



Level



Pressure



Flow



Temperature



Liquid
Analysis



Registration



Systems
Components



Services

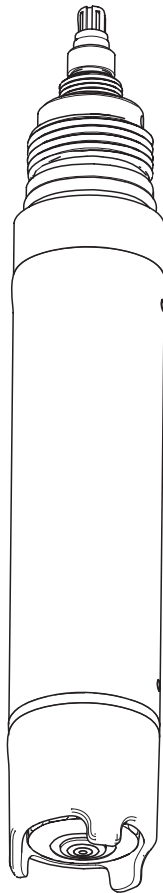


Solutions

Operating Instructions

Oxymax W COS71

Dissolved oxygen sensor



Brief overview

Here is how to use these Operating Instructions to commission your sensor quickly and safely:

	Safety instructions
Page 4 ff. Page 5	General safety instructions Explanation of the warning symbols You can find special instructions at the appropriate position in the chapter in question. The positions are indicated with the icons Warning ⚠, Caution ⚡ and Note 📌.
	▼
	Installation
Page 7 ff. Page 10 ff.	Here you can find installation conditions such as sensor dimensions and the angle of installation. Installation examples can be found here.
	▼
	Wiring
Page 12 ff.	Refer to these pages for sensor wiring.
	▼
	Sensor design and measuring principle
Page 14 Page 15 ff. Page 15 ff.	Here you can read about the sensor design. The measuring principle is explained on this page. Here you can find the possible calibration methods.
	▼
	Commissioning
Page 18 ff.	The sensor must be polarised before calibration. Please, read on the given page how to do it.
	▼
	Maintenance
Page 20 ff. Page 21 ff. Page 26	It is absolutely essential to carry out maintenance tasks on a regular basis. Individual parts are subject to normal wear and tear. Here you can find out how to replace such parts. Here you can find an overview of the spare parts which can be delivered as well as an overview of the system.
	▼
	Trouble-shooting
Page 24 ff.	If faults occur during operation, use the checklist to locate the cause.
	▼
	▼
	Index
Page 29 ff.	You can find important terms and keywords on the individual sections here. Use the keyword index to find the information you need quickly and efficiently.

Table of contents

1	Safety instructions	4	10	Technical data	27
1.1	Designated use	4	10.1	Input	27
1.2	Installation, commissioning and operation	4	10.2	Performance characteristics	27
1.3	Operational safety	4	10.3	Environment	27
1.4	Return	4	10.4	Process	27
1.5	Notes on safety icons and symbols	5	10.5	Mechanical construction	28
2	Identification	6		Index	29
2.1	Product structure	6			
2.2	Scope of delivery	6			
3	Installation	7			
3.1	Incoming acceptance, transport, storage	7			
3.2	Installation conditions	7			
3.3	Installation instructions	8			
3.4	Installation examples	10			
3.5	Post-installation check	11			
4	Wiring	12			
4.1	Direct connection to the transmitter	12			
4.2	Connection via junction box	13			
4.3	Post-connection check	13			
5	Operation	14			
5.1	Sensor design	14			
5.2	Measuring principle	15			
5.3	Calibration	15			
6	Commissioning	18			
6.1	Function check	18			
6.2	Polarisation	18			
6.3	Calibrate	19			
7	Maintenance	20			
7.1	Cleaning the sensor	20			
7.2	Regenerating the sensor	21			
8	Accessories	23			
8.1	Connection accessories	23			
8.2	Installation accessories	23			
8.3	Measurement, controlling and sensor cleaning	23			
9	Trouble-shooting	24			
9.1	Trouble-shooting instructions	24			
9.2	Sensor checks	25			
9.3	Spare parts	26			
9.4	Return	26			
9.5	Disposal	26			

1 Safety instructions

1.1 Designated use

The oxygen sensor COS71 is suitable for continuous measurement of dissolved oxygen traces in water.

The main application is:

the monitoring of the dissolved oxygen concentration in boiler feed water of power plants.

Any other use than the one described here compromises the safety of persons and the entire measuring system and is, therefore, not permitted.

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

1.2 Installation, commissioning and operation

Please note the following items:

- Installation, electrical connection, commissioning, operation and maintenance of the measuring system must only be carried out by trained technical personnel.
The technical personnel must be authorised for the specified activities by the system operator.
- Technical personnel must have read and understood these Operating Instructions and must adhere to them.
- Before commissioning the entire measuring point, check all the connections for correctness. Ensure that electrical cables and hose connections are not damaged.
- Do not operate damaged products and secure them against unintentional commissioning. Mark the damaged product as being defective.
- Measuring point faults may only be rectified by authorised and specially trained personnel.
- If faults can not be rectified, the products must be taken out of service and secured against unintentional commissioning.
- Repairs not described in these Operating Instructions may only be carried out at the manufacturer's or by the service organisation.

1.3 Operational safety

The sensor has been designed and tested according to the state of the art and left the factory in perfect functioning order.

Relevant regulations and European standards have been met.

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

- Installation instructions
- Local prevailing standards and regulations.

1.4 Return

If the device requires repair, please send it *cleaned* to the sales centre responsible. Please use the original packaging, if possible.

Please enclose the completed "Declaration of contamination" (copy the second last page of these Operating Instructions) with the packaging and the transportation documents.

No repair without completed "Declaration of contamination"!

1.5 Notes on safety icons and symbols



Warning!

This symbol alerts you to hazards. They can cause serious damage to the instrument or to persons 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.

2 Identification

2.1 Product structure

Certificate	
A	Ex free version
Cable length	
0	Cable length: 1.5 m (4.92 ft)
2	Cable length: 7 m (22.97 ft)
4	Cable length: 15 m (49.22 ft)
8	Without Cable (TOP 68 version only)
9	Special design to customer specifications
Cable connection	
F	Fixed cable connection
S	Cable connection using TOP 68 plug (with COM223/253-WX/WS only)
COS71-	Complete order code

2.2 Scope of delivery

The following items are included in the delivery:

- Oxygen sensor with transport protection cap for membrane protection
- Accessories Set with the following contents:
 - 2 replacement cartridges (replacement membrane caps)
 - 10 plastic ampoules containing electrolyte
 - 1 sealing kit with 3 O-rings
 - 6 abrasive sheets
- Operating Instructions english

If you have any questions, please contact your supplier or your sales centre responsible .

3 Installation

3.1 Incoming acceptance, transport, storage

- Make sure the packaging is undamaged!
Inform the supplier about damage to the packaging.
Keep the damaged packaging until the matter has been settled.
- Make sure the contents are undamaged!
Inform the supplier about damage to the delivery contents.
Keep the damaged products until the matter has been settled.
- Check that the scope of delivery is complete and agrees with your order and the shipping documents.
- The packaging material used to store or to transport the product must provide shock protection and humidity protection. The original packaging offers the best protection. Also, keep to the approved ambient conditions (see "Technical data").
- If you have any questions, please contact your supplier or your sales centre responsible.

3.2 Installation conditions

3.2.1 Dimensions

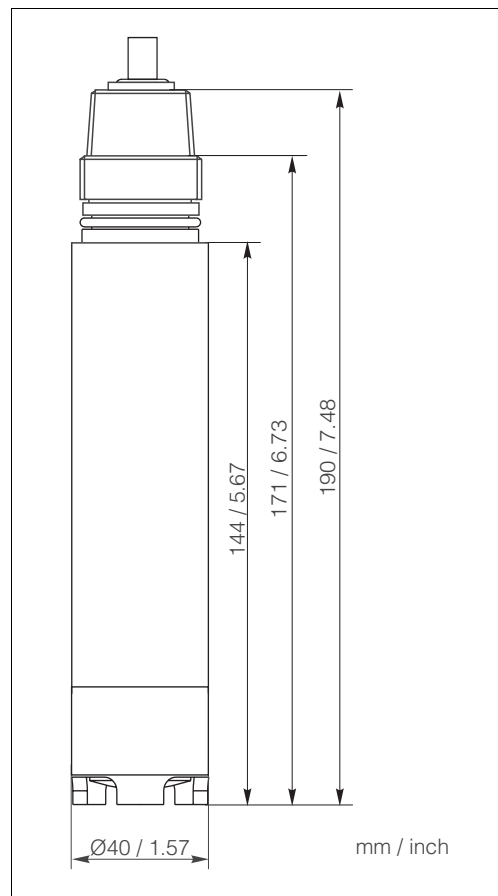


Fig. 1: Fixed cable version

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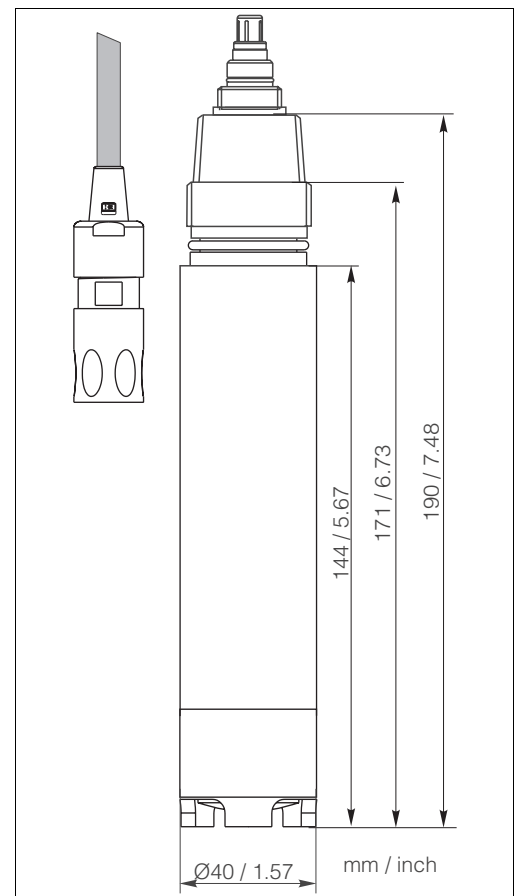


Fig. 2: TOP 68 plug-in head version

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3.2.2 Angle of installation

The sensor can be installed up to the horizontal in an assembly, support or a suitable process connection (Fig. 3). Other angles are not permissible. Do **not** install the sensor overhead.

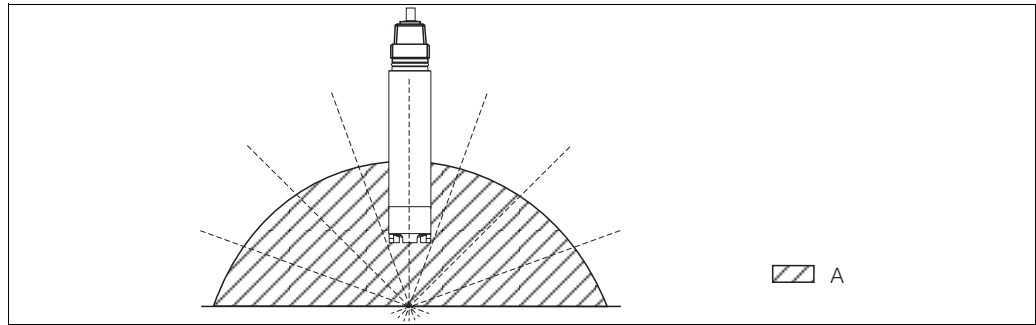


Fig. 3: Angle of installation

A Permissible installation positions: 0 ... 180 °, overhead installation is not permitted



Note!

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

3.2.3 Installation place

- 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 Installation instructions

3.3.1 Measuring system

A complete measuring system comprises at least:

- Oxygen sensor
- Transmitter, e.g. Liquisys M COM223/253-WX/WS
- Special measuring cable
- Assembly, e.g. flow assembly COA260 or retractable assembly COA451

Optional:

- Junction box VS (with cable extension)

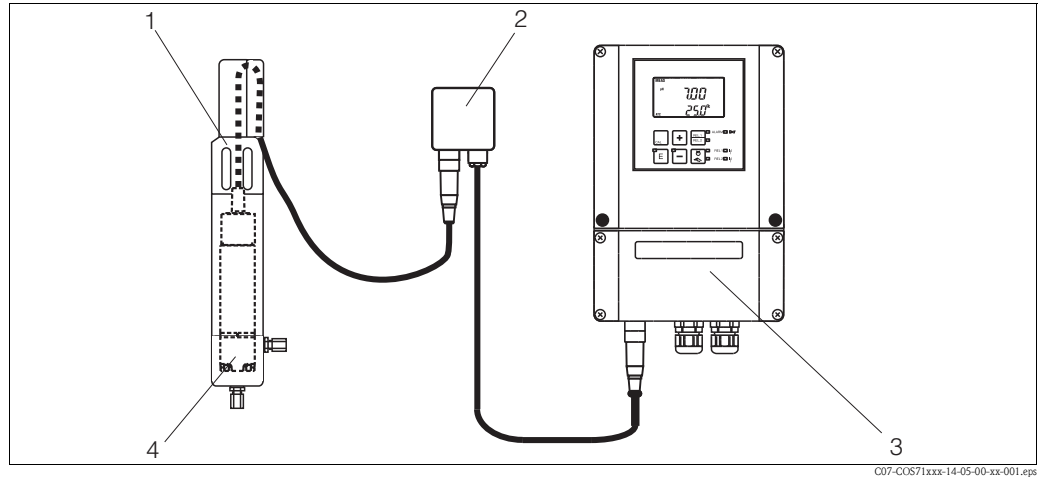


Fig. 4: Measuring system (example)

- 1 Flow assembly
- 2 Junction box VS (optional)
- 3 Transmitter Liquisys M COM253
- 4 Oxygen sensor

3.3.2 Installing a measuring point

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

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



Caution!

- **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.

3.4 Installation examples

3.4.1 Flow operation

Install the flow assembly COA260 acc. to Fig. 5 to ensure a total height of 540 mm (21.26 inch) for sensor installation or removal.

The inlet is at the bottom of the assembly, the outlet lateral of the assembly.

If necessary use devices for medium cooling resp. for pressure minimisation (max. permissible values: 50 °C / 122 °F resp. 10 bar / 145 psi).



Caution!

In a pressure system with reflow (Fig. 6):

- Pressurisation and work at constant overpressure up to 10 bar (145 psi) causes no problems..
- Rapid pressure loss at the measuring point leads to air degassing in the electrolyte due to 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 close all the valves of the assembly (pos. 4 and 5).

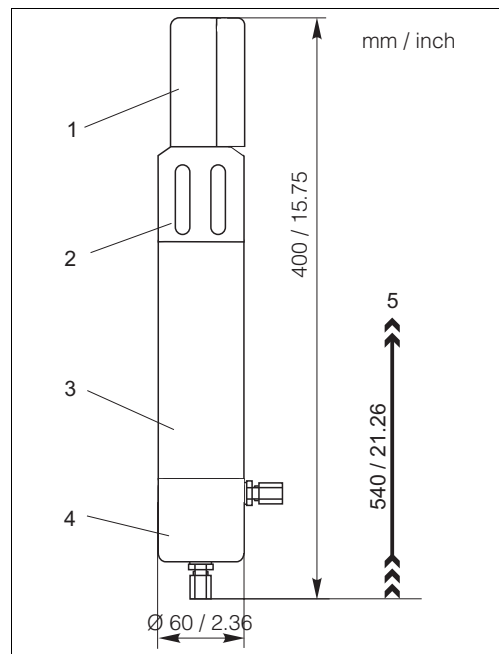


Fig. 5: Flow assembly COA260

- 1 Cap
- 2 Pressing screw
- 3 Intermediary
- 4 Flow vessel
- 5 Required height for sensor installation or removal

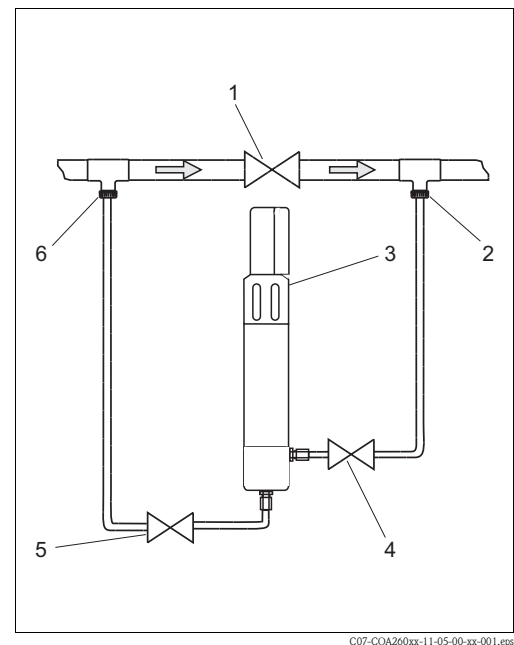


Fig. 6: Bypass installation with manually actuated or solenoid valves

- 1 Main line
- 2 Medium return
- 3 Flow assembly
- 4, 5 Manually actuated or solenoid valves
- 6 Medium removal

3.4.2 Retractable assembly

The assembly is designed for installation on tanks and pipes. Suitable nozzles must be available for this.

Install the assembly at places with constant flow. The minimum pipe diameter is DN 80.

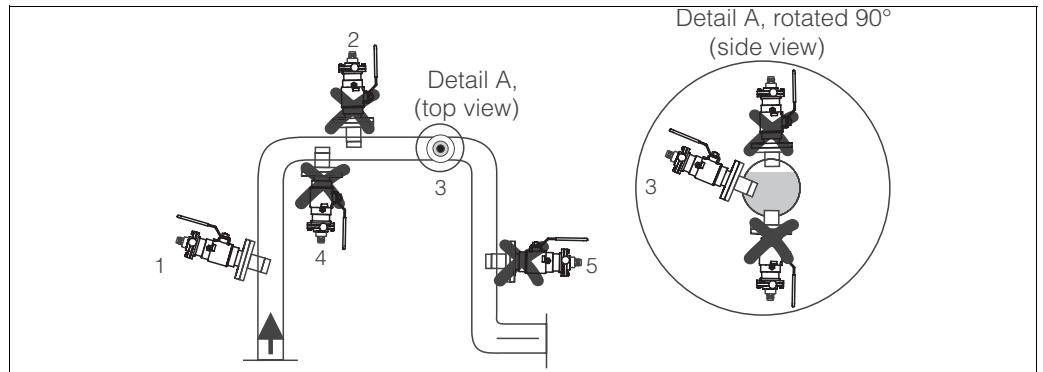


Fig. 7: Permissible and impermissible sensor installation positions

- 1 Ascending pipe, best position
- 2 Horizontal pipe, sensor top down, impermissible due to air cushion or foam bubble forming
- 3 Horizontal pipe, installation with permissible emitting angles (acc. to sensor version)
- 4 Overhead installation, impermissible due to missing electrolyte contact of the sensor electrodes
- 5 Down pipe, impermissible



Note!

- Do not install the assembly at places, where air cushions or foam bubbles can be formed or where suspended particles can settle on the sensor optics (→ Fig. 7).
- Measuring errors can occur, if:
 - the sensor is not immersed into the medium
 - suspended particles are settled on the sensor membrane
 - the sensor is installed overhead.

3.5 Post-installation check

- Check the membrane for leak tightness und replace it if necessary.
- Compliance with permissible sensor installation position?
- Is the sensor installed to an assembly and is not suspended from the cable?
- Avoid moisture by rain by fitting the protective cap to the immersion assembly?

4 Wiring



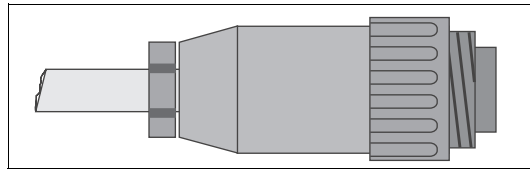
Warning!

- The electrical connection must only be carried out by authorised technical personnel.
- Technical personnel must have read and understood the instructions in this manual and must adhere to them.
- Ensure that there is no voltage at the power cable before beginning the connection work.

4.1 Direct connection to the transmitter

The sensor connection is different acc. to the transmitter version:

- Field device (COM253-WX/WS):
Connect the sensor directly to the transmitter by using the special measuring cable with SXP plug.



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Fig. 8: SXP plug

- Panel mounted device (COM223-WX/WS):
 - Please, remove the SXP plug (transmitter side!) from the cable.
 - Take out the cable specification and the corresponding pins of Liquisys M COM223-WX/WS from the following table.
Please note, that the cable specification differs acc. to the sensor version (fixed cable or TOP68 plug-in connection).

Pin of COM223	Sensor with fixed cable (OMK)		Sensor with TOP68 plug-in head (CYK71)	
	Colour	Assignment	Colour	Assignment
87	yellow	+U _B	yellow	+U _B
0	grey	OV	white	OV
96	pink	NTC (analogue) or comm. (digital)	green	Communication (digital)
97	blue	NTC (analogue) or comm. (digital)	brown	Communication (digital)
88	brown	-U _B	Coax inner	-U _B
19	green	Alarm		
18	white	Sensor signal		

4.2 Connection via junction box

To lengthen the sensor connection beyond the length of the fixed cable, you require a junction box VS (Fig. 9, Fig. 10).

Always connect the sensor cable with the SXP plug to the junction box. The cable extension to the transmitter then depends from the transmitter version, i.e. field device or panel mounted device.

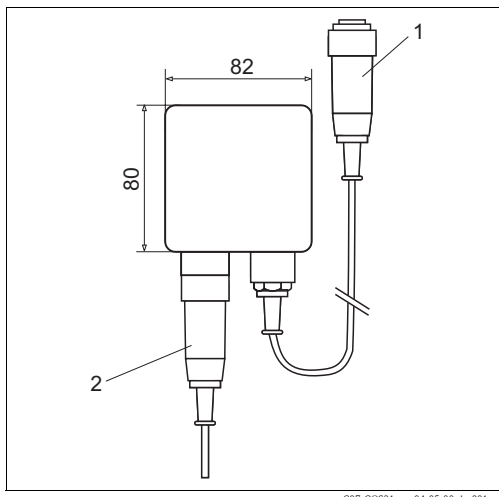


Fig. 9: Junction box VS to a field device

- 1 SXP plug to field device
- 2 SXP plug from sensor

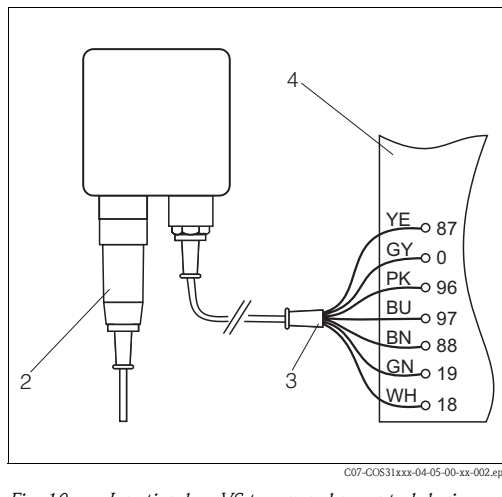


Fig. 10: Junction box VS to a panel mounted device

- 2 SXP plug from sensor
- 3 Measuring cable (OMK) to the transmitter
- 4 Connection department of the transmitter

4.3 Post-connection check

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?	110/230 V AC 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 ?	Use the connection diagram of COM 2x3.
Are all the screws terminals properly tightened ?	
Are all the cable entries installed, tightened and sealed ?	For cable entries lateral: cable loops downwards for water to be able to drip off.
Are all the cable entries installed downwards or lateral ?	

5 Operation

5.1 Sensor design

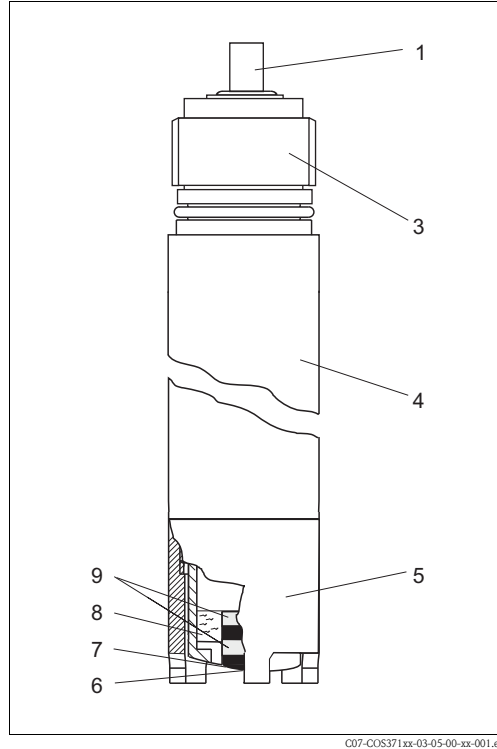


Fig. 11: Sensor design

- 1 Sensor cable
- 3 Threaded connection G1
- 4 Sensor shaft
- 5 Protection basket
- 6 Cathode
- 7 Membrane
- 8 Electrolyte
- 9 Anode

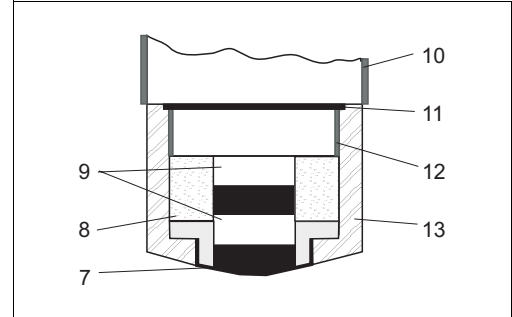


Fig. 12: Sensor head, cutaway drawing

- 7 Membrane
- 8 Electrolyte
- 9 Anode
- 10 Threaded connection for protection basket
- 11 Sealing ring
- 12 Threaded connection for membrane cap
- 13 Membrane cap

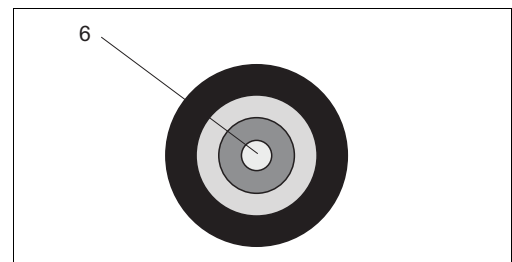


Fig. 13: Sensor head, top view

- 6 Cathode

The sensor consists of the following function units:

- Sensor shaft (Fig. 11, pos. 4)
- Sensor head with cathode and anode (Fig. 12, Fig. 13)
- Membrane cap with electrolyte filling (Fig. 12, pos. 13 and 8)
- Protection basket (Fig. 11, pos. 5)



Note!

- Alternatively to the protection basket, you can use a spray head COR 3 (optional, see "Accessories") 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 pretensioned in the factory.

5.2 Measuring principle

5.2.1 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.

5.2.2 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.

5.2.3 Amperometric principle

The oxygen molecules diffused through the membrane are reduced to hydroxide ions (OH⁻) at the 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 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.

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, a single-point calibration is carried out in the presence of oxygen.

The sensor requires calibration after:

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

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).



Note!

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

Calibration in air is only possible if air temperature ≥ -5 °C.

5.3.1 Calibration in air

1. Remove the sensor from the medium.
2. Clean the outside of the sensor with a damp cloth. Then dry the sensor membrane e.g. by using a tissue.
3. 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.
 - Replace the electrolyte filling and close the membrane cap again.
 - Wait for the polarisation time to end.
4. 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.
5. If the measured value display on the transmitter is stable, carry out the calibration in accordance with the Operating Instructions of the transmitter.
6. 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 the first table
 - the factor **K** acc. to the second table

°C	S [mg/l]
0	14.64
1	14.23
2	13.83
3	13.45
4	13.09
5	12.75
6	12.42
7	12.11
8	11.81
9	11.53
10	11.25

°C	S [mg/l]
11	10.99
12	10.75
13	10.51
14	10.28
15	10.06
16	9.85
17	9.64
18	9.45
19	9.26
20	9.08

°C	S [mg/l]
21	8.90
22	8.73
23	8.57
24	8.41
25	8.25
26	8.11
27	7.96
28	7.82
29	7.69
30	7.55

°C	S [mg/l]
31	7.42
32	7.30
33	7.18
34	7.06
35	6.94
36	6.83
37	6.72
38	6.61
39	6.51
40	6.41

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	0.943						

3. Determine:
 - **L** = rel. air pressure at calibration (1013 hPa if unknown)
 - **M** = 1.02 for calibration in air resp. 1.00 for calibration in air-saturated water
4. Calculate the calibration value **C**:

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

Example

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

Calibration value $C = 9.17 \text{ mg/l}$.

6 Commissioning

6.1 Function check

Before first commissioning, check if:

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

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



Warning!

Danger of medium leaking off

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.

6.2 Polarisation

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

To prepare for calibration, proceed as follows:

1. Remove the sensor protective cap.
2. 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.
3. Connect the sensor to the transmitter and switch on the transmitter.
4. Switch-on the transmitter.
If you connect the sensor to the transmitter Liquisys M COM223/253, polarisation is automatically performed after switching on the transmitter.
5. The polarisation time takes about 1 hour.



Note!

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.

6.3 Calibrate

Calibrate the sensor (Calibration in air, → Page 16) immediately after it's polarisation.

The calibration intervals depend heavily on:

- The application and
- The installation position of the sensor.

The following methods help you determine how long the calibration intervals should be:

1. Check the sensor one month after its being put into operation by taking it out of the fluid, drying it and then measuring the oxygen saturation index at air after 10 minutes.
Decide using the results:
 - a. If the measured value is not at 102 ± 2 %SAT, you have to calibrate the sensor.
 - b. Otherwise, double the length of time to the next inspection.
2. Proceed as per Point 1 after two, four and/or eight months. In this way, you can determine the optimum calibration interval for your sensor.




Note!

Be sure to calibrate the sensor at least once a year.

7 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)
- Check the measuring function:
 1. Remove the sensor from the medium.
 2. Clean and dry the membrane.
 3. After about 10 minutes, measure the oxygen saturation index in air (without recalibration).
 4. The measured value should be near to 102% SAT (display of O₂ saturation with COM 2x3 by pressing 4 times the  key).
- Replace a defective membrane or one which cannot be cleaned any more.
- Recalibration.



Note!

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

7.1 Cleaning 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 for repairs.

Depending on the type of soiling, proceed as follows:

Type of soiling	Cleaning
Salt deposits	Immerse the sensor in drinking water or in 1-5% hydrochloric acid for a few minutes. Afterwards, rinse it with copious amounts of water.
Dirt particles on the sensor body (not on 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.

7.2 Regenerating the sensor

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 cathode	soiled or plated cathode
Replacing the sealing ring	visual damage to the sealing ring
Replacing the electrolyte	unstable or implausible measuring signal or electrolyte soiling
Replacing the membrane cap	uncleanable membrane, damaged membrane (hole or overstretch)



Warning!

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

7.2.1 Cleaning the cathode

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

To clean it, proceed as follows:

1. Unscrew the membrane cap from the membrane body.
2. Carefully clean the 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.
3. Clean the electrode with drinking or distilled water.
4. 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 sales office.

7.2.2 Replacing the sealing ring

Replacing the sealing ring is only necessary when it is visibly damaged. For replacement, use only the supplied sealing rings COY 31-OR.

7.2.3 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.



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.

To replace the electrolyte, proceed as follows:

1. Remove the membrane cap.
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.

7.2.4 Replacing the membrane cap

Removing the old membrane cap

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

Installing the new membrane cap

7. Make sure that there are no dirt particles on the sealing surface.
8. Fill the complete contents of a plastic ampoule (containing electrolyte COY3-F) into the membrane cap.
9. Remove all the air bubbles in the electrolyte by tapping the side of the membrane cap (e.g. with a pencil).
10. Hold the sensor body **at an angle** and carefully screw the membrane cap onto it **down to the stop**.
11. Screw the protection basket back on.



Note!

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.

8 Accessories

8.1 Connection accessories

- VS junction box
with plug-in socket and 7-pole plug,
for cable extension from sensor (COS 31, COS 3 with SXP connector) to transmitter, IP 65;
order no. 50001054
- Measuring cable OMK
for use as extension cable between junction box VS and transmitter, not terminated
sold by the metre – order no. 50004124
- Measuring cable for sensors COS 31 and COS 71 with TOP 68 connector
COK 31; length: 1.5 m (4.92 ft) – order no. 51506820
COK 31; length: 7 m (22.97 ft) – order no. 51506821
COK 31; length: 15 m (49.22 ft) – order no. 51506822

8.2 Installation accessories

- Flow assembly COA260
for plate or wall mounting, for oxygen trace measurements;
ordering acc. to product structure (Technical Information TI310C/07/en, 51507520)
- Retractable assembly Cleanfit COA451
Manually driven retractable assembly, stainless steel, with ball valve, for oxygen sensors;
ordering acc. to product structure (Technical Information TI368C/07/en, 51512831)

8.3 Measurement, controlling and sensor cleaning

- Liquisys M COM223/253
Transmitter with integrated sensor function monitoring, measured value monitoring, free
configuration alarm contact, field or control panel installation, HART® or PROFIBUS possible;
Ordering acc. to product structure, see Technical Information TI 199C/07/en;
order no. 51500281

9 Trouble-shooting

9.1 Trouble-shooting instructions

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

Problem	Check	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 the sensor.
	Electrolyte in the measuring chamber?	Fill with electrolyte or replace electrolyte.
Displayed 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.
Displayed value too low	Cathode silver-plated?	Clean the 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?	Create flow.
	Displayed temperature 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 the sensor in.
	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.

Problem	Check	Remedial action
Membrane breakage alarm	Membrane no longer sealed due to damage?	Replace membrane cap, polarise and calibrate the sensor.
	Membrane outside-to-outside not damaged?	Screw membrane cap tight. If the alarm still occurs: Separate sensor from transmitter for min. 30 seconds. Repeat once or twice, if the alarm remains. If the alarm still occurs: replace membrane cap, polarise and calibrate.
	Sealing ring of membrane cap not clean?	Take the sensor from the medium, clean and dry it. Clean the sealing ring or replace it, if it is damaged. Separate sensor from transmitter for min. 30 seconds. Repeat once or twice, if the alarm remains. If the alarm still occurs: send sensor in for repair.



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.

9.2 Sensor checks



Caution!

Only authorised and trained personnel may test the sensor!
You will also require a multimeter (voltage, resistance).

Check	Measure	Setpoint
Voltage inspection	With the sensor connected, test the operating voltage on the Lquisys M COM 223/253-WX/WS transmitter	between terminals 87 and 0: +8 V between terminals 88 and 0: -8 V
Slope inspection	Place the sensor in the air, and dry with a paper towel.	After 10 minutes: approx. 102% SAT (4 times \square)
Zero point inspection	Immerse the sensor in zero solution ¹ .	Display near to 0 mg/l (0% Sat)
	Open the measuring chamber and dry the electrodes.	
Temperature sensor check	Disconnect the sensor and measure the resistance: – between TOP68 pins 3 and 4 – between SXP pins 3 and 4 (with fixed cable version)	depending on temperature: 5 °C: 74.4 k Ω 10 °C: 58.7 k Ω 15 °C: 46.7 k Ω 20 °C: 37.3 k Ω 25 °C: 30.0 k Ω 30 °C: 24.3 k Ω

¹ How to use the zero solution:

1. Fill a large beaker (1.5 – 2 l) with approx. 1 l of water.
2. Pour a cap-full of the zero solution into the water.
3. Immerse the sensor into the water and wait a sufficient period of time (15 min. for oxygen depletion).
The display drops to around 0 mg/l (0 %SAT).

Depending on the conditions (contact surface water/air), the zero solution is stable for up to 12 hours.



Note!
If there are deviations from the reference values, follow the troubleshooting instructions or contact your sales office.

9.3 Spare parts

	Position	Spare parts kit	order no.	
<p style="font-size: small;">C07-COS41 xxx-09-05-06-xx-001.eps Fig. 14: COS71</p>	1	Sensor	see product structure	
	2	Sealing ring COY31-OR – Material: Viton – 3 pieces	51506985	
	3	Membrane cap – Replacement cartridge COY31-WP for fast response time – 2 preterminated replacement cartridges with pretensioned membrane	51506977	
	4	Membrane protection basket	on request	
	without fig.		Electrolyte COY3-F – 10 plastic ampoules, transparent	50053349
			Polishing sheets COY3-PF – for cathode cleaning – 10 pieces	51506973
			Zero solution – 3 units to produce 3 x 1 litre oxygen free solution	50001041
2-4	Accessories kit COY31-S-Z, one of each: – Electrolyte COY3F – Replacement cartridge COY31S-WP for fast response time – Sealing ring COY31-OR – Polishing sheet COY3-PF	51506785		

9.4 Return

If the device requires repair, please send it *cleaned* to the sales centre responsible. Please use the original packaging, if possible.

Please enclose the completed "Declaration of contamination" (copy the second last page of these Operating Instructions) with the packaging and the transportation documents.
No repair without completed "Declaration of contamination"!

9.5 Disposal

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

10 Technical data

10.1 Input

Measured value	dissolved oxygen [mg/l / % SAT / hPa]
Measuring range	with Liquisys M COM223/253-WX/WS: 0.001 ... 20.000 mg/l 0.0 ... 200.0 % SAT 0 ... 400 hPa

10.2 Performance characteristics

Response time	<ul style="list-style-type: none"> ■ T_{90}: 0.5 minutes ■ T_{99}: 1.5 minutes (each at 20 °C)
Slope	approx. 8000 nA (at 20 °C, 1013 hPa)
Polarisation time	< 60 minutes
Minimum flow rate	typical 2.5 cm/s for 95 % measured value display (200 ml/min with flow assembly COA260)
Drift	with permanent polarisation: < 1 % per month
Zero current	zero current free
Sensor monitoring	with Liquisys M COM 223/253: cable interruption or short-circuit incorrect measurement and sensor passivation

10.3 Environment

Storage temperature	filled with electrolyte: -5 ... 50 °C (23 ... 122 °F) without electrolyte: -20 ... 60 °C (-4 ... 140 °F)
Ingress protection	IP 68

10.4 Process

Process pressure	max. 10 bar (145 psi) permissible overpressure Underpressure operation is not permissible.
Process temperature	-5 ... 50 °C (23 ... 122 °F)

10.5 Mechanical construction

Design, dimensions	see chapter "Installation"	
Weights	with cable length 7 m (22.97 ft): 0.7 kg (1.5 lb.) with cable length 15 m (49.22 ft): 1.1 kg (2.4 lb.) with TOP68 plug-in connection: 0.3 kg (0.7 lb.)	
Materials	Sensor shaft: Membrane cap: Cathode: Anode:	stainless steel1.4571, AISI 316Ti POM Silver Silver / Silver bromide
Process connections	G1	
Cable entry (sensor)	Fixed cable or TOP68 plug-in connection	
Cable entry (transmitter)	<ul style="list-style-type: none"> ■ SXP plug (field device) ■ Terminal connection (panel mounted device) 	
Cable length incl. extension cable	max. 100 m / 328.1 ft (including cable extension)	
Temperature compensation	NTC temperature sensor 30 kΩ at 25 °C (77 °F), 0 ... 50 °C (32 ... 122 °F)	
Membrane thickness	approx. 25 μm	

Index

A

Accessories	
Baffle plate	23
For cleaning	23
For connection	23
For installation	23
Measurement, controlling and cleaning	23
Membrane protection basket	23
Amperometric principle	15
Angle of installation	8

B

Baffle plate	23
--------------	----

C

Cable connection	28
Cable length	28
Calibration	19
Calculating the calibration value	16
General	15
In air	16
Checking	
Connection	13
Function	18
Installation	11
Cleaning	
Gold cathode	21
Sensor	20
Commissioning	4, 18

D

Designated use	4
Dimensions	7
Disposal	26
Drift	27

E

Electrical connection	
Direct connection	12
Via junction box	13
Environment	27
Errors	24

F

Flow assembly	23
Flow operation	10

I

Icons	5
Incoming acceptance	7
Input	27
Installation	4, 7–8
Angle of	8
Check	11
Examples	10
Flow operation	10
Measuring point	9
Place	8
Retractable assembly	11

M

Maintenance	20
Measuring point	9
Measuring principle	15
Measuring system	8
Mechanical construction	28
Membrane	15
Membrane protection basket	23

O

Operation	4
Operational safety	4
Ordering information	6

P

Performance characteristics	27
Polarisation	15, 18
Process	27
Product structure	6

R

Regenerating	21
Replacing	
Electrolyte	21
Membrane cap	22
Sealing ring	21
Retractable assembly	11, 23
Return	4, 26

S

Safety icons	5
Scope of delivery	6
Sealing ring	21
Sensor	
Checks	25
Design	14
Dimensions	7
Regenerating	21
Spare parts	26
Storage	7
Storage temperature	27
Symbols	5

T	
Technical data	27
Environment	27
Input	27
Mechanical construction	28
Performance characteristics	27
Process	27
Transport	7
U	
Use	4
W	
Weight	28
Z	
Zero current	27

Declaration of contamination

Dear customer,

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

Type of device / sensor: _____ Serial no.: _____
Medium / concentration: _____ Temperature: _____ Pressure: _____
Cleaned with: _____ Conductivity: _____ Viscosity: _____

Warning hints for medium used (mark the appropriate hints)



radioactive



explosive



caustic



poisonous



harmful to health



biologically hazardous



inflammable



safe

Reason for return

Company data

Company: _____ _____	Contact person: _____ _____
Address: _____ _____	Department: _____ _____
	Phone: _____ _____
	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.

(Place, date)

(Company stamp and legally binding signature)

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