OPTISENS AAS 2000 Technical Datasheet

Dissolved oxygen sensor

- Digital sensor of the OPTISENS 2000 series for use in waste water applications
- Robust stainless steel body and automatic spray cleaning
- Low maintenance costs with long service intervals

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

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1.1 Digital dissolved oxygen sensor for waste water applications

As all the sensors of the OPTISENS 2000 sensor series, the AAS 2000 dissolved oxygen sensor is equipped with digital communication, a stainless steel enclosure, integrated spray cleaning and the mounting option on an extendable telescopic rod. These unique features enable the AAS 2000 sensors for use in municipal and industrial waste water treatment facilities.

The "Clark" electrode used in the AAS 2000 has a patented design, which guarantees reliable, precise measurements of the concentration of dissolved oxygen in water along with excellent long-term stability. Combined with the low maintenance costs, this allows extremely cost-effective operation of the OPTISENS 2000.

① Stainless steel enclosure
② Spray nozzles for automatic cleaning system
③ Electrode cartridge
④ Cable for digital connection to converter
⑤ Flush hose

Highlights

- Robust stainless steel enclosure
- Automatic spray cleaning
- Mounting option on a flexible telescopic rod
- "Clark" electrode with patented design and Teflon membrane for long lifespans
- Not affected by optical effects (i.e. air bubbles)
- Easily replaceable electrode cartridge
- Wide measuring range: 0...20 mg O_2/l
- Automatic temperature compensation
- Easy to calibrate
- Digital communication with the converter
- Up to four OPTISENS 2000 sensors can be connected to one MAC 080
- Automatic sensor detection during installation

Industries

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

Applications

- Monitoring and control of water treatment processes
- Continuous monitoring of the oxygen concentration in aeration basins
- Monitoring of the water quality of waste water treatment facilities or final effluents

1.2 Options and versions

A complete measuring system consists of:

- MAC 080 multiparameter converter
- One (or up to four) OPTISENS 2000 sensors
- Solenoid valve to control spray cleaning
- Assemblies for submersible installation

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.

Robust design

The specially-designed robust Stainless Steel enclosure with its particular smooth, rounded surfaces, reduces the adherence of dirt particles and minimises ragging.

Combined with the integrated, automatic spray cleaning of the sensor head, as well as the special patented electrode, the AAS 2000 guarantees maximum measuring stability. Furthermore it offers low maintenance requirements and long service intervals.

In addition, the electrode is installed in a cartridge, which allows quick and easy replacement.

OPTISENS 2000 - Assemblies and accessories

The fully-encapsulated OPTISENS 2000 sensor can be mounted on a special, flexible fibreglass telescopic rod, which can be extended to up to 4 m / 13 ft. The stable, yet extremely flexible design of the telescopic rod and its bracket allows the sensor to be in constant motion due to the movement of the flowing water. This prevents ragging and contributes to the self-cleaning of the sensor.

Alternatively, the AAS 2000 sensor can be installed at the side wall of open channels via a slide rail mounting assembly.

You can find detailed information on these assemblies in the Technical Data Sheet of the MAA 2000. An additional accessory for the AAS 2000 is a protection plate to provide mechanical protection of the membrane.

1.3 Combination of sensor / converter / mounting assembly

	MAC 080 converter	MAA 2000 telescopic rod	MAA 2000 slide rail
AAS 2000	x	x	x

1.4 Measuring principle

The electrode is a "Clark" type electrode with a membrane in FEP. The sensor consists of a gold cathode and silver anode. The "Clark" cell detects the oxygen through its reduction at the gold electrode. A membrane covers the two electrodes and blocks access of most species to the electrodes. Only dissolved gases such as oxygen can traverse the membrane, hence the reduction current responds to the oxygen concentration.

The electrode housing is made of PVC and is equipped with an o-ring sealing against the mounting. There is a connector on the electrode for the amplifier cable. Active components included in the electrode are treated to maximize their life span.

In addition, the temperature is measured to be used for temperature compensation of the measured value. It can be read in the converter and used as secondary value when a sensor is configured to use both analog outputs.

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

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 (Download Center).*

Measuring system

Measuring principle	Amperometric measuring principle with a "Clark" electrode.
Application range	Continuous measurement of dissolved oxygen in water, here especially in waste water applications (e.g. in aeration basins).
Measured value	Dissolved oxygen concentration

Design

Modular construction	A typical measuring system consists of: • MAC 080 multiparameter converter • One (or up to four) OPTISENS 2000 sensors • Solenoid valves to control spray cleaning • Assemblies for submersion or side wall installation
Measuring range	0…20 mg/l (ppm)
Electrode	"Clark" type with a membrane in FEP
Flushing	Flushing using clean water or compressed air
	Pressure: 2...6 bar / 29…87 psi
	Solenoid valve: available in 220 V and 117 V versions; up to 2 sensors can be operated on a single valve.
	Flush hose: ¼" external diameter, PE, standard length: 10 m / 32.8 ft

Measuring accuracy

Reference conditions	Medium: water
	Temperature: +25°C / +77°F
	Pressure: 1 barg / 14.5 psig
Maximum measuring error	±1% FS (full scale)
	Temperature: ±0.5°C / 0.5°F
Display resolution (in combination with MAC 080)	0.1 mg/l, extended mode: 0.01 mg/l
	Temperature: +0.1°C / +0.1°F
Calibration	Software-support zero point calibration and single point calibration by calibration measurement in air

Operating conditions

Temperature range	Process temperature = ambient temperature
	0…+50°C / +32…+122°F
Max. immersion depth	10 m / 32.8 ft
Protection category	IP68 (Nema 6)

Installation conditions

AAS 2000 + MAA 2000 fibreglass telescopic rod for submersible installations	Installation on the handrail with up to 4 m length-adjustable, oscillating fibreglass assembly.
	Handrail mounting for: • Round handrails: d = 32...50 mm / 1.3...2" • Square cross-sections: 28...42 mm / 1.1...1.7"
AAS 2000 + MAA 2000 slide rail mounting for side wall installations	Installation on side walls of channels and basins using slide rails for simple sensor removal
Process connection	Submersible version in open basins and channels

Materials

Enclosure	316 SS
"Clark" electrode	Design: replaceable cartridge
	Cathode: gold
	Anode: silver
	Membrane: FEP Teflon (0.025 mm / 0.001")
Connection cable to converter	Insulation: Hytrel (5-pin M12 connector, fixed cable, shielded, 10 m / 32.8 ft long)
Flush hose	PE

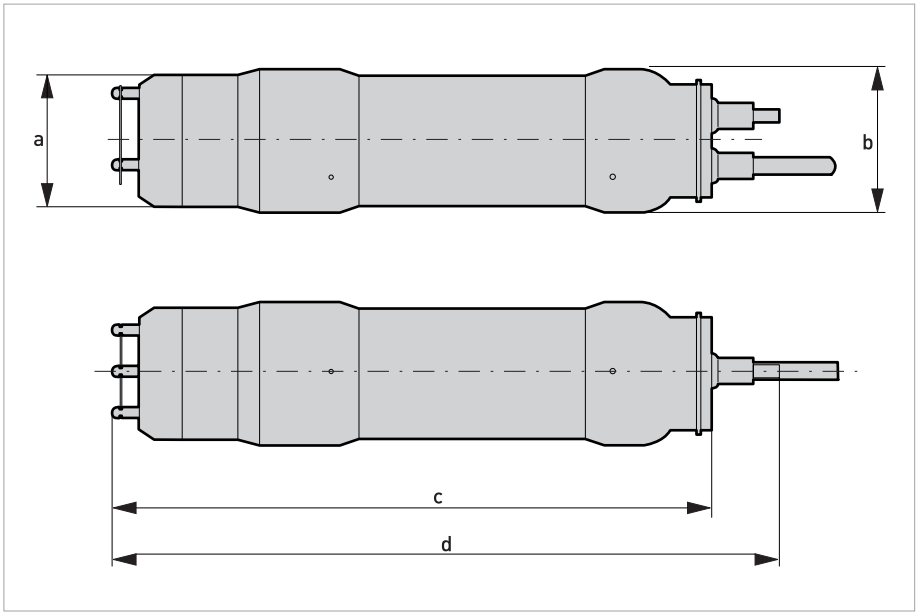
Electrical connections

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 of the relevant converter.
Input and output (I/O)	For full details refer to technical data of the relevant converter.

Approvals

CE sign	This device fulfils the statutory requirements of the EC directives. The manufacturer certifies successful testing of the product by applying the CE mark.
Electromagnetic compatibility	Interference emission to EN 61000-6-4:2001, immunity to EN 61000-6-2:2001.
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 weight



	Dimensions [mm]	Dimensions [inches]	Weight	
			[kg]	[lbs]
a	61	2.4	2.1	4.6
b	66	2.6		
c	275	10.5		
d	307	12.1		

3.1 Intended use

The OPTISENS AAS 2000 sensors are used to measure the concentration of dissolved oxygen in water. They can be used in municipal and industrial waste water treatment facilities, water monitoring stations and other applications.

The AAS 2000 sensors are designed 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 sent 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 solenoid valve is necessary as well.

Examples of typical measuring points are listed in the following sections.

3.5 Installing or changing the electrode

The sensor is delivered with the electrode uninstalled. The electrode must be installed and calibrated before the sensor is submerged into water.

A plastic cap protects the electrode connection plug and the flushing nozzles in the sensor. Remove the plastic cap before installing the electrode. Retain the plastic cap as it may be used as protection later. Do not press on the top of the cap if the electrode is installed.

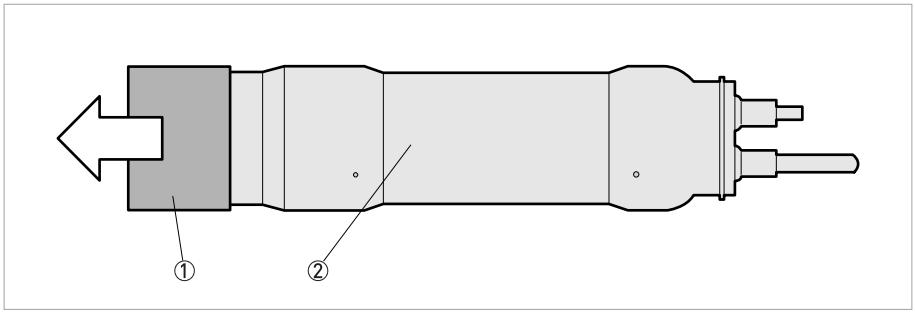


Figure 3-1: Removal of plastic cap

① Plastic cap
② Sensor

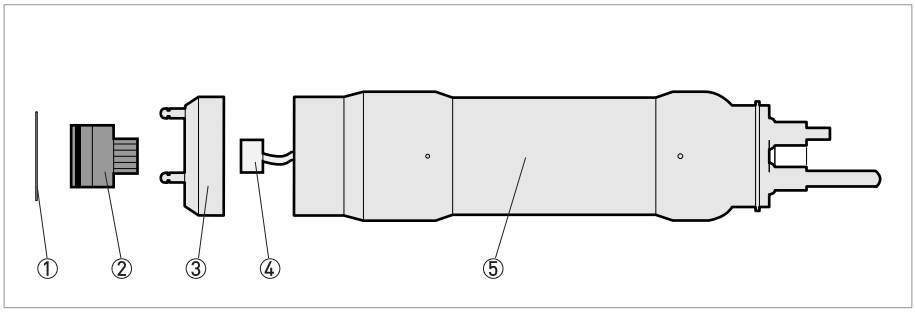


Figure 3-2: Overview of the sensor

① Protection plate
② Electrode
③ Flushing head
④ Cable connector
⑤ Sensor housing

The electrode can usually be assembled and disassembled without tools.

Do not ever clamp onto the sensor housing or part of the cable when installing or removing the flushing head.
Do not touch the membrane of the electrode when mounting.

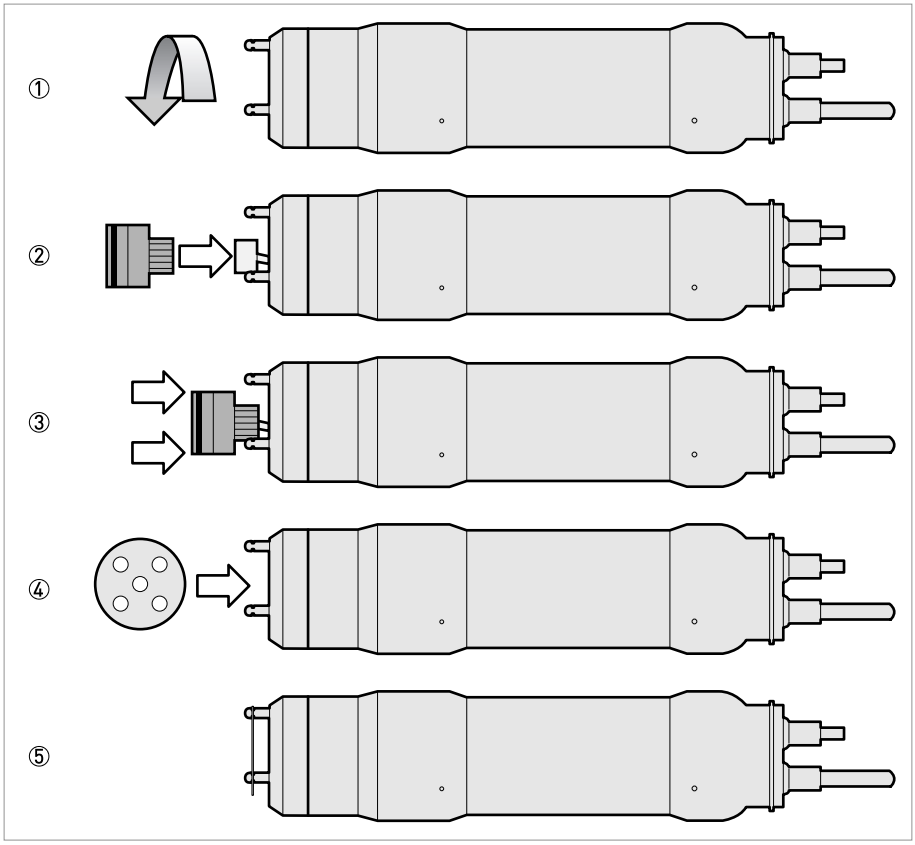


Figure 3-3: Installing a new electrode

Installing a new electrode (see figure above)

- Untighten the flushing head about one turn counterclockwise (if not already loose) to let the air out when the electrode is pushed in place ①.
- Take the electrode out of the plastic container.
- Plug the electrode cable of the sensor into the connector on the electrode ②.
- Install the new electrode into the flushing head ③.
- Tighten the flushing head.
- Mount the protection plate, if needed ④. See below for instructions on mounting the protection plate.
- Perform a new air-calibration. An air calibration must be performed whenever the electrode is changed.

➲ Installation of the electrode is completed.

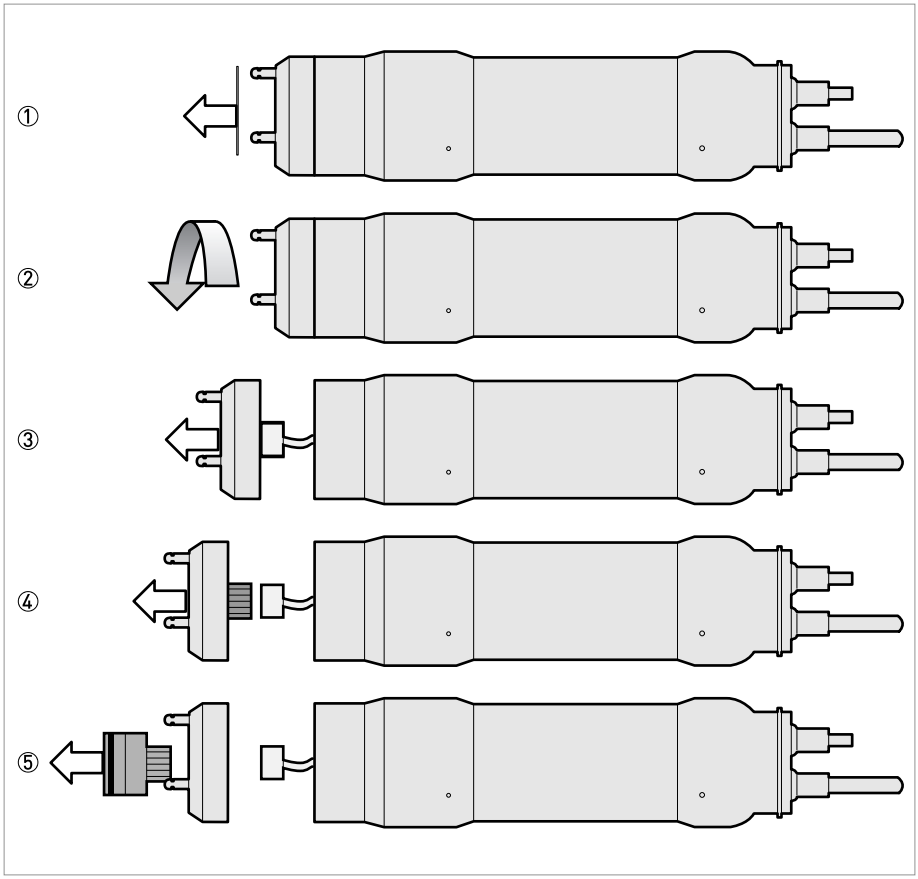


Figure 3-4: Removing an old electrode

Make sure the electrode housing is dry before removing the flushing head. Water may come into the housing when the flushing head is removed.

Removing an old electrode (see figure above)

- Make sure automatic flushing is disabled. This can be checked in the converter in the menu **Cleaning** of the sensor (see "Removing an old electrode" in this section).
- If using the protection plate, pull it off before changing the electrode ①.
- Loosen the flushing head by turning it counterclockwise ②.
- Gently pull the flushing head out of the sensor housing ③.
- Unplug the electrode ④.
- Remove the electrode from the flushing head by pressing firmly on the backside of the electrode near the cable connector ⑤.
- Ensure that the o-ring that seals the flushing head is completely seated in the respective groove in the sensor body.
- If a new electrode should be mounted, please follow the previous instructions ("Installing a new electrode").
- Screw the flushing head back onto the sensor. Do not screw it tight, otherwise the mounting of a new electrode (see previous instructions) will become more complicated.
- If a new electrode should not be mounted, place the plastic cap over the electrode connection plug and the flushing nozzle in the sensor.

Do not ever remove a flushing nozzle in order to mount the protection plate. The nozzles are fastened with a special locking jam.

Mounting the protection plate

- Remove the o-rings in the groove at the top of the three nozzles.
- Bend the plate slightly and press it down between the flushing nozzles.
- Ensure that the plate fits into the notches on the flushing nozzles. Correct the plate when it is mounted.

3.6 Mounting of the sensor

The sensor can be mounted in two ways:

- On a telescopic fibreglass rod placed in a mounting bracket that fastens to a handrail (see next section).
- To an adjustable slide rail holder (see next section but one).

Installation tips

- Adjust the rod so that the sensor is at least 30 cm / 11.8" below the liquid surface or the lowest water level in decant applications to prevent the sensor from coming out of the liquid.
- In an aeration tank, ensure that the sensor is not directly above a diffuser head. It should be installed on the backside of the rolling diffuser effect.
- Flushing may not be required if the tank is well agitated. To verify the need for flushing, remove the sensor from the liquid after it has been in the liquid for several days.

3.6.1 Mounting to MAA 2000 telescopic rod immersion holder

The mounting bracket of the telescopic rod is mounted to a handrail or a separate holder.
In case a handrail is not available, a mounting post with a vertical bar for sensor mounting can be purchased from the manufacturer.

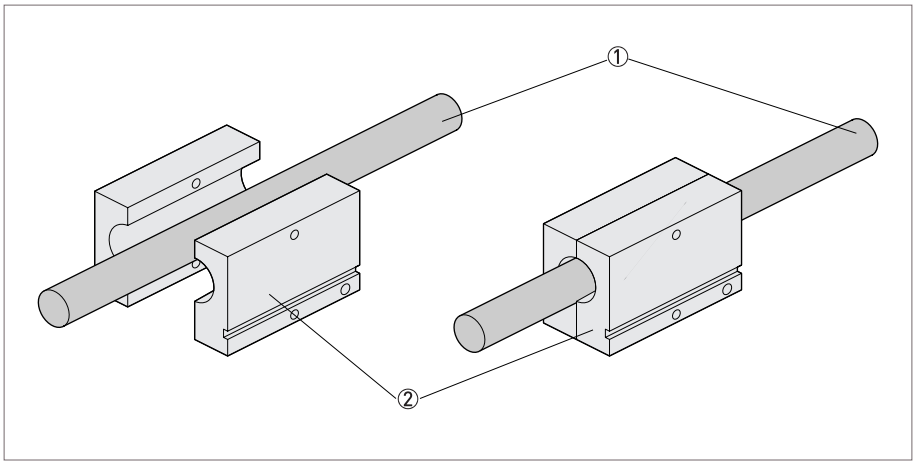


Figure 3-5: Placing the rod holder around the rod

① Telescopic rod
② Rod holder

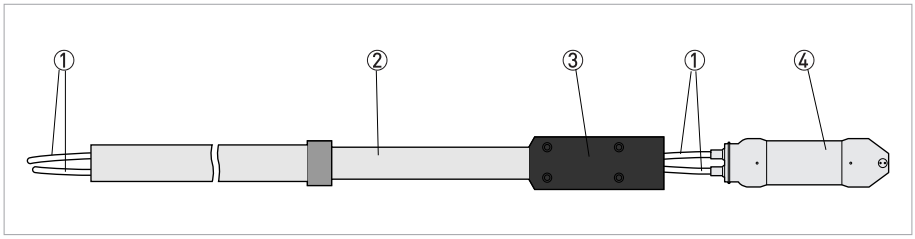


Figure 3-6: Pulling the cable/hose through the rod

① Cable/hose
② Telescopic rod
③ Sensor holder
④ Sensor

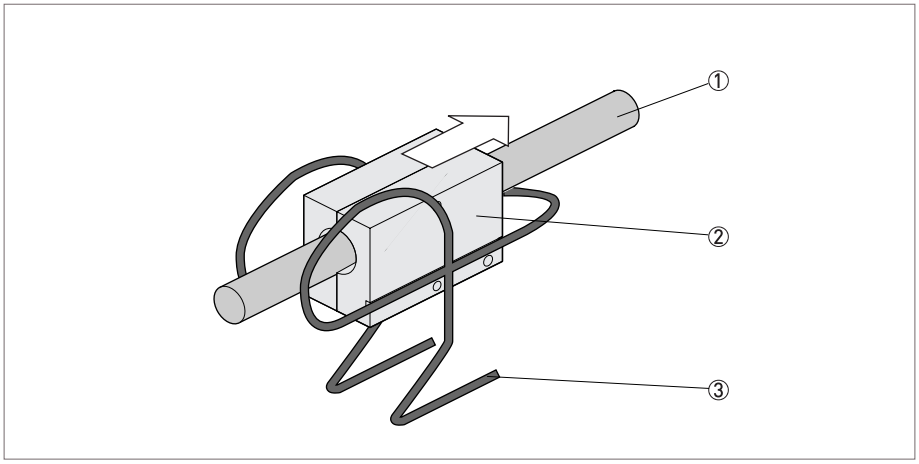
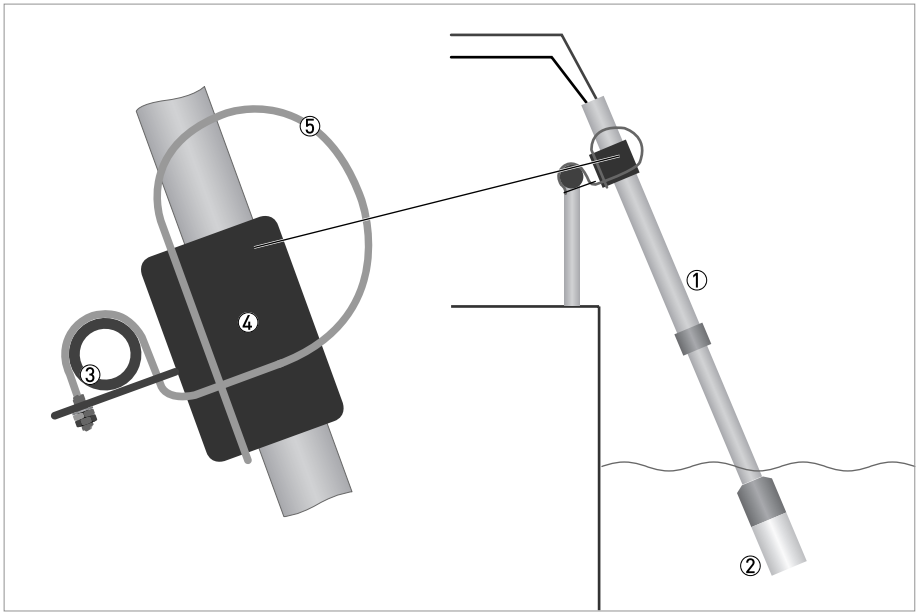


Figure 3-7: Inserting the rod holder into the mounting bracket

① Telescopic rod
② Rod holder
③ Mounting bracket



① Telescopic rod
② Sensor holder
③ Handrail with mounting bracket attached
④ Rod holder
⑤ Mounting bracket

Do not extend the rod sections beyond the black lines. This could lead to rod damage.

For best measurement, the rod shall be mounted in an angle (5...30° from vertical).

Mounting to telescopic rod immersion holder

- Mount the flexible mounting bracket on an existing handrail or on a separate holder, diameter 32...50 mm / 1.3...2.0" or square 28...42 mm / 1.1...1.7". The bent lip on the mounting plate shall be on top and faced toward the liquid or tank.
- Adjust the mounting bracket to the correct angle and tighten the nuts.

➲ The bracket shall be fixed to the rail and must not be able to rotate around it.

- Disassemble the rod holder and place it around the telescopic rod.
- Use the SS screws on the rod holder to tighten the rod holder to the rod.
- Pull the cable and hose through the sensor holder and rod.
- Connect the sensor to the rod with the two piece black PVC sensor holder.
- Tighten the adapter halves until snug, which will leave about 1.5 mm / 0.06" gap. The gap is required so the water can drain from the rod.
- Adjust the length of the telescopic rod as necessary by twisting the nuts while holding the rod. Do not extend the rod sections beyond the black lines. This could lead to rod damage.
- Insert the PVC rod holder with the telescopic rod into the mounting bracket. Make sure that the guide tracks of the rod holder are properly seated in the bracket.
- Fasten the safety-locking clamp.
- Check that the mounting bracket is safely fixed to the rail for the spring to work the way it is intended.

3.6.2 Mounting to MAA 2000 slide rail immersion holder

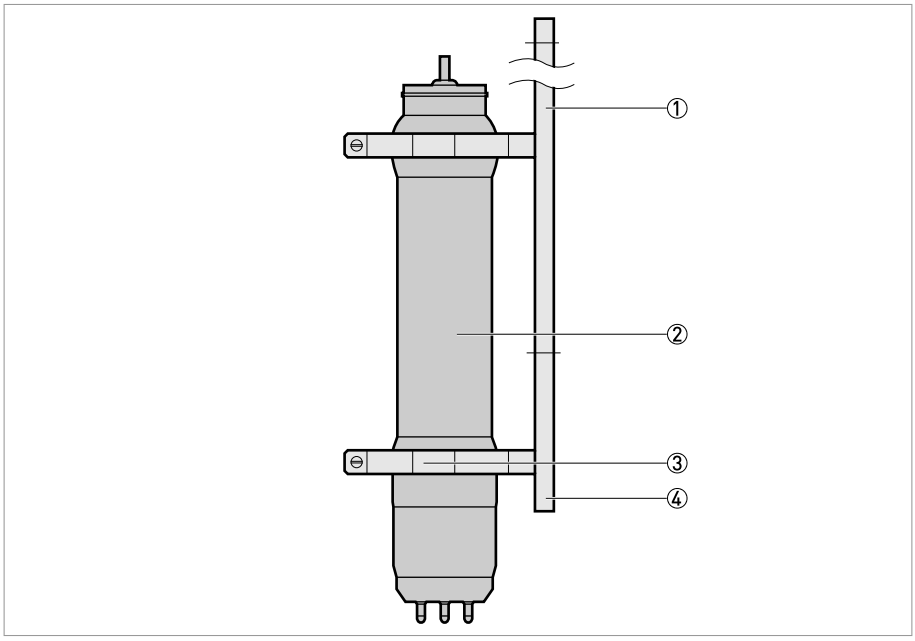


Figure 3-8: Mounting to MAA 2000 slide rail immersion holder

① Slide rail immersion holder
② Sensor
③ 66 mm / 2.60" clamp
④ Adjustable stop

In order to avoid large air bubbles which can affect the measurement please make sure that the slide rail immersion holder is mounted in a certain angle to the vertical position. The angle should be slightly off from vertical position (approx. 20°), but not more than 90°.

Mounting to MAA 2000 slide rail immersion holder

- Mount the slide rail immersion holder to the side wall of the basin or open channel using the two predrilled holes. The adjustable stop should be on the bottom and the two sliding clamps above.
- Take the two sliding clamps off from the slide rail and mount them around the sensor housing. Make sure that the clamps are placed on the two elevated ends of the sensor housing (one on the upper part and one on the lower part, see figure above).
  The two guide tracks have to line-up in one straight line to each other.
- Slide the sensor with the two clamps into the slide rail. Make sure that the guide tracks of the two clamps are properly seated.
- Adjust the sensor position as necessary and fasten the adjustable stop.

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

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 should 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 25 mA.

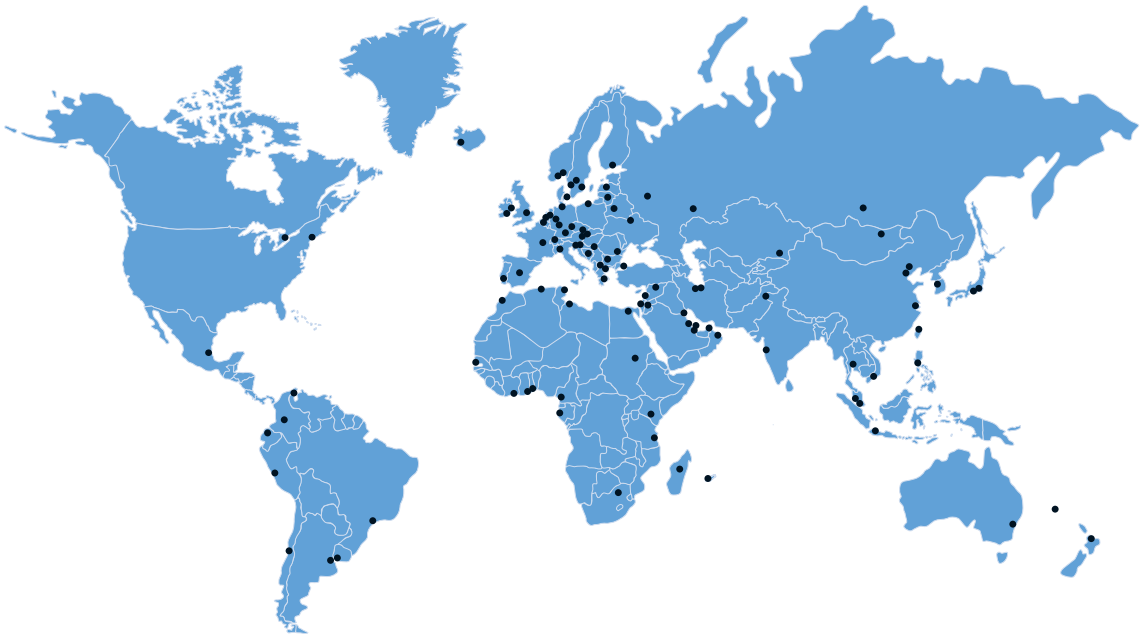
5.1 Order code

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

VGA E	**4**	**Sensor**											
		0	None										
		A	OPTISENS AAS 2000										
			Measuring range										
			0	None									
			1	0...20 mg/l (ppm) DO									
				Sensor features									
				0	None								
				1	Stainless Steel								
					Process conditions								
					0	None							
					2	0...+50°C / +32...+122°F							
						Process connection							
						0	None						
						A	Holder MAA 2000, 1...4 m variable						
							Sensor options						
							0	None					
							A	Temperature compensation and self cleaning					
								Sensor cable connection					
								0	None				
								4	Fixed cable				
									Cable				
									0	None			
									A	AAW 2000			
										Cable features			
										0	None		
										1	Standard		
											Cable length		
											0	None	
											3	10 m / 33 ft	
												Cable options	
												0	None
												A	M12 connector for MAC 080 converter
													Documentation
													0 None
													1 English
													2 German
VGA E	**4**												Order code

5.2 Spare parts and accessories

Order number	Designation
XGA S 02020	Electrode cartridge AAS 2000 DO
XGA S 02010	Protection plate for AAS 2000 membrane
XGA W 08010	Signal cable extension for OPTISENS 2000 sensor (10 m / 33 ft)
XGA W 08020	Signal cable extension for OPTISENS 2000 sensor (30 m / 98.4 ft)



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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