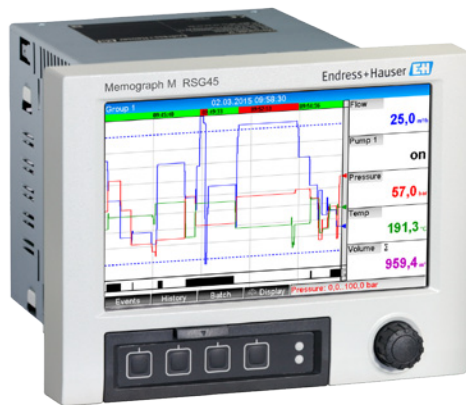
Technical solution: FMR10 with RIA45

The RIA45 process indicator provides both connected level sensors with power. The difference between the two sensors is calculated in one of the two integrated mathematics channels. If a set limit value is reached, the rake cleaning is activated via a relay. In addition, the level in front of the rake is monitored using a limit value in the RIA45.

Alternative: Prosonic S

Alternatively, the Prosonic S can be used with two ultrasonic sensors. In one of the integrated mathematics channels, the difference between the two sensors is similarly calculated here and, if the limit value is reached, rake cleaning is activated. The level in front of the rake is monitored with the Prosonic S.

➔ **Description of RIA45**
see page 8



Example Discharge monitoring of industrial or municipal wastewater

Technical solution:

Memograph M RSG45 with telealarm, optional for remote inquiry with GPRS modem or Ethernet connection. Monitoring and documentation of all required parameters and alarm signaling.

The Memograph M RSG45 is a modern data manager that not only records data, but can also be used flexibly to monitor the wastewater treatment plant outlet and to signal alarms. The Memograph M RSG45 is responsible for storing all relevant data in such a way that it cannot be manipulated. Alarms are reported to the employee responsible via e-mail or SMS functions, and also documented. If the alarm is not acknowledged, more people can be alerted. The on-site data visualization is easy for the operating personnel to read by means of a process screen. Data transmission to the control room is easy to achieve via GPRS or an Ethernet connection. The Field Data Manager software reads the data and stores it in an SQL database where it is protected against manipulation. The data is automatically assigned to the individual external branches. As proof, daily, monthly and yearly reports are very easy to produce.

➔ **Description of Memograph M RSG45**
see page 9



Example

Heat energy calculator for wastewater heat recovery

Technical solution:

EngyCal RH33

Energy efficiency continues to be an important issue for wastewater treatment plants. Besides monitoring energy and energy efficiency, there are also approaches for recovering heat from wastewater streams. The EngyCal RH33 heat meter is ideal for accurately calculating the energy extracted from wastewater. It calculates the energy from the flow rate and the temperature difference from flow and return channels. As this difference is very small, electronic pairing of the temperature sensors via Callendar-van-Dusen coefficients is particularly important. This electronic pairing is carried out internally by the EngyCal RH33 by storing the sensor characteristic curves.

EngyCal RH33

- Suitable for connecting and supplying all common volume flow transmitters and temperature measuring points as standard
- Detailed data storage of current and counter values and of error messages, limit value violations and changes to operating parameters
- Calibrated, electronically paired temperature sensors ensure the highest accuracy and enable replacement also of individual temperature sensors
- Remote readout via Ethernet and fieldbuses



Efficient sludge treatment and biogas use

Sludge treatment is currently one of the major challenges in the wastewater industry around the world. The goal is to reduce the quantities of sewage sludge to be disposed of. The sewage sludge has long been a significant cost factor for wastewater treatment plant operators. Biogas recovery through sludge digestion and improvements in sludge dewatering are generally the answer.

Detection of foam formation: Extra operational safety

Foam can form unexpectedly in digesters. Metrological detection of the foam height can be used to avoid unwelcome downtimes. Anti-foam measures can then be implemented as and when necessary. This reduces costs and increases operational safety during digestion.

Example

Monitoring of the digester with pressure compensation in the headspace

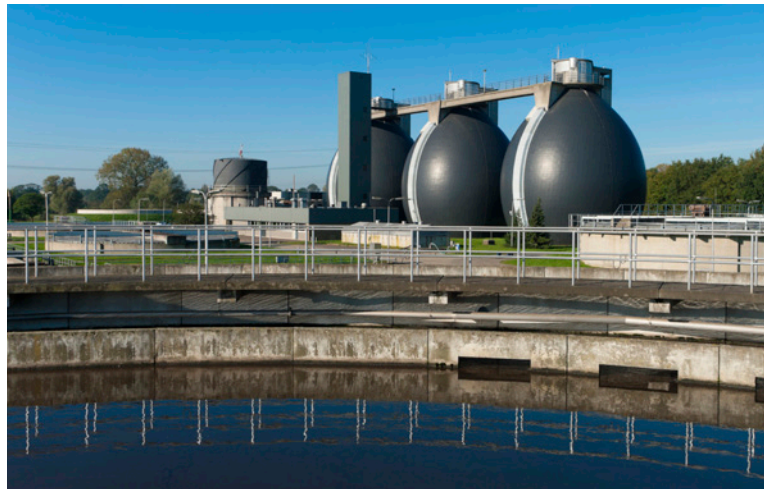
Technical solution:

Deltapilot plus Cerabar M plus RMA42 process transmitter.

The level in the digester is a basic parameter and can be realized very reliably using hydrostatic level measurement.

As pressure fluctuations are to be expected in the digester's headspace, pressure compensation for the hydrostatic level measurement is necessary, using a separate pressure measurement in the headspace.

Both measured values can be offset to find one pressure-compensated measured value relating to level using the RMA42.



RMA42 process transmitter

Universal process transmitter with control unit

- A device for many applications thanks to one or two universal inputs, one or two analog outputs and two optional relays
- Several functions combined in one device: Transmitter, loop power supply and barrier
- Simple solution for complex requirements using one or two calculated values and a linearization table with 32 support points per calculated value
- Easy and quick set-up via PC or on-site
- Digital status output (open collector)



Example

Electronic foam detection through differential pressure measurement

Technical solution:

Deltapilot M plus Cerabar M plus RMA42, Micropilot FMR50 plus RMA42.

Recording the height of the foam in the digester enables increased operational safety in the digester and cost-effective, targeted implementation of anti-foam measures. In addition to the hydrostatic level measurement installed on the floor, this requires an extra continuous measurement from the head of the digester, e.g. with a radar. If foam is formed, the radar measurement records the clearly rising level of the foam surface, while the hydrostatic measurement remains practically unaffected. The difference between the two level signals corresponds to the foam height and specifically triggers the required anti-foam measure.

On-site indication made easy for measuring points that are difficult to see or gain access to

A measuring device cannot always be positioned in such a way that its on-site display is easy to read. Some sensors do not have a display, or the value is so significant that it should be possible to read it from a great distance. Endress+Hauser's complete and modern portfolio of indicators will help here.

- Loop-powered indicators such as the RIA15 show the measured value prominently, without additional auxiliary power. The backlight, which can be activated, is designed to improve readability. With HART®, all four values of one sensor can also be displayed in an alternating manner.
- Many additional functions, e.g. with the RIA45/RIA46 and RIA452 process indicators, offer increased flexibility for meeting your individual requirements:
 - Bright, multi-colored display for excellent readability (own power supply)
 - Integrated loop power supply for two-wire devices, intrinsically safe option available
 - Additional analog output for forwarding the measured value to higher-order systems and relays
- RIA45 and RIA46 are also available as two-channel devices. These offer the option of carrying out simple calculations, such as with differential measurement, over two mathematics channels.

Process indicator with control unit	RIA45 	RIA46 	
Loop-powered indicators	RIA14 	RIA16 	RIA15  HART COMMUNICATION PROTOCOL
Process indicator with pump control	RIA452 		
Fieldbus indicator	RID14 	RID16 	



Explosion protection at wastewater treatment plants – zones safely separated

Two-wire devices used in hazardous areas have special power supply requirements. The power supply must ensure that no sparks can be produced in hazardous areas, even in the event of an error. Intrinsically safe circuits are usually used for this purpose. The most simple way to power a device in hazardous areas is with the RN221N active barrier. It supplies the two-wire device with power in an intrinsically safe manner and transmits the signal to the non-hazardous area in a galvanically isolated manner.

RN221N active barrier

- Galvanic isolation of 4 to 20 mA circuits and power supply of two-wire transmitters
- Intrinsically safe power supply for sensors in hazardous areas
- Flexible power supply thanks to the wide-range power supply unit
- International approvals for use in hazardous areas
- Bidirectional HART® transmission

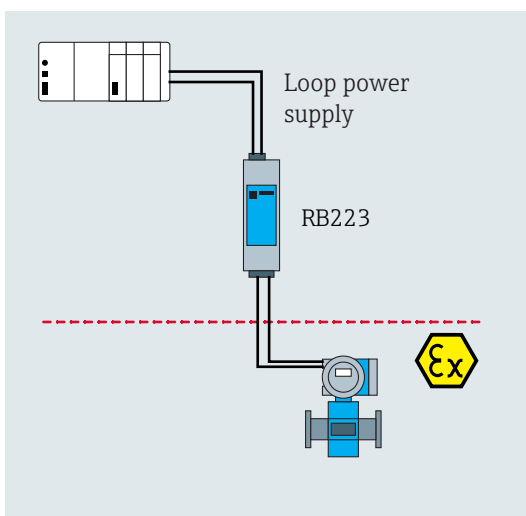


In addition, many of our process indicators, DIN rail devices and heat computers offer optional intrinsically safe inputs so that in these devices, additional components are not needed for zone separation.

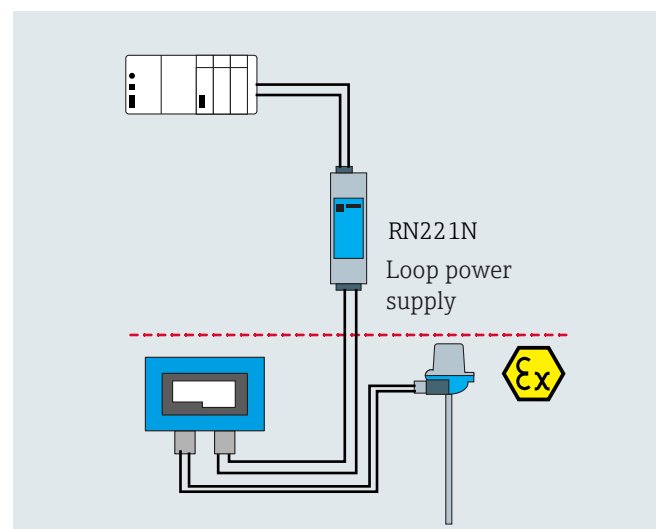
If a PLC is being used for power but its power supply is not intrinsically safe, this power supply can be made intrinsically safe using the RB223 passive barrier.

RB223 passive barrier

- One-channel or two-channel version
- No auxiliary power necessary
- International approvals for use in hazardous areas
- Bidirectional HART® transmission



RB223 passive barrier between PLC and transmitter



RN221N active barrier for loop power supply

Measuring points relevant to the WHG (German Water Resources Act)

Chemicals under control

The German Water Resources Act (Wasserhaushaltsgesetz – WHG), which is internationally recognized, stipulates that containers for water-polluting liquids must be protected against overflowing. These specially certified measuring devices monitor the level and issue an alarm when the maximum permitted level is reached. This makes the WHG one of the most important laws used to protect the environment and ensure safety during operation. The way in which companies apply and comply with this law is monitored by approved monitoring agencies such as the TÜV. Besides optimal fitting of separate limit switches with WHG approval, such as the Liquiphant FTL50, it is also possible to derive WHG overflow protection coupled with an appropriate evaluation device from the continuous signal of a WHG-approved sensor. Approval of the evaluation device in accordance with the WHG is not necessary for this; however, the evaluation device must correspond to the construction and inspection regulations. It must switch safety-related in the event of an error.

All of Endress+Hauser's evaluation units with limit relays comply with the construction and inspection regulations and can be used in WHG overflow protection systems.

Your advantage

- Continuous level measurement and limit detection in accordance with WHG in just one device.

Chemical monitoring in accordance with WHG

Chemicals are used in the treatment process that are relevant to the WHG in the water and wastewater industry, too. A redundant level measurement which continuously indicates the level but reports the maximum limit level in accordance with the WHG is often required.

Endress+Hauser offers two versions

Version a:

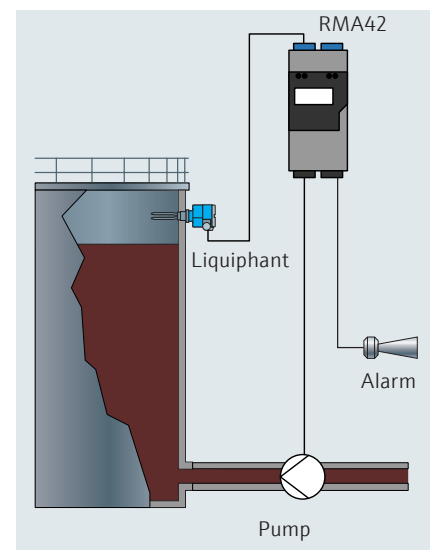
Continuous level measurement (for example, ultrasonic, hydrostatic or radar) and WHG-approved level limit switch (Liquiphant). A level measurement that has no WHG overflow protection cannot be used to derive a WHG overflow contact. In this case, an external level limit switch must be used. For this application, the best option is the Liquiphant, as it only depends on the density of the medium. The separate level limit switch always offers the greatest safety for WHG overflow protection.

Version b:

Continuous radar level measurement with FMR50 as a WHG-approved device coupled with RMA42.

If the level is measured using a continuous level sensor that has WHG approval, e.g. Micropilot FMR50, this signal can be used to derive a WHG limit contact. The evaluation unit itself does not have WHG approval, but must comply with the construction and inspection regulations. This is fulfilled by all of Endress+Hauser's evaluation devices. The evaluation unit that is particularly recommended for this application is the RMA42 process transmitter, or the RIA45 and RIA46 indicators, which have the same function but different designs. Level transmitters that use ultrasonic do not have WHG approval and must not be used.

➔ **Description of RMA42**
see page 13



A contribution to ensuring plant availability

Increase the availability of the plant whilst simultaneously reducing costs with customized overvoltage protection

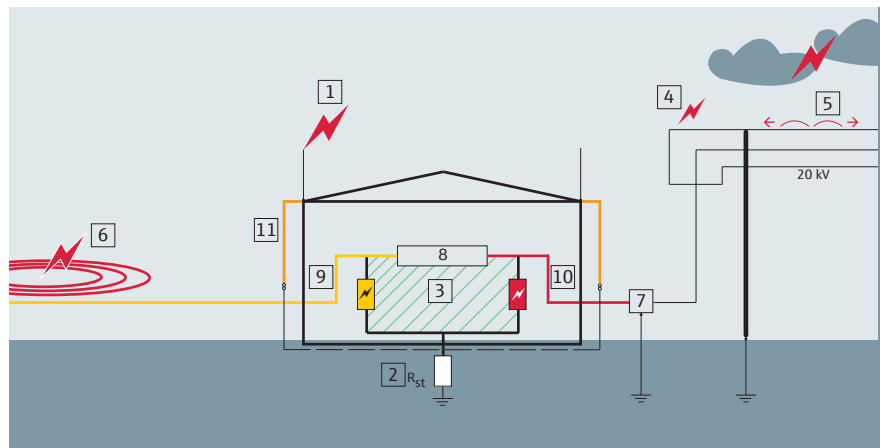
For plant safety and monitoring of critical measuring points in the water and wastewater sector, flawless function as well as high availability of the plants are of huge significance, particularly within the context of stricter statutory requirements. This availability can be ensured with the **HAW562** and **HAW569** surge arresters.

24 out of 100 cases of damage to device electronics are caused by overvoltage. This makes overvoltage one of the most common causes of damage. The most sensitive areas of the plant usually encounter overvoltage first, such as control systems, control devices and of course the measuring instruments and transmitters. If part of the system is damaged in this way, it may be the case that optimal operation of a wastewater treatment plant is no longer possible. This can lead to additional environmental pollution as well as increased operating expenses. Moreover, the acquisition costs for the surge arresters are considerably lower in most cases than for the measuring instruments or other system parts. These devices therefore help to ensure that ever decreasing budgets are not overstretched.



Sources of overvoltage

Overvoltage is a very brief surge which, if it is not diverted, can damage plants and devices. The duration of this type of overvoltage is less than 1/1000th of a second. Overvoltage during a storm can be caused by direct or near hits or by remote strikes by a bolt of lightning.



- | | | | |
|---|--|----|------------------------------------|
| 1 | Strike into external lightning protection | 6 | Fields of the lightning channel |
| 2 | Voltage drop at the pulse earth resistor | 7 | Transformer substation |
| 3 | Induced voltage in loops | 8 | Control room |
| 4 | Strike into medium-voltage overhead line | 9 | Yellow: signal lines |
| 5 | Overvoltage traveling waves on overhead line due to lightning between clouds | 10 | Red: low-voltage supply |
| | | 11 | Orange: outer lightning protection |

Surge arrester for HAW562DIN rail installation

- Compact device for protecting the power supply line or signal line
- Can be integrated flexibly thanks to ATEX and IECEx approval
- Compatibility with standard fieldbuses
- Uninterruptible operation of the plant even when changing modules



Surge arrester for HAW569 field installation

- Simple and space-saving installation directly onto the field device
- Two different versions:
 - Screw-in version that is especially suitable for four-wire devices for simultaneous protection of the power supply lines and signal lines and lead-through version, for which a free cable gland is not necessary
- Also suitable for applications in hazardous areas thanks to ATEX and IECEx approvals



The magnitude of the overvoltage created depends on the length of the line, the distance from the lightning bolt and the strength of the lightning bolt. If the lightning bolt strikes in the line, the overvoltage protection will not be sufficient. In this scenario, external lightning protection, which involves lightning current arresters on buildings, discharge lines and earthing, for instance, is also required.

For internal lightning protection, various lightning protection zones are differentiated. To this end, coarse, medium and fine protection will then be used respectively. These arresters prevent the dangerous overvoltage from penetrating the plants and systems and damaging them.

Apart from the overvoltage described which is caused by lightning strikes, overvoltage can also be caused by switching operations. This can be, for instance, inductive loads such as transformers, throttles and motors being disabled, or fuses being tripped. Sensors and system parts must be protected from damage using surge arresters in this case, too.

Protection of power supply lines and signal lines

Overvoltage can occur in both power supply lines and communication lines.

The Endress+Hauser range offers ideal protection for both types of lines with various device versions for the sensors in your plant. The HAW562 and HAW569 for the power supply lines prevent the occurrence of a damaging voltage drop thanks to impedance-free connection of the arresters. With the surge arresters for signal lines, optimally adapted uncoupling impedances guarantee high compatibility with the device to be protected.

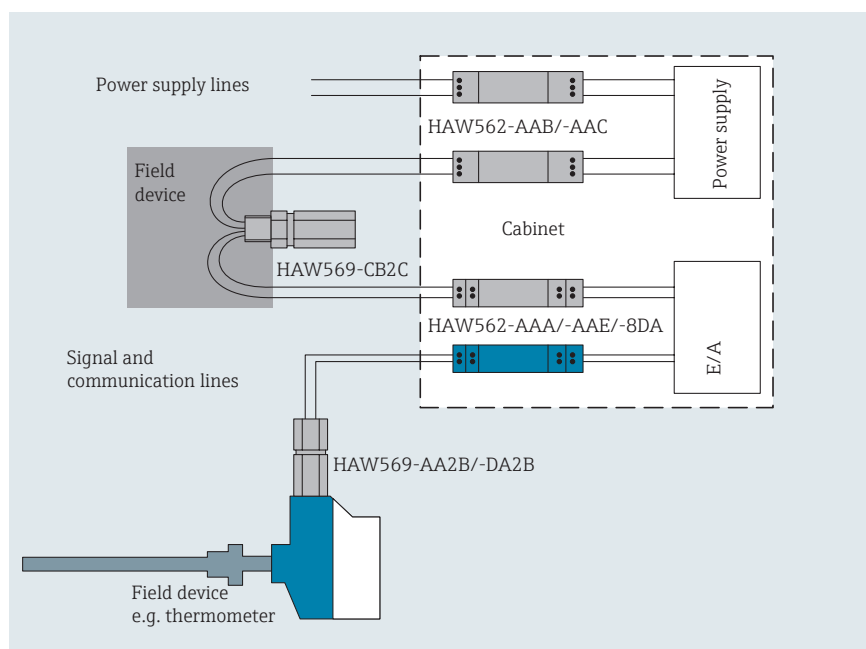
Where is overvoltage protection necessary?

Protective devices are necessary wherever that overvoltage may occur. Here are three areas to pay particular attention to:

- External applications for which sensors and devices are used outdoors
- Crossovers between the individual lightning protection zones
- Everywhere where overvoltage can occur due to switching operations or voltage can be induced by parallel internal and external lines

As overvoltage always spreads in both directions along a line in the form of waves, it is important to make sure when installing surge arresters that they are used on both ends of the line and positioned as near as possible to the device being protected.

To this end, Endress+Hauser offers surge arresters for DIN rail installation in the cabinet, and in the field housing for direct installation on the field device.

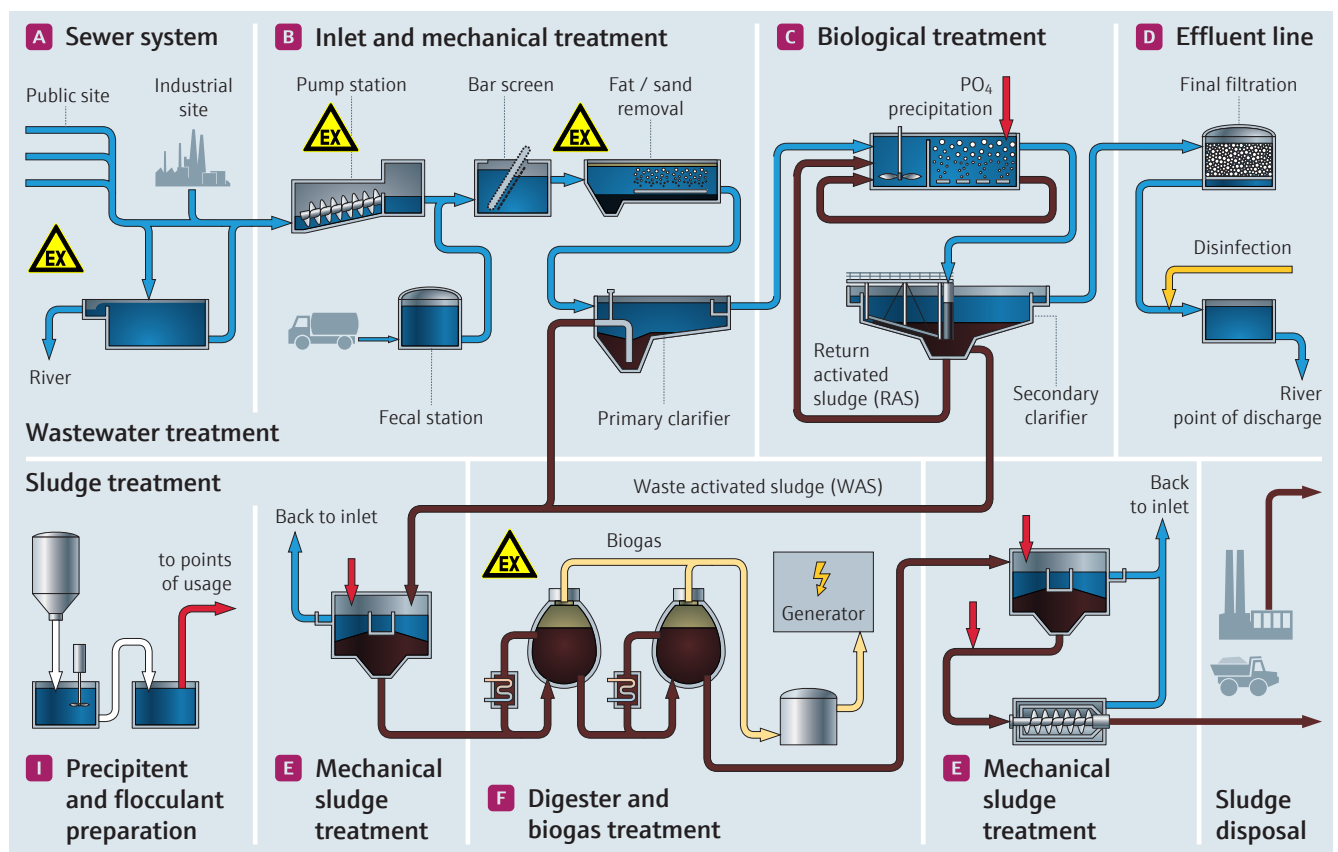


Overvoltage protection with HAW562 and HAW569

Safely discharge more than once




According to the standard DIN EN 61643-21/VDE 0845 3-1, surge arresters must be inspected with a surge voltage pulse and surge current pulse that is predetermined according to the protection class, and a specific number of pulses. The HAW562 and HAW569 are therefore able to discharge the specified overvoltage several times without damage. A short-circuit on the signal lines indicates that the surge arresters have stopped functioning. For the DIN rail devices for power supply lines, the operativeness can even be read easily on the front panel.

Applications:



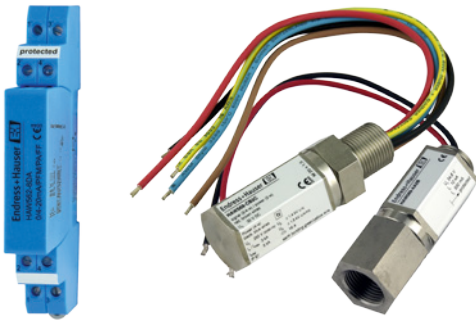
Overview of a wastewater treatment plant

Overvoltage protection can be fitted as followed at various measuring points, for example, on a wastewater treatment plant.

Applications		
	Example for measuring point	Fitting of measuring points
Storm water overflow tank Level and overflow quantity	<ul style="list-style-type: none"> ■ Level measurement: 0/4 to 20 mA ■ Overflow quantity measurement: 0/4 to 20 mA Prosonic S level transmitter FMU90 with two level sensors Prosonic FDU9x	<ul style="list-style-type: none"> ■ 2 x HAW562-AAA for 0/4 to 20 mA remote control signal ■ 1 x HAW562-AAB or HAW562-AAC for energy supply of the transmitter ■ 2 x HAW562-AAE for sensor signal line
Storm water overflow tank	Level measurement with Endress+Hauser Prosonic M FMU40 ultrasonic transmitter with Endress+Hauser Prosonic FDU80 level sensor 4 to 20 mA	<ul style="list-style-type: none"> ■ 1 HAW569-AA2B for 4 to 20 mA remote control signal
Pumping lift station Level	Pump well level measurement: 0/4 to 20 mA Prosonic S FMU90 level transmitter with Prosonic FDU9x level measuring sensor, alternatively FMU40, FMU41 or FMR20	<ul style="list-style-type: none"> ■ 1 x HAW562-AAA for 0/4 to 20 mA remote control signal ■ 1 x HAW562-AAB or HAW562-AAC for supplying the transmitter with energy ■ 1 x HAW562-AAE for sensor signal line
Acceptance of fecal matter  Level	Level measurement: Level transmitter Prosonic S FMU90 with level measuring sensor Prosonic FDU9x with PROFIBUS DP signal	<ul style="list-style-type: none"> ■ 1 x HAW562-AAD for PROFIBUS DP signal.
Acceptance of fecal matter  Intrinsically safe level	Level measurement with E+H Prosonic M FMU41 measuring device PROFIBUS PA signal or alternatively FMR20 with HART® signal	<ul style="list-style-type: none"> ■ 1 HAW569-DA2B for PROFIBUS A signal line or 1 x HAW562-8DA for HART® signal in hazardous areas
Piping  Intrinsically safe pump pressure monitoring	Pressure measurement with Endress+Hauser Cerabar S pressure transmitter 4 to 20 mA	<ul style="list-style-type: none"> ■ 1 HAW569-DA2B for 4 to 20 mA remote control signal
Primary clarifier inlet pH value + temperature	<ul style="list-style-type: none"> ■ pH value measurement: 4 to 20 mA ■ Temperature measurement: 4 to 20 mA Liquisys M CPM253 transmitter with CYA611 and CPS11 measuring sensors	<ul style="list-style-type: none"> ■ 1 x HAW562-AAA for 0/4 to 20 mA remote control signal ■ 1 x HAW562-AAB or HAW562-AAC for supplying the transmitter with energy
Activated sludge Recirculation quantity	Flow measurement: 0/4 to 20 mA Flowmeter Promag 400	<ul style="list-style-type: none"> ■ 1 x HAW562-AAA for 0/4 to 20 mA remote control signal ■ 1 x HAW562-AAB or HAW562-AAC for supplying the transmitter with energy
Aeration basin Oxygenation Denitrification/nitrification monitoring	Measurement of various parameters including oxygen, ammonium, total solids: 0/4 to 20 mA Liquiline CM44 transmitter with COS 61D measuring sensor	<ul style="list-style-type: none"> ■ 1 x HAW562-AAA for 0/4 to 20 mA remote control signal ■ 1 x HAW562-AAB or HAW562-AAC for supplying the transmitter with energy

Applications

	Example for measuring point	Fitting of measuring points
Drainage duct pH value + temperature	See primary clarifier inlet	<ul style="list-style-type: none"> See primary clarifier inlet
Further application example: Flow measurement	e.g. Coriolis Promass 84, 83, 80; T-mass, Prosonic 92F or 91W, 93W	<ul style="list-style-type: none"> 1 HAW569-CB2C for power supply and signal line



Features and benefits

- Everything from a single source and therefore optimal adaptation of the surge arresters to the electronic components of the sensors
- Expensive sensors and devices are safely protected against overvoltage
- Costly plant failures are prevented
- Variable use thanks to Ex approvals, SIL2 conformity and compatibility with the established communications signals and fieldbuses



Energy optimization for your wastewater treatment plant

Our solutions optimize processes, help save energy, and lower operating expenses

There is typically a great deal of potential for energy savings in wastewater treatment plants. However, accurate knowledge of the actual situation of the individual system parts in terms of energy is a prerequisite for effective measures.

Reliable measuring instruments

Accurate measurement of the process values is therefore essential. Endress+Hauser's main area of expertise is providing the suitable sensors for this. We are familiar with the plants and which sensors and measuring principles should be used. Measuring points relating to process and energy can easily be retrofitted with Endress+Hauser's measuring instruments.

Analysis of the measured values

As the technical details of every wastewater treatment plant differ, individual analysis of the measured values is essential for estimating the current plant efficiency and uncovering its potential for improvement. To this end, the correct KPIs must be used to evaluate the plant.

Aeration efficiency

In many plants, around 50% of the electricity consumption is used just to run the aeration system. In addition, blower efficiency is usually unknown. Monitoring pressure drop, air flow and power consumption allows you to evaluate the following important points:

- Blower performance
- Pollution of aeration elements and required cleaning
- "Success" of the aeration control strategy

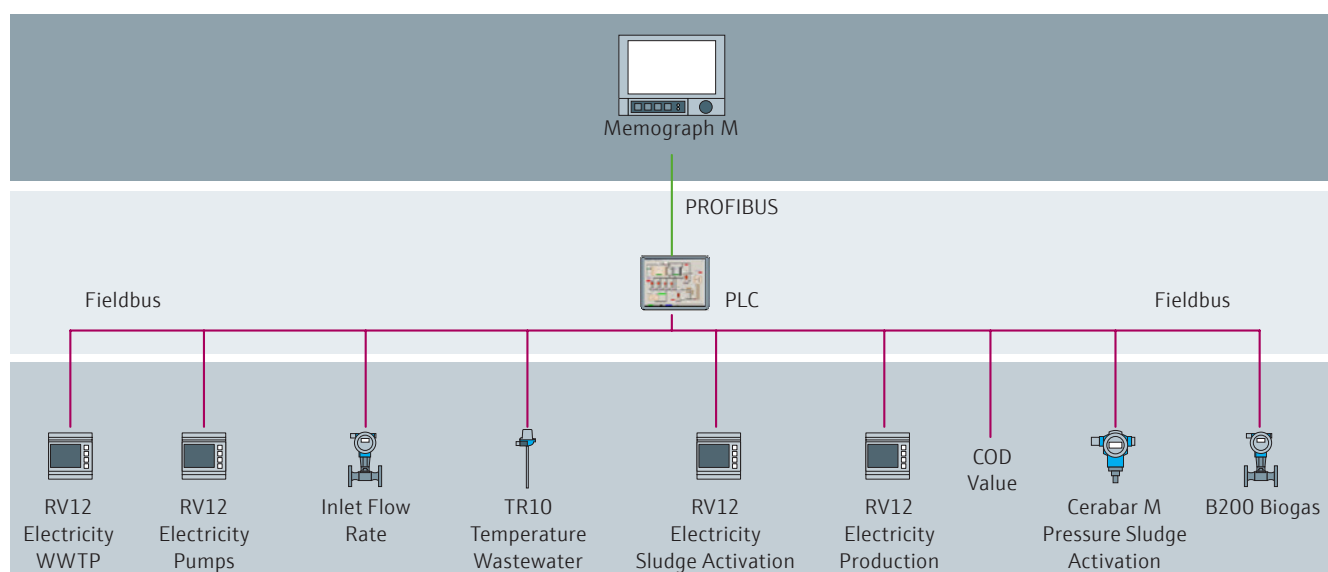
Pump efficiency

Pumps are often oversized or do not operate at their ideal operating point. KPI benchmarking based on electricity consumption, flow rate and pressure is useful for discovering potential instances of poor performance so that pumps can be maintained in time.

Electricity production

An increase in electricity production is usually easier to achieve and less expensive than implementing electricity-saving measures. KPIs such as the gas-to-COD ratio or the electrical and thermal efficiency of combined heat and power systems are essential parameters for optimizing and verifying electricity production or quantifying the effects of co-fermentation. In this context, it is important to focus not only on single processes but to monitor the whole system so that interaction effects can be detected.

With the described KPIs, Endress+Hauser uses those required in the DWA leaflet as a guide. However, the smart scale system offered for wastewater treatment plants is so flexible that further values can be recorded and displayed easily.



Overview of a fieldbus system

Analysis with the Memograph M

The transparent assignment of energy consumption to specific system parts and processes is the key to practical energy management in wastewater treatment plants and the prerequisite for benchmarking with other plants. Based on this data, measures for optimization can be defined and their success verified.

The Memograph M energy manager collects all necessary data for monitoring wastewater treatment plants, stores it and displays it on-site on its display screen. By using the intuitive Field Data Manager software, the data can be accessed from the control room. The data can be converted into informative reports and graphics.



From measurement to analysis

Endress+Hauser is not only the right point of contact for sensors and energy managers. We offer a complete range of services for the energy management of your wastewater treatment plant:

- Analysis of the on-site conditions including site survey
- Designing the necessary measuring points with sensor selection, initial setting and calculations
- Installation and commissioning of the measuring points
- Configuration of the Memograph M and the FDM visualization software
- Project management
- Documentation including drawings, data sheets and recording of the configuration
- Analysis of the KPIs and consultation regarding the measures to be initiated



Features and benefits

- Accurate measuring instruments for high-quality measurements
- Identify potential savings due to constant monitoring of areas in the wastewater treatment plant that are relevant to energy
- Increase transparency by comparing efficiency with similar plants
- Monitor energy costs and better define wastewater costs
- Optimize system and control performance, find the ideal operating point, minimize downtimes and ensure the safety of the plant
- Carry out specific benefit assessment of system modifications and optimizations
- Improve image in the eyes of communities and fee payers



Payback calculation example:

Situation:

- Plant size: 40,000 PE
- Aeration energy: 16 kWh/PE*a
- Air pressure: 50 kPa

Sources of energy loss:

- Pressure loss actual (clogged aeration elements): 13 kPa
- Pressure loss of clean elements: 2 kPa
- Ideal cleaning point: 5 kPa

Payback:

Costs of instruments to monitor aeration efficiency: €4,100

Electricity costs:

€0.15/kWh

Proportion of avoidable energy losses
 $(50-13)/(50-2) * 100 = 23\%$

$16 \text{ (kWh/PE*a)} * 40,000 \text{ PE} * 0.23$
 $= 147,200 \text{ kWh}$

Savings:

$147,200 \text{ kWh} * €0.15$
 $= €22,080/a$

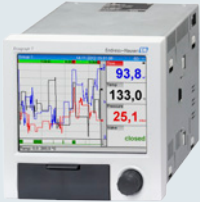

$€4,100 / €22,080 = 0.2 \text{ years}$

Maintenance based on requirements using pressure monitoring saves money; in this example, €1840/month



The payback time is less than three months



Overview of data managers

Model	Ecograph T – RSG35	Memograph M – RSG45
Special feature	Universal Graphic Data Manager with up to 12 universal inputs. Displaying, recording and monitoring device, with an excellent price/performance ratio.	Advanced Graphic Data Manager with universal use of analog HART® and digital signals. Saves, visualizes, analyzes and communicates.
Design		
Universal analog inputs/HART® for RSG45	0/4/8/12	0/4/8/12/16/20 or up to 40 for fieldbus
Digital inputs	6	6 or 14
Analog outputs	-	2
Loop power supply	1 x 24 V DC, max. 250 mA	1 x 24 V DC, max. 250 mA
Counter inputs (pulse)/operation time counter	Yes	Yes
Incident notification inputs	Yes	Yes
Limit values/relays	30/6 relays	60/6 or 12 relays
Measured value display	TFT color graphic, 145 mm (5.7 in.) Resolution: 640 x 480 pixels	TFT color graphic, 178 mm (7 in.) Resolution: 800 x 480 pixels
Signal analysis	Intermediate, daily, monthly, annual analysis	Intermediate, daily, weekly, monthly, overall/ annual analysis
Process screen	-	Up to 10
E-mail functions	Yes	Yes, with telealarm option
Integrated web server	Yes	Yes
CSV file format	Yes (direct)	Yes (direct)
OPC server	Yes (optional software)	Yes (optional software)
Mathematical function	4 mathematics channels (optional)	12 mathematics channels (optional)
Integration	Yes	Yes
Calculation factor for integrated quantities	Yes	Yes
Charge function	-	Optional
Telealarm	-	Optional
Wastewater and storm water overflow tank	-	Optional
Energy package (water + steam)	-	Optional
Text entry	-	Can be preset 30 x
Search function (incidents and values)	Yes	Yes
Memory	Internal memory + SD card + USB stick	Internal memory + SD card + USB stick
Scan rate	100 ms	100 ms
Interfaces	USB (front) Ethernet (reverse), RS232/RS485 (optional), Modbus RTU/TCP slave (optional)	USB (front) RS232/RS485, PROFINET I/O device, Ether- net/IP adapter, RTU/TCP slave, Modbus RTU/ TCP master, Ethernet, USB (reverse)
Supply voltage	90 to 250 V AC 24 V AC/DC	90 to 250 V AC 24 V AC/DC
Degree of protection	IP65/NEMA4 (front)	IP65/NEMA4 (front)
Dimensions (W x H x L) in mm (in.)	144 x 144 x 158 (5.67 x 5.67 x 6.22)	190 x 144 x 158 (7.48 x 5.67 x 6.22)
Milk pasteurizer approval	-	-
FDA 21 CFR 11	-	Yes
User administration	-	Yes
Order No. for technical information	TIO1079R	TIO1180R

Overview of interface devices




Model	RMA42	RN221N	RB223
Special feature	Process transmitter with control unit for monitoring and display of analog measured values	Active barrier with auxiliary power for safe separation of 4 to 20 mA standard signal circuits with optional HART® diagnosis	One-channel or two-channel, loop-powered passive separator for safe separation of 4 to 20 mA standard signal circuits
Design			
Loop power supply	1/2 x 24 V DC, 30 mA	1 x 24 V DC, 30 mA	-
Signal separation/barrier	✓ 	✓ 	✓ 
Power supply	20 to 250 V AC/DC	20 to 250 V AC/DC	Loop-powered
Input - Analog - Temperature (RTD, TC)	1/2 1/2	- -	- -
Output - Analog - Digital - Relay	1/2 1 0/2	1 - 0/1	- - -
Software functions	+, -, multiplication, average, linearization, differential pressure, limit function, overflow protection	HART® status monitoring	-
Approvals	ATEX, FM, CSA, NEPSI, GL, WHG, KTA	ATEX, FM, CSA, TIIS, IECEx, GL	ATEX, FM, CSA
SIL	2	2	3
Display	LCD, five-digit, bar graph, notifications and user-specific text	-	-
Interfaces	PC interface, HART® sockets	HART® sockets	HART® sockets
Width in mm (in)	45 (1.77)	22.5 (0.89)	22.5 (0.89)
Technical information	TI00150R	TI00073R	TI00132R

Overview of process indicators

Model	RIA14	RIA15
Special feature	Loop-powered field indicator in pressure-resistant metal housing (explosion protected in accordance with Ex d)	Loop-powered indicator, panel and field versions, field device made out of robust aluminum or salt-water-resistant plastic, display of HART® values
Design		
Display - Number of digits - Height - Type	5 20.5 mm (0.81 in.) LC display, backlit, bar graph	5 17 mm (0.67 in.) LC display, bar graph, backlight can be activated
Power supply	Loop-powered 4 to 20 mA	Loop-powered 4 to 20 mA
Voltage drop	< 4 V	≤ 1 V for 4 to 20 mA, ≤ 1.9 V for HART® (additional 2.9 V with backlight)
Input - Analog - Digital - Temperature (RTD, TC)	1 - -	1 - -
Loop power supply	-	-
Signal separation	-	-
Output - Analog - Digital (OC) - Relay	- 1 -	- - -
Software functions	Limit function	HART® indicator; primary or secondary HART® master, display of up to four HART® values (SV, PV, TV, QV) from a measuring instrument
Approvals	ATEX, FM, CSA, IECEx, TIIS, GL, UL	ATEX, FM, CSA, IECEx, GL Free from SIL interference
SIL	-	-
Mounting location	Field	Panel, field
Dimensions (W x H x D) in mm (in.)	132 x 135 x 106 (5.2 x 5.31 x 4.17)	Panel: 96 x 48 x 41.5 (3.78 x 1.89 x 1.69) Field: 131 x 81.5 x 55.5 (5.16 x 3.21 x 2.19)
Technical information	TI00143R	TI01043K

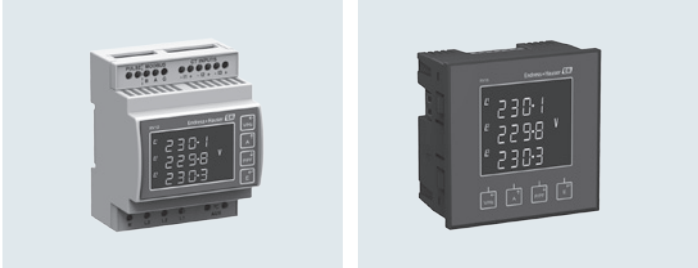
RIA16	RIA45	RIA46	RIA452
Loop-powered field indicator	Process indicator with control unit in the housing installed in the panel for monitoring and displaying analog measured values	Field indicator with control unit for monitoring and displaying analog measured values	Process indicator with alternating pump control and flow rate calculation in open channels in the housing installed in the panel
			
5 26 mm (1.02 in.) LC display, backlit, bar graph	5 17 mm (0.67 in.) LC display, backlit, two-color, bar graph	5 26 mm (1.02 in.) LC display, backlit, two-color, bar graph	5 15 mm (0.59 in.) LC display, backlit, three-color, bar graph
Loop-powered 4 to 20 mA	24 to 230 V AC/DC	24 to 230 V AC/DC	90 to 250 V AC 20 to 28 V AC 20 to 36 V DC
< 4 V	-	-	-
1 - - - -	1/2 - ✓ ✓ 	1/2 - ✓ ✓ 	1 ✓ ✓ ✓ 
- 1 -	1/2 1 0/2	1/2 1 0/2	1 1 4/8
Limit function	+, -, average, multiplication, linearization, differential pressure, limit function, over-fill protection	+, -, average, multiplication, linearization, differential pressure, limit function, over-fill protection	Linearization, integration, limit function, pump control
ATEX, FM, CSA, IECEx, GL, UL	ATEX, FM, CSA, UL, GL, WHG approval	ATEX, FM, CSA, UL, WHG approval	ATEX, FM, CSA, TIIS, UL, CSA GP
-	2	2	-
Field	Panel	Field	Panel
199 x 158 x 96 (7.83 x 6.22 x 3.78)	96 x 48 x 152 (3.78 x 1.89 x 5.98)	199 x 160 x 96 (7.83 x 6.3 x 3.78)	96 x 96 x 145 (3.78 x 3.78 x 5.71)
TI00144R	TI00141R	TI00142R	TI00113R

Energy and Application Managers

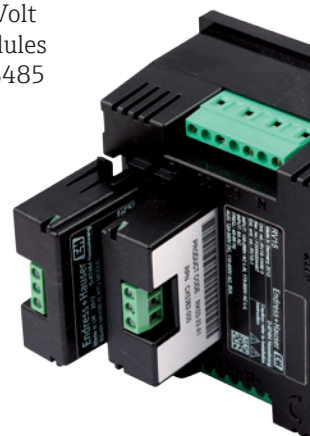
Model	EngyCal RH33	EngyCal RS33	RSG45
Features	Custody transfer BTU meter for recording and measuring energy flow in heating/cooling circuits of water, water/glycol mixtures or other liquids, bidirectional measurement	Steam calculator for recording and measuring the mass and energy flow of saturated or super heated steam; bidirectional measurement	The Memograph M with energy package calculates mass and energy flows in water and steam applications
Construction			
Software functions	Heat quantity and heat quantity difference	Mass/heat quantity	Mass/heat quantity, heat quantity difference
Medium	<ul style="list-style-type: none"> - Water - Water/Glycol - Customer-specific liquids - Steam - Gas 	<ul style="list-style-type: none"> - - - ✓ - 	<ul style="list-style-type: none"> ✓ Table - ✓ -
Number of applications	1	1	6
Data storage	✓	✓	✓
Calculation standards	IAPWS-97	IAPWS-97	IAPWS-97
Highly accurate temperature measurement CvD	✓	✓	-
Differential pressure compensation	✓	✓	✓
Approvals	MID (EN1434), OIML R75, CSA GP, UL, PTB type approval	CSA GP, UL	UL, FDA 21 CFR 11
Communication	Web server, USB, Ethernet TCP/IP, Modbus TCP, Modbus RTU, M-Bus	Web server, USB, Ethernet TCP/IP, Modbus TCP, Modbus RTU, M-Bus	Web server, USB, RS232/RS485, PROFINET I/O device, EtherNet/IP adapter, RTU/TCP slave, Modbus RTU/TCP master, Ethernet
Power supply	100 to 230 V, 24 V AC/DC	100 to 230 V, 24 V AC/DC	90 to 250 V AC, 24 V AC/DC
Loop power supply	1x 24 V DC, 70 mA	1x 24 V DC, 70 mA	1 x 24 V, max. 250 mA
Protection class	IP65	IP65	IP65 (front-panel)
Dimensions (WxHxD) in mm (in)	144x175x138 (5,67x6,89x5,43)	144x175x138 (5,67x6,89x5,43)	190 x 144 x 158 (7.48 x 5.67 x 6.22)
Technical information	TI00151K	TI00154K	TI01180R

RMS621	RMC621	RA33
Energy manager for calculation of steam and water; simultaneous calculation of up to 3 applications; split-range-measurement	Universal flow and energy manager for calculations of gases, liquids, steam and water; simultaneous calculation of up to 3 applications; split-range-measurement	Batch Controller for filling and dosing of any media with automatic correction of overrun quantity
		
Mass/heat quantity, heat quantity difference	Mass/heat quantity, heat quantity difference, for gases: standard volume, heating value, mass	Volume calculation; 1- or 2-stage operation; manual and automatic correction of overrun quantity
✓ - - ✓ --	✓ via table via table ✓ ✓	- - ✓ - -
3	3	1
-	-	✓
IAPWS-97	IAPWS-97, NX19, SGERG88, AGA8, real gas equations (SRK, RK)	ASTM D1250-04
-	-	-
✓	✓	-
OIML R75, UL	OIML R75, ATEX, CSA, FM, UL	CSA GP, UL
1x RS232, 2x RS485, PROFIBUS, M-Bus, Modbus	1x RS232, 2x RS485, PROFIBUS, M-Bus, Modbus	USB, Ethernet TCP/IP, Modbus TCP, Modbus RTU, RS232
90 to 250 V AC, 20 to 36 V DC	90 to 250 V AC, 20 to 36 V DC	100 to 230 V, 24 V AC/DC
per analog input 24 V / 22 mA	per analog input 24 V / 22 mA	1x 24 V DC, 70 mA
IP20	IP20	IP65
135x108x114 (5,31x4,25x4,49)	135x108x114 (5,31x4,25x4,49)	144x175x138 (5,67x6,89x5,43)
TI00092R	TI00098R	TI00163K

Multifunctional electrical energy meters


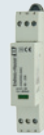
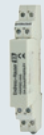



Model	EngyVolt RV12	EngyVolt RV15
Special feature	Multifunctional electrical energy meters for use in single-phase power supply systems and three-phase power supply systems	
Design		
Software functions	Measuring of voltage, frequency, current, power as well as imported and exported active and reactive energy	
Nominal voltage	100 to 289 V AC L-N 173 to 500 V AC L-L	
Nominal current (secondary)	5 A AC RMS	
Measuring range of the secondary current	0.05 to 6 A	
Nominal power (secondary)	1,445 W (three-phase 4,325 W)	
Output		
Pulse output	1	Max. 2
Communication	Modbus RTU	
Mounting location	DIN rail	Panel
Degree of protection	IP30	IP52 front panel IP30 reverse
Dimensions (W x H x D) in mm (in.)	71.3 x 90.5 x 58 basic device (2.81 x 3.56 x 2.28)	96 x 96 x 58 basic device (3.78 x 3.78 x 2.28)
Technical information	TI01025K/09	

Expansion of the EngyVolt RV15 with plug-in modules for pulse output and RS485 Modbus/pulse output






Overview of overvoltage protection

HAW562 – for installation on a DIN rail

Version/ order code	HAW562-AAB	HAW562-AAC	HAW562-AAA	HAW562-8DA	HAW562-AAD	HAW562-AAE
Design						
Application	Protection of the energy supply		Protection of the signal line/communication line, direct and indirect shield grounding possible		Protection of the signal line	
Range/signal	10 to 55 V (+/-20%)	90 to 230 V (+/-10%)	4 to 20 mA, HART®, PFM, PA, FF	4 to 20 mA, HART®, PFM, PA, FF	RS485, Modbus, PROFIBUS DP	Protection module Prosonic S
Arrester class	Type 3 P3		Type 1 P1			
Certificates	SIL 2					
Approval	-	-	-	ATEX/IECEX II2 (1)G Ex ia [ia Ga] IIC T6 Gb	-	-
Accessories	Field housing, mounting bracket		Field housing, mounting bracket, shield grounding terminal			Field housing, mounting bracket
Dimensions (W x H) mm (in.)	18 x 90 (0.71 x 3.54)	18 x 90 (0.71 x 3.54)	12 x 90 (0.47 x 3.54)	12 x 90 (0.47 x 3.54)	12 x 90 (0.47 x 3.54)	12 x 90 (0.47 x 3.54)
Technical information	TI01012K					

HAW569 – for screwing into the field housing

Version/ order code	HAW569-AA2B	HAW569-DA2B	HAW569-CB2C
Design			
Application	Protection of signal lines (4 to 20 mA, PFM, HART®, FF, PA)		Protection of signal lines (4 to 20 mA, PFM, HART®, FF, PA) and power supply lines (0 to 66 V and 80 to 230 V)
Arrester class	Type 2 P1		Type 2 P2
Installation	Screw-through version (direct and indirect shield grounding). Power supply/signals looped through: No additional cable gland	Screw-through version (direct shield grounding). Power supply/signals looped through: No additional cable gland	Screw-in version Parallel connection – no additional resis- tor in the line
Approvals	Non-hazardous area	ATEX/IECEX II2 (1) G Ex ia [ia Ga] IIC T4/T5/T6 Gb	ATEX/IECEX II 2 G Ex d IIC T5/T6 Gb
Certificates	SIL 2		
Accessories	M20 adapter on NPT1/2" Cable gland set Grounding ring	M20 adapter on NPT1/2" Cable gland set Grounding ring	M20 adapter on NPT1/2"
Dimensions	AF 27 x 71 mm (AF 27 mm x 2.8 in.)	AF 27 x 71 mm (AF 27 mm x 2.8 in.)	AF 27 x 63 mm (AF 27 mm x 2.48 in.)
Technical information	TI01013K		

Endress+Hauser
Messtechnik GmbH+Co. KG
Colmarer Straße 6
79576 Weil am Rhein
Germany

Tel. +49 (0)7621 975-01
Fax +49 (0)7621 975-555
info@de.endress.com
www.de.endress.com

CP01199K/09/EN/01.16