KROHNE

achieve more

From the analysis to the solution

Product overview liquid analysis

Achieve more with KROHNE

KROHNE ranks among the world's leading companies involved in developing and producing innovative and reliable process measuring technology, providing solutions for all sectors around the globe.

KROHNE was founded in 1921 in Duisburg, Germany. We have more than 3,000 employees and a turnover of over 400 million euros. The company has 15 production facilities and owns 43 companies and joint ventures.

In fact, KROHNE was the second company after VW to have a joint venture in Shanghai. Today, China is one of KROHNE's major markets. With an equity-to-assets ratio of approx. 42 %, the company is largely financially independent.

KROHNE is always a fair and reliable partner to its customers, business partners and employees.

Our customers are involved in diverse branches of industry that include chemicals, petrochemicals, water, wastewater, food, beverages, pharmaceuticals, oil and gas, power plants, pulp and paper and so on.

We provide them with optimal products and solutions which always meet or exceed their expectations in terms of quality, performance capability, service and design.

KROHNE develops, manufactures, supplies and services products and systems which measure, transmit and control process information. Enabling you to operate and manage processes in a safe, reliable, economical, profitable and environmentally responsible way.

We are also your partner for all aspects of analytical application, from single instrumentation to complete dedicated solutions for different industries. For instance with the new innovative SMARTSENS family for process measurement, enables enormous savings in cost of ownership.

The broad range of OPTISENS products offered by KROHNE supplements the portfolio of flow, level and temperature measuring devices, consolidating our position as the complete supplier.

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Product selection list SMARTSENS sensors

This table will help you in selecting the right sensor for your application

	SMARTSENS PH 8570 pH sensor	SMARTSENS PH 8150 pH sensor	SMARTSENS PH 9950 pH sensor	SMARTSENS PH 8530 pH sensor	SMARTSENS PH 8320 pH sensor	SMARTSENS PH 8510 pH sensor	SMARTSENS ORP 8150 ORP sensor
	Page12/19/38	Page12/19/38	Page12/19/38	Page12/19/38	Page12/19/38	Page12/19/39	Page12/19/39
Measuring principle	Potentiometric	Potentiometric	Potentiometric	Potentiometric	Potentiometric	Potentiometric	Potentiometric
Chemical	o	x	x	–	x	–	x
Petrochemical	o	x	x	–	x	–	x
Pharma	x	–	-	o	–	–	–
Semiconductor	–	o	o	x	–	–	o
Food and beverage (process)	x	–	–	–	–	–	–
Food and beverage (steam generation)	–	–	–	x	–	x	–
Power (cooling water and boiler feed water)	–	–	–	x	–	–	x
Desalination	–	o	–	o	o	o	o
Potable water	o	–	–	o	–	x	–
Service water	–	x	–	–	x	o	x
Wastewater	–	x	x	–	x	–	x

SMARTSENS ORP 8510 ORP sensor	SMARTSENS PH 1590 pH sensor	SMARTSENS PH 2390 pH sensor	SMARTSENS ORP 1590 ORP sensor	SMARTSENS COND 1200 Conductivity sensor	SMARTSENS COND 3200 Conductivity sensor	SMARTSENS COND 5200 Conductivity sensor	SMARTSENS COND 7200 Conductivity sensor
Page12/19/39	Page12/19/39	Page12/19/39	Page12/19/39	Page12/21/40	Page12/21/40	Page12/21/40	Page12/21/40
Potentiometric	Potentiometric	Potentiometric	Potentiometric	Conductive conductivity	Conductive conductivity	Conductive conductivity	Conductive conductivity
–	–	o	o	–	o	x	–
–	–	o	–	–	–	x	–
–	–	–	–	o	o	–	x
o	o	–	o	o	x	o	o
–	–	–	–	–	–	–	x
–	–	–	–	o	o	–	x
x	–	–	x	–	x	–	–
x	o	x	x	–	x	x	–
x	x	–	x	x	o	o	–
x	o	x	x	x	–	x	–
x	–	x	x	o	–	x	–

x = suitable, o = suitable under certain conditions, - = not suitable

Product selection list water analysis

This table will help you in selecting the right sensor for your application

	OPTISENS PH 8XX0/9X00, ORP 8XX0 Sensor family	OPTISENS CL 1100 (Cl_2,ClO_2,O_3) Sensor family	OPTISYS CL 1100 (Cl_2,ClO_2,O_3) Measuring sytems
	Page 14/46/47	Page 15/45	Page 14/44
Measuring principle	Potentiometric	Potentiostatic	Potentiostatic
Potable water			
Water quality/ limit values monitoring	x	x	x
Water quality monitoring in distribution network	–	–	x
Process control water treatment	x	x	x
Filter monitoring	–	–	–
Disinfection control	–	x	x
Power plant (cooling water & boiler feed water)			
Quality control	x	x	x
Process control water treatment	x	x	x
Filter monitoring	–	–	–
Regeneration ion exchanger	–	–	–
Dosing of biocides	–	x	x
Protection of reverse osmosis (RO) membranes	–	x	x
Food and beverage (steam generation)			
Process control water treatment	x	x	x
Filter monitoring	–	–	–
Regeneration ion exchanger	–	–	–
Dosing of biocides	–	x	x
Protection of reverse osmosis (RO) membranes	–	x	x

	OPTISENS COND 1200 Sensor family	OPTISENS IND 1000 Sensor family	OPTISYS TUR 1050 Turbidity measuring system
	Page 15/20/45	Page 15/45	Page 14/33/44
Measuring principle	Conductive conductivity	Inductive conductivity	90° scattered light ISO 7027 or US-EPA 180.1
Potable water			
Water quality/ limit values monitoring	x	–	x
Water quality monitoring in distribution network	–	–	x
Process control water treatment	x	x	x
Filter monitoring	x	–	x
Disinfection control	–	–	–
Power plant (cooling water & boiler feed water)			
Quality control	x	–	x
Process control water treatment	x	–	x
Filter monitoring	x	–	x
Regeneration ion exchanger	–	x	–
Dosing of biocides	–	–	–
Protection of reverse osmosis (RO) membranes	–	–	–
Food and beverage (steam generation)			
Process control water treatment	x	–	x
Filter monitoring	x	–	x
Regeneration ion exchanger	–	x	–
Dosing of biocides	–	–	–
Protection of reverse osmosis (RO) membranes	–	–	–

x = suitable, o = suitable under certain conditions, - = not suitable

Product selection list wastewater analysis

This table will help you in selecting the right sensor for your application

	OPTISENS PH 83X0 Sensor family	OPTISENS IND 1000 Sensor family	OPTISENS TUR 2000 Turbidity sensor	OPTISENS ADO 2000 Dissolved oxygen sensor	OPTISENS ODO 2000 Dissolved oxygen sensor	OPTISYS SLM 2100 Sludge level meter
	Page 14/15/19/46	Page 15/45	Page 16/33/49	Page 16/29/49	Page 16/31/49	Page 16/34/37/48
Measuring principle	Potentiometric	Inductive conductivity	90° straylight	Amperometric	Optical	Optical
Wastewater treatment						
Inlet						
Monitoring of influent values	x	x	–	–	–	–
Primary clarifier						
Automatic extraction of primary sludge	–	–	–	–	–	x
Biological treatment						
Aeration control	–	–	–	x	x	–
Control of sludge retention time/ sludge age	–	–	o	–	–	–
Secondary clarifier						
Automated extraction of sludge	–	–	–	–	–	x
Prevention of sludge washout	–	–	–	–	–	x
Return and waste sludge pump line	–	–	–	–	–	–
Post-precipitant dosage	–	–	–	–	–	–
Outlet						
Monitoring of effluent values	x	–	x	x	–	–

x = suitable, o = suitable under certain conditions, - = not suitable

Product selection list analysis for hygienic applications

This table will help you in selecting the right sensor for your application

	OPTISENS PH 8500 HYG pH sensor	OPTISENS COND 7200 Conductive conductivity sensor	OPTISENS IND 7000 Inductive conductivity sensor	OPTISYS IND 7100 Inductive conductivity measuring system
	Page 17/51	Page 17/51	Page 17/27/51	Page 50
Measuring principle	Potentiometric	Conductive conductivity	Inductive conductivity	Inductive conductivity
Dairies				
Quality control milk reception	x	x	o	o
Process control maturation tanks	x	–	–	–
Process control incubation tanks	x	–	–	–
Process control seperation process (milk/water)	–	–	x	x
Quality control flavor addition	x	–	–	–
Process control sterilisation	x	–	–	–
Process control CIP/SIP cleaning	x	–	x	x
Breweries				
Quality control brew water	x	x	–	–
Process control mashing	x	–	–	–
Quality control yeast dosing	x	–	–	–
Quality control fermentation	x	–	–	–
Leakage monitoring deep cooler	x	–	–	–
Quality control keg and bottle filling	x	–	x	x
Process control bottle cleaning	x	o	x	x
Process control CIP/SIP cleaning	x	o	x	x
Mineral water				
Quality control water extraction	x	x	–	–
Process and quality control softening	x	x	x	x
Process control CIP/SIP cleaning	x	–	x	x
Pharma				
Pure/ultra pure water monitoring	x	x	–	–
Fermentation	x	–	–	–
Distillation	–	x	–	–
Process control CIP/SIP cleaning	x	x	–	–

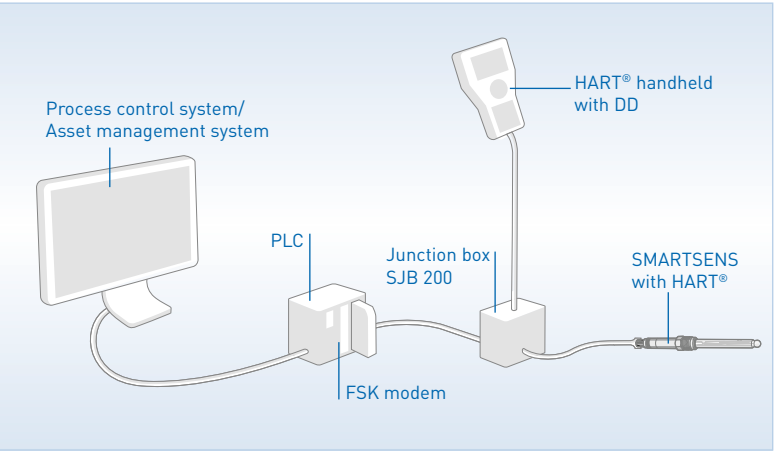
x = suitable, o = suitable under certain conditions, - = not suitable

SMARTSENS – The first family of analytical sensors that no longer require transmitters

Introduced in 2013, SMARTSENS sensors revolutionised the handling of analytical measurements: KROHNE miniaturised the entire transmitter technology and fitted it into the sensor head. Thanks to its unique circuit technology and special encapsulation, the SMARTSENS series offer process reliability at a level previously unknown.

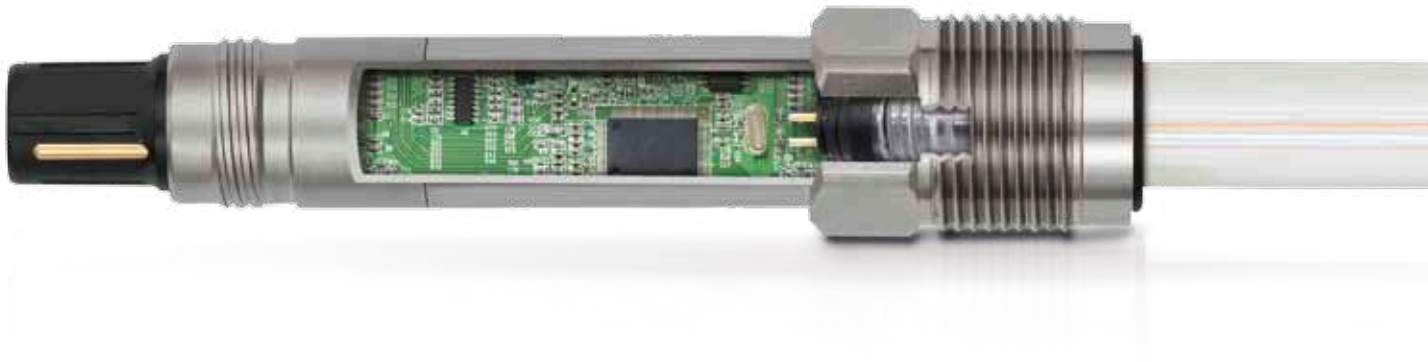
SMARTSENS sensors function as a 2-wire loop powered system. They can be used both in point-to-point operation and for multi-drop installations. Up to 64 sensors can be connected in a loop of more than 1000 m in length.

Each SMARTSENS sensor is specifically designed for its field of application: approvals and certifications range from installation in explosive (zone 0) to hygienic areas. Thanks to its standardised connector design, SMARTSENS sensors are compatible with 98 % of the existing mounting assemblies. A large portfolio of accessories, including loop powered SMARTMAC 200 W with calibration function and displays SD 200 W/R, connection tools and mounting assemblies, ensures that SMARTSENS will fit into your application.



Direct connection to the process control system

KROHNE is the only supplier that uses a real open standard – and a direct connection from sensor to the process control system via the standardised fieldbus. The SMARTSENS sensors store all data and transfer it bidirectionally and digitally with the 4...20 mA current signal via the HART® protocol to process control and asset management systems, handhelds, PCs and other peripheral devices. Sensor configuration is possible using any commercially available HART® handheld device and the freely available HART® DD or via FDT/DTM on all conventional asset management and process control systems.



Offline calibration

SMARTSENS sensors are the only ones that can be connected directly to a PC via SMARTBRIDGE (USB interface cable) and calibrated offline with PACTware™ (FDT/DTM) or online in accordance with HART® DD. Offline in the laboratory – instead of at the application site under continually changing conditions. During the offline calibration the sensors are cleaned and regenerated at the same time. Depending on the application purpose and site, their service life is up to four times longer under these circumstances. Due to the controlled, clean conditions in the laboratory, a much more exact calibration can be performed too. This enables more precise measuring results and higher product quality.

Saves a lot of money, time and effort

The elimination of the external transmitter reduces the price and maintenance costs considerably in comparison with any other competing measuring system. Additionally the offline calibration reduces time and effort significantly. At the same time, it increases productivity and efficiency.

Go to www.goodbye-transmitters.com for more information.

pH/ORP sensors

SMARTSENS PH 8570
Hygienic pH sensor for food, beverage and pharma industry

SMARTSENS PH 8150
High performance pH sensor for chemical industry

SMARTSENS PH 9950
Liquid filled pH sensor for pure water or harsh applications

SMARTSENS PH 8530
pH sensor for pure water applications

SMARTSENS PH 8320
Durable pH sensor for water and wastewater applications

SMARTSENS PH 8510
General purpose pH sensor for water applications

SMARTSENS ORP 8150
High performance ORP sensor for harsh applications

SMARTSENS ORP 8510
General purpose ORP sensor for water applications

SMARTSENS PH 1590
Rugged pH sensor with 3/4" MNPT process connection and ceramic diaphragm for water applications

SMARTSENS PH 2390
Rugged pH sensor with 3/4" MNPT process connection and PTFE diaphragm for wastewater applications

SMARTSENS ORP 1590
Rugged ORP sensor with 3/4" MNPT process connection and ceramic diaphragm for water and wastewater applications

Conductivity sensors

SMARTSENS COND 1200
Conductivity sensor for general purpose water applications

SMARTSENS COND 3200
Conductivity sensor for pure water applications

SMARTSENS COND 5200
Conductivity sensor for harsh applications

SMARTSENS COND 7200
Conductivity sensor for hygienic applications

Accessories

SMARTMAC 200 W
Loop powered display for configuration and calibration with logbook function

SD 200 W/R
Loop powered display for wall or rack mount

SMARTBRIDGE
USB interface cable for offline calibration

SJB 200 W
Junction box for connecting the sensor with the process control system

Also available:
- DTM's for PACTware™
- SMARTBASE – Database for sensor data management and statistics
- HART® handheld
- Sensor cables

Mounting assemblies

SENSOFIT RAM 5810/5830
Automatic retractable assemblies (pneumatic) for demanding process conditions in chemical industry

SENSOFIT RET 5810/5830
Manual retractable assemblies for easy exchange without process interruptions

SENSOFIT INS 1310
Static insertion assemblies for reliable connection to tanks and pipes in general purpose applications

SENSOFIT INS 7311/7312
Static insertion assemblies for reliable connection to tanks and pipes in hygienic applications

SENSOFIT IMM 2925
Immersion assemblies for installation in tanks and open basins

SENSOFIT FLOW 1710
Flow-through assemblies in stainless steel for all applications

Digital sensors with integrated transmitter

MAC 100
Multiparameter converter

OPTISENS PH 8100
pH sensor with Pt100 for low-conductivity media and high temperatures

OPTISENS ORP 8500*
ORP sensor with large platinum ring for reliable and precise measurement in all water applications

OPTISENS PH 8390*, 8590
pH sensors with different diaphragm material for harsh applications

OPTISENS ORP 8590*
ORP sensor with large platinum ring for general applications

Measuring systems

OPTISYS CL 1100
Measuring system for free chlorine, chlorine dioxide and ozone with automatic sensor cleaning system for safe use and extended lifetime

OPTISYS TUR 1050
Turbidity measuring system with cost efficient cuvette calibration and automatic ultrasonic cleaning system

OPTISENS PH 8300*
pH sensor with dirt-repellent PTFE diaphragm
for wastewater, surface and process water

OPTISENS PH 8500
pH sensor with ceramic diaphragm
for general water applications

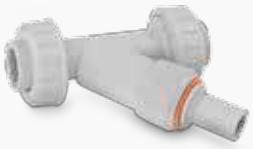
OPTISENS PH 9100, 9500
pH sensors with liquid filling
for special applications

OPTISENS CL1100
Low-maintenance, membrane-free
gold electrode sensor for free
chlorine, chlorine dioxide and ozone
measurements in potable water

OPTISENS COND 1200
2-electrode stainless steel sensor
for conductivity measurements in
all general applications

OPTISENS IND 1000*
Reliable dirt-resistant sensor for
inductive conductivity measurements
suitable also for wastewater

Mounting assemblies



SENSOFIT FLOW 1000
With optimised flow profile and
easy installation

SENSOFIT INS 1000
In stainless steel for quick and
cost-effective installation

SENSOFIT IMM 1000
Immersion assembly in polymeric material
with excellent price-performance ratio

*suitable for wastewater

MAC 100
Multiparameter converter

OPTISENS ADO 2000
Amperometric sensor for dissolved oxygen measurements with easy exchangeable electrode cartridge

OPTISENS ODO 2000
Low maintenance optical sensor for dissolved oxygen measurements, with automatic cleaning, no recalibration required

OPTISENS TUR 2000
90° scattered light sensor for turbidity measurements with NIR-LED for long-term stability and automatic cleaning

Measuring systems

OPTISYS SLM 2100
Optical measuring system for sedimentation profile measurement and continuous tracking of sludge blanket

MAC 100
Multiparameter converter

OPTISENS PH 8500 HYG
Hygienic pH sensor for food, beverage and pharma industry

OPTISENS COND 7200
Conductive conductivity sensor with hygienic connection

OPTISENS IND 7000*
Hygienic sensor for inductive conductivity measurements with EHEDG certificate

Mounting assemblies

SENSOFIT INS 7311/7312
Static insertion assembliess for reliable connection to tanks and pipes

*OPTISENS IND 7000 is also available as compact measuring system

Analysis for hygienic applications

Highlights:

- Digital and analog sensors available
- 2-wire loop powered sensors with integrated transmitter technology
- True open standard in fieldbus systems – HART®
- Ex approvals (zone 0) e.g. IECEx
- Increased safety due to direct connection to the process control system
- Extended lifetime of sensors due to the offline calibration
- Offline statistic over complete life cycle
- Hygienic and corrosion free connectors
- Different diaphragm materials for all applications
- Integrated temperature sensor
- Fits into 98 % of all mounting assemblies
- No special cable needed

pH/ORP measurement

The measuring principle

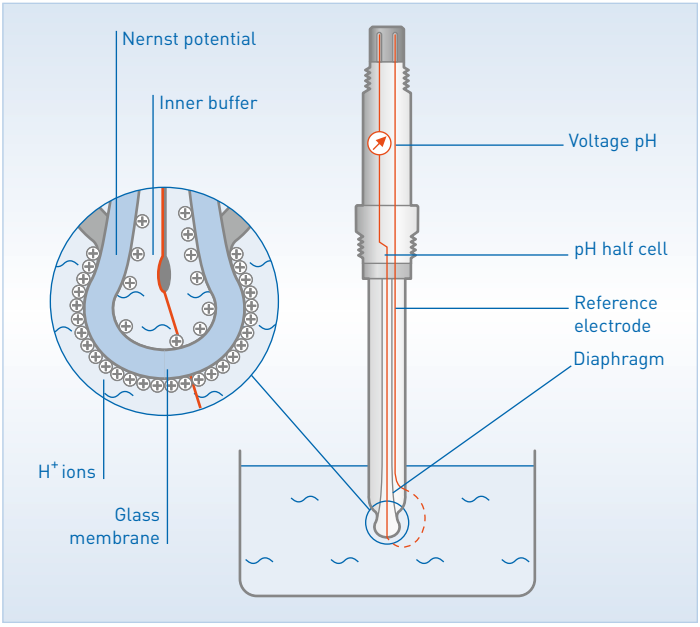
Arnold Orville Beckmann built the first pH-meters in 1935 to measure the citric acid in lemons. These pH-meters determined pH using the potentiometric principle according to the electric Nernst potential, measured across a pH glass membrane.

The glass membrane of a pH sensor is able to reversibly incorporate the H^+ ions from the surface of the liquid to be measured. This results in a electrical potential, which is proportional to the H^+ concentration. An internal electrolyte (inner buffer) common to the pH value to be measured is found on the inside of the electrode. So, the voltage across the glass membrane is set differently between the outer and inner electrolyte with regard to the pH value.
A complete pH measuring chain consists of a pH half cell described above and a reference electrode. The voltage generated by the reference electrode is independent of the pH value and provides a stable potential, the so-called reference potential.

Via the diaphragm, the reference electrode is in electrical contact with the measuring solution. Through this the electric circuit is closed and the voltage generated by the measuring loop can be measured at the converter. The pH half cell and reference electrode are usually integrated in a combination electrode.

The ORP reaction

A Oxidation Reduction Potential (ORP) reaction is a chemical reaction where one reaction partner's electrodes are transferred to the other. This generates an ORP voltage which provides information about the individual reaction partner as to which material oxidises or reduces. The ORP sensor is build similar to a pH combination electrode. However the measuring electrode is made out of metal (gold or platinum) instead of glass. In order to determine the ORP value, the galvanic voltage between the metal tip and the liquid media is measured.



Measurement of pH value in chemical plant

Made to fit

SMARTSENS and OPTISENS range of pH and ORP sensors are available in a wide choice of body styles with different membrane glasses and diaphragm materials. Additionally there are versions with Ex approvals (zone 0) and hygienic certificates available.

This is because pH and ORP measurements are used in conditions spanning measuring pure water, over harsher environments like industrial wastewater treatment plants to processes in chemical industry. As the first sensor line in the market, the SMARTSENS PH/ORP sensors also have an integrated transmitter with build in fieldbus communication and current output, which makes them easy to integrate in any process loop.

So, our SMARTSENS/OPTISENS sensors is made to fit just about every application in liquid analytics.

Typical applications

Chemical
- All types of neutralization processes
- Reverse osmosis
- Plastics production
- Fertilizer production

Biotechnology/pharmacy/food/beverage
- Process control of biotechnological and pharmaceutical fermentation processes
- Process control in the produciton of cheese, milk, beer, fruit juices, yogurt

Power plants/semiconductor manufacturing
- Control of reverse osmosis
- Cooling water control
- Boiler feed water control

Wastewater
- Monitoring for surface water and wastewater
- Control of biology
- Neutralizations in industrial/municipal wastewater
- Process control
- Dosage of flocculation agents
- Oily and greasy media

Water
- Process control and monitoring of limit values in potable water

SMARTSENS
PH 8570

SMARTSENS
PH 8150

SMARTSENS
PH 8530

SMARTSENS
PH 8320

OPTISENS
PH 8300

OPTISENS
PH 8500

OPTISENS
ORP 8500

OPTISENS
PH/ORP 8X90

Conductive conductivity measurement

Highlights:

- Digital and analog sensors available
- 2-wire loop powered sensors with integrated transmitter technology
- True open standard in fieldbus systems – HART®
- Ex approvals (zone 0) e.g. IECEx
- Increased safety due to direct connection to the process control system
- Integrated temperature sensor
- Different cell constants for a wide range of applications
- Stainless steel, titanium or graphite electrode materials
- Wide range of process connections for seamless integration
- Hygienic versions available

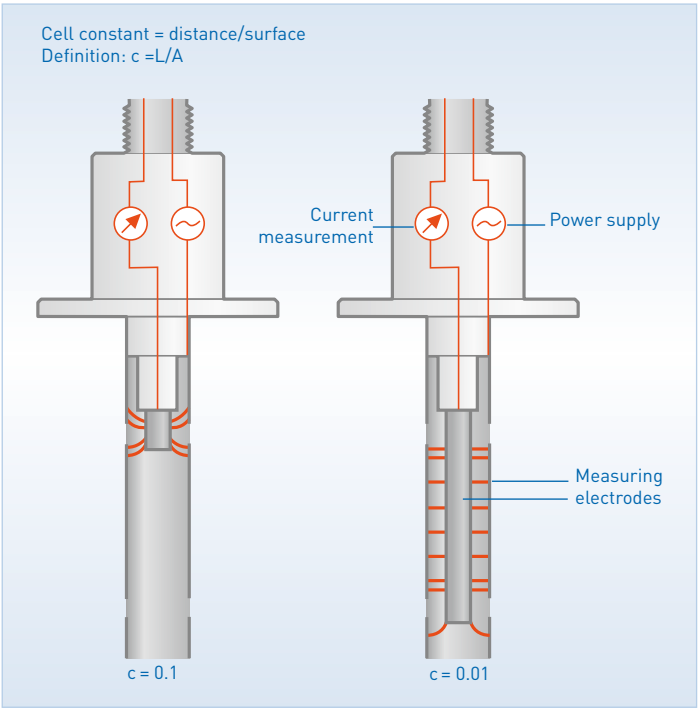
The measuring principle

The principle of conductivity measurement is defined as the capacity of a solution to conduct an electrical current between two electrodes. In a solution, the current flows by ion transport. The higher the ion concentration, the more current can flow. Using Ohm's law: Ohm = Voltage/Current, the resistance of a liquid can be determined by measuring the current while keeping voltage constant. Specific conductivity is defined by 1/resistance. The unit of measurement is Siemens and is normally expressed in µS/cm.

An important criterion for the measuring range of conductivity cells is the geometry of the electrodes. There are two rules which are characteristic for conductivity measurement:

1. The larger the distance between the two electrodes, the higher the resistance.
2. The larger the electrode surface, the lower the resistance.

The surface area (A) and the distance (L) must be correctly matched to the desired measuring range. This is called the "cell constant" defined as c=L/A.



Easy to integrate

Conductive conductivity sensors are used in many applications and is after pH the second most important parameter in analytic measurements.

This is particulary true of the SMARTSENS COND and OPTISENS COND sensors. Its different cell constants and different electrode materials mean it can be successfully applied to anything like aggressive media or from ultrapure water to potable water.

Additionally due to the innovative SMARTSENS technology the SMARTSENS COND sensors can be directly connected to any common process control system using industry standard communication like 4...20 mA/HART®. They are hence easy to integrate into any plant infastructure.

OPTISENS COND 1200

SMARTSENS COND 3200

SMARTSENS COND 5200

SMARTSENS COND 7200

Typical applications

Power
- Quality measurement in condensate, cooling water, boiler feed water
- Reverse osmosis
- Monitoring of ion exchanger

Water
- Process monitoring in water treatment plants (industrial and potable water)

Semiconductor
- Monitoring of ultrapure water in semiconductor production

Food and beverage, pharma
- Pure water and ultrapure water monitoring
- Seperation processes (milk/water)
- Distillation
- Electro deionization
- Monitoring of ion exchanger/ reverse osmosis

Chemical
- Separation processes (caustic/water)
- Process monitoring water treatment
- Process monitoring wastewater treatment

From flow to analysis – Applying our proven operating and service concept

MAC 100

Because we know high-end technology only makes sense if it is simple and convenient for you to access, user-friendliness has always been a top priority at KROHNE, whether during installation, commissioning, operation or in communication. This is why, at KROHNE, user-friendliness begins with the electronics. Over the years, our development and application engineers have developed a comprehensive design we call the General Device Concept (GDC). Customers of KROHNE flow and level meters have benefited from this overarching concept for many years. Now KROHNE is the first and only manufacturer to extend the GDC to analytical parameters.

The MAC 100 analysis converter adheres to the same General Device Concept as our flow and level converter which means rapid commissioning, reduced training times and standardisation of your measuring instruments. Simplifying the operating process helps to reduce costs even further.

For you, this means:

Same Human Machine Interface (HMI)

The MAC 100 has the same state-of-the-art graphic display as KROHNE products you are already familiar with. So, it is not only looking good but the menu is also extremely practical:

A multifunction display with four measuring screens provides you with comprehensive information about measurement values, device status and trends. The user-friendly interface has just four simple and convenient buttons.

Same service concept

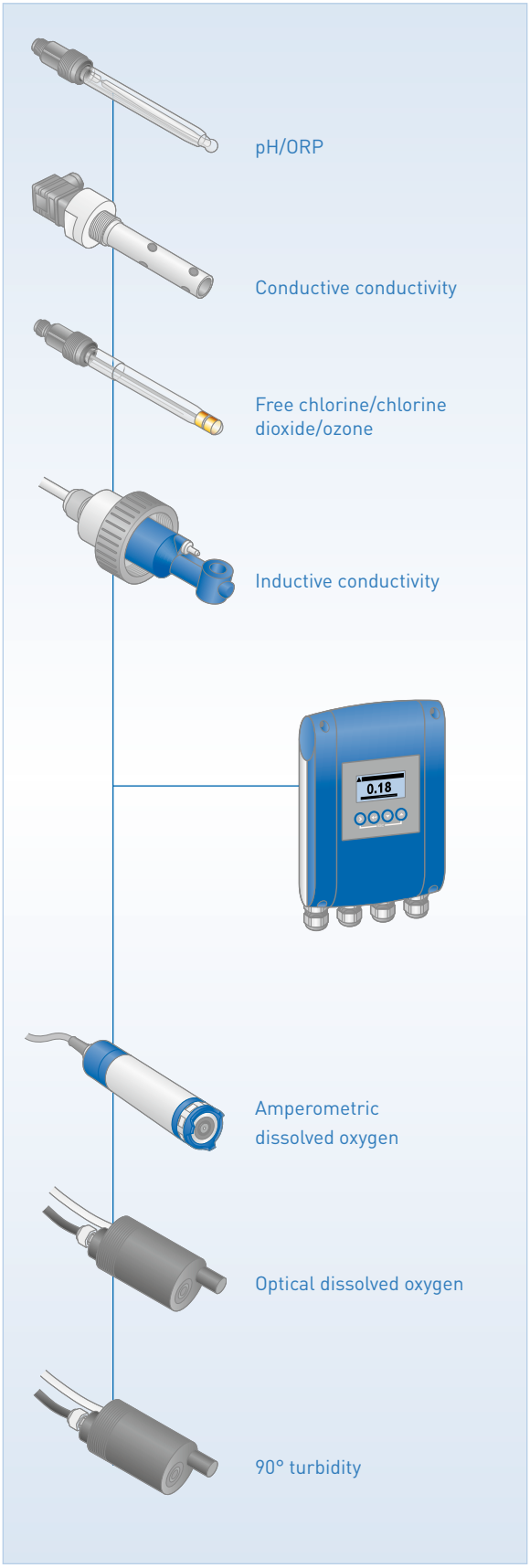
Because the hardware and software platform is the same as other KROHNE products, spare parts supply and field services are unified. This means the cost of spare parts is reduced. Training times for operators and service technicians are also minimised, especially for those already familiar with KROHNE flow or level meters who can therefore easily make the move to analysis devices.

Same communication concept

Like all KROHNE devices, the MAC 100 communicates with most standard Fieldbuses, analogue and digital interfaces.

Same modular structure for tailored solutions

As with our flow and level converter, the MAC 100 can be adapted to suit your specific requirements. You specify the number and type of signal inputs and outputs as well as define the complexity of the measuring point and the number of parameters.



A well organised system

The modular design offers great flexibility in configurations from cost-efficient single-channel converters to complex measuring systems.

Analogue as well as the digital sensors of the OPTISENS series can be connected. This means that a wide variety of applications in liquid analysis can be handled by one single converter.

Thanks to its robust aluminium housing with protection category IP66, the MAC 100 is perfectly suited for external installation even in the harshest ambient conditions.

Free chlorine/ chlorine dioxide/ozone measurement

Highlights:

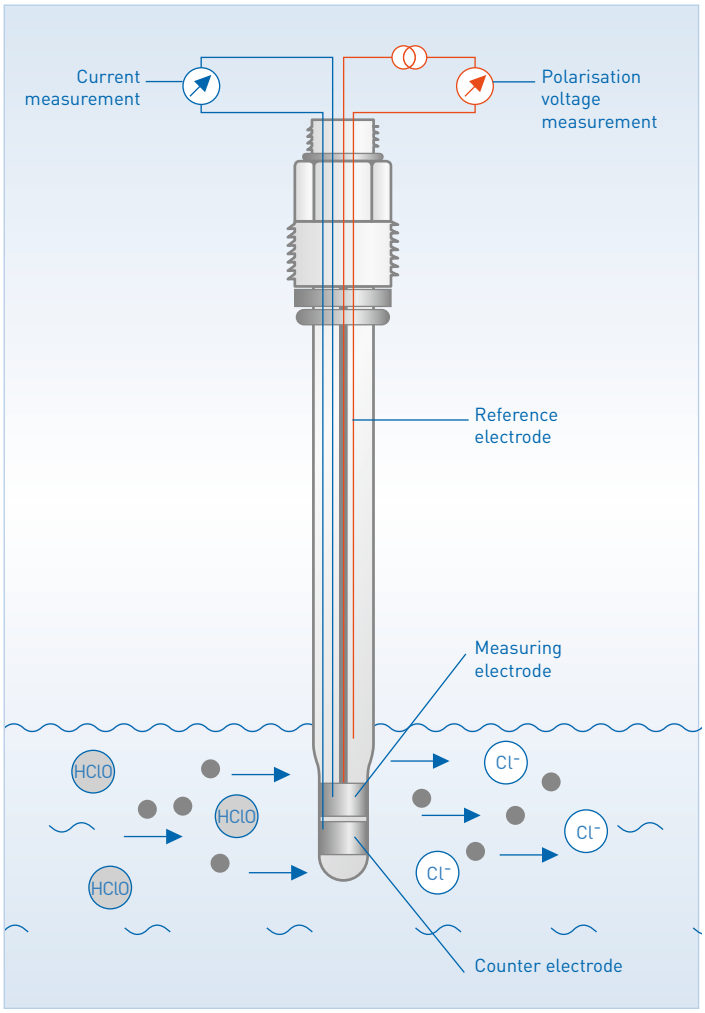
- Membrane-free sensor for long-term stability and easy maintenance
- Gel-filled 12 mm electrodes for a wide range of applications
- Potentiostatic measurement with fast response time
- Automatic sensor cleaning for extended maintenance intervals
- Integrated pH compensation for pH > 8

The measuring principle

The potentiostatic sensor has three electrodes: a measuring electrode (gold), a counter electrode (gold) and a reference electrode (Ag/AgCl).

A precise potential is built up between the measuring and the counter electrode. The measuring electrode starts polarising and negative charges collect close to the measuring electrode. After polarisation, the electrical current decreases to 0 mA as long as the polarising layer is not changed. Free chlorine molecules that hit the surface of the measuring electrode take a defined portion of the charge with them, changing the status of the measuring potential.

The converter constantly measures the potential between the measuring and reference electrode and immediately readjusts the potential as soon as it begins to change. The current needed to maintain a constant potential is directly correlated to the free chlorine concentration in the measuring medium. The measurement of chlorine dioxide or ozone follows the same principle.



OPTISYS CL 1100 and OPTISYS TUR 1050
for monitoring the water quality in pump stations

Self-cleaning sensor with extended lifetime

For easy handling, KROHNE offers you OPTISYS CL 1100 – a complete pre-wired and tested chlorine measuring system including all the necessary components for measurement and compensation as well as a quick and cost effective installation.

The unique combination of the membrane-free OPTISENS CL 1100 sensor and the automatic cleaning system of the OPTISYS CL 1100 means extremely low maintenance.

Even the most persistent coating is no problem, which adds up to an extended product life.

Integrated temperature compensation the integrity of the chlorine signals under all ambient and process conditions. The chlorine measuring system can also manage pH compensation and will handle the complete chlorine measuring range, even at higher pH values.

Combine the OPTISYS CL 1100 with our OPTISYS TUR 1050 turbidity measuring system and you have the best solution for pumping stations.

Typical applications

Water

- Monitoring potable water quality
- Disinfection control
- Process water treatment
- Emergency chlorination for potable water

Wastewater

- Monitoring limit values in industrial effluent

Highlights:

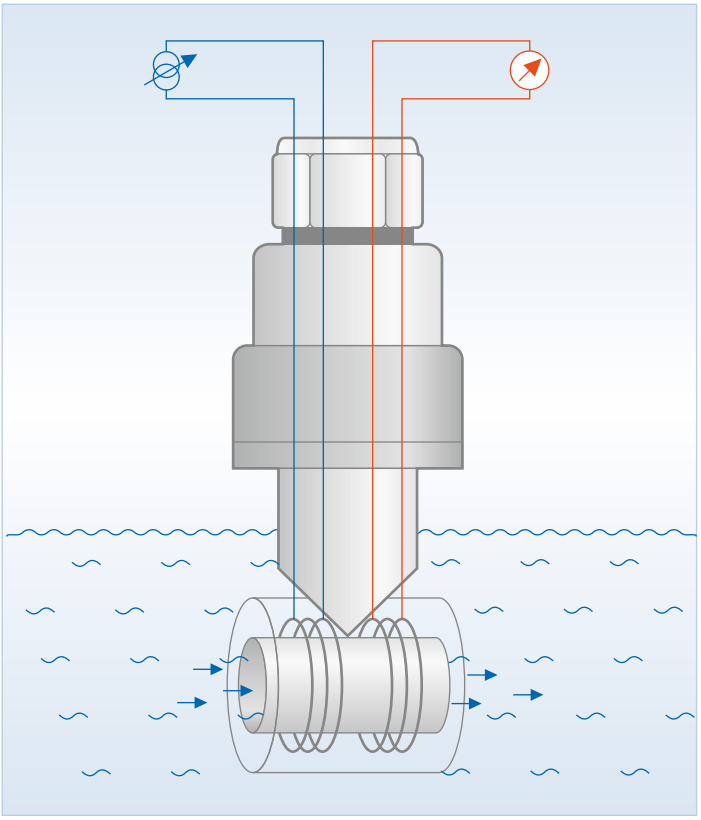
- Electrodes not in contact with the media
- Different materials for all applications e.g. PVDF, PP, PEEK
- Insensitive to contamination
- Integrated automatic temperature compensation with fast response time < 5 seconds
- Excellent long-term stability in all liquids
- Perfect linearity at high conductivity values
- No polarisation effects at high conductivity values
- Different process connections including hygienic connections
- Immersion version for installation in open channels
- Hygienic approvals (EHEDG, FDA)

Inductive conductivity measurement

The measuring principle

The well-known Faraday Law of magnetic induction is used here to determine conductivity in solutions at higher values, where direct contact measurement is not well suited.

When a magnetic field is generated by an electrical coil and a second electrical coil is placed next to it, a certain amount of electric energy will be transferred to it. With an inductive conductivity sensor, the process media flows directly through the middle of both coils. As the voltage in the first coil is constant, the amount of energy transferred to the second coil is directly proportional to the electrical resistance of the solution.



Conductivity monitoring for product control at soft drink manufacturer

Resistant to dirt

The OPTISENS IND sensors can safely be used for conductivity measurements in aggressive and corrosive media like industrial wastewater, sea water and acidic solutions.

Why? Because the measuring electrodes of the OPTISENS IND sensors are completely sealed and have no direct contact with media. We also use tough chemical and dirt-resistant materials, such as PVDF, PP or PEEK.

So, thanks to the OPTISENS IND rugged design and special materials, the sensors have long life span and are practically maintenance free.

The OPTISENS IND 7000 series additionally provides hygienic connections and approvals for applications in food, beverages and pharma process. The hygienic sensors are also available as compact measuring system OPTISYS IND 7100.

Typical applications

Water
- Regeneration of ion exchangers
- Control of sea water desalination processes

Wastewater
- Monitoring of limit values in industrial influent at the inlet of wastewater treatment plants

Food and beverage
- Product control (dairies, breweries, beverages)
- CIP/SIP processes
- Regeneration of ion exchangers (steam generation)

OPTISENS IND 7000 sensor

Amperometric measurement of dissolved oxygen

Highlights:

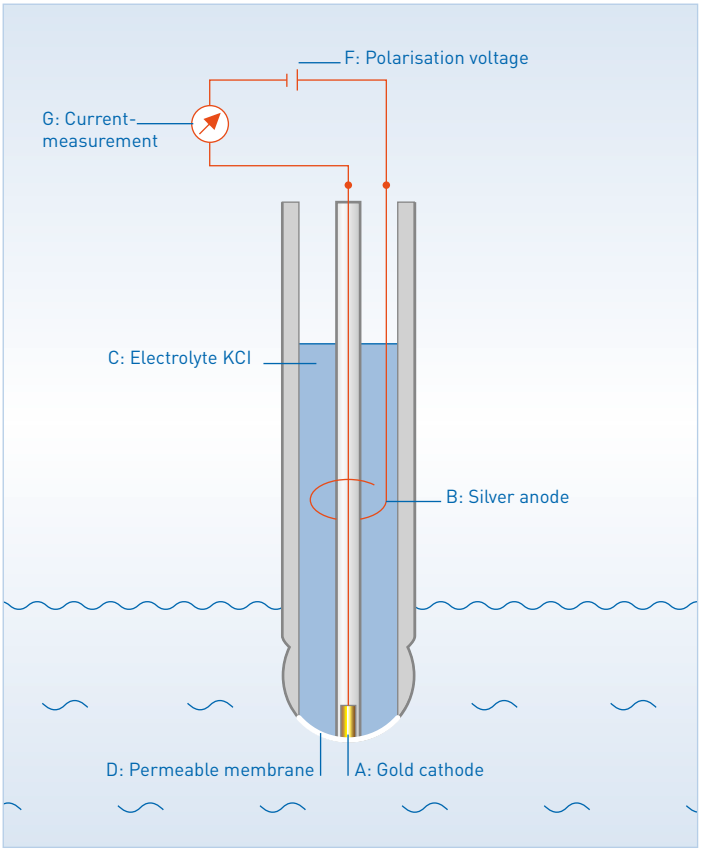
- Fast response time in all applications
- Not effected by air bubbles
- Integrated temperature compensation for reliable measuring results
- Stainless steel housing for harsh applications
- Longer maintenance intervals due to large electrolyte reservoir
- Easy maintenance via sensor cartridge replacement
- 2-wire loop powered sensor for direct connection to the process control system

The measuring principle

The principle of amperometric measurement of dissolved oxygen (DO) was developed by the American Biochemist Leland C. Clark in 1954, who designed the first commercial DO sensor. This sensor is nowadays widely used for instance for wastewater treatment in aeration basins or for fish farming.

The Clark electrode consists of a platinum cathode (A) and a silver anode (B), which are connected via an electrolyte (C). Those electrodes are separated from the water by a permeable membrane (D) e.g. Teflon (PTFE). A polarisation voltage (F) is applied to both electrodes. If the sensor is immersed in the media being measured, such as the biological treatment stage of a sewage plant, O_2 particle pressure difference inside and outside of the membrane leads to O_2 diffusing through the membrane into the measurement chamber. The oxygen entered is reduced at the cathode.

The cathode releases electrons to the oxygen molecules, which are attracted to the anode due to its charge state. Electrons are released from the oxygen on the anode via an oxidation process. The current (G) that is produced by this electron transfer is directly proportional to the partial pressure of the oxygen.



Measurement of dissolved oxygen for aeration control at a wastewater treatment plant

Stable measurements with low maintenance and high accuracy

OPTISENS ADO 2000

Amperometric dissolved oxygen sensors are widely used in wastewater treatment plants to control and monitor the biological treatment of wastewater.

In these applications, where ragging to the sensors can be caused by hair and fibres and contamination by biofilm often makes precise measurement difficult, OPTISENS ADO 2000 sensors perform outstandingly. Their robust stainless steel housing has a large diameter, which minimises ragging and reduces the need for manual cleaning.

In addition, the large Teflon membrane – abrasion resistant even under severe conditions – as well as the large electrolyte reservoir prolongs service intervals and reduces the drifting of measured values. Through the cartridge system, the whole electrode can be changed easily, enabling fast and clean maintenance.

Typical applications

Wastewater

- Monitoring the oxygen content in aeration basins of municipal and industrial wastewater treatment plants
- Controlling of the biological treatment in aeration basins, also possible in combination with nitrate and ammonium measurement

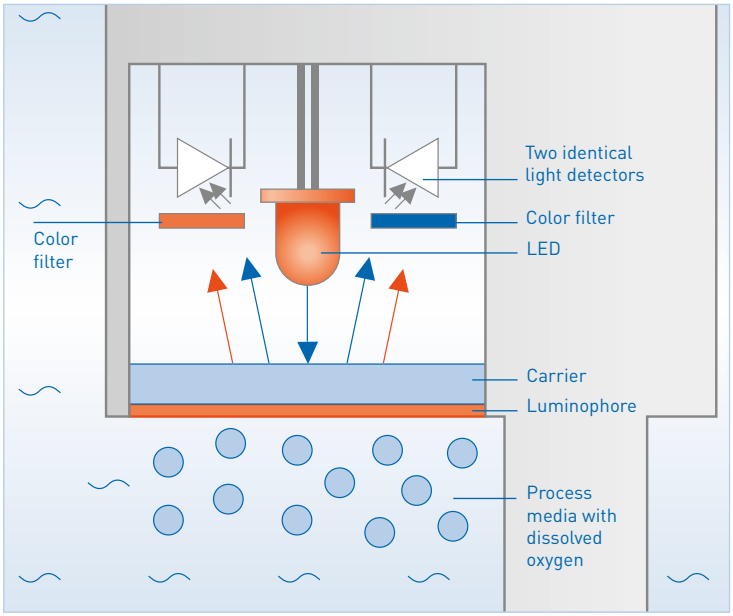
Optical measurement of dissolved oxygen

The measuring principle

As an alternative to the amperometric measurement, dissolved oxygen can also be measured using an optical sensor.

With an optical sensor, a fluorescent dye (luminophore) is stimulated by a short wavelength light source. When the luminophore returns to its original state, light with a longer wavelength is emitted. This signal is recorded as the measurement signal.

If oxygen is contacting the luminophore the time shift of back scattering the light is shortened according to the oxygen concentration on the membrane. The time measured between light being transmitted by the luminophore and it being recorded is inversely proportional to the amount of oxygen present in the water.



Highlights:

- No recalibration necessary
- Reliable measurement via fluorescence measurement
- Fast response time in all applications
- No media flow required
- Low cost of ownership

OPTISENS ODO 2000

Precise measurements without recalibration

Optical dissolved oxygen sensors are widely used to control and monitor oxygen concentration during the biological treatment of sewage water.

OPTISENS ODO 2000 from KROHNE is especially designed for small and medium-sized wastewater treatment plants, where regular calibration and cleaning of the sensors is difficult due to limited maintenance resources.

OPTISENS ODO 2000's use of the optical principal interacting with a fluorescent membrane means there's no need for recalibration. Precision and reliability remain constant.

OPTISENS ODO 2000 measures dissolved oxygen concentration in an aeration basin at a wastewater treatment plant, Stuttgart, Germany

Typical applications

Wastewater

- Monitoring the oxygen content in aeration basins
- Controlling biological treatment in aeration basins, which can also be combined with measuring nitrate and ammonium

Turbidity measurement

The measuring principle

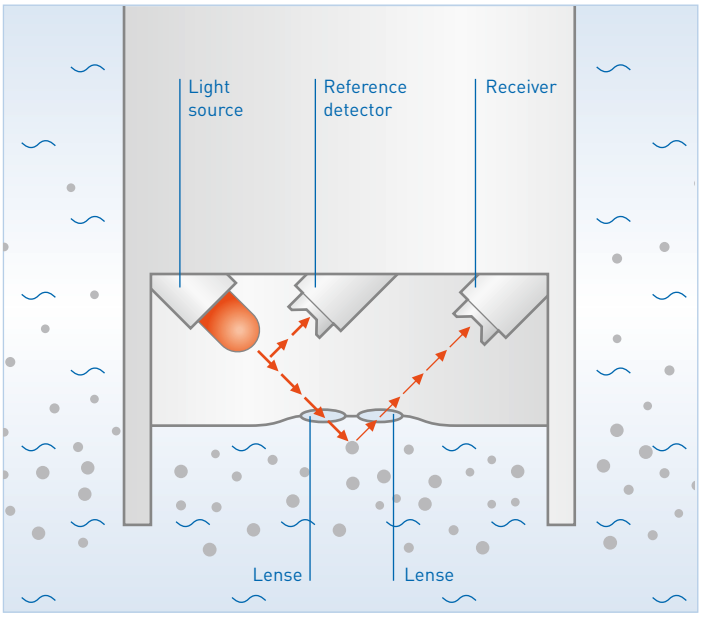
Turbidity is the cloudiness of a fluid caused by the presence of suspended and colloidal matter. In waterworks, a turbidity measurement is used to indicate the clarity of water.

Technically, turbidity is an optical property of water based on the amount of light reflected by colloidal and suspended particles. The measuring unit for the turbidity is Nephelometric Turbidity Unit (NTU).

According to ISO 7027, turbidity values below 40 NTU have to be measured with the 90° scattered light method.

The light source and receiver are positioned in a 90° angle to each other. The light transmitted from the source is directed in equal strength to the reference receiver and into the medium. Light is now reflected from the particles and fractions of the scattered light are received by the detector, positioned at a 90° angle.

The meter now compares the light from the reference receiver and scattered light receiver and calculates the turbidity value.



Highlights:

- Precise turbidity measurement < 40 FNU/NTU through the 90° scattered light method
- Measurement according to ISO 7027/US EPA 180.1
- Fastest calibration on market (less than 15 minutes)
- Reusable calibration cuvettes for calibration without dangerous formazine contact
- High accuracy over the complete range due to unique three-point calibration
- Fast response time due to small sample volume
- Automated ultrasonic cleaning system
- Best price/performance ratio in terms of maintenance and calibration costs
- Overall best price on the market

Turbidity measurement for filter monitoring

Calculating turbidity the easy way

Turbidity measurement is widely used in potable water and wastewater applications. To address a wide range of applications, KROHNE offers different measuring solutions, from open channel measurement with the OPTISENS TUR 2000 to low-range measurement systems such as the OPTISYS TUR 1050.

The OPTISYS TUR 1050 is the best performing turbidity measurement system when it comes to fulfilling all the necessary regulations and requirements. Because of its optimised cuvette measuring system, it has the fastest measuring response time and lowest maintenance requirements on the market.

Typical applications

Water

- Monitoring of potable water quality in pump stations
- Filter monitoring
- Process water treatment
- Controlling of limit values
- Cooling water
- Demineralisation

Wastewater

- Water quality control in the outlet

OPTISENS TUR 2000

OPTISYS TUR 1050


2.180
KROHNE

OPTISYS SLM 2100 – Better knowledge about your sedimentation process

The sludge level meter OPTISYS SLM 2100 features an accurate and reliable profile measurement of your sedimentation tank using an optical sensor which travels through all layers of the tank reading suspended solids concentration at the different heights. This gives you more information than you can ever obtain with any comparable ultra sonic device, which hence generates better knowledge about your sedimentation process.

Some key benefits:

- Reliable measurement of the sedimentation profile as well as sludge blanket and fluff levels
- Continuous level measurement of sludge blanket (zone tracking)
- Direct measurement via sounding with an optical sensor
- No interference with fluff or floating sludge due to the direct measurement
- Common operating and service concept with KROHNE flow and level devices
- Low maintenance due to (optional) automatic flushing of sensor and cable after each measuring cycle

Measurement of sedimentation profile

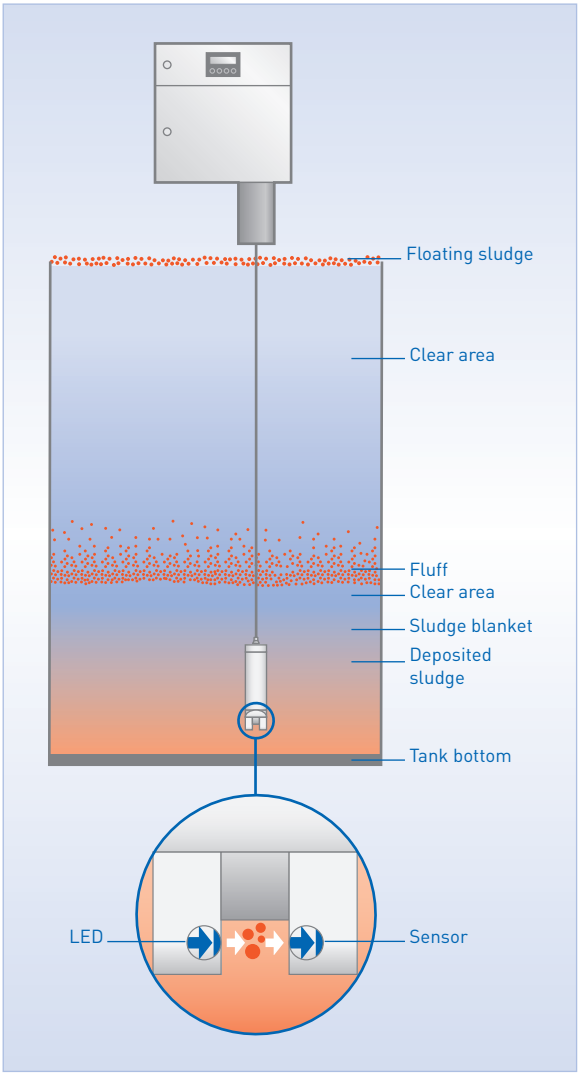
Highlights:

- Direct measurement via sounding with an optical sensor
- No interference with fluff or floating sludge due to direct measurement
- Reliable measurement of the sedimentation profile as well as sludge blanket and fluff levels
- Continuous level measurement of sludge blanket (zone tracking)
- Common operating and service concept with flow and level devices
- Low maintenance due to (optional) automatic flushing of sensor and cable after each measuring cycle
- Rake guard switch protects the sensor from being catched by the rake
- IP54 enclosure and build in heater for outdoor installations
- Durable stainless steel sensor and instrument enclosure
- Reliable signal transmission from sensor, due to digital communication via opto coupler

The measuring principle

Unlike the commonly used ultrasound level measurement, the KROHNE sedimentation profile and sludge blanket meter is using an optical sensor which travels through the media. Thus it can directly measure the suspended solids concentration at different heights.

The measurement of the suspended solids content is based on the method of the transmission of light, which provides precise measurement results independent of the sludge colour. The direct measuring principle excludes incorrect measurements due to echo returns from walls or separating zones as well as signal damping by fluff or floating sludge.



Sludge blanket measurement in secondary clarifier of wastewater treatment plant, Krefeld, Germany

A clear view right to the ground

OPTISYS SLM 2100 goes right down to the bottom of a tank and detects all sludge phases, supplying precice concentration and level measurements.

Via the zone tracking function you can follow one specific concentration (i.e. the sludge blanket) and hence continously monitor one specific "zone", for instance for controlling the pumps during de-pumping of the sludge.

You even have the option of recording a sludge profile, enabling you to detect sedimentation problems early and prevent sludge being washed out to the next stage.

Typical applications

Water

- Monitoring of sedimentation processes and automated de-pumping in sedimentation basins

Wastewater

- Prevention of sludge washout in primary and secondary clarifiers
- Control of sludge settlement and automated extraction of sludge in clarifiers and sludge thickeners

2-wire digital pH/ORP sensors

	Hygienic pH sensor for food, beverages and pharma industry	High performance pH sensor for chemical industry	Liquid filled pH sensor for pure water or for harsh applications	pH sensor for purewater applications	Durable pH sensor for water and wastewater applications
	SMARTSENS PH 8570	SMARTSENS PH 8150	SMARTSENS PH 9950	SMARTSENS PH 8530	SMARTSENS PH 8320
					
Parameter	pH	pH	pH	pH	pH
Type	Ø12; 120 or 225 mm Ø0.5"; 4.7"or 8.9" length	Ø12; 120 or 225 mm Ø0.5"; 4.7"or 8.9" length	Ø12; 120 or 280 mm Ø0.5"; 4.7"or 11" length	Ø12; 120 or 225 mm Ø0.5"; 4.7"or 8.9" length	Ø12; 120 or 225 mm Ø0.5"; 4.7"or 8.9" length
Process connection	PG 13.5	PG 13.5	PG 13.5	PG 13.5	PG 13.5
Measuring range	0...14 pH	0...14 pH	0...14 pH	0...14 pH	0...14 pH
Measuring accuracy	0.5%	0.5%	0.5%	0.5%	0.5%
Diaphragm	Ceramic	2x Open	Platinum	3 x Ceramic	PTFE
Reference	RheoLid gel	Duralid gel	Liquid filled KCl	KCl gel	Ag/AgCl/TepoxGel
Glass type/ measuring electrode	S glass	H glass	H glass	A glass	AH glass
Body material	Glass	Glass	Glass	Glass	Glass
Ambient temperature	0...+140°C; +32...+284°F (CIP, SIP, Autoclavable)	0...+130°C; +32...+266°F	0...+135°C; +32...+275°F	0...+80°C; +32...+176°F	0...+70°C; +32...+158°F
Process temperature	0...+110°C; +32...+230°F	0...+100°C; +32...+212°F	0...+100°C; +32...+212°F	0...+80°C; +32...+176°F	0...+70°C; +32...+158°F
Process pressure	12 bar; 174 psi	12 bar; 174 psi	6 bar; 87 psi	12 bar; 174 psi	16 bar; 232 psi
Min. conductivity	>100 µS/cm	>150 µS/cm	>5 µS/cm	>2 µS/cm	>150 µS/cm
Communication	1 x 4...20 mA (passive), HART® 7	1 x 4...20 mA (passive), HART® 7	1 x 4...20 mA (passive), HART® 7	1 x 4...20 mA (passive), HART® 7	1 x 4...20 mA (passive), HART® 7
Power supply	15...30 V (loop powered)	15...30 V (loop powered)	15...30 V (loop powered)	15...30 V (loop powered)	15...30 V (loop powered)
Temperature sensor	Pt1000	Pt1000	Pt1000	Pt1000	Pt1000
Connector	VP (VarioPin)	VP (VarioPin)	VP (VarioPin)	VP (VarioPin)	VP (VarioPin)
Industries	Food/beverage, pharmaceutical, biotechnology	Chemical, petrochemical, wastewater	Chemical, water/wastewater, power	Power, semiconductor	Water/wastewater
Approvals	Biocompatibility, FDA, IECEx, ATEX, FM, NEPSI, CSA (zone 0)	IECEx, ATEX, FM, NEPSI, CSA (zone 0)	-	-	IECEx, ATEX, FM, NEPSI, CSA (zone 0)
Accessories	VP cables, DD, FDT/DTM (e.g. for PACTware™), SJB 200 W junction box, SMARTMAC 200 W, SD 200 W/R display, SMARTBRIDGE USB interface cable, SMARTBASE database	VP cables, DD, FDT/DTM (e.g. for PACTware™), SJB 200 W junction box, SMARTMAC 200 W, SD 200 W/R display, SMARTBRIDGE USB interface cable, SMARTBASE database	VP cables, DD, FDT/DTM (e.g. for PACTware™), SJB 200 W junction box, SMARTMAC 200 W, SD 200 W/R display, SMARTBRIDGE USB interface cable, SMARTBASE database	VP cables, DD, FDT/DTM (e.g. for PACTware™), SJB 200 W junction box, SMARTMAC 200 W, SD 200 W/R display, SMARTBRIDGE USB interface cable, SMARTBASE database	VP cables, DD, FDT/DTM (e.g. for PACTware™), SJB 200 W junction box, SMARTMAC 200 W, SD 200 W/R display, SMARTBRIDGE USB interface cable, SMARTBASE database

General purpose pH sensor for water applications	High performance ORP sensor for harsh applications	General purpose ORP sensor for water applications	Rugged pH sensor with 3/4" MNPT process connection and ceramic diaphragm for water applications	Rugged pH sensor with 3/4" MNPT process connection and PTFE diaphragm for wastewater applicatons	Rugged ORP sensor with 3/4" MNPT process connection and ceramic diaphragm for water and waste-water applications
SMARTSENS PH 8510	**SMARTSENS ORP 8150**	**SMARTSENS ORP 8510**	**SMARTSENS PH 1590**	**SMARTSENS PH 2390**	**SMARTSENS ORP 1590**
					
pH	ORP	ORP	pH	pH	ORP
Ø12; 120 or 225 mm Ø0.5"; 4.7" or 8.9" length	Ø12; 120 mm Ø0.5"; 4.7" length	Ø12; 120 mm Ø0.5"; 4.7" or 8.9" length	Ø20; 23 mm; Ø0.7"; 0.9" insertion length	Ø20; 23 mm; Ø0.7"; 0.9" insertion length	Ø20; 23 mm; Ø0.7"; 0.9" insertion length
PG 13.5	PG 13.5	PG 13.5	3/4" MNPT	3/4" MNPT	3/4" MNPT
0...14 pH	-1,500...1,500 mV	-1,500...1,500 mV	0...14 pH	0...14 pH	-1,500...1,500 mV
0.5 %	0.5%	0.5%	0.5%	0.5%	0.5%
Ceramic	2 open holes	Ceramic	Ceramic	PTFE	Ceramic
Ag/AgCl/TepoxGel	Duralid polymer gel	Ag/AgCl/TepoxGel	KCl gel	KCl gel	KCl gel
AH glass	Platinum	Platinum	Multi purpose glass	Multi purpose glass	Platinum
Glass	Glass	Glass	Ryton	Ryton	Ryton
0...+70°C; +32...+158°F	0...+130°C; +32...+266°F	0...+70°C; +32...+158°F	0...+80°C; +32...+176°F	0...+80°C; +32...+176°F	0...+80°C; +32...+176°F
0...+70°C; +32...+158°F	0...+100°C; +32...+212°F	0...+70°C; +32...+158°F	0...+80°C; +32...+176°F	0...+80°C; +32...+176°F	0...+80°C; +32...+176°F
2 bar; 30 psi	12 bar; 174 psi	2 bar; 30 psi	6.9 bar; 100 psi at +60°C; +140°F	6.9 bar; 100 psi at +60°C; +140°F	6.9 bar; 100 psi at +60°C; +140°F
>150 µS/cm	>150 µS/cm	>150 µS/cm	>150 µS/cm	>150 µS/cm	>150 µS/cm
1 x 4...20 mA (passive), HART® 7	1 x 4...20 mA (passive), HART® 7	1 x 4...20 mA (passive), HART® 7	1 x 4...20 mA (passive), HART® 7	1 x 4...20 mA (passive), HART® 7	1 x 4...20 mA (passive), HART® 7
15...30 V (loop powered)	15...30 V (loop powered)	15...30 V (loop powered)	15...30 V (loop powered)	15...30 V (loop powered)	15...30 V (loop powered)
Pt1000	Pt1000	Pt1000	Pt1000	Pt1000	Pt1000
VP (VarioPin)	VP (VarioPin)	VP (VarioPin)	VP (VarioPin)	VP (VarioPin)	VP (VarioPin)
Water	Chemical, petrochemical, wastewater	Water/wastewater	Water	Water/wastewater	Water/wastewater
-	IECEx, ATEX, FM, NEPSI, CSA (zone 0)	-	CSA	CSA	CSA
VP cables, DD, FDT/DTM (e.g. for PACTware™), SJB 200 W junction box, SMARTMAC 200 W, SD 200 W/R display, SMARTBRIDGE USB interface cable, SMARTBASE database	VP cables, DD, FDT/DTM (e.g. for PACTware™), SJB 200 W junction box, SMARTMAC 200 W, SD 200 W/R display, SMARTBRIDGE USB Interface cable, SMARTBASE Database	VP cables, DD, FDT/DTM (e.g. for PACTware™), SJB 200 W junction box, SMARTMAC 200 W, SD 200 W/R display, SMARTBRIDGE USB interface cable, SMARTBASE database	VP cables, DD, FDT/DTM (e.g. for PACTware™), SJB 200 W junction box, SMARTMAC 200 W, SD 200 W/R display, SMARTBRIDGE USB interface cable , SMARTBASE database	VP cables, DD, FDT/DTM (e.g. for PACTware™), SJB 200 W junction box, SMARTMAC 200 W, SD 200 W/R display, SMARTBRIDGE USB interface cable, SMARTBASE database	VP cables, DD, FDT/DTM (e.g. for PACTware™), SJB 200 W junction box, SMARTMAC 200 W, SD 200 W/R display, SMARTBRIDGE USB interface cable, SMARTBASE database

2-wire digital conductivity sensors

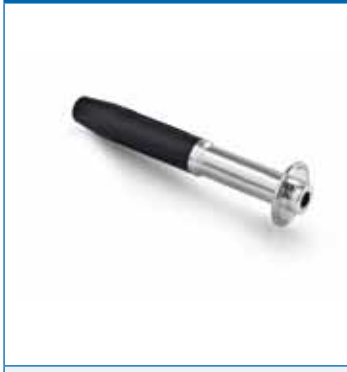
	Conductivity sensor for general purpose water applications	Conductivity sensor for pure water applications	Conductivity sensor for harsh applications	Conductivity sensor for hygienic applications
	SMARTSENS COND 1200	SMARTSENS COND 3200	SMARTSENS COND 5200	SMARTSENS COND 7200
				
Parameter	Conductive conductivity	Conductive conductivity	Conductive conductivity	Conductive conductivity
Type	Two-electrode measuring cell with integrated temp. sensor	Two-electrode measuring cell with integrated temp. sensor	Two-electrode measuring cell with integrated temp. sensor	Two-electrode measuring cell with integrated temp. sensor
Process connections	G3/4A	G3/4A, 3/4"MNPT	G3/4A, 3/4"MNPT	Varivent DN50-150 Clamp DN25, 32, 40, 50 Aseptic DN40, 50
Measuring ranges	c = 0.05 cm^{-1}: 0.05...200 µS/cm c= 0.2 cm^{-1}: 1...2000 µS/cm c = 1 cm^{-1}: 1...20 mS/cm	c = 0.01 cm^{-1}: 0.05...10 µS/cm c = 0.1 cm^{-1}: 1...1000 µS/cm	c = 1 cm^{-1}: 10 µS/cm...15 mS/cm	c = 0.01 cm^{-1}: 0.05...10 µS/cm c = 0.1 cm^{-1}: 1...1000 µS/cm
Measuring accuracy	<3%	<3%	<3%	<3%
Materials	Electrodes: Stainless steel Process connection: PVDF	Electrodes: Stainless steel or Ti Process connection: PVDF	Electrodes: Graphite Process connection: PVDF	Electrodes/process connection: Stainless steel
Process temperature	0...+135°C; +32...+275°F	0...+135°C; +32...+275°F	0...+130°C; +32...+266°F	0...+135°C; +32...+275°F
Process pressure	16 bar; 232 psi (at +25°C; +77°F)	16 bar; 232 psi (at +25°C; +77°F)	16 bar; 232 psi (at +25°C; +77°F)	16 bar; 232 psi (at +25°C; +77°F)
Communication	1 x 4...20 mA (passive); HART® 7	1 x 4...20 mA (passive); HART® 7	1 x 4...20 mA (passive); HART® 7	1 x 4...20 mA (passive); HART® 7
Power supply	15...30 V (loop powered)	15...30 V (loop powered)	15...30 V (loop powered)	15...30 V (loop powered)
Tempera-ture sensor	Pt1000	Pt1000	Pt1000	Pt1000
Connector	VP (VarioPin)	VP (VarioPin)	VP (VarioPin)	VP (VarioPin)
Industries	Water/wastewater	Power, semiconductor, chemical, reverse osmosis	Chemical, water/wastewater	Pharma, food/beverage
Approvals	-	IECEx, ATEX, FM, NEPSI, CSA (zone 0)	IECEx, ATEX, FM, NEPSI, CSA (zone 0)	EHEDG, ASTM, FDA, IECEx, ATEX, FM, NEPSI, CSA (zone 0)
Accessories	VP cables, DD, FDT/DTM (e.g. for PACTware™), SJB 200 W junction box, SMARTMAC 200 W, SD 200 W/R display, SMARTBRIDGE USB interface cable	VP cables, DD, FDT/DTM (e.g. for PACTware™), SJB 200 W junction box, SMARTMAC 200 W, SD 200 W/R display, SMARTBRIDGE USB interface cable	VP cables, DD, FDT/DTM (e.g. for PACTware™), SJB 200 W junction box, SMARTMAC 200 W, SD 200 W/R display, SMARTBRIDGE USB interface cable	VP cables, DD, FDT/DTM (e.g. for PACTware™), SJB 200 W junction box, SMARTMAC 200 W, SD 200 W/R display, SMARTBRIDGE USB interface cable

Accessories

	Loop powered display for configuration and calibration with logbook function	Loop powered display for wall or rack mount	USB Interface cable for offline calibration	Junction box for connecting the sensor with process contol system
	SMARTMAC 200 W	**SD 200 W/R**	**SMARTBRIDGE**	**SJB 200 W**
				
Parameter	pH, ORP, conductivity	pH, ORP, conductivity	All	All
Type	Wall mounted	Wall or rack mounted	-	Wall mounted
Housing	Die-cast aluminium field housing (IP66)	Wall-mounted: IP65 Rack mounted: front IP40, rear IP20	Plastic enclosure (IP65)	Plastic enclosure (IP65)
Display	Graphic display, 128 x 64 pixels	Graphic display, 128 x 64 pixels	-	-
Input	1 sensor input (SMARTSENS)	1 sensor input (4...20 mA)	-	-
Ambient temperature	-20...+55°C; -4...+131°F	-20...+55°C; -4...+131°F	0...+55°C; +32...+131°F	-20...+55°C; -4...+131°F
Power supply	15..30 VDC (loop powered)	15..30 VDC (loop powered)	via USB	-
Communication	1 x 4...20 mA (passive); HART® 7	1 x 4...20 mA (passive); HART® 7	-	-
Approvals	IECEx, ATEX, FM, NEPSI, CSA (zone 1/T4)	IECEx, ATEX, FM, NEPSI, CSA (zone 1/T4)	IECEx, ATEX, FM, NEPSI, CSA (zone 1/T4)	IECEx, ATEX, FM, NEPSI, CSA (zone 1/T4)
Other features	Display of measuring parameter, temperature and sensor status; configuration and calibration for SMARTSENS; error logbook; calibration logbook	Display of measuring parameter, temperature and sensor status for SMARTSENS	-	-

Mounting assemblies

	Automatic retractable assemblies (pneumatic) for demanding process conditions in chemical industry	Manual retractable assemblies for easy exchange without process interruptions	Static insertion assemblies for reliable connection to tanks and pipes in general purpose applications
	SENSOFIT RAM 5810/5830	SENSOFIT RET 5810/5830	SENSOFIT INS 1310
			
Parameter	pH, ORP	pH, ORP	pH, ORP
Sensor type	Ø12; 225 mm length Ø0.5"; 8.9" length; PG 13.5	Ø12; 225 mm length Ø0.5"; 8.9" length; PG 13.5	Ø12; 120 mm length Ø0.5"; 4.7" length; PG 13.5
Materials	Stainless steel (1.4404)	Stainless steel (1.4404)	Stainless steel (1.4404)
Sealing material	FPM (Viton®) or FFKM (Kalrez®)	FPM (Viton®) or FFKM (Kalrez®)	FPM (Viton®) or EPDM (FDA/USP VI)
Process conditions	Up to 16 bar; 232 psi, +140°C; +284°F	Up to 16 bar; 232 psi, +140°C; +284°F	Up to 10 bar; 145 psi, +140°C; +284°F
Process connections	Flange DN32; PN16, DN40; PN16, DN50; PN16, ANSI 2"; 150 lbs or G1 1/4 (DN25)	Flange DN32; PN16, DN40; PN16, DN50; PN16, ANSI 2"; 150 lbs or G1 1/4 (DN25)	G1 1/4 (DN25)
Insertion length	Up to 107 mm; 4.21"	Up to 107 mm; 4.21"	70 mm; 2.75"
Cleaning connection	G1/8; 1/4" NPT	G1/8; 1/4" NPT	-
Certificates	Material certificate 3.1 EN 10204	Material certificate 3.1 EN 10204	Material certificate 3.1 + 2.2 EN 10204, certificate for elastomer EPDM (FDA/USP VI)
Other features	With position switch, cleaning connection	With cleaning connection	With or without protection cage

Static insertion assemblies for reliable connection to tanks and pipes in hygienic applications	Immersion assemblies for installation in tanks and open basins	Flow-through assemblies in stainless steel for all applications
SENSOFIT INS 7311/7312	**SENSOFIT IMM 2925**	**SENSOFIT FLOW 1710**
		
pH, ORP	pH, ORP	pH, ORP, conductivity
Ø12; 120 mm length Ø0.5"; 4.7" length; PG 13.5	1 x Ø12; 120 mm length Ø0.5"; 4.7" length PG 13.5 3 x O12; 120 mm length Ø0.5"; 4.7" length PG 13.5 1 x 3/4" MNPT	SENSOFIT RAM/RET 5810/5830; SENSOFIT INS X31X; G3/4A and 3/4" MNPT sensors
Stainless steel (1.4404)	PP	Stainless steel (1.4571)
EPDM (FDA/USP VI)	FPM (Viton®)	-
Up to 10 bar; 145 psi, +140°C; +284°F	Up to 6 bar; 87 psi, +80°C ; +176°F	Up to 16 bar; 232 psi, +140°C; +284°F
Tri-Clamp 1-1.5" (OD 50.5 mm); Tri-Clamp 2" (OD 64 mm); VARIVENT DN40-125	Flange DN80; PN16, ANSI 3"; 50 lbs or with suspended assemblies	Flange DIN 25, 50, ANSI 1"/2" or welding pipe DN25, DN50
40 or 45 mm; 1.57" or 1.77"	1 or 2 m; 39.37"or 78.74"	-
-	Hose connection	-
Material certificate 3.1 + 2.2 EN 10204, certificate for elastomer EPDM (FDA/USP VI)	-	Material certificate 3.1 EN 10204
Without protection cage	With or without flush cleaning	Flow direction 90° or 180°

Measuring systems

	Turbidity measuring system with cost efficient cuvette calibration and automated ultrasonic cleaning system	Measuring system for free chlorine, chlorine dioxide and ozone with automatic sensor cleaning system for safe use and extended lifetime
	OPTISYS TUR 1050	OPTISYS CL 1100
		
Parameter	Turbidity	Free chlorine (Cl_2), chlorine dioxide (ClO_2), ozone (O_3)
Inputs	-	1-2 sensor
Measuring principle	90° scattered light (EN ISO 7027/US-EPA 180.1)	Potentiostatic
Measuring range	0...100 NTU/FNU 0...1000 NTU/FNU	Cl_2: 0...5 mg/L; ClO_2: 0...5 mg/L; O_3: 0...5 mg/L; pH: 0...14 or ORP: -2000...+2000 mV; temp.: -10...+140°C; +14...+284°F
Measuring accuracy	±2% of the measured value below 40 NTU; ±5% of the measured value above 40 NTU	2% full scale
Resolution	0.0001 NTU/FNU	-
Min. flow rate	0.1 l/min	>30 l/h
Min. conductivity	-	>150 µS/cm
Ambient temperature	+1...+50°C; +34...+122°F	-15...+55°C; +5...+131°F
Process temperature	+1...+50°C; +34...+122°F	-5...+50°C; +23...+122°F
Max. operating pressure	14 bar; 200 psi, built-in pressure regulator	6 bar; 87 psi
Design	Compact device	Mounted on panel
Installation	Bypass	Bypass in flow-through installation
Outputs	4...20 mA current output activ	3 x current output (4...20 mA), all galvanically isolated
Power supply	100...240 VAC, 47...56 Hz, 80 VA	100...230 VAC, 50/60 Hz; 24 VAC/DC
Calibration	Reusable calibration cuvettes (with traceable liquid standard)	-
Automatic cleaning	Ultrasonic cleaning	ASR
Protection category	IP66; NEMA4X	IP66; NEMA4X
Communication	RS485 Modbus	HART® 4...20 mA
Other features	-	Calibration and status logbook, temperature and pH compensation
Approvals	CE (ETL listing acc. to UL 6101108-1-6), ETL certification (acc. to CSA 2.2)	CSA general purpose

Converter

	Multiparameter converter
	MAC 100
	
Type	Wall-mounted
Housing	Die-cast aluminium field housing (IP66)
Display	Graphic display, 128 x 64 pixels
Parameter	pH, ORP, conductive and inductive conductivity, Cl_2, ClO_2, O_3, dissolved oxygen, turbidity
Inputs	1 or 2 sensor inputs
Ambient temperature	-15...+55°C; +5...+131°F
Outputs	3 x current output (4...20 mA), galvanically isolated
Relay	3 mechanical relays (NO and NC), fully programmable
Power supply	100...230 VAC, 50/60 Hz; 24 VAC/DC
Protection category	IP66; NEMA4X
Communication	HART® 4...20 mA
Other features	Calibration and status logbook, temperature compensation, control input (e.g. hold function, flow alarm)
Approvals	CSA general purpose

Analog chlorine and conductivity sensors

	Low-maintenance, membrane-free gold electrode sensor for free chlorine, chlorine dioxide and ozone measurements in potable water	2-electrode stainless steel sensor for conductivity measurements in all general applications	Reliable dirt-resistant sensor for inductive conductivity measurements suitable also for wastewater
	OPTISENS CL 1100	**OPTISENS COND 1200**	**OPTISENS IND 1000***
			
Parameter	Free chlorine (Cl_2), chlorine dioxide (ClO_2), ozone (O_3)	Conductive conductivity	Inductive conductivity
Type	12/120 mm 0.5/4.7" length PG 13.5	2-electrode measuring cell with integrated temperature sensor	Inductive measuring cell with integrated temperature sensor
Measuring range	Cl_2: 0.03...5 mg/l ClO_2: 0.05...5 mg/l O_3: 0.05...5 mg/l	0...10 µS/cm (c=0.01), 0...200 µS/cm (c=0.05), 0...1000 µS/cm (c=0.1), 0...2000 µS/cm (c=0.2), 0...20 mS/cm (c=1)	0...2000 mS/cm
Process temperature	-5...+70°C; +23...+158°F	-10...+135°C; +14...+275°F	-10...+80°C; +14...+176°F
Process pressure	6 bar; 87 psi	16 bar; 232 psi (at +25°C; +77°F)	max. 10 bar; 145 psi (at +20°C; +68°F)
Min. flow rate	>30 l/h	-	-
Min. conductivity	>150 µS/cm	-	-
Installation	Flow-through installation only	Pipe installations Immersion installations	Pipe installations Immersion installations
Materials	Glass shaft, gold electrodes, EPDM gasket	Electrode: stainless steel or titanium Process connection: PVDF	PP or PVDF
Diaphragm	Ceramic	-	-
Connector	M12	4-pin right-angle plug (Hirschmann)	Fixed cable
Cables	CL-W 1100 (max. 10 m; 32 ft)	COND-W 1200 (max. 15 m; 49.2 ft)	IND-W 1000 (10 m; 32 ft)

*suitable for wastewater

Analog pH/ORP sensors

	pH sensor with Pt100 for low-conductivity media and high temperatures	pH sensor with dirt-repellent PTFE diaphragm for wastewater, surface and process water	pH sensor with ceramic diaphragm for general water applications	pH sensors with liquid filling for special applications
	OPTISENS PH 8100	**OPTISENS PH 8300***	**OPTISENS PH 8500**	**OPTISENS PH 9100, 9500**
				
Parameter	pH	pH	pH	pH
Type	12/120 mm 0.5/4.7" length PG 13.5	12/120 mm 0.5/4.7" length PG 13.5	12/120 mm 0.5/4.7" length PG 13.5	12/160 mm; 0.5/6.3" length refillable liquid KCL filling
Measuring range	0...14 pH	0...14 pH	0...14 pH	0...14 pH
Process temperature	0...+130°C; +32...+266°F	-5...+70°C; +23...+158°F	-5...+70°C; +23...+158°F	-5...+100°C; +23...+212°F
Process pressure	6 bar; 87 psi	16 bar; 232 psi	2 bar; 30 psi	Pressure less
Min. conductivity	>2 µS/cm	>150 µS/cm	>150 µS/cm	>20 µS/cm
Installation conditions	Pipe installations Immersion installations	Pipe installations Immersion installations	Pipe installations Immersion installations	Various (pressure less)
Temperature sensor	Pt100	Pt100	Pt100	-
Materials	H-glass, EPDM gasket	AH-glass, EPDM gasket	AH-glass, EPDM gasket	AH-glass
Diaphragm	Open	PTFE	Ceramic	OPTISENS PH 9100: open; OPTISENS PH 9500: ceramic
Connector	VarioPin (VP)	DIN-Coax or SixPlug	DIN-Coax or SixPlug	DIN-Coax
Cables	pH/ORP-W VP 8.0 (max. 10 m; 33 ft)	pH/ORP-W Coax/SixPlug (max. 10 m; 33 ft)	pH/ORP-W Coax/SixPlug (max. 10 m; 33 ft)	pH/ORP-W Coax (max. 10 m; 33 ft)

*suitable for wastewater

ORP sensor with large platinum ring for reliable and precise measurement in all water applications	pH sensor with PTFE diaphragm for harsh applications	pH sensor with ceramic diaphragm for harsh applications	ORP sensor with large platinum ring for general applications
OPTISENS ORP 8500	**OPTISENS PH 8390**	**OPTISENS PH 8590**	**OPTISENS ORP 8590**
			
ORP	pH	pH	ORP
12/120 mm 0.5/4.7" length PG 13.5	20/23 or 44 mm; 0.6/0.9 or 1.7" insertion length; 3/4" MNPT	20/23 or 44 mm; 0.6/0.9 or 1.7" insertion length; 3/4" MNPT	20/23 or 44 mm; 0.6/0.9 or 1.7" insertion length; 3/4" MNPT
-2000...+2000 mV	0...14 pH	0...14 pH	-2000...+2000 mV
+5...+70°C; +23...+158°F	-5...+80°C; +23...+176°F	-5...+80°C; +23...+176°F	-5...+80°C; +23...+176°F
2 bar; 30 psi	6.9 bar; 100 psi at +60°C; +140°F	6.9 bar; 100 psi at +60°C; +140°F	6.9 bar; 100 psi at +60°C; +140°F
>150 µS/cm	>150 µS/cm	>150 µS/cm	>150 µS/cm
Pipe installations Immersion installations	Various	Various	Various
-	Pt100	Pt100	Pt100
Glass, platinum electrodes, EPDM gasket	CPVC, glass	CPVC, glass	CPVC, platinum electrode
Ceramic	PTFE Double junction	Ceramic Double junction	Ceramic Double junction
DIN-Coax	4-pin connector or attached cable	4-pin connector or attached cable	4-pin connector or attached cable
pH/ORP-W Coax (max. 10 m; 33 ft)	pH/ORP-W 4-wire double coax cable (max. 10 m; 33 ft)	pH/ORP-W 4-wire double coax cable (max. 10 m; 33 ft)	pH/ORP-W 4-wire double coax cable (max. 10 m; 33 ft)

Measuring system

	Optical measuring system for sedimentation profile measurement and continuous tracking of sludge blanket
	OPTISYS SLM 2100
	
Parameter	-
Measuring principle	Optical - transmitted light
Design	Compact measuring system with integrated MAC 100 converter and „YoYo" sensor
Measuring range	0...10m; 0...33 ft (0.1...50 g/l)
Measuring modes	1. Profile measurement (height and concentration) 2. Sludge blanket and fluff level 3. Zone tracking (continous measurement)
Ambient temperature	-20...+50°C; -4...+122°F
Process temperature	0...+60°C; +32...+140°F
Enclosure rating	IP54 (enclosure), IP68 (sensor)
Communication	2 x 4...20 mA current output (active)
Power supply	230 VAC 50/60 Hz or 115 VAC/60 Hz
Other features	Build-in heater, flush cleaning system for sensor and cable (optional), 1 x maintenance switch, 2 x rake guard switch, height and depth measurement switchable

Converter

	Multiparameter converter
	MAC 100
	
Type	Wall-mounted
Housing	Die-cast aluminium field housing (IP66)
Display	Graphic display, 128 x 64 pixels
Inputs	1 or 2 sensor inputs
Signal transmission	-
Parameter	pH, ORP, conductive and inductive conductivity, Cl_2, ClO_2, O_3, dissolved oxygen, turbidity
Ambient temperature	-15...+55°C; +5...+131°F
Outputs	3 x 4...20 mA, galvanically isolated
Relay	3 mechanical relays (NO and NC), fully programmable
Power supply	100...230 VAC, 50/60 Hz; 24 VAC/DC
Communication	HART® 4...20 mA
Other features	Calibration and status logbook temperature compensation, control input (e.g. hold function, flow alarm)
Approvals	CSA general purpose

Wastewater sensors

	Amperometric sensor with easy exchangable electrode cartridge	Low maintenance optical sensor for dissolved oxygen measure-ments, with automatic cleaning, no recalibration required	90° scattered light sensor for turbidity measurements with NIR-LED for long-term stability and automatic cleaning
	OPTISENS ADO 2000	OPTISENS ODO 2000	OPTISENS TUR 2000
			
Parameter	Dissolved oxygen	Dissolved oxygen	Turbidity
Measuring principle	Amperometric	Optical	90° scattered light
Type	Digital sensor with 4...20 mA current output or for connection to MAC 100	Digital sensor with 4...20 mA current output or for connection to MAC 100	Digital sensor with 4...20 mA current output or for connection to MAC 100
Electrode	Clark type	Luminophore disc	Near Infrared (NIR) - LED
Measuring range	0...20 mg/l	0...20 mg/l	0.001...4 NTU/FNU, 0.01...40 NTU/FNU, 0.1...400 NTU/FNU; measuring range is preconfigured at KROHNE (40 NTU is standard)
Measuring accuracy	±1% of reading	±0.1 ppm at <1 ppm; ±0.2 ppm at >1ppm	<1% or 0.001
Process temperature	0...+50°C; +32...+122°F	-5...+50°C; +23...+122°F	0...+50°C; +32...+122°F
Process pressure	6 bar; 87 psi at +20°C; +86°F	1bar; 14.5 psi	1bar; 14.5 psi
Min. conductivity	-	-	-
Installation conditions	Immersion installation	Immersion installation	Immersion installation
Materials	Body: stainless steel	PVC	PVC
Enclosure rating	IP68	IP68	IP68
Cleaning system	-	Integrated cleaning nozzle for compressed air	Integrated cleaning nozzle for compressed air
Connector	Core ends	Core ends	Core ends
Cables	10 m; 32.8 ft attached cable	10 m; 32.8 ft attached cable	10 m; 32.8 ft attached cable
Other features	Integrated temperature compensation; one-point air calibration, plugable electrode cartridge	Integrated temperature compensation; membrane life >1 year (not exposed to sunlight)	-

Measuring system

	Compact measuring system for inductive conductivity
	OPTISYS IND 7100
	
Parameter	Conductivity (inductive)
Type	Compact measuring system incl. converter
Enclosure rating	IP67
Measuring range	0.5...2000 mS/cm
Process temperature	-10...+120°C (briefly +140°C); +14...+248°F (briefly +284°F)
Process pressure	max. 10 bar; 145 psi
Process connection	MK DN50 DIN 11851 screwed pipe fitting
Materials	Transmitter: PA Sensor: PEEK
Installation conditions	Pipe-installations
Outputs	2 x 4...20 mA (active)
Power supply	19...31 VDC, (24 VDC nominal)
Relays	2 x electronic relays (optical isolated)

Converter

	Multiparameter converter
	MAC 100
	
Type	Wall-mounted
Housing	Die-cast aluminium field housing (IP66)
Display	Graphic display, 128 x 64 pixels
Inputs	1 or 2 sensor inputs
Signal transmission	-
Parameter	pH, ORP, conductive and inductive conductivity, Cl_2, ClO_2, O_3, dissolved oxygen, turbidity
Ambient temperature	-15...+55°C; +5...+131°F
Outputs	3 x current output (4...20 mA), galvanically isolated
Relay	3 mechanical relays (NO and NC), fully programmable
Power supply	100...230 VAC, 50/60 Hz; 24 VAC/DC
Communication	HART® 4...20 mA
Other features	Calibration and status logbook, temperature compensation, control input (e.g. hold function, flow alarm)
Approvals	CSA general purpose

Hygienic sensors

	Hygienic pH sensor for food, beverage and pharma industry	Conductive conductivity sensor with hygienic connection	Hygienic sensor for inductive conductivity measurements with EHEDG certificate
	OPTISENS PH 8500 HYG	**OPTISENS COND 7200**	**OPTISENS IND 7000**
			
Parameter	pH	Conductivity (conductive)	Conductivity (inductive)
Type	12/120 mm length PG 13.5	Two-electrode measuring cell with integrated temp. sensor	Inductive measuring cell with integrated temp. sensor
Measuring range	0...14 pH	0.05 µS/cm – 10 µS/cm (C=0.01) 0.001 mS/cm – 1 mS/cm (C=0.1)	0.5...2000 mS/cm
Process temperature	0...+140°C; +32...+284°F	-10...+135°C; +14...+275°F	-10...+125°C (briefly +140°C); +14...+140°F (briefly +284°F)
Process pressure	12 bar; 174 psi	16 bar; 232 psi (at +25°C; +77°F)	max. 10 bar; 145 psi (at +80°C; +176°F)
Process connections	-	Tri-Clamp DN25	MK DN56/60 milk cone; DN40/125 Varivent; G1 1/2, 2
Min. conductivity	>100 µS/cm	-	-
Installation conditions	Pipe-installations Immersion installations	Pipe-installations	Pipe-installations
Temperature sensor	Pt1000	-	-
Materials	S-glass, EPDM (FDA), SS 1.4571	Stainless steel	PEEK
Diaphragm	Ceramic	-	-
Connector	VP connector	M 12 connector	Attached cable (core end sleeves)
Cables	pH/ORP-W VP 8.0 5/10 m; 16.4/33 ft	COND-W-7200-M12 (10 m; 33 ft)	Attached cable (10 m; 33 ft)
Certificates	Biocompatibility/FDA	Material certificate 3.1, FDA/ASTM	EHEDG/FDA

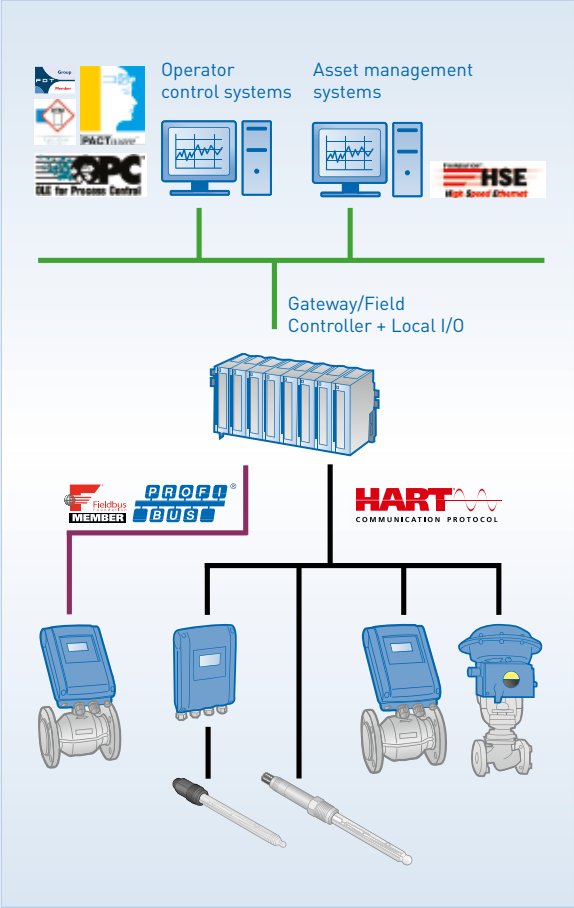
Beyond the highest requirements

Communication at KROHNE: Open for the future

Industrial automation in the process industry has been undergoing rapid change for the past twenty years. This has also affected industrial measurement technology.

Where centralised and largely self-contained structures once dominated, today the pace is set by intelligent, decentralised architectures. So, system concepts in which the products of a variety of manufacturers work harmoniously together are a reality via open, standard interfaces such as HART®, PROFIBUS® and FOUNDATION™ fieldbus.

KROHNE has been actively following this development for years, whether we are talking about flow measurement, level measurement, temperature measurement or analytical measuring technology. All KROHNE field devices are open for the future. They communicate reliably with asset management systems, control systems and PCs and can also be used for a variety of control and regulating tasks.



Integration is a top priority at KROHNE

KROHNE field devices meet all of the prerequisites for integration into modern plant asset management systems, based on integration technologies such as DD/EDD and FDT/DTM.

What's so special about FDT/DTM? For the first time, it makes open, bus-independent integration of field technology into a plant asset management system a reality.

This is without a doubt a milestone for industrial communication and KROHNE, a long-standing member of PACTware and the FDT group, has played and continues to play a significant role. So it is no wonder that we have made DTMs available for our field units with HART® and/or PROFIBUS® interfaces since the beginning of 2003.

Planning tool –
Three steps to a customised tender document

When planning new systems, the speedy and accurate compilation of lists of products and services in the field of measurement technology always calls for information that is up-to-date and complete.

To support its customers, KROHNE has developed an online tender tool based on its 45 years' of knowledge and expertise in the water and wastewater sectors.

The planning tool is tailored to the needs of plant planners in engineering offices who are responsible for creating complete contract specifications.

When the work is finished, all it takes is a few clicks of the mouse to complete the tender documents. Documents are precisely formulated, containing all of the technical details you and we need.

Go to www.krohne-water.com for more information.

KROHNE services:
Serving you from development to after sales

For KROHNE, service starts with the first point of customer contact and lasts throughout the lifecycle of your plant.

Together with you, we work out solutions perfectly tailored to your individual specifications and requirements, starting with telephone advice about configuring and installing products and continuing to our extensive after-sales offering.

And if you ever experience any problems, you can count on an extremely rapid response from our team of experienced service and application engineers.

Overview buffer and reference solutions	
Parameter	**Solution**
pH	pH 4 red pH 7 green pH 10 blue
Conductivity	147 µS/cm 1413 µS/cm 25 mS/cm
Redox	468 mV 220 mV
Dissolved oxygen	Sodium sulfite
Sensor cleaning	Pepsin Thiocarbamide

Field service

- Consulting
- Commissioning
- Maintenance
- Calibration
- Validation

Supply of spare parts and consumables

- Calibration solutions
- Electrodes
- Electrolytes
- Etc.

KROHNE
Product overview

- Electromagnetic flowmeters
- Variable area flowmeters
- Ultrasonic flowmeters
- Mass flowmeters
- Vortex flowmeters
- Flow controllers
- Level meters
- Temperature meters
- Pressure meters
- Analysis products
- Products and systems for the oil & gas industry
- Measuring systems for the marine industry

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