

Operating Instructions

Oxymax COS61D

Dissolved oxygen sensor
With Memosens protocol

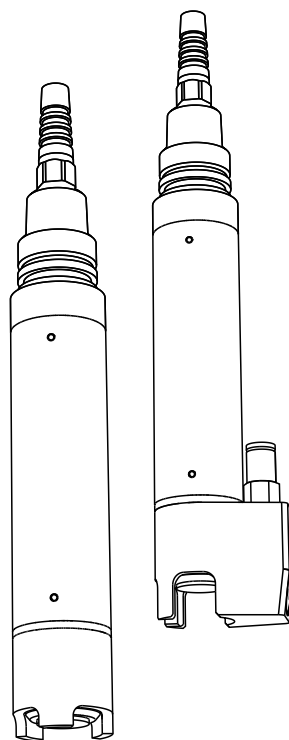


Table of contents

1	Document information	3	10	Maintenance	25
1.1	Warnings	3	10.1	Maintenance schedule	25
1.2	Symbols	3	10.2	Maintenance tasks	25
2	Basic safety instructions	4	10.3	Clean exterior of sensor	25
2.1	Requirements for personnel	4	10.4	Cleaning the sensor optics	26
2.2	Designated use	4	10.5	Wear parts and consumables	26
2.3	Occupational safety	4	11	Accessories	28
2.4	Operational safety	4	11.1	Assemblies (selection)	28
2.5	Product safety	5	11.2	Assembly holder	28
3	Device description, function	6	11.3	Measuring cable	28
3.1	Optical measuring principle	6	11.4	Zero-point gel	28
3.2	Sensor design	7	11.5	Protection guard	29
3.3	Memosens technology	8	11.6	Cleaning unit	29
3.4	Fluorescence cap	8	11.7	Calibration vessel	29
4	Incoming acceptance and product identification	9	12	Repair	30
4.1	Incoming acceptance	9	12.1	Spare parts and consumables	30
4.2	Product identification	9	12.2	Return	30
4.3	Scope of delivery	10	12.3	Disposal	30
5	Installation	11	13	Technical data	31
5.1	Installation conditions	11	Index		34
5.2	Mounting the sensor	12			
5.3	Installation examples	15			
5.4	Post-installation check	18			
6	Electrical connection	19			
6.1	Connecting the sensor	19			
6.2	Ensuring the degree of protection	19			
6.3	Post-connection check	19			
7	Calibration and adjustment	20			
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			
8	Commissioning	23			
8.1	Function check	23			
8.2	Sensor calibration	23			
8.3	Cleaning the sensor automatically	23			
9	Troubleshooting	24			
9.1	Trouble shooting instructions	24			
9.2	Check sensor	24			

1 Document information

1.1 Warnings

Structure of information	Meaning
 DANGER Causes (/consequences) Consequences of non-compliance (if applicable) ► Corrective action	This symbol alerts you to a dangerous situation. Failure to avoid the dangerous situation will result in a fatal or serious injury.
 WARNING Causes (/consequences) Consequences of non-compliance (if applicable) ► Corrective action	This symbol alerts you to a dangerous situation. Failure to avoid the dangerous situation can result in a fatal or serious injury.
 CAUTION Causes (/consequences) Consequences of non-compliance (if applicable) ► Corrective action	This symbol alerts you to a dangerous situation. Failure to avoid this situation can result in minor or more serious injuries.
 NOTICE Cause/situation Consequences of non-compliance (if applicable) ► Action/note	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.
- Measuring point faults may be repaired only by authorized and specially trained personnel.

 Repairs not described in the Operating Instructions provided may only be carried out directly by the manufacturer 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 Occupational 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

1. Before commissioning the entire measuring point, verify that all connections are correct. Ensure that electrical cables and hose connections are undamaged.
2. Do not operate damaged products, and safeguard them to ensure that they are not operated inadvertently. Label the damaged product as defective.

3. If faults cannot be rectified:

Take the products out of operation and safeguard them to ensure that they are not operated inadvertently.

⚠ 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, please 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 surface of the fluorescence layer is in contact with the medium.

The sensor optics are directed at the underside of 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 "answer" (fluoresce) with red light pulses.
 - ↳ The duration and intensity of the response signals is directly dependent on the oxygen contents and the 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

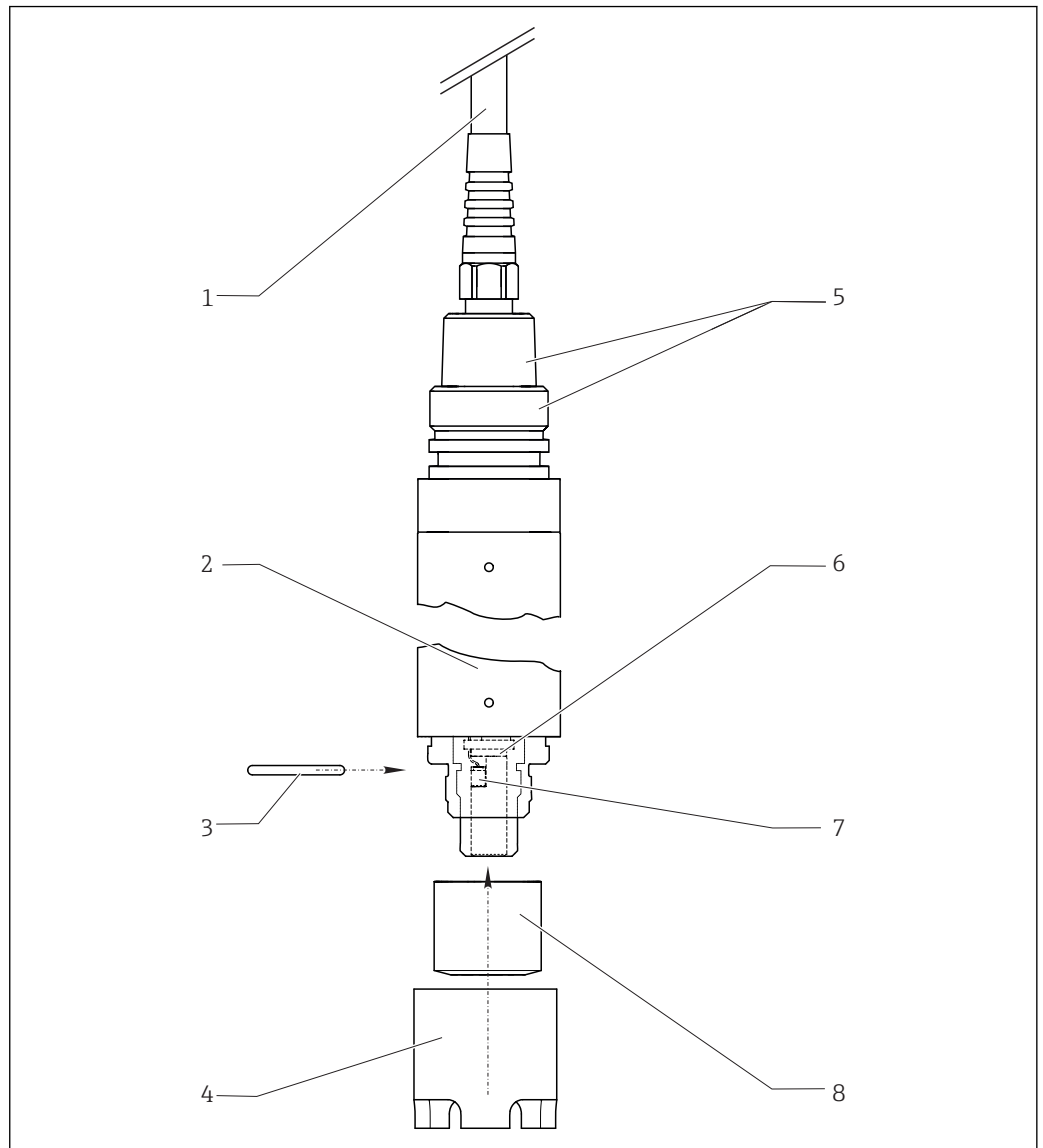
- The sensor returns a signal that is in proportion to the oxygen concentration in the medium.

The medium temperature and air pressure are already taken into account calculated in the sensor.

In addition to the standard values of concentration, saturation index and partial pressure, the sensor also returns a raw measured value in μs . The value corresponds to the decay time of the fluorescence and is approx. 20 μs in air and approx. 60 μs in oxygen-free media.

-  To ensure an optimum measurement result, the current air pressure should be entered at the transmitter during calibration. In the case of saline media, you should also enter the salinity value. For measurement in the units %Vol or %SAT, you must also enter the current operating pressure in measuring mode.

3.2 Sensor design



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1 Sensor structure

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

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 COR3 spray head (→ 29) for immersion operation with cleaning.

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. You can call up the sensor data via the relevant 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 into the fluorescence cap. Suitable flow is not necessarily mandatory but it does improve the speed at which the measuring system responds and ensures a more representative measured value compared to a measurement in static medium.

The cap is only permeable for dissolved gases. Other substances dissolved in the liquid phase e.g. 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 your supplier of any damage to the packaging.
Keep the damaged packaging until the matter has been settled.
2. Verify that the contents are undamaged.
 - ↳ Notify your supplier of any damage to the delivery contents.
Keep the damaged products until the matter has been settled.
3. Check the delivery for completeness.
 - ↳ Check it against the delivery papers and 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.
The permitted ambient conditions must be observed (see "Technical data").

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 data on the nameplate with your order.

4.2.2 Product identification

Product page

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 the product page for your product on the Internet.
2. At the bottom of the page, select the "Online Tools" link followed by "Check your device features".
 - ↳ An additional window opens.
3. Enter the order code from the nameplate into the search field, and then select "Show details".
 - ↳ You will receive information on each feature (selected option) of the order code.

4.3 Scope of delivery

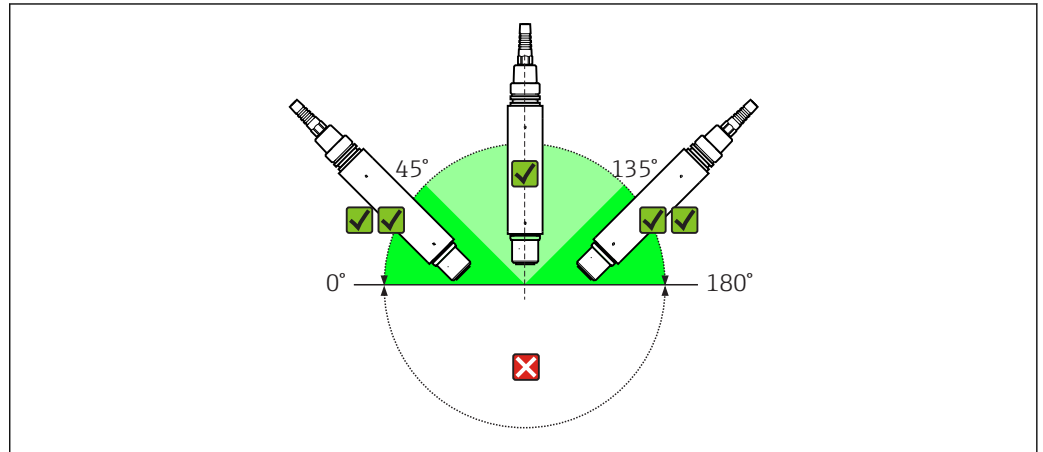
Scope of delivery of sensor

- Oxygen sensor with transport cap or mounted cleaning system (optional)
- 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, bracket or appropriate process connection. Recommended angle: 45°, to prevent the formation 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, support 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.

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

5.1.2 Mounting location

- Choose a mounting location that can be easily accessed at a later stage.
- Ensure that upright posts and fittings are fully secured and vibration-free.
- Select an installation location which produces a typical oxygen concentration for the individual application.

5.2 Mounting the sensor

5.2.1 Measuring system

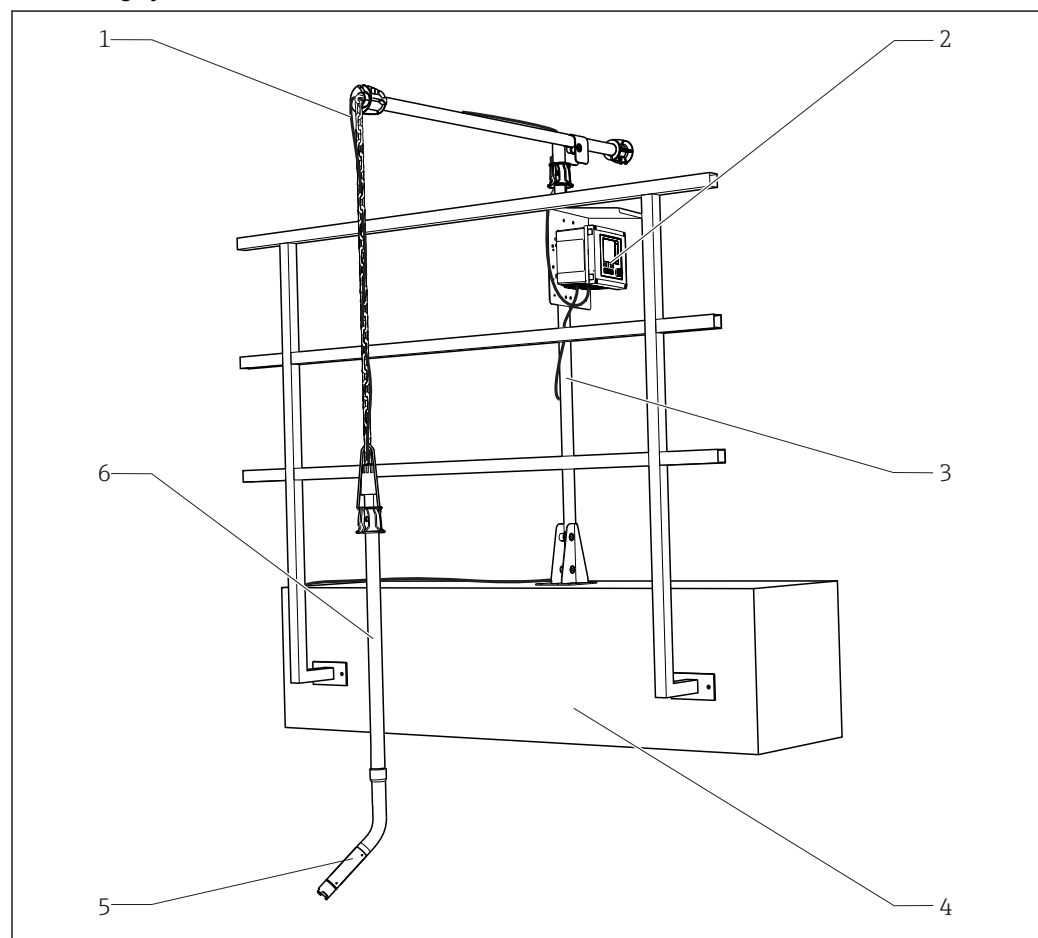
COS61D

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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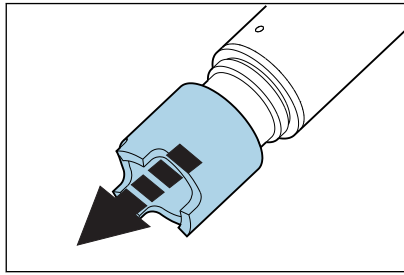
3 Example of a measuring system with COS61D

- | | | | |
|---|-----------------|---|------------------------|
| 1 | Sensor cable | 4 | Basin rim with railing |
| 2 | Liquiline CM44x | 5 | Oxymax COS61D |
| 3 | Flexdip CYH112 | 6 | Flexdip CYA112 |

5.2.2 Mounting the cleaning unit

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

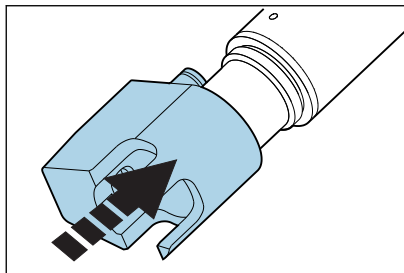
1.



Unscrew the protection guard.

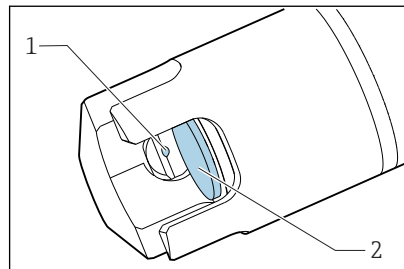
↳ Retain the protection guard for possible reuse at a later stage without the cleaning unit.

2.



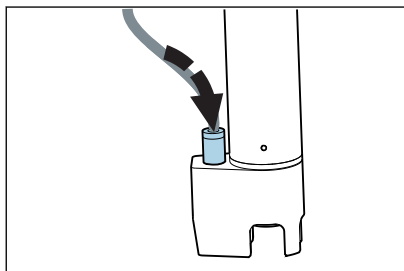
Carefully screw on the shaft sleeve as far as it will go.

↳ 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 a measuring point

Installation in suitable assembly is required (depending on the application)

⚠ WARNING**Electrical voltage**

In the event of a fault, non-grounded metallic assemblies may be under voltage and then are not touchable.

- ▶ When using metallic assemblies and installation equipment, observe the national grounding provisions.



For immersion operation, install the individual modules away from the basin on a solid base. Only carry out the final installation at the intended installation location. Select an installation location that is easy to access.

For a 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 use an assembly with cleaning function).
3. Install and connect the oxygen sensor.

NOTICE**Installation error**

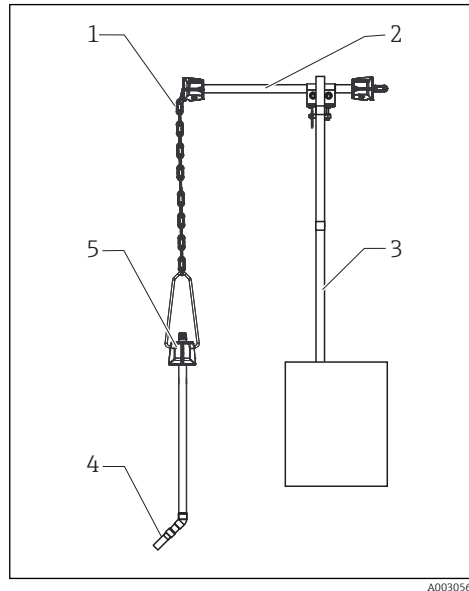
Cable open circuit, loss of sensor due to cable separation, unscrewing of fluorescence cap

- ▶ Do not install the sensor suspended from the cable.
- ▶ Screw the sensor into the assembly so that the cable is not twisted.
- ▶ When installing or uninstalling the sensor body, hold it tightly. Turn **using only the hexagonal nut** on 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. from jerky pulling).
- ▶ Select an installation location that is easy to access for later calibrations.
- ▶ Observe the instructions for installing sensors in the Operating Instructions for the assembly used.

5.3 Installation examples

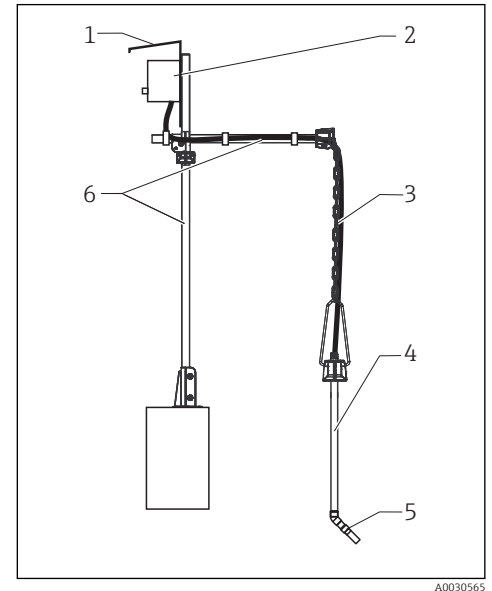
5.3.1 Immersion operation

Universal holder and chain assembly



4 Chain holder on railing

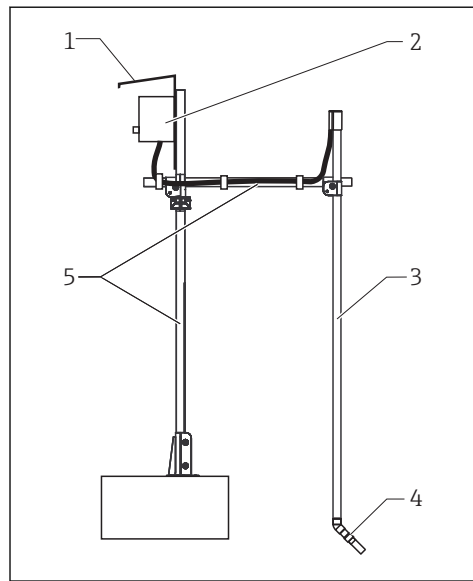
- 1 Chain
- 2 Holder Flexdip CYH112
- 3 Rail
- 4 Sensor Oxymax
- 5 Wastewater assembly Flexdip CYA112



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

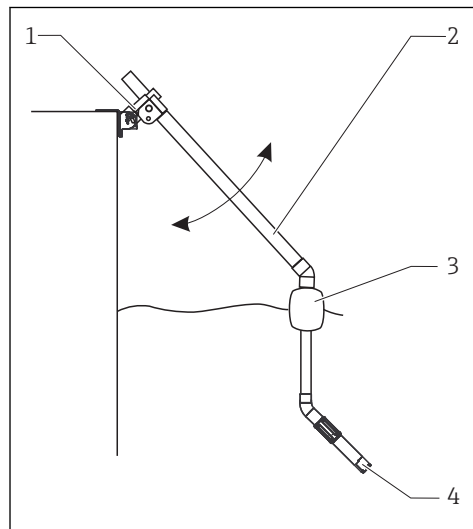


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6 Assembly holder with immersion tube

- 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



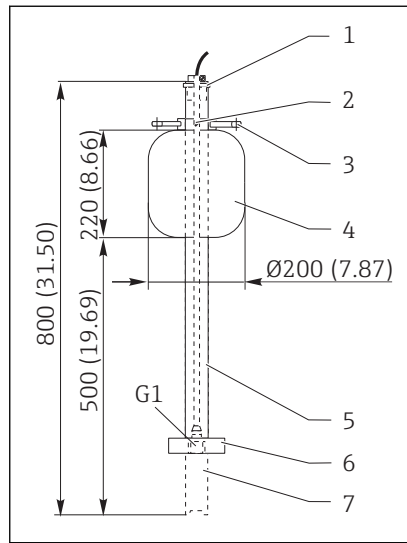
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7 Basin rim mounting

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

Float

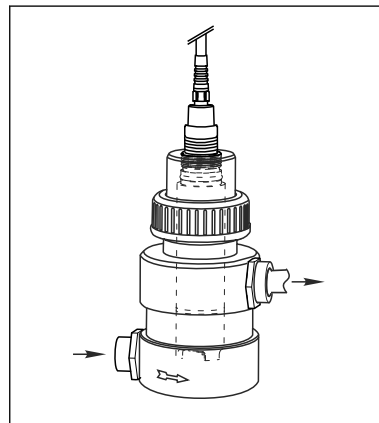
The CYA112 float is for use in the case of large fluctuations in water level, for example in rivers or lakes.



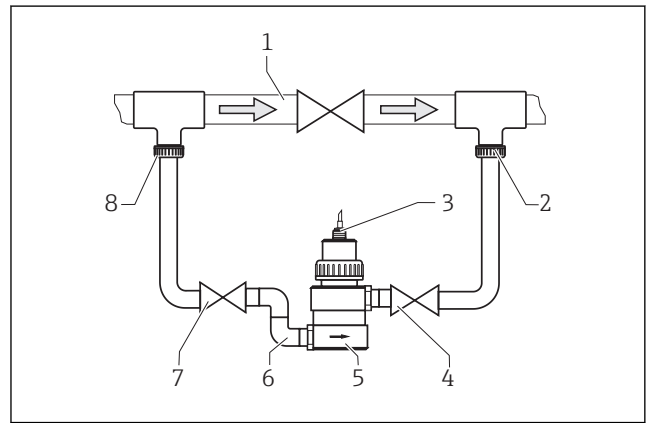
- 1 Cable run with strain relief and rain shield
- 2 Fixing ring for rope and chains with terminal screw
- 3 Eyelets Ø15, 3 x 120 ° for anchoring
- 4 Plastic float, resistant to salt water
- 5 Pipe 40 x 1, stainless steel 1.4571
- 6 Bumper and ballast
- 7 Oxygen sensor

8 Dimensions in mm (inch)

5.3.2 Flow assembly COA250



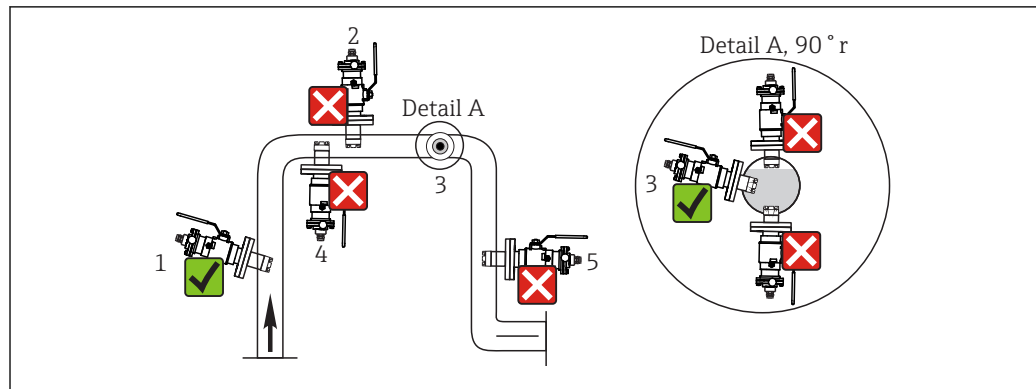
9 COA250



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



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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

- Are the sensor and cable undamaged?
- Is the orientation correct?
- Is the sensor installed in an assembly and is not suspended from the cable?
- Avoid the penetration of moisture by fitting the protective cap to the immersion assembly.

6 Electrical connection

WARNING

Device is live

Incorrect connection may result in injury or death

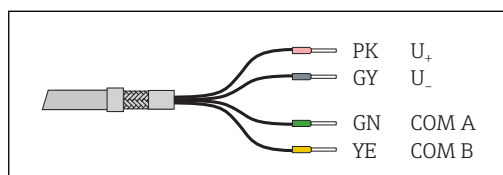
- ▶ The electrical connection may be performed only by an electrical technician.
- ▶ The electrical technician must have read and understood these Operating Instructions and must follow the instructions contained therein.
- ▶ **Prior** to commencing connection work, ensure that no voltage is present 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 on the underside 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) which are loose or insufficiently secured.

6.3 Post-connection check

Device condition and specifications	Notes
Are the outside of the sensor, assembly, cable undamaged?	Visual inspection
Electrical connection	Notes
Are the installed cables strain-relieved and not twisted?	
Is a sufficient length of the cable cores stripped, and is it positioned in the terminal correctly?	Check the fit (by pulling gently)
Are all the screws 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:

- Slope
 - Air, saturated with water vapor
 - Air-saturated water
 - Air, variable
 - Test gas calibration
 - Data entry
- Zero point
 - Single-point calibration in nitrogen or COY8 zero-point gel
 - 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 tissue.
3. Then dry the sensor diaphragm carefully with a paper towel for example. (only amperometric sensors)

4. **NOTICE**

Incorrect measurements caused by atmospheric influences

- Protect the sensor against external influences such as sunlight and wind.

After 20 minutes, measure the oxygen saturation index in air.

5. Decide using the results:
 - ↳ If the measured value is not 100 ± 2 %SAT, you must calibrate the sensor. 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 tissue.
3. Allow approx. 20 minutes for the sensor temperature to adapt to the ambient air. Make sure that the sensor is not exposed to any direct ambient influences (direct sunlight, drafts) during this time.

4. When the measured value display on the transmitter is stable, carry out the calibration according to 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 the sensor.
6. Then insert the sensor into the medium.



Make sure you comply with the instructions for calibration in the Operating Instructions of the transmitter.

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 sensor temperature (air temperature for the calibration type "air", water temperature for the calibration type "air-saturated water")
 - the altitude above sea level
 - the current air pressure (= rel. air pressure to sea level) at the time of calibration. (If undeterminable, use 1013 hPa (407 in H₂O)).
2. Define:
 - 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	Height [m (ft)]	K	Height [m (ft)]	K	Height [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
200 (660)	0.977	750 (2460)	0.916	1250 (4100)	0.864	1750 (5740)	0.815

Altitude [m (ft)]	K	Height [m (ft)]	K	Height [m (ft)]	K	Height [m (ft)]	K
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 the factor **L**:

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

4. Calculate the 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 (405 in H₂O)
- $S = 9.45 \text{ mg/l}$, $K = 0.943$, $L = 0.996$
- Calibration value $C = 8.88 \text{ mg/l}$.

i You do not need factor **K** in the table if your measuring device returns the absolute air pressure L_{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

Before first commissioning, check if:

- the sensor is correctly installed
- the electrical connection is correct.

If using an assembly with automatic cleaning, check that the cleaning medium (e.g. water or air) is connected correctly.

WARNING

Escaping process medium

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

- ▶ Before applying compressed air to an assembly with cleaning facility, make sure the connections are correctly fitted.
- ▶ Do not install the assembly in the process if you cannot make the correct connection reliably.

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 Trouble shooting instructions

If one of the following problems is present, check the measuring system in the sequence listed here.

Problem	Testing	Remedial action
No display, no sensor reaction	Power supply to the transmitter?	► Connect power supply.
	Sensor cable connected correctly?	► Establish correct connection.
	Medium flow present?	► Create medium flow.
	Deposit on the 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 value been taken into account?	► Enter salinity value on transmitter.
Displayed value too low	Is sensor calibrated/adjusted?	► Recalibrate/readjust.
	Medium flow present?	► Create medium flow.
	Displayed temperature clearly too high?	► Check sensor, if necessary send sensor in for repair.
	Deposit 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.

 Please observe the troubleshooting information in the Operating Instructions for the transmitter. If need be, carry out a test on the transmitter.

9.2 Check sensor

Testing	Corrective action	Set point
Slope check	► Move the sensor out to the air. ► Dry it with a paper towel.	Measured value display after 1 minute: approx. 100 % SAT
Zero-point check	► Immerse the sensor in zero-point gel (→  28).	Display close to 0 mg/l (0 % SAT)

- In the case of deviations from the set points:
Follow the troubleshooting instructions or contact your sales office.

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, take into account possible repercussions for process control or 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)
- Greatly varying conditions, e.g. daily CIP cleaning = short cycles (1 month or shorter)

The following method helps you determine the necessary intervals:

1. Inspect the sensor one month after commissioning. Take it out of the medium and dry it.
2. After 10 minutes, measure the oxygen saturation index in air.
 - ↳ Decide depending on the result: If the measured value is not 100 ± 2 %SAT, you must maintain the sensor. Otherwise, double the length of time to the next inspection.
3. Proceed as per Point 1 after two, four and/or eight months. In this way, you can 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.

10.2 Maintenance tasks

The following tasks are mandatory:

- Clean the sensor and of fluorescence cap
- Replacement of wear parts or consumables:
 - Fluorescence cap
 - Sealing ring
- Check the measuring 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).
 4. The measured value should be 100 ± 2 % SAT.
- Recalibration (if desired or required)

10.3 Clean exterior of sensor.

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

Deposit on the fluorescence cap

↳ These result in longer response times 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 measuring medium.

Clean the sensor:

- before every calibration
- at regular intervals during operation as necessary
- before returning it for repairs.

Type of soiling	Cleaning
Salt deposits	Immerse the sensor in drinking water or in 1-5% hydrochloric acid (for a few minutes). Afterwards, rinse it with copious amounts of water.
Dirt particles on the sensor shaft and shaft sleeve (not fluorescence cap!)	Clean the sensor shaft and sleeve with water and use a suitable sponge.
Dirt particles on fluorescence cap	Clean the fluorescence cap with water and a soft tissue.

 After cleaning, rinse the sensor with copious amounts of clean water.

10.4 Cleaning the sensor optics

The optics need to be cleaned only if medium has penetrated through 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 tissue until the deposit is fully removed.
3. Clean the optics with drinking water or distilled water.
4. Dry the optics and screw on a new fluorescence cap.

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
Process seals	visible damage to a process seal
Replace fluorescencecap	Fluorescence layer can no longer be cleaned or is damaged (hole or overstretching)

10.5.1 Replacing sealing rings

The sealing ring must be replaced if visibly damaged. For replacement, use only original sealing rings.

10.5.2 Replacing 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 the protection guard.
3. Clean the outside of the sensor.
4. Unscrew the fluorescence cap.
5. Clean and dry the optical surface.

Installing the new fluorescence cap

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

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

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 office.

11.1 Assemblies (selection)

Flexdip CYA112

- Immersion assembly for water and wastewater
- Modular assembly system for sensors in open basins, channels and tanks
- Product Configurator on the product page: www.endress.com/cya112

 Technical Information TI00432C

Flowfit COA250

- Flow assembly for oxygen measurement
- Product Configurator on the product page: 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

 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

 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

 Technical Information TI00118C

11.4 Zero-point gel

COY8

Zero-point gel for oxygen sensors

- Oxygen-free gel for the validation, calibration and adjustment of oxygen measuring cells
- Product Configurator on the product page: 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 swift, safe and professional device returns, please read the return procedures and conditions at www.endress.com/support/return-material.

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

Measured values	Dissolved oxygen [mg/l, µg/l, ppm, ppb or % SAT or hPa]
Measuring ranges	Measuring ranges apply for 20 ° (68 °F) and 1013 hPa (15 psi) with Liquiline CM44x, CM44xR: ■ 0 to 20 mg/l ■ 0 to 200 % SAT ■ 0 to 400 hPa

13.2 Performance characteristics

Response time	From air to nitrogen at reference operating conditions: t_{90} : 60 s	
reference operating conditions	Reference temperature:	25 °C (77 °F)
	Reference pressure:	1013 hPa (15 psi)
	Reference application:	Air-saturated water
Maximum measured error	Measuring range < 12 mg/l 12 mg/l to 20 mg/l	Maximum measured error 0.01 mg/l or ±1 % of reading ±2% of reading
Repeatability	±0.5 % of end of measuring range	
Operating life of sensor cap	>2 years (under reference operating conditions, protect against direct sunlight)	

13.3 Environment

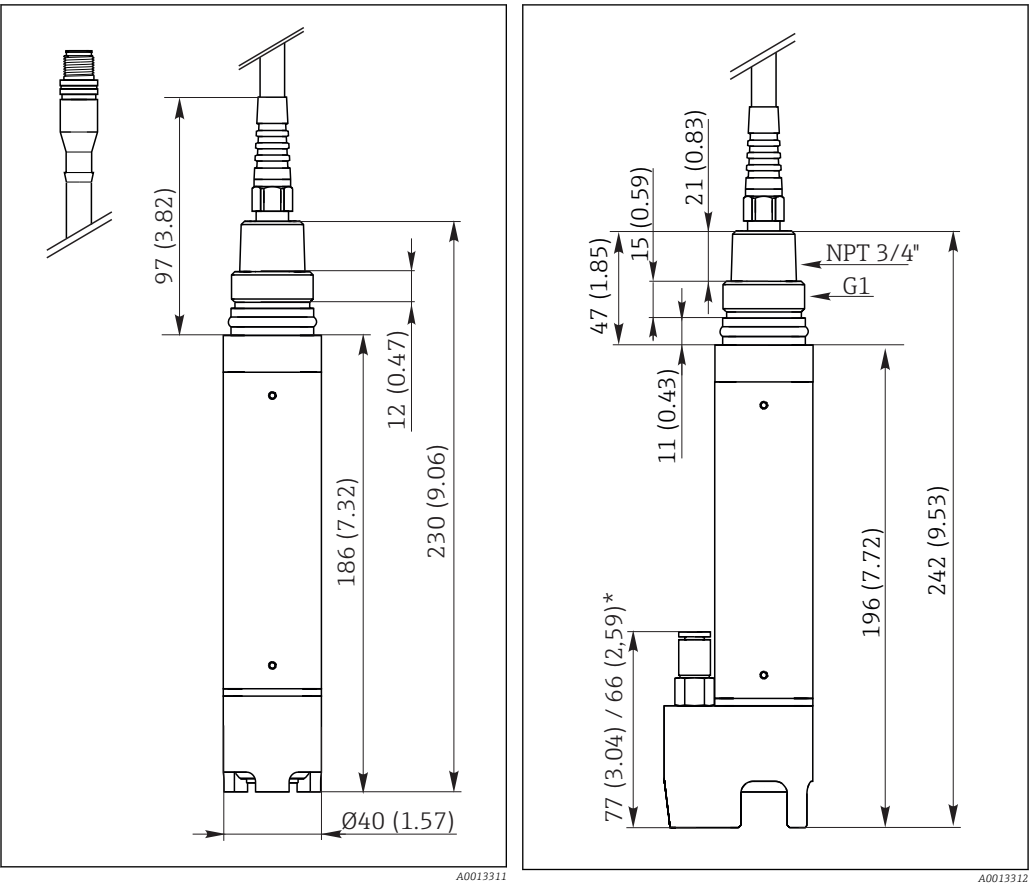
Ambient temperature range	-20 to +60 °C (-4 to 140 °F)
Storage temperature	-20 to +70 °C (0 to 160 °F) at 95% relative air humidity, not condensating
Degree of protection	■ Fixed cable with end sleeves: IP 68 (test conditions: 10 m (33 ft) water column at 20 °C (68 °F) over 7 days) ■ Fixed cable with M12 connector: IP 68 (test conditions: 1 m (3.3 ft) water column, 3N KCl, at 50 °C (122 °F) over 30 days)
Electromagnetic compatibility	Interference emission and interference immunity as per EN 61326: 2005, Namur NE 21:2007

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



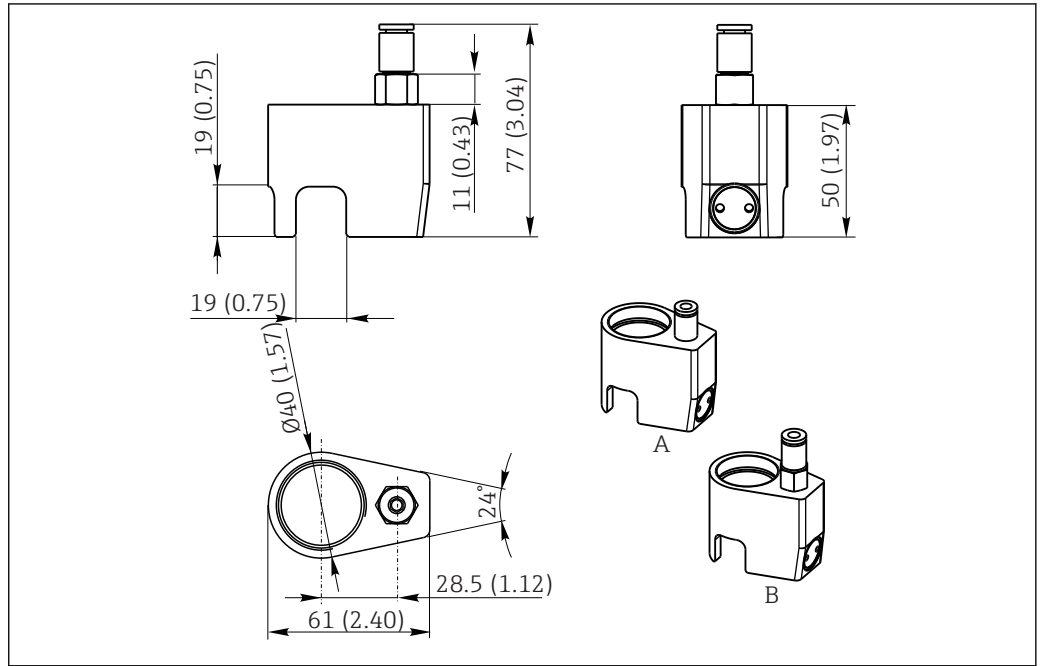
13 With optional M12 connector

14 With optional cleaning unit

Dimensions in mm (inch)

* 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)
	with TOP68 plug connection:	0.3 kg (0.66 lbs) depending on version

Materials	Parts in contact with medium
	Sensor shaft
	Cap with fluorescence layer
	Fluorescence layer
	Stainless steel 1.4435 (AISI 316L)
	POM
	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 sleeves ■ Optional: M12 connector
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Maximum cable length	max. 100 m (330 ft), incl. Cable extension
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Temperature compensation

Internal

Interface	Memosens protocol
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Index

A

Accessories	28
Adjustment	20
Ambient temperature range	31
Assemblies	28

C

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

D

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

E

Electrical connection	19
Environment	31

F

Fluorescence cap	8
Replace	26
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
Materials	33
Maximum measured error	31
Measured values	31
Measuring cable	28

Measuring principle	6
Measuring ranges	31
Measuring system	12
Mode of operation	6

N

Nameplate	9
-----------------	---

O

Occupational safety	4
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	
Occupational safety	4
Operation	4
Product	5
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
Storage temperature	31
Symbols	3

T

Technical data	
Environment	31
Input	31
Mechanical construction	32
Performance characteristics	31

Process	32
Trouble shooting instructions	24
Troubleshooting	24

U

Use	4
---------------	---

W

Warnings	3
Wear parts and consumables	26
Weight	33

Z

Zero-point gel	28
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