OPTISENS PAS 2000 Technical Datasheet

pH and ORP sensors

- Digital sensor of OPTISENS 2000 Series for use in waste water applications
- Robust design and automated self cleaning system
- Low maintenance requirements due to long life span and easy exchangeable electrodes

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

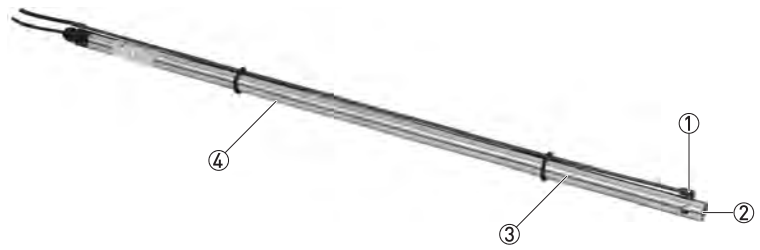
KROHNE

1.1 Digital pH and ORP sensor for waste water applications

As part of the **OPTISENS 2000** sensor series, the **PAS 2000** pH and ORP sensors are equipped with digital communication and automated spray cleaning.

These unique features perfectly enable the **PAS 2000** sensors for operation under harsh conditions as to be found in industrial and municipal waster water treatment facilities.

Low maintenance requirements and long service intervals, in conjunction with quick installations and automated operation, are unique qualities which maximize an optimal cost of ownership.



① Flush nozzle for automatic cleaning
② pH or ORP electrode
③ Build-in temperature sensor
④ Stainless steel sensor housing

Highlights

- Robust stainless steel enclosure
- Automatic spray cleaning
- Build-in temperature sensor
- Pluggable electrode holder for easy exchange of the low maintenance combination electrodes
- Calibration in a few simple steps
- Digital communication with the MAC 080 signal converter
- Up to four OPTISENS 2000 sensors can be connected to one MAC 080 signal converter

Industries

- Municipal and industrial waste water treatment facilities
- Water monitoring stations

Applications

- Monitoring and control of water treatment and neutralization processes (raw sewage, aeration basins, SBR systems)
- Monitoring of water quality of final effluents

1.2 Options and versions

Modular concept and digital technology

A complete measuring system consists of:
- MAC 080 multiparameter converter
- 1 (or up to 4) OPTISENS 2000 sensors
- Solenoid valve to control spray cleaning
- Mounting assemblies

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

Due to digital communication the length of the sensor cable can be extended to max. 100 m / 328 ft without any signal losses. This provides more flexibility in terms of cabling and for the selection of the optimum measuring location, in particular with multisensor measuring points.

PAS 2000 sensors for pH or ORP measurements

The OPTISENS PAS 2000 is available in two versions
- PAS 2000 pH for measuring pH
- PAS 2000 ORP for measuring ORP values (mV)

Robust design, automated cleaning, easy maintenance

The rugged stainless steel body in conjunction with the automated spray cleaning of the sensor guarantees reliable measurements with long service intervals.

In addition for easy replacement, the electrode is mounted in a pluggable, sealed cartridge which can be removed from the sensor tip without using any tool. In conjunction with the easy semi-automatic calibration a recalibration or an electrode exchange is just a matter of minutes.

After maintenance the electrode can be easily plugged back into the sensor rod.

Unique mounting assemblies

For installation on side walls of flumes and open channels the MAA 2000 side rail is available.

For detailed information regarding the different mounting assemblies please refer to the technical data sheet "OPTISENS MAA 1000 & 2000 Assemblies".

1.3 Combination of sensor / converter / mounting assembly

	MAC 080 converter	MAA 2000 slide rail
PAS 2000 pH	x	x
PAS 2000 ORP	x	x

1.4 Measuring principle

The pH value is measured with an electrode where pH is expressed as a function of voltage. Today's electrodes often contain both a measuring electrode and a reference electrode, which in combination provide a voltage in linear proportion to the pH value.

Electrodes internally combined with a reference and measuring cell are divided into two categories: gel electrodes and refillable electrodes. The gel electrode, which we provide, is the simpler and less expensive type, compared to refillable electrodes, where you have to add internal solutions at regular intervals.

To compensate for the temperature dependence of the electrode, the temperature of the media is measured by the transmitter and compensated automatically via the converter software.

The temperature can also be read in the converter and used as secondary value when a transmitter is configured to use two analog outputs.

The built-in temperature measurement is not a precision measurement, but shall be seen as an indication.

The temperature compensation can also be set manually to a fixed value via the converter menu. All settings are made in the converter using a self-instructing menu controlled by just three keys. The output signal is frozen when you switch to menu mode so that the output signal will not change during procedures such a re-calibration.

The converter has two 4...20 mA outputs (extendable to four), and relay outputs for alarm and cleaning of the electrode. The current pH/mV values and the temperature measurement of the active sensor are continuously displayed in the display.

Maximum, minimum and average values for the last 24 hours can be obtained by pressing two buttons.

2.1 Technical data

- *The following data is provided for general applications. If you require data that is more relevant to your specific application, please contact us or your local representative.*
- *Additional information (certificates, special tools, software,...) and complete product documentation can be downloaded free of charge from the website (Downloadcenter).*

Measuring system

Measuring principle	Potentiometric measurement using combination electrodes
Field of application	OPTISENS PAS 2000 pH: continuous measurement of pH in waste water applications
	OPTISENS PAS 2000 ORP: continuous measurement of ORP in waste water applications
Measuring range	OPTISENS PAS 2000 pH: 0...14 pH
	OPTISENS PAS 2000 ORP: -1500...+1500 mV (ORP)

Design

Construction	A typical measuring system consists of: • MAC 080 multiparameter converter • 1 (or up to 4) OPTISENS 2000 sensors • Solenoid valves for flushing • MAA 2000 mounting assemblies
Electrode	Design: combination electrode 12 mm / 0.47"; length: 120 mm / 4.72"
	PG13.5 threaded cap
	KCL gel-filled
	Connector: Coax
Flushing	With filtered air or clean water
	Pressure: 2...6 bar / 29...87 psi
	Hose: ¼" external diameter; length: 10 m / 33 ft
	Solenoid valve: available in 230 V and 117 V versions; up to 2 sensors can be connected to one solenoid valve

Measuring accuracy

Measuring error	±1.5% FS (full scale)
Measuring error (temperature)	±0.5°C
Display resolution (in combination with MAC 080)	pH: 0.1 pH (or 0.01 pH in extended mode)
	ORP: 1 mV
	Temperature: 0.1°C / 0.1°F
Reference conditions	
Medium	Water
Temperature	+25°C / +77°F
Pressure	1 barg / 14.5 psig

Operating conditions

Ambient temperature	-20...+60°C / -4...+140°F
Process temperature	0...+60°C / +32...+140°F
Process pressure	Atmosphere
Other conditions	
Protection category	IP65 (Nema 4X)
Max. immersion depth	0.3 m / 1 ft
Calibration	OPTISENS PAS 2000 pH: two point calibration (smart or manual) using two buffer solutions
	OPTISENS PAS 2000 ORP: offset calibration (automatic or manual) using clean water and one buffer solution

Installation conditions

PAS 2000 + MAA 2000 slide rail for side wall mounting	Installation on the side wall of basins; retractable holder with adjustable stop
Installation position	Submerged in open channels/basins
Dimensions and weights	For detailed information refer to chapter "Dimensions and weights".

Materials

Enclosure	Stainless Steel 316
Cable feed through	PVC
Electrode	KCL gel-filled glass
Flush hose	PE
Connection cable insulation	Hytrel
Flush tube	PVC
O-rings	EPDM
Straps	Polyester, PVC

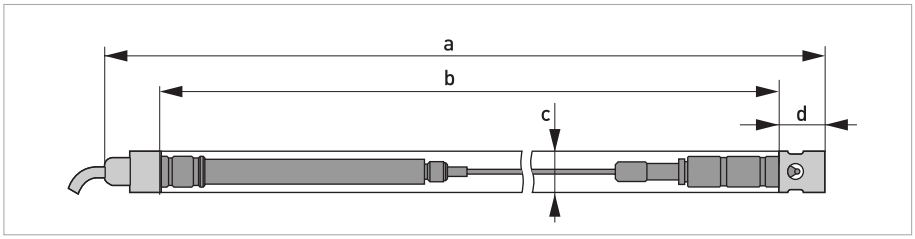
Electrical connections

Connection cable	5-pin M12 contact; fixed on sensor side, shielded; 10 m / 33 ft long
Power supply	For full details, including: power supply, power consumption etc., refer to technical data for the relevant converter.
Input and output (I/O)	For full details refer to technical data for the relevant converter.

Approvals

CE	This device fulfils the statutory requirements of the EC directives. The manufacturer certifies successful testing of the product by applying the CE marking.
EMC	Electromagnetic compatibility (EMC) in accordance with:
	EN 61000-6-4:2001 Emission standard for industrial environments
	EN 61000-6-2:2001 Immunity for industrial environments
Low Voltage Directive	Safety requirements for electrical equipment for measurement, control, and laboratory use in accordance with EN 61010-1:2001

2.2 Dimensions and weights



	Dimensions	
	[mm]	[inches]
a	1085	42.7
b	1000	39.4
c	Ø 28	Ø 1.1
d	35	1.4

	Weight	
	[kg]	[lbs]
PAS 2000 length 1000 mm / 39.4"	1.8	4

3.1 Intended use

The OPTISENS PAS 2000 sensors are used to measure pH value or ORP potential in water and wastewater treatment plants.

The PAS 2000 sensors are to be combined with the MAC 080 converter.

3.2 Notes on installation

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

Check the packing list to check if you received completely all that you ordered.

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.

3.3 Storage and transport

- Store the device in a dry, dust-free location.
- Avoid continuous direct sunlight.
- The original packing is designed to protect the equipment. It has to be used if the device is transported or send back to the manufacturer.

3.4 Configuration of a measuring point

A complete measuring point consists of at least three parts:

- MAC 080 converter
- OPTISENS 2000 sensor (including cable)
- MAA 2000 sensor holder

If automatic flushing is installed an optional available solenoid valve is necessary as well.

3.5 Installing the sensor

3.5.1 Basic installation instructions

The electrode should be placed deep enough so that it always stays in the measuring media, even when the level varies (see figure below). The measuring ability of the electrode is influenced negatively if the column of liquid to be measured is too large. For optimal results the column should not exceed 300 mm / 12".

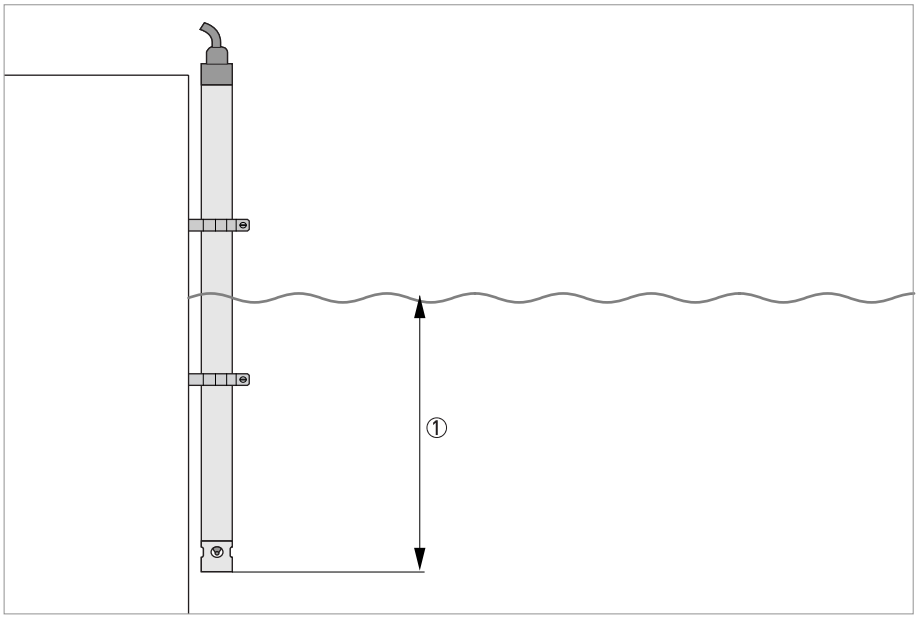


Figure 3-1: Installing the sensor in a flume

① Max. 300 mm / 12"

To protect the sensor from damage, the sensor should never be fully submerged into water.

Please make sure that the assembly is mounted in a vertical position. In some applications it may be desirable to mount at a certain angle. In this case the angle from the horizontal plane should be greater than or equal to 45°.

Before immersing the sensor into the liquid, make sure that the electrode is mounted. If the sensor gets immersed without the electrode being installed, water will leak inside, which can lead to permanent damage of the internal electronics or cable connections.

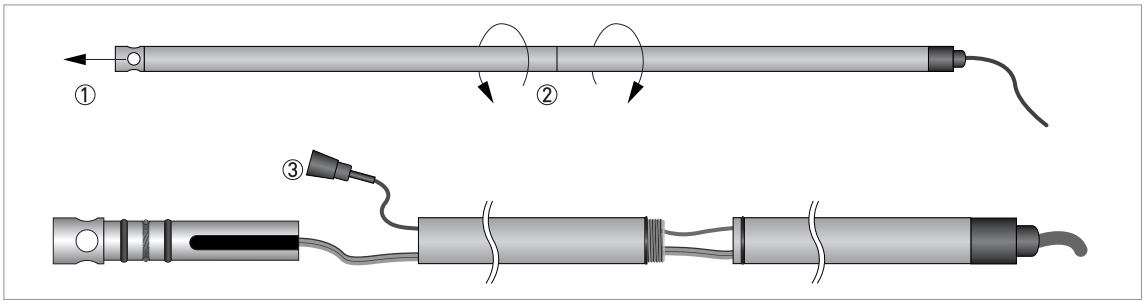
3.5.2 Mounting the electrode

If the electrode has been in the cap for an extended period of time, salt crystals may need to be rinsed away with water.

If the electrode cannot be immersed into the measuring media before it is put to use, the electrode's small, plastic protective cover should be filled with a buffer solution of pH 7.

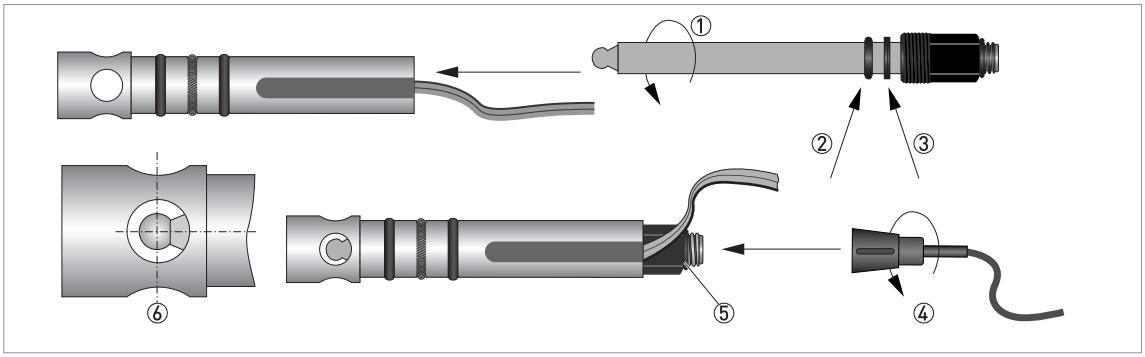
Step 1

- In order to mount an electrode the electrode holder at the lower end of the sensor must be taken off ①.
- If you can't reach the connector ③, please open the sensor rod at the screw joint ② to access the cables.



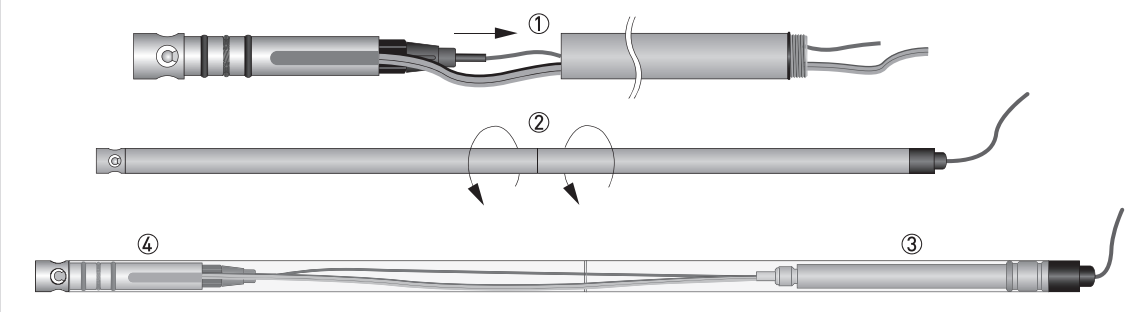
Step2

- The electrode is mounted in the electrode holder by screwing it into the PG 13.5 thread ①. Make sure that the O-ring ② and washer ③ on the electrode are assembled in the sequence indicated in the following drawing.
  Note: Be careful to not damage the ribbon cable which runs to the temperature sensor which is integrated in the electrode holder.
- Tighten the electrode with your hand.
  Note: Please make sure that the electrode ⑤ is properly seated. The electrode tip and the diaphragm have to stick out at lower end of the holder ⑥ in order to be in proper contact with the water.
- Connect the electrode by screwing the connector ④ into the Coax pin on top of the electrode.
  Note: Please make sure that the electrode ⑤ is properly seated.



Step3

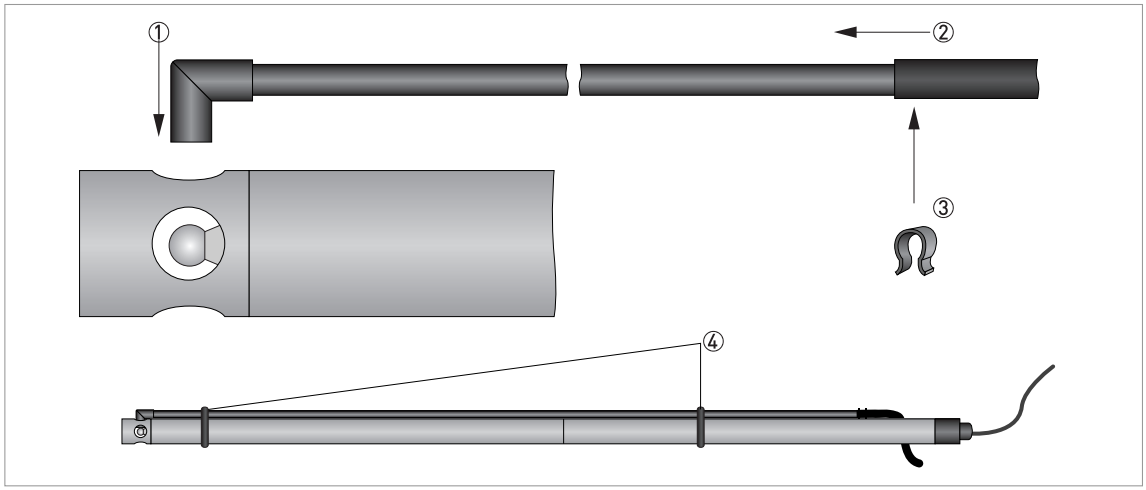
- Feed the cable into the sensor rod ① towards the electronics ③, which is located in the upper part of the sensor. It is easier to get both cables in place if you curl the cables by turning the electrode holder during assembly. Be careful not to damage the cables.
- In case you did open the sensor in the middle, make sure that you rejoin the two sensor rods at the screw joint. Tighten it hand tight ① in order to seal the rod properly.
- Mount the electrode holder ④ back into the assembled sensor rod.



3.5.3 Installing the flushing system

The PAS 2000 sensor is equipped with a flushing system for automatic spray cleaning of the electrode with water or pressurized air. The system consists of four parts:

- Flush tube (with attached flush nozzle)
- Flush hose (10 m / 33 ft)
- Hose clamp to clamp tube and hose together
- Two O-rings to fixate the flushing tube on the sensor rod



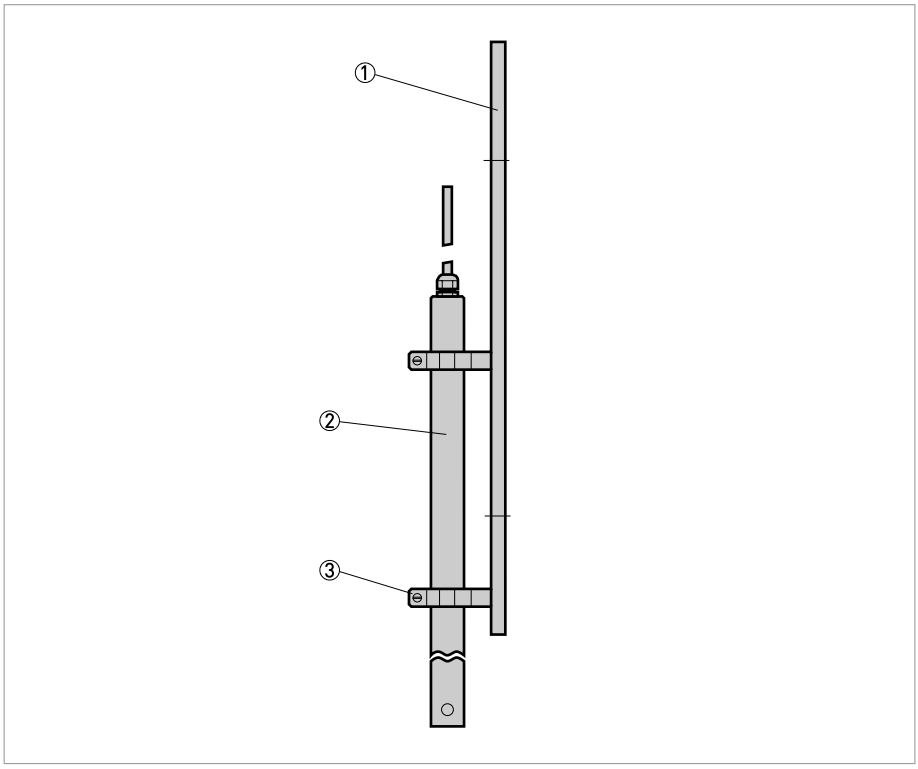
- Mount the flush tube along the sensor housing with the flush nozzle pointing towards the electrode tip ①.
- Clamp the flush hose onto the flush tube ② by using the hose clamp ③.
- Secure the flush tube on the sensor housing via the two O-rings ④ provided with the sensor.

The flush hose is run to the solenoid valve (supplied with the MAC 080 converter). The solenoid valve is wired to a relay in the converter and controls the air or liquid for cleaning. For installation of the solenoid valve see converter documentation.

For PAS 2000 submersible sensor the highest allowed flushing pressure is 6 bar / 87 psi. When using air, 2 bar / 29 psi is usually sufficient.

Pay attention to the requirements for protection against backflow, according to the EN 1717 standard for drinking water devices. If possible, use plant reuse water or effluent water for cleaning.

3.5.4 Assembly of PAS 2000 to MAA 2000 slide rail immersion holder



① Slide rail
② Sensor
③ 28 mm / 1.10" clamp

Mounting instructions:

- Mount the slide rail assembly to the side wall of the basin or open channel using the two pre-drilled holes. The adjustable limit stop should be on the bottom and the two sliding clamps above.
- Take the two clamps off from the slide rail and mount them around the sensor housing. Please make sure the two guide tracks line-up in one straight line to each other. See figure above!
- Slide the sensor with the two clamps into the slide rail and make sure that the guide tracks of the two clamps are properly seated.
- Adjust the sensor position as necessary (see chapter "Basic installation") and fasten the limit stop.

Please make sure that the assembly is mounted in a vertical position. In some applications it may be desirable to mount at a certain angle. In this case the angle from the horizontal plane should be greater than or equal to 45°.

Before immersing the sensor into the liquid, make sure that the electrode is mounted. If the sensor gets immersed without the electrode being installed, water will leak inside, which can lead to permanent damage of the internal electronics or cable connections.

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!

For devices used in hazardous areas, additional safety notes apply; please refer to the Ex documentation.

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 Cable connections

Please refer to the MAC 080 documentation for detailed information.

The sensor is equipped with a fixed 10 m / 33 ft cable, which has a M12 connector attached. Connect the sensor to the converter using the M12 connector. In the event that two or more sensors are to be connected to the same converter, use the optional junction box.

Power requirements:

- The sensor requires 24 VDC power, which is supplied from the converter via the sensor cable.
- The maximum current during operation is 20 mA.

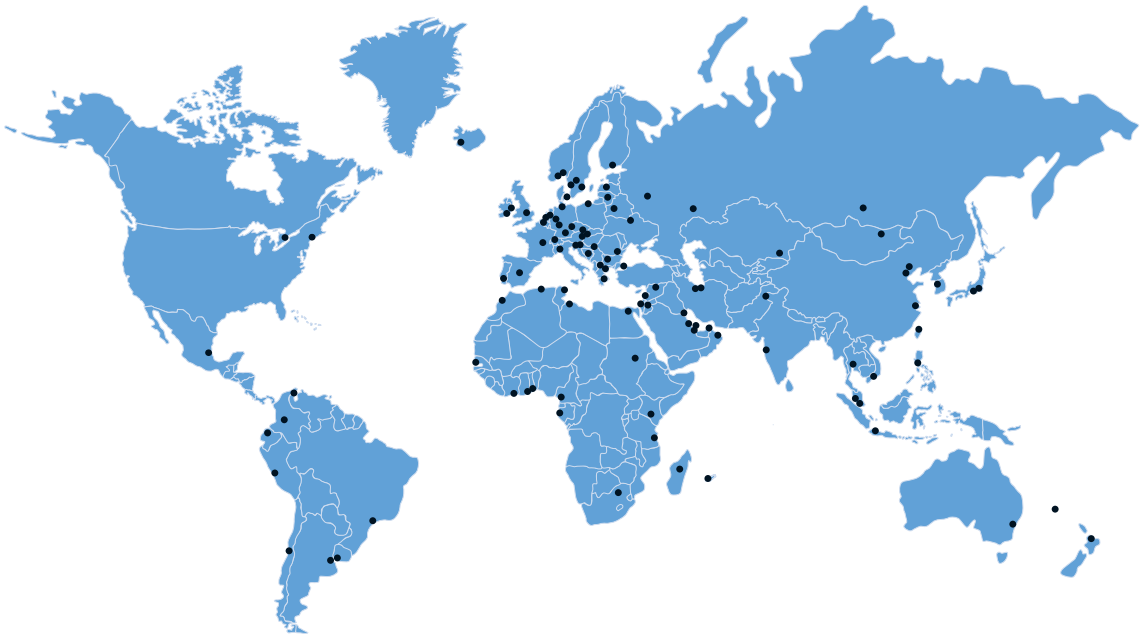
5.1 Order code

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

		Sensor												
		0	None											
		A	OPTISENS PAS 2000											
			Measuring range											
			0	None										
			2	0...14 pH and 0...+110°C / +32...+230°F										
			6	-1500...+1500 mV ORP/Redox										
				Sensor features										
				0	None									
				1	Ceramic diaphragm									
				2	PTFE diaphragm (not PAS 1000 ORP)									
					Process conditions									
					0	None								
					A	0...+60°C / +32...+140°F								
						Process connection								
						0	None							
						B	MAA 2000, immersion depth 1 m / 3.3 ft							
							Sensor options							
							0	None						
							A	Integrated cleaning nozzle						
								Sensor - cable connection						
								0	None					
								4	Fixed cable					
									Cable					
									0	None				
									A	MAW 2000 fixed cable				
										Cable features				
										0	None			
										1	Standard			
											Cable length			
											0	None		
											4	10 m / 33 ft		
												Cable options		
												0	None	
												A	M12 connector for MAC 080 converter	
													Documentation	
													0	None
													1	English
													2	German
VGA B	4													Order code

5.2 Spare parts and accessories

Spare parts and accessories	Order code
Replacement electrode PAS 1000 / PAS 2000 pH, 120 mm, PTFE diaphragm	VGA B 4 112111200000
Replacement electrode PAS 1000 / PAS 2000 ORP/Redox, 120 mm	VGA B 4 361611100000
10 m / 33 ft signal cable extension for OPTISENS 2000 sensor	XGA W 08010
30 m / 98.4 ft signal cable extension for OPTISENS 2000 sensor	XGA W 08020



KROHNE product overview

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

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