

OxyMax W COS 41 Sensor for Measuring Dissolved Oxygen

Operating Instructions



Quality made by
Endress+Hauser



ISO 9001

Endress + Hauser

The Power of Know How



Contents

1	Safety instructions	2	5	Commissioning	15
1.1	Notes on safety conventions and icons	2	5.1	Function check	15
1.2	Designated use	2	5.2	Polarisation	15
1.3	Installation, commissioning and operation	2	5.3	Calibration	16
1.4	Operational safety	3			
1.5	Return	3	6	Maintenance	18
1.6	Disposal	3	6.1	Cleaning the outside of the sensor	18
			6.2	Regeneration	19
2	Identification	4	7	Accessories	22
2.1	Product structure	4	7.1	Connection accessories	22
2.2	Scope of delivery	4	7.2	Installation accessories	22
			7.3	Spare parts	22
3	Installation	5	7.4	Measurement, controlling and cleaning the sensor	22
3.1	Measuring device	5			
3.2	Installation conditions	6	8	Trouble-shooting	23
3.3	Installation location and position	7	8.1	Trouble-shooting instructions	23
3.4	Sensor design and functional description	11	8.2	Sensor test	24
3.5	Post-installation check	12	8.3	Spare parts	24
4	Wiring	13	9	Technical data	25
4.1	Direct connection to the transmitter	13		Index	26
4.2	Connection via the junction box VBM	13			
4.3	Post-connection check	14			

1 Safety instructions

1.1 Notes on safety conventions and icons



Warning!

This symbol alerts you to hazards which could cause serious injuries as well as damage to the instrument if ignored.



Caution!

This symbol alerts you to possible faults which could arise from incorrect operation. They could cause damage to the instrument if ignored.



Note!

This symbol indicates important items of information.

1.2 Designated use

The oxygen sensor COS 41 is suitable for continuous measurement of dissolved oxygen in water.

Typical applications are:

- Measuring oxygen content in activated sludge basins.
The measuring signal is used for monitoring and as a control parameter.
- Checking oxygen content in the discharge of a sewage treatment plant.
- Monitoring public waters.
Measuring and controlling the oxygen content in fish farming water.
- Oxygen enrichment in drinking water.



Warning!

- If the device is used for any application other than those described in this manual, it may lead to unsafe and improper functioning of the measuring system and is therefore not permitted.
- Make sure you strictly adhere to the warnings and notes in these Operating Instructions.

1.3 Installation, commissioning and operation



Warning!

- Only trained technical personnel may carry out installation, electrical connection, commissioning, operation and maintenance of the measuring system. The technical personnel must be authorised to do this by the system operator.
- Technical personnel must be familiar with the instructions in this manual and must adhere to them.
- Before switching on the system, check all the connections again for correctness.
- Do not operate damaged sensors. Indicate them as being defective.
- Measuring point faults may only be remedied by authorised and trained personnel.
- If faults cannot be repaired, the sensor must be taken out of service and secured against unintentional commissioning.
- Repairs may only be carried out by the manufacturer or by the Endress+Hauser service organisation.

1.4 Operational safety

The COS 41 sensor is operationally reliable and is made to the state of the art. The appropriate regulations and EC directives (see "Technical data") have been met.

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

- Explosion protection regulations
- Installation instructions
- Operating instructions for the assembly and its materials
- Local prevailing standards and regulations

1.5 Return

If the device requires repair, please send the sensor **clean** (see page 18) to the appropriate Endress+Hauser sales offices. Please use the original packaging where possible. Please add the filled in »Declaration of contamination« (copy the last but one page of this manual) to the packing of the sensor and add it also to the shipping documents.

1.6 Disposal

Defective, non-repairable sensors must be disposed of.
Please keep to the local disposal regulations!

2 Identification

2.1 Product structure

COS 41

Cable length		
	2	Cable length 7 m
	4	Cable length 15 m
	8	without cable (only for TOP 68 version)
	9	Special design to customer specifications
Cable connection		
	F	Fixed cable connection
	S	Cable connection using TOP 68 plug
COS 41-		Complete order code

2.2 Scope of delivery



Note!

- Make sure the packaging is undamaged!
Inform the post office or the courier of any damage to the packing.
Keep the damaged packaging until the matter has been clarified.
- Make sure the contents are undamaged!
Inform the post office or the courier of any damage to the delivered contents.
Keep the damaged products until the matter has been clarified.
- Use the delivery papers to check that the scope of delivery is complete.

The following items are included in the delivery:

- 1 oxygen sensor COS 41 with transport protection cap for membrane protection
- 1 Accessories Set COY 31-Z with the following contents:
 - 1 spare replacement cartridge COY 31-WP
 - 10 plastic ampoules containing electrolyte filling COY 3-F
 - 1 sealing kit COY 31-OR with 3 O-rings
 - 6 abrasive sheets
- Operating Instructions BA 284C/07/en

If you have questions, please contact your supplier or your nearest Endress+Hauser sales office (see the back page of this Operating Instructions).

3 Installation

3.1 Measuring device

A complete measuring system comprises:

- Oxygen sensor COS 41
- Oxygen transmitter Liquisys M COM 223/253-DX/DS

Optional:

- Universal suspension assembly support CYH 101 for immersed operation
- Immersion assembly COA 110 or DipFit W CYA 611 or flow assembly FlowFit W COA 250 or retractable assembly Probit W COA 461
- Junction box VBM
- Automatic spray cleaning system Chemoclean

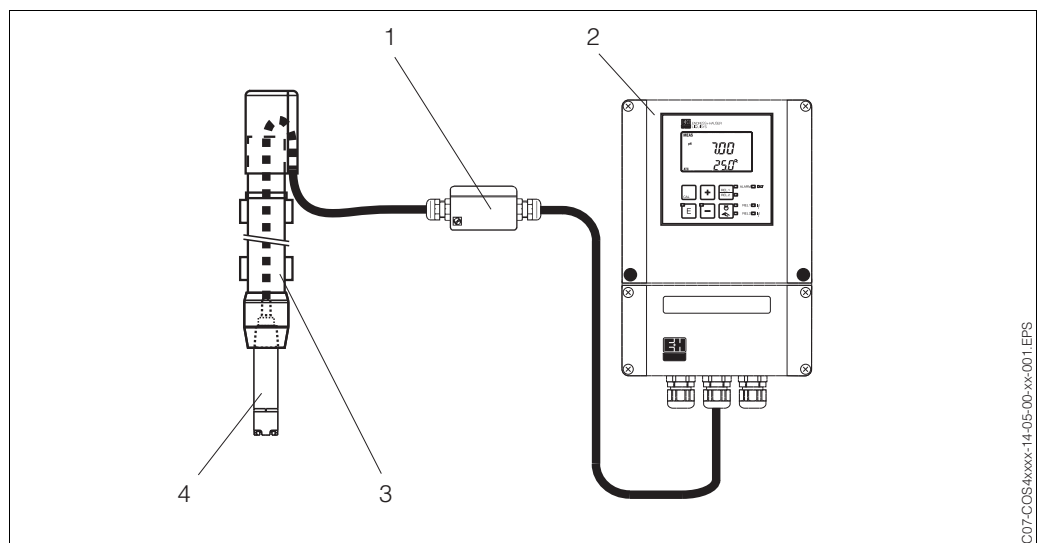


Fig. 3.1: Complete measuring device for COS 41 with Liquisys M COM 223/253-DX/DS

- 1 VBM junction box (only if cable extension required)
- 2 Transmitter Liquisys M COM 223/253-DX/DS
- 3 Immersion assembly CYA 611
- 4 Oxygen sensor COS 41

3.2 Installation conditions

3.2.1 Installation dimensions

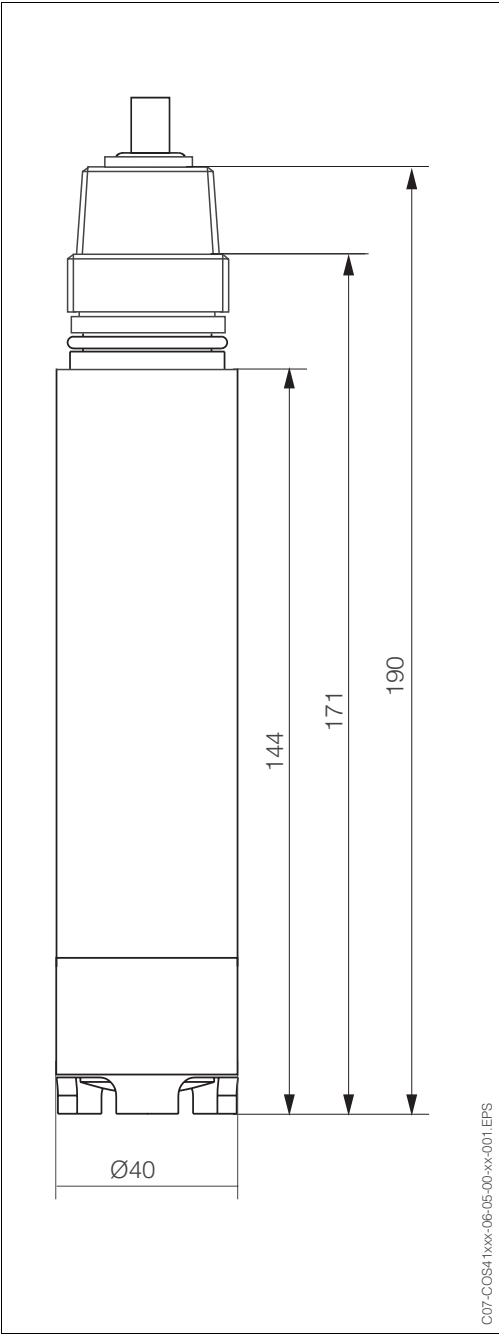


Fig. 3.2: Dimensions COS 41 fixed cable version

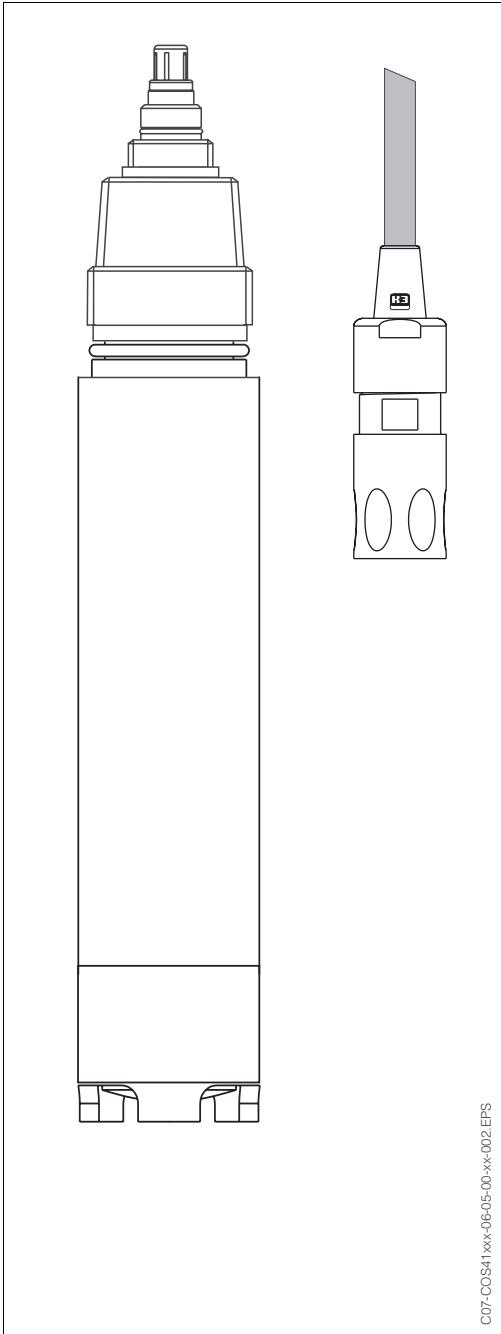


Fig. 3.3: COS 41 with TOP 68 plug-in head and TOP 68 plug-in cable

3.3 Installation location and position

The sensor can be installed up to the horizontal in an assembly, support or a suitable process connection (Fig. 3.4). Other angles are not permissible. Do **not** install the sensor overhead.

Permissible installation

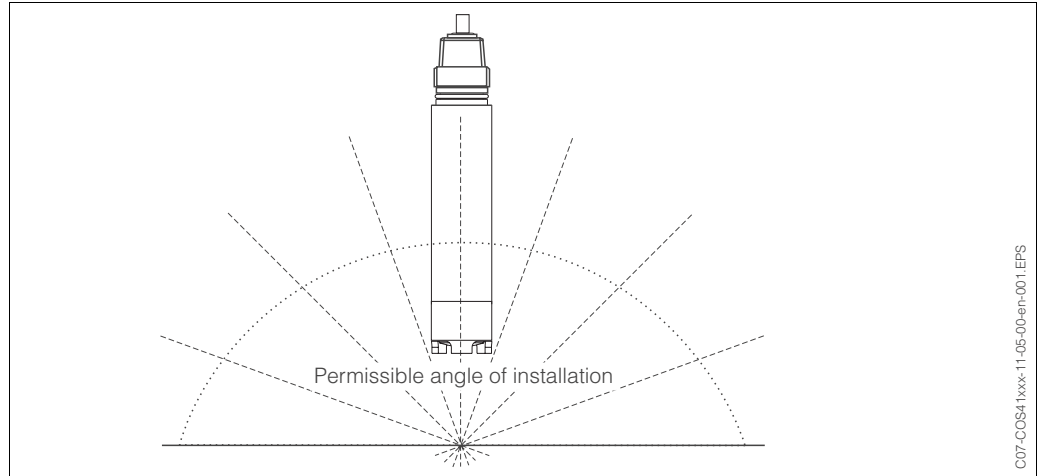


Fig. 3.4: Permissible installation positions for the COS 41 oxygen sensor



Note!

Make sure you comply with the instructions for installing sensors. You will find them in the Operating Instructions for the assembly used.

Installing a
measuring point

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

1. Installing an retractable or an flow assembly (if used) into the process.
2. Water connection to the rinse connections (if you use an assembly with cleaning function).
3. Installing and connecting the oxygen sensor.
4. Installing an immersion or an suspension assembly (if used) into the process.



Caution!

- For immersed operation, the sensor must be installed in an immersion assembly (e.g. CYA 611). **Do not install the sensor suspended from the cable.**
- Screw the sensor into the assembly so that the cable is not twisted.
- Avoid exerting excessive tensile force on the cable (e.g. from jerky pulling).
- Select the installation location so that there is easy access for later calibration.



Warning!

When using metallic assemblies and installation equipment, comply with national grounding regulations.

Pre-installation

For immersed operation, install the individual modules away from the basin on a solid base. Only carry out the final installation at the intended installation location.

Placing

Select the installation location so that there is easy access for later calibration. Make sure that upright posts and assemblies are secured safely and vibration-free. For immersed operation in an activated sludge basin, select an installation location which produces a typical oxygen concentration.

3.3.1 Installation examples

Immersed operation

For large basins, where sufficient installation distance is required from the basin edge, it is advisable to use the **upright post and chain assembly** (Figs. 3.5 and 3.6). The free swinging of the immersed assembly practically rules out vibrations from the upright post.

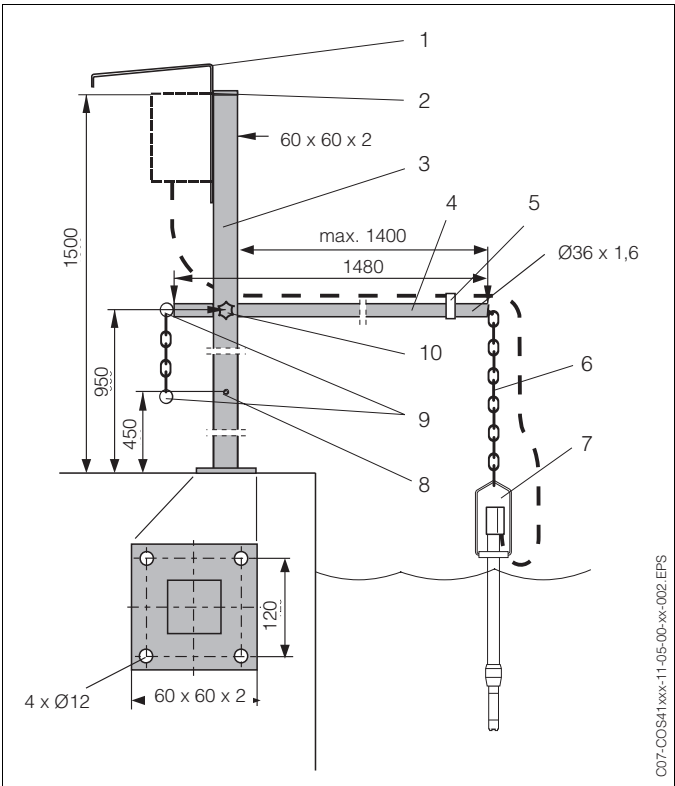


Fig. 3.5: Universal assembly support CYH 101-A with immersible pendulum assembly CYA 611

- 1 Weather protection cover
- 2 Dummy plug
- 3 Upright post square pipe stainless steel AISI 304
- 4 Transverse pipe stainless steel AISI 304
- 5 Velco fastener
- 6 Plastic chain, length 5 m
- 7 Immersion assembly CYA 611
- 8 Second fixing possibility for transverse pipe
- 9 Plastic shackle
- 10 Star handle

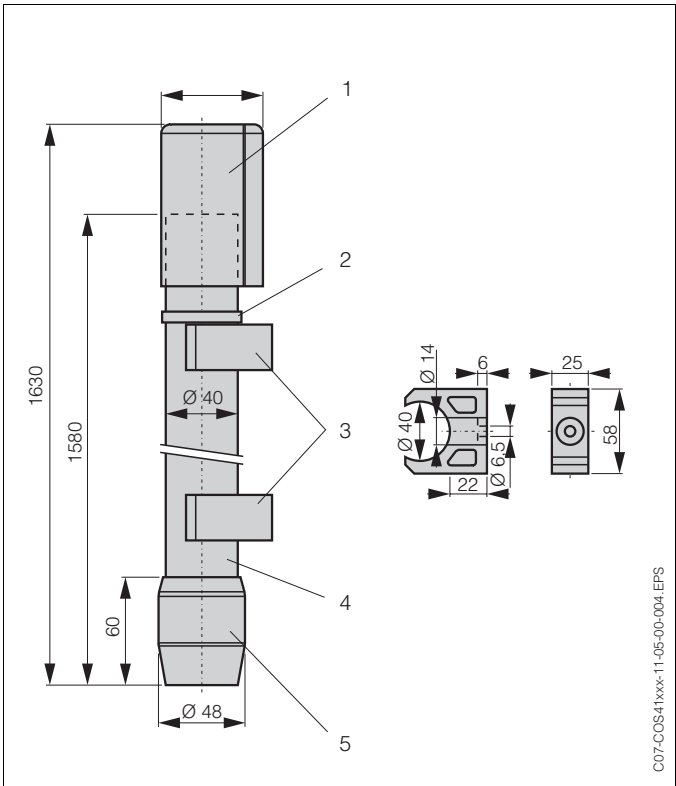


Fig. 3.6: CYA 611: Components and dimensions

- 1 Protective cap
- 2 Worm drive hose clip
- 3 Pipe clips (detailed drawing in right half of figure)
- 4 PVC pipe
- 5 Threaded coupling

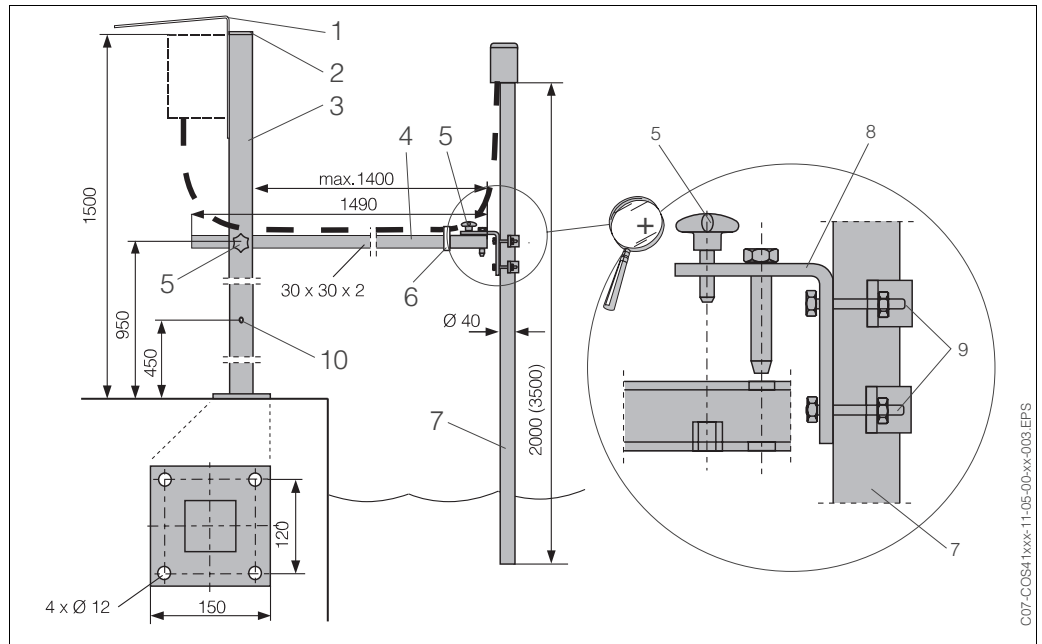


Fig. 3.7: Universal assembly support CYH 101-D or E

- 1 Weather protection cover
- 2 Dummy plug
- 3 Upright post square pipe stainless steel AISI 304
- 4 Transverse pipe stainless steel AISI 304
- 5 Star handle
- 6 Velco fastener
- 7 Immersion tube
- 8 Pipe holder
- 9 Fixing bracket
- 10 Second fixing possibility for transverse pipe

The preferable type of installation for strong or turbulent flow (> 0.5 m/s) in the basin or open channels is to secure the device to an **upright post and a securely mounted immersion tube** (Fig. 3.7). If the flow is very strong, a second transverse pipe (10) can be installed with its own pipe support.

For simple fixing to the sides of the basin or channel, we recommend the use of an immersion tube **basin edge mounting** (see Fig.).

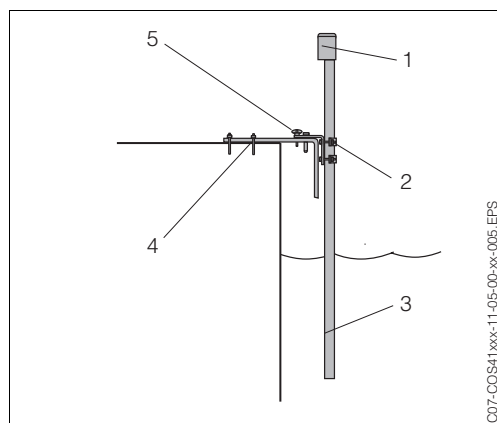


Fig. 3.8: Horizontal basin edge mounting CYY 106-A with immersion tube CYY 105-A

- 1 Shrouding cover for cable entry
- 2 Pipe holder
- 3 Immersion tube SS 304

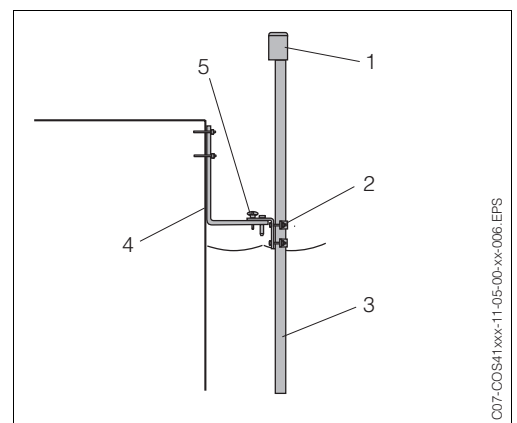
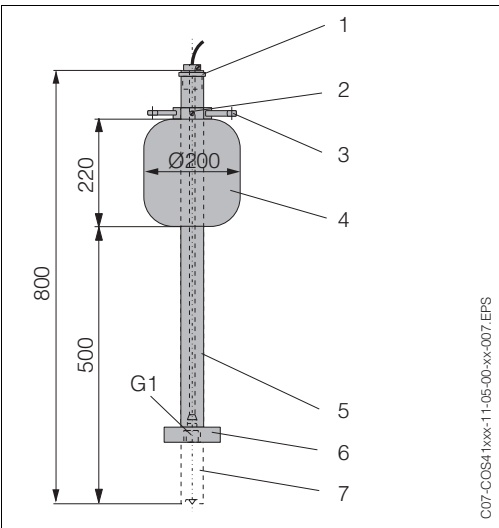


Fig. 3.9: Vertical basin edge mounting CYY 106-A with immersion tube CYY 105-A

- 4 Basin edge mounting
- 5 Star handle

If there is strong turbulence or flow, a second basin edge mounting must be used for an immersion tube.

To aid installation in strongly fluctuating water levels, e.g. in rivers or lakes, there is a **floating body COA 110-50** available (Fig. 3.10).



- 1 Cable route with strain relief and rain protection
- 2 Mounting ring for ropes and chains with locking screw
- 3 Lugs Ø 15; 3x120° for anchoring
- 4 Saltwater-resistant plastic float
- 5 Pipe 40x1, rust-proof steel SS 316Ti
- 6 Shock absorber and weight
- 7 Oxygen sensor COS 41

Fig. 3.10: Float COA 110-50

Flow operation

The COA 250-A flow assembly (Fig. 3.11) with automatic self-venting is suitable for use in pipelines or hose connections. The inlet is at the bottom of the assembly, the outlet at the top (connection thread G 3/4). It can be installed in a pipe by using two 90° pipe brackets to allow inflow to the assembly (Fig. 3.12, Pos. 6).

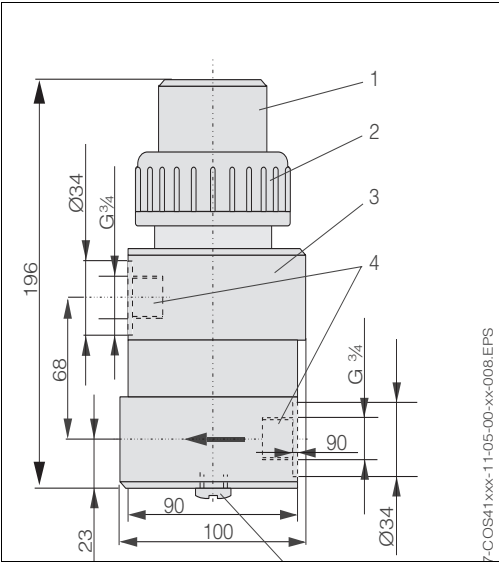


Fig. 3.11: Flow assembly COA 250-A

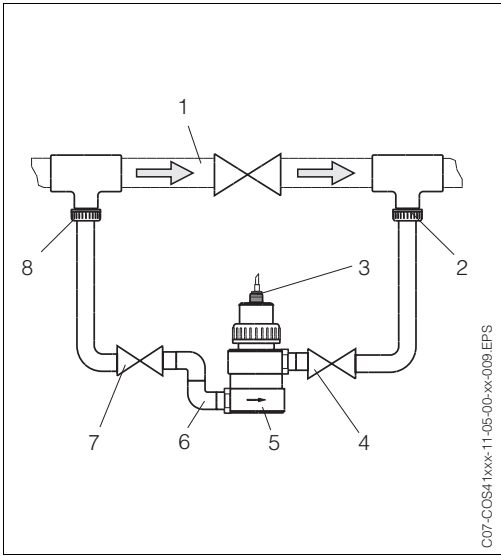


Fig. 3.12: Bypass installation with manually actuated valves or solenoid valves

- 1 Screw-in part for sensor
- 2 Screw ring
- 3 Meter body
- 4 Connection thread G 3/4
- 5 Dummy plug on the connection thread for spray head COR 3

- 1 Main line
- 2 Medium return
- 3 COS 41
- 4, 7 Manually actuated or solenoid valves
- 5 Flow assembly COA 250-A
- 6 90° pipe bracket
- 8 Medium removal

**Caution!**

For pressures > atmospheric pressure

- Pressurisation and work at a constant overpressure up to 10 bar poses no problems.
- Rapid pressure loss at the measuring point leads to air degassing in the electrolyte due to the sudden reductions in solubility. This could lead to a swelling of the sensor membrane.

Avoid this problem by keeping up the pressure on the sensor. In the case of rapid pressure loss e.g. during maintenance work on the pipeline close all the valves (manual mode: manually actuated valves, automatic mode: solenoid valves, see Fig. 3.12, Pos. 4 and 7) of the assembly.

3.4 Sensor design and functional description

3.4.1 Design

The sensor consists of the following function units:

- Sensor body
- sensor head with gold cathode and anode
- Membrane cap with electrolyte filling
- Protection basket

The electrical connection is either done by a fixed cable (1) or by a TOP 68 plug-in connection.

The threaded connections NPT $\frac{3}{4}$ " (2) and G 1 (3) are designed for installing the sensor in an immersion or flow assembly. The protection basket (5) is screwed on. Alternatively to the protection basket, you can use a spray head COR 3 (optional, see "Accessories", page 22) for use in immersed operation with cleaning function.

The membrane cap screwed onto the sensor head is filled with electrolyte. The screw connection seals it from the medium.

The membrane which is in contact with the medium is seated tightly in the membrane cap (pretensioned in the factory).

The gold cathode (6), anode (Ag/AgBr, 9) and an internal temperature sensor are located inside the sensor head.

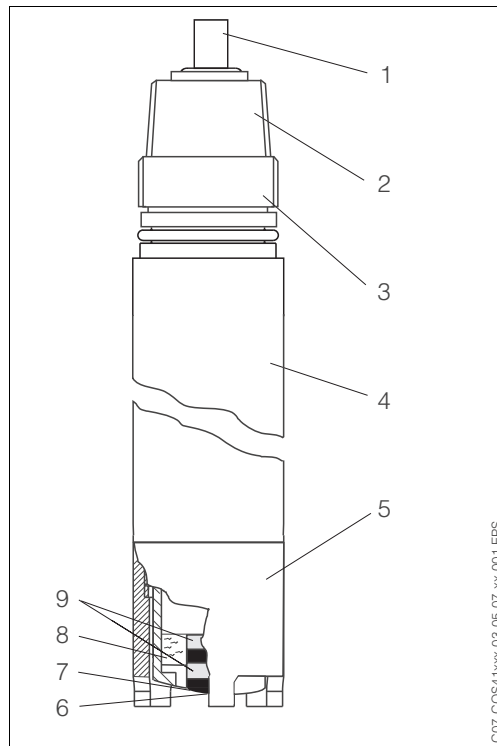


Fig. 3.13: Sensor design COS 41

- | | |
|---|---|
| 1 | Sensor cable |
| 2 | Threaded connection NPT $\frac{3}{4}$ " |
| 3 | Threaded connection G 1 |
| 4 | Sensor body |
| 5 | Protection basket |
| 6 | Gold cathode |
| 7 | Membrane |
| 8 | Electrolyte |
| 9 | Anode |

The figure on the next page shows an enlarged side view (Fig. 3.14) and top view (Fig. 3.15) of the sensor head.

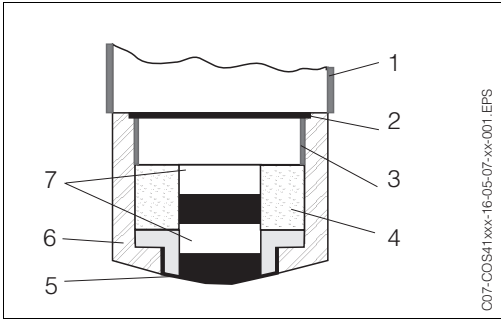


Fig. 3.14: Sensor head with membrane cap (Side view with cut-away view of membrane cap)

- 1 Screw thread for protection basket
- 2 Sealing ring
- 3 Screw thread for membrane cap
- 4 Electrolyte

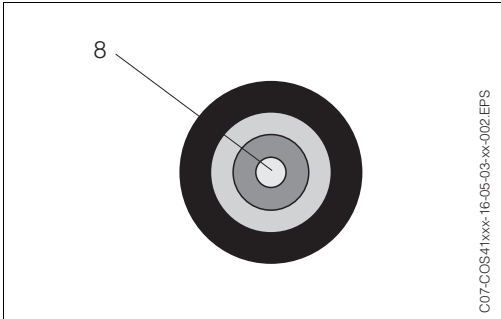


Fig. 3.15: Sensor head (top view with membrane cap removed)

- 5 Membrane
- 6 Membrane cap
- 7 Anode
- 8 Gold cathode

3.4.2 Functional description

Polarisation

When the sensor is connected to the transmitter, a fixed external voltage is applied between the cathode and anode. The resulting polarisation current is indicated on a display on the transmitter. The current starts high but then drops over time. The sensor can only be calibrated when the display is stable.

Membrane

The oxygen dissolved in the medium is conveyed to the membrane by the incoming flow. The membrane 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.

Amperometric measuring principle

The oxygen molecules diffused through the membrane are reduced to hydroxide ions (OH⁻) at the gold cathode. Silver is oxidised to silver ions (Ag⁺) at the anode (this forms a silver bromide layer, AgBr).

A current flows due to the connected electrode release at the gold cathode and accepted at the anode. In equilibrium, this flow is proportional to the oxygen content of the medium.

This current is converted in the measuring instrument and indicated on the display as an oxygen concentration in mg/l, as a saturation index in % SAT or as an oxygen partial pressure in hPa.

3.5 Post-installation check

After installing the sensor, carry out the following checks:

Checks	Remarks
Membrane OK (visual inspection)?	Replace membrane if there is a leak.
Compliance with permissible sensor installation position?	see Chapter 3.3
Sensor installed in immersion assembly?	Do not install the sensor suspended from the cable.
Protective cap fitted to immersion assembly?	Avoid moisture by rain in the assembly.

4 Wiring

4.1 Direct connection to the transmitter

The sensor COS 41 is connected using a special measuring cable. The wiring diagram is contained in the Operating Instructions of the transmitter Liquisys M COM 223/253-DX/DS

4.2 Connection via the junction box VBM

To lengthen the sensor connection beyond the length of the fixed cable, you require a junction box VBM. The connection is lengthened to the transmitter using the special measuring cable CYK 71.

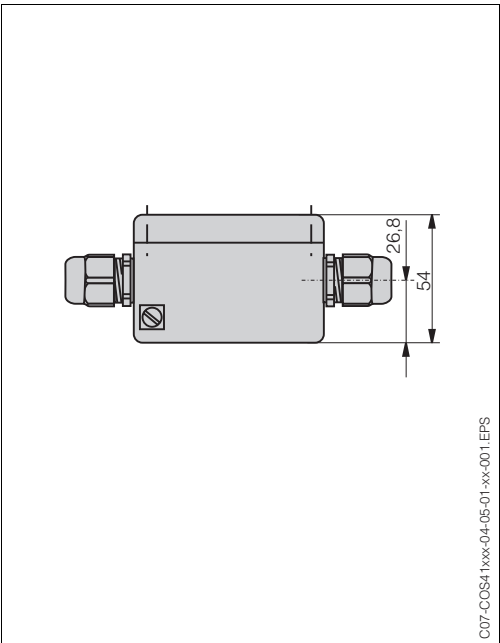


Fig. 4.1: Junction box VBM, side view

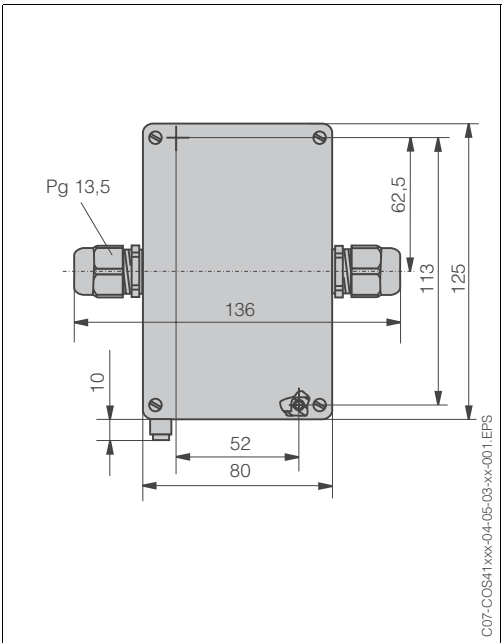


Fig. 4.2: Junction box VBM, plan view

Figs. 4.1 and 4.2 show the junction box VBM with its dimensions. The special measuring cable CYK 71 is depicted in Fig. 4.3. Please refer to it for information on the terminals and their assignment for connection to the transmitter. The interior white and yellow pilot wires have no function.

Special measuring cable
CYK 71

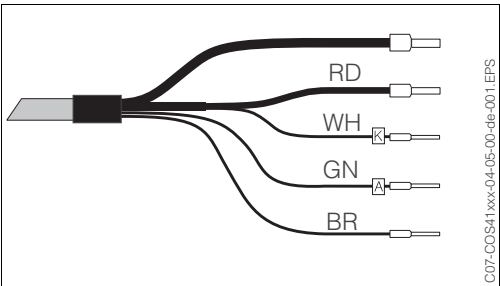


Fig. 4.3: Special measuring cable CYK 71

Terminal	Assignment
S	Outer screening
12	Active inner screening (NTC temperature sensor)
90	Cathode
91	Anode
11	NTC temperature sensor

Fig. 4.4 on page 14 is a schematic diagram of the sensor connection to the junction box VBM.

Connection diagram with junction box

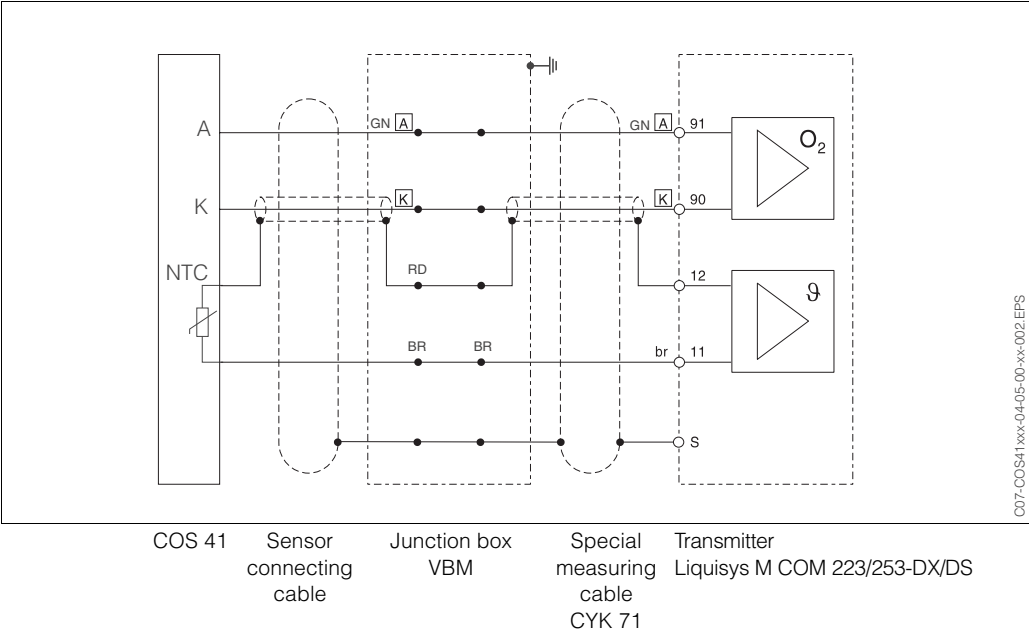


Fig. 4.4: Connection diagram with junction box VBM

4.3 Post-connection check

After wiring up the electrical connection, carry out the following checks:

Instrument status and specifications	Remarks
Are the sensor, assembly, junction box or cable damaged ?	Visual inspection
Electrical connection	Remarks
Does the supply voltage of the transmitter match the specifications on the nameplate ?	100 V ... 230 V AC long-range 24 V AC / DC
Are the installed cables strain-relieved and not twisted ?	
Is the cable type route completely isolated ?	Power cable/weak current cable
Are the power supply and signal cable correctly connected to the transmitter ?	
Are all the screws terminals properly tightened ?	Use the connection diagram of COM 2x3.
Are all the cable entries installed, tightened and sealed ?	
Are all the cable entries installed downwards or lateral ?	
For cable entries lateral: cable loops downwards for water to be able to drip off.	

5 Commissioning

5.1 Function check

Before the first commissioning, make sure of the following points:

- That the sensor was correctly installed (Post-installation check, see Chapter 3.5)
- That the electrical connection is correct (Post-connection check, see Chapter 4.3)

If using an assembly with automatic cleaning, check the correct water connection at the assembly rinse connection.



Warning!

Danger of medium escaping.

Before applying compressed air to an assembly with cleaning facility, make sure the connections are correctly fitted. Otherwise, the assembly may **not** be insert into the process.

5.2 Polarisation

The sensor was tested in the factory for perfect functionality and is supplied ready for operation.

To prepare for calibration, proceed as follows:

- Remove the sensor protective cap.
- Place the externally dry sensor in atmospheric air.
The air should be saturated with water vapour. Therefore, install the sensor as close to the water surface as possible. When calibrating the sensor membrane, make sure the membrane remains dry.
Therefore, avoid any direct contact with the water surface.
- Connect the sensor to the transmitter and switch on the transmitter.
- If you connect the sensor to the transmitter Liquisys M COM 223/253-DX/DS, polarisation is automatically performed after switching on the transmitter.
- The polarisation time takes about 1 hour.

Polarisation starts high, then drops gradually. You will recognise the end of polarisation when the display stabilises and remains practically constant.



Caution!

When you remove the sensor from the medium, protect the sensor from strong sunlight. Make sure you comply with the instructions for commissioning and calibration in the Operating Instructions of the transmitter.

5.3 Calibration

Calibration is a means of adapting the transmitter to the characteristic values of the sensor. As no zero calibration is required for the sensor COS 41, a single-point calibration is carried out in the presence of oxygen.

There are three basic types of calibration:

- In air (preferably saturated water vapour, e.g. near the water surface)
- In air-saturated water
- By entering a reference measured value in the transmitter (sensor remains in the medium).

Following only the calibration in air is described because it is the easiest and that's why the recommended method of calibration.

Calibration in air is only possible if air temperature $\geq -5\text{ }^{\circ}\text{C}$.

The sensor requires calibration after:

- first commissioning
- replacing a membrane or electrolyte
- cleaning the gold cathode
- long breaks in operation without power supply
- typical time intervals dependent on operating experience

5.3.1 Calibration in air

To calibrate the sensor in air, proceed as follows:

- Remove the sensor from the medium.
- Clean the outside of the sensor with a damp cloth. Then dry the sensor membrane e.g. by using a tissue.
- If the sensor is removed from a closed pressure system with a process pressure greater than atmospheric pressure:
 - open the membrane cap to equilibrate the pressure and clean the cap if necessary.
 - Change the electrolyte filling and close the membrane cap again.
 - Wait for the polarisation time to end.
- Then wait while the sensor adjusts to the temperature of the ambient air. This takes about 20 minutes. Check that the sensor is not in direct sunlight during this time.
- If the measured value display on the transmitter is stable, carry out the calibration in accordance with the Operating Instructions of the transmitter.
- Place the sensor in the medium again.



Note!

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

5.3.2 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 (ambient air)
- 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 for an approximate calculation.)

2. Define:

- The saturation value **S** acc. to Table 1 on page 17
- The factor **K** acc. to Table 2 on page 17

3. Determine:

- **L** = [rel. air pressure at calibration] : [1013 hPa]
- **M** = 1.02 for calibration in air
M = 1.00 for calibration in air-saturated water

4. Calculate the calibration value:

$$\text{Calibration value} = S \cdot K \cdot L \cdot M$$

Example:

- Air calibration at 18°C, altitude 500 m above sea level, air pressure 1022 hPa
- S = 9.45 mg/l, K = 0.943, L = 1.0089, M = 1.02

Calibration value = 9.17 mg/l

Table 1:

Saturation value S as a factor of temperature
 (taken at an air pressure of 1013 hPa)

°C	S [mg/l]	°C	S [mg/l]	°C	S [mg/l]	°C	S [mg/l]
0	14.64	11	10.99	21	8.90	31	7.42
1	14.23	12	10.75	22	8.73	32	7.30
2	13.83	13	10.51	23	8.57	33	7.18
3	13.45	14	10.28	24	8.41	34	7.06
4	13.09	15	10.06	25	8.25	35	6.94
5	12.75	16	9.85	26	8.11	36	6.83
6	12.42	17	9.64	27	7.96	37	6.72
7	12.11	18	9.45	28	7.82	38	6.61
8	11.81	19	9.26	29	7.69	39	6.51
9	11.53	20	9.08	30	7.55	40	6.41
10	11.25						

Table 2:

Correction factor K as a factor of mean altitude
 (above sea level)

Altitude [m]	K	Altitude [m]	K	Altitude [m]	K	Altitude [m]	K
0	1.000	550	0.938	1050	0.885	1550	0.834
50	0.994	600	0.932	1100	0.879	1600	0.830
100	0.988	650	0.927	1150	0.874	1650	0.825
150	0.982	700	0.922	1200	0.869	1700	0.820
200	0.977	750	0.916	1250	0.864	1750	0.815
250	0.971	800	0.911	1300	0.859	1800	0.810
300	0.966	850	0.905	1350	0.854	1850	0.805
350	0.960	900	0.900	1400	0.849	1900	0.801
400	0.954	950	0.895	1450	0.844	1950	0.796
450	0.949	1000	0.890	1500	0.839	2000	0.792
500							

6 Maintenance

Maintenance work must be carried out at regular intervals. To ensure that it is carried out, we recommend you enter the maintenance dates into an operations logbook or in an operations calendar in advance.
The following activities must be carried out:

- Cleaning the sensor
In particular when the membrane is soiled (see Chapter 6.1).
- Check the measuring function
A simple inspection of the measuring function is to remove the sensor from the medium. Clean and dry the membrane. After about 10 minutes, measure the oxygen saturation index in air (without recalibration). The measured value should be near to 102% SAT (display of O₂ saturation with COM 2x3 by pressing 4 times »+« - key).
- Replace a defective membrane or one which cannot be cleaned any more.
- Recalibration (see Chapter 5.3.1)



Note!
For regular automatic sensor cleaning, we recommend equipping the measuring point with a fully-automatic cleaning system, e. g. Chemoclean (see "Accessories" on page 22).

6.1 Cleaning the outside of the sensor

The measurement can be corrupted by sensor fouling or malfunction, e.g.:

- Coatings on the sensor membrane
→ cause longer response times and a reduced slope.
- Soiling or poisoning of the electrolyte
→ causes longer response times and false measurement.

To ensure 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 to Endress+Hauser for repairs.

Depending on the type of soiling, proceed as follows:

Type of soiling	Cleaning measure
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 body (not the membrane)	Clean the sensor body mechanically with water and a suitable brush.
Dirt particles on the membrane cap or the membrane	Clean the membrane with water and a soft sponge.



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

6.2 Regeneration

Parts of the sensor will suffer wear and tear during operation.

Suitable action can restore normal operating functionality.

This action includes:

Action	Cause
Cleaning the gold cathode (Chap. 6.2.1)	Soiled or silver-plated gold cathode
Replacing the sealing ring (Chap. 6.2.2)	Visual damage to the sealing ring
Replacing the electrolyte (Chap. 6.2.3)	unstable or implausible measuring signal or electrolyte soiling
Replacing the membrane cap (Chap. 6.2.4)	Uncleanable membrane Damaged membrane (hole or overstretch)



Warning!

Before beginning regeneration, switch off the power supply at the transmitter.

6.2.1 Cleaning the gold cathode

The gold cathode only need be cleaned when it is visibly soiled or there is a coating of silver on it.

To clean it, proceed as follows:

- Unscrew the membrane cap from the membrane body.
- Carefully clean the gold surface in two stages with the abrasive sheet (contained in scope of supply) until the (silver) coating is fully removed. Use the green sheet first and then the yellow sheet.
- Clean the electrode with drinking or distilled water.
- Fill the membrane cap with fresh electrolyte COY 3-F and screw it back onto the membrane body (up to the stop).



Caution!

The **anode** is covered with a silver bromide layer at the factory. **Do not clean the anode under any circumstances!**

If the coating of the anode is removed as a result of operation, the sensor is unusable and must be sent in for recoating. In this case, contact your E+H sales office.

6.2.2 Replacing the sealing ring

Replacing the sealing ring (see Fig. 3.14 on page 12, Pos. 2) is only necessary when it is visibly damaged. For replacement, use only the supplied sealing rings COY 31-OR.

6.2.3 Replacing the electrolyte

The electrolyte COY 3-F is slowly used up during measuring operations. The cause of this is electrochemical substance reactions. No substance reactions occur in de-energised state and the electrolyte is not used up.

The theoretical life of an electrolyte filling for use in air-saturated drinking water at 20°C is max. 5 years. The electrolyte life is shortened by diffused, dissolved gases such as H₂S, NH₃ or high concentrations of CO₂.

Particular loads occur with:

- anaerobic stages (e.g. denitrification)
- Strongly polluted industrial wastewater, particularly at high temperatures

To replace the electrolyte, proceed as follows:

1. Remove the membrane cap (see Chap. 6.2.4).
2. Replace the electrolyte and, if necessary, the membrane cap.
3. Place the membrane cap back on the membrane body and screw the cap to the stop.



Warning!

Risk of acid burns!

The electrolyte is strongly alkaline. You must follow the appropriate occupational safety regulations. Always wear protective gloves and goggles with handling electrolytes.

6.2.4 Replacing the membrane cap

Remove the old membrane cap

1. Remove the sensor from the medium.
2. Unscrew the protection basket.
3. Clean the outside of the sensor (see page 18).
4. Unscrew the membrane cap.
5. If necessary, clean the gold cathode (page 19) or replace the sealing ring if it is damaged (page 20).
6. Rinse the electrode holder with drinking water.

Install the new membrane cap

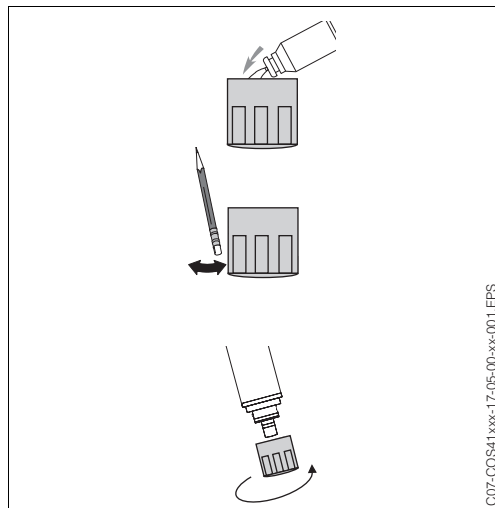


Caution!

Only use the membrane cap COY 31-WP for the COS 41 sensor (colour: black).

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

8. Replace the membrane cap as follows:



Pour the complete contents of a plastic ampoule (containing electrolyte COY3-F) into the membrane cap.

Remove all the air bubbles in the electrolyte by tapping the side of the membrane cap (e.g. with a pencil).

Hold the sensor body **at an angle** and carefully screw the membrane cap onto it **down to the stop**.

9. Screw the protection basket back on.

After replacing the membrane cap, polarise and recalibrate the sensor. Then insert the sensor into the medium and check that no alarm is displayed on the transmitter (if an alarm occurs, see Chap. 8.1).

7 Accessories

7.1 Connection accessories

- Junction box VBM
for extension with special measuring cable CYK 71.
2 screw unions Pg 13.5 for cable entry and 10 high-impedance, isolated screw terminals for single wire connection.
Dimensions: 125 x 80 x 54 mm (L x W x H)
Material: painted aluminium. Ingress protection IP 65; Order No. 50003987
- Special measuring cable CYK 71
Special extension cable between junction box VBM and transmitter;
Order No.: 50085333
- Special measuring cable with TOP 68 plug-in connection
cable COK 41, cable length 7m; Order No.: 51506817
cable COK 41, cable length 15m; Order No.: 51506818

7.2 Installation accessories

- Immersion assembly COA 110-50
- Flow assembly COA 250-A
- Immersion assembly CYA 611
- Immersion assembly COA 110-50
- Installation on basin rim CYY 106-A
- Spray head COR 3 for immersed operation, Order No. COR 3 - other sensor
- Baffle plate OP
extra protection for extreme current conditions; Order No. 50028712
- Membrane protection basket COY 3-SK
for sensor use in fish pens; Order No. 50081787

7.3 Spare parts

- Electrolyte filling COY 3-F
10 plastic ampoules, transparent; Order No. 50053349
- Zero calibration solution
3 screw-top bottles to produce 3 x 1 litre oxygen-free solution;
Order No. 50001041
- Replacement cartridge COY 31-WP for normal response time
2 preterminated spare replacement cartridges with pretensioned membrane;
Order No. 51506976
- Sealing ring COY 31-OR
3 pieces; Order No. 51506985
- Membrane protective basket
for immersion of dissolved oxygen in fish ponds, Order No. 50081787

7.4 Measurement, controlling and cleaning the sensor

- transmitter Liquisys M COM 223/253-DX/DS
Integrated electrode function monitoring,
measured value monitoring, free configuration of alarm contact
Technical Information TI 199C/07/en (Order No.) 51500281)
- Injector unit CYR 10, Technical Information TI 046C/07/en, Order No. 50014223
- Programmer CYR 20, Technical Information TI 046C/07/en, Order No. 50014223

8 Trouble-shooting

8.1 Trouble-shooting instructions

If any of the following problems occur, test the measuring device as indicated.

Problem	Test	Remedial action
No display, no sensor reaction	Mains voltage to the transmitter ?	Connect mains voltage
	Sensor connected correctly ?	Set up correct connection
	Medium flow available ?	Create flow
	Coating on the membrane ?	Clean sensor
	Electrolyte in the measuring chamber ?	Fill with electrolyte or replace electrolyte
Display value too high	With a TOP 68 connection: Humidity or dirt in plug ?	Cleaning of the TOP 68 plug-in connection by using cleaning alcohol
	Polarisation complete ?	Wait until polarisation time ends
	Last calibration with different sensor ?	Recalibrate
	Temperature display clearly too low ?	Check sensor, if necessary send sensor in for repair
	Membrane visibly stretched ?	Replace membrane cap
	Electrolyte soiled ?	Replace electrolyte
	Open sensor. Dry electrodes transmitter display now at 0 ?	Check electrical connection. If the problem still occurs, send the sensor in.
	Anode coating dissolved, is the anode silver instead of brown ?	Send in the sensor for recoating
Value indicated too low	Gold cathode silver-plated ?	Clean the gold cathode
	With a TOP 68 connection: Humidity or dirt in plug ?	Cleaning of the TOP 68 plug-in connection by using cleaning alcohol
	Sensor calibrated ?	Recalibrate
	Medium flow available ?	Produce flow
	Temperature display on transmitter clearly too high ?	Check sensor, if necessary send sensor in for repair
	Coating on the membrane ?	Clean membrane or replace membrane cap
Strong deviations in displayed value	Electrolyte soiled?	Replace electrolyte
	Membrane visibly stretched ?	Replace membrane cap
	Open sensor. Dry electrodes transmitter display now at 0 ?	Check electrical connection. If the problem still occurs, send in the sensor.
	EMC interference on the measuring system ?	Remove outer screening of sensor and extension cable at terminal S. Cut measuring and signalling lines from h.v. power lines.



Note!

Make sure you comply with the instructions for troubleshooting in the Operating Instructions of the transmitter. If necessary, carry out a test of the transmitter.

8.2 Sensor test



Caution!

Only authorised and trained personnel may test the sensor.

You will also require a multimeter (voltage, resistance).

Then carry out the following to test the sensor:

Test	Measure	Setpoint	
Voltage inspection	With the sensor connected, test the polarisation voltage on the Liquisys M COM 223/253-DX/DS transmitter	between terminals 90 and 91: – 650 mV	
Slope inspection	Place the sensor in the air, and dry with a paper towel	After 10 minutes, the measured value display should display approx. 102% SAT (display by 4 times »+« -key).	
Zero point inspection	Immerse the sensor in zero solution (see "Accessories" page 22). Wait for 15 minutes (consumption of the residue of oxygen in the sensor).	Display near to 0 mg/l (0% Sat)	
	Open the measuring chamber and dry the electrodes	Display near to 0 mg/l (0% Sat)	
Temperature sensor check	Disconnect the sensor and measure the resistance between red and brown flexible wires	depending on temper- ature:	
		5°C	74.4 kΩ
		10°C	58.7 kΩ
		15°C	46.7 kΩ
		20°C	37.3 kΩ
		25°C	30.0 kΩ
		30°C	24.3 kΩ
Cable check	Disconnect, open and dry the sensor.		
	Measure the resistance between Gold cathode and white braided wire.	< 1 Ω	
	Measure the resistance between anode and green braided wire.	< 1 Ω	



Note!

If there are deviations from the reference values, follow the troubleshooting instructions or contact your E+H sales office.

8.3 Spare parts

- Replacement cartridge COY 31-WP for replacing membrane cap
2 preterminated spare replacement cartridges with pretensioned membrane;
Order No. 51506976
- Sealing ring COY 31-OR
3 pieces; Order No. 51506985

9 Technical data

General specifications	
Manufacturer	Endress+Hauser
Product name	OxyMax W COS 41
Ambient conditions	
Storage temperature	filled with electrolyte: – 5 ... 50°C without electrolyte: –20 ... 60°C
Process conditions	
Process temperature range	–5 ... 50°C
Process pressure range	10 bar max. permissible overpressure Underpressure operation is not permissible
Measuring system	
Measuring principle	Membrane covered amperometric sensor
Parameter	Oxygen partial pressure-proportional current signal
Measuring range (with Liquisys COM 223/253-DX/DS)	0.05 ... 20.00 mg/l 0.00 ... 200% SAT 0 ... 400 hPa
Slope	approx. 300 nA at 20°C and 1013 hPa
Temperature compensation	NTC temperature sensor 30 k Ω , 0- 50°C
Response time	T ₉₀ : 3 minutes T ₉₉ : 9 minutes (both at 20°C)
Polarisation time	< 60 minutes
Minimum flow speed	typ. 0.5 cm/s for 95% measured value display
Drift	with continuous polarisation: < 1% / month
Zero current	zero-current-free
Sensor monitoring	Connected to Liquisys M COM 223/253-DX/DS: cable interruption or short-circuit, incorrect measurement and sensor passivation
Mechanical construction	
Materials	Sensor body: POM Membrane cap: POM Cathode: Gold Anode: Silver/silver bromide
Threaded connection	G 1 and NPT ¾"
Electrical connection	Double-screened coaxial cable with 2 pilot wires, terminal connection
Membrane thickness	approx. 50 μ m
max. total cable length for cable extension	50 m
Weight (at cable length)	0.7 kg (7 m) or 1.1 kg (15 m)
Ingress protection	IP 68
Cable connection (sensor side)	Fixed cable or TOP 68 connection

Index

A

Abrasive sheet	4
Accessories	22
Accessories Set	4
Air pressure	16–17
Altitude	16–17
Ambient conditions	25
Amperometric measuring principle	12
Assemblies	22

C

Calculating the calibration value	16
Calibration	16
Calibration in air	16–17
Cleaning	18
Cleaning the Gold cathode	19
Commissioning	15
Complete measuring system	5
Connection accessories	22
Correction factor K	17

D

Design	11
Designated use	2
Direct connection	13
Direct connection to the measuring transmitter	13
Disposal	3

E

Electrolyte filling	4, 22
---------------------	-------

F

Flow assembly	5, 22
Flow operation	10
Function	12
Function check	15

I

Identification	4
Immersed operation	8
Immersion assembly	5, 22
Installation	5
Installation conditions	6
Installation dimensions	6
Installation location and position	7
Installation on basin rim	22
Installing a measuring point	7

J

Junction box VBM	5, 13, 22
------------------	-----------

M

Maintenance	18
Measuring system	5
Measuring systems	25
Mechanical construction	25
Membrane	12

O

Operational safety	3
--------------------	---

P

Polarisation	12, 15
Post-connection check	14
Post-installation check	12
Process conditions	25
Product description	4
Product structure	4

Q

Queries	4
---------	---

R

Regeneration	19
Replacing the electrolyte	20
Replacing the membrane cap	20
Replacing the sealing ring	20
Retractable assembly	5
Return	3

S

Safety instructions	2
Safety symbols	2
Saturation value S	17
Scope of delivery	4
Sealing Kit	4
Sealing kit	4
Spare parts	24
Spare replacement cartridge	4
Special measuring cable CYK 71	13–14, 22
Spray head	22

T

Technical data	25
TOP 68	6

W

Wiring	13
--------	----

Z

Zero solution	22
---------------	----

Declaration of contamination

Dear costumer,

Because of legal determinations and for the safety of our employes and operating equipment we need this "Declaration of contamination" with your signature before your order can be handled. Please put the completely filled in declaration to the instrument and to the shipping documents in any case. Add also safety sheets and/or specific handling instructions if necessary.

type of instrument / sensor: _____ serial number: _____

medium / concentration: _____ temperature: _____ pressure: _____

cleaned with: _____ conductivity: _____ viscosity: _____

Warning hints for medium used:



radioactive



explosive



caustic



poisonous



harmful of
health



biological
hazardous



inflammable



safe

Please mark the appropriate warning hints.

Reason for return:

Company data:

company:	_____	contact person:	_____
	_____		_____
	_____	department:	_____
address:	_____	phone number:	_____
	_____	Fax/E-Mail:	_____
	_____	your order no.:	_____

I hereby certify that the returned equipment has been cleaned and decontaminated acc. to good industrial practices and is in compliance with all regulations. This equipment poses no health or safety risks due to contamination.

(Date)

(company stamp and legally binding signature)



Europe

Austria

□ Endress+Hauser Ges.m.b.H.
Vienna
Tel. +43 (0)1 88056-0, Fax +43 (0)1 88056-35

Belarus

□ Belorgsintez
Minsk
Tel. (0172) 263166, Fax (0172) 263111

Belgium / Luxembourg

□ Endress+Hauser N.V.
Brussels
Tel. (02) 2480600, Fax (02) 2480553

Bulgaria

INTERTECH-AUTOMATION
Sofia
Tel. (02) 664869, Fax (02) 9631389

Croatia

□ Endress+Hauser GmbH+Co.
Zagreb
Tel. (01) 6637785, Fax (01) 6637823

Cyprus

I+G Electrical Services Co. Ltd.
Nicosia
Tel. (02) 484788, Fax (02) 484690

Czech Republic

□ Endress+Hauser GmbH+Co.
Prague
Tel. (026) 6784200, Fax (026) 6784179

Denmark

□ Endress+Hauser A/S
Søborg
Tel. (70) 131132, Fax (70) 132133

Estonia

ELVI-Aqua
Tartu
Tel. (7) 441638, Fax (7) 441582

Finland

□ Endress+Hauser Oy
Espoo
Tel. (09) 8676740, Fax (09) 86767440

France

□ Endress+Hauser S.A.
Huningue
Tel. (389) 696768, Fax (389) 694802

Germany

□ Endress+Hauser Messtechnik GmbH+Co.
Weil am Rhein
Tel. +49 (0)7621 975-01, Fax +49 (0)7621 975-555

Great Britain

□ Endress+Hauser Ltd.
Manchester
Tel. +44 (0)161 2865000, Fax +44 (0)161 9981841

Greece

I & G Building Services Automation S.A.
Athens
Tel. (01) 9241500, Fax (01) 9221714

Hungary

Mile Ipari-Elektro
Budapest
Tel. (01) 4319800, Fax (01) 4319817

Iceland

BL ehf
Reykjavik
Tel. (05) 619616, Fax (05) 619617

Ireland

Flomeaco Company Ltd.
Kildare
Tel. (045) 868615, Fax (045) 868182

Italy

□ Endress+Hauser S.p.A.
Cernusco s/N Milano
Tel. (02) 921921, Fax (02) 92107153

Latvia

Rino TK
Riga
Tel. (07) 312897, Fax (07) 312894

Lithuania

UAB "Agava"
Kaunas
Tel. (07) 202410, Fax (07) 207414

Netherlands

□ Endress+Hauser B.V.
Naarden
Tel. (035) 6958611, Fax (035) 6958825

Norway

□ Endress+Hauser A/S
Tranby
Tel. (032) 859850, Fax (032) 859851

Poland

□ Endress+Hauser Polska Sp. z o.o.
Raszyn
Tel. (022) 7201090, Fax (022) 7201085

Portugal

Tecnisis - Tecnica de Sistemas Industriais
Linda-a-Velha
Tel. (21) 4267290, Fax (21) 4267299

Romania

Romconseng S.R.L.
Bucharest
Tel. (01) 4101634, Fax (01) 4101634

Russia

□ Endress+Hauser Moscow Office
Moscow
Tel. (095) 1587564, Fax (095) 1589871

Slovakia

Transcom Technik s.r.o.
Bratislava
Tel. (7) 44888684, Fax (7) 44887112

Slovenia

□ Endress+Hauser D.O.O.
Ljubljana
Tel. (061) 5192217, Fax (061) 5192298

Spain

□ Endress+Hauser S.A.
Sant Just Desvern
Tel. (93) 4803366, Fax (93) 4733839

Sweden

□ Endress+Hauser AB
Sollentuna
Tel. (08) 55511600, Fax (08) 55511655

Switzerland

□ Endress+Hauser AG
Reinach/BL 1
Tel. (061) 7157575, Fax (061) 7111650

Turkey

Intek Endüstriyel Ölçü ve Kontrol Sistemleri
tanbul
Tel. (0212) 2751355, Fax (0212) 2662775

Ukraine

Photonika GmbH
Kiev
Tel. (44) 26881, Fax (44) 26908

Yugoslavia Rep.

Meris d.o.o.
Beograd
Tel. (11) 4441966, Fax (11) 4441966

Africa

Egypt

Anasia
Heliopolis/Cairo
Tel. (02) 4179007, Fax (02) 4179008

Morocco

Oussama S.A.
Casablanca
Tel. (02) 241338, Fax (02) 402657

South Africa

□ Endress+Hauser Pty. Ltd.
Sandton
Tel. (011) 4441386, Fax (011) 4441977

Tunisia

Controle, Maintenance et Regulation
Tunis
Tel. (01) 793077, Fax (01) 788595

America

Argentina

□ Endress+Hauser Argentina S.A.
Buenos Aires
Tel. (01) 145227970, Fax (01) 145227909

Bolivia

Tritec S.R.L.
Cochabamba
Tel. (042) 56993, Fax (042) 50981

Brazil

□ Samson Endress+Hauser Ltda.
Sao Paulo
Tel. (011) 50313455, Fax (011) 50313067

Canada

□ Endress+Hauser Ltd.
Burlington, Ontario
Tel. (905) 6819292, Fax (905) 6819444

Chile

□ Endress+Hauser Chile Ltd.
Santiago
Tel. (02) 3213009, Fax (02) 3213025

Colombia

Colsein Ltda.
Bogota D.C.
Tel. (01) 2367659, Fax (01) 6104186

Costa Rica

EURO-TEC S.A.
San Jose
Tel. (02) 961542, Fax (02) 961542

Ecuador

Insetec Cia. Ltda.
Quito
Tel. (02) 269148, Fax (02) 461833

Guatemala

ACISAAutomatizacionYControlIndustrial S.A.
Ciudad de Guatemala, C.A.
Tel. (03) 345985, Fax (03) 327431

Mexico

□ Endress+Hauser S.A. de C.V.
Mexico City
Tel. (5) 5682405, Fax (5) 5687459

Paraguay

Incoel S.R.L.
Asuncion
Tel. (021) 213989, Fax (021) 226583

Uruguay

Circular S.A.
Montevideo
Tel. (02) 925785, Fax (02) 929151

USA

□ Endress+Hauser Inc.
Greenwood, Indiana
Tel. (317) 535-7138, Fax (317) 535-8498

Venezuela

CONTROVAL C.A.
Caracas
Tel. (02) 9440966, Fax (02) 9444554

Asia

China

□ Endress+Hauser Shanghai
Instrumentation Co. Ltd.
Shanghai
Tel. (021) 54902300, Fax (021) 54902303

□ Endress+Hauser Beijing Office

Beijing
Tel. (010) 68344058, Fax: (010) 68344068

Hong Kong

□ Endress+Hauser HK Ltd.
Hong Kong
Tel. 25283120, Fax 28654171

India

□ Endress+Hauser (India) Pvt Ltd.
Mumbai
Tel. (022) 8521458, Fax (022) 8521927

Indonesia

PT Grama Bazita
Jakarta
Tel. (21) 7975083, Fax (21) 7975089

Japan

□ Sakura Endress Co. Ltd.
Tokyo
Tel. (0422) 540613, Fax (0422) 550275

Malaysia

□ Endress+Hauser (M) Sdn. Bhd.
Petaling Jaya, Selangor Darul Ehsan
Tel. (03) 7334848, Fax (03) 7338800

Pakistan

Speedy Automation
Karachi
Tel. (021) 7722953, Fax (021) 7736884

Papua New Guinea

SBS Electrical Pty Limited
Port Moresby
Tel. 3251188, Fax 3259556

Philippines

□ Endress+Hauser Philippines Inc.
Metro Manila
Tel. (2) 3723601-05, Fax (2) 4121944

Singapore

□ Endress+Hauser (S.E.A.) Pte., Ltd.
Singapore
Tel. 5668222, Fax 5666848

South Korea

□ Endress+Hauser (Korea) Co., Ltd.
Seoul
Tel. (02) 6587200, Fax (02) 6592838

Taiwan

Kingjarl Corporation
Taipei R.O.C.
Tel. (02) 27183938, Fax (02) 27134190

Thailand

□ Endress+Hauser Ltd.
Bangkok
Tel. (2) 9967811-20, Fax (2) 9967810

Vietnam

Tan Viet Bao Co. Ltd.
Ho Chi Minh City
Tel. (08) 8335225, Fax (08) 8335227

Iran

PATSA Co.
Tehran
Tel. (021) 8754748, Fax (021) 8747761

Israel

Instrumetrics Industrial Control Ltd.
Netanya
Tel. (029) 8357090, Fax (03) 8350619

Jordan

A.P. Parpas Engineering S.A.
Amman
Tel. (06) 4643246, Fax (06) 4645707

Kingdom of Saudi Arabia

Anasia Ind. Agencies
Jeddah
Tel. (02) 6710014, Fax (02) 6725929

Lebanon

Network Engineering
Jbeil
Tel. (3) 944080, Fax (9) 548038

Sultanate of Oman

Mustafa & Jawad Sience & Industry Co.
L.L.C.
Ruwi
Tel. 602009, Fax 607066

United Arab Emirates

Descon Trading EST.
Dubai
Tel. (04) 2653651, Fax (04) 2653264

Yemen

YemenCompany for Ghee and Soap Industry
Taiz
Tel. (04) 230664, Fax (04) 212338

Australia + New Zealand

Australia

ALSTOM Australia Limited
Milpera
Tel. (02) 97747444, Fax (02) 97744667

New Zealand

EMC Industrial Group Limited
Auckland
Tel. (09) 4155110, Fax (09) 4155115

All other countries

□ Endress+Hauser GmbH+Co.
Instruments International
D-Weil am Rhein
Germany
Tel. +49 (0)7621 975-02, Fax +49 (0)7621 975345

For more Endress+Hauser products please visit: www.ainstru.com

Mail: Sales@ainstru.com

<http://www.endress.com>



51506691

□ Members of the Endress+Hauser Group 05.00/LC

Endress + Hauser

The Power of Know How

