Operating Instructions

Oxymax COS61D

Sensor for the measurement of dissolved oxygen
With Memosens protocol
# Table of contents

1 Document information .............. 3  
1.1 Warnings .......................... 3  
1.2 Symbols ........................... 3  

2 Basic safety instructions .......... 4  
2.1 Requirements for the personnel .... 4  
2.2 Intended use ........................ 4  
2.3 Workplace safety ..................... 4  
2.4 Operational safety ..................... 4  
2.5 Product safety ........................ 5  

3 Device description, function ..... 6  
3.1 Optical measuring principle .......... 6  
3.2 Sensor design ........................ 7  
3.3 Memosens technology ................. 8  
3.4 Fluorescence cap ......................... 8  

4 Incoming acceptance and product identification .... 9  
4.1 Incoming acceptance .................. 9  
4.2 Product identification .................. 9  
4.3 Scope of delivery ...................... 10  
4.4 Certificates and approvals .............. 10  

5 Mounting ............................ 12  
5.1 Mounting requirements ................. 12  
5.2 Mounting the sensor ..................... 13  
5.3 Installation examples .................... 16  
5.4 Post-mounting check ..................... 19  

6 Electrical connection ............... 20  
6.1 Connecting the sensor .................. 20  
6.2 Ensuring the degree of protection ........ 20  
6.3 Post-connection check ................... 20  

7 Calibration and adjustment ......... 21  
7.1 Types of calibration ..................... 21  
7.2 Calibration intervals ..................... 21  
7.3 Calibration in air with 100% rH .......... 21  
7.4 Calculation example for the calibration value ... 22  

8 Commissioning ....................... 24  
8.1 Function check ......................... 24  
8.2 Calibrating the sensor ................... 24  
8.3 Cleaning the sensor automatically ........ 24  

9 Troubleshooting ..................... 25  
9.1 Troubleshooting instructions .......... 25  
9.2 Testing the sensor ...................... 25  

10 Maintenance ....................... 26  
10.1 Maintenance schedule ................. 26  
10.2 Maintenance tasks ...................... 26  
10.3 Cleaning the exterior of the sensor .... 26  
10.4 Cleaning the sensor optics .......... 27  
10.5 Wear parts and consumables .......... 27  
10.6 Testing the measurement function ..... 28  

11 Accessories ....................... 29  
11.1 Assemblies (selection) ............... 29  
11.2 Assembly holder ....................... 29  
11.3 Measuring cable ....................... 29  
11.4 Zero-point gel ......................... 30  
11.5 Junction box RM COS61D ............... 30  
11.6 Protection guard ....................... 30  
11.7 Cleaning unit ......................... 30  
11.8 Transmitter ......................... 31  

12 Repair ............................ 32  
12.1 Spare parts and consumables .......... 32  
12.2 Return ................................ 32  
12.3 Disposal ............................ 32  

13 Technical data ..................... 33  
13.1 Input ................................ 33  
13.2 Performance characteristics .......... 33  
13.3 Environment ......................... 33  
13.4 Process ............................ 34  
13.5 Mechanical construction .............. 34  

14 Appendices ....................... 37  

Index .................................. 39
1 Document information

1.1 Warnings

<table>
<thead>
<tr>
<th>Structure of information</th>
<th>Meaning</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>DANGER</strong></td>
<td>This symbol alerts you to a dangerous situation. Failure to avoid the dangerous situation will result in a fatal or serious injury.</td>
</tr>
<tr>
<td>Causes /consequences</td>
<td>If necessary, Consequences of non-compliance (if applicable)</td>
</tr>
<tr>
<td>Corrective action</td>
<td></td>
</tr>
<tr>
<td><strong>WARNING</strong></td>
<td>This symbol alerts you to a dangerous situation. Failure to avoid the dangerous situation can result in a fatal or serious injury.</td>
</tr>
<tr>
<td>Causes /consequences</td>
<td>If necessary, Consequences of non-compliance (if applicable)</td>
</tr>
<tr>
<td>Corrective action</td>
<td></td>
</tr>
<tr>
<td><strong>CAUTION</strong></td>
<td>This symbol alerts you to a dangerous situation. Failure to avoid this situation can result in minor or more serious injuries.</td>
</tr>
<tr>
<td>Causes /consequences</td>
<td>If necessary, Consequences of non-compliance (if applicable)</td>
</tr>
<tr>
<td>Corrective action</td>
<td></td>
</tr>
<tr>
<td><strong>NOTICE</strong></td>
<td>This symbol alerts you to situations which may result in damage to property.</td>
</tr>
<tr>
<td>Cause/situation</td>
<td>If necessary, Consequences of non-compliance (if applicable)</td>
</tr>
<tr>
<td>Action/note</td>
<td></td>
</tr>
</tbody>
</table>

1.2 Symbols

<table>
<thead>
<tr>
<th>Symbol</th>
<th>Meaning</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Additional information, tips</td>
</tr>
<tr>
<td></td>
<td>Permitted or recommended</td>
</tr>
<tr>
<td></td>
<td>Not permitted or not recommended</td>
</tr>
<tr>
<td></td>
<td>Reference to device documentation</td>
</tr>
<tr>
<td></td>
<td>Reference to page</td>
</tr>
<tr>
<td></td>
<td>Reference to graphic</td>
</tr>
<tr>
<td></td>
<td>Result of a step</td>
</tr>
</tbody>
</table>

1.2.1 Symbols on the device

<table>
<thead>
<tr>
<th>Symbol</th>
<th>Meaning</th>
</tr>
</thead>
<tbody>
<tr>
<td>![Symbol]</td>
<td>Reference to device documentation</td>
</tr>
<tr>
<td>![Symbol]</td>
<td>Do not dispose of products bearing this marking as unsorted municipal waste. Instead, return them to the manufacturer for disposal under the applicable conditions.</td>
</tr>
</tbody>
</table>
2 Basic safety instructions

2.1 Requirements for the 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 Intended 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 international 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 international standards have been observed.
3 Device description, function

3.1 Optical measuring principle

Sensor structure
Oxygen-sensitive molecules (markers) are integrated into the optically active layer (fluorescence layer).
The fluorescence layer, an optical insulating layer and a cover layer are applied on top of one another on the 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.
Any oxygen molecules present mask the marker molecules. As a result, the response signals are shorter and less intense.

Measurement result
➤ The sensor returns a signal that depends on the concentration of oxygen in the medium.

The air pressure can be either set statically or entered via an additional sensor. The medium temperature is automatically recorded in the sensor. Both values are taken into consideration in the calculation of the oxygen concentration.
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 μs in air and approx. 60 μs in oxygen-free media.

For optimum measurement results

1. During calibration, enter the current air pressure at the transmitter.
2. If the measurement is not performed at Air 100% rh:
   Enter the current humidity.
3. In the case of saline media:
   Enter the salinity.
4. 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

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 standard protection guard, other protection guard models and a cleaning unit can be used. The cleaning unit is suitable for immersion operation. (→ 30).
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 or adjustment

- 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

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

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's 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

4.4 Certificates and approvals
A list of all the approvals is provided below. The approvals that are valid for this product depend on the device version ordered.

4.4.1 CE mark

Declaration of conformity
The product meets the requirements of the harmonized European standards. As such, it complies with the legal specifications of the EU directives. The manufacturer confirms successful testing of the product by affixing to it the CE mark.

4.4.2 EAC (COS61D-GR)
The product has been certified according to guidelines TP TC 004/2011 and TP TC 020/2011 which apply in the European Economic Area (EEA). The EAC conformity mark is affixed to the product.

4.4.3 CSA GP (COS61D-CA)
This device has a CSA GP approval and meets the following requirements:
- Power supply via a Class 2 or limited energy source as per CSA 61010-1-12.
- Overvoltage category I.
- Ambient conditions: max. height 2 000 m (6 560 ft)

4.4.4 CSAus NI Cl 1, Div 2 (COS61D-CJ)
Hazardous areas as per CSAus CL 1, DIV 2 ¹)
- The device must be installed in a housing or (installation) cabinet which can only be accessed with a tool or key.
- Observe the Control Drawing and the operating conditions indicated in the Appendix to the Operating Instructions as well as the notes and instructions in the Appendix.

Ex approvals
Class 1, Division 2, Groups A, B, C and D T6; IP67/IP68 ¹)

¹) Only when connected to CM44x(R)-CD*
This product meets the requirements of the following standards:
- ANSI/UL 61010-1, 3rd Ed.
- ANSI/UL 121201-2017
- ANSI/IEC 60529, Edition 2.2. 2013-08 Degrees of protection provided by enclosures (IP code)

Installation and operation in hazardous areas CL 1, DIV 2

This non-sparking device has the following specified explosion protection data:
- CSAus CL 1, DIV 2
- Groups A, B, C, and D
- Temperature class T6, $-20 \, ^\circ C \leq T_a \leq 60 \, ^\circ C$ (40°F)
- Degree of protection: IP67/IP68
- Control drawing: 211050778 → 38
5 Mounting

5.1 Mounting requirements

5.1.1 Orientation

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
  with fixed cable (with ferrules or M12 plug depending on the version ordered)
- Liquiline CM44x multi-channel transmitter
- Assembly, e.g. flow assembly COA250, immersion assembly CYA112 or retractable assembly COA451

Optionally:
- Flexdip CYH112 assembly holder for immersion operation
- Extension cable CYK11 with junction box
- Cleaning system

_example.png

Example of a measuring system with COS61D

1. Sensor cable
2. Transmitter Liquiline CM44x
3. Assembly Flexdip CYH112
4. Basin rim with railing
5. Oxymax COS61D oxygen sensor
6. Flexdip CYA112 assembly
5.2.2 Mounting the cleaning unit or optional protection guard

If the cleaning unit was not delivered as a pre-assembled unit or if an optionally ordered protection guard is used:

1. Unscrew the standard protection guard.
   - Retain the standard protection guard for possible reuse at a later stage without the cleaning unit.

2. Screw on the cleaning unit or optional protection guard and tighten until the stop.
   - The cleaning nozzle of the cleaning unit should now be level with the spot.

3. Connect the hose for the compressed air supply (to be provided onsite) or compressor (→ 30) to the hose connection of the cleaning unit.
5.2.3 Installing at a measuring point

Must be installed in a suitable assembly.

**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.
  - During final installation, it must be ensured that the metal sensor body is connected to earth, if necessary.

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

1. Install the retractable assembly or 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 the sensor body steady during installation or removal. Otherwise the fluorescence cap or protection guard might be unscrewed. These will then remain in the process or assembly.
- During final installation, it must be ensured that the metal sensor body is connected to earth.
- 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

![Diagram of Immersion operation](image)

- **4** Chain holder on railing
  1. Chain
  2. Holder Flexdip CYH112
  3. Rail
  4. Basin rim
  5. Oxygen sensor
  6. Wastewater assembly Flexdip CYA112

- **5** Chain holder on upright post
  1. Weather protection cover CYY101
  2. Transmitter
  3. Chain
  4. Wastewater assembly Flexdip CYA112
  5. Oxygen sensor
  6. Basin rim
  7. Holder Flexdip CYH112
Universal holder and fixed immersion tube

![Diagram of Universal holder and fixed immersion tube]

1. Protective cover
2. Transmitter
3. Flexdip CYA112 immersion assembly
4. Oxygen sensor
5. Basin rim
6. Assembly holder Flexdip CYH112

Basin rim mounting with immersion tube

![Diagram of Basin rim mounting with immersion tube]

7. Basin rim mounting
1. Pendulum holder CYH112
2. Assembly Flexdip CYA112
3. Assembly float
4. Oxygen sensor
5. Basin rim
**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

![Diagram of float](image)

**5.3.2 Flow assembly COA250**

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
7. Medium removal
8. Bypass installation with manually actuated valves or solenoid valves

![Diagram of flow assembly COA250](image)
5.3.3 Retractable assembly COA451

![Diagram of 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

- Possible installation angle
- Inadmissible installation angle

**NOTICE**
Sensor not fully immersed in the medium, buildup on sensor membrane or sensor optics, buildup due to sensor being 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-mounting 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 of the transmitter

![Sensor fixed cable with terminated cable cores](image_url)

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.

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

<table>
<thead>
<tr>
<th>Device condition and specifications</th>
<th>Action</th>
</tr>
</thead>
<tbody>
<tr>
<td>Are the sensor, assembly or cables free from damage on the outside?</td>
<td>Perform a visual inspection.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Electrical connection</th>
<th>Action</th>
</tr>
</thead>
<tbody>
<tr>
<td>Are the mounted cables strain-relieved and not twisted?</td>
<td>Perform a visual inspection.</td>
</tr>
<tr>
<td>Are a sufficient length of the cable cores stripped, and are the cores positioned in the terminal correctly?</td>
<td>Perform a visual inspection.</td>
</tr>
<tr>
<td>All the screw terminals properly tightened?</td>
<td>Tighten the screw terminals.</td>
</tr>
<tr>
<td>Are all cable entries mounted, tightened and leak-tight?</td>
<td>Perform a visual inspection.</td>
</tr>
<tr>
<td>Are all cable entries installed downwards or mounted laterally?</td>
<td>Point cable loops downward so that water can drip off.</td>
</tr>
</tbody>
</table>
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
- Numeric input
- Slope
- Air 100% rh (air, water vapor-saturated)
- H2O air-saturated (air-saturated water)
- Air, variable
- Numeric input
- Sample calibration
- 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 ± 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 with 100% rH

1. Activate the hold status at the transmitter.
2. Remove the sensor from the medium.
3. Clean the outside of the sensor carefully with a damp cloth.
4. Suspend the sensor just above the surface of the water. Do not immerse the sensor.
5. 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.
6. 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.

7. Where necessary:
   Adjust the sensor by accepting the calibration data.

8. Then place the sensor back into the medium.

9. Deactivate the hold status at the transmitter.
   - 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:
   - Ambient temperature for the sensor (air temperature in the case of the **Air 100% rh** or **Air variable** calibration methods, water temperature in the case of the **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 indeterminable, 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

<table>
<thead>
<tr>
<th>T [°C ('F)]</th>
<th>S [mg/l=ppm]</th>
<th>T [°C ('F)]</th>
<th>S [mg/l=ppm]</th>
<th>T [°C ('F)]</th>
<th>S [mg/l=ppm]</th>
<th>T [°C ('F)]</th>
<th>S [mg/l=ppm]</th>
</tr>
</thead>
<tbody>
<tr>
<td>0 (32)</td>
<td>14.64</td>
<td>1 (34)</td>
<td>14.23</td>
<td>2 (36)</td>
<td>13.83</td>
<td>3 (37)</td>
<td>13.45</td>
</tr>
<tr>
<td>1 (34)</td>
<td>14.23</td>
<td>2 (36)</td>
<td>13.83</td>
<td>3 (37)</td>
<td>13.45</td>
<td>4 (39)</td>
<td>13.09</td>
</tr>
<tr>
<td>2 (36)</td>
<td>13.83</td>
<td>3 (37)</td>
<td>13.45</td>
<td>4 (39)</td>
<td>13.09</td>
<td>5 (41)</td>
<td>12.75</td>
</tr>
<tr>
<td>3 (37)</td>
<td>13.45</td>
<td>4 (39)</td>
<td>13.09</td>
<td>5 (41)</td>
<td>12.75</td>
<td>6 (43)</td>
<td>12.42</td>
</tr>
<tr>
<td>4 (39)</td>
<td>13.09</td>
<td>5 (41)</td>
<td>12.75</td>
<td>6 (43)</td>
<td>12.42</td>
<td>7 (45)</td>
<td>12.11</td>
</tr>
<tr>
<td>5 (41)</td>
<td>12.75</td>
<td>6 (43)</td>
<td>12.42</td>
<td>7 (45)</td>
<td>12.11</td>
<td>8 (46)</td>
<td>11.81</td>
</tr>
<tr>
<td>6 (43)</td>
<td>12.42</td>
<td>7 (45)</td>
<td>12.11</td>
<td>8 (46)</td>
<td>11.81</td>
<td>9 (48)</td>
<td>11.53</td>
</tr>
<tr>
<td>7 (45)</td>
<td>12.11</td>
<td>8 (46)</td>
<td>11.81</td>
<td>9 (48)</td>
<td>11.53</td>
<td>10 (50)</td>
<td>11.25</td>
</tr>
</tbody>
</table>

#### Table 2

<table>
<thead>
<tr>
<th>Altitude [m (ft)]</th>
<th>K</th>
<th>Altitude [m (ft)]</th>
<th>K</th>
<th>Altitude [m (ft)]</th>
<th>K</th>
<th>Altitude [m (ft)]</th>
<th>K</th>
</tr>
</thead>
<tbody>
<tr>
<td>0 (0)</td>
<td>1.000</td>
<td>550 (1800)</td>
<td>0.938</td>
<td>1050 (3450)</td>
<td>0.885</td>
<td>1550 (5090)</td>
<td>0.834</td>
</tr>
<tr>
<td>50 (160)</td>
<td>0.994</td>
<td>600 (1980)</td>
<td>0.932</td>
<td>1100 (3610)</td>
<td>0.879</td>
<td>1600 (5250)</td>
<td>0.830</td>
</tr>
</tbody>
</table>
3. Calculate factor L:

Relative air pressure at calibration

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

4. Determine the \( M \) factor:

- \( M = 1.02 \) (for \text{Air 100\% rh} calibration method)
- \( M = 1.00 \) (for \text{H2O air-saturated} calibration method)

5. Calculate calibration value C:

\[
C = S \cdot K \cdot L \cdot M
\]

Example

- Air calibration at 18 °C (64 °F), altitude 500 m (1650 ft) above sea level, current air pressure 1009 hPa
- \( S = 9.45 \text{ mg/l}, K = 0.943, L = 0.996, M=1.00 \)
- Calibration value \( C = 8.88 \text{ mg/l} \).

Factor K in the table is not required if the 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 Calibrating the sensor
The sensor is calibrated at the factory. A new calibration of the slope is only required after replacing the sensor cap and in special situations.
A new calibration of the zero point is only required in special situations.

8.3 Cleaning the sensor automatically
Compressed air is most suitable for cyclic cleaning. The cleaning unit is either supplied or can be retrofitted, and is screwed onto 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.

**Recommended 115 V compressed air cleaning unit:**
Order No.: 71194623

The following settings are recommended for the cleaning unit:

<table>
<thead>
<tr>
<th>Type of soiling</th>
<th>Cleaning interval</th>
<th>Cleaning duration</th>
</tr>
</thead>
<tbody>
<tr>
<td>Media containing grease and oils</td>
<td>15 min</td>
<td>20 s</td>
</tr>
<tr>
<td>Biofilm</td>
<td>60 min</td>
<td>20 s</td>
</tr>
</tbody>
</table>
9 Troubleshooting

9.1 Troubleshooting instructions

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

<table>
<thead>
<tr>
<th>Problem</th>
<th>Testing</th>
<th>Remedial action</th>
</tr>
</thead>
<tbody>
<tr>
<td>Nothing displayed, no reaction from the sensor</td>
<td>Power supplied to the transmitter?</td>
<td>Establish the power supply.</td>
</tr>
<tr>
<td></td>
<td>Sensor cable connected correctly?</td>
<td>Establish correct connection.</td>
</tr>
<tr>
<td></td>
<td>Deposit buildup on the fluorescence layer of the sensor cap?</td>
<td>Clean the sensor cap or fluorescence layer carefully with a damp cloth.</td>
</tr>
<tr>
<td>Displayed value too high</td>
<td>Is sensor calibrated/adjusted?</td>
<td>Recalibrate/readjust.</td>
</tr>
<tr>
<td></td>
<td>Measured value in air not 100 ± 2 %SAT?</td>
<td>When calibrating, enter the current air pressure at the transmitter.</td>
</tr>
<tr>
<td></td>
<td>Displayed temperature clearly too low?</td>
<td>Check sensor, if necessary send sensor in for repair.</td>
</tr>
<tr>
<td></td>
<td>Has salinity been taken into account?</td>
<td>Enter salinity value on transmitter.</td>
</tr>
<tr>
<td>Displayed value too low</td>
<td>Is sensor calibrated/adjusted?</td>
<td>Recalibrate/readjust.</td>
</tr>
<tr>
<td></td>
<td>Measured value in air not 100 ± 2 %SAT?</td>
<td>When calibrating, enter the current air pressure at the transmitter.</td>
</tr>
<tr>
<td></td>
<td>Displayed temperature clearly too high?</td>
<td>Check sensor, if necessary send sensor in for repair.</td>
</tr>
<tr>
<td></td>
<td>Deposit buildup on the fluorescence layer?</td>
<td>Clean the sensor carefully with a damp cloth.</td>
</tr>
<tr>
<td>Display in Vol% or %SAT not plausible</td>
<td>Medium pressure has not been taken into account</td>
<td>Enter medium pressure on transmitter.</td>
</tr>
</tbody>
</table>

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

9.2 Testing the sensor

<table>
<thead>
<tr>
<th>Testing</th>
<th>Corrective action</th>
<th>Set point</th>
</tr>
</thead>
<tbody>
<tr>
<td>Slope check</td>
<td>▶ Place the sensor in air.</td>
<td>Measured value display after 1 min:</td>
</tr>
<tr>
<td></td>
<td>▶ Dry the sensor with a paper towel.</td>
<td>Approx. 100 % SAT</td>
</tr>
<tr>
<td>Zero-point check</td>
<td>▶ Immerse the sensor in COY8 zero-point gel</td>
<td>Display after 30 min:</td>
</tr>
<tr>
<td></td>
<td>(+→ 30).</td>
<td>Close to 0 mg/l (0 % SAT)</td>
</tr>
</tbody>
</table>

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. activated sludge basin = long cycles (1/2 year)
- Widely varying conditions, e.g. fluctuating process pressure = short cycles (1 month and 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 carefully.
2. After 10 minutes, measure the oxygen saturation index in air.
   - Decide using the results:
     a) Measured value not 100 ± 2 % SAT? → Service the sensor.
     b) Measured value = 100 ± 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. (→ 25)

10.2 Maintenance tasks

The following tasks are mandatory:

1. Clean the sensor fluorescence cap. → 26
2. Replace wear parts or consumables. → 27
3. Check measurement function. → 28
4. Recalibrate (if desired or necessary).
   - Follow the Operating Instructions for the transmitter.

10.3 Cleaning the exterior of the 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

<table>
<thead>
<tr>
<th>Type of contamination</th>
<th>Cleaning</th>
</tr>
</thead>
</table>
| Salt deposits                                              | 1. Immerse the sensor in drinking water or in 1-5 % hydrochloric acid (for a few minutes).  
|                                                            | 2. Then rinse it with copious amounts of water.                           |
| Dirt particles on the sensor shaft and shaft sleeve (not fluorescence cap!) | ▶ Clean sensor shaft and sleeve with water and a suitable sponge.         |
| Dirt particles on fluorescence cap                         | ▶ Clean the fluorescence cap with water and a soft cloth.                |

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

### 10.4 Cleaning the 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. Wipe the optical surface with a soft cloth that is wetted with drinking water or distilled water.
4. Dry the optical surface and screw on a functional fluorescence cap.
5. At the transmitter, execute the Sensor cap change command 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.

<table>
<thead>
<tr>
<th>Corrective action</th>
<th>Reason</th>
</tr>
</thead>
<tbody>
<tr>
<td>Replace process seals</td>
<td>Visible damage to a process seal</td>
</tr>
<tr>
<td>Replace fluorescence cap</td>
<td>Fluorescence layer is damaged or can no longer be cleaned (black protective layer is damaged to the point that the pink fluorescence layer is visible)</td>
</tr>
</tbody>
</table>

### 10.5.1 Replacing sealing rings

It is compulsory to replace the sealing ring if it is visibly damaged. Only use original sealing rings (O-ring kit: Order No.: 51518597).

### 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. Activate the hold function at the transmitter.
2. Remove the sensor from the medium.
3. Unscrew the protection guard or cleaning unit.
4. Clean the exterior of the sensor.
5. Unscrew fluorescence cap.
6. Clean and dry optical surface.

**Installing the new fluorescence cap**

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

7. Carefully screw the new fluorescence cap onto the sensor head and tighten until the stop.  
   - After replacing the fluorescence cap, recalibrate and adjust the sensor.
8. Screw the protection guard or cleaning unit back on.
9. Then place the sensor back into the medium and check that no alarm is displayed on the transmitter.
10. Deactivate the hold function at the transmitter.

**10.6 Testing 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 ± 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)

**Flexdip CYA112**
- 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.
- Plastic or 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 disinfection sensors
- Oxygen-free and chlorine-free gel for the verification, zero point calibration and adjustment of oxygen and disinfection measuring points
- Product Configurator on the product page: [www.endress.com/coy8](http://www.endress.com/coy8)

Technical Information TI01244C

11.5 **Junction box RM COS61D**

**RM**
- Junction box for cable extension of COS61D sensor with Memosens plug-in connector
- With 2x PG 13.5 cable gland
- Degree of protection: IP 65
- Order number: 51500832

11.6 **Protection guard**

**Membrane protection guard**
- For using the sensor in fish farming tanks
- Order No.: 50081787

11.7 **Cleaning unit**

**Compressed air cleaning for COSXX**
- Connection: OD 6/8 mm (incl. reduction hose coupling) or OD 6.35 mm (¼")
- Materials: POM/V4A
- Order No.
  - AD 6/8 mm: 71110801
  - AD 6.35 mm (¼"): 71110802

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

**Spray cleaning for CYA112 assembly**
- Order No.
  - Assembly length 600 mm (23.62 in): 71158245
  - Assembly length 1200 mm (47.42 in): 71158246

**Chemoclean CYR10B**
- Cleaning injector for spray cleaning and retractable assemblies
- Product Configurator on the product page: [www.endress.com/CYR10B](http://www.endress.com/CYR10B)

Technical Information TI01531C
11.8 Transmitter

Liquiline CM44
- Modular multi-channel transmitter for hazardous and non-hazardous areas
- Hart®, PROFIBUS, Modbus or EtherNet/IP possible
- Order according to product structure

Technical Information TI00444C
12 Repair

12.1 Spare parts and consumables

<table>
<thead>
<tr>
<th>Item</th>
<th>Spare parts kit</th>
<th>Order number</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Sensor</td>
<td>As per product structure</td>
</tr>
<tr>
<td>2</td>
<td>Sealing ring x 2</td>
<td>51518597</td>
</tr>
<tr>
<td>3</td>
<td>Sensor cap (fluorescence cap)</td>
<td>51518598</td>
</tr>
<tr>
<td>4</td>
<td>Protection guard</td>
<td>50053276</td>
</tr>
</tbody>
</table>

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 for information on the procedure and conditions for returning devices.

12.3 Disposal

If required by the Directive 2012/19/EU on waste electrical and electronic equipment (WEEE), the product is marked with the depicted symbol in order to minimize the disposal of WEEE as unsorted municipal waste. Do not dispose of products bearing this marking as unsorted municipal waste. Instead, return them to Endress+Hauser for disposal under the applicable conditions.
13  Technical data

13.1  Input

Measured variables  Dissolved oxygen [mg/l, µg/l, ppm, ppb or %SAT or hPa]

Measuring ranges  Measuring ranges apply for 20 °C (68 °F) and 1013 hPa (15 psi)
With Liquiline CM44x, CM44xR, CM44P:
- 0 to 20 mg/l
- 0 to 400 hPa
- 0 to 200 % SAT

13.2  Performance characteristics

Response time  From air to nitrogen at reference operating conditions:
\[ t_{90} \approx 60 \text{ s} \]

Reference operating conditions  Reference temperature: 25 °C (77 °F)
Reference pressure: 1013 hPa (15 psi)
Reference application: Air-saturated water

Maximum measured error 2)

Measuring range  Maximum measured error
< 12 mg/l  0.01 mg/l or ±1 % of reading
12 mg/l to 20 mg/l  ±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  −20 to 60 °C (−4 to 140 °F)
at 95% relative air humidity, non-condensing

Storage temperature  −20 to 60 °C (−4 to 140 °F)
at 95% relative air humidity, non-condensing

Degree of protection  IP 68 (test conditions: 10 m (33 ft) water column, at 25 °C (77 °F) over 30 days)

Electromagnetic compatibility  Interference emission and interference immunity as per EN 61326: 2005, Namur NE 21:2007

2)  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 1 to 10 bar (14.5 to 145 psi) abs.

13.5 Mechanical construction

Dimensions

Dimensions in mm (inch)

* depending on version of cleaning unit
Optional cleaning unit

- **A** Compressed air cleaning COS61/61D OD 6/8 mm (additional information → 30)
- **B** Compressed air cleaning COS61/61D OD 6.35 mm (¼") (additional information → 30)

### 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
- **Parts in contact with medium**
  - Fluorescence cap: PVC / POM
  - Spot layer: Silicone
  - Orifice plate: PET
  - O-rings: EPDM
  - Cap holder: 1.4404
  - Shaft tube: 1.4571
  - Housing connection: POM
  - Protection guard: POM
  - Housing air purge unit: POM

### Process connection
- G1, NPT 3/4"

### Sensor cable
- Shielded 4-core fixed cable

### Cable connection at transmitter
- Terminal connection, end ferrules
- Optional: M12 connector

### Maximum cable length
- max. 100 m (330 ft), incl. Cable extension

### Temperature compensation
- Internal
<table>
<thead>
<tr>
<th>Interface</th>
<th>Memosens protocol</th>
</tr>
</thead>
</table>

Technical data

Oxymax COS61D

Endress+Hauser
14 Appendices

EU-Konformitätserklärung
EU-Declaration of Conformity
Déclaration UE de Conformité

Company
Endress+Hauser Conducta GmbH+Co. KG
Dieselstraße 24, 79089 Geisingen, Germany

Product
Oxymax COS61D

Regulations
den folgenden Europäischen Richtlinien entspricht:
conforms to following European Directives:
est conforme aux prescriptions des Directives Européennes suivantes:

EMC 2014/30/EU (89/336)
RoHS 2011/65/EU (1995/51)

Standards
angewandte harmonisierte Normen oder normative Dokumente:
applied harmonized standards or normative documents:
normes harmonisées ou documents normatifs appliqués:

EN 61326-1 (2013)
EN 61326-2-3 (2013)
EN 50563 (2012)

Geisingen, 31.05.2017
Endress+Hauser Conducta GmbH+Co. KG

L.V. Jörg Martin Müller
Technology

I.V. Robert Binder
Technology Certifications and Approvals

EC_00156_02.16
# Index

## A
- Accessories ................................ 29
- Adjustment ................................ 21
- Ambient temperature ........................ 33
- Assemblies ................................ 29

## C
- calibration
  - Calculation example ....................... 22
  - In air .................................. 21
  - types of calibration ........................ 21
- CE mark .................................. 10
  - Check connection .............................. 20
  - Function .................................. 24
  - mounting .................................. 19
- Cleaning
  - sensor ........................................ 26
  - Sensor optics ................................ 27
- Cleaning the sensor optics ..................... 27
- Cleaning unit ................................ 14
  - Check ...................................... 20
  - Ensuring the degree of protection ......... 20

## D
- Declaration of conformity ..................... 10
- degree of protection
  - Ensuring .................................... 20
- Degree of protection
  - Degree of protection ....................... 33
- Device description ............................ 6
- Dimensions .................................. 34
- Disposal .................................... 32

## E
- Electrical connection ......................... 20
- Environment ................................ 33

## F
- Fluorescence cap .............................. 8
  - replacing .................................... 27
- Function check .................................. 24

## I
- Incoming acceptance ........................... 9
- Installation instructions ....................... 12
- Intended use .................................. 4

## M
- Maintenance schedule ........................ 26
- Maintenance tasks ............................ 26
- Manufacturer's address ....................... 10
- Materials .................................... 35
- Measured error ............................... 33
- Measured variables ............................ 33
- Measurement function ....................... 28

## N
- Nameplate .................................. 9

## O
- Operating life of sensor cap .................. 33
- Operating principle ........................... 6
- Operational safety ............................ 4
- Optical measuring principle .................. 6
  - orientation ................................... 12

## P
- Performance characteristics .................. 33
- Process ....................................... 34
- Process connection ............................ 35
- Process pressure ............................... 34
- Process temperature ........................... 34
- Product identification ....................... 9
- Product safety ................................ 5

## R
- Reference operating conditions ............... 33
- Repair ....................................... 32
- Repeatability ................................ 33
- Replacing sealing rings ....................... 27
- Response time ................................ 33
- Return ...................................... 32

## S
- safety
  - operation .................................... 4
  - Product ...................................... 5
  - Workplace safety ........................... 4
- Safety instructions ............................ 4
- Scope of delivery ............................. 10
  - sensor
    - calibrating .................................. 24
    - Cleaning ................................ 24, 26
    - mounting .................................. 13
    - testing .................................... 25
  - Sensor
    - connecting .................................. 20
    - Design .................................... 7
    - Sensor design ............................... 7
    - Spare parts ................................. 32
    - Spot cap ................................ 27
Index

Storage temperature .......................... 33
Symbols ....................................... 3

T
Technical data
  Environment .................................. 33
  Input ........................................ 33
  Mechanical construction .................... 34
  Performance characteristics ............... 33
  Process ..................................... 34
Troubleshooting .............................. 25
Troubleshooting instructions ............... 25

U
Use ............................................ 4

W
Warnings ...................................... 3
Wear parts and consumables .................. 27
Weight ........................................ 35
Workplace safety ............................. 4

Z
Zero-point gel ................................. 30