

Technical Information

Oxymax W COS31

Potentiostatic amperometric three-electrode sensor

Long-term stable sensor for water and wastewater applications



Application

The continuous measurement of the dissolved oxygen concentration is very important in many areas of water management:

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

Your benefits

- Maximum measurement accuracy:
 - Longterm-stable measurement thanks to potentiostatic amperometric three-electrode system
 - Long maintenance intervals
 - Intelligent sensor self monitoring
- Calibration to any transmitter or location and subsequent installation at measuring point (in digital mode with Liquisys M COM 223/253) as calibration data is stored in the sensor
- Membrane covered sensor, i.e.:
 - High O₂ selectivity
 - Minimum maintenance effort
 - Minimum calibration effort thanks to simple calibration in air

Function and system design

Measuring principle

The oxygen molecules diffused through the membrane are reduced to hydroxide ions (OH⁻) at the cathode. Silver is oxidized to silver ions (Ag⁺) at the anode (this forms a silver halogenide layer). A current flows due to the electron release at the cathode and the electron reception at the anode. Under constant conditions, this flow is proportional to the oxygen content of the medium. This current is converted in the transmitter and indicated on the display as an oxygen concentration in mg/l (ppm), as a saturation index in % SAT or as an oxygen partial pressure in hPa.

Potentiostatic amperometric three-electrode system

The high-impedance, current-free reference electrode plays an important role. The formation of a silver bromide or silver chloride coating on the anode uses up the bromide or chloride ions dissolved in the electrolyte. In the case of conventional membrane-covered sensors working with the two-electrode system, this causes an increase in signal drift.

This is not the case with the three-electrode system: The change in bromide or chloride concentration is registered by the reference electrode and an internal control circuit holds the working electrode potential constant. The advantages of this principle are significantly increased accuracy of the signal and considerably extended calibration intervals.

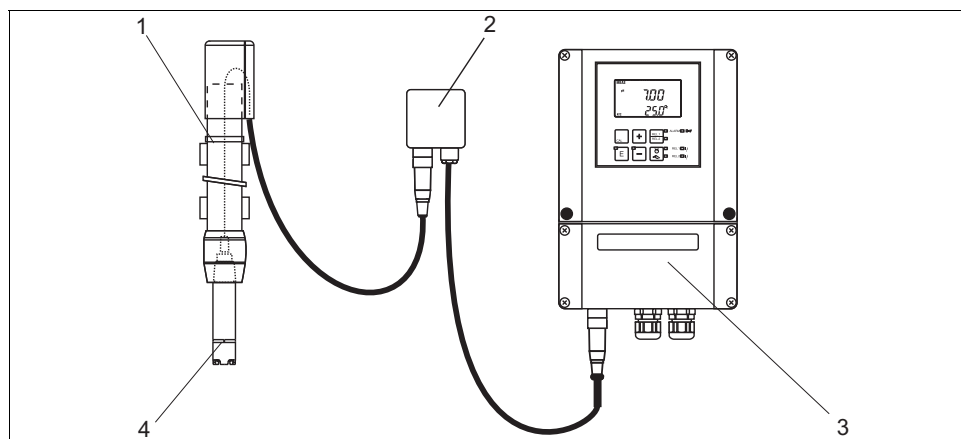
Measuring system

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 COA250, immersion assembly CYA611 or retractable assembly COA451

Optional:

- Universal suspension assembly support CYH101 for immersed operation
- Junction box VS (with cable extension)
- Automatic spray cleaning system Chemoclean



Measuring system (example)

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

Input

Measured variable Dissolved oxygen [mg/l, ppm, % SAT or hPa]

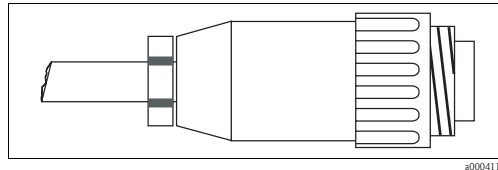
Measuring range With Liquisys M COM223/253-WX/WS:
 0.02 to 60.00 mg/l (0.02 to 60.00 ppm)
 0.00 to 600 % SAT
 0 to 1200 hPa (0 to 17.4 psi)

Wiring

Electrical connection

Direct connection to the transmitter (field device)

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



SXP plug

Direct connection to the transmitter (panel mounting device)

- Remove the SXP connector (transmitter side!) from the cable.
- Refer to the following table for the cable assignment and the assigned terminals for Liquisys M COM223-WX/WS.
- Please note that the cable assignment changes depending on the sensor version (fixed cable or TOP68 connection).

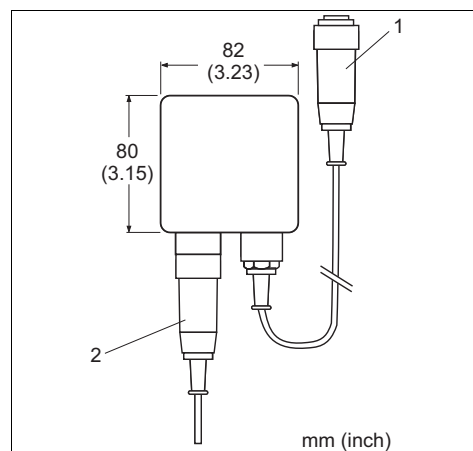
Terminal COM223	Sensor with fixed cable (OMK)		Sensor with TOP68 connection (CYK71)	
	Core	Assignment	Core	Assignment
87	YE	+U _B	YE	+U _B
0	GY	0 V	WH	0 V
96	PK	NTC (analog) or Com. (digital)	GN	Communication (digital)
97	BU	NTC (analog) or Com. (digital)	BN	Communication (digital)
88	BN	-U _B	Shield	-U _B
19	GN	Alarm		
18	WH	Sensor signal		

Connection with cable extension

To lengthen the sensor connection beyond the length of the fixed cable, a junction box VS is required.

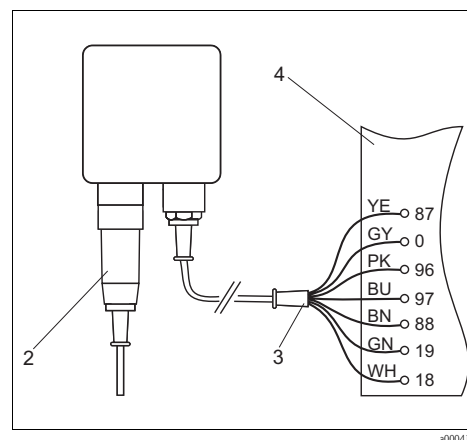
Always connect the sensor cable with the SXP plug to the junction box.

The cable extension to the transmitter then depends on the transmitter version, i.e. field device or panel mounted device.



Junction box VS to a field device

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



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

Performance characteristics

Response time

- COS31-XXX1 (membrane cap for normal response time):
 - T_{90} : 3 minutes
 - T_{99} : 9 minutes (each at 20°C / 68°F)
- COS31-XXX2 (membrane cap for fast response time):
 - T_{90} : 0.5 minutes
 - T_{99} : 1.5 minutes (each at 20°C / 68°F)

Reference operating conditions

Reference temperature: 25°C (77°F)
Reference pressure: 1013 hPa (15 psi)

Signal current in air¹⁾

- COS31-***1 (black membrane cap):
approx. 300 nA
- COS31-***2 (white membrane cap):
approx. 1100 nA

Zero current

Zero current free

Measured value resolution

0.01 mg/l (0.01 ppm)

Maximum measured error

±1 % of measured value²⁾

Long-term drift

With permanent polarization: < 1 % per month

Influence of medium pressure

Pressure compensation not necessary

1) For the reference operating conditions indicated
2) In accordance with IEC 746-1 at nominal operating conditions

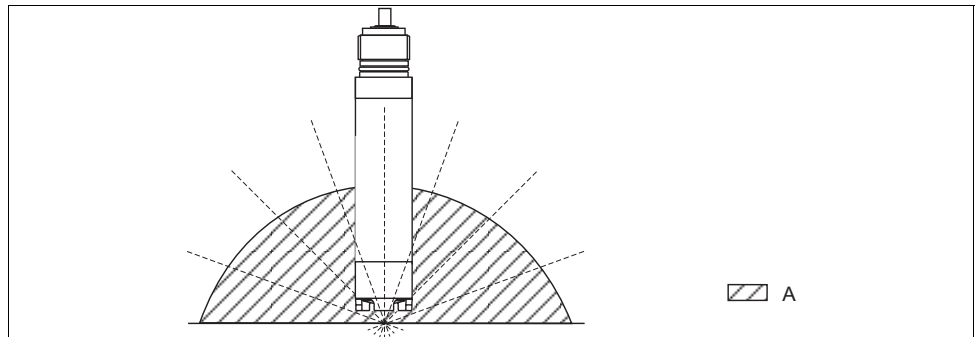
Polarization time < 60 minutes

Oxygen intrinsic consumption

- COS31-***1:
Approx. 90 ng/h in air at 25°C (77°F)
- COS31-***2:
Approx. 270 ng/h in air at 25°C (77°F)

Installation

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



Angle of installation

A Permissible installation positions: 0 to 180 °



Note!

Make sure you comply with the instructions for installing sensors, refer to the Operating Instructions for the assembly used.

Environment

Ambient temperature range -5 to 50°C (20 to 120°F)

Storage temperature filled with electrolyte: -5 to 50°C (20 to 120°F)
without electrolyte: -20 to 60°C (0 to 140°F)

Ingress protection

- Fixed cable versions:
IP 68 (10 m / 33 ft) water column at 25°C (77°F) for 30 days (similar to NEMA 6P)
- Top 68 plug-in head versions:
IP 68 (1 m / 3.3 ft) water column at 50°C (122°F) for 7 days (similar to NEMA 6P)

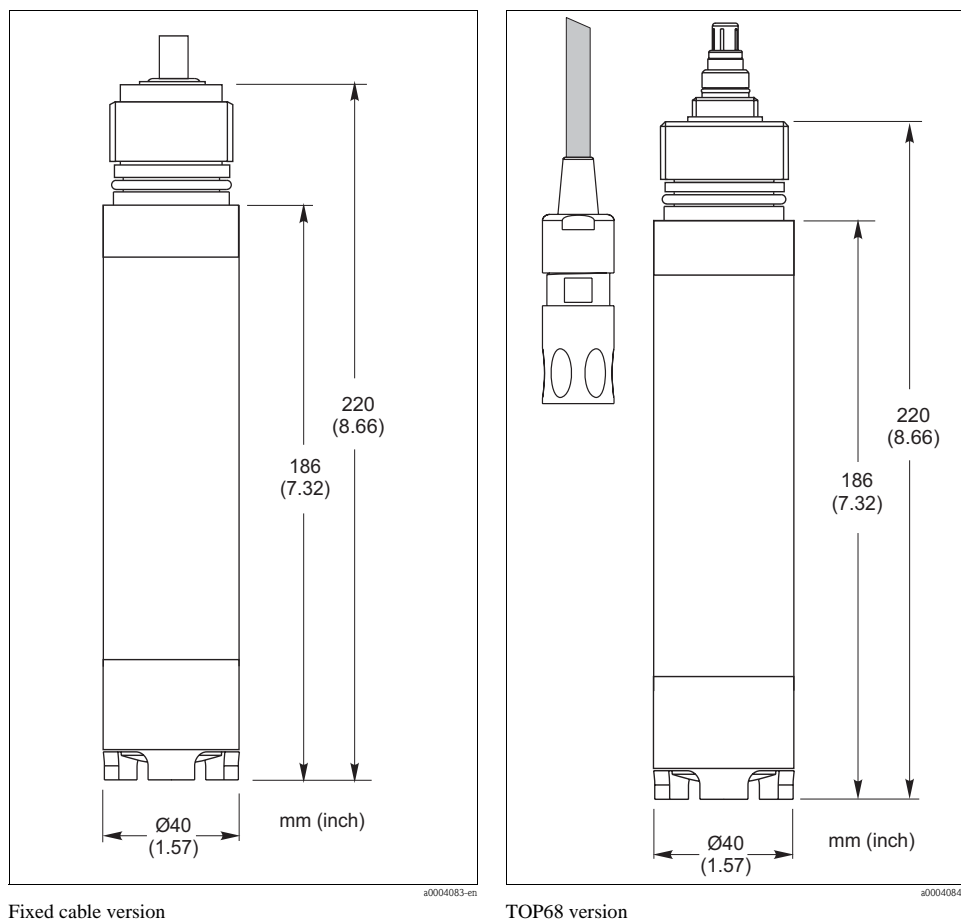
Process

Process temperature -5 to 50°C (20 to 120°F)

Process pressure max. 10 bar (145 psi) permissible overpressure
Vacuum operation is not permissible.

Mechanical construction

Design, dimensions



Weight	With cable length 7 m (23 ft): 0.7 kg (1.5 lbs.)
	With cable length 15 m (49 ft): 1.1 kg (2.4 lbs.)
	With TOP68 plug-in connection: 0.3 kg (0.66 lbs.)

Material	Sensor shaft:	stainless steel 1.4571, AISI 316Ti
	Membrane cap:	POM
	Cathode:	Gold
	Anode/Reference electrode:	Silver / Silver bromide

Process connection	G1 threaded
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Maximum cable length	max. 100 m / 328 ft (including cable extension)
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Membrane thickness	■ COS31-XXX1: approx. 50 µm
	■ COS31-XXX2: approx. 25 µm

Electrolyte	Alkaline electrolyte
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Ordering information

Product structure	Certificate		
	A	Non-hazardous areas	
	Cable length		
	0	Cable length: 1.5 m (4.9 ft)	
	2	Cable length: 7 m (23 ft)	
	4	Cable length: 15 m (49 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	
Membrane cap			
	1	COY31-WP membrane cap, minimum flow rate 5 mm/s (0.02 ft/s), for normal response time	
	2	COY31-S-WP membrane cap, minimum flow rate 25 mm/s (0.08 ft/s), for fast response time	
COS31- <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> Complete order code			

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 (on CD only)
- Brief Operating Instructions (paper version)

Accessories



Note!

In the following sections, you find the accessories available at the time of issue of this documentation. For information on accessories that are not listed here, please contact your responsible service.

Assemblies (selection)

Retractable assembly Cleanfit COA451

- Manually driven retractable assembly, stainless steel, with ball valve, for oxygen sensors;
- Ordering acc. to product structure (Technical Information TI368C/24/ae)

Flow assembly COA250

- For sensor installation in pipe lines, PVC
- Ordering acc. to product structure (Technical Information TI111C/24/ae)

Immersion assembly Dipfit W CYA611

- For sensor immersion in basins, open channels and tanks, PVC
- Ordering acc. to product structure (Technical Information TI166C/24/ae)

Zero solution

- 3 units to produce 3 x 1 liter oxygen-free solution
- Order no. 50001041

Measuring cable

COK31 special measuring cable

- For sensors COS31, COS61 and COS71 with TOP68 plug-in head
- Order numbers:
 - Cable length 1.5 m (4.9 ft): 51506820
 - Cable length 7 m (23 ft): 51506821
 - Cable length 15 m (49 ft): 51506822

Measuring cable OMK

- For use as extension cable between junction box VS and transmitter, not terminated
- Sold by the meter - order no. 50004124

Junction box

VS junction box

- With plug-in socket and 7-pole plug
- For cable extension from sensor (COS71, COS61, COS31, COS3 with SXP connector) to transmitter, IP 65 (similar to NEMA 4);
- Order no. 50001054

Transmitter

Liquisys M COM 223/253

- Transmitter for oxygen measurement
- Field or panel-mounted housing
- Hart® or Profibus available
- Ordering acc. to product structure, see Technical Information (TI 199C/24/ae)

USA	Canada	México	Instruments International
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