



Level



Pressure



Flow



Temperature



Liquid
Analysis



Registration



Systems
Components



Services



Solutions

Experts in Liquid Analysis

Sensors, transmitters, compact devices and assemblies
for all applications



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Endress+Hauser – from a supplier of instruments to a complete provider

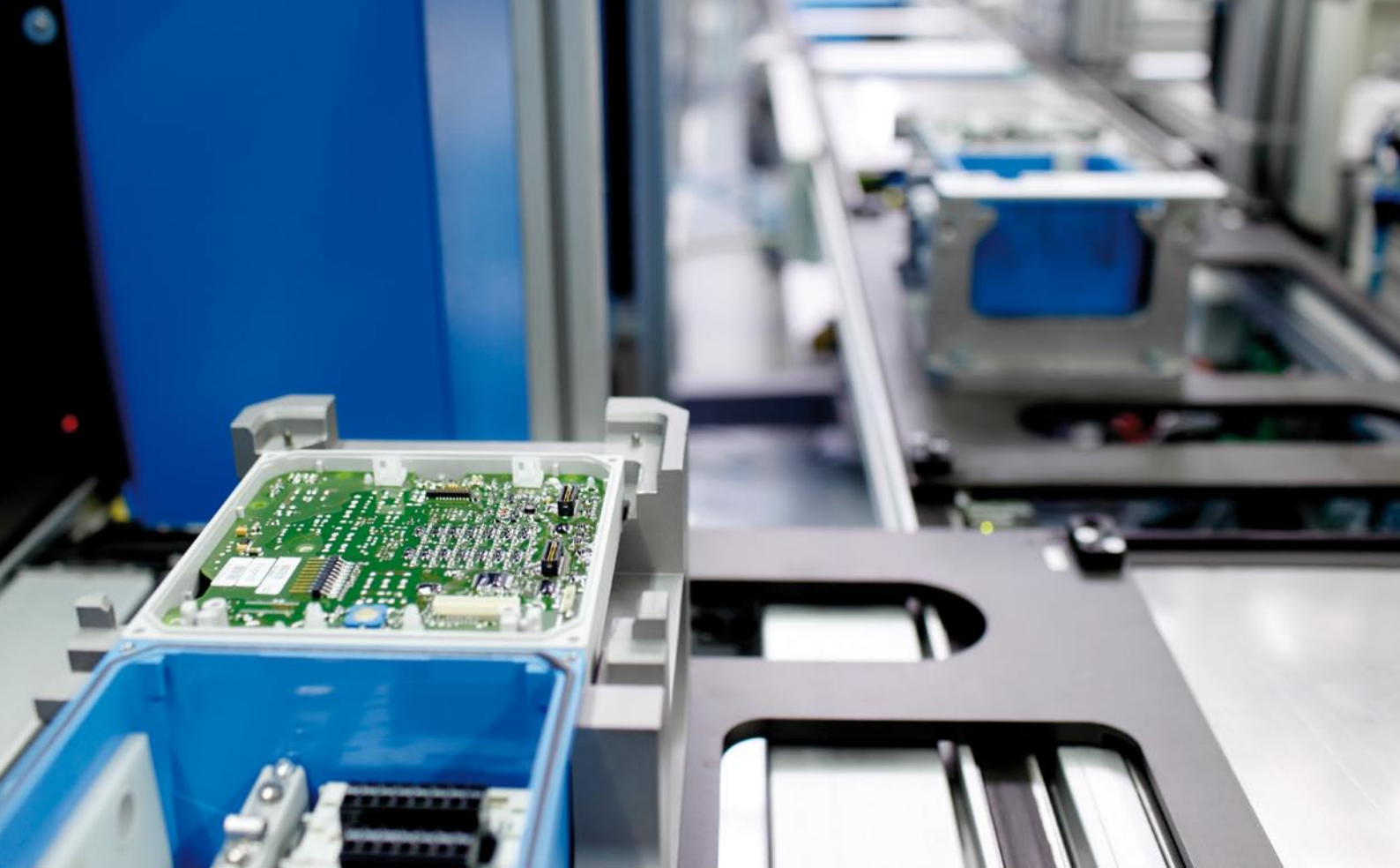
“What does Endress+Hauser have to offer?” There’s no simple answer to this question. After all, our expertise across products, solutions and services has continued to grow. That’s how we have evolved from a supplier of measuring technology to a complete provider, with the aim of accompanying our customers throughout the entire life cycle of their plants and enhancing their industrial productivity. This has prompted us to organize our business into four core processes: development, manufacturing and supply of quality products, solutions and trendsetting services. Wherever measuring technology is needed for level, pressure, flow, temperature, liquid analysis and recording, or wherever systems and components are in use, you’ll find that many businesses value the knowledge and expertise of Endress+Hauser. It is not least for this reason that we are a leading partner worldwide for measurement, control and automation solutions for production and logistics in the process industry.

For more information visit:
www.endress.com

We are a family-run business with a global headcount of over 8,400 and a total annual revenue of 1.2 billion euros in 2008. Thanks to our worldwide sales and service network, as well as a total of 19 production centers in Europe, Asia and the USA, we are always in close contact with our customers. This level of contact fosters one of Endress+Hauser’s primary goals - that of supporting the competitiveness of our customers on the long term with the highest levels of quality, safety and efficiency. By continuously optimizing our processes and using innovative, cutting-edge technology, we are able to push the application boundaries in instrumentation, control and automation engineering while finding safer and more efficient solutions to benefit you the user. In doing so, we ensure that our processes work in harmony with the environment to conserve energy and resources.

All this gives you the confidence that today, tomorrow and in the years ahead you can rely on us - the “People for Process Automation”.





Your partner for liquid analysis



Over 35 years' experience in analytical measuring technology makes the globally present Endress+Hauser Group a strong partner. Endress+Hauser analytical measuring systems can be found anywhere customers require reliable measured values, high availability and long operating times.

With the production of 260,000 process electrodes per year, the company has achieved the top position in the world market. The quality of the electrodes and solutions is among the highest customers can actually use. Ongoing expansion of its research and development capacity in the past number of years has further improved the performance and high quality of the products, and the company has been able to offer new technologies to the user. By mastering all the technically difficult production stages in conjunction with a high degree of automation in almost all production areas, Endress+Hauser has achieved an excellent vertical range of manufacture.

This results in very high and consistent product quality for the customer, as well as rapid turnaround times and outstanding delivery reliability with regard to all standard products or individual products tailor-made for special applications.



Know-how

Many experts play a key role in making a product program successful. At Endress+Hauser, chemists, physicists, design engineers, electronic technicians and software professionals work in unison to provide our customers with a product range that is top quality in every respect.



Innovative products that give our customers an added advantage are central to the success of Endress+Hauser. In 2008, the company filed 200 new patents and invested 8 % of its total revenue in research and development. There are currently 3,900 intellectual property rights registered in the name of the Endress+Hauser Group.

Sensor technology know-how

In no other component of a measuring point is so much development and time invested than in sensor systems. With our knowledge and expertise in research and development, we intend to become technology leaders in this field. The vertical range of manufacture, modular design and a high degree of automation guarantee users absolutely reliable quality and safety.

Platform concepts

Platform concepts make use of collective knowledge and resources. This helps us to boost the quality and speed of our processes and reduce complexity and costs for our customers.

Our products are based on established standards and platforms and harness synergy in all areas, be that in the enclosures, electronic modules, software, interfaces or displays. We also actively support standardization and open systems, thereby making life easier for our customers. From the standardized use of the hardware to operation, and to integration into automation systems and easy maintenance and servicing, our customers benefit from this platform throughout the entire product life cycle. The platform concept also simplifies inventory management and helps cut inventory costs.



Added Values

W@M – hand in hand throughout the life cycle of your system

Fast, efficient, and at your side any time, anywhere – with Endress+Hauser as your partner, you benefit from an extensive service network and qualified customer service technicians around the world.

We offer the following services for your field devices:

- Commissioning and maintenance concepts.
- Calibration and calibration strategies.
- Factory repair and spare parts service.
- Seminars and courses to train your in-house team of experts.
- Helpdesks, which immediately answer any questions surrounding our instruments and systems.

Enhancing competitiveness

Many companies outsource tasks that are not part of their core business activities. In terms of field devices and process automation, they are looking for partners who:

- Will take care of the maintenance, calibration, repair and replacement of instruments throughout the entire operating life of the system.
- Offer service agreements to minimize system downtime.
- Provide the right skills at a reasonable price.



Operation

- Up-to-date information 24 hours a day/365 days a year
- Efficient repair, maintenance and optimization of the installed base
- Risk minimization for your system

Commissioning

- Easy commissioning from the control room
- More process and staff safety

Installation

- Product documentation is available in several languages
- The latest software version is always available
- No long searches - the right documentation can always be retrieved in a matter of seconds

Planning

- Swift and reliable selection and planning of the right instrument for your application
- Project documentation and administration
- Start of life cycle monitoring in W@M – Life Cycle Management

Procurement

- Optimum support for your processes
- Your prices and delivery terms are always available on line
- High level of process quality



Solutions

Our automation solutions help you optimize your logistic, production and maintenance processes. They are reliable, long-lasting, scalable and cost-effective.

Production

Process control plays a key role in quality and efficient production. We offer control and visualization solutions on an instrument, system or area level. Our solutions are built on open standards, thereby ensuring cost-effective solution implementation.

Asset Management

Asset management is central to the smooth operation of your plant. We offer local and Web-based tools that support you in all phases of your system's life cycle.

Engineering

Good planning and design ensures long-term investment protection. We are your experienced partner, guiding you along the way from conceptual design to commissioning.

Digital communication

To get the best from a fieldbus device, it must be perfectly integrated into your system. We offer a host of services that optimize the operation of your instruments.



Applicator

The Applicator software is a convenient selection and design tool for your planning process. By entering application parameters, e.g. from the measuring point specification, the Applicator identifies a range of suitable products and solutions. With additional sizing functions and a project management module, it makes your day-to-day engineering tasks easier.

Selection

Applicator Selection is a product selection tool. You enter application parameters, such as ambient conditions, interface specifications or approvals, and Applicator suggests suitable products and components, and displays them with graphics and features on the screen. With the chosen application, Applicator Industry Applications uses graphics or tree structures to guide you to the right product selection.

Administration

With Applicator Project, it is possible to save data from the product selection and sizing process. Using the project module, you can manage projects which are hierarchically structured from the business level down to the tag number. The Spec Sheet Interface allows users to import electronic specification sheets and transfer the data to an Applicator module.

www.endress.com/applicator

Sensors with Memosens technology

Liquid analysis makes great 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 additionally require a high-impedance connection to the transmitter. Moisture in the connection can change the measured value and may even result in measurement failure.

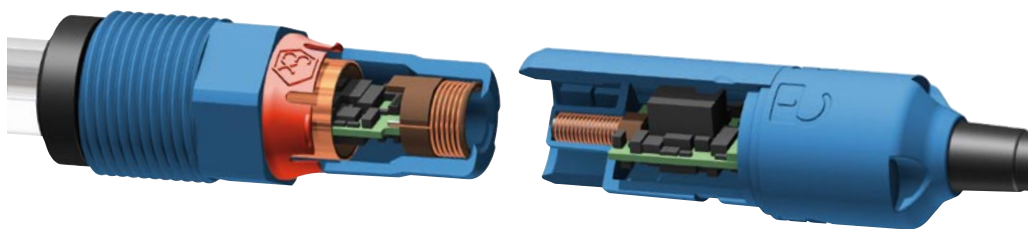
The Memosens technology revolutionizes the safety of data transfer by digitalizing the measured value in the sensor and transferring it to the transmitter without a contacting, and thus moisture-sensitive, connection. The jump in technology to a new generation of sensors has additional advantages and eliminates general limitations of the technology in place to date.

Memosens makes the sensors digital with integrated data storage

Sensors with Memosens technology save the current calibration data and other information which can be used for look-ahead maintenance, such as hours of operation, maximum and minimum measured values and maximum and minimum temperature. When the sensor is mounted, the calibration data are automatically transferred to the transmitter and used to calculate the current value.

The result:

- Measuring point maintenance is no longer based on individual issues identified but rather all relevant sensor data are used
- The current application of the sensors can be made to depend on the previous history.



An unestablished connection between the sensor and transmitter is actively displayed – the first really definite connection

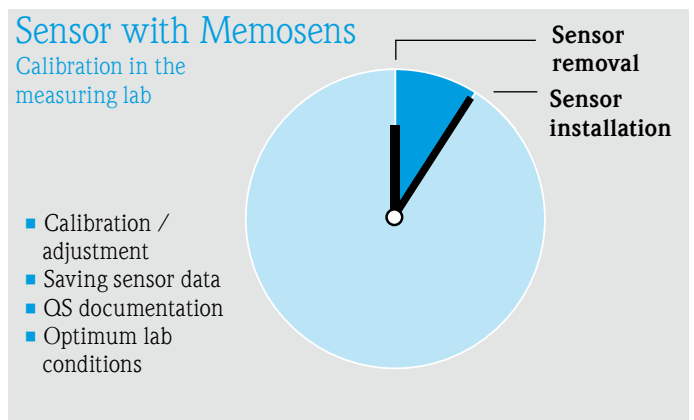
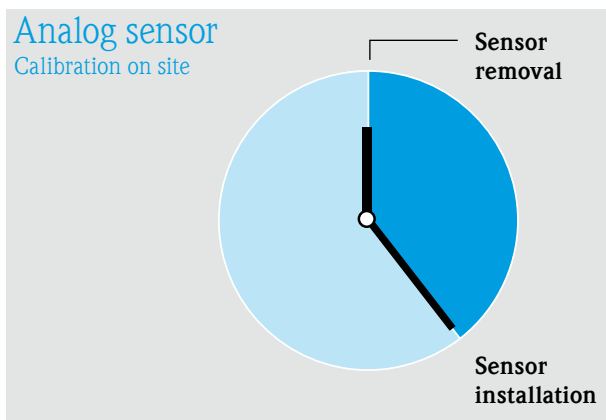
Digital measured value transmission automatically results in an error message if the signal flow is interrupted. And this regardless of whether the sensor or measuring cable is no longer working properly.

The result:

- The availability of the measuring point is dramatically increased and ensured
- Automatic sensor detection allows for unproblematic sensor replacement

- Non-contacting and digital signal transmission
- Lab calibration possible
- Cost saving – calculate yourself: www.apps.endress.com/memosens





Sensors with Memosens technology are the first sensors to allow calibration/adjustment away from the measuring point in the measuring lab.

■ Measuring point maintenance
■ Measurement

The result:

- The availability of the measuring point is dramatically increased by the quick, easy replacement of calibrated sensors.
- Measuring point down-time is reduced to the time between detecting and replacing the sensor.
- The calibration/adjustment itself takes place under optimum external conditions in the measuring lab.

The first non-contact measured value transmission from the sensor to the transmitter

Sensors with integrated Memosens technology transmit the measured value contactlessly from the plug-in head of the sensor to the cable coupling.

The result:

- Always free from corrosion of the connection
- A coupling system that can even be connected under water
- Free from leaks and measured value distortion due to moisture

EMC safety through galvanic decoupling of medium from transmitter

Highly integrated electronics in the sensor convert the analog signal of the sensor to digital information which is then transferred via the cable coupling to the transmitter contactlessly and free from interference potential.

The result:

- No more need to ask about “symmetrically high-resistance” or “unsymmetrically” or an impedance converter for pH measurement.

Memosens data management

- Documentation of the complete life cycle
- Traceability of the calibration history
- Recording of sensor load data (total operating hours, operating hours in extreme process conditions, etc.)
- Data export to Excel or HTML format

Memosens sensor management

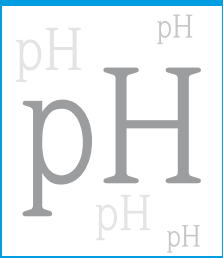

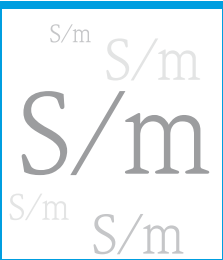







- Assignment of new sensors to special measuring points or groups of measuring points
- Deactivation of scrap sensors in the database
- External identification of sensors using Memoclip

Documentation of the entire sensor life cycle

- From commissioning to scrapping
- Data automatically recorded during calibration
- With laboratory calibration system Liquiline CM42
- For pH glass electrodes, non-glass pH sensors with ISFET technology, conductivity and dissolved oxygen sensors



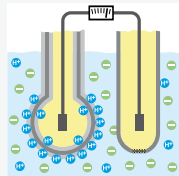
Measuring parameter overview

	Description	Applications
<p>pH/ORP</p> 	<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
<p>Conductivity</p> 	<p>Description Monitoring electrolytic conductivity is important for monitoring wastewater treatment and controlling cleaning processes (CIP) in the food and pharmaceutical industry. 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
<p>Turbidity</p> 	<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
<p>Dissolved oxygen</p> 	<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. Two specific technologies are used - amperometry and quenching.</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
<p>Disinfection</p> 	<p>Description The measurement of chlorine and chlorine dioxide is needed in all areas of disinfection to ensure safe and effective water treatment.</p>	<p>Applications</p>  <ul style="list-style-type: none"> Flexible disinfection system in swimming pools Process water and cooling circuits Lasting disinfection in drinking water
<p>Analyzers</p> <ul style="list-style-type: none"> Samplers MIR spectrometer Nutrients Carbons Industrial parameters 	<p>Samplers Page 41</p> <p>For the automatic sampling, defined distribution and preservation of liquid samples</p> <ul style="list-style-type: none"> CSF48 stationary samplers CSP44 portable samplers 	<p>MIR spectrometer Page 41</p> <p>Process spectrometer for the analysis of complex mixtures</p> <ul style="list-style-type: none"> Easy-to-use system Modular concept comprising the sensor, assembly, control unit and cleaning unit

Measuring principle

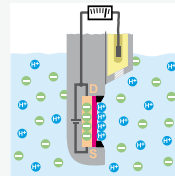
Page 19

Potentiometric measuring principle Page 14



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

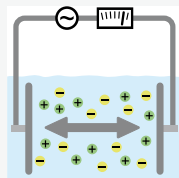
Ion-selective measuring principle Page 15



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

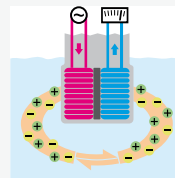
Page 23

Conductive measuring principle Page 21



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

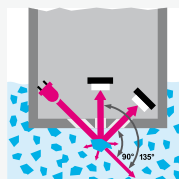
Inductive measuring principle Page 22



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

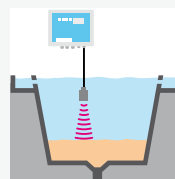
Page 27

Optoelectronic measuring principle Page 25



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

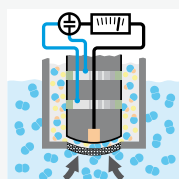
Ultrasonic measurement Page 26



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

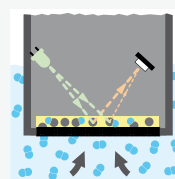
Page 31

Amperometric measuring principle Page 29



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

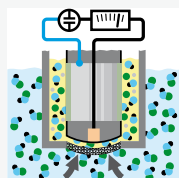
Quenching Page 30



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

Page 35

Amperometric measuring principle Page 33



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

Nutrients Page 41

Online systems for measuring nutrient parameters

- Ammonium
- Nitrate and nitrite
- Phosphate and total phosphate

Carbons Page 41

Systems for determining organic load of water

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

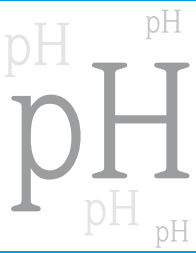
Industrial parameters Page 41

Different water quality requirements depending on the branch of industry

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

Experts in pH measuring technology

pH/ORP



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 over 35 years' experience and an annual production rate of 260,000 process electrodes, the company is an international market leader.

With its accredited calibration laboratory, Endress+Hauser sets another 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. Our sensors with their twin-chamber, double-gel reference system and gel compositions offer maximum protection against contamination and a wider measuring range.

- Outstanding price/performance ratio
- Long electrode operating times reduce operating costs
- Consistently high product quality
- Excellent vertical range of manufacture guarantees high product availability

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. Sensors for fermenter applications with a pressurized reference system, or sensors for overhead installation are further examples of successful developments in sensor technology.



Important milestones have also been reached in the area of glass research: The new B glass introduces a membrane glass which meets process requirements both today and in the future.

- Over 35 years' experience
- More than 260,000 electrodes every year
- Accredited calibration laboratory

The B glass features a wide measuring range from pH 0 to 14, minimum acid and alkaline errors and can be sterilized.

All Endress+Hauser sensors are approved to ATEX/FM, NEPSI and TIIS and equipped with Memosens technology or a TOP 68 connection. This ensures a safe connection which is TÜV certified at three-fold safety.

Memosens - a strong partner in pH measuring technology

The advantages of Memosens technology are particularly evident in pH measuring technology. 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.

Modularity as a prerequisite for flexible measuring point concepts

The ambitious implementation of a modular concept across all modules of a pH measuring point - i.e. from the sensor and the assembly to the transmitter - makes it possible for Endress+Hauser to develop instruments catering for the simplest standard right up to high-tech applications. If it's a case of upgrading a manual measuring point to a fully automated pH solution, you will find the ideal solution for all your needs.

There is a great range of assemblies and retractable assemblies to choose from with so 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.



Five basic types of sensor are available to cover the wide range of applications:

- Sensors with a Teflon diaphragm and gel reference (CPS11D/11)
- Sensors with a ceramic diaphragm and liquid reference (CPS41D/41)
- Sensors with a ceramic diaphragm and gel reference (CPS71D/71)
- Sensors with an open diaphragm and gel reference (CPS91D/91)
- Non-glass sensors with diverse reference systems (CPS441D/441/471D/471/491D/491)

To ensure the safe transmission of measured values from contacting plug-in systems, double-shielded measuring cables are required to prevent electromagnetic interference impulses. Simple cables are available where only the pH value is transmitted, as are multi-pin cables which also

allow temperature measured value transmission (TOP68). With Memosens technology, the sensor data are digitized directly in the sensor and transmitted with a standard bus cable of low impedance.

pH glass electrodes using the potentiometric method

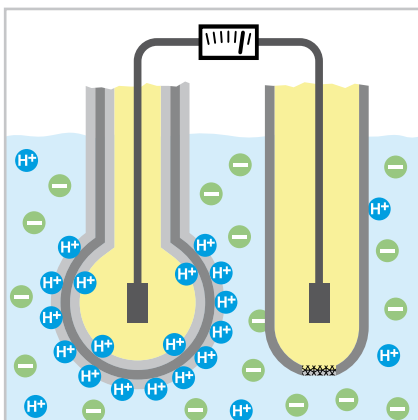
The method of pH measurement using glass electrodes is a potentiometric measurement method. Since glass is an electric insulator, transmitters for analog pH measurement must have an extremely high input impedance. In the case of Memosens electrodes, signals are transmitted without interference. The measuring 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 achieves the outstanding performance of the linear measurement of a material component over a concentration range of 14 (!) exponents. pH glass electrodes have become a standard worldwide.

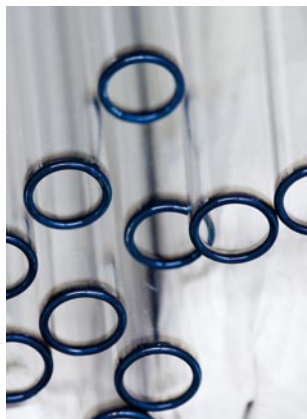
Glass has the advantage of being very chemically inert and very stable when working with hot acids and alkalis.

!	■ Universal use (pH 0-14)
	■ High chemical resistance
	■ Lead-free shaft glass
	■ Temperatures up to 135 °C

This means that pH glass electrodes can be used universally in a multitude of applications.



Potential buildup during pH measurement with glass electrodes



1 Standard sensor Orbisint CPS11D/11
Long-term monitoring in the chemical, potable water and wastewater industry; dirt-repellent Teflon ring diaphragm; reliable measurement (pH 0-14) up to 16 bar, easy-to-use system

2 High-performance sensor Ceraliquid CPS41D/41
Chemical industry, pharmaceutical industry, pure water (low conductivity); for high accuracy and speed; reliable measurement (pH 0-14) in fast-changing medium compositions

3 Hygienic sensor Ceragel CPS71D/71
Food and pharmaceutical industry; (CIP / SIP capabilities, autoclavable); certified biocompatibility, acrylamide-free; BP version with pressurized reference system; overhead installation

4 Contamination-resistant sensor Orbipac CPF81D/81
Water, wastewater, paper industry, power stations; integrated assembly; large dirt-repellent Teflon diaphragm; flat membrane and fixed cable available

5 Contamination-resistant sensor Orbipore CPS91D/91
Pigment production, paper industry, dye/paint production; for precipitation reactions, suspensions, emulsions; rapid response, high-stability gel

Non-glass pH electrodes using the ion-selective method

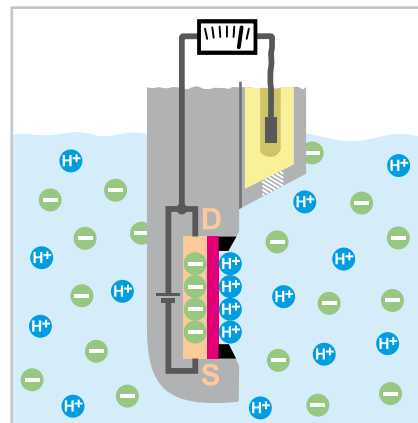
The pH value can also be measured with an ion-selective field effect transistor (ISFET). It is, in effect, a simple transistor with a source and drain that are separated from the base by a semiconductor. Hydrogen ions from the medium may accumulate here. The resulting positive charge on the outside is „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 pharmaceutical industry, since fragile glass electrodes could cause problems if broken.

- Non-glass, break-proof electrode
- For low water content
- Fast response
- For low temperatures



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



1 High-performance sensor Tophit CPS441D/441
 FDA-certified, EPDM chip seal, 3A; perfluoroelastomer seal for process applications; ceramic diaphragm, liquid reference; overhead installation possible

2 Hygienic sensor Tophit CPS471D/471
 Sterilizable, autoclavable, FDA-certified; rapid response in applications with low temperature and low water content; ceramic diaphragm, twin-chamber reference system, polyacrylamide-free gel

3 Sensor for suspensions Tophit CPS491D/491
 For process applications; for low temperatures and high particle content; open aperture diaphragm, extremely stable twin-chamber reference system with gel

ORP electrodes 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.



Gold pin or platinum ring as measuring electrode

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.

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

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.



1 Standard sensor Orbisint CPS12D/12
Long-term monitoring in water treatment, detoxification, or the chemical industry; platinum ring or gold pin; measuring range: -1500 mV to +1500 mV; dirt-repellent Teflon ring diaphragm, easy-to-use system

2 High-performance sensor Ceraliquid CPS42D/42
Chemical industry, detoxification, water treatment, power stations; for media that tend to form buildup, and fast-changing medium compositions; platinum ring; measuring range: -1500 mV to +1500 mV

3 Hygienic sensor Ceragel CPS72D/72
Food industry, fermenter, biotechnology with rapidly changing oxidation reduction potential; platinum ring; measuring range: -1500 to +1500 mV; acrylamide-free, excellent resistance to temperature and pressure changes

4 Sensor for suspensions Orbipore CPS92D/92
Paper and pulp industry; open aperture diaphragm for very contaminated media such as emulsions, precipitation reactions, dispersions; platinum cap for rapid response; long operating times thanks to innovative, stabilized gel

Accredited pH laboratory

Correct results you can rely on

Our permanent calibration laboratory for pH quality buffers meets highest customer requirements.

Endress+Hauser has successfully passed the tough accreditation process of the German Calibration Service (DKD) in accordance with the specifications of DIN EN ISO/IEC 17025:2005. This accreditation

guarantees our customers even greater reliability when it comes to pH measurement.

The accuracy of a pH measuring point is rooted

in achieving the right calibration with pH buffer solutions. With 260,000 pH electrodes produced each year, Endress+Hauser is one of the market leaders in pH measuring technology in the world. We even produce pH buffer solutions for the most stringent requirements of the pharmaceutical industry, which are specified with the actual value and an accuracy rating of ± 0.02 pH.

- In-house DKD calibration laboratory
- Maximum measured error $\pm 0,02$ pH
- Traceable calibration values

On May 5 2009, the accreditation body granted a calibration license with the DAR registration number DKD-K-52701 to the permanent laboratory in Waldheim. This accreditation confirms that the actual values and deviations of the buffer solutions produced are determined correctly.

Furthermore, the quality buffers meet the strict requirements of the pharmaceutical industry and contain only FDA-listed preservative agents. Users in the chemical, food and water/wastewater industries also benefit from the reliability of the calibration solutions.



Fully automated measurement, cleaning, calibration and sterilization

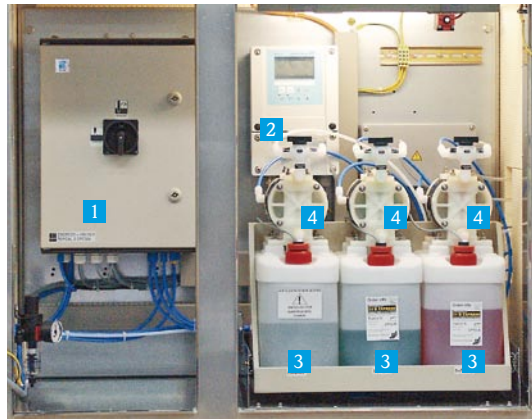
Continuous maintenance of the sensor guarantees a high degree of accuracy and the highest degree of availability of a pH measuring point. However, this causes a hike in operating and maintenance costs, particularly in applications with strict requirements, such as in the chemical, food and pharmaceutical industry or with measuring points with aggressive process conditions. Endress+Hauser offers automatic pH measuring points to keep these costs to a minimum. Thanks to the various degrees of automation, a suitable automatic measuring system can be found for each process: from the simple application in the area of wastewater to processes in the chemical industry right up to very demanding applications with regard to accuracy and measuring safety and certainty in the pharmaceutical industry. Depending on the system, the maintenance work is limited to changing the electrodes, buffers and the cleaning solution, performing a manual calibration or rinsing and cleaning the electrodes outside the process. With Factory Acceptance Tests (FAT) and Site Acceptance Tests (SAT), we make sure that the systems meet your requirements.

- 8 programs to choose from for cleaning, calibration and sterilization
- Optionally available with ATEX approval
- Factory Acceptance Tests (FAT) and Site Acceptance Tests (SAT)
- Wide range of retractable assemblies

Topcal

The fully automated Topcal system for very demanding applications provides reliable measurement results particularly in aggressive and highly contaminated media as often occur in chemical processes. With Topcal, you can clean and calibrate fully automatically outside the process. Maintenance work is limited to changing the electrodes, buffers and cleaning solution. The Parawin software allows you to do a complete configuration of the Topcal at the PC. To transfer the data to the Topcal, you can use the DAT module.

pH/ORP



- 1 Pneumatic control unit
- 2 Transmitter Mycom
- 3 Cleaner and buffer canisters
- 4 Double-membrane pumps

pH solutions from Endress+Hauser benefit all sectors of industry



1. Wastewater industry:

pH measurement is an important parameter in municipal and industrial wastewater treatment plants. Measuring points are typically located in the inlet, sludge activation basin, and the outlet.

Solution:

pH electrodes Orbipac CPF81D/81, also available with a flat membrane for fibrous processes, and Orbisint CPS11D/11 with contamination-resistant Teflon diaphragms. The Flexdip CYA112 assembly ensures optimum installation.

Benefits:

- No penetration of acids or alkalis into the wastewater treatment plant
- Optimum decomposition behavior of microorganisms
- Legal compliance with limit values

2. Chemical industry:

pH measurement must be permanently available. It acts as a measured variable for process control, as a control and actuating variable and for controlling the quality of batching and continuous processes.

Solution:

- Topcal with automatic cleaning and calibration for particularly demanding processes.
- Orbisint CPS11D/11 with ion trap for processes contaminating the reference system, CPS41D/41, CPS91D/91, CPS441D/441
- Pneumatic retractable assemblies e.g. Cleanfit CPA472D and CPA473

Benefits:

- Laboratory calibration concept with Memobase
- Precise measurements, long pH electrode operating life
- Topcal enables on-the-fly cleaning and calibration



3. Food industry:

pH measurement controls and regulates production and meets strict hygiene, cleaning and sterilization requirements.

Solution:

- CPS471D/471 based on ISFET
- CPS71D/71 glass sensor
- Topcal with hygienic CPA475 retractable assembly

Benefits:

- Non-glass electrodes eliminate glass splinters in the product
- ISFET meets 3A standard and EHEDG test criteria
- Topcal enables on-the-fly cleaning and calibration

Experts in conductivity measurement

Experienced, skilled, reliable

Over 35 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). Endress+Hauser is a leader in this field today. Since then, the range of applications for conductivity measurement has been constantly expanded, with new products introduced for the chemical and pharmaceutical industry, making Endress+Hauser a supplier for all sectors of industry today.

High-tech production

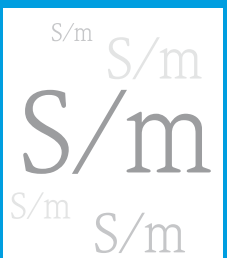
Cutting-edge plastic injection molding and connection techniques are key processes in the production of sensors. Before being packed for distribution, each individual sensor is inspected and its cell constant measured. The electronic components are produced on state-of-the-art pick-and-place machines and assembly stands. Each assembly is tested individually. The production subsystems are centrally

controlled and allow a high degree of flexibility teamed with excellent production safety. This ensures the consistent high quality of our products.

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 at 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.

Conductivity



- EHEDG-certified sensors for ultrapure water
- Injection molding technology for particularly smooth surfaces
- Consistently high product quality
- Excellent vertical range of manufacture guarantees high product availability



Conductivity sensors using the conductive method

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

The electrical resistance R, or its reciprocal value - the conductance value G - are measured following 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:

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

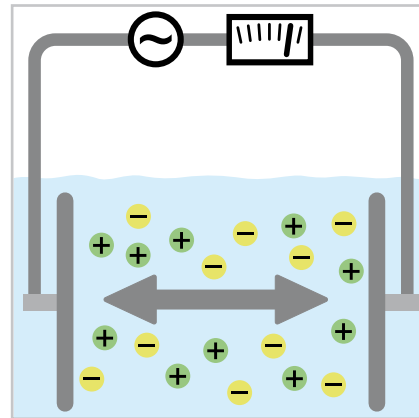
The cell constant k usually has the unit cm^{-1} and is specified by the manufacturer for each sensor. With an ideal plate capacitor, the cell constant is:

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

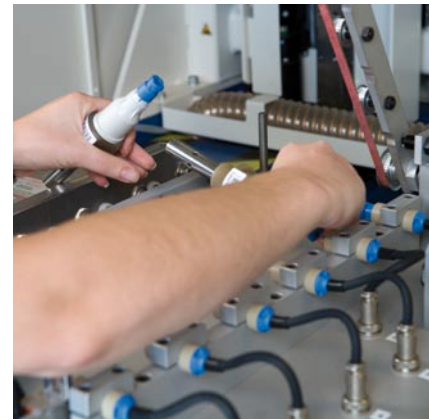
The choice of sensor with a specific cell constant depends on the desired measuring range: the lower the conductivity, the smaller the cell constant selected.

The size of the cell constant affects the optimum arrangement of the electrodes. For example, for ultrapure water the preference is for a concentric arrangement of cylindrical electrodes.

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



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



1 High-temperature sensor Condumax CLS12/13

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 Pure and ultrapure sensor Condumax CLS15D/CLS15

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

3 Hygienic sensor Condumax CLS16D/16

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

4 Low-cost sensor Condumax CLS19

Pure and ultrapure water; compact design

5 Drinking water and wastewater sensor Condumax CLS21D/21

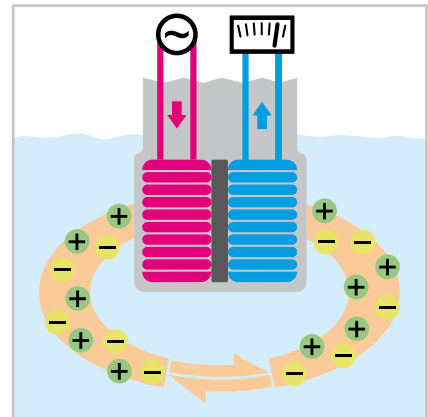
Medium separation; potable water treatment, wastewater treatment; measuring range up to 20 mS/cm; Ex approval

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.

- ! No restrictions in the case of high conductivity values due to polarization effects
- ! No galvanic contact with the medium
- ! Not sensitive to contamination



A magnetic alternating field induces an electrical voltage in the medium



1



2

1 Robust sensor Indumax CLS50/50D
 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 Hygienic sensor Indumax CLS54
 Food and pharmaceutical industry; certified, hygienic design: FDA, EHEDG, 3-A, USP <87> and <88> class VI; part of the Smartec S CLD134 measuring system

Conductivity solutions from Endress+Hauser benefit all sectors of industry



1. Pharmaceutical industry:

In the pharmaceutical industry, the requirements for hygiene and cleanliness in all systems are particularly high. The most important raw material is ultrapure water. Conductivity is an important variable in monitoring pharmaceutical water.

Solution:

- Conductivity sensor Condumax CLS16D, sterilizable in accordance with EHEDG up to 150 °C
- Liquiline CM42, stainless steel version

Benefits:

- Meets all hygienic requirements
- Minimum product loss thanks to early warning that indicates that the system has to be regenerated

2. Food and beverage industry:

Conductivity measurement is required in particular for the cleaning procedure used in the systems (CIP = Cleaning in Place). It monitors the concentration of the solutions in the return line and measures the temperature with integrated temperature sensors.

Solution:

- Smartec CLD134 in stainless steel housing with hygienic sensor CLS54 as a compact or separate unit.

Benefits:

- Certified design meets hygienic requirements
- Process safety and cost savings thanks to optimized CIP cycles



3. Power plants:

Conductivity measurement makes it possible to monitor the quality of the boiler feedwater.

Solution:

- Conductivity panel with
- 2 conductive conductivity sensors Condumax CLS15D
- 2 Liquiline CM42 units
- RMM621 computer module

Benefits:

- High degree of safety thanks to necessary temperature compensation for ultrapure water
- pH calculation based on differential conductivity (in accordance with VGB-R 450L guidelines for operators of large power plants)

Experts in turbidity and sludge level measurement

Focus on water and wastewater

In the area of turbidity and sludge level measurement, the focus is on providing solutions for the water and wastewater industries. Regardless of whether you're measuring turbidity downstream of a sand filter in waterworks in the limit range of optical metrology, or the solid contents of sewage sludge so concentrated it can barely 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 sensors that are based on the 4-beam alternating light method and, depending on the particular measuring range, use scattered light, forward scattered light or backscattered light. These optical sensors are also used in sludge level measurement. Ultrasonics provides an alternative method of determining the level of sediment in a basin or container by measuring the "time-of-flight" of the acoustic signal.

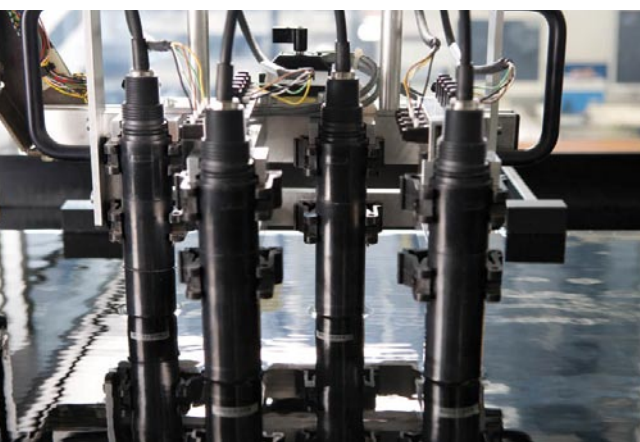
The simple CUE21/CUE22 cell flow system is perfect for measuring drinking water. It enables the measurement of lowest turbidity levels in accordance with EN ISO 7027 and US EPA 180.1. The measuring device is calibrated with reusable, traceable turbidity standards.

Flexible installation

Turbidity sensors from Endress+Hauser are designed to be equally 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 CUA250 flow assembly, and the CUA451 ball valve retractable assembly.



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



Turbidity sensors using established scattered light methods 90-degree, 135-degree and 4-beam alternating light method

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

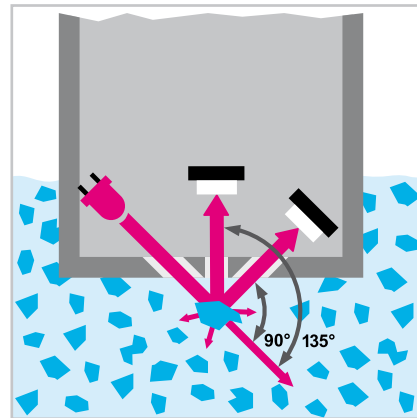
turbidity of the medium is calculated from the amount of scattered light. A temperature signal is recorded and transmitted in addition to the turbidity signal. Digital filter functions with interference signal suppression and automatic sensor monitoring make measurements even more reliable.

4-beam alternating light method

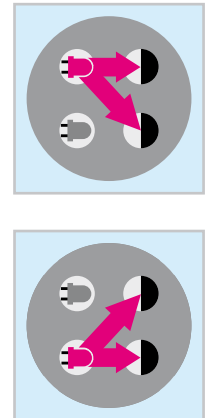
The method is based on two lights and four detectors. Long-life light emitting diodes are employed as monochromatic light sources. These light emitting diodes are pulsed at a frequency of several kHz so

as to eliminate any effects of extraneous light. With each light signal, two measuring signals are detected at 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.

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



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

Turbidity



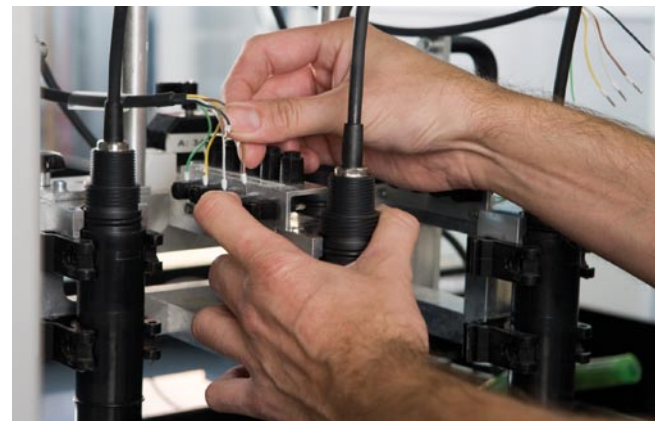
1 Online turbidimeter Turbimax CUE21
Drinking water and treated process water; with infrared light measurement in accordance with EN ISO 7027 / DIN 27027; measuring range: 0-1000 NTU/FNU; ultrasonic cleaning, simple calibration.



2 Online turbidimeter Turbimax CUE22
Drinking water and treated process water; with white light measurement in accordance with US EPA 180.1, measuring range: 0-1000 NTU/FNU, ultrasonic cleaning, simple calibration.



3 Potable water sensor Turbimax CUS31
Fine turbidity range with a resolution of 0.001 FNU ; scattered light measurement in accordance with EN ISO 7027 / DIN 27027; long-term stable and write-protected factory calibration

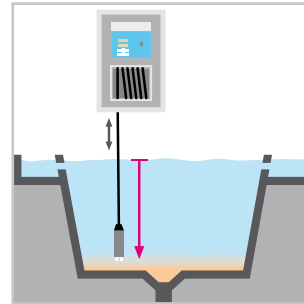


4 Wastewater sensor Turbimax CUS51D
All wastewater applications; 4-beam alternating light methods; excellent long-term stability; cleaning only - no maintenance; automatic air cleaning, if required

Sludge level measurement using the optoelectronic or ultrasonic method

Optoelectronic method

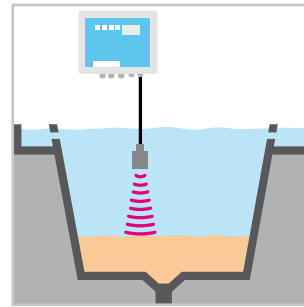
The optoelectronic system also uses the 4-beam alternating light method, which compensates for aging and fouling of optical components.



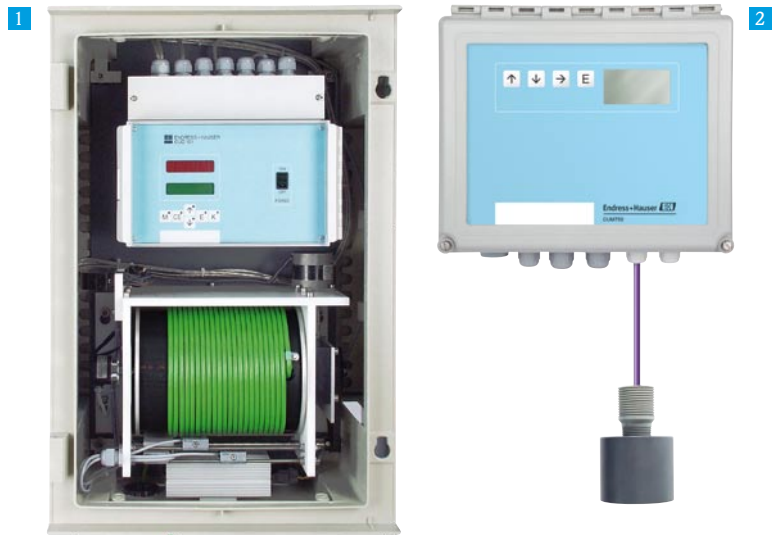
Ultrasonic method

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 again to the receiver.



- Easy configuration
- Simple calibration
- Quick and easy installation



1 Optoelectronic system CUC101
 Water, wastewater, mining, chemical industry; in secondary clarification and flotation plants, direct continuous measurement performed by probe in delay mode

2 Ultrasonic system CUM/CUS750
 Water, wastewater, mining, chemical industry; in preclarification and thickeners; multichannel design for parallel measuring, no moving parts, quick and easy to install

Turbidity solutions from Endress+Hauser benefit the water treatment sector and the primaries industry



1. Drinking water:

In drinking water, the turbidity value is an important measure of quality. Practically every country in the world has a legal limit value for drinking water turbidity. Turbidity measurement can be used to monitor and control all of the steps involved in drinking water treatment.

Solution:

Online turbidimeter Turbimax CUE21

Benefits:

- Continuous turbidity measurement
- Very fast response times thanks to the low flow cell volume
- No interfering air bubbles and little cleaning required thanks to automatic ultrasonic cleaning

2. Wastewater:

In the area of wastewater treatment, turbidity and solids measurement is used in different applications. From the inlet and sludge treatment, to sludge dewatering, the aeration basin and the outlet, it helps monitor and control the processes.

Solution:

- Wastewater sensor Turbimax CUS51D
- Multichannel controller Liquiline CM442

Benefits:

- Excellent long-term stability
- Only cleaning required - no maintenance - thanks to extremely even surfaces
- Quick and easy to install as protecting tubes are not necessary



3. Process engineering:

In process engineering, sedimentation is used to separate suspensions in many processes. Sludge level measurement helps prevent water from entering the thickener, for example.

Solution:

- Optoelectronic measuring system for sludge levels and sludge concentration CUC101

Benefits:

- Direct, continuous concentration measurement performed by immersion sensor in delay mode
- Simple sludge profile analysis thanks to simultaneous concentration measurement and level determination

Experts in dissolved oxygen measurement

A solution for every industry

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

Established and new sensor technologies

Two types of technology are deployed in sensory measuring technology: the well-known and tried-and-tested amperometry - here oxygen concentrations are converted to electric currents - and the optical method of fluorescence quenching which is relatively new in process measuring technology. Here, the fluorescing light of an oxygen-sensitive molecule is used to determine the concentration. In the transmitter, the signals are processed further for the desired reading.

Flexible measuring point concept

Channels, pipes, tanks – not a problem. With the flexible measuring point concept, every task is mastered. Oxygen sensors from Endress+Hauser are designed both for use in channels and basins as well as for installation in pipes and tanks. The wide range of assemblies on offer safely positions this sensor at the place of application - these assemblies include the CYA112 immersion assembly, the COA250 flow assembly or the COA451 retractable assembly. This strategy of flexibility is completed by the Liquiline platform whose transparent operating concept impresses every user.

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

Superb product quality

Sensor production is highly automated. Testing is also performed in 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 consistent high quality of our products.

Dissolved oxygen



Oxygen sensors using the amperometric principle

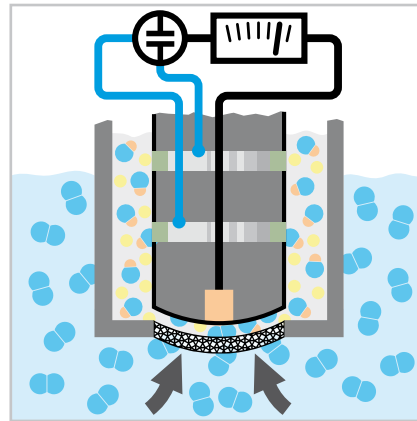
When performing measurements according to the amperometric principle, the sensor comprises a working electrode and a counterelectrode in the simplest version of the two-electrode system. Both are surrounded by an electrolytic liquid in a common chamber. A membrane provides the link to the medium or process: 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.

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

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.



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

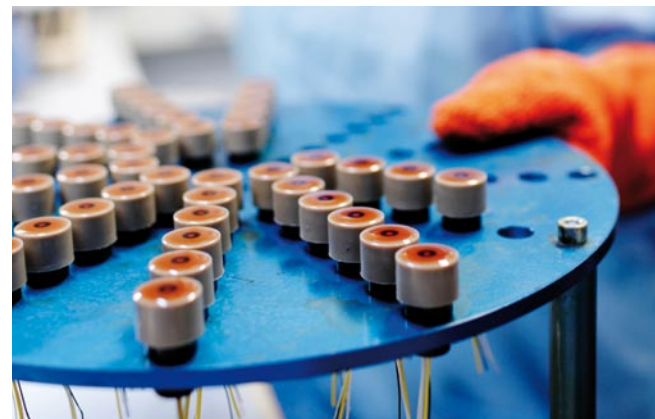
Dissolved oxygen



**1 Hygienic sensor
Oxymax COS21D**
Digital sensor for food, pharmaceuticals, energy, chemicals, inertization; very wide measuring range: 0.001-20 mg/l; 12 mm stainless steel design, CIP and SIP compatible.

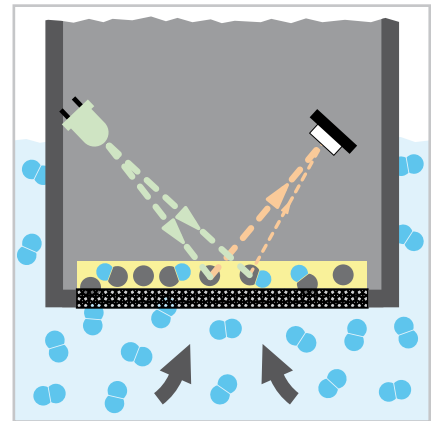
**2 Water sensor
Oxymax COS41**
Analog sensor for water treatment; tried-and-tested 40 mm design; two-electrode system; measuring range: 0.0-20mg/l

**3 All-round sensor
Oxymax COS51D**
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, just as with the amperometric sensor.



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

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

Dissolved oxygen



1 Optical sensor Oxymax COS61

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

2 Memosens sensor Oxymax COS61D

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

Oxygen solutions from Endress+Hauser benefit the water treatment sector, power stations, and the food and pharmaceutical industries



1. Water and wastewater:

Oxygen measurement is an important parameter to control nitrogen degradation in the aeration basin. Insufficient oxygen means too little degradation, while too much oxygen means high energy costs.

Solution:

- Amperometric measurement with Oxymax COS51D; optical measurement with Oxymax COS61D
- Liquiline CM442

Benefits:

- A high level of availability while ensuring reliable measured values
- Lower energy costs thanks to optimized system operation
- Long maintenance intervals

2. Power stations and industrial process water:

Hot boiler feedwater in conjunction with dissolved residual oxygen will lead to corrosion on the system units. High pressure and high temperature demand a trace sensor suitable for daily use, with reliable sample conditioning, to reliably display the residual oxygen contents.

Solution:

- Trace oxygen measurement with Oxymax COS21D and sample conditioning
- Liquiline CM42

Benefits:

- Oxygen-free water that does not cause corrosion
- Optimum system operation
- Increased system safety



3. Food and pharmaceutical industry:

Oxygen is unwanted in the area of inertization applications and beverage bottling. This is where trace measurement is important. In fermentation plants, measurements help to check and regulate the fermentation process.

Solution:

- Autoclavable and sterilizable sensor Oxymax COS21D, stainless steel design
- Liquiline CM42, stainless steel version

Benefits:

- Optimum oxygen supply in fermenters
- High product quality thanks to the absence of oxygen
- Prevents bacterial fouling

Experts in chlorine and chlorine dioxide 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 best solution currently available worldwide.

Complete measuring points

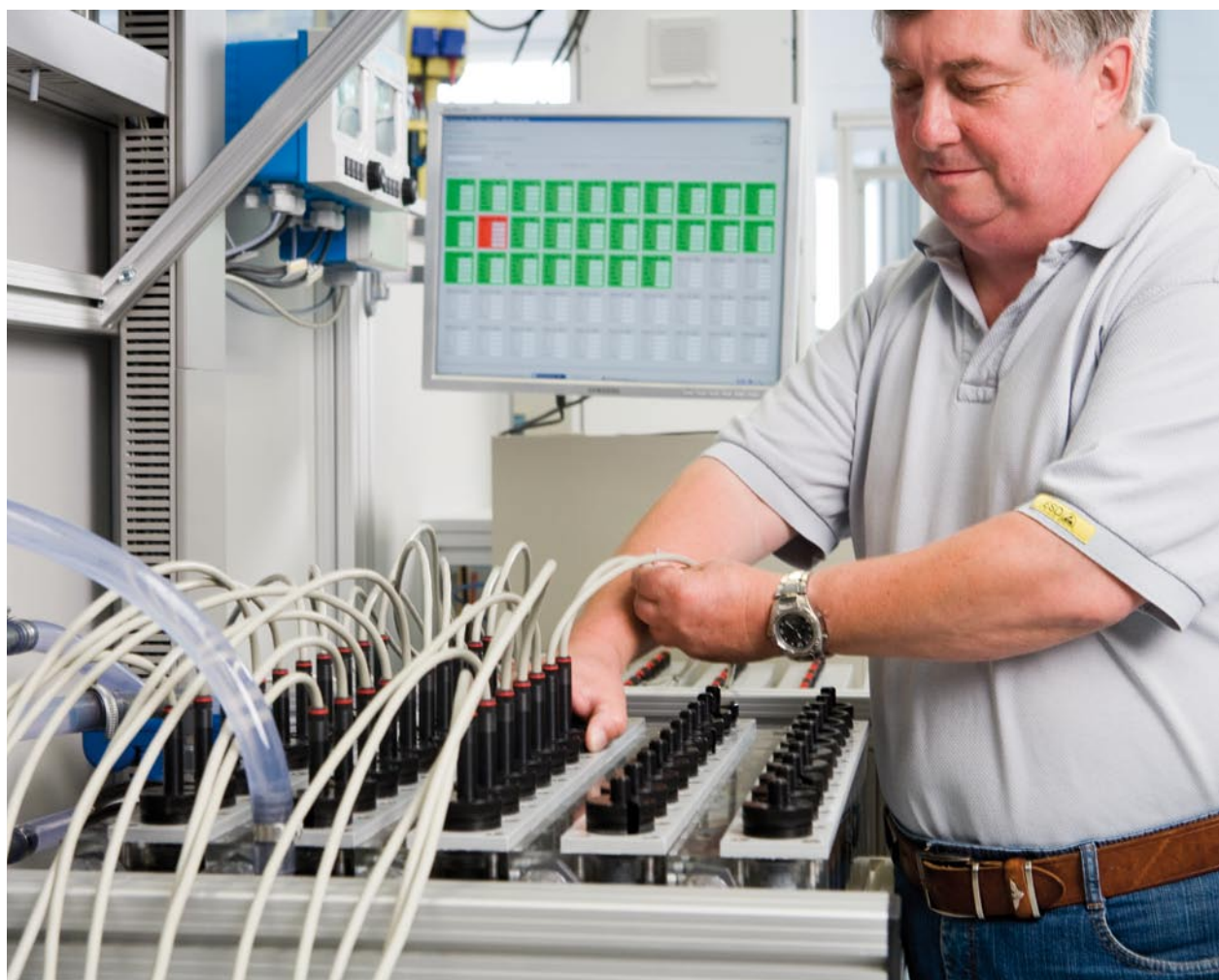
The sensory mechanism uses the amperometric principle, i.e. the chlorine concentrations are converted to electric currents in the sensor, which are then processed in the transmitter to provide the required reading. To do this, the medium (mostly water) is supplied to the sensor via a flow assembly. The 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. The measuring points are often fully mounted on a panel; once the water supply and operating voltage have been connected, measurement can begin without delay.

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 and total chlorine are also available. The highly automated production process guarantees consistently high quality.

- Sensors for all forms of chlorine: free available chlorine, chlorine dioxide and total chlorine
- Easy installation thanks to complete measuring panels with flow assembly
- Simultaneous measurement of pH and ORP values possible
- High-quality products guaranteed

Testing is also performed on a fully automated testbed, where the sensors are tested for zero point, slope and constancy and the results documented.



Sensors for disinfection using the amperometric principle

The sensors work in accordance with the amperometric principle in a membrane-covered cell. How they work can be described using the example of chlorine dioxide measurement:

The sensor features a metallic cathode, which is separated from the medium by a thin membrane.

Chlorine dioxide coming from the medium diffuses

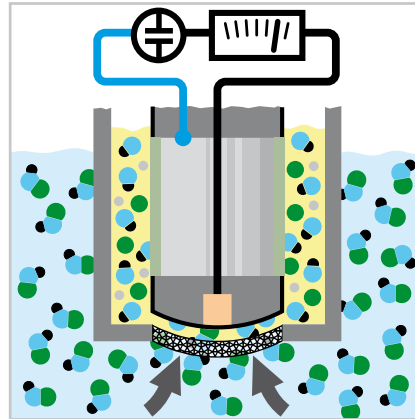
through this membrane and is reduced at the gold cathode. The circuit is completed by means of the silver anode and the electrolyte.

- Membrane-covered
- No zero point calibration
- Virtually independent of flow
- Low maintenance

The electron reduction at the cathode 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 in a wide pH and temperature range. The situation with free available chlorine is somewhat different. Here, 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 is more complicated. In addition to hypochlorous acid, chloramines also play a part in a complex system of reactions.



Chlorine dioxide diffuses through the membrane and is reduced at the gold cathode



1 Sensors for free available chlorine CCS140/CCS141
CCS140: Recreational water and industrial water; measuring range: 0.05 to 20 mg Cl₂/l; CCS141: drinking water; measuring range: 0.01 to 5 mg Cl₂/l; independent of flow over 30 l/h

2 Sensors for chlorine dioxide CCS240/CCS241
CCS240: Recreational water and industrial water; measuring range: 0.05 to 20 mg ClO₂/l; CCS241: drinking water; measuring range: 0.01 to 5 mg ClO₂/l; independent of flow over 30 l/h

3 Sensor for total chlorine CCS120
Drinking water, recreational water, industrial water and wastewater; measuring range: 0.1 to 10 mg/l including chloramines; wide pH range 5.5 to 9.5; for flow and immersion operation

4 Digital Memosens sensor for free available chlorine CCS142D
Drinking water, process water, industrial water and wastewater; measuring range: 0.01 to 20 mg Cl₂/l depending on version; digital signal processing; storage of sensor and process data



Measuring panels for disinfection – practical complete solutions

A complete measuring point including all medium-conducting components and connections, complete and ready to operate on a single panel. Set it up and off you go! CCE stations are available in two versions: CCE10 based on Liquisys CCM253 and CCE11 based on Liquiline CM330.

They are fully mounted and tested. All the customer has to do is connect them to the water supply. The water circuit already includes a filter, check valve and sampling tap. This facilitates easy sampling for DPD comparison measurements used for calibration.

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



1



2

1 Universal measuring panel CCE10
 Drinking water, industrial water, swimming pools; chlorine dosage for water treatment; based on Liquisys CCM253; for free available chlorine, chlorine dioxide or total chlorine as well as pH and temperature

2 Digital measuring panel CCE11
 Drinking water, industrial water, swimming pools, quality control and monitoring in the distribution network; based on Liquiline CM330; for free available chlorine, pH and temperature; digital, precalibrated sensors

Disinfection solutions from Endress+Hauser benefit all water applications



1. Swimming pools

The best known application for disinfection solutions is the swimming pool. Not only must the disinfection process in a pool be just right, so too must the pH value. And allowances must be made for widely fluctuating visitor numbers and therefore dynamic changes in contamination levels.

Solution:

- DI sensor CCS140 with pH/ORP sensors CPS31/32
- Flowfit CCA250
- Liquisys CCM253

Benefits:

- Accurate measured values for controlling chlorine dosage
- Reliable disinfection
- Prevention of excessive chlorine concentrations and therefore corrosion and taste impairment
- Compliance with pH limits

2. Process water and cooling circuits

Chlorine measurement is used in the process to control the disinfection of any water used for industrial purposes. In cooling circuits, it is used in the decomposition and long-term prevention of biofilms within cooling systems and related equipment.

Solution:

- DI sensors CCS140 or CCS240 with pH/ORP sensors CPS31/32
- Flow assembly CCA250
- Transmitter Liquisys CCM253

Benefits:

- Prevention of film formation in cooling systems
- Cost-effective reuse of treated water



3. Drinking water

In the case of drinking water, effective and long-lasting disinfection of the water is required. The depot effect of chlorine, in addition to its instant germ-killing properties, plays an important role here. Unconverted chlorine remains active and guarantees that water remains germ-free in the long-run.

Solution:

- Trace sensors CCS141/CCS241 with pH/ORP sensors CPS31/32
- Flow assembly CCA250
- Transmitter Liquisys CCM253, or
- Trace sensor CCS142D with Liquiline CM330

Benefits:

- Reliable control of chlorine dosage
- Monitoring of active chlorine in the distribution network
- Germ-free water from the distribution network right to the end customer's water tap

Assemblies open a window onto the process

No assembly, no measurement!

For almost every measurement, whether in the food or chemical industries or in environmental applications, an assembly is required which 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 how the sensor is looked after and also depends on cleaning and calibration. Endress+Hauser offers a range of retractable, flow and installation assemblies, which are used to move the sensor in the process kettle, pipe or fermenter to the desired position in the medium and to remove it while the process is running. After all, no assembly means no measurement!

Our expertise, which is based on our continuously expanding experience and progress, guarantees you an optimized and reliable measuring unit from one source! What is unique is the range of choice available with a large variety of process connections to ensure that the right assembly solution is available for all possible installation positions and applications.

For example, our heavy-duty assemblies CPA472D also operate reliably at very high temperatures and pressures up to 10 bar. The modular design makes it possible to switch between corrosion-proof stainless steels and special materials such as Alloy, PEEK or PVDF. Many modifications are available on request.

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



Assemblies

Retractable assemblies

Cleanfit

Only a retractable assembly allows you to achieve continuous availability of the sensor. 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.



- High level of sensor availability for 120/225 mm sensors
- Safety for people and processes thanks to patented sealing concept or the use of a ball valve as a process seal
- Easy to operate with safety functions
- Sensors can be replaced and checked while process is running
- Integrated rinse chamber means that work, including calibration, can be carried out in a contamination-free environment
- Provision of suitable special materials and seals ensures maximum chemical resistance
- Easy adaptation of assemblies for gel- or liquid-filled sensors

Installation assemblies

Unifit CPA442/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 or stainless steel 1.4435 for the food and pharmaceutical industries
- Low-cost pipe and kettle 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 kettles
- 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.



- Bypass measurement
- Installation of up to three sensors
- Resistant PP or PMMA housing
- Cost-effective and high level of sensor availability due to bypass installation
- Spray cleaning possible
- Integrated flow display and adjustment for CCA250

Bracket and assembly for immersion operation

Flexdip CYH112/CYA112

Flexdip brackets and assemblies for immersion applications allow for modular and flexible inclusion of sensors in the process.



- 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
- Floating versions for varying levels

Transmitters display the measured value

Transmitters make the measuring point complete!

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 transmitter concept of Endress+Hauser ranges from the high-performance Liquiline with two-wire technology to the world's best-selling Liquisys transmitter to the top-class Mycom S instrument.

The latest device in the portfolio is the multiparameter and multichannel controller Liquiline CM442. Two Memosens sensors 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 product line, in particular, offers one-of-a-kind convenience with the Navigator. In addition, its modular design makes it very simple to expand the functionality and also saves you storage costs. Software updates and transferring the configuration to other transmitters are also simple. A DAT module is available for the Mycom S and Liquiline CM42 for this purpose.

The Liquiline CM442 is even more up-to-date, using an SD card. Liquiline CM442 is the heart of the new Endress+Hauser platform for

liquid analysis. Its hardware and software are also integrated into the new samplers Liquistation CSF48 and Liquiport CSP44. Our objective is to make your everyday work easier – with maximum uniformity to provide you with the utmost reliability at low costs.

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



Transmitters

Liquiline CM442

The multiparameter and multichannel controller is suitable for all Memosens sensors and digital sensors with Memosens protocol.



- One controller for all parameters: pH, ORP, conductivity, dissolved oxygen, turbidity and nitrate - any sensor combination is possible
- Modular concept for a wide variety of applications
- Easy operation with uniform and easy-to-understand menu guidance for all parameters
- Saves time thanks to preconfigured software and easy sensor replacement with precalibrated Memosens sensors
- Standardized components reduce maintenance and storage costs

Liquiline CM42

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



- Version for pH/ORP, conductivity, dissolved oxygen – easy switch of parameters via sensor modules
- Available with stainless steel housing in hygienic design
- Convenient operation with large, high-contrast display and the Navigator, intuitive operation with plain-text display and online help
- Available outputs in addition to 4 to 20 mA, HART, Profibus PA and FOUNDATION Fieldbus
- Predictive maintenance possible with Memosens sensors
- Liquiline CM330 available as version for chlorine

Liquisys

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



- Version for pH/ORP, conductivity, dissolved oxygen, turbidity 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

Mycom CPM153

The four-wire transmitter is suitable for both hazardous and non-hazardous locations and comes with a variety of functions.



- Version for pH/ORP and conductivity
- For one or two sensor circuits
- High measuring reliability with integrated monitoring functions
- Logbooks for operation, calibration and error messages
- Extended relay functions for control and cleaning
- Extended diagnostic functions
- Various outputs available: 4 to 20 mA, HART, Profibus PA/DP

Experts in analyzers, sample conditioning, containers, solutions

Today, most process conditions demand far more than just an accurate analyzer. Many applications require sample conditioning for reliable and accurate results. Other cases call for an interface for integration into cost-saving automated systems. In addition, special housings are needed to protect your devices that are installed outdoors or in aggressive environments. Frequently, correct sampling and sample conditioning are critical for successful analysis. Endress+Hauser sample conditioning units are optimally matched to your process conditions. They are reliable in everyday operation and easy to install and maintain. Intelligent solutions such as the in-situ sampling systems relieve the customer of the additional installation of a sample pump.

Analysis does not have to be complicated!

Customers in all sectors benefit from our many years of experience in wastewater treatment.

Whether you need an analyzer for certain parameters or for complex mixtures - Endress+Hauser helps you select the suitable device and any peripherals you may need. Our analyzers need few or no consumables and are so simple that they can be easily operated by operating personnel.

The modular design of all analyzers also simplifies inventory management and provides a previously

unknown level of flexibility that makes your investment future-proof. In many cases, adaptations are possible even for already installed devices. The analyzer product line has been consistently further developed to make us a complete supplier in environmental technology.

- | | |
|---|--|
| ! | ■ Wide variety of measuring principles |
| | ■ In-situ and cabinet devices |
| | ■ For all industries |
| | ■ Robust |



Analizers

Samplers

MIR spectrometer

Nutrients

Carbons

Industrial parameters

Parameter

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.



- **Liquistation CSF48**
Stationary sampler for automatic sampling, defined distribution and preservation of liquid samples taken using the vacuum system
- **Liquistation 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

MIR spectrometer

The spectrometer measures the concentration of multiple components simultaneously, thus providing the basis for optimizing the process control and product quality.



- **Sensor CVS90** for measuring light intensity at various wavelengths
- **Assembly Cleanfit P CVA476** for installing the sensor in the process
- **Control unit CVG90** with panel PC with touchscreen
- **Cleaning system Topcal CVC400** for automatic cleaning without removing the sensor
- **Software Liquisens CVS90** for calculating the included components from the overall spectrum of a mixture

Nutrients

In addition to decomposing carbon, today's wastewater treatment plants also reduce nitrogen and phosphate. For this purpose, online measurement of nutrient parameters plays an important role.



Nitrate

- Viomax CAS51D
- ISEmax CAS40/CAM40
- STIP-scan CAS74/CAM74

Nitrite

- Stamolys CA71NO

Ammonium

- ISEmax CAS40/CAM40
- Stamolys CA71AM

Phosphate

- Stamolys CA71PH
- SPECTRON TP CA72TP (total phosphate)

Carbons

To evaluate the organic load of water and wastewater, the primary parameters measured are TOC, SAC, BOD and COD. Endress+Hauser offers various measurement methods for these parameters.



TOC

- TOCII CA72TOC
- EZ-TOCII CA52TOC
- STIP-scan CAS74/CAM74 (TOCeq)

SAC

- Viomax CAS51D (SAC)
- Stamosens CSS70/CSM750
- STIP-scan CAS74/CAM74

BOD

- STIP-scan CAS74/CAM74

COD

- Stamolys CA71COD
- STIP-scan CAS74/CAM74
- EZ-TOCII CA52TOC
- TOCII CA72TOC

Industrial parameters

The requirements differ depending on the branch of industry. However, most process water is softened and virtually all manufacturing processes require corrosion-free water that is likewise free of turbidity, color, iron and manganese.



- Stamolys CA71AL
- Stamolys CA71CL
- Stamolys CA71CR
- Stamolys CA71FE
- Stamolys CA71MN
- Stamolys CA71HA
- Stamolys CA71HY
- Stamolys CA71SI
- Stamolys CA71CU

- **Aluminium**
- **Chlorine**
- **Chromate**
- **Iron**
- **Manganese**
- **Hardness**
- **Hydrazine**
- **Silicic acid**
- **Copper**

Container measuring stations

In industrial parks, the various types of wastewater are monitored before being fed to a wastewater treatment plant in order to prevent incidents. Endress+Hauser offers complete solutions for this environmental monitoring.



- **Measuring containers**
Fully climate-controlled, individually sized containers with necessary accessories for a laboratory, online analytical measuring devices, samplers and flowmeters
- Application advice and basic engineering
- Construction and software integration
- Commissioning and maintenance

Experts in services

As a manufacturer of measuring equipment for plant engineering, Endress+Hauser has been active in the market for over fifty years now. We work together constantly 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 - our job is to support you with the right balance of services so that you can reach this goal with maximum plant safety and optimum effort.

Our contribution to your return on investment

Our entire organization is oriented towards helping you in your tasks in the procurement, installation, commissioning and operation phases. This starts with continuously optimizing our measuring equipment for plant engineering to your branch of industry, in conjunction with

developing special solutions for your specific needs, and continues with our range of innovative tools and services. Whether your facility just 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.

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

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. With our service support, we offer you everything you need over the life cycle of your facility.



Calibration

Accurate liquid analysis is of great importance in many manufacturing processes. We calibrate your conductivity measuring point onsite according to USP recommendations and ASTM standards. We offer the same service for pH measuring points calibrated with our DKD (German Calibration Service) accredited buffer solutions. If a turbidity, DI, oxygen or nitrate sensor should ever leave its ideal line, we restore its accuracy with a factory calibration.

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

Maintenance concepts

Our maintenance concepts provide the right safeguard for quality and safety-related measuring points. We work closely together 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, with which you can select the service components you need individually, we offer professional support, both for Endress+Hauser devices and those from other manufacturers.

Application advice and commissioning

The demands on your employees are increasing continuously. They have to 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 contact persons provide comprehensive application advice, draft concepts and work with you to develop the ideal solution. If you like, we can study your wastewater as a snapshot. We analyze your sample using recognized reference methods and according to the measuring point requirements and recommend how to proceed. 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.



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