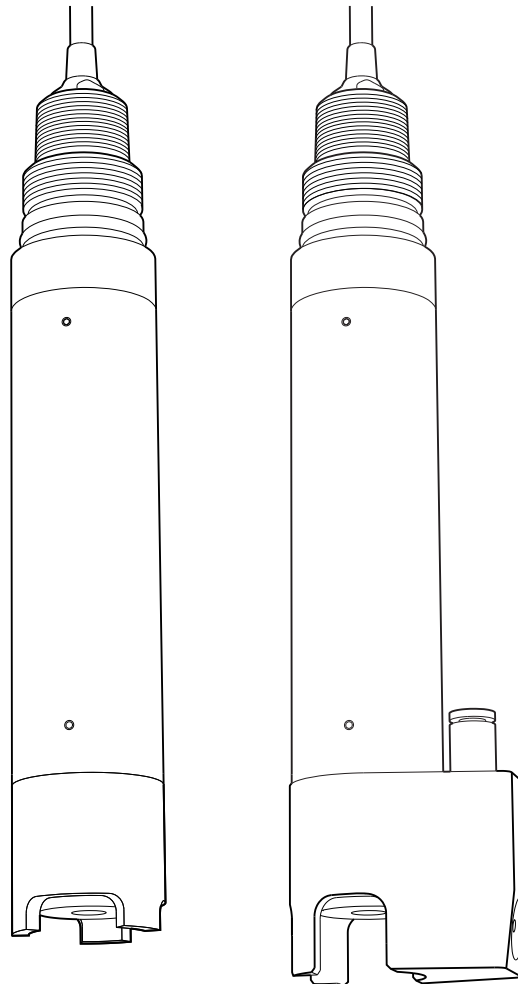


# Operating Instructions

## Oxymax COS61D

Sensor for measuring dissolved oxygen  
With Memosens protocol






## Table of contents








<b>1</b>	<b>About this document</b> .....	<b>3</b>	<b>10</b>	<b>Maintenance</b> .....	<b>25</b>
1.1	Warnings .....	3	10.1	Maintenance schedule .....	25
1.2	Symbols .....	3	10.2	Maintenance tasks .....	25
<b>2</b>	<b>Basic safety instructions</b> .....	<b>4</b>	10.3	Cleaning exterior of sensor .....	25
2.1	Requirements for personnel .....	4	10.4	Cleaning sensor optics .....	26
2.2	Designated use .....	4	10.5	Wear parts and consumables .....	26
2.3	Workplace safety .....	4	10.6	Checking the measurement function .....	27
2.4	Operational safety .....	4	<b>11</b>	<b>Accessories</b> .....	<b>28</b>
2.5	Product safety .....	5	11.1	Assemblies (selection) .....	28
<b>3</b>	<b>Device description, function</b> .....	<b>6</b>	11.2	Assembly holder .....	28
3.1	Optical measuring principle .....	6	11.3	Measuring cable .....	28
3.2	Sensor design .....	7	11.4	Zero-point gel .....	29
3.3	Memosens technology .....	8	11.5	Protection guard .....	29
3.4	Fluorescence cap .....	8	11.6	Cleaning unit .....	29
<b>4</b>	<b>Incoming acceptance and product identification</b> .....	<b>9</b>	11.7	Calibration vessel .....	29
4.1	Incoming acceptance .....	9	<b>12</b>	<b>Repair</b> .....	<b>30</b>
4.2	Product identification .....	9	12.1	Spare parts and consumables .....	30
4.3	Scope of delivery .....	10	12.2	Return .....	30
<b>5</b>	<b>Installation</b> .....	<b>11</b>	12.3	Disposal .....	30
5.1	Installation conditions .....	11	<b>13</b>	<b>Technical data</b> .....	<b>31</b>
5.2	Mounting the sensor .....	12	13.1	Input .....	31
5.3	Installation examples .....	15	13.2	Performance characteristics .....	31
5.4	Post-installation check .....	18	13.3	Environment .....	31
<b>6</b>	<b>Electrical connection</b> .....	<b>19</b>	13.4	Process .....	32
6.1	Connecting the sensor .....	19	13.5	Mechanical construction .....	32
6.2	Ensuring the degree of protection .....	19	<b>Index</b> .....	<b>34</b>	
6.3	Post-connection check .....	19			
<b>7</b>	<b>Calibration and adjustment</b> .....	<b>20</b>			
7.1	Types of calibration .....	20			
7.2	Calibration intervals .....	20			
7.3	Calibration in air .....	20			
7.4	Calculation example for the calibration value .....	21			
<b>8</b>	<b>Commissioning</b> .....	<b>23</b>			
8.1	Function check .....	23			
8.2	Sensor calibration .....	23			
8.3	Cleaning the sensor automatically .....	23			
<b>9</b>	<b>Troubleshooting</b> .....	<b>24</b>			
9.1	Troubleshooting instructions .....	24			
9.2	Checking the sensor .....	24			

# 1 About this document

## 1.1 Warnings

Structure of information	Meaning
 <b>DANGER</b> <b>Causes (/consequences)</b> If necessary, Consequences of non-compliance (if applicable) <ul style="list-style-type: none"> <li>▶ Corrective action</li> </ul>	This symbol alerts you to a dangerous situation. Failure to avoid the dangerous situation <b>will</b> result in a fatal or serious injury.
 <b>WARNING</b> <b>Causes (/consequences)</b> If necessary, Consequences of non-compliance (if applicable) <ul style="list-style-type: none"> <li>▶ Corrective action</li> </ul>	This symbol alerts you to a dangerous situation. Failure to avoid the dangerous situation <b>can</b> result in a fatal or serious injury.
 <b>CAUTION</b> <b>Causes (/consequences)</b> If necessary, Consequences of non-compliance (if applicable) <ul style="list-style-type: none"> <li>▶ Corrective action</li> </ul>	This symbol alerts you to a dangerous situation. Failure to avoid this situation can result in minor or more serious injuries.
<b>NOTICE</b> <b>Cause/situation</b> If necessary, Consequences of non-compliance (if applicable) <ul style="list-style-type: none"> <li>▶ Action/note</li> </ul>	This symbol alerts you to situations which may result in damage to property.


## 1.2 Symbols

Symbol	Meaning
	Additional information, tips
	Permitted or recommended
	Not permitted or not recommended
	Reference to device documentation
	Reference to page
	Reference to graphic
	Result of a step

## 2 Basic safety instructions

### 2.1 Requirements for personnel

- Installation, commissioning, operation and maintenance of the measuring system may be carried out only by specially trained technical personnel.
- The technical personnel must be authorized by the plant operator to carry out the specified activities.
- The electrical connection may be performed only by an electrical technician.
- The technical personnel must have read and understood these Operating Instructions and must follow the instructions contained therein.
- Faults at the measuring point may only be rectified by authorized and specially trained personnel.

 Repairs not described in the Operating Instructions provided must be carried out only directly at the manufacturer's site or by the service organization.

### 2.2 Designated use

The oxygen sensor is suitable for continuous measurement of dissolved oxygen in water.

The main areas of application are:

- Wastewater treatment plants
  - Oxygen measurement and regulation in the activated sludge basin for a highly efficient biological cleaning process
  - Monitoring the oxygen content in the wastewater treatment plant outlet
- Water monitoring
  - Oxygen measurement in rivers, lakes or seas as an indicator of the water quality
- Water treatment
  - Oxygen measurement for status monitoring, e.g. of drinking water (oxygen enrichment, corrosion protection etc.)
- Fish farming
  - Oxygen measurement and regulation for optimum living and growth conditions

Use of the device for any purpose other than that described, poses a threat to the safety of people and of the entire measuring system and is therefore not permitted.

The manufacturer is not liable for damage caused by improper or non-designated use.

### 2.3 Workplace safety

As the user, you are responsible for complying with the following safety conditions:

- Installation guidelines
- Local standards and regulations

#### **Electromagnetic compatibility**

- The product has been tested for electromagnetic compatibility in accordance with the applicable European standards for industrial applications.
- The electromagnetic compatibility indicated applies only to a product that has been connected in accordance with these Operating Instructions.

### 2.4 Operational safety

**Before commissioning the entire measuring point:**

1. Verify that all connections are correct.
2. Ensure that electrical cables and hose connections are undamaged.

3. Do not operate damaged products, and protect them against unintentional operation.
4. Label damaged products as defective.

**During operation:**

- ▶ If faults cannot be rectified:  
products must be taken out of service and protected against unintentional operation.

**⚠ CAUTION****Cleaning not switched off during calibration or maintenance activities**

Risk of injury due to medium or cleaning agent!

- ▶ If a cleaning system is connected, switch it off before removing a sensor from the medium.
- ▶ If you wish to check the cleaning function and have therefore not switched off the cleaning system, wear protective clothing, goggles and gloves or take other appropriate measures.

## 2.5 Product safety

The product is designed to meet state-of-the-art safety requirements, has been tested, and left the factory in a condition in which it is safe to operate. The relevant regulations and European standards have been observed.

## 3 Device description, function

### 3.1 Optical measuring principle

#### Sensor structure

Oxygen-sensitive molecules (markers) are integrated into an optically active layer (fluorescence layer).

The fluorescence layer, an optical insulating layer and a cover layer are applied on top of one another on a carrier. The cover layer is in direct contact with the medium.

The sensor optics are directed at the rear of the carrier and therefore at the fluorescence layer.

#### Measurement process (principle of quenching)

If the sensor is immersed in the medium, an equilibrium is very quickly established between the oxygen partial pressure in both the medium and the fluorescence layer.

1. The sensor optics send green light pulses to the fluorescence layer.
2. The markers "respond" (fluoresce) with red light pulses.
  - ↳ The duration and intensity of the response signals are directly dependent on the oxygen contents and oxygen partial pressure.

If the medium is free from oxygen, the response signals are long and very intense.

Oxygen molecules mask the marker molecules. As a result, the response signals are shorter and less intense.

#### Measurement result

- ▶ The sensor returns a signal that is proportional to the oxygen concentration in the medium.

The medium temperature and air pressure are already taken into account to calculate the oxygen concentration in the sensor.

The sensor provides measured values for temperature and partial pressure as well as a raw measured value. This value corresponds to the fluorescence decay time and is approx. 20  $\mu$ s in air and approx. 60  $\mu$ s in oxygen-free media.

#### For optimum measurement results

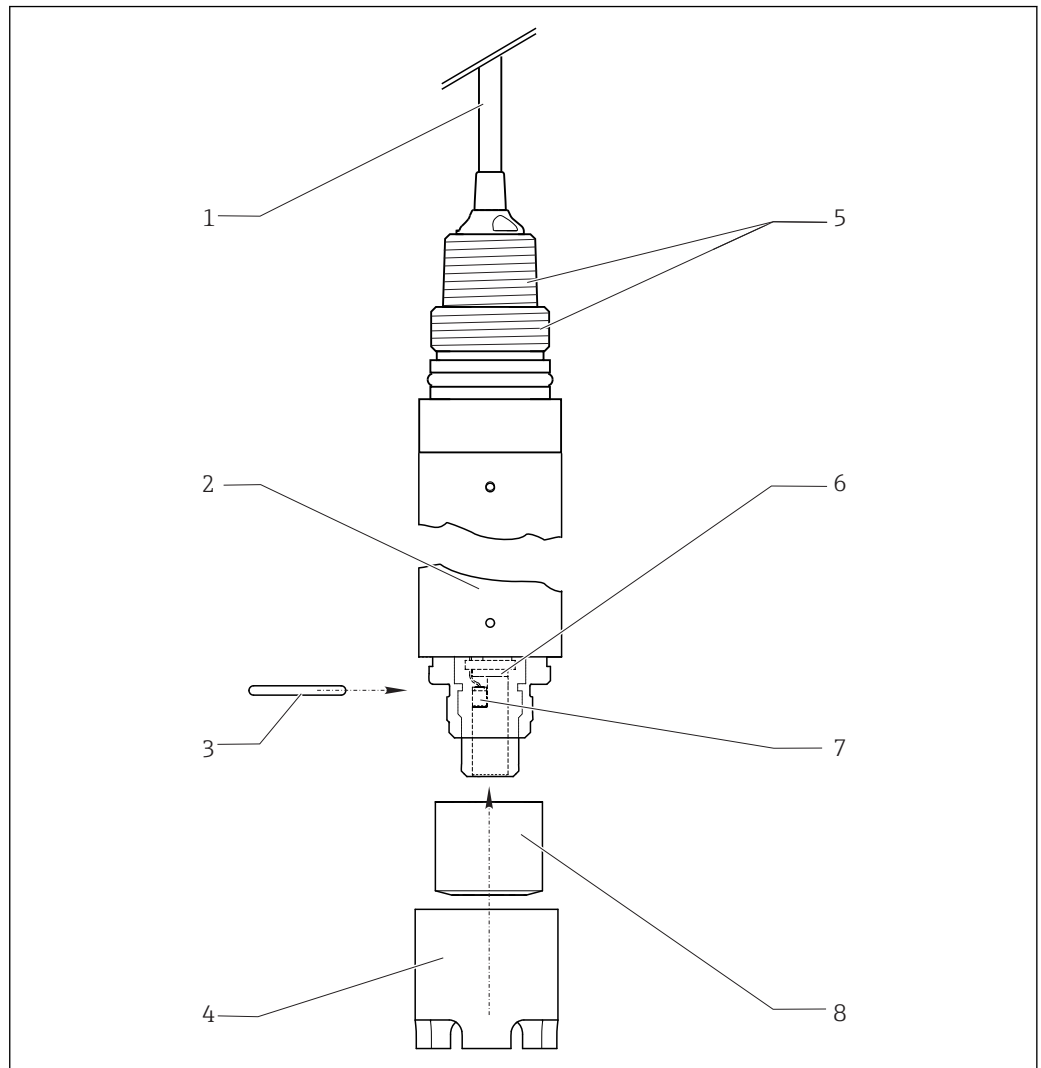
1. During calibration, enter the current air pressure at the transmitter.
2. In the case of saline media:  
Enter the salinity.
3. For measurements in the units %Vol or %SAT:  
Also enter the current operating pressure in the measuring mode.



Operating Instructions for Memosens, BA01245C

For all transmitters, analyzers and samplers in the Liquiline CM44x/P/R, Liquiline System CA80XX and Liquistation CSFxx product families

## 3.2 Sensor design



A0037096

1	Sensor structure	5	Threaded connection
1	Sensor cable	6	Detector
2	Sensor shaft	7	Emitter diode
3	O-ring	8	Fluorescence cap
4	Protection guard		

The sensor consists of the following function units:

- Sensor shaft
- Sensor head with optics (emitter and detector)
- Fluorescence cap
- Protection guard

As an alternative to the protection guard, you can use a cleaning unit for immersion operation with cleaning (→ 29).

### 3.3 Memosens technology

Sensors with Memosens protocol have an integrated electronics unit that stores calibration data and other information. Once the sensor has been connected, the sensor data are transferred automatically to the transmitter and used to calculate the measured value.

- ▶ Call up the sensor data via the corresponding DIAG menu.

Digital sensors can store measuring system data in the sensor. These include the following:

- Manufacturer data
  - Serial number
  - Order code
  - Date of manufacture
- Calibration data
  - Calibration date
  - Calibration values
  - Number of calibrations
  - Serial number of the transmitter used to perform the last calibration
- Operating data
  - Temperature application range
  - Date of initial commissioning
  - Hours of operation under extreme conditions

### 3.4 Fluorescence cap

The oxygen dissolved in the medium is diffused to the fluorescence layer of the fluorescence cap. A suitable flow is not required, as no oxygen is consumed during measurement. However, flow improves the speed at which the measuring system reacts and ensures a more representative measured value compared to a measurement in a static medium.

The cap is permeable for dissolved gases only. Other substances dissolved in the liquid phase, such as ionic substances, will not penetrate through the membrane. Therefore, medium conductivity has no impact on the measuring signal.

## 4 Incoming acceptance and product identification

### 4.1 Incoming acceptance

1. Verify that the packaging is undamaged.
  - ↳ Notify the supplier of any damage to the packaging.  
Keep the damaged packaging until the issue has been resolved.
2. Verify that the contents are undamaged.
  - ↳ Notify the supplier of any damage to the delivery contents.  
Keep the damaged goods until the issue has been resolved.
3. Check that the delivery is complete and nothing is missing.
  - ↳ Compare the shipping documents with your order.
4. Pack the product for storage and transportation in such a way that it is protected against impact and moisture.
  - ↳ The original packaging offers the best protection.  
Make sure to comply with the permitted ambient conditions.

If you have any questions, please contact your supplier or your local Sales Center.

### 4.2 Product identification

#### 4.2.1 Nameplate

The nameplate provides you with the following information on your device:

- Manufacturer identification
  - Order code
  - Extended order code
  - Serial number
  - Safety information and warnings
- ▶ Compare the information on the nameplate with the order.

#### 4.2.2 Product identification

##### Product page

[www.endress.com/cos61d](http://www.endress.com/cos61d)

##### Interpreting the order code

The order code and serial number of your product can be found in the following locations:

- On the nameplate
- In the delivery papers

##### Obtaining information on the product

1. Go to [www.endress.com](http://www.endress.com).
2. Call up the site search (magnifying glass).
3. Enter a valid serial number.
4. Search.
  - ↳ The product structure is displayed in a popup window.

5. Click on the product image in the popup window.
  - ↳ A new window (**Device Viewer**) opens. All of the information relating to your device is displayed in this window as well as the product documentation.

**Manufacturer address**

Endress+Hauser Conducta GmbH+Co. KG  
Dieselstraße 24  
D-70839 Gerlingen

### 4.3 Scope of delivery

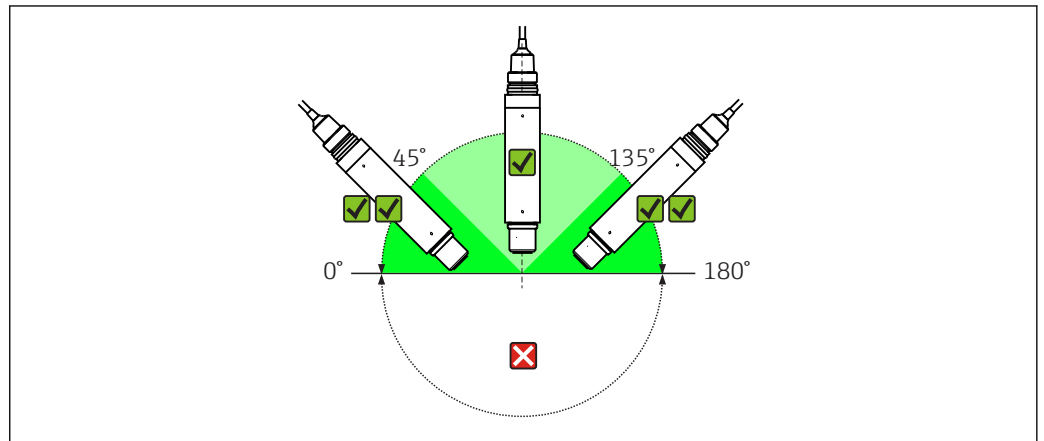
**Scope of delivery of sensor**

- Oxygen sensor with protection cap or mounted cleaning system (optional)
- Brief Operating Instructions


## 5 Installation

### 5.1 Installation conditions

#### 5.1.1 Orientation




 2 Angle of installation

 Recommended angle of inclination

The sensor must be installed at an angle of inclination in an assembly, holder or appropriate process connection. Recommended angle: 45° to prevent the attachment of air bubbles. At angles of inclination of 45 to 135°, air bubbles at the oxygen-sensitive membrane may increase the measured value.

The sensor can be installed up to the horizontal in an assembly, holder or suitable process connection. The optimum installation angle is 45°.

Other angles and upside-down installation are not recommended. Reason: Possible sediment formation and resulting falsification of measured value.

 Follow the instructions for installing sensors in the Operating Instructions for the assembly used.

#### 5.1.2 Mounting location

1. Choose a mounting location that is easy to access.
2. Ensure that upright posts and assemblies are fully secured and vibration-free.
3. Choose a mounting location with an oxygen concentration that is typical for the application.

## 5.2 Mounting the sensor

### 5.2.1 Measuring system

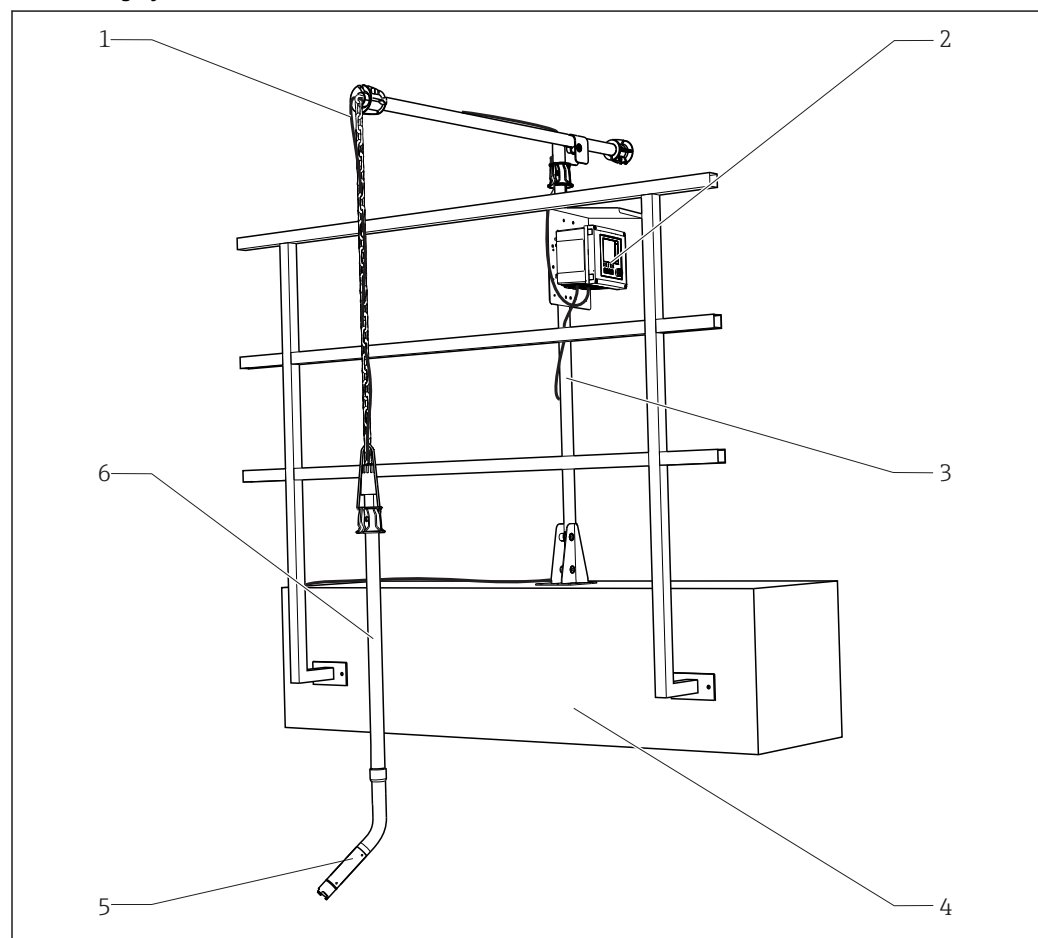
#### COS61D

A complete measuring system consists of the following components at least:

- Oxymax COS61D oxygen sensor
- Liquiline CM44x multi-channel transmitter
- Sensor cable, optionally available with M12 connector
- Assembly, e.g. flow assembly COA250, immersion assembly CYA112 or retractable assembly COA451

Optionally:

- Assembly holder Flexdip CYH112 for immersion operation
- Extension cable CYK11
- Cleaning system



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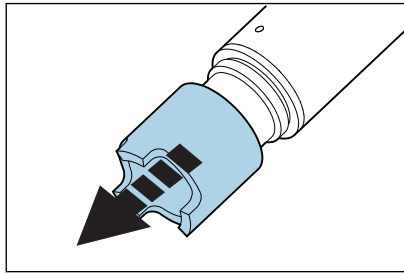
3 Example of a measuring system with COS61D

- |   |                 |   |                        |
|---|-----------------|---|------------------------|
| 1 | Sensor cable    | 4 | Basin rim with railing |
| 2 | Liquiline CM44x | 5 | Oxymax COS61D          |
| 3 | Flexdip CYH112  | 6 | FlexdipCYA112          |

### 5.2.2 Mounting the cleaning unit

If the cleaning unit is not supplied in a preassembled state:

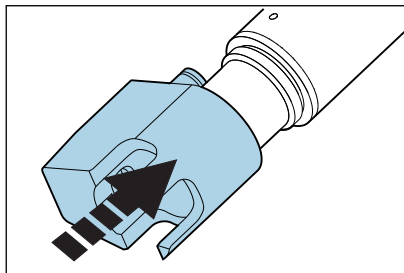
1.



Unscrew protection guard.

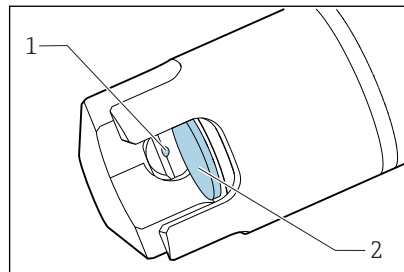
↳ Retain the protection guard for possible reuse at a later stage without the cleaning unit.

2.



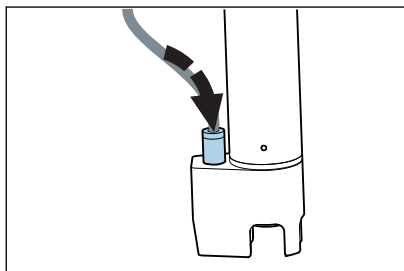
Screw on cleaning unit and tighten until the stop.

↳ The cleaning nozzle should now be level with the spot.



- 1 Cleaning nozzle  
2 Spot

3.



Connect the hose for the compressed air supply (to be provided onsite) or compressor (→ 29) to the hose connection of the cleaning unit.

### 5.2.3 Installing at a measuring point

Must be installed in a suitable assembly (depending on the application).

**⚠ WARNING****Electrical voltage**

In the event of a fault, non-grounded metallic assemblies may be live and as such are not safe to touch!

- ▶ When using metallic assemblies and installation equipment, national grounding provisions must be observed.



- For immersion operation, install individual assemblies away from the basin on a solid base.
- Final assembly must be performed only at the assigned mounting location.
- Choose a mounting location that is easy to access.

For complete installation of a measuring point, proceed as follows:

1. Install a retractable or a flow assembly (if used) into the process.
2. Connect the water supply to the rinse connections (if you are using an assembly with a cleaning function).
3. Install and connect the oxygen sensor.

**NOTICE****Installation error**

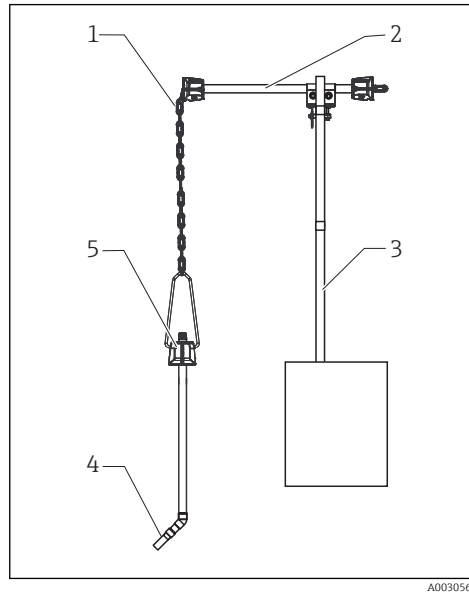
Cable breakage, loss of sensor due to cable separation, unscrewing of fluorescence cap!

- ▶ Do not install the sensor freely suspended from the cable.
- ▶ Screw the sensor into the assembly, ensuring that the cable is not twisted.
- ▶ Hold on to the sensor body during installation or removal. Turn **only at the hexagonal nut** of the armored coupling. Otherwise you might unscrew the fluorescence cap. This will then remain in the assembly or process.
- ▶ Avoid exerting excessive tensile force on the cable (e.g. through jerky pulling movements).
- ▶ Choose a mounting location that is easy to access for later calibrations.
- ▶ Follow the instructions for installing sensors in the Operating Instructions for the assembly used.

### 5.3 Installation examples

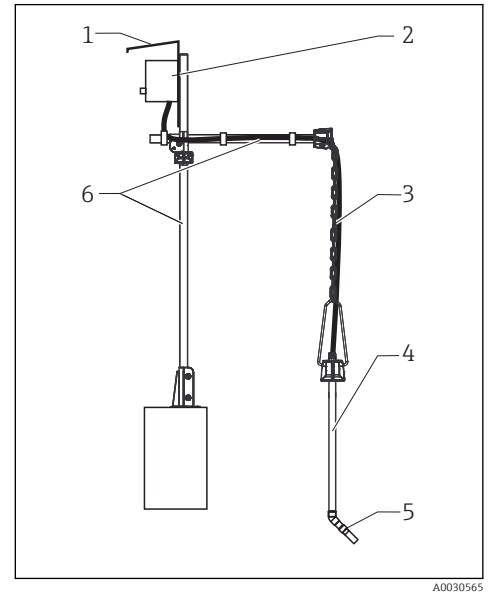
#### 5.3.1 Immersion operation

##### Universal holder and chain assembly



4 Chain holder on railing

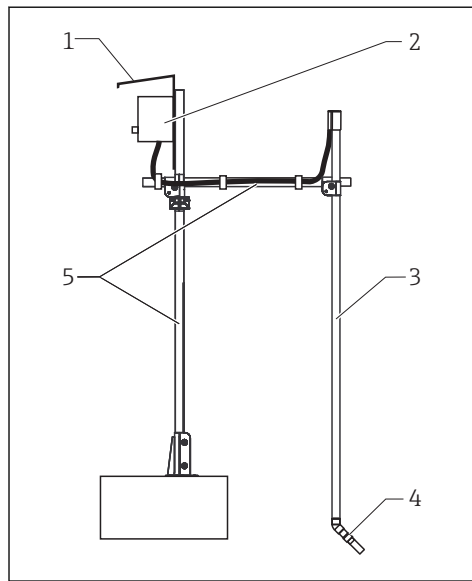
- 1 Chain
- 2 Holder Flexdip CYH112
- 3 Rail
- 4 Sensor Oxymax
- 5 Wastewater assembly Flexdip CYA112



5 Chain holder on upright post

- 1 Weather protection cover CYY101
- 2 Controller / transmitter
- 3 Chain
- 4 Wastewater assembly Flexdip CYA112
- 5 Sensor Oxymax
- 6 Holder Flexdip CYH112

### Universal holder and fixed immersion tube

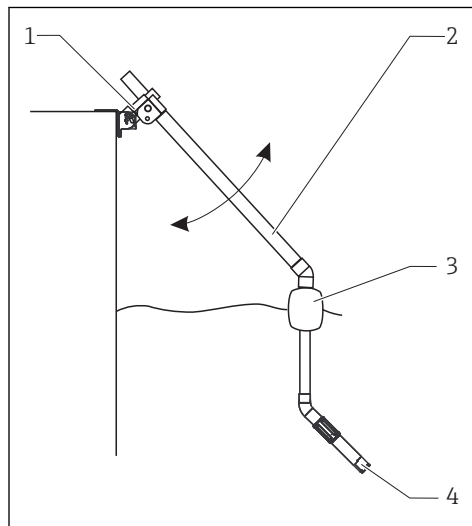


A0030567

6 Assembly holder with immersion tube

- 1 Protective cover
- 2 Controller / transmitter
- 3 Flexdip CYA112 immersion assembly
- 4 Sensor Oxymax
- 5 Assembly holder Flexdip CYH112

### Basin rim mounting with immersion tube



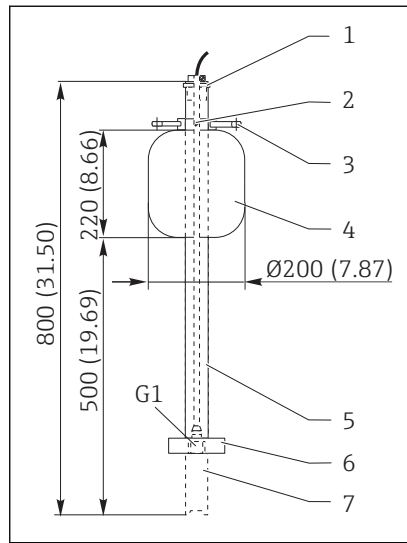
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7 Basin rim mounting

- 1 Pendulum holder CYH112
- 2 Assembly Flexdip CYA112
- 3 Assembly float
- 4 Sensor Oxymax

**Float**

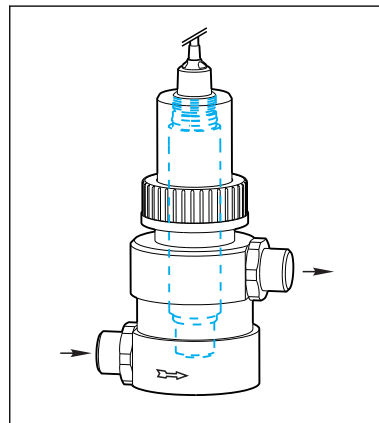
The CYA112 float is for use in the case of large fluctuations in water level, for example in rivers or lakes.



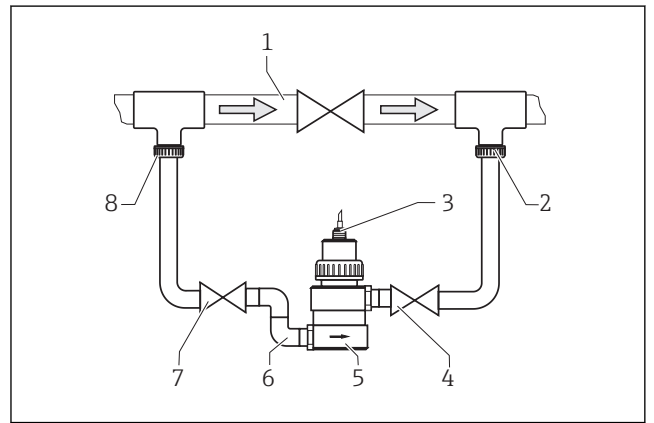
- 1 Cable run with strain relief and rain shield
- 2 Fixing ring for rope and chains with terminal screw
- 3 Eyelets Ø15, 3 x 120 ° for anchoring
- 4 Plastic float, resistant to salt water
- 5 Pipe 40 x 1, stainless steel 1.4571
- 6 Bumper and ballast
- 7 Oxygen sensor

8 Dimensions in mm (inch)

**5.3.2 Flow assembly COA250**



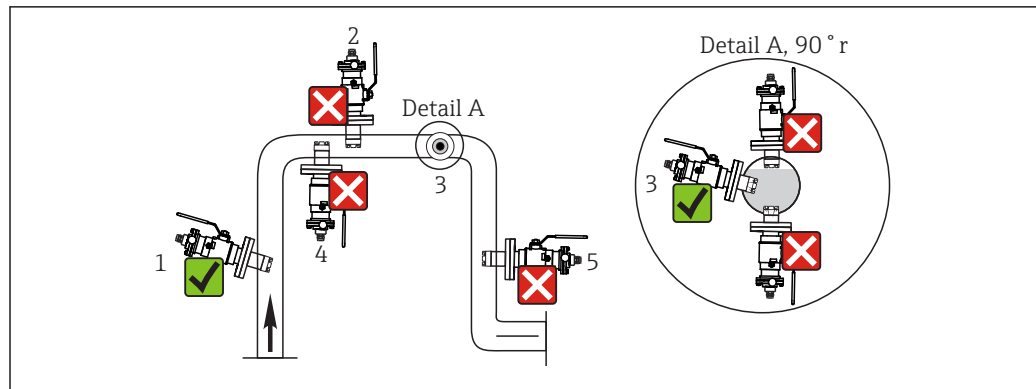
9 COA250



10 Bypass installation with manually actuated valves or solenoid valves

- 1 Main pipe
- 2 Medium return
- 3 Oxygen sensor
- 4, 7 Manually actuated or solenoid valves
- 5 Flow assembly COA250-A
- 6 90 ° pipe elbow
- 8 Medium removal

### 5.3.3 Retractable assembly COA451



A0030571

11 Permissible and impermissible sensor installation positions with retractable assembly COA451

- 1 Ascending pipe, best position
- 2 Horizontal pipe, sensor top down, impermissible due to air cushion or foam bubble forming
- 3 Horizontal pipe, lateral installation with permissible installation angle (acc. to sensor version)
- 4 Down pipe, impermissible

#### NOTICE

**Sensor not fully immersed in the medium, deposit on sensor membrane or sensor optics, sensor installed upside down**

Incorrect measurements are possible and these may affect the measuring point.

- ▶ Do not install the assembly at points where air pockets or bubbles form or where suspended particles may build up at the sensor membrane or sensor optics (item 2).

### 5.4 Post-installation check

1. Are the sensor and cable undamaged?
2. Is the orientation correct?
3. Is the sensor installed in an assembly and is not suspended from the cable?
4. Avoid the penetration of moisture by fitting the protection cap on the immersion assembly.

## 6 Electrical connection

**⚠ WARNING**

**Device is live!**

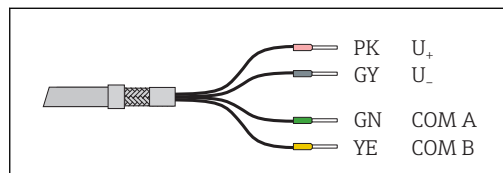
Incorrect connection may result in injury or death!

- ▶ The electrical connection may be performed only by an electrical technician.
- ▶ The electrical technician must have read and understood these Operating Instructions and must follow the instructions contained therein.
- ▶ **Prior** to commencing connection work, ensure that no voltage is present on any cable.

### 6.1 Connecting the sensor

Connection data

- Sensor cable connected directly to the terminal connector of the basic module
- Optional: sensor cable plug connected to the M12 sensor socket of the transmitter  
With this type of connection, the transmitter is already wired at the factory.



12 Sensor fixed cable with terminated cable cores

### 6.2 Ensuring the degree of protection

Only the mechanical and electrical connections which are described in these instructions and which are necessary for the required, designated use, may be carried out on the device delivered.

- ▶ Exercise care when carrying out the work.

Otherwise, the individual types of protection (Ingress Protection (IP), electrical safety, EMC interference immunity) agreed for this product can no longer be guaranteed due, for example to covers being left off or cable (ends) that are loose or insufficiently secured.

### 6.3 Post-connection check

Device condition and specifications	Notes
Are the sensor, assembly, or cables free from damage on the outside?	Visual inspection
Electrical connection	Notes
Are the mounted cables strain-relieved and not twisted?	
Is a sufficient length of the cable cores stripped, and are the cores positioned in the terminal correctly?	Check the fit (by pulling gently)
Are all the screw terminals properly tightened?	Tighten
Are all cable entries mounted, tightened and leak-tight?	For lateral cable entries, make sure the cables loop downwards to allow water to drip off
Are all cable entries installed downwards or mounted laterally?	

## 7 Calibration and adjustment

### 7.1 Types of calibration

The following types of calibration are possible:

- Zero point
  - Single-point calibration in nitrogen or COY8 zero-point gel
  - Data entry
- Slope
  - Air, water vapor-saturated
  - Air-saturated water
  - Air, variable
  - Data entry
- Sample calibration
  - Slope
- Temperature adjustment

### 7.2 Calibration intervals

#### Specifying the intervals

If you want to calibrate the sensor intermittently for a special application and/or on account of a special type of installation, you can calculate the intervals using the following method:

1. Remove the sensor from the medium.
2. Clean the outside of the sensor with a damp cloth.
3. Then dry the sensor diaphragm carefully with a soft paper towel for example.
4. **NOTICE**  
**Incorrect measurements caused by atmospheric influences!**
  - ▶ Protect the sensor against external influences such as sunlight and wind.

After 10 minutes, measure the oxygen saturation index in air.

5. Decide using the results:
  - a) Measured value is **not**  $100 \pm 2$  %SAT → Calibrate sensor.
  - b) If the values are within the interval specified, you do not need to calibrate the sensor. Extend the period until the next inspection.
6. Repeat the steps specified after two, four or eight months to determine the optimum calibration interval for your sensor.
  - ▶ In any case, calibrate the sensor at least once a year.

### 7.3 Calibration in air

1. Remove the sensor from the medium.
2. Clean the outside of the sensor with a damp cloth.
3. Allow a temperature compensation time of approx. 20 minutes for the sensor in the ambient air. Make sure that the sensor is not exposed to any direct ambient effects (direct sunlight, drafts) during this time.

4. Is the measured value display on the transmitter stable:  
Perform the calibration in accordance with the Operating Instructions for the transmitter. Pay particular attention to the software settings for the stability criteria for calibration and for the ambient pressure.
  5. Where necessary:  
Adjust sensor.
  6. Then place the sensor back into the medium.
- Follow the calibration instructions in the Operating Instructions for the transmitter used.

## 7.4 Calculation example for the calibration value

As a check, you can calculate the expected calibration value (transmitter display) as shown in the following example (salinity is 0).

1. Determine the following:
  - The ambient temperature for the sensor (air temperature for **Air 100% rh** or calibration methods **Air variable**, water temperature for **H2O air-saturated** calibration method)
  - The altitude above sea level
  - The current air pressure (= relative air pressure based on sea level) at the time of calibration. (If undeterminable, use 1013 hPa.)
2. Determine the following:
  - The saturation value S acc. to Table 1
  - The altitude factor K acc. to Table 2

Table 1

T [°C (°F)]	S [mg/l=ppm]	T [°C (°F)]	S [mg/l=ppm]	T [°C (°F)]	S [mg/l=ppm]	T [°C (°F)]	S [mg/l=ppm]
0 (32)	14.64	11 (52)	10.99	21 (70)	8.90	31 (88)	7.42
1 (34)	14.23	12 (54)	10.75	22 (72)	8.73	32 (90)	7.30
2 (36)	13.83	13 (55)	10.51	23 (73)	8.57	33 (91)	7.18
3 (37)	13.45	14 (57)	10.28	24 (75)	8.41	34 (93)	7.06
4 (39)	13.09	15 (59)	10.06	25 (77)	8.25	35 (95)	6.94
5 (41)	12.75	16 (61)	9.85	26 (79)	8.11	36 (97)	6.83
6 (43)	12.42	17 (63)	9.64	27 (81)	7.96	37 (99)	6.72
7 (45)	12.11	18 (64)	9.45	28 (82)	7.82	38 (100)	6.61
8 (46)	11.81	19 (66)	9.26	29 (84)	7.69	39 (102)	6.51
9 (48)	11.53	20 (68)	9.08	30 (86)	7.55	40 (104)	6.41
10 (50)	11.25						

Table 2

Altitude [m (ft)]	K	Altitude [m (ft)]	K	Altitude [m (ft)]	K	Altitude [m (ft)]	K
0 (0)	1.000	550 (1800)	0.938	1050 (3450)	0.885	1550 (5090)	0.834
50 (160)	0.994	600 (1980)	0.932	1100 (3610)	0.879	1600 (5250)	0.830
100 (330)	0.988	650 (2130)	0.927	1150 (3770)	0.874	1650 (5410)	0.825
150 (490)	0.982	700 (2300)	0.922	1200 (3940)	0.869	1700 (5580)	0.820

Altitude [m (ft)]	K	Altitude [m (ft)]	K	Altitude [m (ft)]	K	Altitude [m (ft)]	K
200 (660)	0.977	750 (2460)	0.916	1250 (4100)	0.864	1750 (5740)	0.815
250 (820)	0.971	800 (2620)	0.911	1300 (4270)	0.859	1800 (5910)	0.810
300 (980)	0.966	850 (2790)	0.905	1350 (4430)	0.854	1850 (6070)	0.805
350 (1150)	0.960	900 (2950)	0.900	1400 (4600)	0.849	1900 (6230)	0.801
400 (1320)	0.954	950 (3120)	0.895	1450 (4760)	0.844	1950 (6400)	0.796
450 (1480)	0.949	1000 (3300)	0.890	1500 (4920)	0.839	2000 (6560)	0.792
500 (1650)	0.943						

3. Calculate factor **L**:


$$L = \frac{\text{Relative air pressure at calibration}}{1013 \text{ hPa}}$$

4. Calculate calibration value **C**:

$$C = S \cdot K \cdot L$$

**Example**

- Air calibration at 18 °C (64 °F), altitude 500 m (1650 ft) above sea level, current air pressure 1009 hPa
- $S = 9.45 \text{ mg/l}$ ,  $K = 0.943$ ,  $L = 0.996$
- Calibration value  $C = 8.88 \text{ mg/l}$ .

 You do not need factor **K** in the table if your measuring device returns the absolute air pressure  $L_{\text{abs}}$  (air pressure depending on altitude) as the measured value. The formula for calculation is then:  $C = S \cdot L_{\text{abs}}$ .

## 8 Commissioning

### 8.1 Function check

Prior to initial commissioning, ensure that:

- The sensor is correctly installed
- The electrical connection is correct

If using an assembly with automatic cleaning function:


- ▶ Check that the cleaning medium (water or air, for example) is connected correctly.

#### **WARNING**

#### **Escaping process medium**

Risk of injury from high pressure, high temperatures or chemical hazards!

- ▶ Before applying pressure to an assembly with cleaning system, ensure that the system has been connected correctly.
- ▶ If you cannot reliably establish the correct connection, do not install the assembly in the process.

 Following commissioning, the sensor must be serviced at regular intervals, as only then can reliable measurement be guaranteed.

 Operating Instructions for the transmitter used, such as BA01245C if using the Liquiline CM44x or CM44xR.

### 8.2 Sensor calibration

The sensor is calibrated at the factory. A new calibration is only needed in special situations.

### 8.3 Cleaning the sensor automatically

Compressed air is most suitable for cyclic cleaning. The cleaning unit is either provided or can be retrofitted, and is attached to the sensor head. It operates at a capacity of 20-60 l/min. Optimum results are achieved at 2 bar (29 psi) and 60 l/min.

*The following settings are recommended for the cleaning unit:*

Type of soiling	Cleaning interval	Cleaning duration
Media containing grease and oils	15 min	20 s
Biofilm	60 min	20 s

## 9 Troubleshooting


### 9.1 Troubleshooting instructions

- ▶ If one of the following problems is present:  
Check the measuring system in the order shown.

Problem	Testing	Remedial action
Nothing displayed, no reaction from the sensor	Power supply to the transmitter?	▶ Connect power supply.
	Sensor cable connected correctly?	▶ Establish correct connection.
	Deposit buildup on fluorescence layer?	▶ Clean sensor.
Displayed value too high	Is sensor calibrated/adjusted?	▶ Recalibrate/readjust. ↳ During calibration, enter the current air pressure at the transmitter.
	Displayed temperature clearly too low?	▶ Check sensor, if necessary send sensor in for repair.
	Has salinity been taken into account?	▶ Enter salinity value on transmitter.
Displayed value too low	Is sensor calibrated/adjusted?	▶ Recalibrate/readjust.
	Displayed temperature clearly too high?	▶ Check sensor, if necessary send sensor in for repair.
	Deposit buildup on the fluorescence layer?	▶ Clean sensor.
Display in Vol% or %SAT not plausible.	Medium pressure has not been taken into account.	▶ Enter medium pressure on transmitter.

1. Pay attention to the troubleshooting information in the Operating Instructions for the transmitter.
2. Check the transmitter if necessary.

### 9.2 Checking the sensor

Testing	Corrective action	Set point
Slope check	<ul style="list-style-type: none"> <li>▶ Place the sensor in air.</li> <li>▶ Dry the sensor with a paper towel.</li> </ul>	Measured value display after 1 minute: Approx. 100 % SAT
Zero-point check	▶ Immerse the sensor in zero-point gel (→  29).	Display close to 0 mg/l (0 % SAT)

1. In the case of deviations from the set points:  
Perform troubleshooting as indicated in the troubleshooting instructions.
2. Contact the Sales Center if necessary.

## 10 Maintenance

Take all the necessary precautions in time to ensure the operational safety and reliability of the entire measuring system.

### NOTICE

#### Effects on process and process control!

- ▶ When carrying out any work on the system, bear in mind any potential impact this could have on the process control system and the process itself.
- ▶ For your own safety, only use genuine accessories. With genuine parts, the function, accuracy and reliability are also ensured after maintenance work.

### 10.1 Maintenance schedule



Maintenance cycles depend to a great extent on the operating conditions.

The following rule of thumb applies:

- Constant conditions, e.g. Power plant = long cycles (1/2 year)
- Widely varying conditions, e.g. daily CIP or SIP cleaning = short cycles (1 month or shorter)




The following method helps you determine the necessary intervals:

1. Inspect the sensor one month after commissioning. To do so, remove the sensor from the medium and dry it.
2. After 10 minutes, measure the oxygen saturation index in air.
  - ↳ Decide using the results:
    - a) Measured value not  $100 \pm 2$  %SAT? → Service the sensor.
    - b) Measured value =  $100 \pm 2$  %SAT? → Double the length of time to the next inspection.
3. Proceed as indicated in Step 1 after two, four and eight months.
  - ↳ This allows you to determine the optimum maintenance interval for your sensor.

 Particularly in the case of widely fluctuating process conditions, damage may occur to the fluorescence layer even within a maintenance cycle. You can recognize this by implausible sensor behavior. (→  24)

### 10.2 Maintenance tasks

The following tasks are mandatory:

1. Clean the sensor fluorescence cap . →  25
2. Replace wear parts or consumables. →  26
3. Check measurement function. →  27
4. Recalibrate (if desired or necessary).
  - ↳ Follow the Operating Instructions for the transmitter.

### 10.3 Cleaning exterior of sensor

The measurement can be corrupted by sensor fouling or malfunction due to the following, for example:

Deposit buildup on the fluorescence cap

↳ This results in a longer response time and, under certain circumstances, a reduced slope.

For reliable measurement, the sensor must be cleaned at regular intervals. The frequency and intensity of the cleaning operation depend on the medium.

Clean the sensor:

- Before every calibration
- At regular intervals during operation as necessary
- Before returning it for repairs

Type of contamination	Cleaning
Salt deposits	<ol style="list-style-type: none"> <li>1. Immerse the sensor in drinking water or in 1-5 % hydrochloric acid (for a few minutes).</li> <li>2. Then rinse it with copious amounts of water.</li> </ol>
Dirt particles on the sensor shaft and shaft sleeve ( <b>not fluorescence cap!</b> )	<ul style="list-style-type: none"> <li>▶ Clean sensor shaft and sleeve with water and a suitable sponge.</li> </ul>
Dirt particles on fluorescence cap	<ul style="list-style-type: none"> <li>▶ Clean the fluorescence cap with water and a soft cloth.</li> </ul>

- ▶ After cleaning:  
Rinse with copious amounts of clean water.

## 10.4 Cleaning sensor optics

The optics need to be cleaned only if medium has penetrated a defective fluorescence cap.

1. Unscrew the protection guard and fluorescence cap from the sensor head.
2. Carefully clean the optical surface with a soft cloth until the buildup is fully removed.
3. Clean the optical surface with drinking water or distilled water.
4. Dry the optical surface and screw on a functional fluorescence cap.
5. At the transmitter, execute the command **Sensor cap change** and then perform the necessary calibrations.

### NOTICE

#### Damage, scratches on optical surface

Distorted measured values

- ▶ Make sure that the optical surface is not scratched or damaged in any other way.

## 10.5 Wear parts and consumables

Parts of the sensor are subject to wear during operation. By taking suitable measures, you can restore the normal operating function.

Corrective action	Reason
Replace process seals	Visible damage to a process seal
Replace fluorescence cap	Fluorescence layer can no longer be cleaned or is damaged (hole or overstretching)

### 10.5.1 Replacing sealing rings

It is compulsory to replace the sealing ring if it is visibly damaged. For replacement, use only original sealing rings.

### 10.5.2 Replacing the fluorescence cap

The typical operating life of a fluorescence cap is more than 2 years. The sensor checks whether the cap is aging and issues a warning via the transmitter if the rate of aging reaches a specific value. The sensor is still able to measure at this stage. However, it is advisable to change the cap as quickly as possible.

**Removing the old fluorescence cap**

1. Remove the sensor from the medium.
2. Unscrew protection guard.
3. Clean exterior of sensor.
4. Unscrew fluorescence cap.
5. Clean and dry optical surface.

**Installing the new fluorescence cap**

Make sure that there are no dirt particles on the sealing surfaces.

6. Carefully screw the new fluorescence cap onto the sensor head and tighten until the stop.
7. Screw protection guard back on.
  - ↳ After replacing the fluorescence cap, you must recalibrate and adjust the sensor.
8. Then place the sensor back into the medium and check that no alarm is displayed on the transmitter.

**10.6 Checking the measurement function**

1. Remove the sensor from the medium.
2. Clean and dry the fluorescence cap.
3. After about 10 minutes, measure the oxygen saturation index in air (without recalibration).
  - ↳ The measured value should be at  $100 \pm 2$  % SAT.

## 11 Accessories

The following are the most important accessories available at the time this documentation was issued.

- ▶ For accessories not listed here, please contact your Service or Sales Center.

### 11.1 Assemblies (selection)

#### FlexdipCYA112

- Immersion assembly for water and wastewater
- Modular assembly system for sensors in open basins, channels and tanks
- Material: PVC or stainless steel
- Product Configurator on the product page: [www.endress.com/cya112](http://www.endress.com/cya112)



Technical Information TI00432C

#### Flowfit COA250

- Flow assembly for oxygen measurement
- Product Configurator on the product page: [www.endress.com/coa250](http://www.endress.com/coa250)



Technical Information TI00111C

#### Cleanfit COA451

- Manual retractable assembly made of stainless steel with ball valve shutoff
- For oxygen sensors
- Product Configurator on the product page: [www.endress.com/coa451](http://www.endress.com/coa451)



Technical Information TI00368C

### 11.2 Assembly holder

#### Flexdip CYH112

- Modular holder system for sensors and assemblies in open basins, channels and tanks
- For Flexdip CYA112 water and wastewater assemblies
- Can be affixed anywhere: on the ground, on the capstone, on the wall or directly onto railings.
- Stainless steel version
- Product Configurator on the product page: [www.endress.com/cyh112](http://www.endress.com/cyh112)



Technical Information TI00430C

### 11.3 Measuring cable

#### Memosens data cable CYK11

- Extension cable for digital sensors with Memosens protocol
- Product Configurator on the product page: [www.endress.com/cyk11](http://www.endress.com/cyk11)



Technical Information TI00118C

## 11.4 Zero-point gel

### COY8

Zero-point gel for oxygen and chlorine sensors

- Oxygen-free gel for the validation, calibration and adjustment of oxygen measuring cells
- Product Configurator on the product page: [www.endress.com/coy8](http://www.endress.com/coy8)



Technical Information TI01244C

## 11.5 Protection guard

### Membrane basket protector COY3-SK

- For using the sensor in fish farming tanks
- Order No.: 50081787

## 11.6 Cleaning unit

### Compressed air cleaning for COSXX

- Connection: AD 6/8 mm (incl. hose reducer coupling) or AD 6.35 mm (1/4")
- Materials: POM/V4A
- Order No.
  - AD 6/8 mm: 71110801
  - AD 6.35 mm (1/4"): 71110802

### Compressor

- For compressed air cleaning
- Order No.
  - 230 V AC order no. 71072583
  - 115 V AC order no. 71194623

## 11.7 Calibration vessel

### Calibration vessel

- For COS61D/61
- Order No.: 51518599

## 12 Repair

### 12.1 Spare parts and consumables

	Item	Spare parts kit	Order number
	1	Sensor	As per product structure
	2	Sealing ring x 2	51518597
	3	Sensor cap (fluorescence cap)	51518598
	4	Protection guard	50053276

### 12.2 Return

The product must be returned if repairs or a factory calibration are required, or if the wrong product was ordered or delivered. As an ISO-certified company and also due to legal regulations, Endress+Hauser is obliged to follow certain procedures when handling any returned products that have been in contact with medium.

To ensure the swift, safe and professional return of the device:

- ▶ Refer to the website [www.endress.com/support/return-material](http://www.endress.com/support/return-material) for information on the procedure and conditions for returning devices.

### 12.3 Disposal

The device contains electronic components, and must therefore be disposed of in accordance with regulations on the disposal of electronic waste.

- ▶ Observe the local regulations.

## 13 Technical data

### 13.1 Input

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Measured variables	Dissolved oxygen [mg/l, µg/l, ppm, ppb or %SAT or hPa]
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Measuring ranges	Measuring ranges apply for 25 °C (77 °F) and 1013 hPa (15 psi) With Liquiline CM44x, CM44xR, CM44P: <ul style="list-style-type: none"> <li>■ 0 to 20 mg/l</li> <li>■ 0 to 400 hPa</li> <li>■ 0 to 200 % SAT</li> </ul>
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### 13.2 Performance characteristics

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Response time	From air to nitrogen at reference operating conditions: t <sub>90</sub> : 60 s
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Reference operating conditions	Reference temperature:	25 °C (77 °F)
	Reference pressure:	1013 hPa (15 psi)
	Reference application:	Air-saturated water

---

Maximum measured error <sup>1)</sup>	<b>Measuring range</b>	<b>Maximum measured error</b>
	< 12 mg/l 12 mg/l to 20 mg/l	0.01 mg/l or ±1 % of reading ±2% of reading

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Repeatability	±0.5 % of end of measuring range
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Operating life of sensor cap	>2 years (under reference operating conditions, protect against direct sunlight)
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### 13.3 Environment

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Ambient temperature	-20 to 60 °C (-4 to 140 °F)
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Storage temperature	-20 to 70 °C (-4 to 158 °F) at 95% relative air humidity, not condensating
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Degree of protection	IP 68 (test conditions: 10 m (33 ft) water column, at 25 °C (77 °F) over 30 days)
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Electromagnetic compatibility	Interference emission and interference immunity as per EN 61326: 2005, Namur NE 21:2007
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1) In accordance with IEC 60746-1 at rated operating conditions

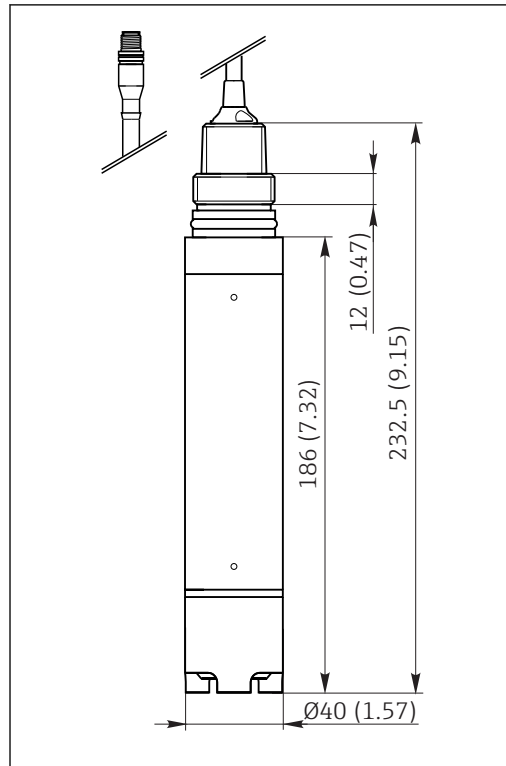
### 13.4 Process

Process temperature -5 to +60 °C (20 to 140 °F)

Process pressure Ambient pressure ... 10 bar (... 145 psi) abs.

### 13.5 Mechanical construction

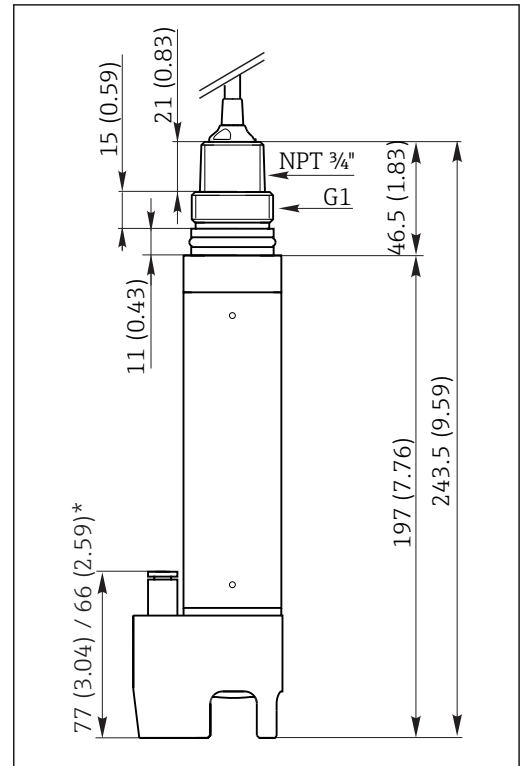
#### Dimensions



A0037103

13 With optional M12 connector

Dimensions in mm (inch)

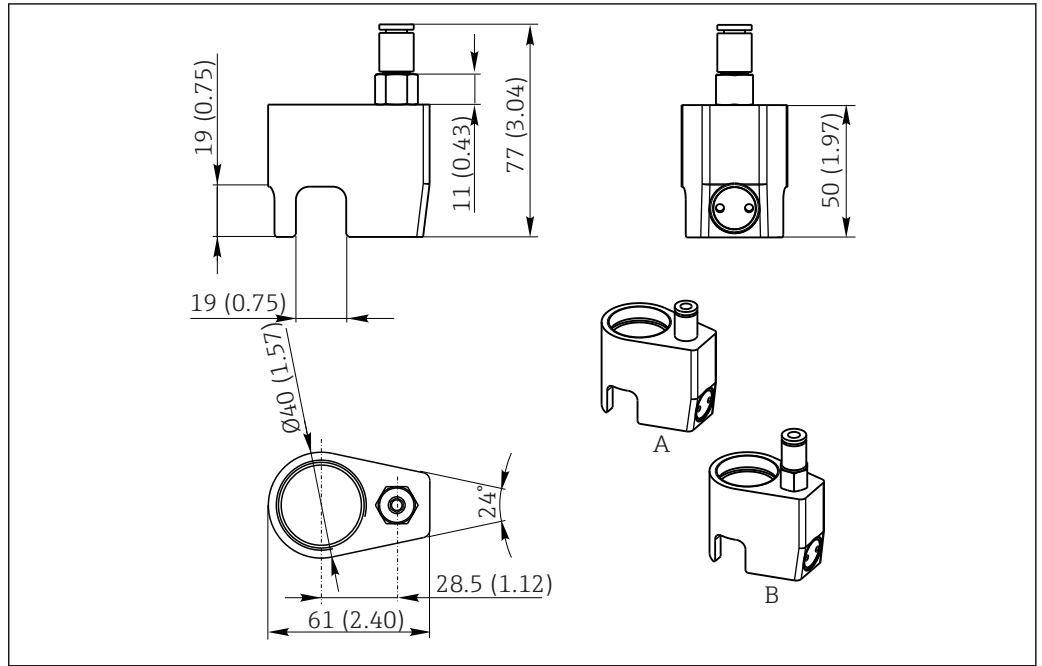


A0037093

14 With optional cleaning unit

\* depending on version of cleaning unit

Optional cleaning unit



15 Dimensions in mm (inch)

A0013314

Weight	with cable length 7 m (23 ft):	0.7 kg (1.5 lbs)
	with cable length 15 m (49 ft):	1.1 kg (2.4 lbs)

Materials	<b>Parts in contact with medium</b>	
	Sensor shaft	Stainless steel 1.4435 (AISI 316L)
	Cap with fluorescence layer	POM
	Fluorescence layer	Silicone

Process connection	G1, NPT 3/4"
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Sensor cable	Shielded 4-core fixed cable
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Cable connection at transmitter	■ Terminal connection, end ferrules
	■ Optional: M12 connector

Maximum cable length	max. 100 m (330 ft), incl. Cable extension
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Temperature compensation	Internal
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Interface	Memosens protocol
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# Index

## A

Accessories . . . . .	28
Adjustment . . . . .	20
Ambient temperature . . . . .	31
Assemblies . . . . .	28

## C

Calibration	
Calculation example . . . . .	21
In air . . . . .	20
Types of calibration . . . . .	20
Check	
Connection . . . . .	19
Function . . . . .	23
Installation . . . . .	18
Cleaning	
Sensor . . . . .	25
Sensor optics . . . . .	26
Cleaning sensor optics . . . . .	26
Cleaning unit . . . . .	13
Connection	
Check . . . . .	19
Ensuring the degree of protection . . . . .	19

## D

Degree of protection	
Degree of protection . . . . .	31
Ensuring . . . . .	19
Designated use . . . . .	4
Device description . . . . .	6
Dimensions . . . . .	32
Disposal . . . . .	30

## E

Electrical connection . . . . .	19
Environment . . . . .	31

## F

Fluorescence cap . . . . .	8
Replacement . . . . .	26
Function . . . . .	6
Function check . . . . .	23

## I

Incoming acceptance . . . . .	9
Installation	
Check . . . . .	18
Cleaning unit . . . . .	13
Examples . . . . .	15
Orientation . . . . .	11
Sensor . . . . .	12
Installation instructions . . . . .	11

## M

Maintenance schedule . . . . .	25
Maintenance tasks . . . . .	25
Manufacturer address . . . . .	10

Materials . . . . .	33
Maximum measured error . . . . .	31
Measured variables . . . . .	31
Measurement function . . . . .	27
Measuring cable . . . . .	28
Measuring point . . . . .	13
Measuring principle . . . . .	6
Measuring ranges . . . . .	31
Measuring system . . . . .	12

## N

Nameplate . . . . .	9
---------------------	---

## O

Operating life of sensor cap . . . . .	31
Operational safety . . . . .	4
Optical measuring principle . . . . .	6
Orientation . . . . .	11

## P

Performance characteristics . . . . .	31
Process . . . . .	32
Process connection . . . . .	33
Process pressure . . . . .	32
Process temperature . . . . .	32
Product identification . . . . .	9
Product safety . . . . .	5

## R

Reference operating conditions . . . . .	31
Repair . . . . .	30
Repeatability . . . . .	31
Replacing sealing rings . . . . .	26
Response time . . . . .	31
Return . . . . .	30

## S

Safety	
Operation . . . . .	4
Product . . . . .	5
Workplace safety . . . . .	4
Safety instructions . . . . .	4
Scope of delivery . . . . .	10
Sensor	
Calibration . . . . .	23
Check . . . . .	24
Cleaning . . . . .	23, 25
Connecting . . . . .	19
Design . . . . .	7
Mounting . . . . .	12
Sensor design . . . . .	7
Spare parts . . . . .	30
Spot cap . . . . .	26
Storage temperature . . . . .	31
Symbols . . . . .	3

**T**

Technical data	
Environment . . . . .	31
Input . . . . .	31
Mechanical construction . . . . .	32
Performance characteristics . . . . .	31
Process . . . . .	32
Troubleshooting . . . . .	24
Troubleshooting instructions . . . . .	24

**U**

Use . . . . .	4
---------------	---

**W**

Warnings . . . . .	3
Wear parts and consumables . . . . .	26
Weight . . . . .	33
Workplace safety . . . . .	4

**Z**

Zero-point gel . . . . .	29
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