

Sensors, transmitters, compact devices and assemblies

Experts in Liquid Analysis





Endress+Hauser – Your partner

Endress+Hauser is a global leader in measurement instrumentation, services and solutions for industrial process engineering.

For more than 70 years, Endress+Hauser has been a reliable partner for customers around the world in improving their processes. We support our customers in major tasks such as digitalization or decarbonization and contribute to people's health, nutrition and well-being. We provide our customers with the most comprehensive offering in the industry and efficient solutions for digitalizing their plants. Thanks to valuable insights into their processes, our customers can make better decisions. We bring a lot of industry expertise and deep application knowledge to our work. Our customers benefit from this experience when tackling their challenges. As a family-owned company, we also stand for longevity and stability. That's why our customers can always rely on us – today and tomorrow.

Global network

We maintain a close presence to our customers worldwide. With our own sales centers, plus select representatives, we guarantee competent support around the globe. Product centers on four continents and an efficient supplier and logistics network ensure fast and flexible delivery to our customers, wherever they are located.

Sustainable development

For us, profit is not the ultimate aim, but the result of good management. We place a high value on being financially solid. The bulk of our earnings is reinvested in the company to ensure our continued success and independence.

Expertise in liquid analysis

Within the globally active Endress+Hauser Group, Endress+Hauser Liquid Analysis is a leading international manufacturer of sensors, transmitters, assemblies, analyzers, samplers and complete solutions for liquid analysis. As a center of excellence, we have worked hard over the last 50 years to achieve a top-ranking position on the international market. Endress+Hauser Liquid Analysis has six production plants: Gerlingen (Germany), Waldheim (Germany), Groß-Umstadt (Germany), Anaheim (USA), Suzhou (China) and Aurangabad (India).



Gerlingen, Germany



Waldheim, Germany



Groß-Umstadt, Germany



Anaheim, USA



Suzhou, China



Aurangabad, India

Precise liquid analysis

Environmental protection, consistent product quality, process optimization and safety – just a few reasons why liquid analysis is becoming increasingly essential.

Liquids such as water, beverages, dairy products, chemicals and pharmaceuticals have to be analyzed day in and day out. We offer application expertise and cutting-edge technologies to support in these processes. Our comprehensive portfolio always offers the product best suited to your process needs.

- From standard sensors to complete measuring stations – we provide cutting-edge technology for every liquid analysis parameter.
- Our high-precision instruments help you to increase product yield, improve product quality and ensure process safety.
- State-of-the-art communication interfaces and protocols enable you to seamlessly integrate our devices into your production and business processes and your plant asset management.
- Whether process lab, process or utilities – leverage our know-how and expertise to optimize your application.
- As a leading supplier of analytical measuring technology, we support you during the entire product life cycle - wherever you are in the world.



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Liquid analysis in industries

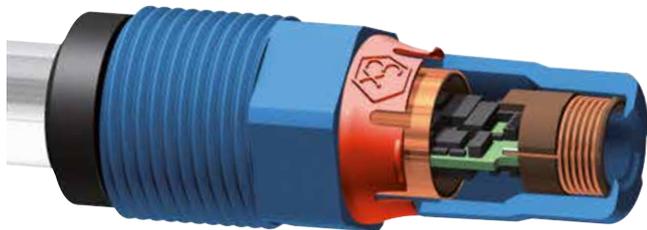
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Memosens 2.0 - Simple, safe, connected

Liquid analysis places high demands not only on the sensor element but also on the transmission of the measured value from the sensor to the transmitter. When measuring pH, low currents and very high sensor internal resistances also require a high-impedance connection to the transmitter. Moisture in the connection can change the measured value and may even result in measurement failure.

Memosens technology has revolutionized data transfer security by digitalizing the measured value in the sensor and transferring it to the transmitter without a contacting, hence moisture-sensitive, connection.

This jump in technology has eliminated general limitations encountered to date.



Memosens 2.0 is leading Memosens technology into the future. The upgraded sensor electronics offer:

- Ideal foundation for IIoT connectivity: You always have the relevant information on your measuring point close to hand using the right app.
- Predictive maintenance 2.0: The storage capacity for up to 8 times more relevant data provides an excellent basis for predicting maintenance requirements and planning maintenance cycles. This ensures more accurate process management and enhanced plant management.
- Increased flexibility when configuring the measuring point even in hazardous areas: Any Ex-approved Memosens 2.0 sensor can be connected to any Ex-approved Liquiline transmitter.

Memosens 2.0 collects networked data

Maintenance strategies taken to a new level

- The upgraded electronics unit means that the new sensors can store eight times more calibration data.
- More available data enables customers to develop a specific maintenance strategy for their measuring points, e.g. with Heartbeat Technology, thereby extending the sensor service life.
- By exchanging, cleaning and calibrating them regularly, Memosens sensors can live up to 30% longer – even in harsh conditions.
- For further analysis and optimization of the measuring points, Memosens 2.0 can be supplemented with the Memobase Plus software, which enables full tracking of all sensors.

Ideal basis for IIoT services

- The sensors' digital data can be transferred directly to the Netilion cloud and used for IIoT applications such as Netilion Health or Value.
- Netilion Health allows our customers to query the sensor's health status from anywhere via smartphone, tablet or laptop and respond quickly to an unexpected event.
- Netilion Value allows customers to access their measured values at any time and from anywhere so they always know exactly what is happening at the plant. Digital access to this information means that they can accurately manage the quality of their operating processes – even remotely.

Memosens 2.0 is easy to use

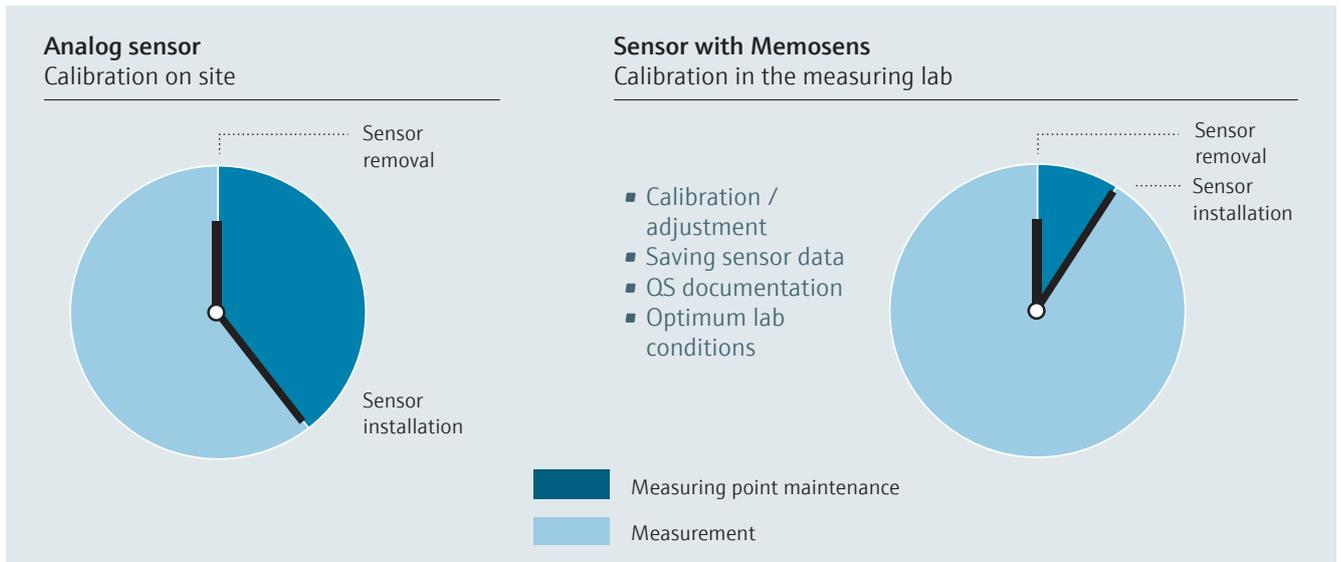
Very user-friendly

- The bayonet lock of the plug-in head can be easily opened and closed without twisting the cable.
- Real plug & play: Each Memosens sensor is automatically recognized and identified by the transmitter.
- Sensor and process-specific data is stored directly in the sensor head. Personnel no longer need to worry whether they have all they need for calibration when they are out in the field – they simply take a precalibrated sensor and exchange it on-site.
- Calibration is performed in the comfort of the laboratory where harsh weather conditions and difficult access to measuring points do not cause complications.
- Quick sensor replacement at the plant reduces the time required for maintenance and thus plant operating costs.



Benefits

- Safe digital data transmission: inductive, corrosion-free, 100% reliable
- Sensors store up to 8 times more calibration data for predictive maintenance and IIoT services
- Fast plug & play with pre-calibrated sensors
- International de-facto standard



Memosens 2.0 guarantees reliability

Reliability you've come to expect

- Memosens technology digitizes the measuring signal in the sensor and sends it to the transmitter via an inductive, non-contact connection. This makes the measurements completely resistant to environmental influences such as moisture, corrosion and salt bridges.
- The galvanic isolation of sensor and transmitter eliminates interference signals.
- The digital measured value transmission automatically results in an error message if the signal flow is interrupted: this dramatically increases the reliability and availability of the measuring point.

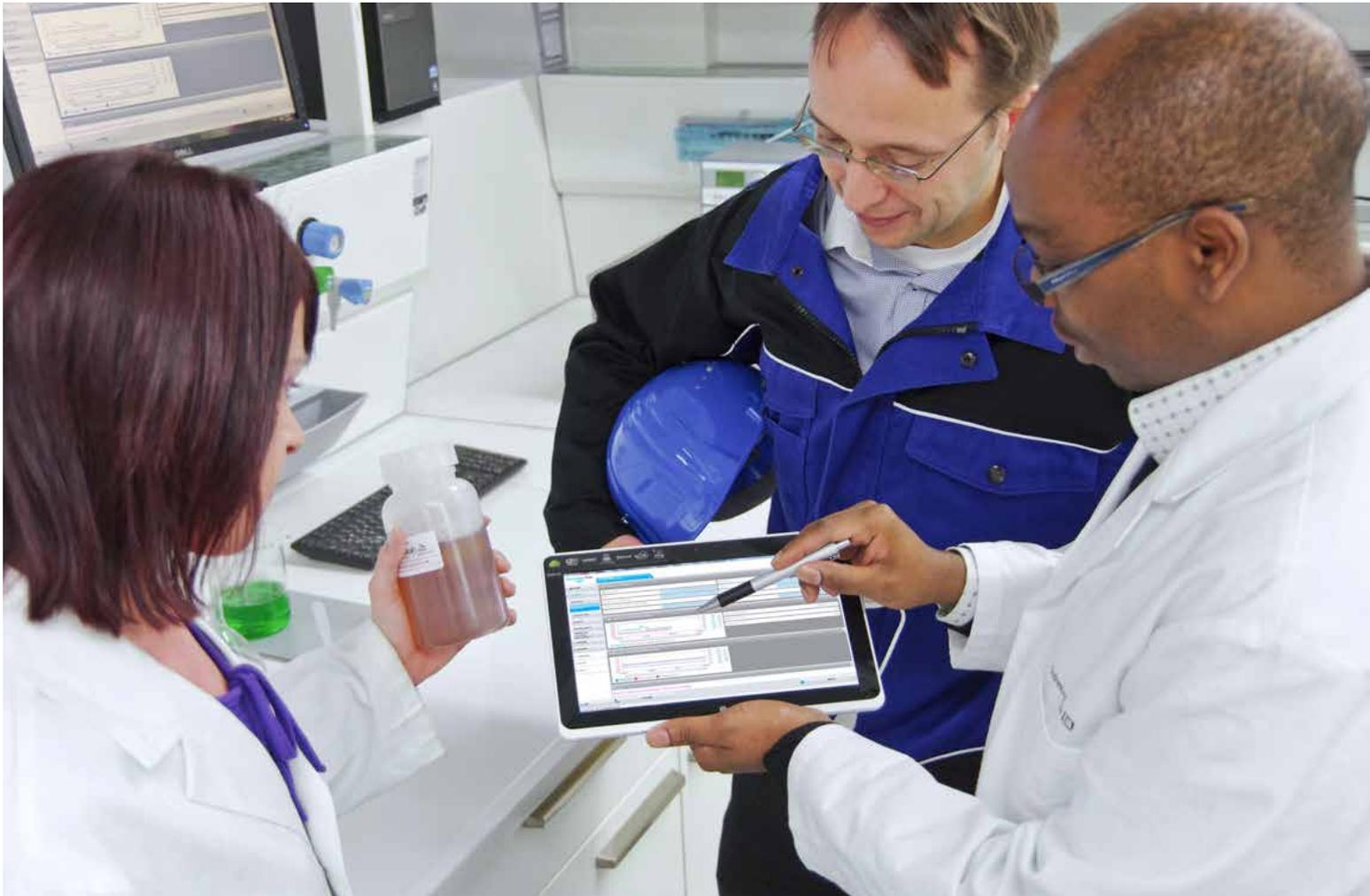
Maximum flexibility even when setting up a measuring point in hazardous areas

- All transmitters, from a multiparameter and multichannel Liquiline transmitter with cCSAus approval to the Ex-approved Liquiline CM42 transmitter or the compact Liquiline Compact CM72/CM82 with Ex approval, can be combined with the Memosens 2.0 sensor versions for hazardous areas.
- Be it a field device, panel mounting or compact transmitter, compliance with the requirements for hazardous areas is always guaranteed and the measuring point is compatible.
- The plant planning stage is easier and faster and plant safety is increased.



Video about Memosens technology





Memosens sensor and measuring point management

Measure, calibrate and document with Memobase Plus

Memobase Plus enables easy and accurate calibration of Memosens sensors and documentation of the entire sensor life cycle, offering full traceability with minimum paperwork. It can also be used as a laboratory measuring device in combination with a standard PC.

Better process safety with sensor traceability

Memobase Plus offers a complete lifetime history of all Memosens sensors used.

- Beneficial for GLP, GMP, Audit Trail, enables you to operate in accordance with FDA 21CFR Part 11 and comply with the standards of the life sciences industry.
- Documents as-found/as-left values, to identify and store changes in the sensor characteristics during the batch.
- Offers network functionality to store all values in a central database: even local calibrations with a laptop are synchronized as soon as the computer re-connects to the network.

Increased efficiency with simple sensor

maintenance: With plug and play technology, Memosens sensors can be exchanged in the process for convenient maintenance and calibration in the laboratory or workshop.

Improved process reliability with sensor diagnostics

Memobase Plus stores sensor performance data for true sensor diagnostics.

- Programmable value limits for sensor exposure to adverse conditions ensures optimum sensor performance.
- Timely sensor cleaning and regeneration extends sensor life.

Versatile measuring station High-performance instrument for use with up to four Memosens sensors simultaneously.

- Storage and export of measurement data enable fast and easy creation of high quality reports.
- Use of an identical sensor in the lab and the process minimizes the risk of inconsistency between laboratory results and online values.
- Real multipoint sensor adjustments and calibrations provide optimum accuracy for your measurements.

Easy buffer management You use a scanner to import the lot number, the expiry date, etc. of our buffers into Memobase Plus. This allows you to easily trace which sensor has been calibrated with which buffer.

Memobase Pro App

With the powerful Memobase Pro app, you can turn your smartphone into a smart measurement and calibration system. Connect your smartphone to a Liquiline Mobile CML18 via Bluetooth and quickly and easily perform many daily tasks digitally. For example, enrich sample measurements with GPS coordinates and a photo of the measuring point, and document the measured data directly in the app. Also, calibrate and adjust your sensors via a guided procedure and benefit from an easy-to-use buffer management.

- Interface with excellent usability, dashboards and sophisticated visualizations
- Save measured data automatically with a unique ID and time stamp and add GPS coordinates, photos and comments if required
- Traceable sensor management including operation and calibration history and status indication as per NAMUR NE107
- Make it easy and scan the QR code to import all the data of the reference solutions used and traceably document the sensor calibrations with the app
- Sample measurements and calibrations with the associated sensor data and reference solutions can be directly accessed on the smartphone at all times



Qualification and servicing of measuring points with Memosens technology

Reliable measurements are a prerequisite for high process safety. With the Memocheck tools you can always be sure that measured value transmission is error-free, since these tools simulate measured values for qualification of digital data transmission.

- Comprehensive checks: from cable coupling to process control system
- Flexible application: for all transmitters with Memosens technology, available for hazardous or non-hazardous areas
- Always precise: Requalification with quality certificate possible

Memocheck Sim is the tool to check all parameters. It simulates freely configurable measured values, value ramps, errors and calibration values and supports you during installation, commissioning or troubleshooting of various measuring points.

Memocheck supports service personnel during quick online measuring point checks. The double plug-in head simulates two predefined sensor statuses.



Benefits

- Reliable measurements guaranteed
- Full traceability
- Better comparability of process and laboratory

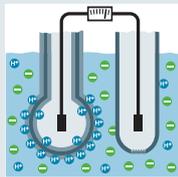


Measuring parameter overview

	Description	Applications
pH/ORP	<p>Description pH value monitoring guarantees optimized production output in all areas of industry. Furthermore, the pH value is a critical controlled variable that affects plant efficiency. Endress+Hauser's reliable products help protect people and the environment, and guarantee the quality of high-grade products.</p>	<p>Applications</p>  <ul style="list-style-type: none"> Process control in the chemical industry Municipal and industrial wastewater treatment plants Control in the food industry
Conductivity	<p>Description Monitoring electrolytic conductivity is important for monitoring wastewater treatment and controlling cleaning processes (CIP) in the food and pharmaceutical industries. In the chemical industry, conductivity is used to determine the concentration of acids and bases.</p>	<p>Applications</p>  <ul style="list-style-type: none"> Monitoring of WFI water in the pharmaceutical industry Monitoring of cleaning processes Monitoring of boiler feedwater Control of water treatment
Turbidity	<p>Description In drinking water, the turbidity value is an important measure of quality. In the field of wastewater treatment, turbidity is measured to control wastewater treatment processes for primary sludge, sludge dewatering and in the aeration basin and outlet.</p>	<p>Applications</p>  <ul style="list-style-type: none"> Drinking water measurement in the fine turbidity range Monitoring of residual water in the concrete industry Monitoring of the sewage treatment plant outlet
Dissolved oxygen	<p>Description Dissolved oxygen is a key water quality indicator when monitoring surface water or in water treatment systems. It is also a critical factor in ensuring a highly effective aeration basin system and in guaranteeing optimum conditions for fish farming.</p>	<p>Applications</p>  <ul style="list-style-type: none"> Controlling in the aeration basin Monitoring of boiler feedwater Control of fermenters Measurement in inertization and beverage bottling
Disinfection	<p>Description Precise monitoring of disinfection processes is important in all areas of water treatment to ensure people's health, protect the environment and guarantee safe industrial processes. The disinfectants used range from chlorine via bromine to ozone.</p>	<p>Applications</p>  <ul style="list-style-type: none"> Disinfection in drinking water treatment and distribution Disinfection in seawater desalination Safe process and cooling water No harmful substances in wastewater
Analyzers	<p>Samplers</p> <p>SamplersPage 34</p> <p>Nutrients</p> <p>For automatic sampling, defined distribution and preservation of liquid samples</p> <ul style="list-style-type: none"> CSF48 stationary samplers CSP44 portable samplers <p>Carbons</p> <p>Industrial parameters</p> <p>Analytical solutions</p>	<p>Nutrients.....Page 34</p> <p>Online systems for measuring nutrient parameters</p> <ul style="list-style-type: none"> Ammonium Nitrate and nitrite Phosphate and total phosphate

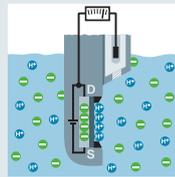
Measuring principle

Potentiometric measuring principle.....Page 12



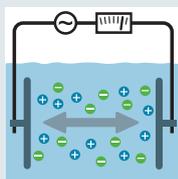
Based on a pH-sensitive glass membrane on which hydrogen ions accumulate, thereby causing electrical potential to build up.

Ion-selective measuring principlePage 14



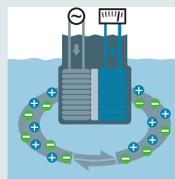
The ISFET is a simple transistor which is isolated from the gate by an isolator. Hydrogen ions can accumulate on this gate.

Conductive measuring principlePage 18



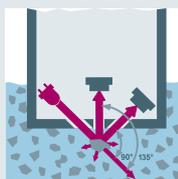
An alternating voltage is applied to two electrodes located in the medium. The conductance value is calculated according to Ohm's law.

Inductive measuring principlePage 19



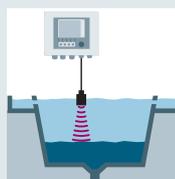
Based on an alternating magnetic field that induces an electrical current in the medium which generates a magnetic field in the secondary coil.

Optoelectronic measuring principlePage 21



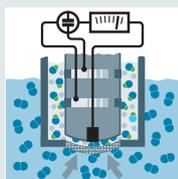
A beam of light is directed through the medium and scattered by elements with a greater optical density.

Ultrasonic measurement.....Page 22



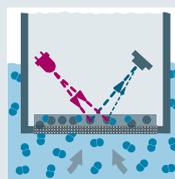
A piezoelectric crystal generates an ultrasonic signal that reaches solid particles and comes back to the receiver.

Amperometric measuring principle.....Page 24



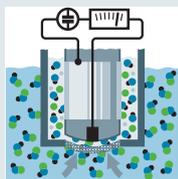
Oxygen reaches the working electrode via a membrane and is converted to an electric current. A counter electrode keeps the system running.

Fluorescence quenching.....Page 25



Marker molecules are excited by a green light and respond with a red fluorescent light. Oxygen molecules adapt and reduce the fluorescent light.

Amperometric measuring principle.....Page 27



Chlorine is reduced at the gold electrode. The electron acceptance is proportional to the concentration of chlorine.

CarbonsPage 34

Systems for determining organic load of water

- SAC (spectral absorption coefficient)
- BOD (biological oxygen demand)
- COD (chemical oxygen demand)
- TOC (total organic carbon)

Industrial parameters.....Page 34

Different water quality requirements depending on the branch of industry

- Softened for rinsing and washing water
- Without calcium for industrial water
- Without dyes or iron for paper

Analytical solutions Page 34

Turn-key solutions with all necessary measuring devices

- Monitoring stations from panels up to complete measuring containers
- Automation solutions for process optimization

Experts in pH measuring technology

Experienced, skilled, reliable

Endress+Hauser pH measuring systems are in operation anywhere priority is given to reliable measured values, a high degree of availability and long operating times. With an annual production rate of over 330,000 process sensors, the company is an international market leader.

With its accredited calibration laboratory, Endress+Hauser sets a new standard when it comes to ensuring correct measurement results. For our customers, this means they can rely completely on our pH quality buffers.

Research and development pay

Ranging from non-glass pH sensors to fully automated measuring points, R&D certainly pays off and means we can offer excellent price/performance ratios to our customers. With their twin-chamber reference system or ion traps and gel compositions for tough, chemical applications, our sensors offer maximum protection against contamination and a wider measuring range.

They boast a service life many times that of conventional pH/ORP sensors, which translates to a significant reduction in operating costs for pH measuring points. Further examples of new technology include sensors for fermenter applications with a pressurized reference system or sensors for upside-down installation.

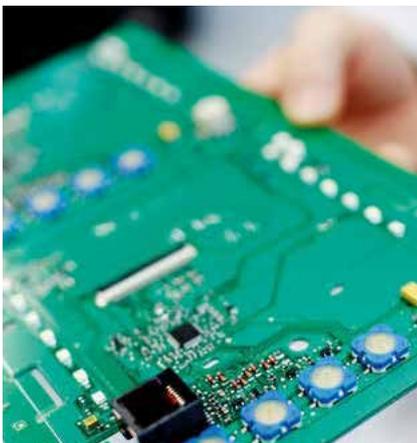


Benefits

- Long electrode operating times reduce operating costs
- Consistently high product quality
- Outstanding price/performance ratio
- Excellent manufacturing structure guarantees high product availability



Video on pH measuring principles



The pH sensor portfolio covers the complete range of applications:

- Water and wastewater treatment and long-term monitoring: Standard sensors with A-glass for fast response times and PTFE junctions for durability (CPS11E).
- Fast-changing medium compositions or low conductivity in the chemical industry: Sensors with chemically highly resistant B-glass, liquid reference and ceramic junction to guarantee fast responses in these applications (CPS41E).
- Hygienic applications in the food and life sciences industries: Sensors with ion trap to protect against poisoning and highly resistant N-glass with excellent durability for autoclaving, suitable for SIP to 140 °C and CIP (CPS61E).
- High fiber or particle content in the pulp & paper or power & energy industries: Sensors with open junction and durable B-glass to avoid blocking (CPS91E).
- Applications that do not tolerate glass breakage, for example in the food industry, or with high organic solvent content: Unbreakable ISFET sensors with a chip that is insensitive to organic solvents (CPS47E, CPS77E, CPS97E) or long-life, CIP- and SIP-suitable enamel sensors (CPS341D)
- Highly sensitive applications that require extremely accurate monitoring: Combined pH/ORP sensors with various reference systems (CPS16E, CPS76E, CPS96E).

All important Endress+Hauser sensors are approved according to ATEX, IECEx, IK Ex, CSA C/US, NEPSI, Japan Ex and Korea Ex for applications in zone 0, zone 1 and zone 2 hazardous areas.

! Benefits

- Complete portfolio for all kinds of applications
- All relevant approvals
- Memosens technology for highest reliability

Memosens - a strong partner in pH measuring technology

The advantages of Memosens technology are particularly evident in the pH measuring domain. Problems with moisture are a thing of the past. In addition to excellent transmission reliability, for the first time ever a system is available that can detect a cable break or other interruptions in the measuring signal. This, in turn, significantly reduces process downtime.



Safe transmission of measured values

To ensure safe transmission of measured values from contacting plug-in systems, double-shielded measuring cables are required to prevent electromagnetic interference impulses.

With Memosens technology, values and data are digitized directly in the sensor and transmitted with a standard low impedance bus cable. New generation Memosens technology also provides the ideal basis for predictive maintenance and IIoT services.



Flexible measuring point concepts for every need

Endress+Hauser not only offers a complete sensor portfolio but also a wide range of transmitters and assemblies. Transmitters range from basic one-channel transmitters to multichannel and multiparameter transmitters for up to 8 sensors. There is a unique range of assemblies and retractable assemblies to choose from, with many different process connections for every installation position and a wide range of materials



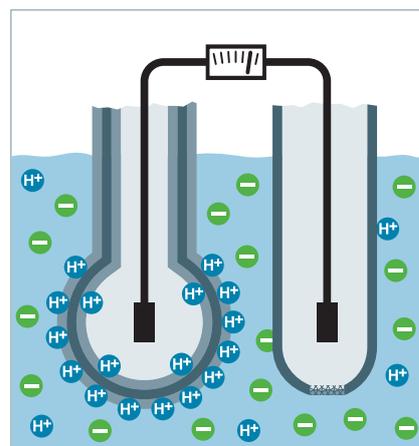
ranging from PVC to stainless steel and Hastelloy. All sensor types fit into the same assemblies. As a result, it is easy to convert to another sensor type even in difficult applications. If you're looking to upgrade a manual measuring point to a fully automated pH system, you will find the ideal solution in Liquiline Control CDC90.

pH sensors using the potentiometric method

The method of pH measurement using glass electrodes is a potentiometric measurement method. Since glass is an electrical insulator, transmitters for analog pH measurement must have an extremely high input impedance. In the case of Memosens electrodes, signals are transmitted digitally without interference. The measuring effect is based on a pH-sensitive glass membrane whose surface reacts to the acid content of the solution with a specific voltage. This voltage is then measured relative to a reference element made of silver/silver chloride (Ag/AgCl).

Nowadays, the most modern pH glasses display high selectivity (low cross-sensitivity to ions other than H^+) over a wide temperature range. A pH sensor can perform linear measurement of a material component over an impressive concentration range of 14 (!) exponents. pH glass electrodes have become a standard worldwide. Glass has the advantage of being very chemically inert and very stable when working with hot acids and alkalis. This means that pH glass electrodes can be used universally in a multitude of applications.

Combined pH/ORP sensors enable simultaneous measurement of pH value and ORP potential. These values can be used to calculate the rH value which is an indicator of the oxidizing or reducing effect of a medium.



Potential buildup during pH measurement with glass electrodes

! Benefits

- Universal use (pH 0-14)
- High chemical resistance
- Lead-free shaft glass
- Temperatures up to 140 °C



1 Memosens CPS11E allround sensor

Long-term monitoring in the chemical, pure and potable water and wastewater industries; dirt-repellent PTFE ring junction; reliable measurement (pH 0-14) up to 16 bar; salt storage for pure water; easy-to-use system

2 Memosens CPS31E water sensor

Pool water, potable water, pH compensation in disinfection processes; 3 ceramic junctions for reliable measurement at low conductivity; low drift due to minimal ion depletion in electrolyte; optional salt storage for long operating life

3 Memosens CPS41E liquid-filled sensor

For all applications in chemical industry, pure water (low conductivity); for high accuracy and speed; reliable measurement (pH 0-14) in fast-changing medium compositions

4 Memosens CPS71E high-performance, gel-filled sensor

Chemical industry, chemical processes in all industries; gel type sensor with ceramic junction for fast responding; poison resistant thanks to ion trap with pressurized reference system (TP version); upside-down installation realized by TU version

5 Memosens CPS61E hygienic sensor

Bioreactors and fermenters in the biotech industry; specialized glass membrane and gel for long-term stability; precise after many CIP/SIP and autoclaving cycles (up to 140°C); certified biocompatibility; pressurized reference; version for upside-down installation

6 Memosens CPF81E contamination, abrasion-resistant sensor

Primaries, water, wastewater, paper industry, power stations; integrated assembly; flat membrane for abrasive media; double-chamber reference; large dirt-repellent PTFE junction; fixed cable available

7 Memosens CPS91E blocking-resistant sensor

Pigment production, paper industry, dye/paint production; for precipitation reactions, suspensions, emulsions; rapid response, high-stability gel

8 Memosens CPS16E combined pH/ORP sensor

Standard sensor for long-term monitoring in water treatment or the chemical industry; dirt-repellent PTFE ring junction; poison-resistant ion trap

ORP sensors using the potentiometric method

The ORP value is an indicator of the oxidizing or reducing properties of a process medium and is measured in mV. In aqueous media, the measuring range is between -1 500 mV and +1 500 mV. A precious metal electrode (silver, gold or platinum) acts as the measuring electrode. As is the case with pH measurement, the electrochemical potential is measured against a silver/silver chloride reference (Ag/AgCl) and indicated in mV.

All ORP pairs in a process make up the oxidation reduction potential. As such, in contrast to pH measurement, the ORP value is a sum parameter that cannot be assigned quantitatively to the individual ORP pairs.

Even though only one sum parameter is measured, ORP measurement is an effective and low-cost method which can be used for chromate detoxification, cyanide detoxification or to measure the metering of oxidants for disinfection purposes.

The ORP value can also be indicated as a percentage. Here, two characteristic mV values are assigned to a 20 % and an 80 % value, making it possible to detect activities pertaining to chemical reactions and also of reaction endpoints.

! Benefits

- Cost-effective measurement method
- Universal use
- Gold electrodes for oxidizing media
- Platinum electrodes for reducing media



Gold pin or platinum cap as measuring electrode



1 Memosens CPS76E combined pH/ORP sensor
Chemical industry, chemical processes in all industries; ceramic junction for fast response time; poison resistant thanks to the ion trap with pressurized reference system; upside-down installation

2 Memosens CPS96E combined pH/ORP sensor
Robust sensor for chemical processes, pulp and paper industry; open aperture for very contaminated media and suspended solids; fast response time

3 Memosens CPS12E standard sensor
Long-term monitoring in water treatment, detoxification, or the chemical industry; platinum cap or gold pin; dirt-repellent PTFE ring junction

4 Memosens CPS42E liquid-filled sensor
Chemical industry, detoxification, water treatment, power stations; for media that tend to form buildup, and fast-changing medium compositions; platinum cap

5 Memosens CPS62E hygienic sensor
Bioreactors and fermenters in the biotech industry; long-term stable, precise after many CIP/SIP and autoclaving cycles (up to 140°C) thanks to specially developed gel; certified biocompatibility; version for upside-down installation; platinum cap

6 Memosens CPS72E high-performance, gel-filled sensor
Chemical industry, chemical processes in all industries; gel sensor with ceramic junction and platinum cap for fast response time; acrylamide-free; poison resistant thanks to the ion trap; excellent resistance to temperature and pressure changes

7 Memosens CPF82E contamination-, abrasion-resistant sensor
Primaries, water, wastewater, paper industry, power stations; integrated assembly; double-chamber reference; large dirt-repellent PTFE junction; platinum ring

8 Memosens CPS92E sensor for suspensions
Paper and pulp industry; open aperture for contaminated media such as emulsions, precipitation reactions, dispersions; platinum cap for rapid response

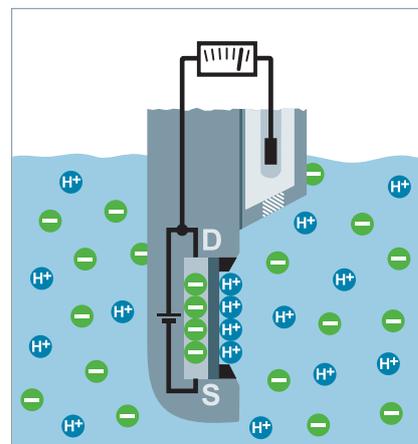
Non-glass pH sensors using the ion-selective method

The pH value can also be measured with an ion-selective field effect transistor (ISFET). It is, in effect, a simple transistor with a source and drain that are separated from the base gate by a semiconductor. Hydrogen ions from the medium may accumulate here. The resulting positive charge on the outside is "mirrored" on the inside of the base where a negative charge occurs. This makes the semiconductor channel conductive. The lower the pH value of the liquid, the more H⁺ ions accumulate on the base and the more current can measurably flow between the source and drain.

The accumulation of protons is a purely electrostatic effect. As a result, the sensor material does not change and the need for recalibration is by no

means as frequent as with glass electrodes. Since there is no gel-like layer, ISFET electrodes are also suitable for pH measurement in media with a low proportion of water.

Modern gate materials are highly selective and follow the Nernst law in close tolerance limits. The particularly robust nature of the sensors is a result of the ISFET chip being embedded in a stable and unbreakable PEEK body (polyetheretherketone; polymer thermoplastic with excellent mechanical and chemical resistance properties that are retained at high temperatures). ISFET-based pH electrodes are primarily used in applications where unbreakability is required, as is the case in the food and life sciences industries, since fragile glass electrodes could cause problems if broken.



The current between the source and drain of the semiconductor element depends on the charge at the base and thus directly on the pH value



! Benefits

- Non-glass, break-proof electrode
- Reliable measurement even with low water content
- Fast response
- Precise at low temperatures
- Improved CIP stability

1 High-performance sensor Memosens CPS47E

For high levels of organic solvents and clogging media; liquid KCl reference, ceramic junction, FDA, EHEDG, 3-A certified; USP87, USP88 class VI, USP381, USP661; perfluorelastomer seal with all hygiene certificates; overhead installation possible

2 Hygienic sensor Memosens CPS77E

For hygienic and sterile applications; bacteria-tight thanks to gel-filled reference and micro-porous ceramic junction; 6 times higher CIP stability, sterilizable, autoclavable; FDA, EHEDG, 3-A certified; USP87, USP88 class VI, USP381, USP661; perfluorelastomer seal with all hygiene certificates

3 Sensor for suspensions Memosens CPS97E

For contaminated media in the chemical and paper industries; for low temperatures and high particle content; open aperture; reference system with stabilized gel; best cleanability thanks to sensor head design and larger measuring surface

4 Sensor with pH-sensitive enamel Ceramax CPS341D

Pharmaceutical industry, food & beverage; CIP/SIP capabilities; no aging, extremely corrosion resistant



Fully automated measurement, cleaning and calibration

Continuous maintenance of the sensor guarantees a high degree of accuracy and the highest level of availability of a pH measuring point. However, this causes a hike in operating and maintenance costs, particularly in applications with strict requirements, such as in the chemical, food and life sciences industries or with measuring points with aggressive process conditions. Endress+Hauser offers fully automatic measuring, cleaning and calibration systems for up to two Memosens pH sensors to keep these costs to a minimum.

We conduct Factory Acceptance Tests (FAT) and Site Acceptance Tests (SAT) to make sure that the systems meet your requirements.

Liquiline Control CDC90

Liquiline Control CDC90 offers high sensor availability and maximum reproducibility of calibrations, ensuring reliable measurement results and a long sensor lifetime, particularly in aggressive and highly contaminated media. Thanks to its web-based technology, Liquiline Control CDC90 supports remote access from anywhere at any time. Access is possible via process control systems or any mobile device such as tablets, smartphones or notebooks.

✓ When do I use Liquiline Control CDC90?

- The pH sensor must be cleaned and calibrated frequently.
- The pH measuring point is difficult to access.
- The process demands reproducible precise pH measurements.
- Appropriate maintenance of the pH measuring points is difficult due to lack of resources.
- The pH sensor must be calibrated frequently between batch processes or even during a batch process.

High product safety and product yield

- Customizable cleaning and calibration cycles ensure high process safety, product quality and optimum product yield. Substances blocking or soiling the sensors are removed in good time.
- Intelligent media distribution and dosing ensure reproducible calibration results and reliable measured values at all times.

Maximized occupational safety

- Maintenance and service measures are reduced to a minimum. Plant personnel visits to potentially dangerous sites are minimized.

- The need for manual cleaning and calibration in difficult-to-access and dangerous areas is eliminated.

Reduced operating and maintenance costs

- Process integration is easy and seamless thanks to a certified communication standards such as 0/4 to 20 mA, PROFIBUS DP, Modbus TCP, EtherNet/IP, PROFINET and webserver technology.
- Efficient distribution and dosing of buffers and cleaning agents ensure minimum consumption and reduced operating costs.



- 1 CDC90 control unit
- 2 Pneumatic control unit
- 3 Double-membrane pumps
- 4 Cleaner and buffer canisters
- 5 Cover and media valves

Experts in conductivity measurement

Experienced, skilled, reliable

Over 40 years ago, Endress+Hauser began using the measurement of electrolytic conductivity not only to monitor water treatment, but also to control cleaning processes in the food industry (CIP = Cleaning in Place). Today, we are a leader in this field to. Since the early days, the range of applications for conductivity measurement has been constantly expanded, with new products introduced for the chemical and pharmaceutical industries, which means that Endress+Hauser now supplies all industry sectors.

High-tech production

Cutting-edge plastic injection molding and connection techniques are key processes in the production of sensors. Before being packed for distribution, each individual sensor is inspected and its cell constant measured. The electronic components are produced

on state-of-the-art pick-and-place machines and assembly stands. Each assembly is individually tested. The production subsystems are centrally controlled and allow a high degree of flexibility teamed with excellent production safety. This guarantees consistently high product quality.

Developing solutions for customers

In addition to the clear segmentation of the product portfolio for individual industries, Endress+Hauser also provides support in planning and implementing customized solutions. Qualified experts are on hand to provide our customers with professional application advice. Furthermore, Endress+Hauser also offers services to ensure the long-term reliability and availability of the measuring systems.

! Benefits

- EHEDG-certified sensors for ultrapure water
- Injection molding technology for particularly smooth surfaces
- Consistently high product quality
- Excellent manufacturing structure guarantees high product availability

Video on conductivity measuring principles



Conductivity sensors using the conductive method

The electrical conductivity of liquids is determined using a measuring arrangement incorporating two electrodes located opposite one another - as in a capacitor.

The electrical resistance R , or its reciprocal value - the conductance value G - is measured applying Ohm's law. From this, the specific conductivity (Greek; kappa) is calculated using the cell constant k , which describes the geometry of the individual electrode arrangement:

$$\kappa = k \cdot G = k / R$$

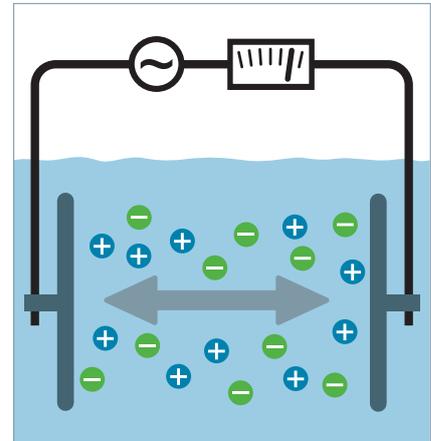
The cell constant k usually has the unit cm^{-1} and is specified by the manufacturer for each sensor. With an ideal plate capacitor, the cell constant is:

$$k = \text{electrode spacing} / \text{electrode surface}$$

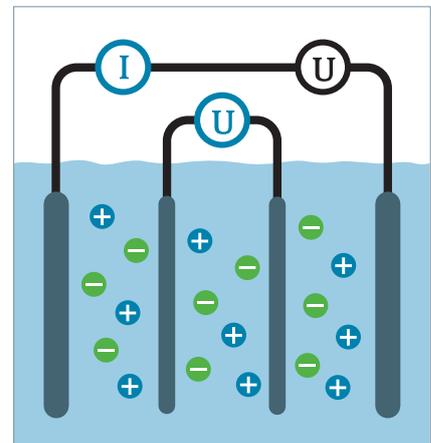
The choice of sensor with a specific cell constant depends on the desired measuring range: the lower the conductivity, the smaller the cell constant selected. The size of the cell constant determines the optimum arrangement of the electrodes. For example, for ultrapure water the preference is for a concentric arrangement of cylindrical electrodes.

Four-electrode method

The four-electrode method is particularly suited to applications which cover a wide measuring range. The sensor has two additional electrodes to compensate for polarization effects that occur with two-electrode sensors at higher conductivities. The two additional electrodes measure the voltage drop in the medium which depends on the medium's conductivity. The connected transmitter calculates the conductance from the measured voltage and the given current.



Two electrodes are located opposite one another - as in a capacitor



Two additional inner electrodes compensate the polarization effect.

! Benefits

- High sensitivity
- Can be used over a wide range
- Simple design



1 Condamax CLS12/13 high-temperature sensor

Industrial and power plant applications (boiler feedwater); measurement of low conductivity values at high pressures (up to 40 bar) and high temperatures; Ex approval

2 Memosens CLS15E pure and ultrapure water sensor

Monitoring of ion exchangers, reverse osmosis, distillation and chip cleaning; electropolished electrode surfaces; Ex approval

3 Memosens CLS16E hygienic sensor

Pharmaceutical industry, WFI (Water for Injection); monitoring of ion exchangers, reverse osmosis, distillation, FDA, EHEDG and 3A certificates; Ex approval

4 Memosens CLS21E drinking water and wastewater sensor

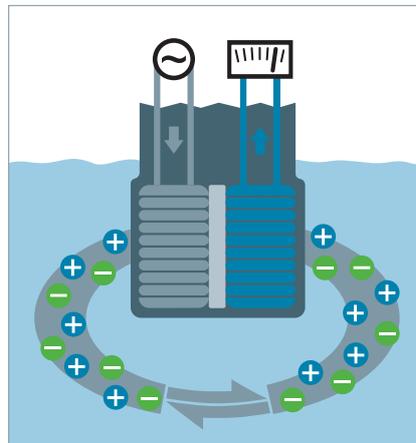
Medium separation; potable water treatment; wastewater treatment; measuring range up to 20 mS/cm; Ex approval

5 Memosens CLS82E 4-electrode sensor

Life sciences; monitoring of phase separation, fermentation or chromatography; FDA-listed, EHEDG, 3-A certificates, complies with USP Class VI; suitable for CIP, SIP, autoclaving; wide measuring range 1 $\mu\text{S}/\text{cm}$ - 500 mS/cm

Conductivity sensors using the inductive method

In the case of inductive conductivity measurement, a transmitter coil generates a magnetic alternating field that induces an electrical voltage in the medium. This sets the positively or negatively charged ions in the liquid in motion and an electrical alternating current flows through the liquid. This current produces a magnetic alternating field in the receiver coil. The induction current produced in the coil in this way is evaluated by the electronics system and used to calculate the conductivity.



A magnetic alternating field induces an electrical voltage in the medium



Benefits

- No restrictions for high conductivity values due to polarization effects
- No galvanic contact with the medium
- Not sensitive to contamination



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1 Indumax CLS50D/CLS50 robust sensor
Concentration measurements for acids, bases and salts, product monitoring, wastewater treatment; excellent chemical resistance properties thanks to PEEK or PFA; up to 125 or 180°C; Ex approval

2 Indumax CLS54D/CLS54 hygienic sensor, Smartec CLD134 measuring system
Food and life sciences industries; ideally suited to control of CIP processes and detection of phase separation; certified hygienic design: FDA, EHEDG, 3-A, USP <87> and <88> class VI

3 Smartec CLD18 cost-effective, hygienic measuring system
Food & beverage industry; ideally suited for control of CIP processes and detection of phase separation; certified hygienic design: FDA, 3-A, EHEDG; optional IO-Link for easy integration into the plant infrastructure

Experts in turbidity and sludge level measurement

Focus on water and wastewater

In the turbidity and sludge level measurement field, the focus is on providing solutions for the water and wastewater industries. Whether you're measuring turbidity downstream of a waterworks sand filter the optical metrology limit range or the solid contents of sewage sludge which is too concentrated to be pumped, Endress+Hauser's sensors cover a wide range of applications. With the 90-degree scattered light measurement system that complies with DIN/ISO specifications, we provide a universal sensor system that can be used for most common applications. Our product portfolio is complemented by absorption sensors that measure the transmitted light and sensors based on the 4-beam alternating light method. Depending on the particular measuring range,

these use scattered light, forward scattered light or backscattered light. These optical sensors are also used in sludge level measurement. Ultrasonics provides an alternative method for determining the level of sediment in a basin or container by measuring the "time-of-flight" of the acoustic signal.

Flexible installation

Turbidity sensors from Endress+Hauser are suitable for installation in pipes or containers and for immersion applications in basins or channels. A wide range of assemblies safely positions the sensor in the process, including the CYA112 immersion assembly, the CYA251, CUA252, CUA262 flow assemblies, and the CUA451 ball valve retractable assembly.

! Benefits

- Cost-saving solutions for control, monitoring and quality assurance
- Compact devices and sensors
- Factory calibration offering long-term stability
- Versatile applications

▶ Video on turbidity measuring principles



Turbidity sensors using established scattered light methods, 4-beam alternating light method and attenuation measurement

Scattered light methods

The 90-degree scattered light method in accordance with ISO 7027 / EN 27027 measures turbidity values under standardized, comparable conditions mainly in the low turbidity range. The 135-degree scattered light method is optimized for the measurement of high turbidities. With both methods, the solid particles in the medium cause the incident light to scatter. The scattered light thus generated is measured using scattered light receivers. The turbidity of the medium is calculated from the amount of scattered light.

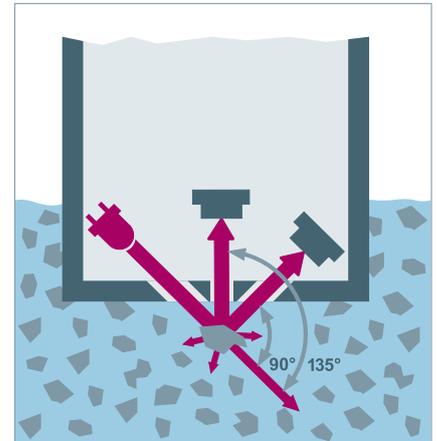
4-beam alternating light method

The method is based on two lights and four detectors. Long-life light emitting diodes are employed as monochromatic light sources. These light emitting diodes are pulsed at a frequency of several kHz so as to eliminate any effects of extraneous light. With each

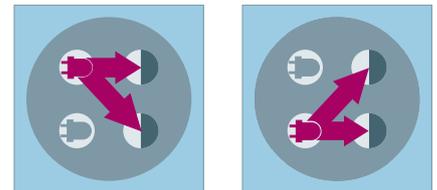
light signal, two measuring signals are detected by the four detectors. Eight measuring signals in total are processed in the sensor and converted to solid concentrations. The 4-beam alternating light method allows users to compensate for any fouling and aging of optical components.

Attenuation measurement

Attenuation measurement is also performed in accordance with ISO 7027. A light source radiates a light beam through the medium. The detector is positioned in line with the light source and detects the transmitted light. This measuring method is suitable for medium to high turbidities.



Scattered light methods: The scattered light generated by solid particles is measured at 90° and 135°



The 4-beam alternating light method compensates fouling and aging



1 Turbimax CUS52D potable and process water sensor

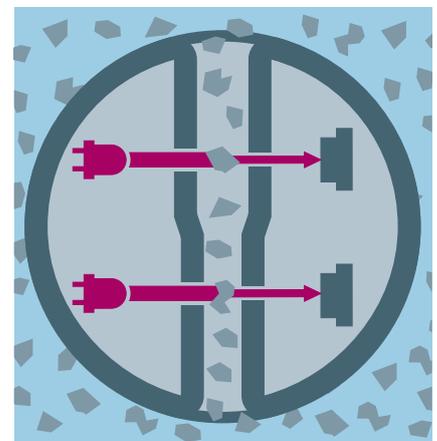
Fine turbidity range with a resolution of 0.0015 FNU; scattered light measurement according to ISO 7027; easy calibration and verification with solid state reference; hygienic version for direct inline mounting

2 Turbimax CUS51D wastewater sensor

All wastewater applications; 4-beam alternating light methods; excellent long-term stability; cleaning only - no maintenance; automatic air cleaning, if required

3 Turbimax CUS50D absorption sensor

For industrial wastewater and process applications; light attenuation according to ISO 7027; high level of measurement accuracy and repeatability; robust materials for application in aggressive media or seawater; optional automatic air cleaning

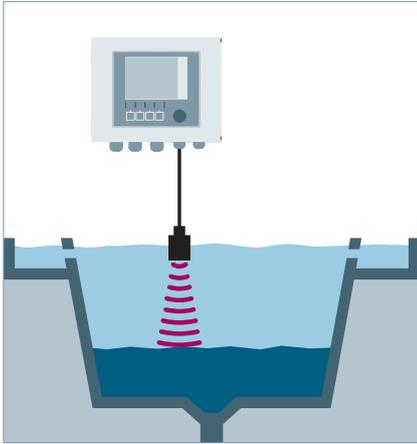


Attenuation measurement: The transmitted light is measured.

! Benefits

- Standardized measurement method
- Reliable measurements
- Excellent long-term stability
- Portfolio suits all applications

Sludge level measurement using the ultrasonic method



Ultrasonic method

In the ultrasonic method, a piezoelectric crystal is encased in a flat cylindrical plastic body. When the crystal is excited with voltage it generates a sonar signal. In the process, ultrasonic waves are emitted to scan the separation zones. The measured variable is the time the emitted ultrasonic signal needs to reach the solid particles in the separation zone and return to the receiver.



! Benefits

- Easy configuration
- Simple calibration
- Quick and easy installation



1 Turbimax CUS71D/
Liquiline CM44
ultrasonic system
Water, wastewater,
mining, chemical
industry; in
preclarification,
secondary clarification
and thickeners;
multichannel design
for parallel measuring,
no moving parts, quick
and easy to install

Experts in dissolved oxygen measurement

A solution for every industry

The dissolved oxygen sensor range from Endress+Hauser covers many applications, from controlling the aeration of activated sludge basins in wastewater treatment and residual oxygen measurement in power station boiler feedwater, to controlling fermentation in biotechnology and food processes and assessing color and taste in the production of red wine.

Established and new sensor technologies

There are two different types of sensory measuring technology: the well-known and tried-and-tested amperometry in which oxygen concentrations are converted to electric currents, and the optical method of fluorescence quenching. In the latter method, the fluorescing light of an oxygen-sensitive molecule is used to determine the concentration. The signals are then further processed in the transmitter to obtain the desired reading.

Flexible measuring point concept

Channels, pipes, tanks ... no problem. The flexible measuring point concept covers all configurations. Oxygen sensors from Endress+Hauser are designed for use in channels and basins as well as for installation in pipes and tanks. The wide range of assemblies available means that the sensor can be securely positioned where it is needed.

These assemblies include the CYA112 immersion assembly, the COA250 flow assembly and the COA451 retractable assembly. This strategy of flexibility is completed by the Liquiline platform which offers an extremely user-friendly and transparent operating concept.

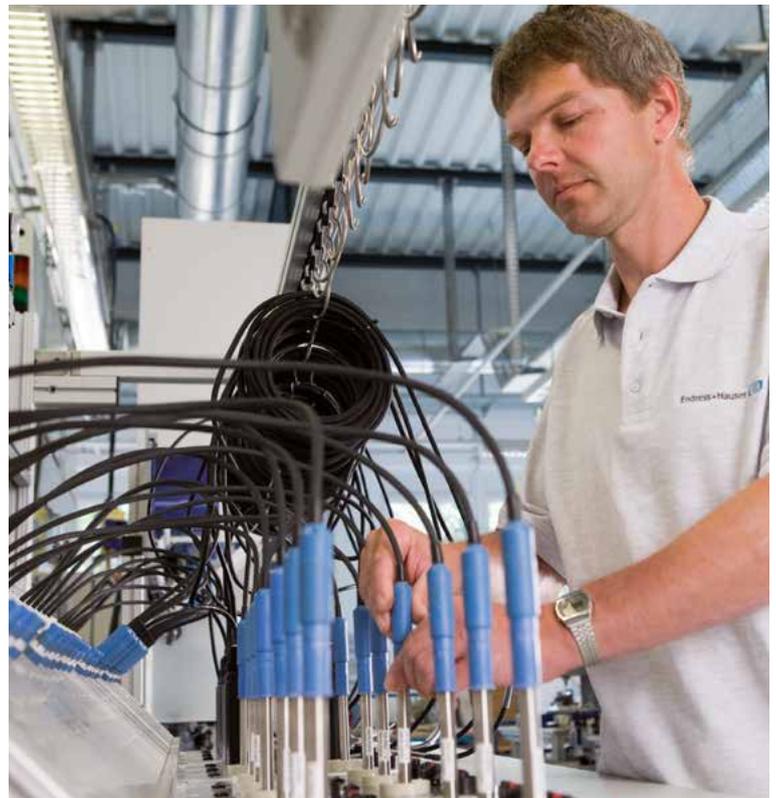
Superb product quality

Sensor production is highly automated. Testing is also performed on a fully automated test stand. Here, the zero point, slope and constancy of the sensors are checked and the results are documented. This guarantees the consistently high product quality.

! Benefits

- A wide range for all applications
- Technologies for different measuring requirements
- Flexible installation
- High-quality products guaranteed

▶ Video on the dissolved oxygen measuring principles



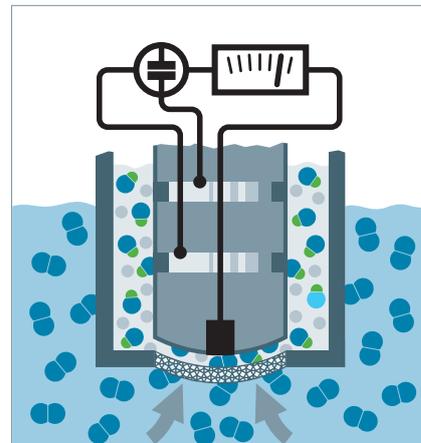
Oxygen sensors using the amperometric principle

When performing measurements using the amperometric principle, the sensor comprises a working electrode and a counterelectrode in the simplest version of the two-electrode system. Both are surrounded by an electrolytic liquid in a common chamber. A membrane provides the link to the medium or process: oxygen permeates from the medium into the electrolyte through the membrane and is converted to a current at the working electrode. The counterelectrode keeps the system running by means of a chemical equivalence reaction. The resulting current response is in direct proportion to the oxygen partial pressure. The current is converted in the downstream transmitter and displayed to the user in the familiar units of oxygen saturation, concentration (in mg/l or ppm) and oxygen partial pressure.

In more complex three-electrode systems, an extra electrode is used (the reference electrode) to accurately control and regulate the internal condition of the sensor. This sensor demonstrates a high level of long-term stability.

! Benefits

- Proven technology
- Highly accurate
- Excellent long-term stability
- With a three-electrode system



Oxygen permeates into the electrolyte through the membrane and is converted to a current



1 Memosens COS22E hygienic sensor

Digital sensor for food, pharmaceuticals, energy, chemicals, inertization; very wide measuring range: 0.001-10 mg/l trace sensor; 0.01-60 mg/l standard; 12mm stainless steel design, CIP and SIP compatible; approvals for hazardous area application approvals

2 Oxymax COS41 water sensor

Analog sensor for water treatment; tried-and-tested 40mm design; two-electrode system; measuring range: 0.0-20 mg/l

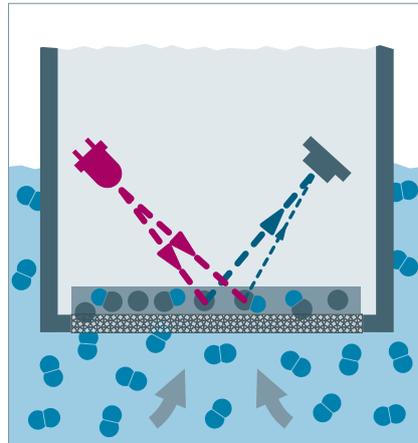
3 Memosens COS51E all-round sensor

Digital sensor for water and wastewater; very wide measuring range: 0.05-100 mg/l; 40 mm design, 3-electrode system; long-term stability

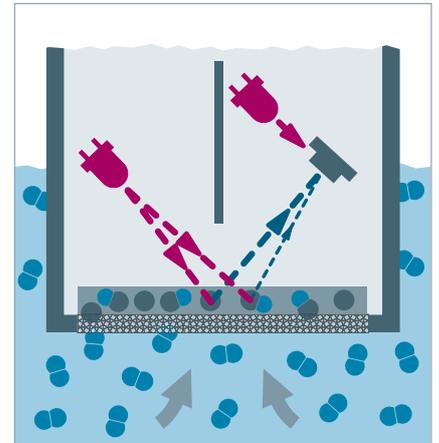
Oxygen measurement using the principle of fluorescence quenching

With the fluorescence quenching method, a layer that is permeable to oxygen also forms the junction with the process. This layer contains just as many oxygen molecules as the medium (the partial pressure of the oxygen is just as high in the medium as in the layer). It is separated from the optics at the sensor by means of a substrate that is permeable to light. The layer contains marker molecules that are optically excited with a green light and respond with a red fluorescence light.

Oxygen molecules adapt to these marker molecules and decrease (quench) the fluorescence light emitted. The reduction in fluorescence light is connected to the oxygen partial pressure, both in terms of the amplitude and the duration. The light signal is converted in the downstream transmitter and made available to the user in the familiar units of oxygen saturation, concentration (in mg/l or ppm) and oxygen partial pressure. In applications that involve higher



Oxygen molecules adapt to the marker molecules and decrease the fluorescence emitted



The reference LED compensates for the aging of the measurement LED.

temperatures, e.g. during sterilization or cleaning, sensors with reference LEDs are used. This LED compensates for the aging of the measurement LED and delivers reliable results even in demanding applications.

! Benefits

- Purely optical system
- Short response times
- Low maintenance
- Excellent availability



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1 Memosens COS81E hygienic sensor
Digital sensor for life sciences, food & beverage; wide measuring range: 0.004-30 mg/l; long-term stable measurement; certified hygienic design: EHEDG, FDA, USP Class VI, suitable for CIP and SIP; hazardous-area approvals

2 Oxymax COS61 optical sensor
Water, wastewater, fish farming; digital signal processing in the sensor; measuring range: 0.05-20 mg/l; long-term measurement stability; long maintenance intervals; intelligent self-monitoring

3 Oxymax COS61D Memosens sensor
Water, wastewater, fish farming; digital signal processing in the sensor; measuring range: 0.05-20 mg/l; long-term measurement stability; long service intervals; intelligent self-monitoring

Experts in disinfection measurement

Disinfection solutions for all applications

Disinfection solutions play a particularly important role in applications such as drinking water, industrial water treatment and swimming pools. In these applications, the focus is on safe and cost-effective water treatment and disinfection as a means of protecting people and systems. An appropriate disinfectant is added to the process in a waterworks, swimming pool, cooling tower or bottle cleaning facility. Due to their powerful disinfectant properties, chlorine and chlorine dioxide have established themselves as the state-of-the-art solution available worldwide. Ozone is often applied in the treatment process in waterworks and bromine is suitable for salt water applications such as ships' ballast water or fish farming.

Complete measuring points

The sensory mechanism uses the amperometric principle, i.e. the disinfectant concentrations are converted to electric currents in the sensor, which are then processed in the transmitter to obtain the required reading. To do this, the medium (mostly water) is supplied to the sensor via a flow assembly. The discharged medium is either returned under pressure or directed into the drain. This is referred to as a lost sample, a method commonly used in the field of drinking water for the prevention of all possible contamination.

Wide range of high-quality products

Endress+Hauser offers a wide range of sensors. Besides the sensor for free available chlorine, sensors for chlorine dioxide, total chlorine, free bromine and ozone are available. The highly automated production process guarantees consistently high quality. Testing is also performed on a fully automated testbed, where the sensors are tested for zero point, slope and constancy and the results are documented.



Benefits

- Wide range of sensors: free available chlorine, chlorine dioxide, total chlorine, free bromine and ozone
- Easy installation thanks to complete measuring panels with flow assembly
- Simultaneous measurement of pH and ORP values, conductivity and oxygen possible
- High-quality products guaranteed



Video on amperometric measuring principle for disinfectants



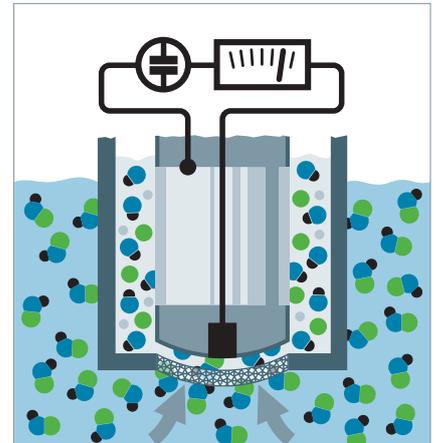
Sensors for disinfection using the amperometric principle

The sensors work in accordance with the amperometric principle in a membrane-covered cell.

Their operation can be described using the example of chlorine dioxide measurement:

The sensor includes a metallic working electrode, which is separated from the medium by a thin membrane. Chlorine dioxide coming from the medium diffuses through this membrane and is reduced at the working electrode. The circuit is completed by means of the counter electrode and the electrolyte. The electron reduction at the working electrode is proportional to the concentration of chlorine dioxide in the medium. The transmitter converts this current to the appropriate display

value. With chlorine dioxide, this process works across a wide pH and temperature range. The scenario with free available chlorine is somewhat different. In this case, hypochlorous acid diffuses through the membrane and produces a reaction. The presence of hypochlorous acid in the medium depends on the pH value. This dependency is compensated by means of pH measurement in the flow assembly and balancing in the transmitter. Total chlorine measurement also includes bound chlorine, i.e. chloramines, in addition to hypochlorous acid.



Chlorine dioxide diffuses through the membrane and is reduced at the working electrode

! Benefits

- Long-term stability thanks to the dirt-repellent, ultrasonically welded membrane
- Efficient due to fast response time
- No zero point calibration
- Low water consumption
- Low maintenance



1 Memosens CCS51E sensors for free available chlorine

Drinking water, pool water, industrial and process water; measuring ranges: 0 to 200 mg/l at flow exceeding 5 l/h (CYA27); convex, dirt-repellent membrane and ultrasonic welding for long-term stable measurement; fast response time for precise dosing

2 Memosens CS50E sensors for chlorine dioxide

Drinking water, industrial and process water; measuring ranges: 0 to 200 mg/l at a flow over 5 l/h (CYA27); convex, dirt-repellent membrane and ultrasonic welding for long-term stable measurement; fast response time for precise dosing

3 Memosens CS53E sensors for total chlorine

Wastewater and process water; measuring range: 0 to 20 mg/l including chloramines; wide pH range 5.5 to 9.5; for immersion operation in CYA112 and flow operation in CYA27; no deactivation during absence of chlorine; fast polarization for high plant availability

4 Memosens CCS55E sensors for free available bromine

Seawater, cooling and process water, pool water; measuring ranges: 0 to 200 mg/l, at a flow rate of 5 l/h (CYA27); convex membrane and ultrasonic welding for long-term stable measurement; fast response time for precise dosing

5 Memosens CCS58E sensors for ozone

Drinking water, process water, wastewater; measuring range: 0 to 2 mg/l at a flow rate of 5 l/h (CYA27); reliable thanks to highest specificity for ozone, robust membrane with high surfactant resistance, perfectly suited to cleaning processes

Monitoring panels for disinfection - practical complete solutions

The monitoring panels for disinfection are fully mounted, tested and delivered complete, including medium-conducting components and connections. All the customers have to do is connect them to the media pipe. Installation errors are practically excluded. Depending on the panel version, the media line includes a filter for sample preparation and a check valve. The sampling valve of the Flowfit CYA27 assembly facilitates easy sampling for DPD comparison measurements used for calibration.

Panels for free chlorine are the standard solution for:

- Drinking water: to monitor, control and optimize disinfection processes
- Swimming pools: to monitor the water quality
- Utilities in all industries



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1 Monitoring panel for free chlorine

Drinking water, industrial water, swimming pools; chlorine dosage for water treatment; based on Liquiline CM44 transmitter, Memosens CCS51E sensor for free available chlorine, pH and temperature measurement and Flowfit CYA27 flow assembly

These standard panels comprise:

- 1 panel
- 1 Liquiline CM44 transmitter
- 1 Flowfit CYA27 flow assembly
 - 1 module for free chlorine including sampling valve
 - 1 module for pH compensation
 - 1 module with flow indicator, flow switch and status indication light
- 1 Memosens CCS51E sensor for free chlorine
- 1 Memosens CPS31E pH sensor
- 2 CYK10 cables

Disinfection panels for free chlorine can be easily ordered as bundles under the material number 71481757.

Standard panels for the measurement of free bromine are also available as bundles. They are mainly used in seawater applications. Material number: 71518450.

The Flowfit CYA27 flow assembly offers a high degree of flexibility for designing monitoring panels. It enables simultaneous measurement of up to 6 parameters and integration of conductivity, ORP or oxygen sensors. In this way, monitoring panels can be perfectly adapted to all applications, from a single disinfection measurement to complete monitoring of water quality.



Benefits

- System is ready to connect
- Easy to access from the front
- Easy to calibrate
- Easy to maintain
- Easy ordering of the bundles



Assemblies open a window onto the process

No assembly, no measurement!

For almost every measurement, whether in the food or chemical industry or in environmental applications, an assembly is required that must be optimally designed to suit the sensor and the application. In the chemical industry in particular, monitoring, accuracy and plausibility (for example of the pH value), guarantee optimum productivity and the highest quality. The accuracy of the measured value depends on sensor maintenance, cleaning and calibration. Endress+Hauser offers a range of retractable, flow and installation assemblies, which are used to move the sensor in the process boiler, pipe or fermenter to the desired position in the medium and to remove it while the process is running.

The range of materials and process connections available to provide the right assembly solution for all possible installation positions and applications is truly unique.

For example, the new Cleanfit CPA871 assembly generation includes immersion chamber versions for application in sticky media. Its modular design makes it possible to switch between stainless steel and PEEK, PVDF, Hastelloy C-22 or titanium. The hygienic Cleanfit CPA875 assembly offers a wide range of features, from double service chamber to dynamic sealing, to meet the most stringent hygienic process requirements.



Benefits

- Process-compliant assembly family
- High degree of modularity for individual adaptation
- Flexible range of materials, from plastic to alloy for any kind of application
- Internal research and development and high-tech manufacturing



Assemblies

Retractable assemblies

Cleanfit

Only a retractable assembly offers continuous sensor availability. When the tank is full and in the event of process pressure, you can remove the sensor and replace it, or clean it and calibrate it.



Advantages and benefits

- Safety for people and processes thanks to the patented sealing concept or the use of a ball valve as a process seal
- Easy to operate with safety functions
- High level of sensor availability
- Sensors can be replaced and checked while the process is running
- Integrated rinse chamber means that maintenance, including calibration, is contamination free.



Video on the functional principle of CPA875



Installation assemblies

Unifit CPA842/CPA640

Simple and cost-effective assemblies may be used if the sensor does not require replacement or cleaning online/ under pressure and the application permits it!



- Easy fixed mounting, EHEDG-certified design
- Integrated basket protector protects against electrode breakage
- Versatile PVDF (CPA640) or stainless steel 1.4435 (CPA842) for the food and pharmaceutical industries
- Low-cost pipe and boiler mounting
- Cost-effective solution

Immersion assemblies

Dipfit

These assemblies are used mainly in wastewater treatment plants or in the chemical industry. They are also a good choice for top-mounting in tanks or containers.



- Installation in open basins, tall containers and rubberized boilers
- Sensor holder with bayonet lock facilitates dismantling and prevents twisting of the cable
- Sensor removal following removal of complete assembly
- Range of materials facilitates wide range of uses
- Installation of up to three electrodes possible

Flow assemblies

Flowfit

Flow assemblies are often found in waterworks, in the food and chemical industries and on analysis panels in power stations.



- High level of sensor availability due to bypass installation
- For 12- and 40-mm sensors
- Resistant plastic housing
- Spray cleaning possible

Flowfit CYA27

- Maximum flexibility thanks to modular design
- Up to 6 parameters can be measured in parallel
- Optional flow monitoring and cleaning/dosing module

Holder and assembly for immersion operation

Flexdip CYH112/CYA112

Flexdip holder and assemblies for immersion applications allow for modular and flexible insertion of sensors in the medium.



- For open basins, channels and tanks
- Easy, cost-effective and flexible
- Existing structures can be used
- Easy to install and service, with rapid fastening for quick installation and sensor replacement
- Assembly version in stainless steel V4A or PVC with a wide range of connection threads for all applications
- Floating versions for varying levels

Transmitters display the measured value

Transmitters complete the measuring point!

They process the measured value of the sensor and display it or make it available for further processing. They also make it possible to adapt the measuring point exactly to the operating and process conditions and to take over control tasks.

The Endress+Hauser transmitter concept comprises the Liquisys transmitters and the Liquiline platform. The platform includes the cost-efficient Liquiline CM14 one-parameter device, the high-performance Liquiline CM42 with two-wire technology, and the Liquiline CM44 multiparameter and multichannel controller. Up to 8 sensors with Memosens technology can be connected to the controller simultaneously in any desired parameter combination.

The outstanding feature of the devices is their easy and uniform operator guidance. The Liquiline multiparameter transmitter, in particular, offers unparalleled convenience. It features an integrated web server that allows the operator to remotely access device parameters via any web browser. It also offers the HART, PROFIBUS, PROFINET, EtherNet/IP or Modbus digital fieldbus protocols for seamless integration into process control systems.

The platform is completed by Liquiline Compact, the smallest transmitter for sensors with a Memosens plug-in head and the Liquiline Mobile handheld device. Liquiline Compact is particularly suited to limited mounting spaces and can be operated by any Smartphone or tablet via a secure Bluetooth connection.

The modular design of the Liquiline platform makes it very easy to expand the functionality. Its hardware and software are integrated into the Liquistation CSF48 and CSF28 as well as Liquiport 2010 CSP44 samplers and the new Liquiline System CA80 analyzer generation. All this saves you storage costs and simplifies your day-to-day work.



Benefits

- Transmitters for every application
- Reliable thanks to easy operation
- Modular design saves time and costs
- Flexible due to standardization
- Heartbeat Technology



Transmitters

Liquiline CM44/CM44R

The multiparameter and multichannel controller is suitable for all Memosens sensors and digital sensors with Memosens technology. The transmitter is available as a field device and DIN-rail version for mounting in cabinets and on DIN rails.



Advantages and benefits

- Easy operation with uniform and easy-to-understand menu guidance for all parameters and each sensor combination
- Simple commissioning and integration into process control systems thanks to HART, PROFIBUS DP, EtherNet/IP and Modbus communication
- Comfortable device configuration and checking with any browser
- Saves time thanks to preconfigured software and easy sensor replacement with precalibrated sensors with Memosens technology
- Modular and standardized components reduce maintenance and storage costs
- Heartbeat Technology offers easy and improved control of the measuring points:
 - Extended proof test cycles and standardized diagnostic messages for efficient maintenance;
 - Verification of the measuring point without process interruption simplifies the verification procedure;
 - Monitoring data for trend recognition facilitates predictive maintenance and targeted process optimization.

Liquiline CM42

The high-performance 2-wire transmitter can be used in hazardous and non-hazardous locations.



- Version for pH/ORP, conductivity, dissolved oxygen – easy switching of Memosens sensors via plug & play
- Intuitive operation with plain-text display and online help
- Easy integration into process control systems thanks to HART, PROFIBUS PA and FOUNDATION Fieldbus
- Predictive maintenance possible with sensors with Memosens technology
- Available with stainless steel housing in hygienic design

Liquiline CM14

The compact 4-wire transmitter is suitable for Memosens sensors.



- Low-priced, reliable one-channel controller for one of the pH/ORP, oxygen or conductivity parameters
- Very easy operation and handling
- Time saving and comfortable: Plug & play thanks to pre-calibrated Memosens sensors
- Safe and resistant to interference due to digital signal transmission
- Compact housing fits into standard control panels

Liquiline Mobile CML18, und Liquiline To Go CYM291

The multiparameter handhelds support Memosens pH/ORP, conductivity and oxygen sensors. Liquiline To Go CYM291 is suitable for application in hazardous areas.



- Real plug & play thanks to Memosens technology
- Reliable measurement thanks to digital, non-contact data transfer
- Suitable for demanding environments thanks to waterproof housing (IP66/67)
- Identical measuring technologies in the laboratory and the process to ensure consistent lab and process measurements

Liquiline Mobile CML18

- Easy operation via mobile devices and the Memobase Pro app

Liquiline Compact CM72/CM82

The smallest transmitter for sensors with Memosens plug-in head can be used in hazardous and non-hazardous areas.

Links to download the SmartBlue app:
Apple iOS Android



- Easy commissioning and operation via existing tablets or smartphones and the SmartBlue app (CM82)
- Fast and reliable: A secure bluetooth connection enables verification of measuring points that are dangerous or difficult to access from a safe distance (CM82)
- Reliable measurement thanks to digital, non-contact data transmission
- Space-saving installation: The 2-wire device fits inside an assembly

Liquisys

The 4-wire transmitter is available with a field or panel-mounted housing.



- Version for pH/ORP, conductivity, dissolved oxygen and chlorine
- Easy-to-understand menu structure makes configuration easier
- Large two-line display enables simultaneous display of measured value and temperature
- 4 to 20 mA, HART or PROFIBUS PA/DP outputs for connection to the process control system available
- Optional relay functions, e.g. for neutralization processes
- Extended diagnostic functions

Experts in analyzers, samplers and solutions

Analyzers and samplers

Whether you need an analyzer for certain parameters or for complex mixtures, our analyzers are simple enough to be operated by standard personnel and use few consumables. The modular design of the new Liquiline System CA80 analyzers simplifies inventory management and allows easy upgrading to a complete measuring station. Simply connect Memosens sensors, measure all analytics-relevant parameters with just one device and reduce your installation effort.

Many applications require sample conditioning for reliable and accurate results. Endress+Hauser sample conditioning units are optimally matched to your process conditions and easy to install and maintain.



Benefits

- Wide variety of measuring principles
- Easy operation and maintenance
- Low reagent consumption
- In-situ and cabinet devices for all industries and installation situations

If your process requires verification of the measuring results in the laboratory, you can use stationary and portable samplers for automatic sampling, defined distribution and preservation of your liquid samples.

Turnkey solutions for Liquid Analysis

Depending on the measuring task in question, we develop customer-specific analytical solutions such as monitoring panels, cabinets or stations as well as automation systems. We will support you from the concept development stage to implementation and commissioning.

Monitoring

Our monitoring stations are supplied in turnkey condition and contain all of the components required from sample preparation right through to the transfer of data to higher-level systems. This guarantees easy installation, operation and calibration. These monitoring solutions are individually adapted to the customer's specific ambient conditions as well as communication and service requirements.

Automation

Our automation solutions support you in optimizing your processes, whether for aeration control or phosphate dosing in a wastewater treatment plant, or automatic cleaning and calibration of pH measuring stations in the chemical or life sciences industries.



Parameter	Advantages and benefits		
<p>Samplers The new samplers from Endress+Hauser can be easily equipped with sensors for online measurement of various parameters and integrated into the control system.</p>	 <ul style="list-style-type: none"> ■ Liquistation CSF48 Stationary sampler for automatic sampling, defined distribution and preservation of liquid samples taken using the vacuum or peristaltic system or the CSA420 assembly ■ Liquiline CSF28 Stationary sampler for automatic sampling and distribution of liquid samples. Suitable for basic applications offering simple, wizard-guided programming ■ Liquistation 2010 CSP44 Portable sampler for automatic sampling and defined distribution of liquid samples using a peristaltic pump, easy and user-friendly, compact design with integrated grips 		
<p>Nutrients In addition to decomposing carbon, today's wastewater treatment plants also reduce nitrogen and phosphate. For this application, online measurement of nutrient parameters plays an important role.</p>	 <table border="0"> <tr> <td data-bbox="831 752 1094 887"> <p>Nitrate</p> <ul style="list-style-type: none"> ■ Viomax CAS51D* ■ ISEmax CAS40D* <p>Nitrite</p> <ul style="list-style-type: none"> ■ Liquiline System CA80NO </td> <td data-bbox="1142 752 1406 931"> <p>Ammonium</p> <ul style="list-style-type: none"> ■ ISEmax CAS40D* ■ Liquiline System CA80AM <p>Phosphate</p> <ul style="list-style-type: none"> ■ Liquiline System CA80PH ■ Liquiline System CA80TP (total phosphorus) </td> </tr> </table> <p>* in combination with Liquiline multichannel controller</p>	<p>Nitrate</p> <ul style="list-style-type: none"> ■ Viomax CAS51D* ■ ISEmax CAS40D* <p>Nitrite</p> <ul style="list-style-type: none"> ■ Liquiline System CA80NO 	<p>Ammonium</p> <ul style="list-style-type: none"> ■ ISEmax CAS40D* ■ Liquiline System CA80AM <p>Phosphate</p> <ul style="list-style-type: none"> ■ Liquiline System CA80PH ■ Liquiline System CA80TP (total phosphorus)
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<p>Sum parameters To evaluate the organic load of water and wastewater, the primary parameters measured are TOC, SAC and COD. Endress+Hauser offers various measurement methods for these parameters.</p>	 <table border="0"> <tr> <td data-bbox="831 1043 1094 1200"> <p>TOC</p> <ul style="list-style-type: none"> ■ TOCII CA72TOC ■ Memosens Wave CAS80E* <p>SAC</p> <ul style="list-style-type: none"> ■ Viomax CAS51D (SAK)* ■ Memosens Wave CAS80E <p>TN</p> <ul style="list-style-type: none"> ■ Liquiline System CA80TN </td> <td data-bbox="1142 1043 1406 1223"> <p>COD</p> <ul style="list-style-type: none"> ■ Liquiline System CA80COD ■ TOCII CA72TOC ■ Viomax CAS51D* ■ Memosens CAS80E* <p>BSB</p> <ul style="list-style-type: none"> ■ Memosens Wave CAS80E* </td> </tr> </table> <p>* in combination with Liquiline multichannel controller</p>	<p>TOC</p> <ul style="list-style-type: none"> ■ TOCII CA72TOC ■ Memosens Wave CAS80E* <p>SAC</p> <ul style="list-style-type: none"> ■ Viomax CAS51D (SAK)* ■ Memosens Wave CAS80E <p>TN</p> <ul style="list-style-type: none"> ■ Liquiline System CA80TN 	<p>COD</p> <ul style="list-style-type: none"> ■ Liquiline System CA80COD ■ TOCII CA72TOC ■ Viomax CAS51D* ■ Memosens CAS80E* <p>BSB</p> <ul style="list-style-type: none"> ■ Memosens Wave CAS80E*
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<p>Metals and other water treatment parameters The requirements vary depending on the industry sector. However, most process water is softened and virtually all manufacturing processes require corrosion-free water that is also free of turbidity, color and iron.</p>	 <table border="0"> <tr> <td data-bbox="831 1335 1094 1480"> <ul style="list-style-type: none"> ■ Liquiline System CA80CR ■ Liquiline System CA80FE ■ Liquiline System CA80AL ■ Liquiline System CA80HA ■ Liquiline System CA80SI ■ CA76NA </td> <td data-bbox="1118 1335 1382 1480"> <p>Chromate Iron Aluminum Hardness Silica Sodium</p> </td> </tr> </table>	<ul style="list-style-type: none"> ■ Liquiline System CA80CR ■ Liquiline System CA80FE ■ Liquiline System CA80AL ■ Liquiline System CA80HA ■ Liquiline System CA80SI ■ CA76NA 	<p>Chromate Iron Aluminum Hardness Silica Sodium</p>
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<p>Analytical solutions Endress+Hauser supports the development of customer-specific solutions from application consulting and basic engineering via mechanical design and software integration right through to commissioning and maintenance.</p>	 <ul style="list-style-type: none"> ■ Monitoring stations with all necessary components from sample preparation up to data transfer to higher-level The stations range from panels through cabinets to fully climate-controlled, individually sized containers. ■ Automation solutions for the optimization of processes such as aeration control or phosphate dosing and automatic cleaning and calibration of pH measuring points. 		



For further information on analyzers and samplers, see FA00012C





Water is our life

Increase your efficiency and ensure compliance with an experienced and trusted partner

Today more than ever the water & wastewater industry must balance the opposing pressures of improving water safety and shrinking budgets. Whether treating for consumption or discharge, process complexity is rising. Endress+Hauser combines a wide portfolio of smart measuring instruments with industry-experienced consulting and expert services to flexibly and efficiently ensure water safety with verifiable regulatory compliance.

Endress+Hauser helps you to improve your processes:

- With a comprehensive portfolio of measuring instruments and tailor-made services
- With reliable industry application expertise
- With optimized maintenance routines through instruments with self-diagnostic functionalities

Product highlights



Liquiline CM44

Flexible multichannel and multiparameter transmitter for 12 different parameters and up to eight sensors. Fast commissioning thanks to plug & play. Easy operation thanks to intuitive menu guidance. Seamless integration into process control systems via digital fieldbuses. Comfortable remote access via any web browser.



Oxymax COS61D

Optical oxygen sensor with Memosens technology for fast, drift-free measurements in the biological stage of wastewater treatment plants or reliable monitoring of surface water and drinking water quality. Low maintenance thanks to optical technology and stable fluorescence layer.



Turbimax CUS52D/CUS51D

Turbidity sensors with Memosens technology. CUS52D for safe measurements in the low turbidity range and in drinking water. Reduces installation effort and prevents product losses. CUS51D for reliable measurements in a wide application range thanks to integrated application models. Very low maintenance due to self-cleaning design.



Memosens CCS51E

Digital sensor with Memosens technology for measurement of free chlorine in drinking water, pool water or process water. Reliable values even with fluctuating flow rates and conductivities. Long maintenance and calibration intervals thanks to the membrane-covered sensor head.



Liquistation CSF48

Stationary sampler for water and wastewater treatment. Safe samples thanks to insulated, cooled sample compartment. Fast cleaning and maintenance due to easy removal of medium-transporting parts. Flexible adaptation to application requirements via a variety of sampling methods and sampling programs.



Liquiline System CA80

Analyzer for precise online measurement of e.g. ammonium at all critical control points of wastewater treatment plants: inlet, aeration basin, outlet. Low maintenance thanks to automatic calibration and cleaning. Low reagent consumption. Connection of up to four Memosens sensors. Advanced diagnostics for higher process safety and improved process documentation.

Safe water

The cost-effective supply of clean water is a major challenge, both now and for the future. Comprehensive monitoring of water quality requires a portfolio that covers all relevant parameters. Liquiline CM44 allows you to measure up to eight water quality parameters simultaneously - simply by connecting the corresponding sensors via plug and play. This guarantees:

- Reliable, accurate measured values
- High plant availability thanks to low-maintenance operation and calibration in the laboratory
- Easy installation, commissioning and operation for cost-optimized plant operation
- Seamless integration into your process control system via diverse digital fieldbuses
- Documentation of sensor life cycles and process traceability using sensor and measuring point management tools such as Memobase Plus

Comply with limit values - reduce fees

The primary focus in wastewater treatment plants is to protect downstream waters. This is why the limit values are becoming stricter every year. To keep discharge fees at reasonable levels and to avoid penalties, managers of wastewater treatment plants need nutrient monitoring they can rely on. Liquiline System CA80 analyzers use standardized measuring methods for full consistency with laboratory results. In addition, the analyzers include the logbooks to provide continuous documentation of the measured values for water authorities.





Trust in quality

We help you to improve quality while reducing operational costs.

Constant demand for consistency in product quality and taste makes Food & Beverage a demanding industry. Complexity increases as ever more stringent hygiene regulations for food safety add cost pressures. Endress+Hauser's industry leading portfolio of reliable instrumentation, expert global consulting and accredited calibration services all combine to enable greater plant availability, resource conservation and high repeatability in processing with traceable compliance.

Endress+Hauser helps you to improve your processes:

- With a hygienic, robust product portfolio that meets international standards
- With access to traceable, reliable and real-time data
- With a network of industry application experts that help you ensure greater plant availability throughout the product life cycle

Product highlights



Smartec CLD18/CLD134

Compact, inductive conductivity systems for beverage plants. Hygienic design prevents product contamination. Fast detection of phase separation minimizes product losses and organic load of wastewater. Suitable for cleaning in place (CIP). CLD18 is suitable for small pipe diameters.



Liquiline CM44

Flexible multichannel and multiparameter transmitter for 12 different parameters and up to eight sensors. Fast commissioning thanks to plug and play. Easy operation due to intuitive menu guidance. Seamless integration into process control systems via digital fieldbuses. Comfortable remote access via any web browser.



Indumax CLS54D

Inductive conductivity sensor with Memosens technology for the most stringent hygienic and sterile demands. Food-grade virgin PEEK body without joints or crevices. With all required hygienic certificates. Suitable for cleaning in place (CIP) and sterilization in place (SIP). Available with all common hygienic process connections.



Memosens CPS77E and Ceramax CPS341D

Glass-free pH sensors with Memosens technology for hygienic applications. Unbreakable for optimum product safety. Low maintenance. CPS77E provides reliable measurements and fast response times even at low temperatures and features contamination-resistant gel. Sterilizable and autoclavable. CPS341D offers long-term stability over many years. Suitable for cleaning in place (CIP) and sterilization in place (SIP). High mechanical stability thanks to pH-sensitive enamel on a steel carrier.



OUSAF11

Glass-free NIR/VIS absorption sensor for phase detection and suspended solids. Unbreakable for optimum product safety. Fast response time for minimized product losses. Suitable for cleaning in place (CIP) and sterilization in place (SIP). Flexible installation: insertion in pipes or immersion in basins. Low maintenance thanks to stable lamp and dirt-repellent FEP sensor head. FDA and 3-A certificates.

Cleaning in Place (CIP)

Cleaning in place is a key application in every food or beverage process. The concentration of the cleaning agents is a decisive factor in ensuring the hygienic operation of a production facility. This concentration is controlled by conductivity measurement using the Smartec compact devices or Liquiline CM44 and Indumax CLS54D. These inline measurements deliver fast measured values for optimized control of the cleaning process and precise dosing of the cleaning agents.

Phase separation

Cost efficiency plays a decisive role in the food industry. Cost savings can be achieved by avoiding product losses and reducing the organic load of the wastewater. To achieve these aims, fast detection of the product/water phase separation is indispensable. In processes where media with different conductivities are used, Smartec compact devices or the Indumax CLS54D with Liquiline CM44 guarantee reliable phase separation detection. Liquiline CM44P and the glass-free OUSAF11 process photometer are the ideal solution for dairies.

No glass breakage in foodstuffs

Food applications do not tolerate glass breakage, which is why glass-free sensors are used in these applications for maximum product safety.





Competitive and safe

We help you boost your plant's safety and performance

Maximizing productivity and profitability whilst meeting toughening safety and sustainability standards is the greatest challenge facing the chemical industry today. Technological innovation brings opportunity, but reliability is vital. Plant modernization is expedient, yet project delivery complex. Our innovatory instrumentation with safety built-in, allied to expert safety and project consulting, enables Endress+Hauser to deliver solutions to safely and reliably attain peak plant performance.

Endress+Hauser helps you to improve your processes:

- With our field instruments that are designed with safety in mind
- With our worldwide industry application know-how
- With technologies and services for performance optimization

Product highlights



Liquiline CM42

Robust transmitter for demanding applications and hazardous areas. Intuitive operating concept for easy commissioning, operation and maintenance. Seamless system integration via HART, PROFIBUS PA, FOUNDATION Fieldbus. International approvals for hazardous areas.



Memosens CPS71E

Digital pH sensor with Memosens technology for fast-changing media compositions. Poison-resistant thanks to the pressurized reference system or ion trap. Fast response time due to ceramic junction. International approvals for hazardous areas.



Memosens CPS11E

Digital pH sensor with Memosens technology for long-term monitoring of stable processes. Long poison diffusion path and dirt-repellent PTFE diaphragm. Process glass for highly alkaline media available. Pressure-stable up to 16 bar. International approvals for hazardous areas.



Indumax CLS50D

Inductive conductivity sensor with Memosens technology for concentration measurement of acids, bases, brine and chemical products. High chemical stability and temperature-stable up to 125°C thanks to PFA or PEEK coating. Large sensor opening avoids soiling. International approvals for hazardous areas.



OUSTF10

Scattered light turbidity sensor for undissolved solids, emulsions and immiscible media. Highly sensitive inline measurement for quality control of product purity, fast detection of filter blocking or filter ruptures and leakage detection in heat exchangers. Temperature-stable up to 90°C. Approved for hazardous area use (ATEX, FM).



Cleanfit CPA871/CPA472D

Retractable assemblies for sensor cleaning and calibration without process interruption. Intelligent safety functions prevent unintended moving of the sensor into or out of the process. Suitable wetted materials for corrosive processes. Manual versions are pressure-stable up to 8 bar (CPA871) or 4 bar (CPA472D), pneumatic versions up to 16 bar (CPA871) or 10 bar (CPA472D).

Safety for people and environment

Handling combustible, toxic substances is still a critical challenge for the chemical industry and a potential risk for the safety of people and environment. When developing our devices, we take all relevant factors for safe plant operation into account. Our instruments comply with international safety standards/recommendations and are approved for application in explosion-hazardous areas.

Process safety for sensors

Chemical processes often involve aggressive media, which makes regular sensor cleaning a must. Retractable assemblies such as Cleanfit CPA871 enable sensor cleaning and calibration without process interruption and are perfectly suited to the chemical industry.

- Robust thanks to wetted materials such as PEEK, PVDF, etc. for corrosive processes
- Mechanically stable thanks to metallic support housing
- Intelligent safety functions prevent unintended movement of the sensor into or out of the process.

Technologies for efficiency and quality

In the chemical industry, production efficiency, product quality and operating costs are key factors in production. They are, however, interdependent which makes optimization complex. Finding the right balance is not always easy. To achieve optimum performance in production processes, a large amount of reliable and precise data and key performance indicators are necessary. Innovative technologies and services for liquid analysis support the generation and analysis of this data. They guarantee:

- Reduced maintenance by providing accurate process data
- Precise key performance indicators for the measuring points to ensure optimum reliability
- Higher availability of the measuring points thanks to Memosens
- Lower operating costs and higher occupational safety thanks to calibration in the laboratory



The pulse of life sciences

Trust a reliable partner who helps you achieve operational excellence

Today's thriving biopharmaceutical industry demands high productivity and efficiency balanced with meticulous alignment to GMP standards. From our innovatory ASME-BPE compliant product portfolio enabling standardized production automation, reliable monitoring and predictive maintenance, to our expert consulting in process scale-up and operations optimization, Endress+Hauser offers the full solution. We speed time to market, sustain operational excellence, enhance productivity, and reduce risk.

Endress+Hauser helps you to improve your processes:

- With the largest range of innovative and compliant measuring instruments, integrated calibration solutions and the latest instrument diagnostics
- With standardized project engineering and project management as well as a service portfolio that focuses on higher productivity

Product highlights



Liquiline CM44P

Flexible multichannel and multiparameter transmitter. Combines up to four Memosens sensors and two process photometers for the monitoring of process quality in the life sciences industry. Fast commissioning and seamless integration into process control systems thanks to digital fieldbuses. Comfortable remote access via any web browser.



Memosens CPS61E

Robust digital pH sensor for fermentation processes in bioreactors. Suitable for SIP, CIP and autoclaving. Certified biocompatibility with regard to biological reactivity acc. to USP Class VI, FDA compliant, no cytotoxicity, free from animal-derived materials. Optional pharma certificate of compliance.



Memosens CLS82E

Digital 4-electrode conductivity sensor for reliable measurements over a wide measuring range. Certified aseptic design according to EHEDG and 3-A. Sterilizable and autoclavable. Unique electrode connection surveillance for maximum safety. Compact design for small pipe diameters.



OUSA44

UV absorption sensor for reliable monitoring of product concentrations. Excellent accuracy for maximum linearity and full consistency with laboratory results. Suitable for sterilization in place (SIP) and cleaning in place (CIP). Liquid-free online calibration traceable to NIST.



Cleanfit CPA875

Sterilizable retractable assembly for sterile applications. Patented, dynamic sealing concept for highest product safety. Certified sterile design according to EHEDG and ASME BPE. FDA and USP Class VI compliant seals. Flexible adaptation to process requirements thanks to a large number of available process connections.



Memobase Plus CYZ71D

Multichannel and multiparameter tool for measurement, calibration and documentation. Higher process safety thanks to sensor traceability: full history of all applied Memosens sensors. Supports GLP, GMP, Audit Trails. Enables operation according to FDA 21CFR Part 11. Minimizes the risk of discrepancies between laboratory results and process values.

Memosens technology

Product quality, measuring accuracy and reproducibility are all critical in the highly regulated life sciences industry. Memosens digital technology enables you to achieve consistent measured values from the laboratory from pilot plants through to the process. With Memosens, you can perform calibration under optimum ambient conditions to improve measuring accuracy. Furthermore, it offers advanced diagnostic functions that provide an excellent database to decide whether a sensor is still ready for the next batch or needs to be cleaned and regenerated – a very important benefit for biotech processes.

Memobase Plus for full traceability

Memobase Plus stores the complete lifetime history of all Memosens sensors used. It is beneficial for GLP, GMP, Audit Trail and enables you to operate in accordance with FDA 21CFR Part 11. With as-found/as-left documented values, changes in the sensor characteristics during the batch can be identified, printed and stored. Memobase Plus turns your computer into a space-saving, high-performance workstation with up to four channels. It minimizes the risk of discrepancies between laboratory results of grab samples and online values. The same type of sensors with identical signal communication can be used in the laboratory and in the process – essential for product quality improvement as well as production efficiency.





Power up your plant

Power plants play a vital role, we help maximize uptime while delivering safety and productivity

Today's Power & Energy industry must strike a complex balance: meeting spiraling demand for affordable and reliable energy while increasing cleaner and renewable sources in the energy mix. As cost and regulatory pressures grow, modernization is essential for efficient, safe resource use. As renewables advance, so does the need for energy storage. With best-fit instrumentation, deep power application expertise, services and solutions, Endress+Hauser brings efficient, reliable productivity.

Endress+Hauser helps you to improve your processes:

- With innovative installation concepts executed during operation to minimize downtime
- With experts to advise you from concept to commissioning
- With measurement technologies, accessories and mechanical pre-assembled components to minimize outages

Product highlights



Liquiline CM44

Flexible multichannel and multiparameter transmitter for 12 different parameters and up to eight sensors. Fast commissioning thanks to plug and play. Easy operation due to intuitive menu guidance. Seamless integration into process control systems via digital fieldbuses. Integrated VGB calculation models.



Memosens CLS15E

Digital conductive conductivity sensor with Memosens technology for pure and ultra-pure water. Reliable measurement of lowest conductivities and determination of differential conductivity for the calculation of pH values enable safe determination of corrosion, impurities and conditioning of the water. Low maintenance thanks to polished measuring surfaces.



Memosens CPS11E

Digital pH sensor with Memosens technology. Long poison diffusion path and dirt-repellent PTFE junction. Salt storage for accurate measurements at low conductivity in steam production. International approvals for hazardous areas.



Memosens COS22E

Digital amperometric oxygen sensor with Memosens technology for trace measurement. Optional gold cathode for compensation of cross-sensitivities. Reliable measured values for safe detection of possible pipe corrosion. Long-term stability with international approvals for hazardous areas.



Liquiline System CA80

Analyzers for precise online measurement. Accurate silicate values for the monitoring of ion exchanger quality during feedwater preparation. Reliable iron values for safe detection of potential corrosion in heat exchangers. Low maintenance thanks to automatic calibration and cleaning. Low reagent consumption. Connection of up to four Memosens sensors to Liquiline System CA80.



SWAS panel

Panel containing the complete measuring technology for online monitoring of water and steam quality, including temperature and pressure reduction. Seamless integration into process control systems. Tamper-proof documentation of the measured values. Tailored to individual customer requirements.

Optimum safety thanks to reliable trace measurement

In power plants, the quality of the water is a key factor in keeping the water/steam cycle free from contamination. Turbines, boilers and pipes can become corroded and encrusted if the water is not pure enough, leading to expensive repairs or even complete unit replacement. The high temperatures and pressures in the water/steam cycle and the low measuring ranges require smart solutions.

- Conductivity, pH and oxygen sensors that have been designed for trace measurement ensure that even minute impurities in the demineralized feedwater are detected.
- SWAS (Steam/Water Analysis System) panels comprise all the measuring technology needed to monitor a water/steam cycle. The measurements are performed online, i.e. a sample of the feedwater comes directly from the cycle, passes through a temperature and pressure reduction system (sample preparation) and is then sent to the sensors and analyzers mounted on the panel. The sample is discarded after measurement.





Extracting more from less

In a world of lower ore grades, skill gaps and excavation challenges, we can help you hit your targets.

Never more so than today has the mining, minerals & metals industry had to manage such tension between soaring demand, increased scarcity, lower ore grades, fluctuating prices, and toughening safety and sustainability criteria. Combining our innovative product portfolio with our deep application and industry knowledge enables Endress+Hauser customers to optimize processes, boost productivity, and ensure safety and environmental compliance.

Endress+Hauser helps you to improve your processes:

- With process experts who recommend the best-fit products, services and solutions according to industry requirements
- With solutions that mitigate risk and reduce your environmental impact
- With access to the right data at the right time

Product highlights



Liquiline CM44

Flexible multichannel and multiparameter transmitter for 12 different parameters and up to eight sensors. Fast commissioning thanks to plug and play. Easy operation due to intuitive menu guidance. Seamless integration into process control systems via digital fieldbuses. Comfortable remote access via any web browser. Chemoclean function for automated sensor cleaning.



Memosens CPF81E

Digital pH sensor with Memosens technology. Robust polymer housing protects against mechanical damage. Flat pH membrane for application in abrasive media. Second electrolyte bridge for better protection against electrode poisoning ions (S^{2-} , CN^{-}).



Turbimax CUS71D

Digital ultrasonic sensor for interface measurement e.g. in thickeners. Quick, continuous interface information ensures precise control of valves and separators. Fast commissioning thanks to predefined calculation models. Low maintenance due to wiper function.



Flexdip CYH112/CYA112

Modular holder for the installation of sensors and assemblies in open basins or tanks. Flexibly adaptable to any installation situation: ground, wall or rail mounting with chain retainer, fixed or pendulum holder.



Cleanfit CPA871/CPA472D

Retractable assemblies for sensor cleaning and calibration without process interruption. Guarantees longer sensor lifetime even in harsh environments. Intelligent safety functions prevent unintended moving of the sensor into or out of the process. Suitable wetted materials for corrosive processes. Manual versions are pressure-stable up to 8 bar (CPA871) or 4 bar (CPA472D), pneumatic versions up to 16 bar (CPA871) or 10 bar (CPA472D).



Cleanfit Control CYC25

Cleaning unit for retractable assemblies. Combined with Liquiline CM44 and Chemoclean Plus, it provides automated, regular sensor cleaning. Enables interval measurement in aggressive and abrasive media. Extends sensor lifetime even in harsh environments.

Measuring reliably even under the toughest conditions

Processes in the primaries and metals industries are extremely demanding for sensors because they often involve abrasive solids. The sensor design must be very robust or the sensors must to be regularly cleaned to withstand these conditions.

- Memosens CPF81E pH sensor features a flat membrane that offers little contact surface for abrasive media.
- Cleanfit CPA871 assembly offers an optional immersion chamber that provides additional protection for the sensors.
- Cleanfit Control CYC25 in combination with Liquiline CM44 provides automated regular cleaning of the sensors thus contributing to reliable measurements.

Memosens technology makes daily life easier for plant personnel

The primaries and metal industries are not only demanding for measuring technology but also for the people who work in these industries. Thanks to Memosens digital technology, only a short visit to the plant is needed to replace the sensors. Cleaning, regeneration and calibration can be done in the safe and comfortable environment of the laboratory.





Fuel for thought

We reduce complexities to help you perform, comply and thrive in the Oil & Gas sector

Maximizing plant availability, safety and the efficiency of operations are the key challenges for today's oil and gas industry. Complexity increases in the face of volatile market forces, strict international regulations and your ever-tightening resources. Close, accurate monitoring of key process parameters is critical. Our broad, reliable portfolio of instrumentation, deep industry experience, and our services and solutions make Endress+Hauser the ideal partner for optimal plant performance.

Endress+Hauser helps you to improve your processes:

- With the largest portfolio of safety instruments that comply with international regulations
- With applied technologies and people who have extensive industry application know-how
- With access to accurate and traceable information

Product highlights



Liquiline CM42

Robust transmitter for demanding applications and hazardous areas. Intuitive operating concept for easy commissioning, operation and maintenance. Seamless system integration via HART, PROFIBUS PA, FOUNDATION Fieldbus. International approvals for hazardous areas.



Memosens CPS11E

Digital pH sensor with Memosens technology. Long poison diffusion path and dirt-repellent PTFE junction. Salt storage for accurate measurements at low conductivity in steam production. International approvals for hazardous areas.



Indumax CLS50D

Inductive conductivity sensor with Memosens technology for high-temperature applications and hazardous areas. High chemical stability thanks to robust materials (PFA, PEEK). Large sensor opening avoids soiling. International approvals for hazardous areas.



Cleanfit CPA871/CPA472D

Retractable assemblies for sensor cleaning and calibration without process interruption. Guarantees longer sensor lifetime even in harsh environments. Intelligent safety functions prevent unintended moving of the sensor into or out of the process. Suitable wetted materials for corrosive processes. Manual versions are pressure-stable up to 8 bar (CPA871) or 4 bar (CPA472D), pneumatic versions up to 16 bar (CPA871) or 10 bar (CPA472D).



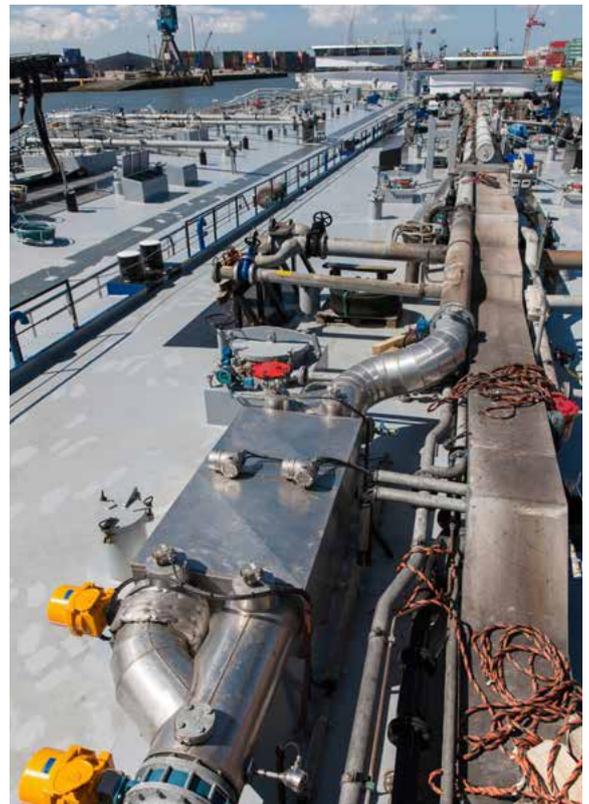
Memobase Plus CYZ71D

Multichannel and multiparameter tool for measurement, calibration and documentation. Higher process safety thanks to sensor traceability: full history of all applied Memosens sensors. Minimizes the risk of discrepancies between laboratory results and process values. Enhanced safety for plant personnel: they only spend minimal time in the plant when replacing sensors. Cleaning, regeneration and calibration is done in the safe and comfortable environment of the laboratory.

Water preparation and treatment in oil production and refining

Production and refining of mineral oil requires large amounts of water and steam that need to be prepared for the refining process and treated after the process. Our portfolio provides complete monitoring of the water quality:

- Steam monitoring is performed by pH and conductivity sensors for accurate measured values in low measuring ranges. They help to avoid corrosion and deposits in the steam pipes and to prevent leakages.
- During process water preparation, digital pH sensors with salt storage provide precise monitoring of the boiler feedwater while turbidity sensors control the preparation process.
- Wastewater treatment and water reuse are becoming more and more important due to increasing water scarcity. Here, oxygen, turbidity, conductivity and ammonium measurements support the refineries in optimizing the wastewater treatment, increasing their water reuse and reducing discharge fees.





Steam and industrial water management

Rely on Endress+Hauser to boost your steam management and industrial water treatment

Utilities such as water, air, gas, energy and steam play a vital role in a multitude of auxiliary industrial processes, and yet despite the potential they offer they can be overlooked in the search for optimization opportunities. Whether for steam systems or industrial water treatment, the portfolio of applications and rich consultancy expertise offered by Endress+Hauser enable our partners to improve plant availability, safety, efficiency and compliance.

Endress+Hauser helps you to improve your processes:

- With customized solutions for your energy applications
- With competent planning, commissioning and maintenance
- With engineering, project management of simple solutions, for example, for boiler houses all the way to complete system solutions

Product highlights



Liquiline CM44

Flexible transmitter for 12 different parameters and up to eight sensors. Fast commissioning thanks to plug and play. Easy operation due to intuitive menu guidance. Seamless integration into process control systems via digital fieldbuses. Comfortable remote access via any web browser.



Memosens CLS15E

Digital conductive conductivity sensor with Memosens technology for pure and ultra-pure water. Reliable measurement of lowest conductivities for safe determination of corrosion, impurities and conditioning of the water. Low maintenance thanks to polished measuring surfaces.



Memosens CPS16E

Combined pH/ORP sensor with Memosens technology. Provides simultaneous pH and ORP measurement for better process control. Delivers information on the acid load and oxidizing effect of the water in filtration systems, for example.



Memosens COS22E

Digital amperometric oxygen sensor with Memosens technology for trace measurement. Optional gold cathode for compensation of cross-sensitivities. Reliable measured values for safe detection of possible pipe corrosion. Long-term stability with international approvals for hazardous areas.



Liquiline System CA80

Analyzers for precise online measurement. Accurate silicate values for the monitoring ion exchanger quality during feed water preparation. Reliable iron values for safe detection of potential corrosion of the heat exchanger. Low maintenance thanks to automatic calibration and cleaning. Low reagent consumption. Connection of up to 4 Memosens sensors to Liquiline System CA80.



Memosens CCS51E

Digital sensor with Memosens technology for measurement of free chlorine in process water. Reliable values even with fluctuating flow rates and conductivities. Long maintenance and calibration intervals thanks to the membrane-covered sensor head.

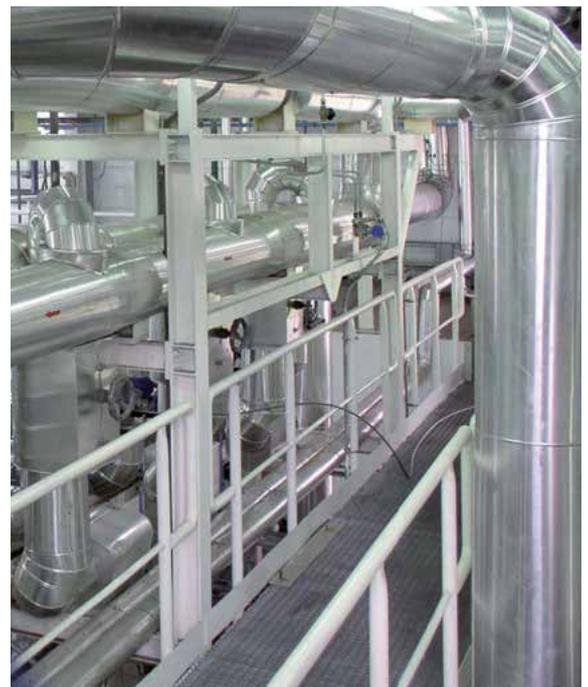
No contamination of feed water

High quality of boiler feed water is a key factor to avoid corrosion or build-up of deposits in boilers or pipes. These can lead to expensive repairs or even complete unit replacement. Conductivity, pH and oxygen sensors, specially designed for trace measurement, ensure that even minute impurities in the demineralized feed water are detected. Plant operators can react quickly and take the necessary measures.

Safe cooling water cycles

Cooling water cycles must run stably and must not interfere with the product. Contaminated cooling media can cause corrosion or build-up of deposits and thus leakage in the cooling water cycle that leads to mixing of product and cooling medium. Conductivity, pH, chlorine and SAC sensors ensure that contamination is detected before problems can occur.

Cooling water must be of sufficiently high quality to ensure that no microorganisms can settle in the system. They form a biofilm on the pipes that impedes the heat transfer and thus limits the cooling performance. Reliable chlorine measurement enables precise chlorine dosing resulting in bacteria-free water.



Seamless system integration

Greater transparency through added information: only digital fieldbuses enable device and process data to be transmitted simultaneously. That is why our devices are available with all state-of-the-art fieldbus technologies.

Intelligent devices with digital communication offer users a vast number of benefits for plant operation. In addition to seamless integration into automation systems and the ability to monitor functional capability, digital communication also allows you to see what's happening in the process. This offers significant benefits:

- Comfortable device configuration and optimization of your processes.
- Optimum plant availability and reliability thanks to state-of-the-art diagnostics and predictive maintenance.
- High flexibility: main device variables and parameters are available.
- Full transparency thanks to access to all parameters and diagnostics for the devices and process environment.
- Cost-efficient, fast system integration without additional network components or gateways.



Endress+Hauser's fieldbus laboratory in Reinach (CH)

Fieldbus technology from Endress+Hauser

Endress+Hauser only uses internationally-recognized open standards for the digital communication of its field devices. This ensures seamless integration into plants and guaranteed investment protection. Various communication systems supported by Endress+Hauser have become established in the field of process automation:

- HART
- PROFIBUS DP/PA
- FOUNDATION Fieldbus
- Modbus
- EtherNet/IP
- PROFINET

Endress+Hauser is a pioneer in fieldbus technology. The company plays a leading role in the implementation of HART, PROFIBUS DP/PA and FOUNDATION Fieldbus technology. Endress+Hauser operates its own fieldbus laboratory in Reinach, Switzerland:

- Accredited PROFIBUS competence center
- Engineering of fieldbus networks
- System integration testing
- Training courses and seminars
- Customer-specific application development
- Troubleshooting



Tools for selection and operation

Endress+Hauser Applicator

Our Applicator software is a convenient selection and sizing tool for planning processes. Using the entered application parameters, e.g. from measuring point specifications, Applicator determines a selection of suitable products and solutions. Applicator Industry Applications uses graphics or tree structures to guide you to the right product selection. With additional sizing functions and the Applicator Project module for project management, it makes your day-to-day engineering tasks easier.



www.endress.com/applicator

Endress+Hauser Operations App

The app offers mobile access to up-to-date product information and device details such as order code, availability, documentation, spare parts, successor products for old devices and general product information - wherever you are, whenever you need it. Simply enter the serial number or scan the data matrix code on the device to download the information.



Endress+Hauser SmartBlue App

- Time-saving, mobile access to the device and its diagnostic and process information – even in hazardous areas
- Secure data transmission for fast and reliable configuration and maintenance. Checked by Fraunhofer Institute.

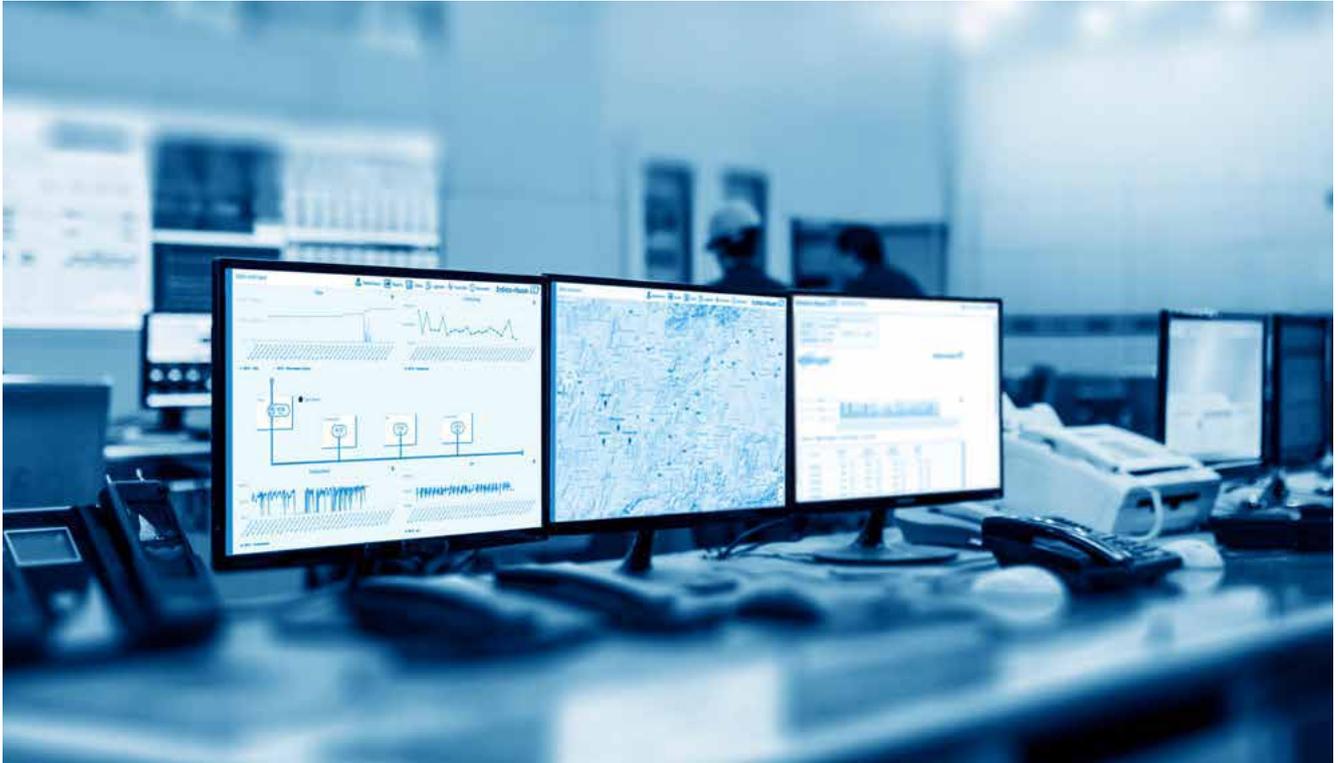


All apps are available for apple and android devices:



Netilion – the multi-brand ecosystem

Netilion is a cloud-based IIoT ecosystem, designed for industrial processes. It connects the physical and digital worlds to send valuable information from the field straight to your phone, tablet or other devices. Netilion empowers you to improve efficiency and drive innovation.



Multi-brand ecosystem

You have equipment from various vendors in your installation. An IIoT solution should provide data from as many assets as possible, and Netilion can do that. This multi-brand ecosystem brings transparency into a plant regardless of device type or manufacturer.

Security and privacy

Your facility's information is valuable and needs protection. Netilion allows users to access data digitally because it meets internationally recognized standards of cloud-platform security. It's a safe harbor for your data.

Decentralized processes monitored efficiently

- Reduction of routine checkup tours through comprehensive visualization of essential process variables, e.g. flow quantities, limit values, levels, temperature, pressure or physicochemical quality parameters
- Low operating costs through fast reaction in case of failure

Legal compliance thanks to automation

- Continuous measurement of quantitative and qualitative parameters
- Generation of legally compliant documentation thanks to integrated reporting systems

Data access around the clock

- Complete data access independent of time and place
- Numerous options to analyze and visualize ratios, amounts, thresholds, time series and trends, as well as balances
- Everything at a glance thanks to the web-based visualization of networks with optimized depiction for highly diverse terminal devices



More about Netilion:

www.netilion.endress.com

5. Data fusion and analysis

Algorithms for leakage detection, verification, forecasts, etc.



4. Data management and visualization

Monitoring of networks and decentralized infrastructures



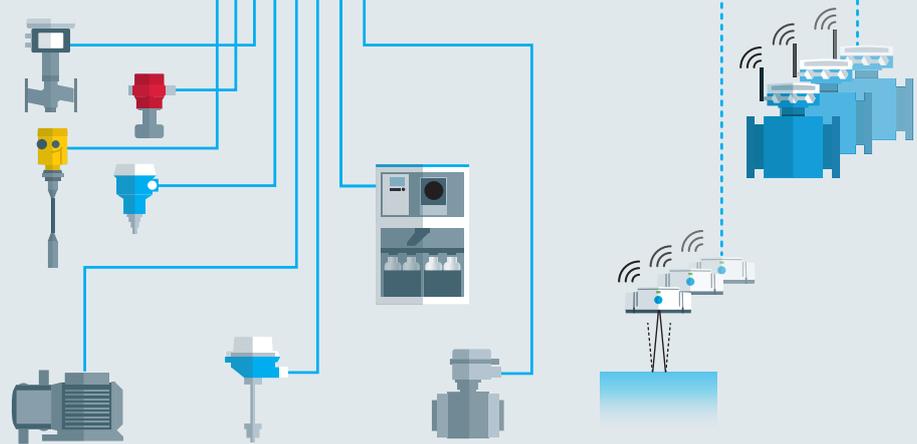
3. Data collection and transmission

Flexible edge connectivity solutions



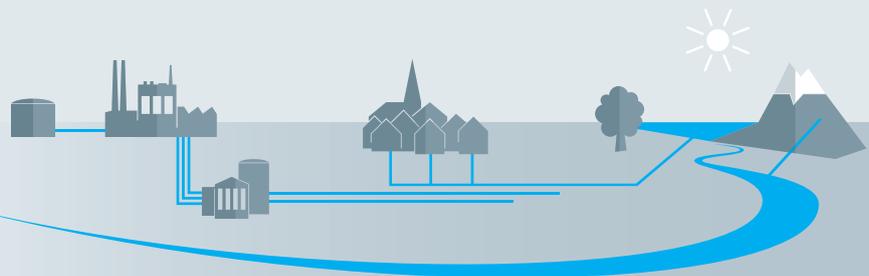
2. Data collection and control

Smart field devices and sensors (flow, analysis, pressure, level, temperature, etc.)



1. Physical world

Infrastructure (pipes, pumps, valves, etc.)



Experts in services

As a manufacturer of measuring equipment for plant engineering, Endress+Hauser has been active in the market for over sixty years. We work together with our customers, providing support in every situation. Whether you need troubleshooting, fast delivery of spare parts, calibration or on-target advice, our entire business structure is oriented towards helping you achieve your business goals at all times. Your job is to manufacture optimum product quality safely, reliably and profitably, and our job is to support you with our services so that you can reach this goal with maximum plant safety and minimal effort.



Benefits

- Services for the entire life cycle
- Worldwide service network
- Cooperation as partners

Our contribution to your return on investment

Our entire organization is oriented towards helping you in the procurement, installation, commissioning and operation phases. This starts with continuously optimizing our measuring equipment for plant engineering to your industry sector, alongside developing special solutions for your specific needs, and continues with our range of innovative tools and services. Whether your facility recently came online or has been running for twenty years, our customer service consultants can help you optimize maintenance schedules, improve your return on capital and avoid costs incurred by unnecessary downtime.

Comprehensive service offering

Endress+Hauser offers a wide range of services focused on industrial measurement and process automation. These range from application advice to commissioning and calibration and even complete maintenance packages. Our service support offering gives you everything you need for the entire life cycle of your facility.



Calibration

Accurate liquid analysis is extremely important in many manufacturing processes. We calibrate your conductivity measuring point on-site according to USP recommendations and ASTM standards. We offer the same service for pH measuring points. If a turbidity, disinfection, oxygen or nitrate sensor leaves its ideal line, we restore its accuracy with a factory calibration.

Application advice and commissioning

The demands on your employees are increasing continuously. They must maintain the existing facilities while simultaneously planning and commissioning new ones with state-of-the-art technology. Endress+Hauser can help you with these tasks. Our contacts provide comprehensive application advice, draft concepts and work with you to develop the ideal solution. If desired, we can study your wastewater as a snapshot. We analyze your sample using recognized reference methods and according to the measuring point requirements and propose a recommended course of action. We commission the measuring points along with you, provide support for the integration into the facility-wide process control and asset management system and run a series of tests to ensure that your measuring point works correctly.

Maintenance concepts

Our maintenance concepts provide the right safeguards for quality and safety-related measuring points. We work closely with our customers and, in consultation with you, determine the amount of maintenance required for your devices.

From Service Level 1, in which we carry out all required maintenance tasks and generate documented reports about compliance with quality procedures, to Service Level 4, where you can select the service components you need individually, we offer professional support both for Endress+Hauser devices and other makes.



Benefits

- Calibration to international standards
- Expert application advice
- Flexible maintenance concepts for every need



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