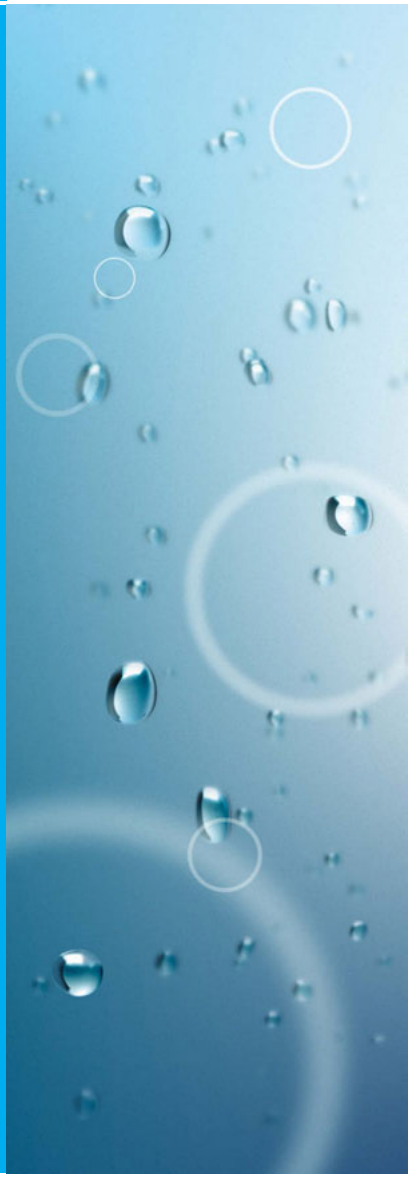
Process photometers

Expertise 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 12,000 „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 68 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 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

Analytical Solutions

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.

Service expertise

As a maker of plant measuring equipment, Endress+Hauser has been in business for over sixty years. We continuously work closely with our customers and lend support in every situation. No matter whether you have to troubleshoot problems, need spare parts quickly, require a calibration or just need informed advice, our business is structured so that we're always there to help you achieve your business goals. You need to ensure optimum product quality in a reliable and profitable manner - our job is to provide the right balance of services to help you deliver on this goal while ensuring maximum plant safety and cost optimization.

Advantages

- Services throughout the product life cycle
- Global service network
- Co-operative partnership

Our contribution to your return on investment
Our entire organization is geared towards lending you support in procuring, installing, commissioning and operating instruments for your application. This starts with the constant optimization of our measuring equipment for your industry, coupled with the development of special solutions for your particular needs, and continues into our portfolio of innovative instruments and services. Regardless of whether your plant has just gone into operation or has been running for twenty years - our customer service representatives can help you optimize your maintenance schedules, improve your ROI and avoid unnecessary costs arising from downtime.

Comprehensive service portfolio
Endress+Hauser offers its customers a wide range of services focusing on industrial measurement and process automation, ranging from application advice and commissioning to calibration and all-round maintenance packages. With our service support we provide you with everything you need throughout the life cycle of your plant.

Absorbance and turbidity measurement

Absorbance

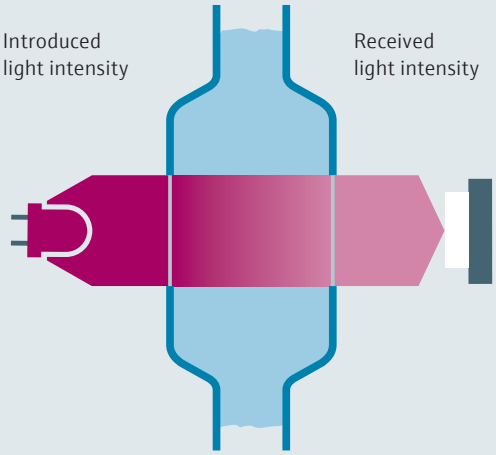
Absorbance measurement is based on the interaction of introduced light with the medium according to the Lambert-Beer law.

$$A = \varepsilon \cdot c \cdot OPL$$

A Absorption
ε Extinction coefficient
c Concentration
OPL Optical path length

A light source emits radiation through the medium and the transmitted radiation is measured on the detector side. A photodiode determines the intensity of the light and converts it to a photoelectric current. The intensity of light received is proportional to the concentration of the substances under measurement. The final conversion to absorption units (AU, OD) is performed by the transmitter.
Modern photometers enable accurate and reproducible concentration measurement by determining UV absorbance, color, NIR absorbance, turbidity and cell growth.
Thanks to their simple measuring principle, swift response time, low maintenance and minimum cross-sensitivity with other process parameters, photometers can be used in a wide range of diverse applications.

Measuring principle of absorbance measurement

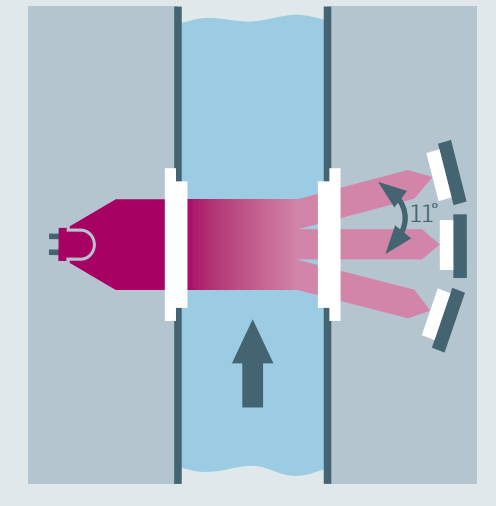


Absorbance = measurement of the attenuation of light relative to the introduced light intensity

Turbidity

Turbidity measurement is based on the scattering of incident light through particles in the medium. Here, particles are understood to be all parts with a refractive index that differs to that of the carrier medium. This not only includes solids like minerals, yeast cells or metals but also substances such as colloids, proteins, undissolved oil in water, milk in water, gas bubbles or aerosols.
In turbidity measurement, a light source introduces a focused beam into the medium. This beam is deflected by particles in the medium, causing it to scatter. The scattered light is measured by receivers at a certain angle, e.g. 11°, 90° or 135°, and the turbidity is determined.
If turbidity is low, forward scatter measurement at 11° and side scatter at 90° are suitable methods. In the 90° method, both small and large particles create the same scatter intensity, while small particles create a low scatter intensity and large particles a high scatter intensity in the 11° method. Forward scatter measurement is an excellent method of monitoring filtration as the individual large particles that enter the medium if the filter fails are detected immediately and the measured value rises quickly.

Turbidity measurement



Scattered light method: the scattered light caused by solid particles is measured at an angle of 11°.

Overview of optical measuring principles

	Description		Applications
OUSAF44	The OUSAF44 UV sensor delivers fast and reliable process information that is fully consistent with laboratory results. It speeds up your measuring task and increases product yield.		Applications ▪ Filtration control in the life sciences industry ▪ Filter monitoring and detection of aromatic compounds ▪ Quantitative concentration measurement
OUSAF12	The OUSAF12 absorbance sensor helps you accurately monitor the quality of your products and processes. It can be used in all environments, ranging from hazardous areas to hygienic processes.		Applications ▪ Quick phase separation determination ▪ Turbidity measurement in hazardous areas ▪ Quality monitoring
OUSBT66	The OUSBT66 sensor monitors cell growth, biomass process and algae systems. It provides reliable and accurate real-time measured values to optimize your process and product yield.		Applications ▪ Cell growth and biomass in bacterial fermentation ▪ Monitoring of crystallization processes ▪ Measurement of undissolved solids
OUSAF22	The OUSAF22 color and absorbance sensor measures even the slightest change of color in your products to determine product concentration or quality. Due to its outstanding precision, it meets the toughest industry standards.		Applications ▪ Color measurement for quality control ▪ Concentration measurement ▪ Distillation control
OUSTF10	The OUSTF10 scattered light turbidity sensor delivers highly sensitive measurements of undissolved solids, emulsions and immiscible media. It can be used in all environments, ranging from hazardous areas to hygienic processes.		Applications ▪ High-sensitivity turbidity measurement ▪ Filter monitoring ▪ Leak detection in heat exchangers
OUSAF11	OUSAF11 is a glass-free sensor for the in-line detection of changing phases and solids. Its hygienic, glass-free design guarantees the maximum safety of your products at all times.		Applications ▪ Sensor for the glass-free determination of phase separation ▪ Monitoring loss of product ▪ Absorbance measurement in aggressive media
CM44P	Liquiline CM44P is a multiparameter and multichannel transmitter for all process photometers and Memosens sensors. It offers easy setup of complete measuring points for monitoring processes such as chromatography, fermentation, phase separation and filtration.		Applications ▪ Transmitter for all process photometers and Memosens sensors ▪ Use in every industry

Measuring principles

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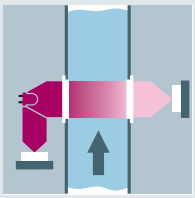
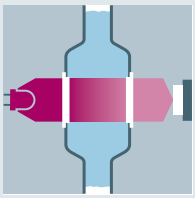


UV absorbance measurement ..... Page 9

The measuring principle of the OUSAF44 is based on absorbance measurement at a selectable wavelength in UV. A reference detector compensates for lamp aging.

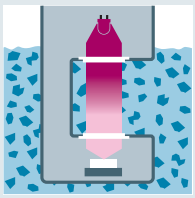
Page 12



Absorbance measurement ..... Page 13

The measuring principle of the OUSAF12 is based on absorbance measurement at a certain wavelength or wavelength range in the visible region of the light spectrum or in the near infrared range.

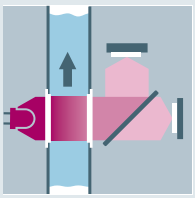
Page 14



NIR absorbance measurement ..... Page 15

The OUSBT66 optical sensor measures absorption at a selected wavelength in the near infrared range.

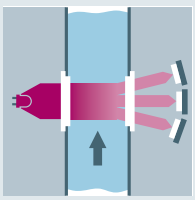
Page 18



Absorbance measurement at two wavelengths ..... Page 19

The measuring principle of the OUSAF22 is based on absorbance measurement at two wavelengths in the visible light range. The second absorbance measurement makes it possible to compensate for variations in turbidity.

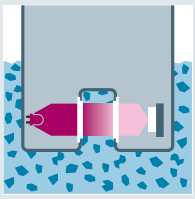
Page 20



Forward scatter ..... Page 21

The measuring principle of the OUSTF10 is based on the measurement of the light scattered forwards and the light absorbance as a reference.

Page 24



NIR/VIS absorbance measurement ..... Page 25

The measuring principle of the OUSAF11 is based on light absorbance measurement in the visible and near infrared light range.

Page 28

Wide variety of communication protocols and interfaces

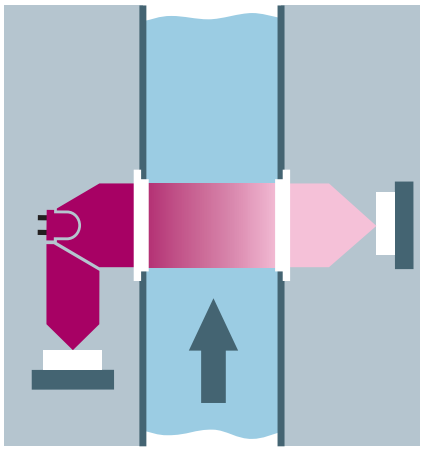
- 0/4 to 20 mA
- HART
- PROFIBUS DP
- Modbus
- EtherNet/IP
- Web server

Application

- Measurement of protein concentrations
- Chromatography control
- Permeate and retentate monitoring
- Concentration measurement of organic compounds
- Aromatics detection
- Filter monitoring

UV sensor OUSAF44

In-line process photometer



UV sensor OUSAF44
The UV sensor OUSAF44 provides the possibility for direct, real-time process control and minimizes inaccurate measurements and costly, time-consuming laboratory measurements. The sensor provides a precise, linear and reproducible measurement of the UV absorbance which is directly comparable with laboratory results. High accuracy and linearity is achieved by the optimized measurement filters at discrete wavelengths between 254 and 365 nm and a reference detector for lamp compensation. The sensor has been designed for in-line installation with a flow assembly. Its concept, the low flow assembly retention volume, the broad variety of process connections and wetted materials allow adaptation to most processes with hygienic and sterile demands. An optional pressure-capsulated lamp housing allows installation in hazardous areas.

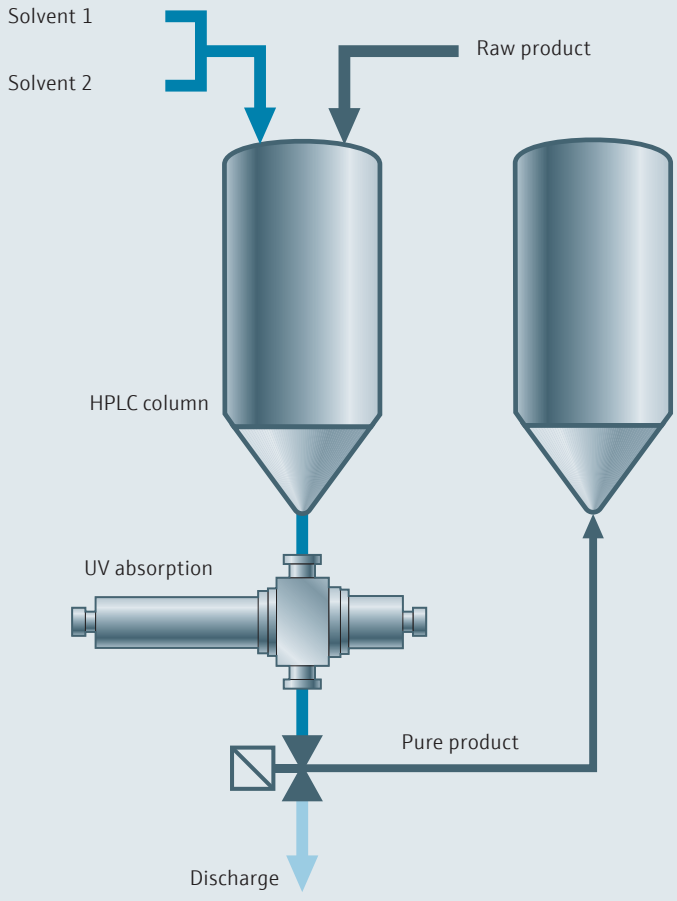
Features and benefits

- Quick and reliable monitoring of product concentration for better process control and quality
- Precise measured values that are fully comparable with laboratory results
- Optional, patented Easycal™ system for easy, liquid-free online calibration traceable to NIST
- Low-maintenance longlife sensor offering stable operation
- Outstanding filter performance providing utmost linearity
- Suitable for cleaning in place (CIP) and sterilization in place (SIP)
- Approved for hazardous areas

Easycal™ and Precision Optical Pathlength (POPL)
The Easycal™ system is an accurate and easy method for in-line verification and calibration. It comprises an optical detector system with certified, traceable filters that can be rotated into the light path. The mechanically sealed and compact design results in a long life and stability of the certified filters, even under the harshest conditions. The Precision Optical Pathlength (POPL) system allows a precise setting of the optical path. POPL in combination with Easycal™ enables the liquid-free calibration of the entire measuring point that is traceable to NIST.

OUSAF44 monitors chromatographic separation

Monitoring of chromatographic separation



Application

Many pharmaceutical processes start with the fermentation of solid organisms like yeast or bacteria.
After fermentation the product is extracted from the yeast/bacteria and the liquids and solids are separated using a centrifuge during this process. Once the solids have been separated from the liquid, the liquid is concentrated using a range of chromatographic methods and separated further. These include:

- Gel filtration (substances sorted based on their molecular size)
- Ion exchange (substances bonded by electric charge)
- Hydrophobic interaction (separation on basis of hydrophobic character)
- Affinity (bonding of substances by attachment to receptors).

These chromatographic methods can be performed at high and low pressure at temperatures ranging from +2 °C to room temperature.
The separated parts must be accurately determined so the pure product can be collected.

Solution

The OUSAF44 is installed directly in the pipe downstream from the HPLC column to detect the pure product separated in the HPLC column. Thanks to its outstanding filtration performance and linearity it guarantees precise product detection. Furthermore, the Easycal function allows the user to perform a simple sensor calibration before every batch and thereby further improve the precision of the sensor.

Advantages

- Minimum loss of product
- Maximum product quality
- Ultimate operational safety
- Disturbances quickly detected by in-line measurement

The perfect package

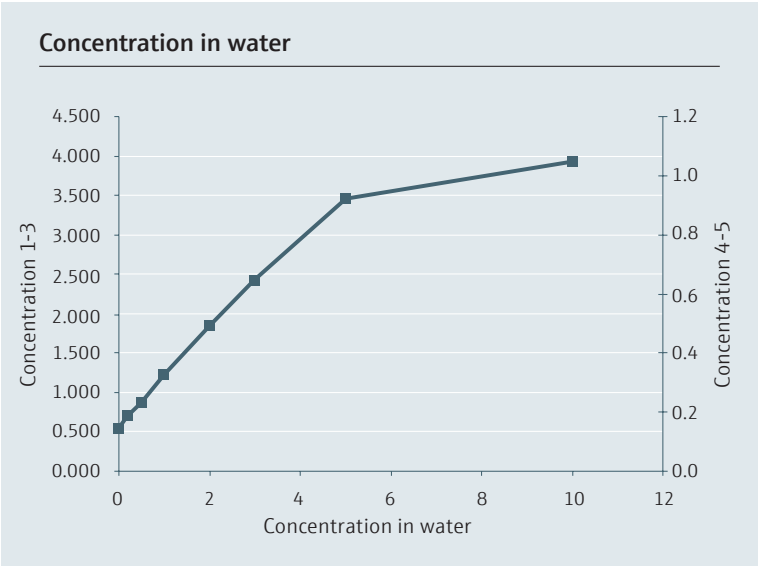
Connect OUSAF44, the CPS71D pH sensor and the CLS82D conductivity sensor to only one Liquiline CM44P transmitter. This ensures precise detection of the target product and helps to enhance the separation quality of the column, resulting in optimal product yield. Furthermore, the transition from product to cleaning phase is accurately detected, allowing you to optimize cleaning and flushing cycles in the column.

Monitoring of reverse osmosis

Application
Most processes in the production of pharmaceuticals use reverse osmosis to enrich and treat the product. Over time, however, the membrane wears out and can tear, which would destroy an entire batch of product.
By monitoring whether particles pass through the membrane, it is possible to avoid serious damage to the membrane and lost product batches.

Solution
Given that most pharmaceutical products are based on proteins, the protein concentration is a good measure of the quality of a product. Thanks to its excellent filtration quality and linearity, the OUSAF44 optical sensor achieves a high degree of accuracy and can accurately determine the concentration of protein.
Installation directly in the process is optimum with the OUA260 flow assembly, being suitable for both CIP and SIP and therefore ideal for hygienic processes.

Advantages
- Precise monitoring of membrane functionality prevents lost batches
- Accurate detection of proteins increases product quality.

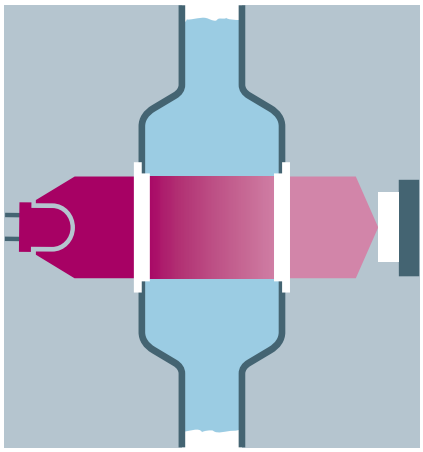


Application

- Quality control / purity monitoring
- Filter monitoring
- Condensate monitoring
- Turbidity in breweries
- Leak detection in heat exchangers
- Turbidity in brine

Absorbance sensor OUSAF12

In-line detection of suspended solids and product interphases



Accurate quality control and more efficiency for your production: OUSAF12 process photometer.

Absorbance measurement
OUSAF12 is an optical sensor measuring VIS/NIR absorption in liquid media. It detects suspended solids directly inline, thus enabling accurate monitoring of the consistency and quality of your product. In processes with two or more product phases, such as Food or Oil & Gas, OUSAF12 reliably detects product interphases. This enables faster and more direct process control, avoids loss of product and at the end of the day it saves costs.

ATEX-approved and hygienic
Particle and turbidity measurement are important process control parameters in many industries. OUSAF12 is ready for all kinds of environments, from hazardous areas (ATEX, FM) to hygienic processes. This makes it perfect for applications in Life Sciences, Chemical, Food & Beverage, Oil & Gas and Pulp & Paper.

Features and benefits

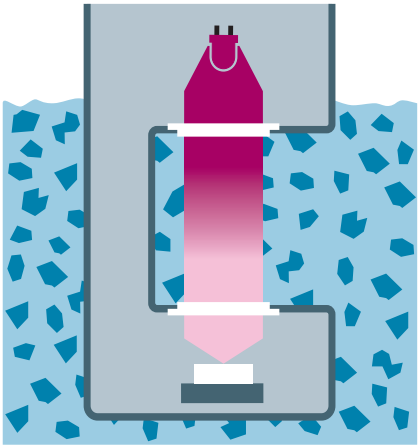
- Better product quality monitoring in pharmaceutical and chemical processes
- Cost savings and less lost product thanks to product interphase detection
- Incandescent light for a long service life and stable operations
- Color-independent measurement
- Easy and liquid-free verification

Application

- Cell growth in bacterial fermentation
- Biomass measurement during the fermentation process
- Monitoring of algae concentration
- Monitoring of crystallization processes
- Measurement of undissolved solids
- For use in laboratory, pilot and production fermenters and bioreactors

Cell growth sensor OUSBT66

Hygienic sensor for measurement of NIR absorbance



Features and benefits

- Real-time measurement for optimized processes and product yield
- Reliable, precise measured values that correlate perfectly with lab results
- Easy verification with traceable clip-on filters
- Hygienic stainless steel body and sapphire windows without seals and crevices
- Suitable for CIP/SIP and autoclavable
- Various path and sensor lengths for perfect installation in any fermenter and bioreactor
- Pg 13.5 thread for installations with standard assemblies or using head plate

OUSBT66 measures cell growth and biomass in fermentations

The OUSBT66 measures the absorbance of the sample under analysis at a selected wavelength in the infrared region of the light spectrum. As this wavelength is not in the visible region of the spectrum, the influence of color in the medium will be negligible and you can measure and monitor algae and cell growth, and biomass and crystallization processes based on the turbidity. This method is particularly suitable for high turbidity values. The sensor's 12-mm design enables direct installation in fermenters and bioreactors and makes it possible to use the sensor in hygienic installation and retractable assemblies. This allows you to choose from a wide variety of process connections and perform automatic sensor cleaning under hygienic conditions.

Ready for life sciences
OUSBT66 provides reliable and accurate real-time measured values to optimize your process and product yield. The sensor's hygienic design is suitable for CIP/SIP cleaning and allows autoclaving. Fitted with approved clip-on filters that are traceable to NIST, OUSBT66 is extremely easy to calibrate and adjust.

OUSBT66 with different path lengths

Clip-on filters traceable to NIST

OUSAF12 and OUSBT66 in service

OUSAF12 – pharmaceutical industry

Monitoring of suspended solids in centrifuges

Application
Many pharmaceutical processes start with the fermentation of solid organisms like yeast or bacteria.
After fermentation, the product is extracted from the organisms. During this process, the liquids and solids are separated using a centrifuge and the solids collect in the centrifuge until the container is full. Further separation is impossible at this point and the solids must be removed. Accurate control is essential to empty the centrifuge efficiently and ensure the purity of the products.
There are two possible methods to perform this task:

- Manual: Draining is triggered periodically or when the centrifuge is full. This method does not provide a good quality clarified stream and can put an undue load on downstream filtration and clarification equipment.
- Timed: The centrifuge container is cleared regularly during centrifugation. This is the most widely used method of keeping the centrifuge clear but it does lead to loss of product in the solids stream. To minimize the loss of product, a short rather than a full draining cycle is employed. In many cases this does not clear the centrifuge container completely, however. Solids build up, impairing the efficiency of the centrifuge.

Solution
In-line measurement in the inlet and outlet of the centrifuge with the OUSAF12 sensor enables automated and optimized draining processes. Typically, the concentration of solids is high at the start of the draining process and fades out towards the end of the process.

Advantages

- By monitoring and controlling the solids/liquid mixture supplied, a constant feed can be achieved without overloading the centrifuge.
- Measuring the clarity of the centrate in the outlet enables accurate control of centrifuge draining and minimizes product loss.
- The centrate quality check also optimizes the subsequent process steps.

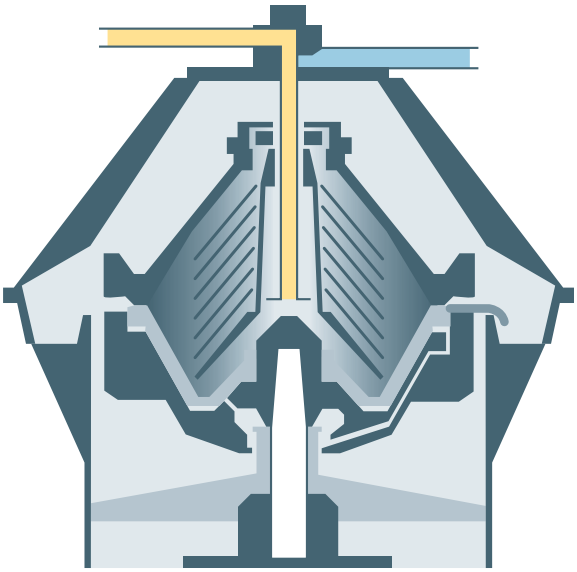
Separation of organic and aqueous phases

Application
By separating the raw product through centrifugation the aim is to obtain an aqueous and organic phase that are as pure as possible. If the organic phase is contaminated with water, this reduces the product quality. If, on the other hand, there is organic matter in the aqueous phase, this drives up the time and costs of water treatment.

Solution
In-line measurement using the OUSAF12 sensor is installed in the outlets of both the organic and aqueous phase. By measuring the turbidity, this sensor determines the content of water in the organic phase discharge, e.g. oil, and the organic concentration in the aqueous phase discharge. It provides precise and stable turbidity values for both phases. Thanks to its fast response time it enables the immediate detection of severe turbidity changes and possible failure, thereby allowing plant operators to respond immediately and make fast process-related decisions.

Advantages

- Less product lost thanks to fast reaction to failure
- Optimized separation processes for better product quality
- Less organic load in the water
- Cost savings as manual sampling not required

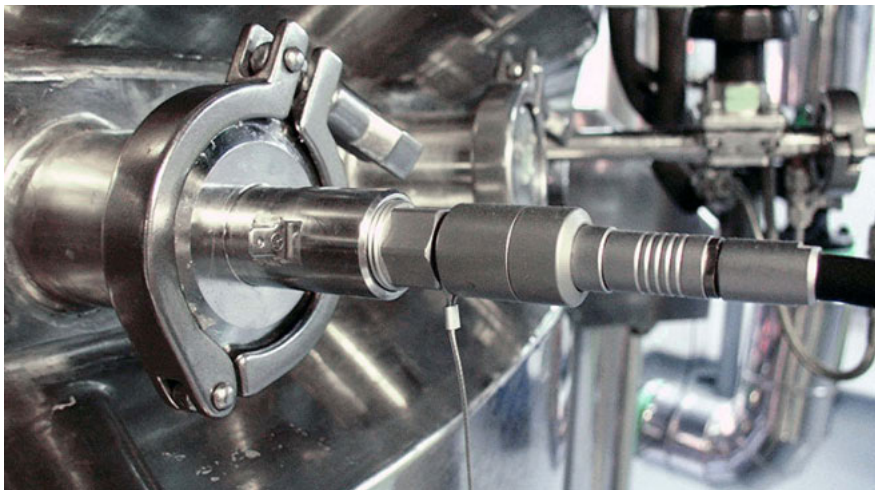


OUSBT66 – optimization of fermentation processes

Application
Biotechnological processes are becoming increasingly important in modern research and production owing to moderate process conditions, the high level of selectivity and the resulting improvement in product yield and profitability. Fermentation is at the heart of biotechnology processes. The cells for the target product are bred on a large scale here. If fermentation fails, the entire production process must be restarted, making quick fermenter control extremely important.

The aim is to measure cell growth of nitrogen-fixing bacteria in-line and replace laboratory measurement. Azospirillum (see graphic) and rhizobium strains were tested. A 5000 liter stainless steel tank served as the experimental reactor. The onsite data were analyzed for five months and the sensor gradually validated.

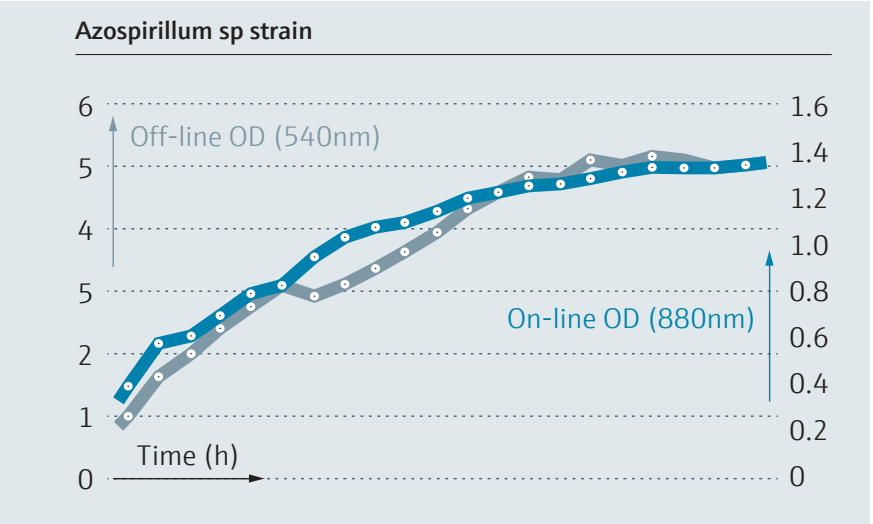
Solution
The OUSBT66 optical sensor is installed directly in the fermenter and is therefore the optimum solution for quick fermenter control. It measures the absorption in the near infrared range and uses an LED as a light source, making it completely independent of color. In contrast to other parameters, such as pH, oxygen, etc. that primarily determine the fermentation conditions, the optical sensor measures the expected cell growth.
The results achieved show that the optical sensor is suitable for measuring bacteria growth directly and can replace the laboratory measurement. The online measurement was implemented after successful validation comparing against several laboratory tests.



Advantages of automatic process control over the measurement of optical density (OD)

- Better process reproducibility: more reproducible OD values were obtained.
- No sampling: in-line measurement eliminates sampling at the fermenter, thereby preventing contamination.
- Standardization and improved traceability: one standard process can be used for different cell cultures and the behavior of the bacteria can be monitored constantly instead of just checking a small sample.
- Alarm signals and data collection in the PLC: the sensor's 4-20 mA output signal makes it possible to configure alarm signals via the PLC and collect data for further analyses.
- Early process decisions: problems caused by contamination, process errors or lack of quality can be detected and prevent lost batches before or after packaging.

The perfect package
The combination of the OUSBT66 photometer with the COS22D oxygen and the CPS171D pH sensors facilitates perfect growth conditions for the microorganisms at all times. Measurement of cell growth with the OUSBT66 also shows when the fermentation has achieved the appropriate process phase resulting in optimal product yield. Connect all sensors to only one Liquiline CM44P to get a complete overview of your process.



The offline OD curves at 540 nm behave in a manner that is very similar to the online curves of the sensor at 880 nm.

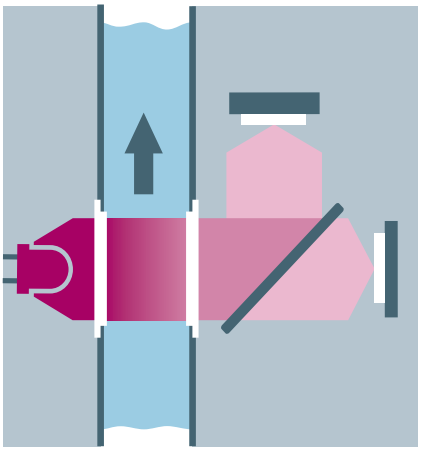
Application

- Quality control / purity monitoring
- Color metering
- Discoloration check
- Distillation monitoring

- Life Sciences
- Chemicals
- Food and Beverages
- Oil and Gas
- Water

Color sensor OUSAF22

Optical sensor OUSAF22 for precise in-line color and concentration measurement in liquids



Color and color scale measurement
Color is an obvious but also very reliable quality indicator of a product. The optical sensor OUSAF22 measures the slightest color changes, thus ensuring the high quality standards of your product.

The sensor delivers fast values according to all standard color scales, such as APHA/Hazen, EBC, ASTM etc. This gives you an immediate insight into how pure your vaccine or beer is, whether your synthetic has a yellow hue that is shouldn't or whether your distilled water is really clear enough for your process.

Concentration measurements
Following appropriate calibration, the concentrations of a range of substances can be determined via absorbance in the visual region of the light spectrum. For example, OUSAF22 accurately measures the concentration of ClO_2 in disinfection water or whether the electrolyte concentration is still high enough for electroplating. This allows you to optimize your process control.

Avoid complicated sampling
Thanks to in-line color measurement with OUSAF22, you avoid complicated and expensive sampling: no labor costs, no dilution errors in the lab – just fast and direct values.

ATEX-approved and hygienic
Color is a versatile product control parameter, applied in various industries. OUSAF22 is ready for all kinds of environments, from hazardous areas (ATEX, FM) to hygienic processes. This makes it fit for many industries such as Life Sciences, Chemical, Food & Beverage, Oil & Gas or Water.

Features and benefits

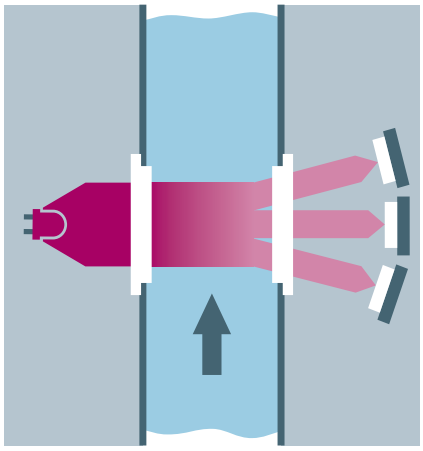
- Accurate monitoring of color and purity for better product quality
- Sampling is avoided: fast and direct in-line measurement
- Values according to standard color scales (APHA/Hazen etc.)
- Incandescent light for a long service life and stable operations

Application

- Quality control / purity monitoring
- Filter monitoring
- Condensate monitoring
- Turbidity in breweries
- Leak detection in heat exchangers
- Turbidity in brine

Turbidity sensor OUSTF10

Optical sensor OUSTF10 for measuring turbidity and suspended solids inline



Scattered light measurement
The OUSTF10 scattered light turbidity sensor is used to measure undissolved solids, emulsions and immiscible media.

Quality and purity monitoring
The OUSTF10 process photometer provides accurate measurements directly inline, so you know immediately whether your beer is clear enough or whether the condensate of your heat exchanger is really pure. OUSTF10 also tells you if the chemicals are unusually cloudy, an indicator that filters are blocked or - worst still - about to rupture.

The accurate measurement gives you more control over the process conditions and quality of your products.

ATEX-approved and hygienic
Turbidity is a versatile process control parameter, applied in almost any industry. OUSTF10 therefore is ready for all kinds of environments, from hazardous (ATEX, FM) to hygienic. It also resists very high temperatures which makes it fit for many industries such as Chemical, Food & Beverage or Oil & Gas.

Features and benefits

- Accurate and highly sensitive purity monitoring for better product quality
- Filter condition monitoring
- Detect heat exchanger leaks
- Incandescent light for a long service life and stable operations

OUSAF22 and OUSTF10 in service

OUSAF22 – color-based in-line detection of beer types

Application
Large breweries easily produce over 20 different types of beer, so it's quite a challenge to keep a clear overview in production. If you add soft drinks and bottled water to the product range, up to 40 different types of drink are bottled in some plants.
The trend towards craft beers also requires increased production flexibility because the bottled quantity per beer type reduces while the variety of beer types increases.

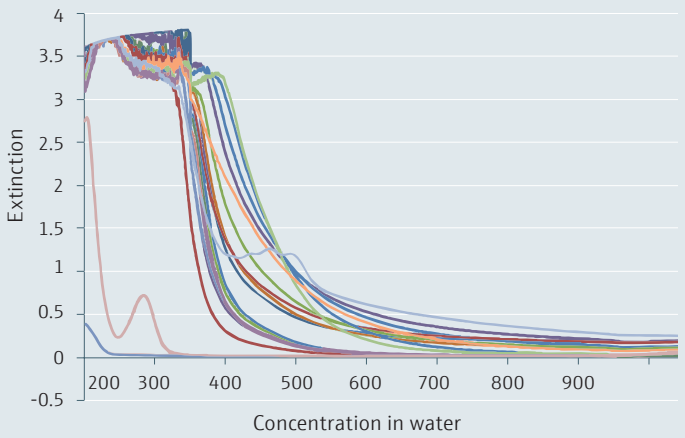
To ensure production runs smoothly, drink manufacturers must distinguish the individual types of drink automatically and directly inline where possible. Twenty different products are analyzed: dark beers, pale beers, cloudy beers, clear beers, bottled water and soft drinks.

Solution
A dual-channel process photometer is used for the measurement, making it possible to analyze color absorbance at 430 nm according to EBC guidelines and opacity, which is measured at 720 nm. Together with a conductivity measurement, the individual beer types can be assigned to the measuring signals.

The tests demonstrated that it was possible to easily distinguish the dark beers, the pale cloudy beers and the pale clear beers from one another. Even individual products, such as shandy or lemonade, could be clearly identified based on their spectrum.
Given that conductivity sensors are already installed in the plants anyway for CIP, the measured values for this additional parameter can be used at no extra cost. The combination of color measurement and conductivity measurement actually makes it possible to clearly identify every type of beverage tested.

Advantages
- Accurate process control
- No lost product from incorrect bottling
- Hygienic CIP and SIP in-line design
- Reproducible and accurate measurement without delay

Spectra of different beer types



OUSTF10 – monitoring wort and clarification of wine

Monitoring the wort

Application
In brewing, the quality of the wort plays a major role in the subsequent fermentation process. Therefore, turbidity must be checked before and after wort filtration according to EBC guidelines. To ensure fermentation gets off to a good start, the EBC value must be < 10.

Solution
Two OUSTF10 sensors are installed directly in the pipe upstream and downstream from the filter. They measure the turbidity and immediately alert the operator if the turbidity values are too high.

Advantages
- The filtration process is optimized.
- Less product lost.
- The loss of entire fermentation batches is avoided since fermentation is not started if turbidity values are too high.

Monitoring the clarification of wine

Application
Wine clarification is a two-step process. In the first step yeast is removed at the end of the fermentation process. In the second step, the finished wine is clarified in a special clarifier to guarantee the quality of the wine and increase the service life of the downstream filters.

Solution
An OUSTF10 sensor is installed directly downstream of the clarifier to measure the cloudiness of the wine after the clarification process. The quality of the wine is therefore checked without delay.

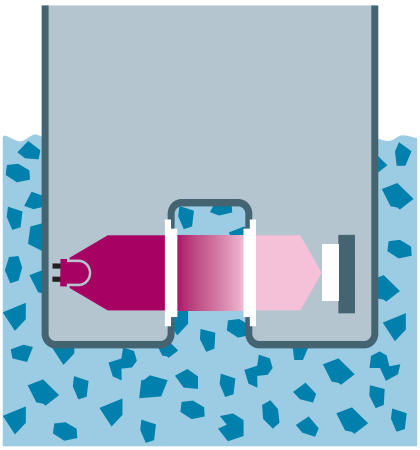
Advantages
- An optimized filtration process ensures less product is lost.
- The operator can respond quickly if the wine is not of the correct quality.
- The costs for manual sampling and analysis are drastically reduced.

Application
Food industry:
- Product loss detection in effluent
- Phase separation milk/water
- Interphase detection yeast/beer
- Milk detection in CIP solutions

Primaries and metal industry:
Suspended solids measurement

Glass-free absorption sensor OUSAF11

Optical sensor for measuring VIS/NIR absorption



Phase detection and solids measurement
The sensor OUSAF11 measures absorption directly in the process. It immediately recognizes whether your pipe's cleaning phase is completed or whether the product has changed to batching. Furthermore it checks the content of product in the wastewater. In this way it allows you to gain optimum control of your processes and achieve high product yield, accurate cleaning agent dosing and effective wastewater treatment.

OUSAF11 can be easily installed both in pipes and in open tanks or basins. The hygienic, glass-free sensor design rules out any contamination of your product.
The sensor is also ready for suspended solids measurement in the primaries and metal industry, as it can withstand high temperatures and aggressive media.

Features and benefits

- Ultimate product safety thanks to glass-free, hygienic design
- Cost savings and less lost product thanks to quick interphase detection
- Low-maintenance longlife sensor offering stable operation
- Flexible installation:
  - Submersible sensor for applications in open tanks and basins
  - Insertion sensor with Triclamp or Varivent connection for sanitary applications in pipes and vessels
- Robust sensor resistant to aggressive chemicals and fouling
- Suitable for cleaning in place (CIP) and sterilization in place (SIP)
- FDA and 3-A approval

OUSAF11 for monitoring milk production

Determining product/water interphases in the CIP process

Cleaning and sterilization are daily tools of the trade in all areas of the dairy industry. Whether processing the product or bottling it, cleaning in place (CIP) is involved in every stage of the process. This is not only essential in order to produce a high-grade product but is also stipulated by law. Monitoring the CIP cleaning process increases product safety and production efficiency and is therefore the standard in the food industry.

Application

During cleaning in place, different media are alternately passed through the plant parts and pipes. The changeover from product to water at the start of the cleaning process and the change back at the end is of central importance here. In this process, the product comes into contact with cleaning agent and most damage can be done as too much product can be lost to the CIP media and the wastewater. This not only means lost productivity but also drives up costs because of the higher COD load of the wastewater.
All plant parts that come into contact with product are cleaned and sterilized. While the individual processes can differ, every process will contain rinsing stages. Therefore it is necessary to take measurements at many points in the plant but particularly in the CIP media return lines.
Quick, highly reproducible measurements are needed to meet this challenge. The measuring point should be as low-maintenance and flexible as possible, e.g. during product changeover, and it must also meet the hygienic requirements of the industry. And if the sensor does not need glass it is also ideal for dairy use.

Solution

An OUSAF11 is installed directly in the return line for the CIP media. It determines how much product is in the rinse water using light attenuation: the more solids in the water, the less light gets through. Even low concentrations of milk cause a significant signal increase in comparison to water. The sensitivity is adapted to the application using the optical path length (5 or 10 mm). The sensor also has a very compact design and the housing for the optical components is made from stable, break-proof Teflon. This means no glass can get into the process.

Monitoring of milk fat in the effluent

Application

Too much milk fat in the effluent means more lost product and a high BOD load in the wastewater treatment plant. Therefore the milk fat must be detected quickly in order to adapt the process accordingly.

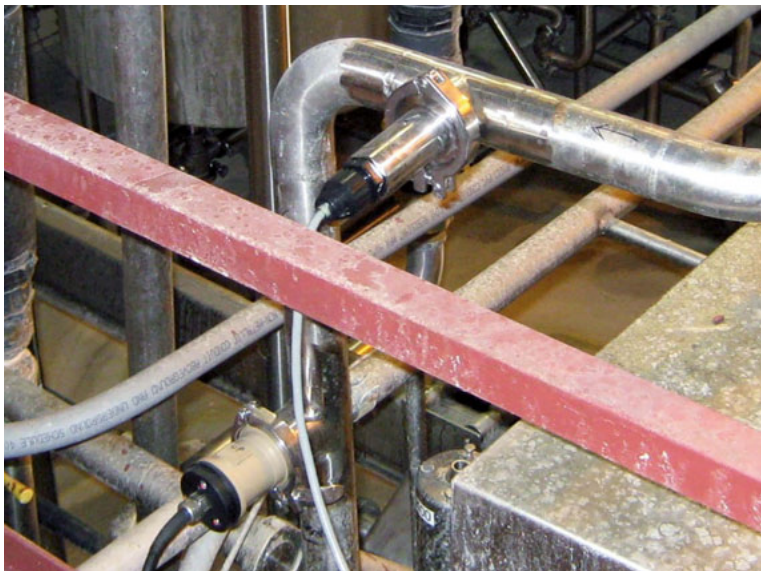
Solution

The OUSAF11 is installed with the Flexdip CYH112 holder in the wastewater outlet for this application. OUSAF11 guarantees fast milk fat detection and generates an alarm. The customer detects product loss early on and can made the appropriate corrections to his plant.
Furthermore, this alarm can be used to control the WWTP retention system to prevent an excessively high BOD load in the wastewater. The contaminated water is routed to a retention tank and slowly discharged with the subsequent volumes of water.

Monitoring of the product/product interphases when filling

Application
When there is a product change during filling, product loss is inevitable if monitoring is only based on time and flow.

Solution
An OUSAF11 sensor installed directly in the filling line continuously monitors the product interphases from water to product and product to product. As soon as the sensor detects the change from water to product, it generates a signal that the filling process can be started. For example, if the product changes from milk to cream a signal is also generated so that the correct containers are provided.



Advantages
- Quick interphase detection reduces product loss
- Fines are avoided as lower BOD load in wastewater
- Less water and chemicals used for CIP process.
- Glass-free design for process safety

Application

Liquiline CM44P is the multiparameter transmitter for all Memosens sensors and process photometers.

- NIR/VIS absorbance sensor OUSAF11
- Suspended solids and color sensor OUSAF12
- Color sensor OUSAF22
- UV absorbance sensor OUSAF44
- Turbidity and suspended solids sensor OUSTF10
- Cell growth and biomass sensor OUSBT66

It is suitable for all industries and has a wide variety of communication protocols and interfaces such as:

- 0/4 to 20 mA
- HART
- PROFIBUS DP
- Modbus
- EtherNet/IP
- Ethernet web server

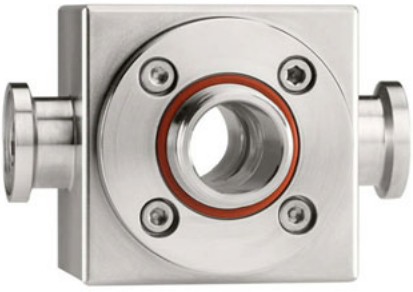
Liquiline CM44P

Multichannel and multiparameter transmitter for every industry

Liquiline CM44P gives you the opportunity of combining process photometers and Memosens sensors. It facilitates the setup of complete measuring points for monitoring processes such as chromatography, fermentation, phase separation and filtration. The transmitter saves time and money by offering seamless system integration, simple operation and a reduced need for spare part stock. Liquiline CM44P brings all benefits of the Liquiline platform to process photometers.

Features and benefits

- Intelligent design: One controller for all parameters including process photometers
- Cost-saving and comfortable set-up of measuring points: Combine up to two process photometers and four Memosens sensors for a perfect fit to your application
- Easy to operate and calibrate thanks to intuitive user interface and menu guidance
- Seamless integration into distributed control systems thanks to digital fieldbus protocols such as HART, Modbus, PROFIBUS and EtherNet/IP
- Process control and safety: Integrated web server that allows the operator to remotely view diagnostic data, perform configurations, or access device parameters in any web browser - even via Smartphone.
- Available as DIN-rail version for applications with limited mounting space - perfect for system integrators and skids



OUA260

Flow assembly for process photometers

OUA260 is a first-rate flow assembly for absorbance, color and turbidity measurements. Its hygienic design and certified biocompatibility meet the strictest requirements for the reliable protection of your products against contamination. Multiple process connections and materials ensure perfect integration and performance even in aggressive media. Furthermore, its low cell volume results in faster sensor response times, providing you with quick measured values.

Features and benefits

- Quick measured values thanks to low cell volume
- Suitable for cleaning in place (CIP) and sterilization in place (SIP)
- Certified biocompatibility according to USP Class VI
- Ultrahygienic owing to electropolished surface, Ra=0.4 µm (16 µinch)
- Extremely corrosion resistant
- Wide range of materials and process connections for perfect integration into every application
- Numerous optical window materials and path lengths for optimum adaptation to any process

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

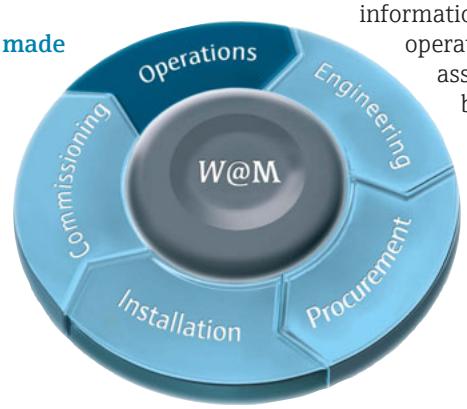
W@M life cycle management

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

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Endress+Hauser

People for Process Automation