Analyzers, in-situ sensors and samplers

Experts in Liquid Analysis

Endress+Hauser
People for Process Automation

Endress+Hauser – Your partner

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

Endress+Hauser supports customers around the globe with a wide range of instruments, services and automation solutions for industrial process engineering. Around half of the 14,000 „People for Process Automation“ work in sales. They help customers throughout the world to make their processes safe, economical and environmentally friendly. With sales centers in over 40 countries, Endress+Hauser is always near its customers. In places and locations where Endress+Hauser is not directly present, representatives complete this global network allowing Endress+Hauser to serve its customers quickly, flexibly and individually.

Concentrated expertise
The headquarters of our production centers focus on production, product management, research and development, as well as logistics. At sites in Germany and Switzerland, we produce core components for our worldwide production. Plants in Brazil, China, the Czech Republic, France, India, Italy, Japan, South Africa, the UK and the United States assemble, test and calibrate instruments and devices mainly for regional markets.

Sustained growth
For us, profit is not the goal but the result of good economic activities. The Group focuses on sustained growth on its own strength. The basis for this endeavor is a sound equity ratio of 70 percent. Profits are predominantly returned to the company – this also ensures the success and independence of the Group. Endress+Hauser was founded by Swiss native Georg H. Endress and German native Ludwig Hauser in 1953. Over the years, the company thrived and is now a global enterprise - wholly owned by the Endress family since 1975.

Expertise in liquid analysis

Within the globally active Endress+Hauser Group, Endress+Hauser Conducta counts among the leading international manufacturers of sensors, transmitters, assemblies, analyzers, samplers and complete solutions for liquid analysis. As a center of excellence, we have worked hard over the last 40 years to achieve a top-ranking position on the international market. Endress+Hauser Conducta has five production plants: in Gerlingen (Germany), Waldheim (Germany), Groß-Umstadt (Germany), Anaheim (USA) and Suzhou (China).


Gerlingen, Germany


Waldheim, Germany


Groß-Umstadt, Germany


Anaheim, USA


Suzhou, China

Precise Liquid Analysis

Environmental protection, consistent product quality, process optimization and safety – these are 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 support you in fulfilling all these measuring tasks with application know-how and cutting-edge technologies. 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 – use our know-how and expertise to optimize your application.
- As leading supplier of analytical measuring technology, we support you during the entire product life cycle - everywhere in the world.

Content

Measuring principles

Nowadays, if for example you need to measure nitrate or ammonium online, you will often have a tough time deciding what analysis principle the device should use. It's an important decision because an unsuitable measuring principle can lead to seriously incorrect measurements. On the other hand, no general recommendation can be made for a measuring principle that is ideally suited to every application.

The question is more what the measurement results are to be used for:

- If the focus is on control and regulation strategies, you need fast measured values that reflect the current conditions in the process. These rapid measured values are mostly returned by sensor systems that are used directly in the process. They work based on optical or potentiometric measuring principles.
- If monitoring and documentation tasks are to be performed, high-precision, self-cleaning analyzers that are automatically calibrated are the solution. Such types of measuring systems are based on colorimetric, wet-chemical, biological or potentiometric measuring principles.

Endress+Hauser's unique complete product range always offers you the right device with the right measuring principle for your application.

Photometric methods

Photometry is one of the oldest and most time-tested analysis procedures there is. It is based on the fact that different substances contained in an aqueous sample absorb, or filter out, different amounts of light introduced into the sample. Detectors on the receiver side of the measuring system analyze this difference between the light introduced and the light received, and use the calibration curve saved in the system to determine the concentration of the specific substance in the sample.

The majority of all the measuring systems available today works on the basis of photometric measuring principles:

- Colorimetry: using special reagents, the initially invisible particles are "dyed" and the dyed substances are then measured photometrically.
- UV absorption: The substances to be measured display direct self-absorption in the ultraviolet range of the light. People often refer to optical measuring systems here that usually analyze a measuring wavelength and a reference wavelength.

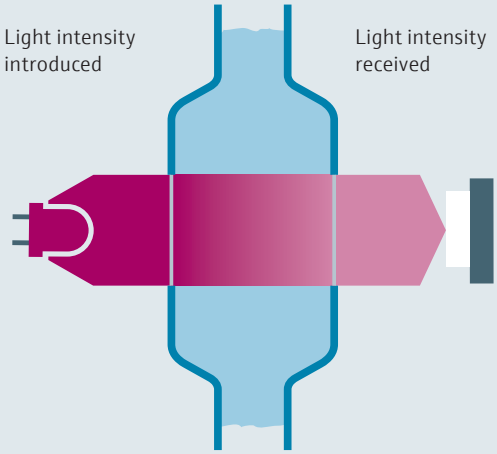
Colorimetry measuring principle
One or more reagents are added to the water sample to "dye" the sample to be analyzed. Afterwards, the aqueous sample is measured by photometric means. The intensity of the specific absorption signal is proportional to the concentration of the dyed substance in the sample. A reference measurement (sample without chemicals) is taken before every measurement to be able to compensate for any interference caused by inherent color, turbidity or contamination. The actual concentration of the substance is ascertained using this information.

Video on the colorimetric measuring principle

Most standardized procedures for water and wastewater inspection are based on photometry and colorimetry. By specifically selecting the dye reagents, many different parameters can be measured very accurately, ranging from aluminum and silicate to phosphate.

Endress+Hauser's Liquiline System CA80 online analyzers use these tried-and-tested laboratory procedures so you can be sure you can rely on the measurement result.

Measuring principle: colorimetric absorption measurement

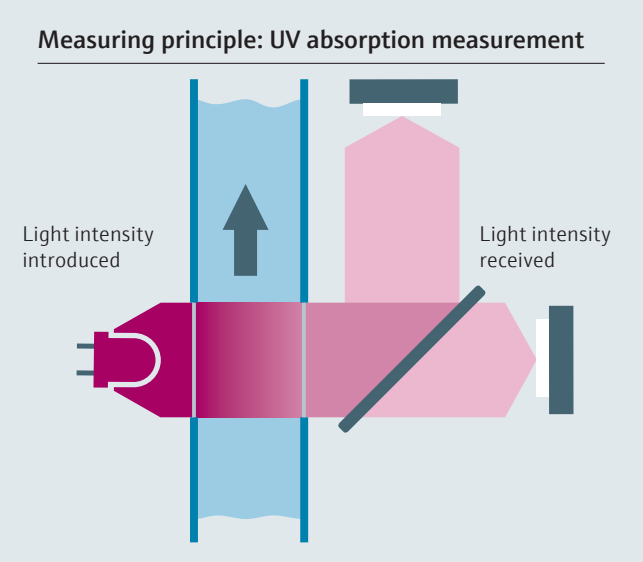


Absorption = measurement of the attenuation of light relative to the introduced light intensity

Measuring principle: UV absorption
UV sensors use the self-absorption of the substance that is to be measured in the ultraviolet range of the light.

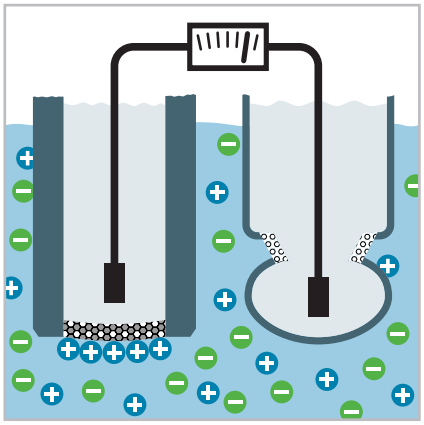
For this purpose, the ultraviolet light of a pulsed, highly stable flash lamp is shone through the measurement section. The substances in the sample which are to be measured absorb this light in proportion to their concentration. The intensity of the attenuated beam of light is measured at two fixed wavelengths (measuring wavelength and reference wavelength) using photodiodes. Interference from turbidity, contamination or other organic hydrocarbons is eliminated mathematically. The substance concentration is determined with the aid of a calibration curve saved in the system.

The Viomax CAS51D in-situ sensors for measuring nitrate or SAC work on the principle of UV absorption. The sensors measure directly in the process. Nitrate and SAC (sum parameter for the organic load of the water) absorb directly in the UV range without reagents being added.



Potentiometric method with ion-selective electrodes (ISE)

Potentiometric measurement using ion-selective electrodes is similar to pH measurement. The heart of the ion-selective electrode (ISE) is a membrane that is selective for the specific ion to be measured. Ionophores are accommodated in this membrane. These ionophores facilitate the selective “migration” of the ions to the inside of the electrode and this change in charge causes an electrochemical potential. This potential is measured against a separate reference electrode with a constant potential. It is proportional to the ion concentration in the medium. With this measuring principle, the measurement result is not affected by the color and turbidity of the medium. Since the ISE sensor is immersed directly into the medium and responds rapidly, the measuring system reacts very quickly to changes in concentration. The measuring signal and concentration of the measured ions are directly related over a very broad range in such a way that these systems can cover a very wide measuring range.



Measuring parameter overview

	Description	Applications
Nutrients	**Description** In addition to reducing carbon, modern wastewater treatment plants also reduce nitrogen and phosphate. For this purpose, online measurement of the following parameters is required: ▪ Ammonium ▪ Nitrate ▪ Nitrite ▪ Phosphate ▪ Total phosphorus Online analysis helps in meeting the more stringent discharge limit values and in reducing operating costs, for example wastewater discharge costs.	Applications  ▪ WWTP aeration: Ensuring nitrification with minimum oxygen consumption and sufficient denitrification, controlling recirculation, optimizing precipitant dosage ▪ WWTP outlet: Monitoring and documentation of limit values ▪ Water treatment: Monitoring and documentation of limit values
Sum parameters	**Description** Four parameters are mainly used to measure and assess the organic load of water and wastewater: ▪ Spectral absorption coefficient (SAC) ▪ Biological oxygen demand (BOD) ▪ Chemical oxygen demand (COD) ▪ Total organic carbon (TOC)	Applications  ▪ WWTP inlet: Process control and monitoring by measuring the total organic carbon and the amount that can be broken down biologically ▪ WWTP outlet: Monitoring and documentation of mandatory limit values, product loss monitoring, load accounting ▪ River monitoring
Metals and others	**Description** The requirements for water quality differ depending on the industry. Drinking water and most of the process water is, however, chlorinated, softened and/or chemically conditioned for setting the pH value, corrosion control and for preventing sludge buildup. Practically all manufacturing processes require corrosion-free water, which shows neither turbidity and color nor contains iron and manganese. Microbiological growth is also to be avoided. The following parameters are measured: ▪ Aluminum (Al) ▪ Chromate (Cr) ▪ Iron (Fe) ▪ Hardness (Ha) ▪ Silica (Si) ▪ Sodium (Na)	Applications  ▪ Drinking water: Ensuring unspoilt, odorless quality ▪ Ultrapure water for water and steam generation ▪ Softening of industrial wash and rinse water ▪ WWTP outlet: Monitoring and documentation of mandatory limit values ▪ Color and iron measurement in paper processes
Sampling, sample condtioning	**Sample conditioning** Correct sample conditioning is part and parcel of every analysis. Good sample conditioning should: ▪ Not alter the sample ▪ Retain all the particles etc. that cause interference ▪ Require minimum maintenance This is particularly important in the wastewater industry.	Applications Page 18  ▪ WWTP: From the inlet through various stages of treatment to the outlet ▪ Raw wastewater in the chemical, food and paper industry ▪ Drainage water

Measuring principles

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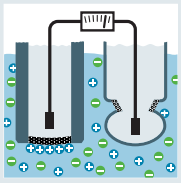
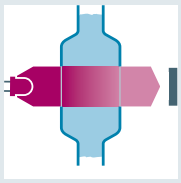
Potentiometric measuring principle.....Page 5



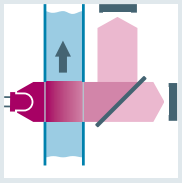
Based on an ion-selective membrane on which ammonium and nitrate ions accumulate thereby causing an electrical potential to build up.

Colorimetric measuring principle .....Page 4



Reagents are added to the water sample to "dye" it. Afterwards the sample is measured by photometric means.

Measuring principle UV absorption.....Page 5



Based on an absorbance measurement at two fixed wavelengths in UV.

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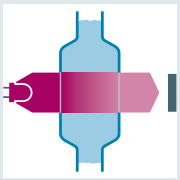
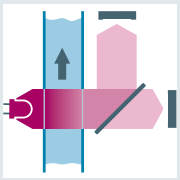
Colorimetric measuring principle .....Page 4



Reagents are added to the water sample to "dye" it. Afterwards the sample is measured by photometric means.

Measuring principle UV/infrared absorption.....page 5



Based on absorbance measurement at defined wave lengths.

- UV: UV light is shone through the measurement section and the absorption is measured at two fixed wavelengths (SAC).
- IR: The sample is combusted and the combustion gas is cooled down. Afterwards the CO_2 content is determined by IR absorption and used to calculate the TOC value.

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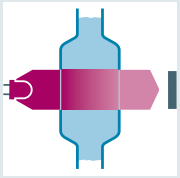
Colorimetric measuring principle .....Page 4



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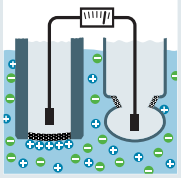
Potentiometric measuring principle.....Page 5



Based on an ion-selective membrane on which sodium ions accumulate thereby causing an electrical potential to build up.

Samplers

Samplers provide automatic sampling, defined distribution and preservation of liquid samples. They guarantee that these samples remain undistorted until they are analyzed in the laboratory.
The Liquistation and Liquiport samplers can easily be equipped with sensors for online measurement of various parameters. They can also be seamlessly integrated into process control systems.

Applications.....Page 19

- Municipal and industrial wastewater treatment plants
- Laboratories and water authorities
- Monitoring of liquid media in industrial processes

Nutrient parameters

	Ammonium	Nitrate	Nitrite	Phosphate	Total phosphorus
ISEmax CAS40D	■	■			
Viomax CAS51D		■			
Liquiline System CA80AM	■		■	■	■

Nutrient measurement enables process optimization and outlet control in wastewater treatment plants. It also helps to monitor the water quality during water treatment.

Ion-selective measuring system ISEmax CAS40D/Liquiline CM44 for ammonium and nitrate measurement

ISEmax is used for the continuous measurement of ammonium and/or nitrate, with the compact system comprising one sensor and one transmitter. The sensor consists of ion-selective electrodes and a reference electrode which is installed in an immersion assembly with automatic compressed-air cleaning and a pre-amplifier. Using a suitable holder, the sensor is mounted directly on the basin rim, e.g. suspended vertically from a chain. In this way, the sensor and the electrodes are immersed directly into the process.

Up to three ion-selective electrodes measure ammonium, nitrate and, where applicable, other measured variables simultaneously. They have easily replaceable membrane caps which are selective for the ion to be measured. The novel membranes are very robust and the integrated compressed-air cleaning system keeps them free from fouling and contamination. As a result, they are always operational.

View of CAS40D sensor head ISE electrode Membrane cap

Your benefits
- Compact system
- Reagent-free
- Online measurement means concentration levels can be determined immediately
- Easy to use: no external sampling required
- Ammonium and nitrate in a single sensor means you always have nitrification and denitrification under control

Typical applications
- Measurement of the concentration of ammonium and nitrate directly in the sludge activation process
- Rapid change of measured values for control and regulation
- Determining the ammonium load (pH-compensated) in the inlet to the sludge activation process
- Load-dependent aeration control

Diverse measuring ranges
- Ammonium-nitrogen: from 0.1 to 1000 mg/l NH_4-N
- Nitrate-nitrogen: from 0.1 to 1000 mg/l NO_3-N

Liquiline CM44 transmitter

UV measuring system Viomax CAS51D/Liquiline CM44 for nitrate measurement

In-situ UV sensor
With this sensor it is possible to measure nitrate directly in the medium.

The sensor does not require any wipers, moving parts or axial seals in the wastewater. High-grade stainless steel assemblies allow for installation in basins or in channels. In aerated media, vertical installation with the sensor suspended from a chain holder has proven to be an effective solution. If you prefer installation in the sample bypass, Endress+Hauser provides an ideal solution in the form of a flow vessel. Thanks to its outstanding dynamic measuring range, the sensor has a very broad field of application.

Your benefits
- No sample conditioning
- No consumable materials
- No reagents
- No wear parts
- Short response time
- Continuous measurement

Typical applications
The all-rounder with an 8-mm gap
- Monitoring of nitrate content in the outlet of wastewater treatment plants
- Monitoring and optimization of denitrification

Drinking water sensor with a 2-mm gap
- Monitoring and control of drinking water treatment plants
- Nitrate measurement in natural bodies of water

Diverse measuring ranges
- From 0.01 to 50 mg/l NO_3-N

Viomax CAS51D in-situ sensor with Liquiline CM44

Colorimetric analyzers Liquiline System CA80 for nutrient measurement

Liquiline System CA80 with cooling module

Liquiline System CA80 analyzers provide highly precise measurements for monitoring and documentation tasks. Thanks to their integration in the Liquiline Memosens platform, they offer the same intuitive operating concept as Liquiline transmitters and can be commissioned fast and easily together with their sample preparation systems.

Your benefits

- Standardized measuring methods according to ISO and DIN regulations for reliable, regulation compliant measurements
- Low operating costs thanks to automatic calibration and low reagent consumption
- Easy maintenance with minimal tools
- Advanced diagnostics with remote access for higher process safety
- Easy upgrade to a complete measuring station by connecting Memosens sensors
- Seamless integration into process control systems via Modbus, PROFIBUS, EtherNet/IP or webserver communication
- Proper sample preparation by selecting one of three filter systems, based on the specific application conditions

Nitrite measurement with Liquiline System CA80NO

Nitrite is an important chemical indicator of the water quality. It is toxic and promotes the formation of carcinogenic nitrosamines. That's why authorities stipulate strict nitrite limits for drinking water, mineral water and raw water for food production, especially for baby food. With Liquiline System CA80NO, waterworks and producers of mineral water or food can rely on high-precision online monitoring of the denitrification process.

The analyzer allows:

- Online measurement according to the standardized colorimetric naphthylamine method following ISO 6777 and DIN EN 26777 that guarantees direct compatibility with lab results.
- Fast reaction and troubleshooting of possible process disturbances
- Higher safety of the denitrification process.

Typical applications

Monitoring of the strict nitrite limits in

- Drinking water
- Mineral water
- Raw water for food production

Measuring range

Nitrite nitrogen
10 µg/l - 3 mg/l NO_2-N

Ammonium and ortho-phosphate measurement with Liquiline System CA80AM and CA80PH

Liquiline System CA80AM

The primary focus in wastewater treatment plants is to protect downstream waters. This is why the limit values for ammonium and orthophosphate are becoming stricter every year. Phosphate load is particularly important as phosphorus is the decisive factor for excessive algae and plant growth in water bodies.

Liquiline System CA80AM and CA80PH analyzers use standardized colorimetric measuring principles to ensure direct comparability to lab results:

- Indophenol blue method following ISO 7150-1, DIN 38406-5, GB 7181-87 for ammonium
- Molybdenum blue method following DIN EN 1189 for low orthophosphate concentrations
- Molybdate vanadate method (yellow method) for higher orthophosphate concentrations

Typical applications
The analyzers provide highly precise ammonium and phosphate analyses at all critical control points:

Outlet The analyzers support compliance with limit values and appropriate documentation.

Aeration basin The analyzers save energy and costs.

- The ammonium analyzer combined with an oxygen sensor allows accurate measurement of ammonium and oxygen concentrations and thus a precise, load-dependent control of the blowers.
- The reliable orthophosphate measurement helps to optimize precipitant dosing.

Inlet The analyzers continuously monitor the incoming freight and allow prompt handling of peak loads.

Water treatment In cooling cycles, the analyzers help to optimize phosphate dosing which is used to stabilize water hardness and for corrosion protection.

Measuring ranges

- Ammonium nitrogen
  0.05 - 100 mg/l NH_4-N
- Orthophosphate phosphorus
  0.05 - 10 mg/l PO4-P (blue method)
  0.5- 50 mg/l PO4-P (yellow method)

Total phosphorus measurement with Liquiline System CA80TP

New quality standards require a reduction in the amount of phosphorus released from wastewater treatment plants into rivers and lakes because phosphorus is the decisive factor for excessive algae and plant growth in water bodies. Liquiline System CA80TP helps managers of wastewater treatment plants to achieve these reductions without increasing the costs for precipitants.

Precise online measurement of total phosphorus

- The standard molybdenum blue method following ISO 6878 ensures consistent comparability to lab measurements.
- Peristaltic pumps are able to cope with representative samples containing particles.
- The optional dilution module enables compliant measurements even in water with higher phosphorus load.
- The optical dosing unit ensures optimized reproducibility of the measuring results.
- Detailed logbooks enable consistent documentation of the TP values.

Highest level of safety

The analyzer features a pressure reactor that ensures highest operational and occupational safety during thermal and chemical digestion.

- A precisely adjusted reactor temperature guarantees complete digestion of the sample.
- The software-controlled safety cover prevents opening of the digestion reactor if it is too hot or under pressure. The safety cover can only be removed for maintenance when the reactor is in a safe state.
- The optical dosing unit is equipped with a redundant safety light barrier which ensures the best level of reliability.

Typical applications

- Inlets and outlets of wastewater treatment plants for documentation purposes and calculation of the cleaning capacity.
- Discharges of industrial wastewater treatments plants to determine discharge fees and to support the polluter-pays-principle
- Process water

Measuring ranges

- 0.05 – 10 mg/l P_{tot}
- 0.5 – 50 mg/l P_{tot} (with dilution module)

Sum parameters

	SAC	COD	COD_{eq}	TOC	TOC_{eq}
Viomax CAS51D	■		■		■
TOCII CA72TOC			■	■	
Liquiline System CA80COD		■			

Sum parameters help to assess the organic load of water and wastewater.

UV measuring system Viomax CAS51D/Liquiline CM44 for SAC measurement

In-situ UV sensor
This sensor makes it possible to measure the SAC directly in the medium.

It can be installed in a basin or channel with a high-grade stainless steel assembly. In aerated media, vertical installation with the sensor suspended from a chain holder is possible. To install the sensor in the sample bypass, Endress+Hauser provides an ideal solution in the form of a flow vessel.
Thanks to the optical measurement method used by the sensor, no reagents or chemicals are required. With its outstanding dynamic measuring range it has a very broad field of application. In addition, the sensor and transmitter can display values such as the COD_{eq}, TOC_{eq} or related parameters.

Viomax CAS51D in-situ SAC sensor with Liquiline CM44

Your benefits
- No sample conditioning
- No consumable materials
- No reagents
- No wear parts
- Short response time
- Continuous measurement

Typical applications
- Determination of the spectral absorption coefficient
- Continuous monitoring of wastewater for organic pollution
- River monitoring
- Special measuring tasks in UV range

Diverse measuring ranges
- From 0.1 to 700 m^{-1}

TOCII CA72TOC high-temperature analyzer for continuous TOC measurement

TOCII CA72TOC monitors industrial wastewater using high-temperature measurement in double-batch operation in a way that is safe and easy to maintain. The system is optimized for industrial applications, even those with varying pH values and high salt loads.

Your benefits

- Accurate and fast measurement with “double-batch” operation
- One and two-channel measurement available
- Fast and easy maintenance thanks to good accessibility of all components
- Heatable salt trap significantly increases the service life
- Exchangeable furnace concept significantly decreases service time thanks to prepared furnace
- pH-controlled acid dosage for TIC stripping minimizes acid consumption
- Externally triggered self testing with TOC standard

Typical applications

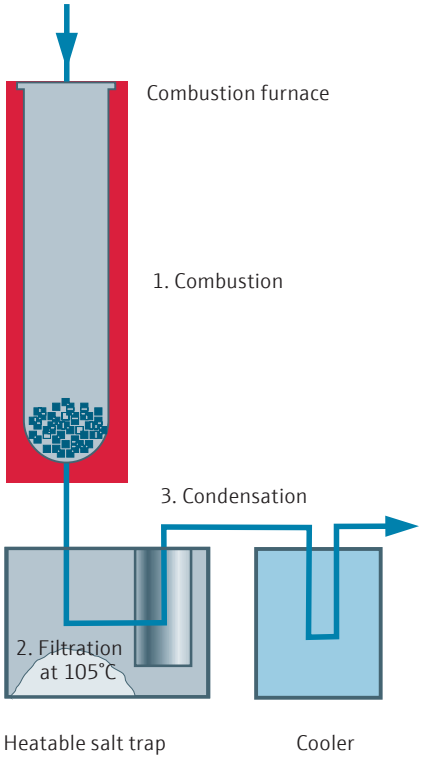
- Industrial wastewater monitoring (for example in inlet and outlet)
- Control of process wastewater
- Monitoring of industrial surface water
- Municipal wastewater monitoring

Properties

- Thermal catalytic combustion according to EPA Method 415.1, DIN EN 1484, ISO 8245
- Measuring time in double-batch: New measured value every seven minutes
- Optional extension of measuring range thanks to predilution by a factor of 20
- Programmable dosage of sample into the furnace guarantees extremely high accuracy

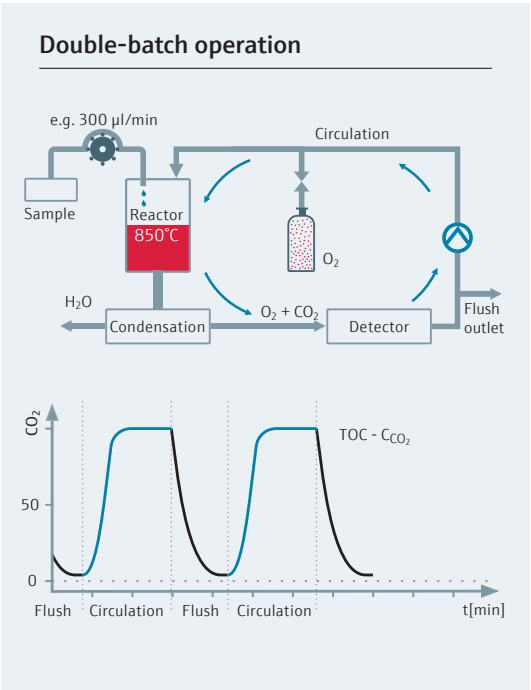
Diverse measuring ranges

- from 0.25 to 12,000 mg/l



Double-batch operation

The patented double-batch operation links the water and the gas circuits. The aqueous sample is continuously prepared in the analyzer and fed batch-wise into the furnace. During measurement, the gas containing CO_2 is circulated and accumulated in the gas circuit. This makes it possible to record large sample volumes (1200 µl) which leads to high sensitivity. After measurement, the gas circuit is flushed with CO_2-free carrier gas and the basic line for the next measurement is determined.



Heatable salt trap

- With the heatable salt trap, the majority of volatile salts precipitate in the salt trap and not in the furnace.
- The furnace does not have to cool down before maintenance is performed on the salt trap. This increases the availability of the measuring point dramatically.
- It only takes 5 minutes to clean or replace the salt trap.

Liquiline System CA80COD colorimetric analyzer for COD measurement

The chemical oxyen demand (COD) is the most commonly used parameter to determine the organic load of wastewater.

True COD values for highly accurate environmental monitoring
Liquiline System CA80COD is the right analyzer for those users that require "true" online COD values to comply with regulations:
- The established dichromate COD method ensures consistent comparability to lab measurements.
- Peristaltic pumps support a representative determination of the chemical oxygen demand because they are able to cope with samples containing particles.
- The optional dilution module guarantees compliant and precise measurements even in water with higher organic loads.
- The optical dosing unit ensures optimized reproducibility of the measuring results.
- Detailed logbooks enable consistent documentation of the COD values

Highest level of safety
The analyzer features a pressure reactor that ensures highest operational and occupational safety during thermal and chemical digestion.
- A precisely adjusted reactor temperature guarantees complete digestion of the sample.
- The software-controlled safety cover prevents opening of the digestion reactor if it is too hot or under pressure. The safety cover can only be removed for maintenance when the reactor is in a safe state.
- The optical dosing unit is equipped with a redundant safety light barrier which ensures the best level of reliability.

Typical applications
- Municipal wastewater treatment plants:
  The COD value is measured in the inlet and outlet to re-direct incoming water with high load into buffer basins and to calculate the cleaning capacity of the plant.
- Industrial wastewater treatments plants:
  COD is measured in the outlet to enable load-based billing for the dischargers and support the polluter-pays-principle.
- Process water

Measuring ranges
- 10 – 5,000 mg/l O_2
- 40 – 20,000 mg/l O_2
  (with dilution module)

Your benefits
- Low operating costs thanks to automatic calibration and cleaning
- Easy maintenance with minimal tools
- Advanced diagnostics with remote access for higher process safety
- Easy upgrade to a complete measuring station by connecting Memosens sensors
- Seamless integration into process control systems via Modbus, PROFIBUS, EtherNet/IP or webserver communication

Metals and other parameters of water treatment

	Aluminum	Chromate	Iron	Hardness	Silica	Sodium
Liquiline System CA80	■	■	■	■	■	
CA76NA						■

Metal content and other parameters are mainly measured in process, drinking and ultra-pure water treatment to ensure a good water quality. For users of process water and operators of water, wastewater and steam generation plants, it is very important to know which substances are dissolved or suspended in the water.

Aluminum, iron and hardness measurement with Liquiline System CA80

Liquiline System CA80FE

Continuous monitoring as key to safe water

Iron, aluminum and hardness are important chemical indicators of the water quality:

- Aluminum is naturally present in low levels in groundwater. If it, however, occurs in higher concentrations, it is harmful to human health.
- Iron only rarely occurs in concentrations that are harmful to human health but even very low concentrations of iron suffice to impair the water taste and color.
- Water hardness has an impact on the product quality, for example in the beverage or paper industry.
- Liquiline System analyzers ensure compliance with the with the strict limits for drinking water, bottled water and process water. Thanks to their standardized measuring methods, they deliver measured values that are consistently comparable to lab measurements.
- Iron: standardized ferrozine method
- Aluminum: colorimetric pyrocatechol violet method according to DIN ISO 10566
- Hardness: phthalein violet method

The analyzers feature detailed logbooks to provide continuous documentation of the measured values to the authorities

Typical applications

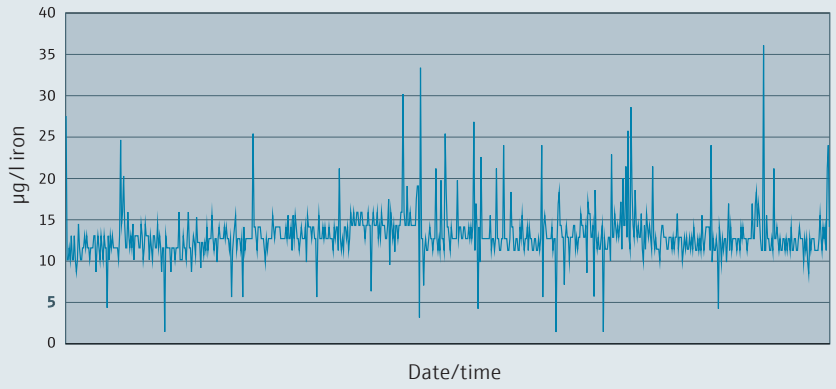
- Liquiline System CA80FE supports optimization of iron removal since it enables optimum control of the air blowers.
- Liquiline System CA80AL optimizes aluminum dosing: as much as necessary to safely remove suspended particles but avoid high aluminum concentrations.
- Liquiline System CA80HA supports improvement of softening processes in waterworks and informs about the hardness of drinking water.

Measuring ranges

- Aluminum: 15 - 1000 µg/l (ppb) Al
- Iron: 0.05 - 2.5 mg/l (ppm) Fe
  0.1 - 5 mg/l (ppm) Fe
- Hardness: 0 - 80 mg/l (ppm) $CaCO_3$

Application example

Mineral water monitoring, limit value 30 µg/l iron



Sodium and silica measurement with CA76NA and Liquiline System CA80SI

Silica and sodium are two core parameters for the water quality in power plants. The maximum silica content permitted in boiler feedwater is often contractually agreed on between turbine and boiler suppliers and power plant operators. Increased silica and sodium concentrations can lead to deposits on turbines, boiler walls and heat exchangers that have an adverse effect on a power plant's efficiency and can even cause damages of the expensive plant equipment. In addition, accurate silica and sodium measurement provides an early indication of condenser leakages or exhaustion of the ion exchanger bed.

Liquiline System CA80SI

- Helps ensuring the required water quality. Detailed logbooks facilitate documentation of the measured values.
- Delivers measurement results that are directly comparable to laboratory measurements thanks to its standardized heteropoly blue method.
- Can be fitted with up to 6 sampling channels allowing for online measurement at all important control points and easy adaptation to any kind of application.
- Is easily upgraded to a complete measuring station by connection of up to 4 Memosens sensors .

CA76NA sodium analyzer

- Uses the potentiometric measuring principle with a separate reference pH electrode for precise temperature compensation and optimum pH value adjustment.
- Offers up to 6 sampling channels for perfect process adaptation.

Typical applications

- In the boiler
- At the ion exchanger outlet
- In the feedwater make-up line after the condenser

Measuring ranges

- Silica
  0.5 - 200 µg/l (ppb) SiO_2
  50 - 5,000 µg/l (ppb) SiO_2
- Sodium
  0.1 - 9,999 µg/l (ppb) Na

Liquiline System CA80SI

CA76NA

Chromate measurement with Liquiline System CA80CR

For industrial wastewater, regulations stipulate close monitoring of specific parameters. In case of chromate, electroplating companies and tanneries operate their own wastewater treatment to reduce the contaminants to levels that allow the discharge into municipal wastewater treatment plants. Here, the standardized diphenyl-carbazide method of Liquiline System CA80CR ensures compliance with discharge regulations and the analyzer's detailed logbooks provide continuous documentation of the chromate values.

Typical applications

- Optimizing cleaning capacity of industrial wastewater treatment plants
- Outlets of electroplating companies and tanneries
- Monitoring of membrane filtration

Measuring ranges

- 0.03 - 2.5 mg/l Cr(VI)
- 0.2 - 5.0 mg/l Cr(VI)

Sample conditioning for analyzers

Correct sample conditioning is part and parcel of every analysis. Complementing the sample conditioning system, the sample collector conveys treated sample to the analyzer and ensures that sufficient sample is always available for analysis.

Liquiline System CAT810
- Filtration system with sieve filter for installation in by-passes or pressurized pipes
- Fully automated backflushing with pressurized air
- Controlled by Liquiline System CA80 or independent, timer-controlled version

Liquiline System CAT860
- In-situ micro-filtration system for heavily loaded wastewater, e.g. in the inlets of wastewater treatment plants
- Complete system with integrated pump and additional chemical cleaning of the filter element
- Controlled by Liquiline System CA80 with advanced diagnostic possibilities

Liquiline System CAT820
- In-situ micro-filtration system for biological stages and channels
- Complete system with integrated pump
- Longer maintenance intervals thanks to optional automated backflushing
- Controlled by Liquiline System CA80 with advanced diagnostic possibilities or independent version

CAT810

Y-Strainer

CAT860 open

CAT820 open

PA-2 at device

CAT411 closed

Y-strainer for Liquiline System CA80TP and CA80COD
- Direct sampling from bypass pipes.
- Easy installation by standard adhesive fitting (40 mm).
- Representative samples thanks to the sample hose floating in the middle of the sample stream.
- Fluidic movement removes particles and avoids blocking.

PA-2/PA-3/PA-8 sample conditioning for CA72TOC
- Low-maintenance thanks to tangential filter principle and fully automated backflushing
- Volume flow from 0.1 to 8 m^3/h
- Very long operating life, no mechanical wear
- Stainless steel version also available for high pressures and temperatures
- For all wastewater applications, including heavy-duty applications

Stamoclean CAT411
- Micro-filtration module for the filtration of fiber-free wastewater in the bypass of pressure lines
- Easy-to-change filters
- Low investment costs
- Self-cleaning effect due to action of shear forces on the membrane

Automatic samplers

The Liquistation CSF48 and Liquiport 2010 CSP44 samplers provide automatic sampling, defined distribution and preservation of liquid samples. They guarantee that these samples remain undistorted until they are analyzed in the laboratory. As member of the Liquiline platform, they can be easily upgraded to complete measuring stations offering real plug & play for Memosens sensors.

Safety for your samples

- Sampling with Liquistation CSF48 and Liquiport 2010 CSP44 complies with international standards and legislation.
- No more corrupt samples due to temperature variations: The fail-safe cooling system guarantees stable temperatures in the sample compartment.
- No more samples lost by vandalism: No screws outside to open the locked device.

Simple to use

- Operation of all Endress+Hauser samplers and Liquline transmitters is identical – for more user friendliness and significantly less operating errors.
- Setting the sampling programs is easy yet flexible - three user levels guide you safely through all steps.
- An integrated web server allows you to remotely access device parameters via any web browser.
- The digital fieldbus protocols HART, PROFIBUS and Modbus allow seamless integration into process control systems.
- Back-friendly sample handling: Transport the separate bottle trays with uncounted bottle combinations safely and comfortably to the laboratory.

Simple to adapt

- Select from four housing materials: Cost-efficient plastic and stainless-steel versions for standard applications and heavy-duty versions for demanding industrial applications.
- Glass or plastic, one or 24 bottles: You always find the exactly suitable container for your sample and are compliant with DIN/IEC and ISO.

One platform – all analytical functions integrated in the samplers.

Liquistation CSF48 and Liquiport 2010 CSP44

Three sampling technologies for any kind of use

- If your application demands high accuracy, repeatability and speed, select the vacuum pump.
- For short suction heights, variable sample volumes and toxic applications, choose the peristaltic pump.
- If you need to sample directly from pressurized pipes, the Samplefit CSA420 assembly is the best choice.

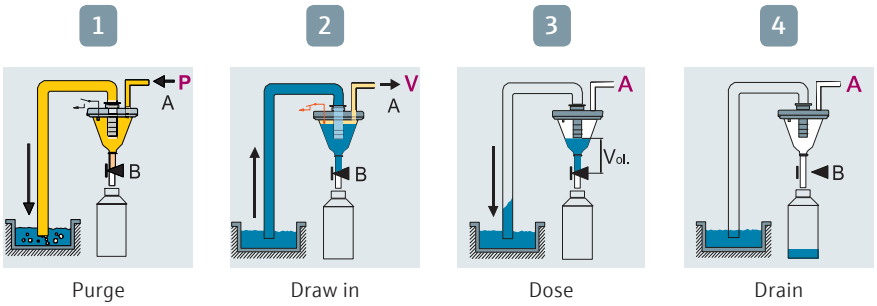
Simple to maintain

- Cleaning the sampling system is very easy. The pumps can be removed and maintained without any tools.
- The compact cooling system with 24 VDC eliminates all problems with different supply voltages and can be maintained and replaced without special knowledge.
- Replacing electronic modules is also a swift matter. The sampler detects them automatically which reduces the maintenance time to a minimum.

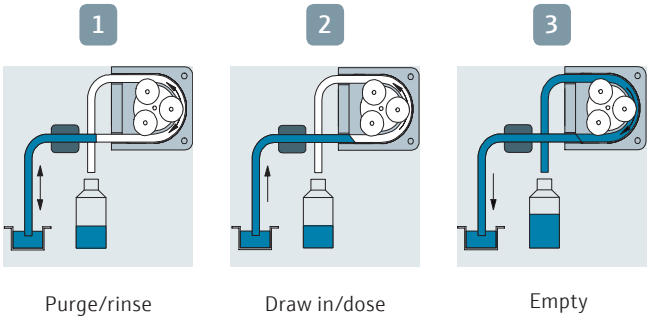
Future-proof

- When equipped with sensors with Memosens technology, the sampler turns into a complete system solution for modern environmental monitoring.
- Currently, it measures twelve different parameters with a tendency steeply upward: pH, ORP, conductivity, oxygen, turbidity, chlorine, nitrate, SAC, ammonium, chloride, potassium and sludge level. Four of those parameters can be measured at the same time.

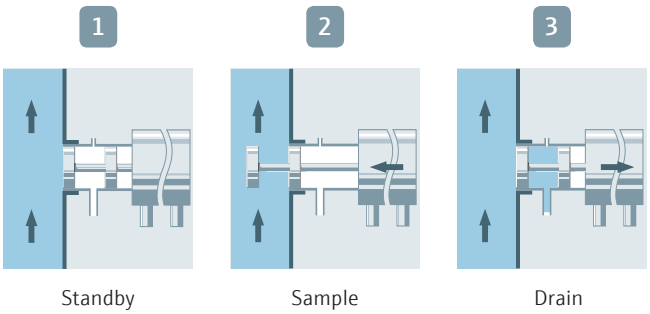
Principle of the vacuum pump



Principle of the peristaltic pump



Principle of sampling with Samplefit CSA420



- What will your process look like in two years? Keep all doors open: Make your sampler ready for four measuring channels in no time.
- Integration into FieldCare and W@M enables effective asset management. These tools offer allround support throughout the plant lifecycle and provide up-to-date and complete information.

Analytical solutions

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. What's more, with our global support network, you can rely on Endress+Hauser as your partner throughout the entire life cycle of your solution.

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, be this aeration control or phosphate dosing in a wastewater treatment plant or the automatic cleaning and calibration of pH measuring stations in the chemical or life sciences industries.

Your benefits
- Single source supplier
- Ready to use thanks to excellent project consultation right from the planning stage
- Efficient process integration as our containers and cabinets are designed in cooperation with you
- Fast commissioning due to function-tested analytical measuring technology
- Reliable operation in the field with easy measured value management provided by optional remote access and telealarm
- Worldwide support

Experts in pH, conductivity, oxygen, turbidity and disinfection

Endress+Hauser pH measuring systems can be found in any application that requires reliable measured values, a high degree of availability and long operating times. With our extensive experience in the production and development of process sensors, we occupy a leading position in the world market.

Know-how in sensor technology
In no other component of a measuring point is so much development expertise and time invested than in sensors. The vertical range of manufacture, modular assemblies and a high degree of automation guarantee the utmost in product quality, safety and reliability no matter what liquid analysis parameter you want to measure.

User-friendly transmitters
Endress+Hauser transmitters are renowned for their standardized, easy-to-use interfaces. With its navigator function, the Liquiline product family, in particular, offers users added convenience. Furthermore, its modular design means that it can be easily extended as required.

The product portfolio ranges from the low-cost single-channel unit to the multichannel and multiparameter controller Liquiline CM44, so you always have the right transmitter to suit every application.

Wide range of assemblies
Virtually any measurement in the process requires an assembly that has to be optimally designed for the sensor and application. Our line of assemblies ranges from extremely flexible immersion holders to the automatic heavy-duty retractable assembly which enables on-the-fly sensor removal and delivers reliable measured values even at elevated pressures and temperatures. Combined with a wide range of process connections, you are sure to find a solution for every installation position.

Parameters		Advantages and benefits
pH The monitoring of the pH value is a guarantee for optimized product yields in all sectors of industry. In addition, the pH value is an important controlled variable that has a bearing on the efficiency of a plant.		▪ Universal glass electrodes (0 - 14 pH) Large product portfolio for all applications. Available with gel or liquid reference and various diaphragms. Suitable for temperatures up to 140 °C ▪ Non-glass ISFET sensors For hygienic applications and processes with a high particle content. Shatter-proof sensors that react quickly and are suitable for low temperatures ▪ Shatter-proof electrode with pH-sensitive enamel For hygienic applications and direct installation in the process, stable measurements over many years, extremely corrosion-resistant
Conductivity Monitoring the electrolytic conductivity level is important for monitoring wastewater treatment and controlling treatment processes. In the chemical industry, the conductivity is used to determine the concentration of acids and bases.		▪ Conductive conductivity sensors Wide range for all applications: for high temperatures, in pure and ultrapure water, in hygienic applications and in wastewater and drinking water; the sensors have a simple design and are very sensitive ▪ 4-electrode conductive conductivity sensors For applications with widely varying conductivity values such as phase separation ▪ Inductive conductivity sensors Robust Indumax CLS50D sensor with excellent chemical resistance properties, for measuring the concentration of acids, bases and salts; hygienic sensor CLS54D for the food and pharmaceutical industry, suitable for high conductivity values, not sensitive to fouling
Oxygen The level of dissolved oxygen is an important indicator of the quality of water when monitoring surface water or during water treatment. It is also a key parameter for optimum conditions in the aeration basin and in fish farming.		▪ Amperometric oxygen sensors Always the right sensor for a wide range of tasks, ranging from hygienic applications and water treatment to wastewater; time-tested technology with accurate results, Oxymax COS51D with 3-electrode system for maximum long-term stability ▪ Optical oxygen sensors COS61D for water, wastewater and fish farming, COS81D for hygienic applications in the life sciences and food industries; purely optical measurement method based on the principle of fluorescence quenching; characterized by short response times, high availability and low maintenance
Turbidity Turbidity measurement is an important quality parameter in drinking water. In wastewater, turbidity is measured to control the wastewater treatment processes in the primary sludge, in sludge dewatering and in the aeration basin through to the outlet.		▪ Turbidity sensors Online turbidimeters and sensors for drinking water and treated process water and wastewater sensors; use the common scattered light method at 90°, 135°, the alternating light method and the absorption method; reliable sensors offering long-term stability ▪ Sludge level measurement For water, wastewater, mining and the chemical industry, ultrasonic system for parallel measurement, minimum installation effort, easy configuration
Disinfection Chlorine and chlorine dioxide must be measured in all areas of disinfection to ensure safe and efficient water treatment.		▪ Amperometric disinfection sensors Suitable for drinking water, recreational water, industrial water and wastewater, sensors for all kinds of chlorine: free available chlorine, chlorine dioxide and total chlorine, membrane-covered, low maintenance and virtually unaffected by flow conditions ▪ Measuring panels for disinfection Complete measuring points including all components carrying medium and couplings, ready for connection, easily accessed from the front and easy to calibrate and maintain
Transmitters and systems Transmitters complete the measuring point. They process the measured value and display it or make it available for further processing. Automatic cleaning and calibration systems prove their worth in applications with strict requirements.		▪ Transmitters For all possible applications. Product portfolio ranges from the cost-effective 4-wire device Liquiline CM14 over the powerful, 2-wire device Liquiline M CM42 to Liquiline CM44 - the multiparameter and multichannel controller for all digital sensors with Memosens technology. The portfolio is supplemented by Liquiline Compact CM72/CM82, the smallest transmitter for Memosens sensors with plug-in head. ▪ For analog systems, the Liquisys systems are available. ▪ Fully automated cleaning and calibration systems for pH measurement For demanding applications, or for aggressive process conditions in the chemical, food and pharmaceutical industries
Assemblies Assemblies are the interface to the process. They place the sensors in the boiler, pipe, fermenter or basin in the preferred position in the medium.		▪ Retractable assemblies For constant sensor availability e.g. full tank or process pressure ▪ Installation assemblies Low-cost assemblies if the application does not require sensor replacement or cleaning under process pressure ▪ Holder and assemblies for immersion operation Flexible systems for open basins and channels, or installation in tanks from above ▪ Flow assemblies For bypass measurement in water works, food and chemical industry, power stations

Water is our life

Water quality, discharges, regulations, the environment … just rely on a trusted partner.

As budgets shrink and legislative demands soar, we bring expertise to challenging needs. Safe potable water, discharges, environmental penalties, water infrastructure for developing countries, energy monitoring, the rising quantities of sludge from wastewater treatment and the opportunities they create for biogas – we make sense of it all with experienced thinking supported by process technology solutions for your every need.

Working with water in over 100 countries, Endress+Hauser offers a refreshing alternative:

- Improve plant safety and availability
- Optimize costs in your internal water processes
- Support your risk and failure management

Product highlights

Liquiline CM44
Fexible 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.

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 avoids 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 CCS51D
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 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 needs via a variety of sampling methods and sampling programs.

Liquiline System CA80
Analyzer for precise online measurement of e.g. ammonium in 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 one of the main challenges - today and in future. Comprehensive monitoring of water quality requires a portfolio that covers all relevant parameters. Liquiline CM44 enables you to measure up to eight of the water quality parameters simultaneously - simply by connecting the corresponding sensors via plug and play. You achieve:

- 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 feature the logbooks to provide continuous documentation of the measured values to the water authorities.

Analyzers and samplers in wastewater treatment

Preliminary sedimentation
During primary treatment, the wastewater is separated into „generally liquid substances“ - the water part - and „generally solid substances“ - the sludge part. The water part contains organic carbon as well as nitrate and ammonium. These are known as nutrient parameters.

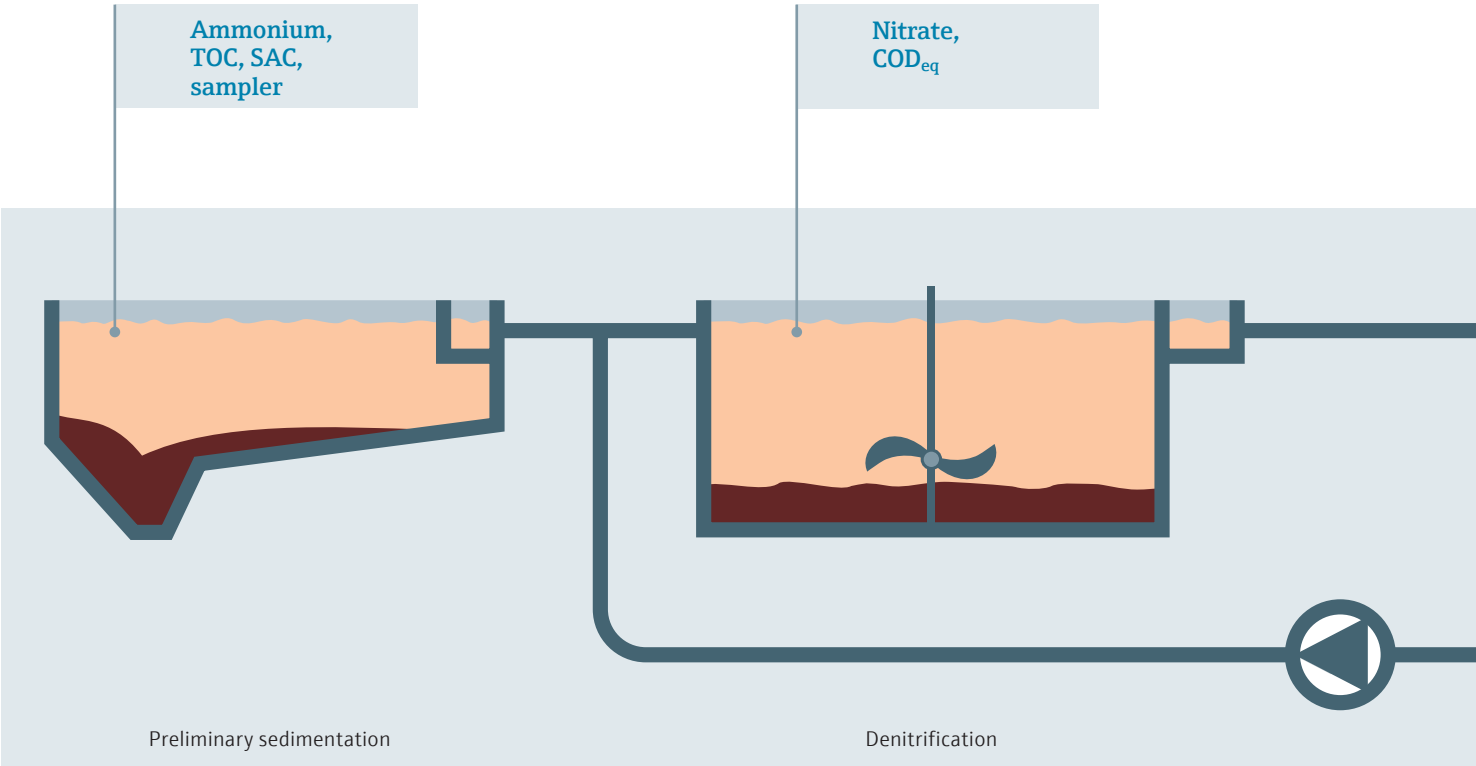
What is measured?
- TOC and SAC measurements provide information on the carbon load entering the plant > CAS51D, CA72TOC
- Ammonium measurement provides information on the amount of nitrogen in the wastewater. This nitrogen also has to be digested in the biological treatment phase > CAS40D, CA80AM with CAT860
- Sampling enables a detailed analysis of the introduced water.

These measurements taken prior to sludge activation make it possible to detect load spikes and to redirect these into buffer basins. Their subsequent return to the wastewater treatment process allows for safe and smoother system operation. The discharge values can be maintained at any time.

Denitrification and recirculation
Wastewater and activated sludge are merged during this process. If oxygen is not present, nitrate is reduced to basic nitrogen. This is the first step in the biological treatment process. Carbon serves as a source of nutrition for the bacteria and is also reduced.

What is measured?
- The measured COD value provides information on the amount of carbon in the biological treatment process > CA80COD, CAS51D
- Nitrate measurement indicates the nitrate nitrogen which is reduced during this stage of the process > CAS51D

The next stage of the treatment process can commence as soon as the nitrate is processed. A low concentration of nitrate in the denitrification stage is essential to achieving low concentrations in the outlet and thus reducing wastewater charges. By determining values for the sludge parameters it is possible to optimally control the sludge process.



Nitrification
During the nitrification stage, oxygen is used to reduce the remaining ammonium to nitrate. Some of the wastewater is returned to the denitrification stage for further nitrate reduction and to „inoculate“ the fresh wastewater.

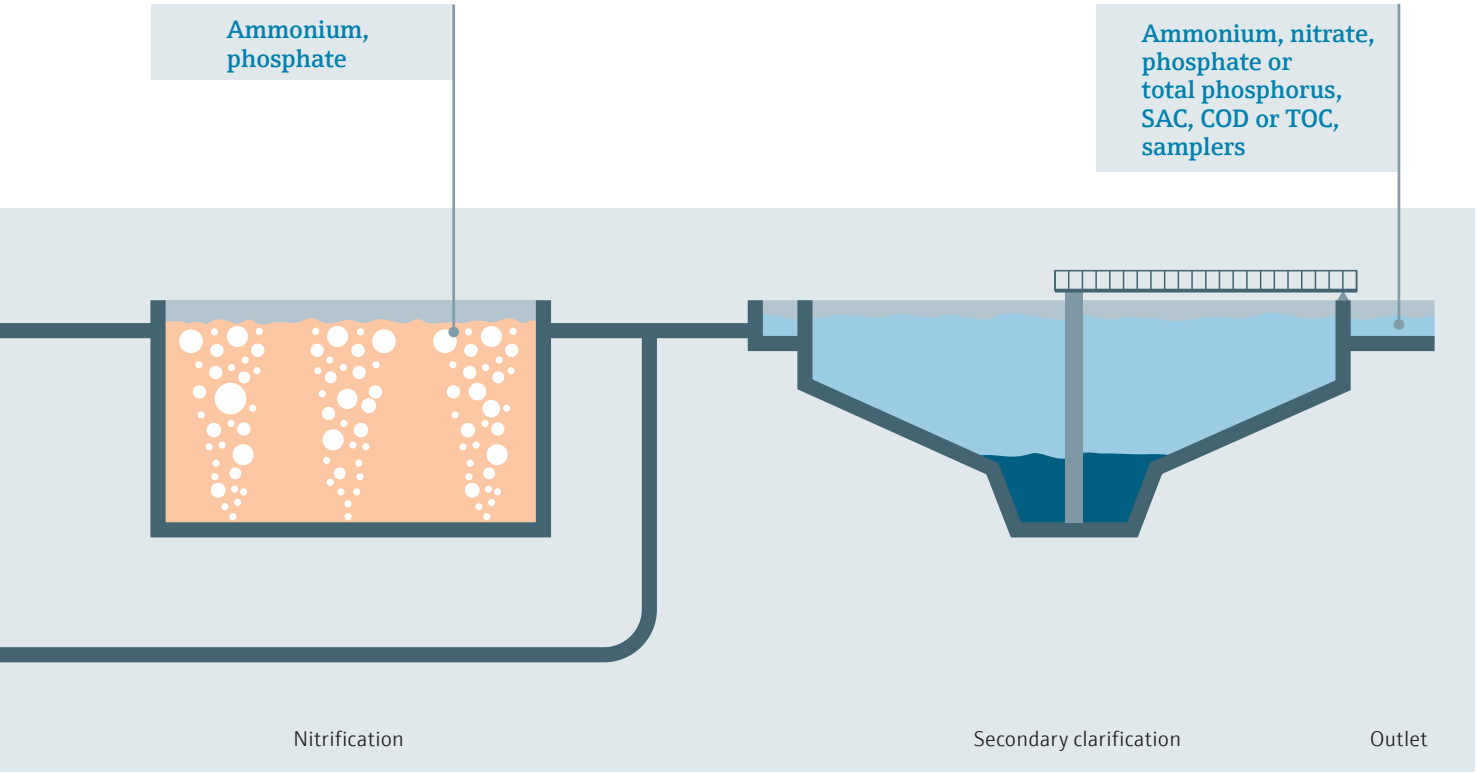
What is measured?
- The ammonium measurement indicates how much ammonium has been reduced > CAS40D, CA80AM with CAT820
- Oxygen is measured to help regulate and control the efficiency of the reduction process. Too little oxygen slows down the process while too much drives up operating costs > COS61D
- Orthophosphate measurement is used to regulate and control the dosing of precipitants > CA80PH with CAT820

Aeration accounts for up to 70% of the power used in biological wastewater treatment plants. Sensors for ammonium, nitrate and oxygen can reduce aeration and thus lower the energy consumption of the plant.

Outlet
After biological treatment, the wastewater settles in the secondary clarifier. The sludge settles on the floor and can be reused as activated sludge or surplus sludge. The clear water is drawn off and directed as clean water into public bodies of water via the drainage canal.

What is measured?
In clear water:
- Ammonium and nitrate measurements are indicators of the ability of the wastewater treatment plant to reduce the nitrogen load > CA80AM, CAS51D
- SAC, COD and TOC measurements document the degradation efficiency of the wastewater treatment plant with regard to the carbon load >CAS51D, CA80COD, CA72TOC
- The measurement of phosphate in the form of PO_4^{3-} or P_{tot} provides information on the rate of phosphate removal > CA80PH, CA80TP
- Sampling in combination with comprehensive quality monitoring proves compliance with legal discharge limits

Continuous monitoring of the discharge values ensures safety. Complete documentation can be used as proof of wastewater treatment performance to the authorities, and also for internal monitoring purposes. As the sludge profile is monitored, changes caused by a heavy downpour, for instance, can be detected quickly and countermeasures can be taken.



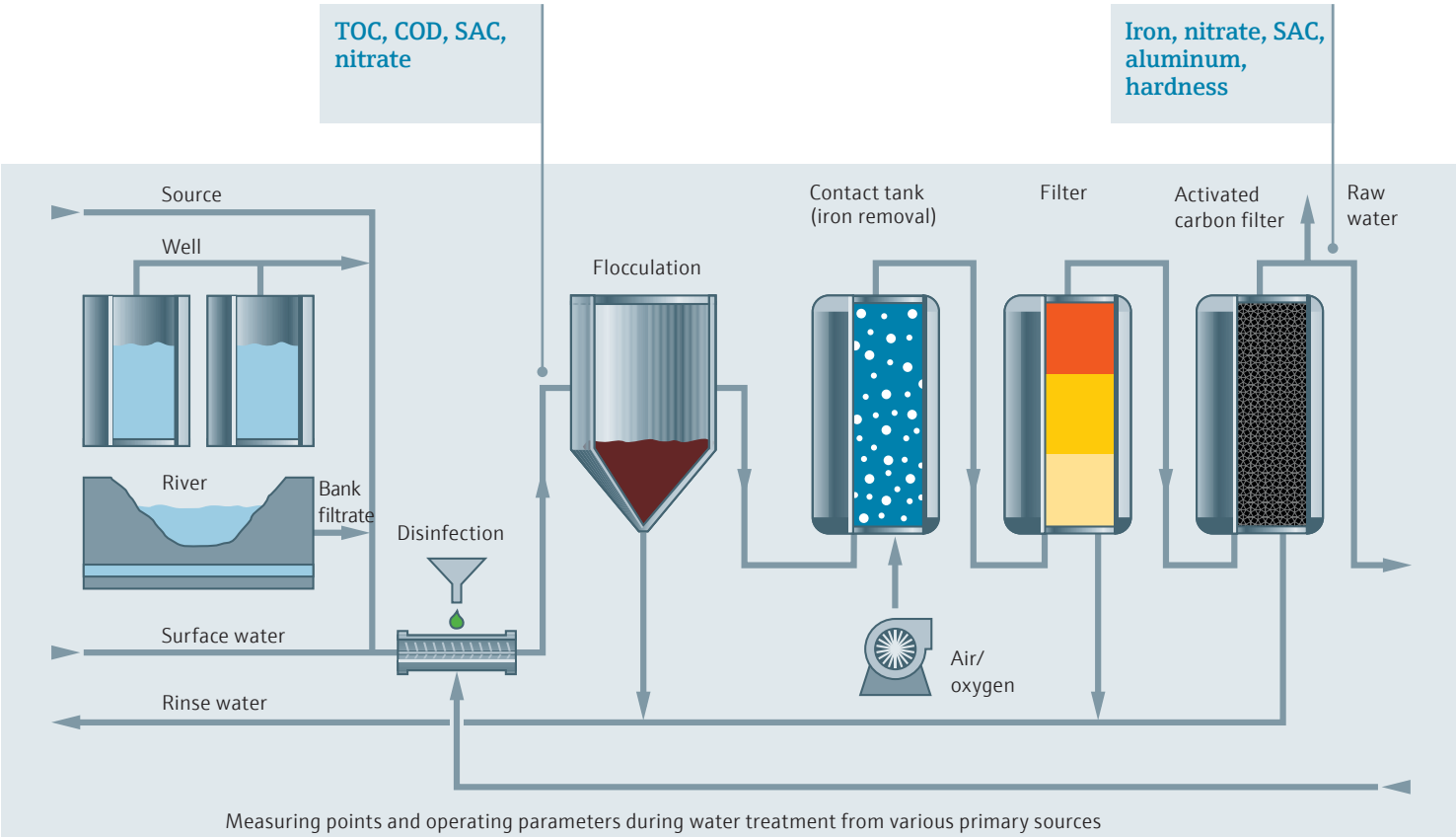
Analyzers and samplers in water treatment

Untreated water
Water from different sources carries with it different loads. For example, water from springs and wells contains particles; surface water contains additional biologically active elements; and process water from industrial processes contains chemicals. The aim here is to ascertain the quality of the untreated (raw) water:

What is measured?
- Physical variables such as the pH value, turbidity and conductivity, and the organic load SAC, TOC and derived variables provide information on the usability of the untreated water > CM44, CAS51D, CA72TOC
- Nitrate - when converted to nitrite - can cause toxicity and thus has to be measured > CAS51D, CA80NO
- Sampling after bank filtration allows for monitoring of the sample quality in the laboratory > CSF48, CSP44

Industrial water treatment
The water passes through various stages in the treatment process: substances causing turbidity are removed by flocculation and gravel filters; oxygen is added to oxidize iron; and the pH balance is regulated. The resulting water is now the basis for drinking water. It is also used as process water in industry.

What is measured?
- The physical variables pH, turbidity and conductivity make it possible to regulate the pH balance and oxidation > CM44
- The iron content is measured after the filtration process to gauge the efficiency of the oxidation > CA80FE
- The nitrate concentration is measured to check the limit value for drinking water. Nitrite measurement provides information on the presence or absence of hazardous substances > CAS51D, CA80NO
- The residual aluminum is measured to determine the flocculant that remains after filtering > CA80AL
- Water hardness analysis helps optimize softening processes such as ion exchange or reverse osmosis > CA80HA



Measuring points and operating parameters during water treatment from various primary sources

Drinking water treatment

The treated water is pressurized or pumped into an elevated tank. Depending on the conditions, chlorine is injected into the pipe as a disinfectant and the water is then fed into the drinking water system. The water quality undergoes a thorough analysis at the waterworks outlet.

What is measured?

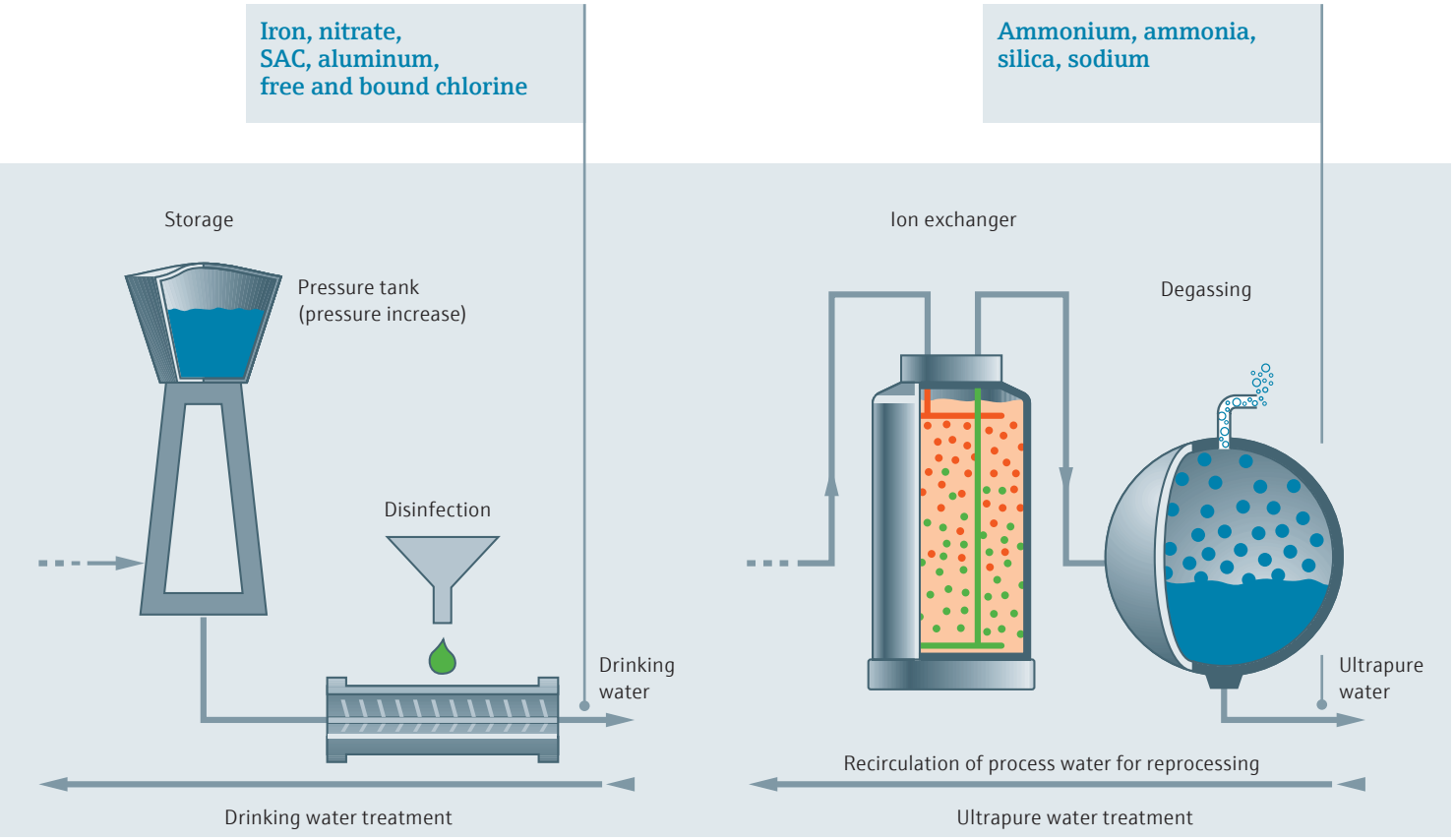
- The amount of free available chlorine reflects the disinfection quality of the water > CM44, CCS51D
- Physical variables such as pH and turbidity are measured to ensure that water quality complies with legal regulations > CM44
- The amount of manganese, iron and aluminum in the water also provides information on compliance with legal regulations > CA80FE, CA80AL
- Water hardness is measured to classify drinking water > CA80HA

Ultrapure water treatment

Ionic salts are removed from the treated water. The water is softened and gas is removed. This results in ultrapure water for industrial processes or boiler feedwater for power stations. As they have already been treated, the return water and condensate are directed back into the water system.

What is measured?

- At high pressures and temperatures, residual oxygen can cause excessive corrosion and thus has to be monitored > CM44
- The difference in conductivity provides information about the operation of the ion exchanger and the pH value > CM44
- Ammonia is used as a corrosion inhibitor. It is measured to ensure optimum dosing > CA80AM
- Silica can cause buildup on the turbine blades. For this reason, it is very important to monitor the amount of silicate in power plants > CA80SI
- Sodium content detects dissolved impurities and is an early indication of condenser leaks or malfunction of ion exchangers > CA76NA



Nourishing your productivity

Your global partner for accurate measurements and expert support in food and beverage automation.

From hygiene regulations and food safety to the basic demands of reliability and uptime, high-quality food and beverage producers profit from our experience in more than 100 countries. Get it right the first time and make your safe choice:

- Constant food quality and compliance
- Resources savings
- An expert partner

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
Fexible 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 highest 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 CPS77D and Ceramax CPS341D
Glass-free pH sensors with Memosens technology for hygienic applications. Unbreakable for highest product safety. Low maintenance. CPS77D provides reliable measurements and fast response times even at low temperatures and features contanimation-resistant gel. Sterilizable and autoclavable. CPS341D is long-term stable 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 highest 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 cleansing agents is a decisive factor to ensure 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 cleansing 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 indispensible.
In processes where media with different conductivities are used, the Smartec compact devices or Indumax CLS54D with Liquiline CM44 guarantee a reliable detection of phase separation. In dairies, Liquiline CM44P and the glass-free OUSAF11 process photometer are the ideal solution.

No glass breakage in foodstuff
Food applications do not tolerate glass breakage – that's why glass-free sensors are used in these applications for maximum product safety.

Global chemicals, competitive and safe

Get the extra project skill and know-how you need to boost your plant's safe performance.

You gain concrete benefits from a partner who has first-hand knowledge of your sector's issues around the globe: on increased safety, on environmental protection, on over-supply leading to cost pressure and on finding engineering support and service when required. You can rely on our help to become more competitive in your line of business.

With a long history of industry firsts we have grown with the sector by listening, acting and innovating to better serve you with:

- Safety, built-in
- The technology to lead
- Best-fit project management

Product highlights

Liquiline CM42
Robust transmitter for demanding applications, hazardous areas or functional safety areas. Intuitive operating concept for easy commissioning, operation and maintenance. Seamless system integration via HART, PROFIBUS PA, FOUNDATION Fieldbus. International approvals for hazardous areas.

Ceragel CPS71D
Digital pH sensor with Memosens technology for fast-changing media compositions. Resistant to poisoning thanks to pressurized reference system or ion trap. Fast response time due to ceramic diaphragm. International approvals for hazardous areas.

Orbisint CPS11D
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 turditiy 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 assembly 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 a 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 for 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 of production. They are, however, interdependent which makes optimization a rather complex task. It is not easy to find the right balance. To achieve top performance of production processes, a great number of reliable and precise data and key performance indicators are necessary. Innovative technologies and services for liquid analysis support the generation and analysis of these data. They enable:

- Reduced maintenance by providing accurate process data
- Precise key performance indicators of the measuring points for highest 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 puts quality, compliance and cost control at the heart of life sciences.

It is a daily task to meet stringent GxP regulations and productivity goals throughout your product lifecycle. You can count not only on our world-class instruments, designed to ASME-BPE standards, but also on our highly qualified engineering input and experienced service teams.

We partner with you to generate process optimization, higher plant availability and continuous improvement. Our experience, gained at the heart of the sector, will help you to:

- Streamline your projects
- Attain operational excellence
- Make the right decisions

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 CPS171D
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 zytotoxicity, free from animal-based materials. Optional pharma certificate of compliance.

Memosens CLS82D
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.

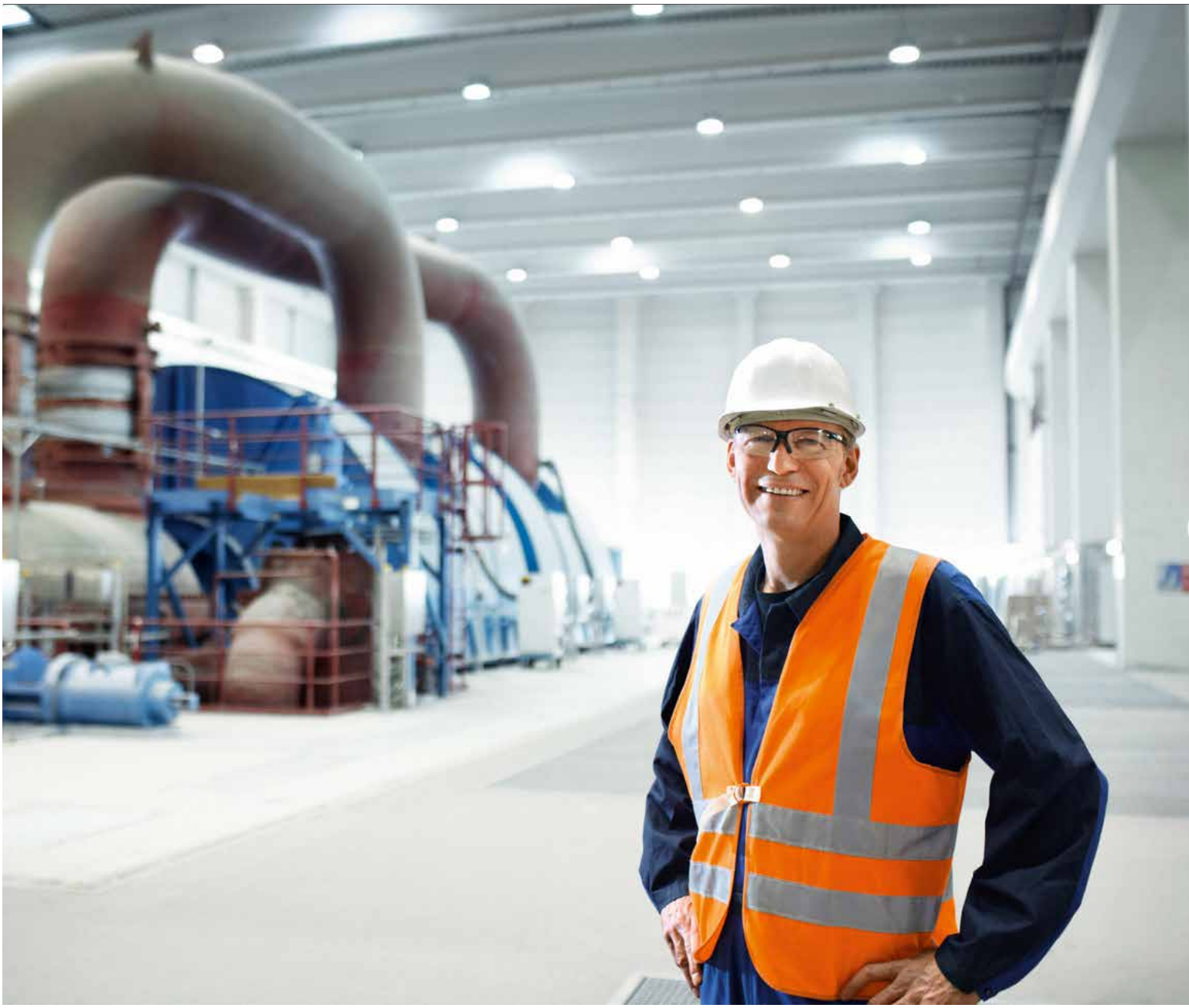
OUSAF44
UV absorption sensor for reliable monitoring of product concentrations. Excellent accuracy for maximum linearity and full consistency with laboratory results. Suitable for sterilization in place (SIP) and cleaning in place (CIP). Liquid-free online calibration traceable to NIST.

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 over 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 as 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 minimize downtime while delivering safety and productivity.

Your plant needs a multi-skilled, versatile partner. You need reliable solutions that meet your application requirements and industry quality standards. And you may need to upgrade ageing plants with proven and state-of-the-art technologies, to keep output consistently high.

As the industry shifts towards natural gas, renewables and the new market dynamics driven by shale gas, our mission is to provide the all-round support and experience you need. This includes elevated standards of safety for your staff – and the ability to meet even-higher environmental demands in flue gas cleaning processes such as SCR catalysts for nitrogen oxide reduction, electrostatic precipitators (ESPs) for particle separation and limestone scrubbing processes for desulphurization.

When you choose us, you:

- Boost the efficiency of your plant
- Heighten safety
- Maintain expertise

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.

Condumax CLS15D
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.

Orbisint CPS11D
Digital pH sensor with Memosens technology. Long poison diffusion path and dirt-repellent PTFE diaphragm. Salt ring for accurate measurements at low conductivity in steam production. International approvals for hazardous areas.

Oxymax COS22D
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 stable 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 of 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.

Highest 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 demand 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 panels (Steam/Water Analysis System) comprise all the measuring technology that is 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 that are mounted on the panel. The sample is discarded after the measurement.

Extracting more from less

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

We've seen how lower grades are driving an acute need for ever-better automation and controls. You are also facing an emerging skills gap, requiring better-informed industry partners. At the same time, energy costs are only going one way, and the legislative environment is becoming increasingly stringent. Tough challenges call for experienced heads who can:

- Reduce your metal and mineral production costs
- Keep your plant safe
- Boost compliance and responsibility

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.

Orbipac CPF81D
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 poisioning ions (S^{2-}, CN^{-}).

Turbimax CUS71D
Digital ultrasonic sensor for interface measurement in e.g. 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 assembly 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 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 cleaned regularly to withstand these conditions.

- Orbipac CPF81D 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, they only have to spend little time in the plant to exchange the sensors. Cleaning, regeneration and calibration can be done in the safe and comfortable environment of the laboratory.

Fuel for thought

With vast experience in the oil & gas sector, we help you to perform, comply and thrive.

From exploration to refinery, from storage to distribution – from plant upgrades to new projects, we have the application expertise to help you succeed. At a time when the sector faces skills shortages and tightening of regulations, our organization is here across the full life cycle of your project always keeping your deadlines in mind.

While complexity of facilities and processes are ever increasing, and downtime must be reduced, your competitiveness is enhanced with reliable, accurate and traceable asset information. In short, you need to do more with less, benefiting from a stable partner who is here for the long haul and ready across the globe, offering:

- Assured plant safety
- Optimized return on investment
- Best-fit products, solutions and services

Product highlights

Liquiline CM42
Robust transmitter for demanding applications, hazardous areas or functional safety areas. Intuitive operating concept for easy commissioning, operation and maintenance. Seamless system integration via HART, PROFIBUS PA, FOUNDATION Fieldbus. International approvals for hazardous areas.

Orbisint CPS11D
Digital pH sensor with Memosens technology. Long poison diffusion path and dirt-repellent PTFE diaphragm. Salt ring 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 robust materials (PFA, PEEK). Large sensor opening avoids soiling. International approvals for hazardous areas.

Cleanfit CPA871
Retractable assembly 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. More safety for plant personnel: they only spend minimal time in the plant to exchange the 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 ring 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.

Saving energy and costs – together

Generating and distributing air, steam, gas, cooling or heating water requires a considerable amount of cost and energy. We help you to run these utilities as efficiently as possible.

Are you the maintenance technician, engineer or plant manager whose job it is to maintain competent support for the gas, steam or water utilities of your company? Are you the process or finance manager who has to balance the 'trade-off' between increasing plant efficiency and reducing operating overheads and energy costs? Do you find that the dictates of quality audits, standard operating procedures and environmental protection require ever-stricter process monitoring?

Yes? Then you can fully count on Endress+Hauser in regard to energy and cost savings. We can offer the all-inclusive solutions package you need:

- Customized solutions for your energy applications
- Competent planning, commissioning and maintenance
- Engineering, project management of simple solutions, for example, for boiler houses all the way to complete system solutions
- Professional support from specialists in all sectors

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.

Condumax CLS15D
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 CPS16D
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.

Oxymax COS22D
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 stable 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 four Memosens sensors to Liquiline System CA80.

Memosens CCS51D
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 conductitivities. Long maintenance and calibration intervals thanks to membrane-covered sensor head.

No contamination of feed water
High quality of boiler feedwater is a key factor to avoid corrosion or build-up of deposits in boilers or pipes. They might 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 fast and take necessary measures.

Safe cooling water cycles
Cooling water cycles must run stably and must not interfere with the product. Contaminated cooling medium 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 such quality that no micro organisms 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 leading to bacteria-free water.

Seamless system integration

Greater transparency through added information: only digital field buses 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 access to 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 due to access to all parameters and diagnostics of 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 intergraton into plants and guaranteed investment protection. Various communication systems that Endress+Hauser also supports have become established in the area of process automation:

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

Endress+Hauser is one of the pioneers of 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

HART COMMUNICATION PROTOCOL PROFIBUS FOUNDATION Modbus EtherNet/IP

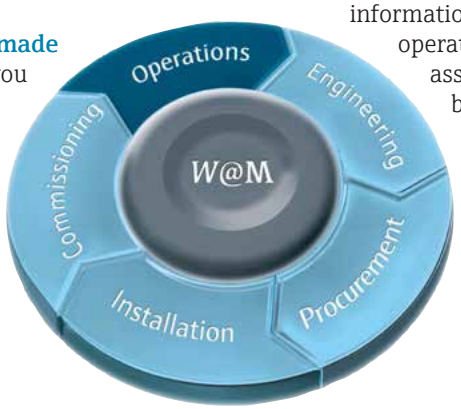
W@M life cycle management

Improved productivity with information at your fingertips

Data relevant to a plant and its components is generated from the first stages of planning and during the asset's complete life cycle. W@M life cycle management is an open and flexible information platform with online and on-site tools. Instant access to current, in-depth data shortens your plant's engineering time, speeds up procurement processes and increases plant uptime. Coupled with the right services, W@M Life Cycle Management boosts productivity in every phase.

W@M engineering – reliable planning and traceability A variety of online tools and updated data simplify your daily engineering tasks. Throughout your project all data is documented and securely stored for all subsequent processes.

W@M procurement – purchasing made easy Electronic purchasing allows you to optimize your processes. It simplifies the procurement, reduces purchasing costs and strengthens your competitive position.



W@M installation – prepare fast device setup Efficient 'first-time' installation of your equipment is now possible with easy downloading of related and updated technical information and device drivers for smooth device configuration.

W@M installation, commissioning, operation – full document history Simplify commissioning with access to all relevant measuring device and field network information and ensure smooth handover of all documentation for site acceptance tests, checks, operation and maintenance.

W@M operations – data to optimize maintenance Optimal maintenance is driven by information. Transfer your device data easily into the operation phase and enrich it with up-to-date asset information to manage your installed base.

Tools for selection and operation

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

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.

Available on the App Store

ANDROID APP ON Google play

Premium service for analyzers and samplers

The right maintenance guarantees smooth operation for long-term, optimum instrument performance

Just as cars regularly have to go in for inspection to make sure they are roadworthy, your instrument also needs professional servicing and maintenance. The right maintenance is key to getting the best from your measuring device. At Endress+Hauser, we support you throughout the entire life cycle of your device - from commissioning to comprehensive maintenance - and perfectly tailor our services to suit your special needs and local conditions.

Commissioning
Correct device commissioning is central to optimum equipment performance right from the start.

Your benefits
- Specialized knowledge at the right time guarantees that production starts on time.
- Efficient transfer of knowledge ensures optimum training for your staff.
- Commissioning reports meet your safety and quality standards.
- Endress+Hauser expertise assists you in optimizing your processes.
- Any technical issues are resolved quickly on site.
- All inclusive – no additional or unexpected costs.

Preventive maintenance
Improves the service life of your plant and ensures that all instruments work within the specifications of the application.

Your benefits
- Higher availability thanks to regular inspection and preventive maintenance measures
- Longer instrument operating life
- No hidden costs - travel, work time and spare parts are included in the price
- Device-specific certificates guarantee compliance with legal regulations (ISO, national legislation etc.)
- Regular contact with specialists to obtain the latest technical information and expand the internal knowledge base
- Your staff can focus on their core competencies

Talk to our technicians at your local Endress+Hauser Service and Sales Center to discover which service level best suits your needs.

Guide to analyzers, sensors and samplers

Parameter	Typical applications	Device	Ranges
Aluminum	▪ Water treatment	Liquiline System CA80AL	10 - 1,000 µg/l Al
Ammonium	▪ Water treatment ▪ Wastewater ▪ Boiler feedwater	Liquiline System CA80AM	0.05 - 20 mg/l NH_4-N 0.5 - 50 mg/l NH_4-N 1 - 100 mg/l NH_4-N
	▪ Wastewater: optimization of nitrification/denitrification	ISEmax CAS40D/CM44	0.1 - 1,000 mg/l NH_4-N
Chromate	▪ Industrial wastewater ▪ Process water	Liquiline System CA80CR	0.03 - 2.5 mg/l Cr (VI) 0.2 - 5 mg/l Cr (VI)
COD (chemical oxygen demand)	▪ Raw wastewater, inflow and outflow monitoring ▪ Raw wastewater, load control ▪ Industrial discharger monitoring ▪ Monitoring of cooling water	Liuqiline System CA-80COD	10 - 500 mg/l COD 40 - 20,000 mg/l COD
		Viomax CAS51D (SAC)/ CM44	0.15 - 75 mg/l COD_{eq} Equiv. KHP 0.75 - 370 mg/l COD_{eq} Equiv. KHP 2.5 - 1,000 mg/l COD_{eq} Equiv. KHP
Hardness	▪ Monitoring of softening processes in water and drinking water treatment	Liquiline System CA80HA	0 - 80 mg/l $CaCO_3$
Iron	▪ Drinking water ▪ Wastewater ▪ Mineral well	Liquiline System CA80FE	0.05 - 2.5 mg/l Fe 0.1 - 5 mg/l Fe
Nitrate	▪ Drinking water ▪ Outlet monitoring of wastewater treatment plants ▪ Monitoring and optimization of denitrification	Viomax CAS51D/CM44	2 mm gap 0.1 - 50 mg/l NO_3-N 0.4 - 200 mg/l NO_3 8 mm gap 0.01 - 20 mg/l NO_3-N 0.04 - 80 mg/l NO_3
	▪ Wastewater: optimization nitrification/denitrification	ISEmax CAS40D/CM44	0.1 - 1,000 mg/l NO_3-N
Nitrite	▪ Water treatment ▪ Wastewater	Liquiline System CA80NO	10 - 500 µg/l NO_2-N 0.1 - 1 mg/l NO_2-N 0.2 - 3 mg/l NO_2-N
Phosphate	▪ Wastewater ▪ Drinking water ▪ Boiler water ▪ Cooling tower water	Liquiline System CA80PH	0.05 - 2,5 mg/l PO_4-P (blue method) 0.05 - 10 mg/l PO_4-P (blue method) 0.5 - 20 mg/l PO_4-P (yellow method) 0.5 - 50 mg/l PO_4-P (yellow method)
SAC_{254} (spectral absorption coefficient)	▪ Continuous monitoring of wastewater for organic pollution ▪ Special measuring tasks in UV range ▪ Surface water ▪ Drinking water	Viomax CAS51D/CM44	0.1 - 50 m^{-1} SAC 0.5 - 250 m^{-1} SAC 1.5 - 700 m^{-1} SAC
Silica	▪ Power plants: Boiler feedwater, feedwater return from condensers, ion exchanger outlet	Liquiline System CA80SI	0.5 - 200 µg/l (ppb) Si 50 - 5,000 µg/l (ppb) Si
Sodium	▪ Power plants: Boiler feedwater, feedwater returning from condensers, ion exchanger outlets, feedwater from desalination plants	Ca76NA	0.1 - 9,999 µg/l (ppb) Na
TOC (total organic carbon)	▪ Municipal water containing solids ▪ Very polluted industrial wastewater ▪ Chemical industry	TOCII CA72TOC	0.25 - 600 mg/l TOC 1 - 2,400 mg/l TOC 2.5 - 6,000 mg/l TOC 5 - 12,000 mg/l TOC
	▪ Continuous monitoring of wastewater for organic loads ▪ Surface water ▪ Drinking water	Viomax CAS51D (SAC)/ CM44	0.06 - 30 mg/l TOC_{eq} Equiv. KHP 0.3 - 150 mg/l TOC_{eq} Equiv. KHP 0.9 - 410 mg/l TOC_{eq} Equiv. KHP
Total phosphorus	▪ Wastewater ▪ Boiler feedwater ▪ Cooling tower water	Liquiline System CA80TP	0.05 - 10 mg/l P_{tot} (blue method) 0.5 - 50 mg/l P_{tot} (blue method)
Sampling	▪ Inlet of wastewater treatment plant ▪ Outlet of wastewater treatment plant	Liquistation CSF48 Liquiport 2010 CSP44	

Additional documentation

TI01111C	Liquiline System CA80AM	Ammonium analyzer
TI01258C	Liquiline System CA80NO	Nitrite analyzer
TI01219C	Liquiline System CA80PH	Orthophosphate analyzer
TI01265C	Liquiline System CA80CR	Chromate analyzer
TI01291C	Liquiline System CA80FE	Iron analyzer
TI01185C	Liquiline System CA80COD	COD analyzer
TI00448C	TOCII CA72TOC	TOC analyzer
TI01264C	Liquiline System CA80TP	Total phosphorus analyzer
TI01290C	Liquiline System CA80AL	Aluminum analyzer
TI01352C	Liquiline System CA80HA	Hardness analyzer
TI01315C	Liquiline System CA80SI	Silica analyzer
TI01339C	CA76NA	Sodium analyzer
TI00459C	Viomax CAS51D	In-situ sensor
TI00444C	Liquiline CM44	Transmitter
TI00427C	ISEmax CAS40D	In-situ sensor
TI01138C	Liquiline System CAT810	Sampling system
TI01131C	Liquline System CAT820	Sampling system
TI01137C	Liquiline System CAT860	Sampling system
TI00349C	Stamoclean CAT411	Micro-filtration system
TI00443C	Liquistation CSF48	Stationary sampler
TI00465C	Liquiport 2010 CSP44	Portable sampler
FA00007C	Experts in liquid analysis Sensors, transmitters, compact devices and assemblies for every application	

www.addresses.endress.com

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Endress+Hauser

People for Process Automation