

# Measuring Dissolved Oxygen *OxyMax W COS 31*

## Potentiostatic amperometric three-electrode sensor



### Applications

Continuous measurement of the concentration of dissolved oxygen in water plays an important role in many areas of water engineering:

- Sewage treatment plants:  
O<sub>2</sub> measurement and regulation in the activated sludge basin to achieve high efficiency of the biological cleaning process
- Water supervision:  
O<sub>2</sub> measurement in rivers, lakes and seas as an indicator of water quality
- Water treatment:  
O<sub>2</sub> measurement e.g. in drinking water to verify the state (oxygen enrichment / corrosion prevention etc.)
- Fish farming:  
O<sub>2</sub> measurement and regulation to maintain optimum survival and growth conditions

### Features and benefits

- Broad compatibility with customary measuring transmitters on the market through automatic switch-over between digital and analogue mode
- Calibration to any measuring 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
- Minimum calibration effort due to simple air calibration.  
No zero calibration required.
- Due to disconnectable cable connection on sensor side (TOP 68 plug-in connector) easy to maintain.
- High adaptability due to simple upgrade from standard to high-speed response by simply replacing membrane cap
- High reliability against incorrect measurements through sensor self-monitor
- High long-term stability through potentiostatic-amperometric three-electrode system

Quality made by  
Endress+Hauser



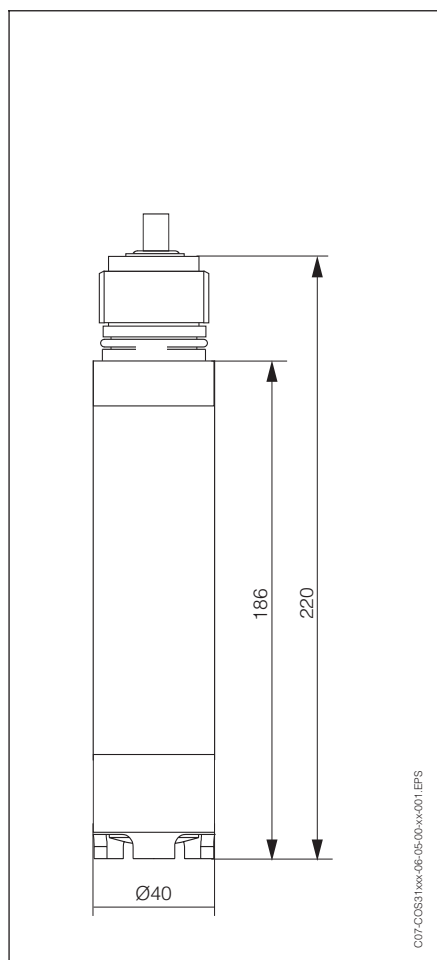
ISO 9001

## Endress+Hauser

The Power of Know How



## Dimensions and functional principle



Dimensions of COS 31

Oxygen occurs in the medium in the form of physically dissolved gas and conveyed to the membrane by the required flow. Due to the materials used and the production process, this means that only dissolved gases permeate through the membrane, and not the substances which occur in the liquid phase. Similarly, dissolved salts and ionic substances are retained. This is why the conductivity of the medium has no impact on the measuring signal when the sensor membrane is covered, as opposed to the open measuring principle.

The oxygen molecules diffused through the membrane are reduced to hydroxide ions ( $\text{OH}^-$ ) on the gold cathode. On the counterelectrode, silver is oxidised to silver ions ( $\text{Ag}^+$ , formation of a silver bromide layer,  $\text{AgBr}$ ). The associated release of electrons from the gold cathode and the acceptance of electronic at the counterelectrode result in a current flow which, under constant conditions, is proportional to the external concentration of oxygen in the medium. The current flow is converted in the measuring device and displayed on the LCD as the content of dissolved oxygen in mg/l, the oxygen saturation index in % SAT or the partial oxygen pressure in hPa.

## Sensor monitoring

As a protection against incorrect measurements, the membrane cap is permanently monitored for tightness. As soon as an operation-related leak occurs, an alarm is generated immediately. This means the membrane cap or the fill electrolyte can be replaced before an undesirable system state occurs.

A special sensor check system in the Liquisys M COM 223/253 transmitter detects other error states:

- implausibly high or low measured values
- disturbed controller caused by defective measured values
- Sensor passivation, i.e. no or very slow change in the measuring signal despite an external change in the oxygen content in the medium.

## Special technical features

- Optional fixed cable on sensor or TOP 68 plug-in connector
- Automatic adaptation of sensor transmitter data communication: analogue or digital depending on the transmitter used
- High EMC protection through digital communication with the Liquisys M COM 223/253
- Calibration data saved in the sensor in digital mode

- Upgradable any time from normal to high-speed response and vice versa
- No zero calibration required
- Extremely stable »elephant skin« membrane
- Easy to maintain: both the membrane cap and the electrolyte are preterminated

## Measuring system

The functional measuring system comprises:

- an oxygen sensor COS 31 and transmitter Liquisys M COM 223 / 253-WX/WS
- Immersion assembly DipFit W CYA 611, if necessary extended by a universal suspension assembly holder CYH 101-A, or flow assembly COA 250 or retractable assembly ProbFit W COA 461

- Associated installation accessories.

We recommend the following under extreme operating conditions:

- Automatic spray cleaning system Chemoclean.

# Technical data

## General data

Manufacturer	Endress+Hauser
Product designation	OxyMax W COS 31

## Mechanical data

Measuring principle	Potentiostatic-amperometric three-electrode sensor
Materials	Sensor body: stainless steel 1.4571 (SS 316Ti); Membrane cap.: POM
Membrane thickness	approx. 50 µm (COS 31-xxx1), approx. 25 µm (COS 31-xxx2)
Threaded connection	G 1
Electrical connection	- Screened 7-conductor special measuring cable (fixed cable) or - Double-screen coaxial cable with 4 pilot wires (on TOP 68 plug-in connector) SXP plug-in or snap-in terminal on transmitter
Cable lengths	1, 5 m / 7 m / 15 m / Special version on request
Max. total cable extension	100 m
Weight without packaging (for cable length)	0.7 kg (7 m) or 1.1 kg (15 m)

## Measuring range

Lower range limit	typ. 0.05 mg/l (COS 31-xxx1) typ. 0.02 mg/l (COS 31-xxx2)
Upper range limit	60 mg/l

## Operating data

Response time	t <sub>90</sub> : 3 min (COS 31-xxx1) t <sub>90</sub> : 0.5 min (COS 31-xxx2) each at 20 °C, 1013 hPa
Polarisation time	< 60 min
Min. flow velocity	typ. 0.5 cm/s for 95% measured variable display. (COS 31-xxx1) typ. 2.5 cm/s for 95% measured variable display. (COS 31-xxx2)
Sensor monitor	- Membrane rupture detector - in conjunction with Liquisys M COM 223/253-WS: Cable breakage or short-circuit, Incorrect measurement and sensor passivation
Drift	under continuous polarisation: < 1%/month
Zero current	zero-current-free

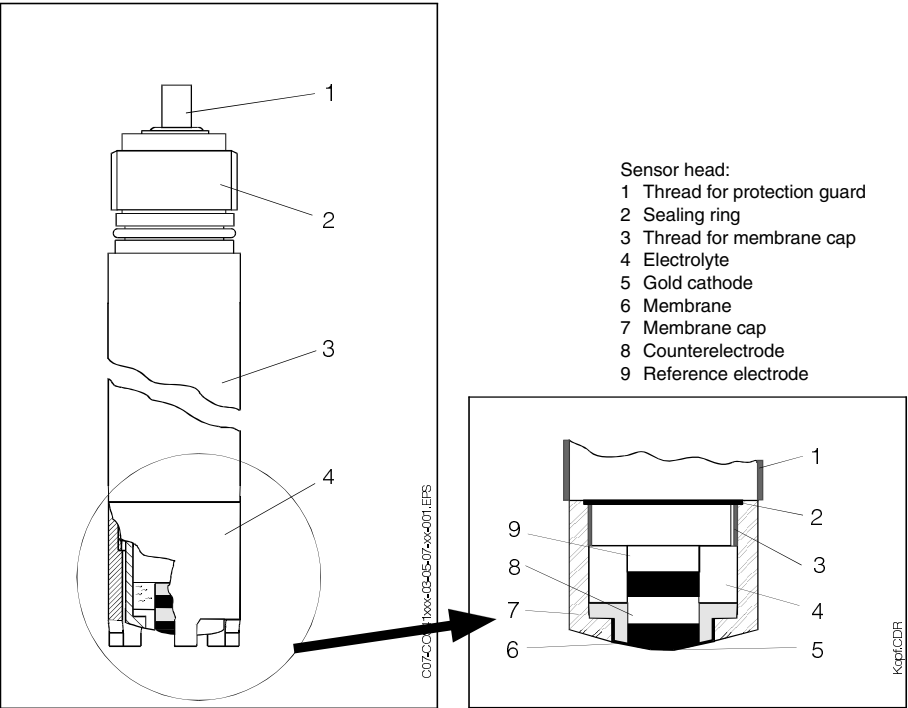
## Process conditions

Max. permissible overpressure	10 bar
Degree of protection	IP 68
Nominal operating temperature	-5 ... 50 °C
Storage temperature	filled: -5 ... 50 °C, unfilled: -20 ... 60 °C
Temperature compensation	with NTC temperature sensor, 0 ... 50 °C

Subject to modification.

# Design

- COS 31:
- 1 Sensor cable
  - 2 Thread G 1
  - 3 Sensor body
  - 4 Protection guard



# Product overview

Oxygen sensor COS 31				
<b>Certificate</b>				
A	variant for non-hazardous areas			
<b>Cable length</b>				
0	Cable length 1.5 m			
2	Cable length 7 m			
4	Cable length 15 m			
8	Without cable (only on TOP 68 version)			
9	Special version to customer requirements			
<b>Cable connection</b>				
F	Fixed cable connection			
S	Cable connection with TOP 68 connector (only on Liquisys M COM 223/253-WX/WS)			
<b>Membrane cap</b>				
1	Cap COY 31-WP, for normal response ( $t_{90}$ =3 min)			
2	Cap COY 31S-WP, for fast response ( $t_{90}$ = 0.5 min)			
<div><div>COS 31-</div><div></div><div></div><div></div><div></div></div> <div>Complete Order Code</div>				

## Accessories

- ☐ **COY 31-WP**  
2 preterminated spare replacement cartridges with pretensioned membrane (normal response)  
Order No.: 51506976
- ☐ **COY 31S-WP**  
2 preterminated spare replacement cartridges with pretensioned membrane (fast response) Order No.: 51506977
- ☐ **COY 3-F**  
Fill electrolyte for COS 31, 10 plastic ampoules, transparent  
Order No.: 50053349
- ☐ **COY 31-PF**  
polishing film (for gold cathode) 6 pcs, Order No.: 51506973
- ☐ **COY 31-OR**  
Sealing ring, 3 pcs  
Order No.: 51506985
- ☐ **Accessory set COY 31-Z**  
each 1x COY 3-F, COY 31-WP, COY 31-OR and COY 31-PF  
Order No.: 51506784
- ☐ **Accessory set COY 31-S-Z**  
each 1x COY 3-F, COY 31S-WP, COY 31-OR and COY 31-PF  
Order No.: 51506785
- ☐ Liquisys M COM 223 / 253-WX/WS  
Technical Information No. 51500281
- ☐ Immersion assembly DipFit W CYA 611  
Technical Information No. 50085985
- ☐ Suspension assembly holder CYH 101  
Technical Information No. 50061228
- ☐ Immersion assembly DipFit W COA 110  
Technical Information No. 50057221
- ☐ Flow assembly FlowFit W COA 250  
Technical Information No. 50068520
- ☐ Retractable assembly Probit W COA 461  
Technical Information No. 50082361
- ☐ Automatic cleaning system Chemoclean CYR 10 / CYR 20  
Technical Information No. 50014223

## Supplementary documentation

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