



OPTISENS COND 1200 Technical Datasheet

- Reliable conductive conductivity sensor for use in water analysis
- Wide measuring range for all water applications
- Rugged sensor design with integrated temperature sensor

The documentation is only complete when used in combination with the relevant documentation for the signal converter.

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1.1 Conductivity sensor for water analysis

The conductivity sensor **OPTISENS COND 1200** have a standardised robust design and a long lifespan. In combination with the **MAC 100** signal converter, it is possible to create an extremely reliable low-cost measurement system, which is suitable for a wide range of water analysis measurement tasks.

The conductive measurement principle is characterised by high sensitivity, especially at low conductivity values. For this reason, the **OPTISENS COND 1200** is perfect for low-contaminated, non-corrosive media such as pure water, steam and cooling water.

Also a special industrial version with graphite electrodes for media separation, drinking water purification and wastewater checks/treatment is available.



- ① Process connection
- ② Shaft with two-electrode measuring cell
- ③ 4-pin right-angle plug (Hirschmann plug)

Highlights

- Available with a large range of cell constants for various applications
- Conductive measurement with two stainless steel, titanium or graphite electrodes
- Integrated temperature sensor
- Standard design for all cell constants
- Long lifespan
- Suitable for connection to the MAC 100 signal converter

Industries

- Water industry
- Power plants
- Metal industry and mining
- Paper industry
- Chemicals industry

Applications

- Quality control of steam and cooling water
- Monitoring of filters / ionic exchangers
- Quality control of pure water, drinking water
- Media separation, drinking water purification, wastewater checks/treatment

1.2 Design and options

MAC 100 Multiparameter signal converter for liquid analytical measurements



A complete measuring system consists of:

- MAC 100 Multiparameter signal converter
- 1 or 2 sensors
- Mounting holders

Up to two sensors (for identical or different parameters) can be connected to the signal converter.

The signal converter MAC 100 can be adapted perfectly for your requirements: you specify the number and type of signal inputs and outputs you define the complexity of the measuring point and the number of parameters. The standardised user interface also speeds up commissioning of the device and opens access to a wide range of diagnostic functions for devices and processes.

OPTISENS COND 1200



The **OPTISENS COND 1200** is manufactured using different sensor shaft and electrode materials to cover a wide range of applications.

OPTISENS COND 1200 (W) is available with PVDF body and stainless steel electrodes.

OPTISENS COND 1200 (PW) is available with PVDF or stainless steel body and stainless steel or titanium electrodes.

OPTISENS COND 1200 (GF) is available with PVDF body and graphite electrodes.

Available cell constants c (depending on the sensor type)

- $c=0.01$ (0.05...10 $\mu\text{S}/\text{cm}$)
- $c=0.05$ (0.1...200 $\mu\text{S}/\text{cm}$)
- $c=0.1$ (0.001...1 mS/cm)
- $c=0.2$ (1...2000 $\mu\text{S}/\text{cm}$)
- $c=1$ (1...15/20 mS/cm)

Made to Fit

Holders to SENSOFIT 1000

As a complete provider for water analysis, we naturally offer a complete range of holders. In addition to immersion holders, there is also a range of flow-through holders and adapters for process connections in a wide range of materials.

For the OPTISENS COND 1200 sensor type for the following individual holders are available:

- SENSOFIT IMM 1000 for OPTISENS COND 1200 (W) with $c=0.05/0.2/1$
- SENSOFIT FLOW 1000 for OPTISENS COND 1200 (W) with $c=0.05/0.2/1$

Special versions for special operating conditions or other materials are available on request.

For further information please consider the technical datasheets

1.3 Conductive measurement

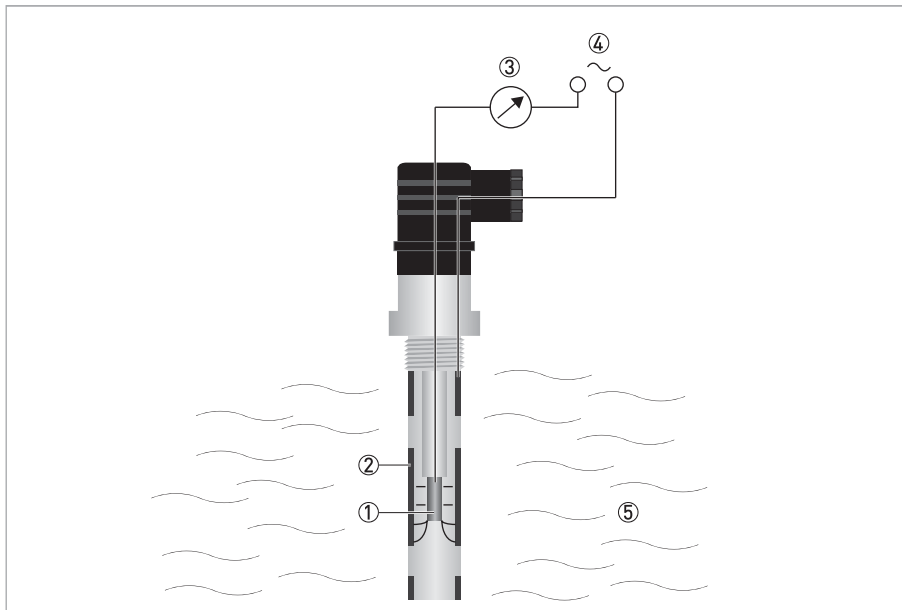


Figure 1-1: Measuring principle for conductivity measurement

- ① Inner electrode
- ② Outer electrode
- ③ Current measurement
- ④ Power supply
- ⑤ Measuring medium

The principle of conductivity measurement is defined as the capacity of a solution to conduct an electrical current between two electrodes. For determining the electrolytic conductivity it is necessary to record the number of dissolved ions summarily. The parameter serves as a scale for water purity and is given in Siemens. As there are two open cells, mutual voltage is being produced. This one on its part generates electricity depending on the resistance of the medium. As the medium is in direct contact with the electrode, the medium reacts faster to differences in measuring values. The integrated temperature sensor compensates the conductivity.

Using Ohm's law: $\text{Ohm} = \text{Voltage} / \text{Current}$, the resistance of a liquid can be determined by measuring the current while keeping voltage constant. Specific conductivity is defined by $1 / \text{resistance}$. The unit of measurement is Siemens and is normally expressed in $\mu\text{S}/\text{cm}$ or mS/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 larger 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 $c = L/A$.

2.1 Technical data

Measuring system

Measurement principle	Conductive conductivity
Measuring range	OPTISENS COND 1200 (W) 0.1...200 $\mu\text{S}/\text{cm}$ (c=0.05) 1...2000 $\mu\text{S}/\text{cm}$ (c=0.2) 1...20 mS/cm (c=1)
	OPTISENS COND 1200 (PW) 0.05...10 $\mu\text{S}/\text{cm}$ (c=0.01) 0.001...1 mS/cm (c=0.1)
	OPTISENS COND 1200 (GF) 10 $\mu\text{S}/\text{cm}$...15 mS/cm (c=1)

Materials

Construction	OPTISENS COND 1200 (W): Body: PVDF Cell: Stainless steel (1.4571)
	OPTISENS COND 1200 (PW): Body: PVDF Cell: Stainless steel (1.4571) or titanium
	OPTISENS COND 1200 (GF): Body: PVDF Cell: Graphite (GF)
Sensor options	With integrated Pt100 temperature sensor
Process connection	OPTISENS COND 1200 (W): G3/4 A male thread G1/2 A male thread for immersion holder
	OPTISENS COND 1200 (PW/GF): G3/4 A male thread G1/2 A male thread G1 A male thread 3/4-14 NPT male thread

Measuring accuracy

Conductivity accuracy	OPTISENS COND 1200 (W): +/- 2% full scale ①
	OPTISENS COND 1200 (PW): +/- 10% from the nominal value ①
	OPTISENS COND 1200 (GF): +/- 10% from the nominal value ①

Operating conditions

Temperature range	OPTISENS COND 1200 (W/PW): 0...+135°C / +32...+275°F
	OPTISENS COND 1200 (GF): 0...+130°C / +32...+266°F
Max. operating pressure	OPTISENS COND 1200 (W/PW): 16 bar at +25°C, 9 bar at +60°C / 232 psi at +77°F, 130.5 psi at +140°F
	OPTISENS COND 1200 (GF): 16 bar at +25°C, 9 bar at +60°C / 232 psi at +77°F, 130.5 psi at +140°F

① Depending on the production conditions, the cell constant can deviate from the nominal value. This deviation can be compensated at the signal converter.

Electrical connection

Cable	Cable COND-W 1200
Sensor-cable connection	OPTISENS COND 1200 (W/PW/GF): 4-pin connector (Hirschmann)
	OPTISENS COND 1200 (W): Immersion version with attached cable 10 m / 33 ft
Cable length	5 m / 16.5 ft
	10 m / 33 ft
	15 m / 49 ft
	20 m / 65 ft
Cable options	Core end sleeve

2.2 Dimensions

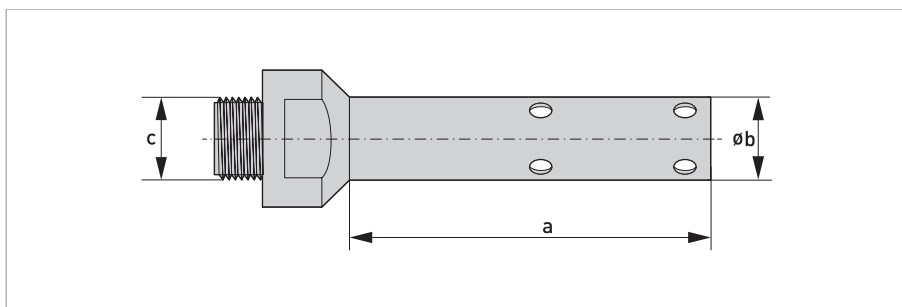


Figure 2-1: OPTISENS COND 1200 (W) immersion version

	Dimensions [mm]	Dimensions [inch]
a	100	3.94
b	Ø 20	Ø 0.79
c	G1/2 A	

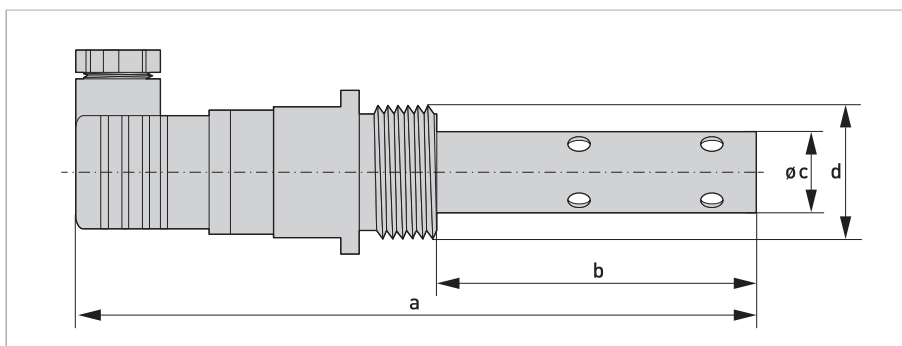


Figure 2-2: OPTISENS COND 1200 (W)

	Dimensions [mm]	Dimensions [inch]
a	186	7.32
b	100	3.94
c	Ø 20 mm	Ø 0.79
d	G3/4 A	

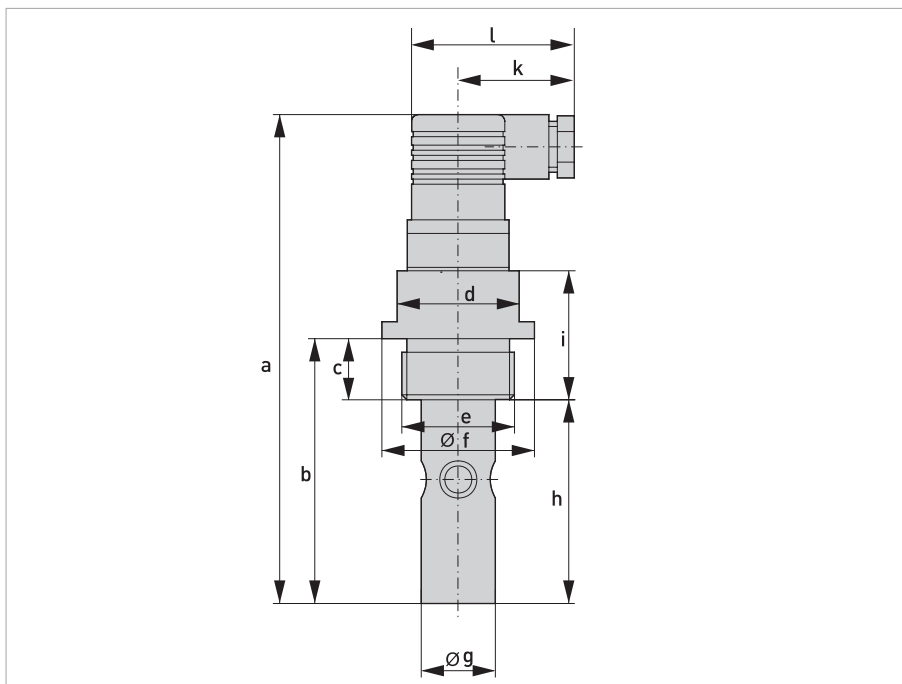


Figure 2-3: OPTISENS COND 1200 (PW)

Dimension in mm										
a	b	c	d	e	f	g	h	i	k	l
145	80	20	36	3/4-14NPT	45	23.8	60	38	37	50
	78	18		G1 A		22				
	76	16		G3/4 A		22				
	74	14		G1/2 A		16				

Dimension in inch										
a	b	c	d	e	f	g	h	i	k	l
5.71	3.15	0.79	1.42	3/4-14NPT	1.77	0.94	2.36	1.5	1.46	1.97
	3.07	0.71		G1 A		0.87				
	3	0.63		G3/4 A		0.87				
	2.91	0.55		G1/2 A		0.63				

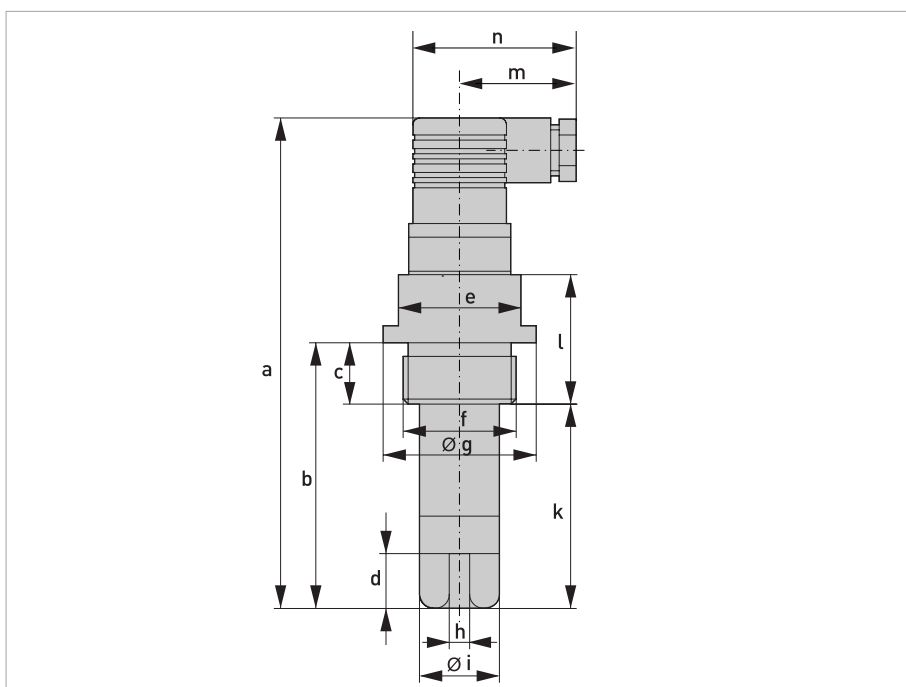


Figure 2-4: OPTISENS COND 1200 (GF)

Dimension in mm												
a	b	c	d	e	f	g	h	i	k	l	m	n
145	80	20	16	36	3/4-14NPT	45	6	23.5	60	38	37	50
	78	18			G1 A							
	76	16			G3/4 A							

Dimension in inch												
a	b	c	d	e	f	g	h	i	k	l	m	n
5.71	3.15	0.79	1.42	1.42	3/4-14NPT	1.77	0.24	0.93	2.36	1.5	1.46	1.97
	3.07	0.71			G1 A							
	3	0.63			G3/4 A							

2.3 Combination sensor/signal converter

Sensor type	Measured parameter	Measuring principle	Signal converter	
			Input A	Input B
pH	pH value	Potentiometric	X	X
ORP	ORP value	Potentiometric	X	X
Cl ₂	Free chlorine	Amperometric	X	-
ClO ₂	Chlorine dioxide	Amperometric	X	-
O ₃	Ozone	Amperometric	X	-
DO	Dissolved oxygen	Amperometric ①	X	-
		Optical ①	X	-
COND	Conductivity/ specified resistance	Conductive	X	X
IND	Toroidal conductivity	Inductive	X	X
TUR	Turbidity	Optical ①	X	-

① only for single channel version

3.1 Notes on installation

Inspect the cartons carefully for damages or signs of rough handling. Report damage to the carrier and to the local office of the manufacturer.

Do a check of the packing list to make sure that you have all the elements given in the order.

Look at the device nameplate to ensure that the device is delivered according to your order. Check for the correct supply voltage printed on the nameplate.

3.2 Intended use

Responsibility for the use of the measuring devices with regard to suitability, intended use and corrosion resistance of the used materials against the measured fluid lies solely with the operator.

The manufacturer is not liable for any damage resulting from improper use or use for other than the intended purpose.

The intended use of OPTISENS COND 1200 conductivity sensor is the measurement of conductive liquids. The sensor is suitable for connection to the MAC 100 signal converter.

3.3 Pre-installation requirements

Never touch or scratch the sensor shaft or the inner electrode.

Make sure that the sensor shaft and the inner electrode are clean and dust-free. If necessary, clean the sensor as described in the manual of the sensor.

- *Install the sensor against the flow to ensure direct exposure of the electrodes.*
- *Install the sensor only in T-pieces or flow through holders of the manufacturer.*
- *Avoid air getting trapped around the sensor.*
- *Avoid solids collection around the electrodes.*

3.4 Installing the sensor

3.4.1 General installation instructions

Ensure that the pipe is without pressure before installing or removing a sensor!

This installation procedure is only recommended for very clean water without any particles in the water. Otherwise turn the flow-through holder and be sure that the tube is completely filled with water, otherwise the measuring reading is wrong.

During installation you should fix a shut-off valve in front of and behind the instrument so that the sensor can be taken out of the bypass in case of check.

To achieve reliable measuring results, note the following items:

- *Always install the sensor in the designated flow through holder.*
- *The sensor must always have full contact with the measuring medium.*

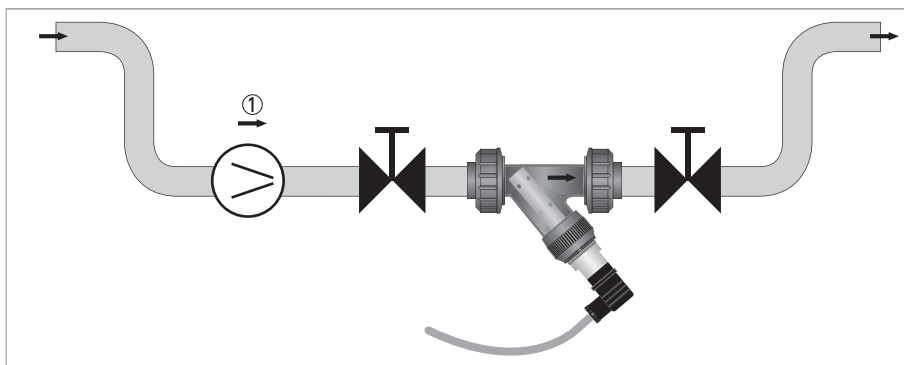


Figure 3-1: Installation requirements

① Flow direction

Installation recommendation

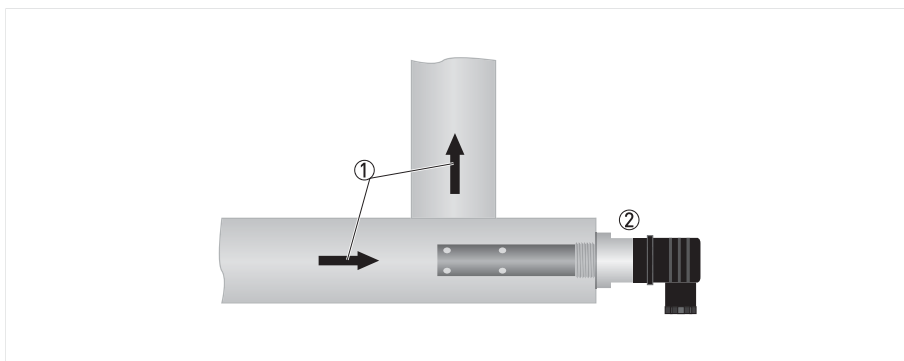


Figure 3-2: Typical installation

- ① Flow direction
- ② Ordered sensor

- Installation against the flow to ensure direct exposure of the electrodes.

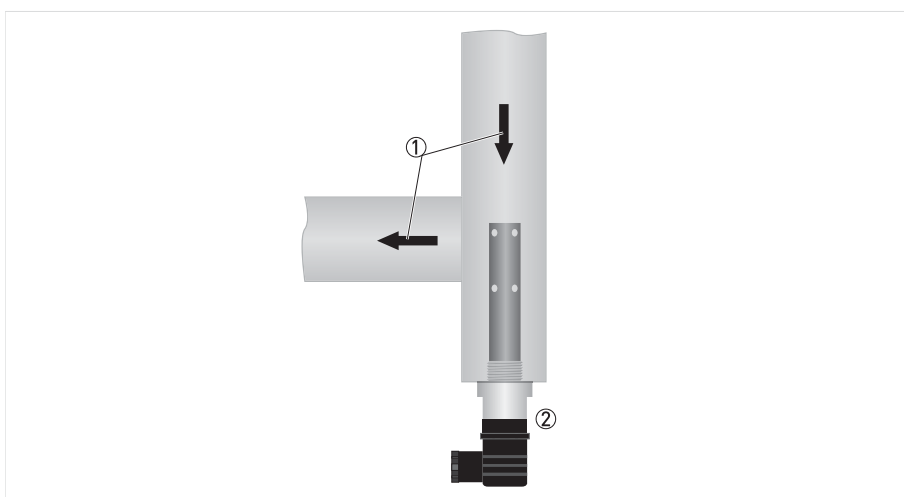


Figure 3-3: Installation for clean water

- ① Flow direction
- ② Ordered sensor

- This installation is only recommended if there are no particles or air bubbles in the pipe.

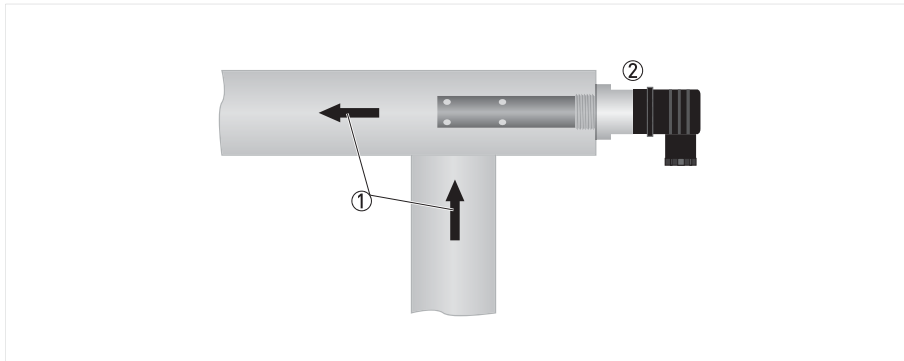


Figure 3-4: Installation for clean water

- ① Flow direction
- ② Ordered sensor

- This installation is only recommended if the pipe is completely filled.

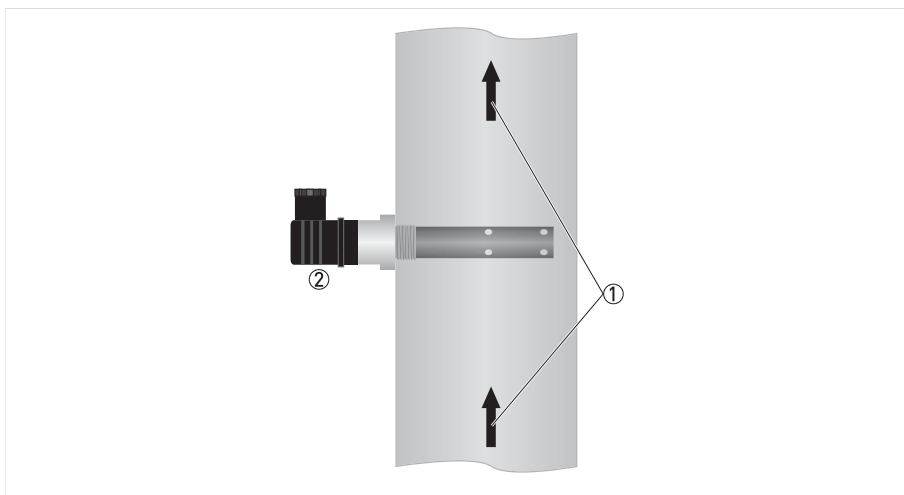


Figure 3-5: Possible installation

- ① Flow direction
- ② Ordered sensor

- This installation is only recommended if the pipe is completely filled.
- Consider the diameter of the pipe, i.e. compare pipe DN with insertion length of the sensor shaft.

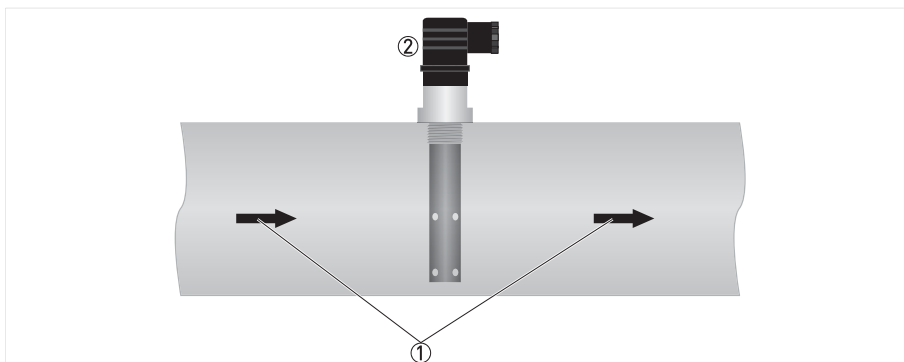


Figure 3-6: Possible installation

- ① Flow direction
- ② Ordered sensor

- This installation is only recommended if the pipe is completely filled and if there are no particles or air bubbles in the pipe.

3.4.2 Mounting to a flow through holder

Ensure that the pipe is without pressure before installing or removing a sensor!

The flow through holder is an optional accessory and not part of the standard scope of delivery. It has to be installed horizontally in pump or sample lines or directly in the process.

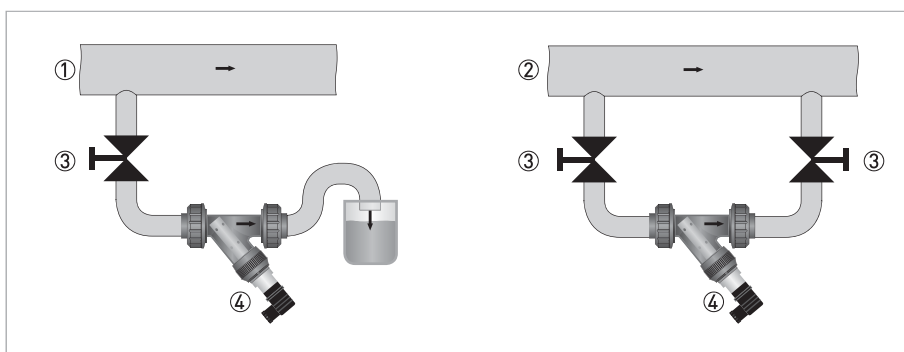


Figure 3-7: Possible mounting positions of the flow-through holder

- ① Mounting in an outlet pipe
- ② Mounting in a bypass pipe
- ③ Shut-off valve
- ④ Sensor installed in flow through holder

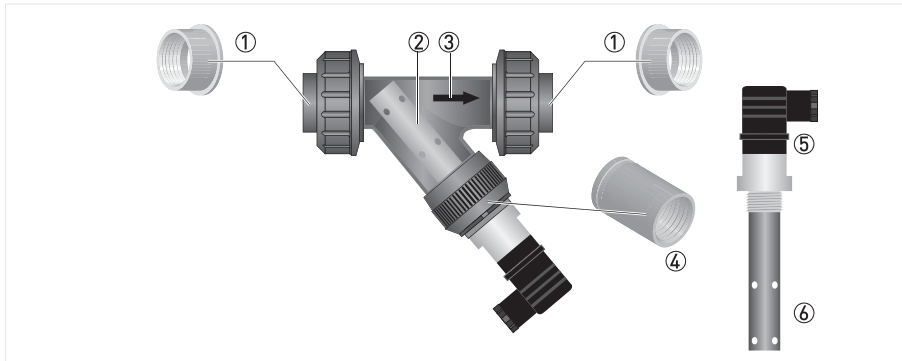
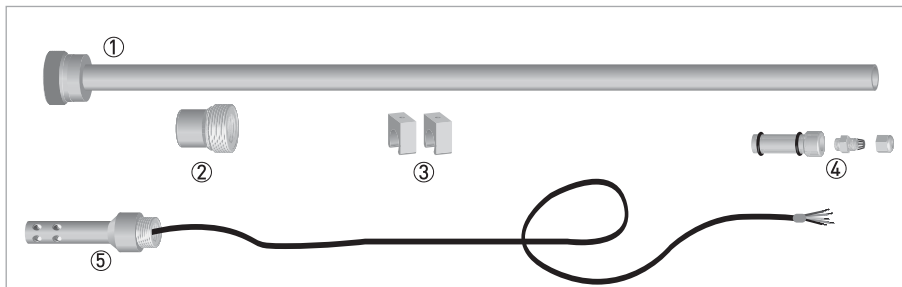


Figure 3-8: Installing the sensor into the flow-through holder

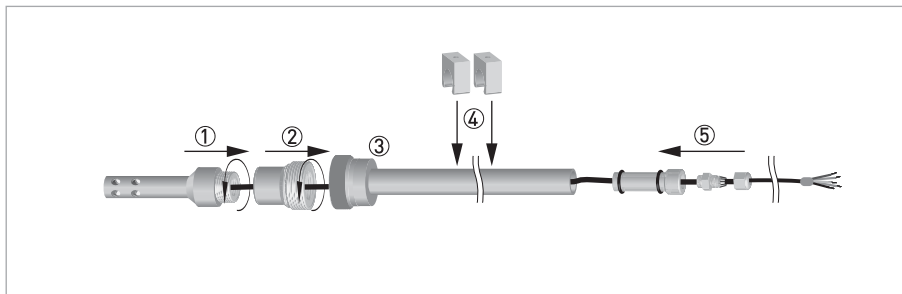
- ① Process connection
- ② Protective cage
- ③ Flow direction
- ④ Female thread
- ⑤ 4-pin-right-angle plug
- ⑥ Sensor

- Make sure that the plug ⑤ is connected to the sensor ⑥.
- Screw the sensor into the female thread ④ of the flow through holder. Tighten the sensor by hand.

3.4.3 Mounting sensor into immersion holder



- ① Immersion holder
- ② Sensor-holder connector
- ③ Clamps
- ④ Caps with cable gland
- ⑤ Sensor (only for immersion version with attached cable)

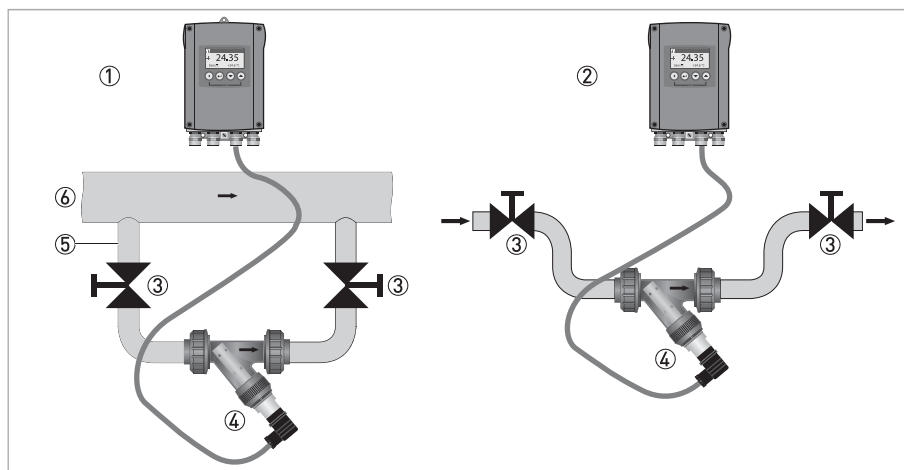


- ① Sensor with attached cable
- ② Sensor-holder connector
- ③ Immersion holder
- ④ Clamps onto immersion holder
- ⑤ Cap with cable gland

- Pull the cap with cable gland ⑤ off the immersion holder
- Push the sensor cable through the sensor-holder connector ②, the immersion holder ③ and the cap with cable gland ⑤.
- Screw the sensor-holder connector ② into the immersion holder ③. Then screw the sensor ① into the sensor-holder connector.
- Push the cap with cable gland onto the immersion holder again ④.

3.5 Examples of a typical measuring point

The following examples each show the signal converter, a sensor with integrated temperature sensor, and the flow-through or immersion holder.



- ① Bypass measurement
- ② Inlet measurement
- ③ Shut-off valve
- ④ Flow-through holder with sensor
- ⑤ Bypass pipe
- ⑥ Main pipe

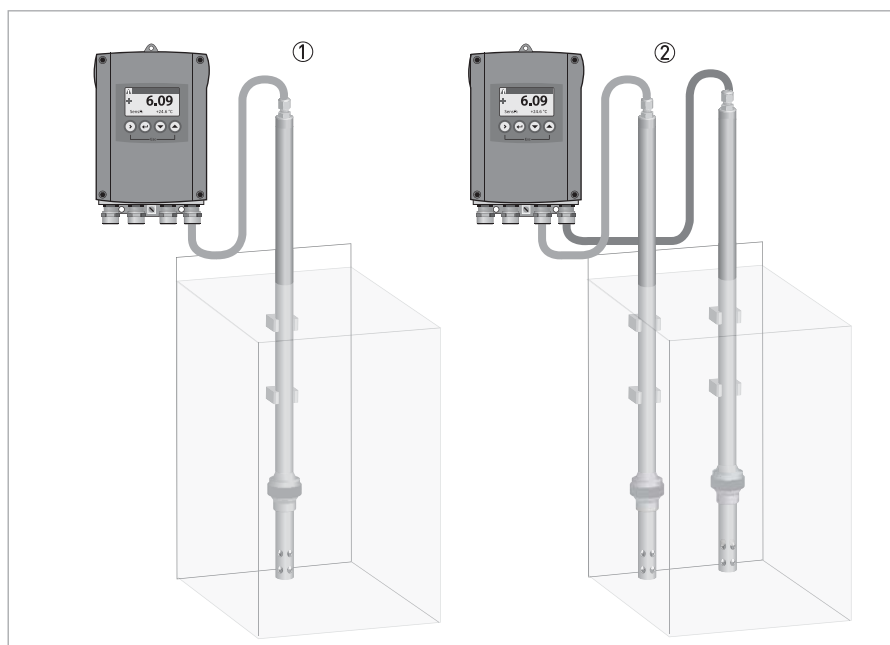


Figure 3-9: Installation with signal converter

- ① Single channel version
- ② Dual channel version

4.1 Safety instructions

All work on the electrical connections may only be carried out with the power disconnected. Take note of the voltage data on the nameplate!

Observe the national regulations for electrical installations!

Observe without fail the local occupational health and safety regulations. Any work done on the electrical components of the measuring device may only be carried out by properly trained specialists.

Look at the device nameplate to ensure that the device is delivered according to your order. Check for the correct supply voltage printed on the nameplate.

4.2 Connecting the cable to the sensor

*Moisture inside the sensor connector must be avoided! Moisture will shortcut the mV signal between the electrodes and deliver erratic readings!
If moisture has entered the connector dry it with air (e.g. hair blower).*

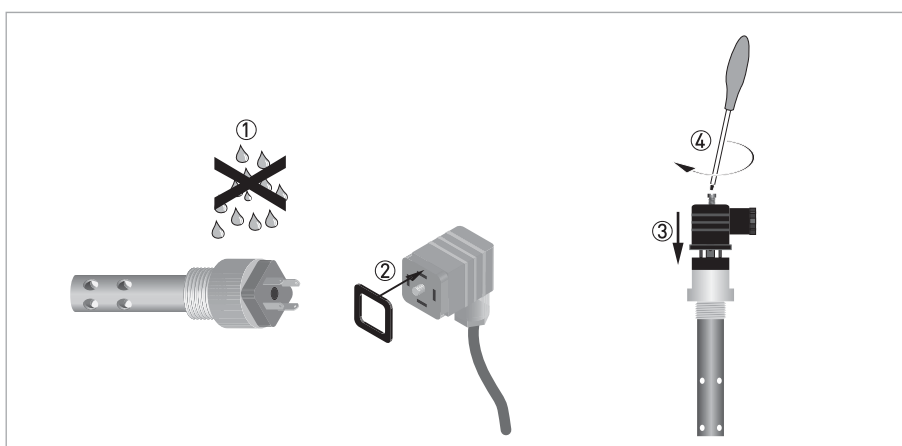


Figure 4-1: Connecting the Hirschmann plug to the sensor

Ensure that both cable and sensor connector are absolutely dry ①.

Make sure that the seal is positioned on the sensor connector ②.

Push the cable connector ③ on the sensor.

Screw the cable connector to the sensor and tighten it with a screw driver ④.

4.2.1 Cable assign of a Hirschmann plug

Do not shorten the cable length. This can influence the measuring accuracy.

The given colours only refer to the delivered cables! When using cables of a different provider, take into account the manufacturer's notes concerning the cable colour and designation.

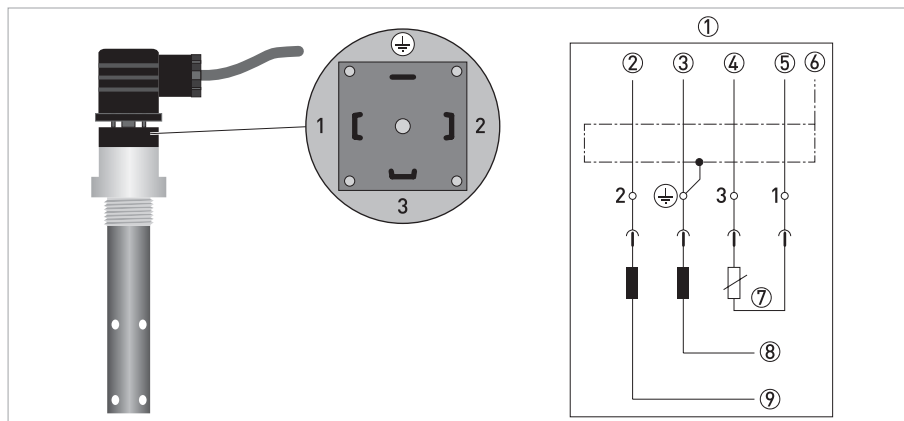


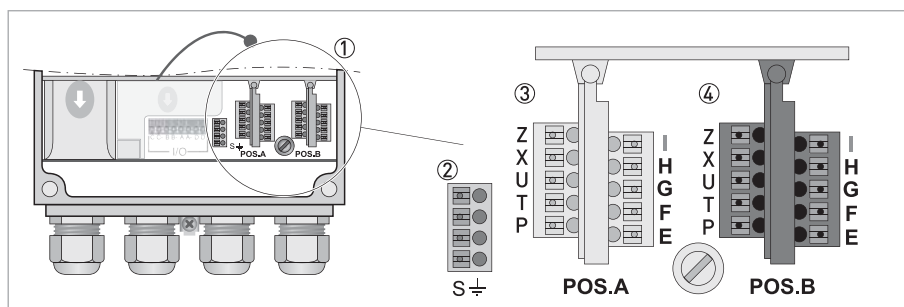
Figure 4-2: Cable assign of a Hirschmann plug

- ① Cable LIYCY 4x0.5 mm
- ② White
- ③ Brown
- ④ Yellow
- ⑤ Green
- ⑥ Shield
- ⑦ Pt100 sensor
- ⑧ Outer electrode
- ⑨ Inner electrode

4.3 Connecting the sensor cable to the signal converter

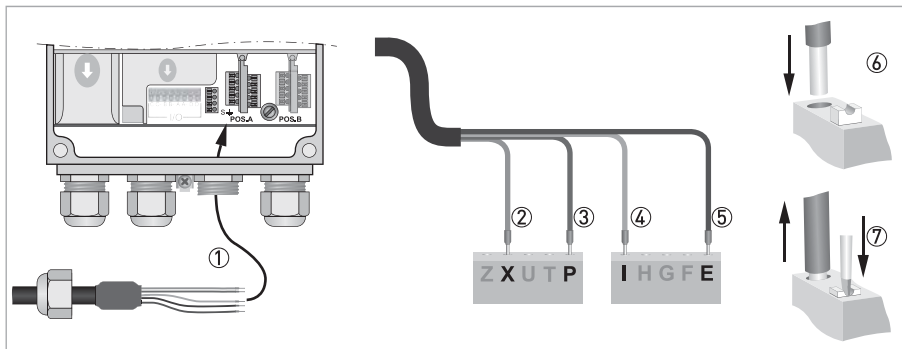
All work on the electrical connections may only be carried out with the power disconnected. Take note of the voltage data on the nameplate!

Look at the device nameplate to ensure that the device is delivered according to your order. Check for the correct supply voltage printed on the nameplate.



- ① Sensor connection terminals
- ② Terminal block S (protective earth)
- ③ Terminal block A: terminals for sensor
- ④ Terminal block B: terminals for sensor

When ordering the single channel version, only the interface "Pos.A" is populated. In the version with dual channels the interfaces "Pos.A" and "Pos.B" are populated.



Connecting the sensor cable to the signal converter

- Thread the sensor cable through the middle right cable gland ①.
- Push the wire ⑦ into the terminal block Pos. A or Pos. B as described in the chart.
- To remove a cable, press down the white clip ⑧ on the corresponding terminal and pull the cable out.

Wire	Terminal block Pos. A / B
Green ②	X
Yellow ③	P
White ④	I
Brown ⑤	E

5.1 Order code

The characters of the order code highlighted in light grey describe the standard.

VGA H	4	Sensor type	
		1	OPTISENS COND 1200 (W)
		2	OPTISENS COND 1200 (GF)
		A	OPTISENS COND 1200 (PW)
		Measuring range	
		1	0.1...2000 µS/cm (c=0.05) (only OPTISENS COND 1200 W)
		2	1...2000 µS/cm (c=0.2) (only OPTISENS COND 1200 W)
		3	1...20 mS/cm (c=1) (only OPTISENS COND 1200 W)
		4	10 µS/cm...15mS/cm (c=1) (only OPTISENS COND 1200 GF)
		A	0.05...10µS/cm (c=0.01) (only OPTISENS COND 1200 PW)
		B	0.001...1 mS/cm (c=0.1) (only OPTISENS COND 1200 PW)
		Sensor features	
		1	Body: PVDF, Cell: Stainless Steel (1.4571) (only OPTISENS COND 1200 W / PW)
		2	Body: PVDF, Cell: Titanium (only OPTISENS COND 1200 PW)
		5	Body: PVDF, Cell: Graphite (only OPTISENS COND 1200 GF)
		Process conditions	
		1	0...+135°C, 16 bar at +25°C and 9 bar at +60°C +32...+275°F, 232 psi at +77°F and 130,5 psi at +140°F
		2	0...+130°C, 16 bar at +25°C and 9 bar at +60°C +32...+266°F, 232 psi at +77°F and 130,5 psi at +140°F (only OPTISENS COND 1200 GF)
		Process connection	
		1	G3/4 A male thread
		2	for immersion holder (only OPTISENS COND 1200 W)
		3	G1/2 A male thread (only OPTISENS COND 1200 PW)
		4	G1 A male thread (only OPTISENS COND 1200 PW / GF)
		5	3/4-14 NPT male thread (only OPTISENS COND 1200 PW / GF)
		Sensor options	
		1	Pt100
		Sensor-cable connection	
		1	4-pin connector (Hirschmann)
		4	Attached cable for immersion installation (only OPTISENS COND 1200 W)
		Cable	
		0	none
		1	Cable COND-W 1200 (for immersion version only)
		Cable features	
		0	none
		1	Standard (for immersion version only)

[illegible]

5.2 Spare parts, consumables and accessories

Spare parts	Order code
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OPTISENS COND 1200 (W)

OPTISENS COND 1200-0.05-SS-PF-G3/4A	VGA H 4 1111111000000
OPTISENS COND 1200-0.2-SS-PF-G3/4A	VGA H 4 1211111000000
OPTISENS COND 1200-1-SS-PF-G3/4A	VGA H 4 1311111000000
OPTISENS COND 1200-0.05-SS-PF-IMM	VGA H 4 1111214113100
OPTISENS COND 1200-0.2-SS-PF-IMM	VGA H 4 1211214113100
OPTISENS COND 1200-1-SS-PF-IMM	VGA H 4 1311214113100

OPTISENS COND 1200 (PW)

OPTISENS COND 1200-0.01-SS-PF-G3/4A	VGA H 4 AA11111000000
OPTISENS COND 1200-0.10-SS-PF-G3/4A	VGA H 4 AB11111000000
OPTISENS COND 1200-0.01-TI-PF-G3/4A	VGA H 4 AA21111000000
OPTISENS COND 1200-0.10-TI-PF-G3/4A	VGA H 4 AB21111000000
OPTISENS COND 1200-0.01-SS-PF-3/4NPT	VGA H 4 AA11511000000
OPTISENS COND 1200-0.1-SS-PF-3/4NPT	VGA H 4 AB11511000000
OPTISENS COND 1200-0.01-TI-PF-3/4NPT	VGA H 4 AA21511000000
OPTISENS COND 1200-0.1-TI-PF-3/4NPT	VGA H 4 AB21511000000
OPTISENS COND 1200-0.01-SS-PF-G1/2A	VGA H 4 AA11311000000
OPTISENS COND 1200-0.1-SS-PF-G1/2A	VGA H 4 AB11311000000
OPTISENS COND 1200-0.01-TI-PF-G1/2A	VGA H 4 AA21311000000
OPTISENS COND 1200-0.1-TI-PF-G1/2A	VGA H 4 AB21311000000
OPTISENS COND 1200-0.01-SS-PF-G1A	VGA H 4 AA11411000000
OPTISENS COND 1200-0.1-SS-PF-G1A	VGA H 4 AB11411000000
OPTISENS COND 1200-0.01-TI-PF-G1A	VGA H 4 AA21411000000
OPTISENS COND 1200-0.1-TI-PF-G1A	VGA H 4 AB21411000000

Spare parts	Order code
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OPTISENS COND 1200 (GF) with graphite electrode

OPTISENS COND 1200-1.0-GF-PF-G3/4A	VGA H 4 2452111000000
OPTISENS COND 1200-1.0-GF-PF-G1A	VGA H 4 2452411000000
OPTISENS COND 1200-1.0-GF-PF-3/4NPT	VGA H 4 2452511000000

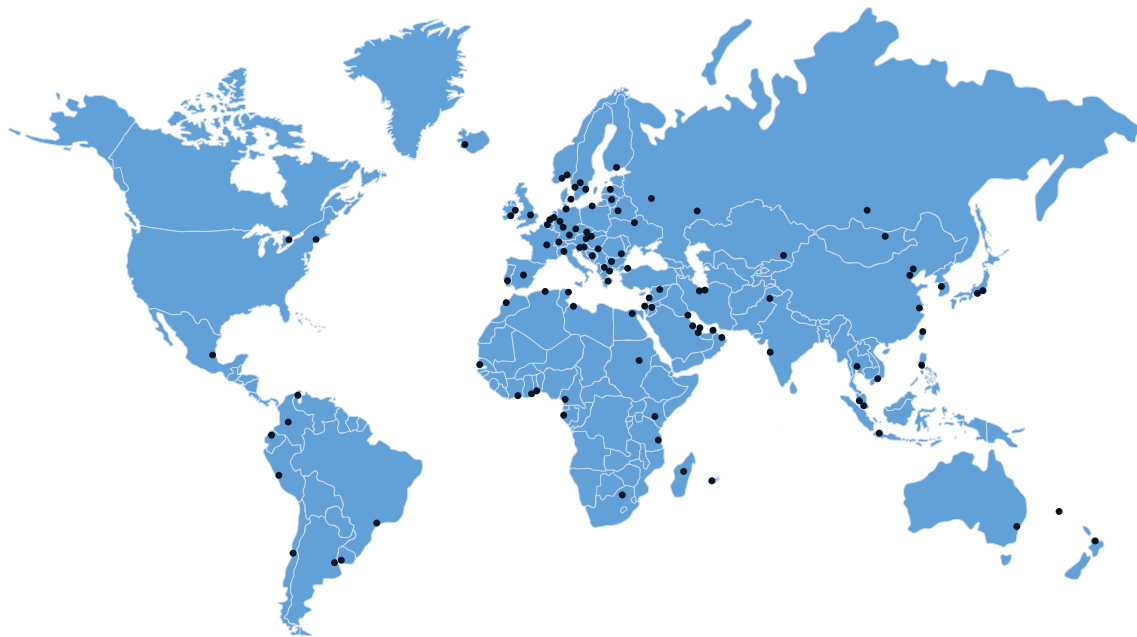
Consumables	Order code
Standard solid solution 15 μ S/cm, 1 x 250 ml	XGA S 030010
Standard solid solution 147 μ S/cm, 1 x 250 ml	XGA S 030020
Standard solid solution 1413 μ S/cm, 1 x 250 ml	XGA S 030030
Standard solid solution 25 mS/cm, 1 x 250 ml	XGA S 030040

Accessories	Order code
SENSOFIT IMM 1000 immersion holder	Please see technical datasheet SENSOFIT IMM 1000
SENSOFIT FLOW 1000 flow-through holder	Please see technical datasheet SENSOFIT FLOW 1000
OPTISENS Cable COND-W-1200-5 (5m/16.5ft)	XGA W 0 21121
OPTISENS Cable COND-W-1200-10 (10m/33ft)	XGA W 0 21131
OPTISENS Cable COND-W-1200-15 (15m/49.5ft)	XGA W 0 21141
OPTISENS Cable COND-W-1200-20 (20m/66ft)	XGA W 0 21151









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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