

# Technical Information

## Oxymax COS61D/COS61

Measurement of dissolved oxygen



Digital optical sensor based on the principle of fluorescence quenching, with or without Memosens protocol

### Application

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

### Your benefits

- Optical technology:
  - Minimum maintenance
  - Maximum availability
- Sensor with digital signal processing:
  - Calibration data saved in sensor
  - High degree of EMC protection thanks to digital communication with the transmitter
- Extended maintenance intervals and a high degree of longterm stability
- Intelligent self-monitoring guarantees reliable measured values
- No flow needed - measurement possible in still water
- COS61D - the Liquiline sensor
  - Plug&Play: Safe communication based on Memosens protocol
  - Optionally with M12 plug for fast connection to the transmitter
- COS61 - the Liquisys sensor
  - Compatible with tried-and-tested COS31 with COM2x3W: Easy measuring point changeover to optical technology
  - Compatible with COS41 with COM2x3D with conversion kit

## Function and system design

### Measuring principle

#### Sensor structure

Oxygen-sensitive molecules (markers) are integrated into an optically active layer (fluorescence layer).

The fluorescence layer, an optical insulating layer and a cover layer are applied on top of one another on a carrier. The cover layer is in direct contact with the medium.

The sensor optics are directed at the rear of the carrier and therefore at the fluorescence layer.

#### Measurement process (principle of quenching)

If the sensor is immersed in the medium, an equilibrium is very quickly established between the oxygen partial pressure in both the medium and the fluorescence layer.

1. The sensor optics send green light pulses to the fluorescence layer.
2. The markers "respond" (fluoresce) with red light pulses.
  - ↳ The duration and intensity of the response signals are directly dependent on the oxygen contents and oxygen partial pressure.

If the medium is free from oxygen, the response signals are long and very intense.

Oxygen molecules mask the marker molecules. As a result, the response signals are shorter and less intense.

#### Measurement result

- ▶ The sensor returns a signal that is proportional to the oxygen concentration in the medium.

The medium temperature and air pressure are already taken into account to calculate the oxygen concentration in the sensor.

The sensor provides measured values for temperature and partial pressure as well as a raw measured value. This value corresponds to the fluorescence decay time and is approx. 20  $\mu$ s in air and approx. 60  $\mu$ s in oxygen-free media.

#### For optimum measurement results

1. During calibration, enter the current air pressure at the transmitter.
2. In the case of saline media:  
Enter the salinity.
3. For measurements in the units %Vol or %SAT:  
Also enter the current operating pressure in the measuring mode.



- Operating Instructions for Memosens, BA01245C  
For all transmitters, analyzers and samplers in the Liquiline CM44x/P/R, Liquiline System CA80XX and Liquistation CSFxx product families
- Operating Instructions for Liquisys COM2x3, BA00199C

**Measuring system**

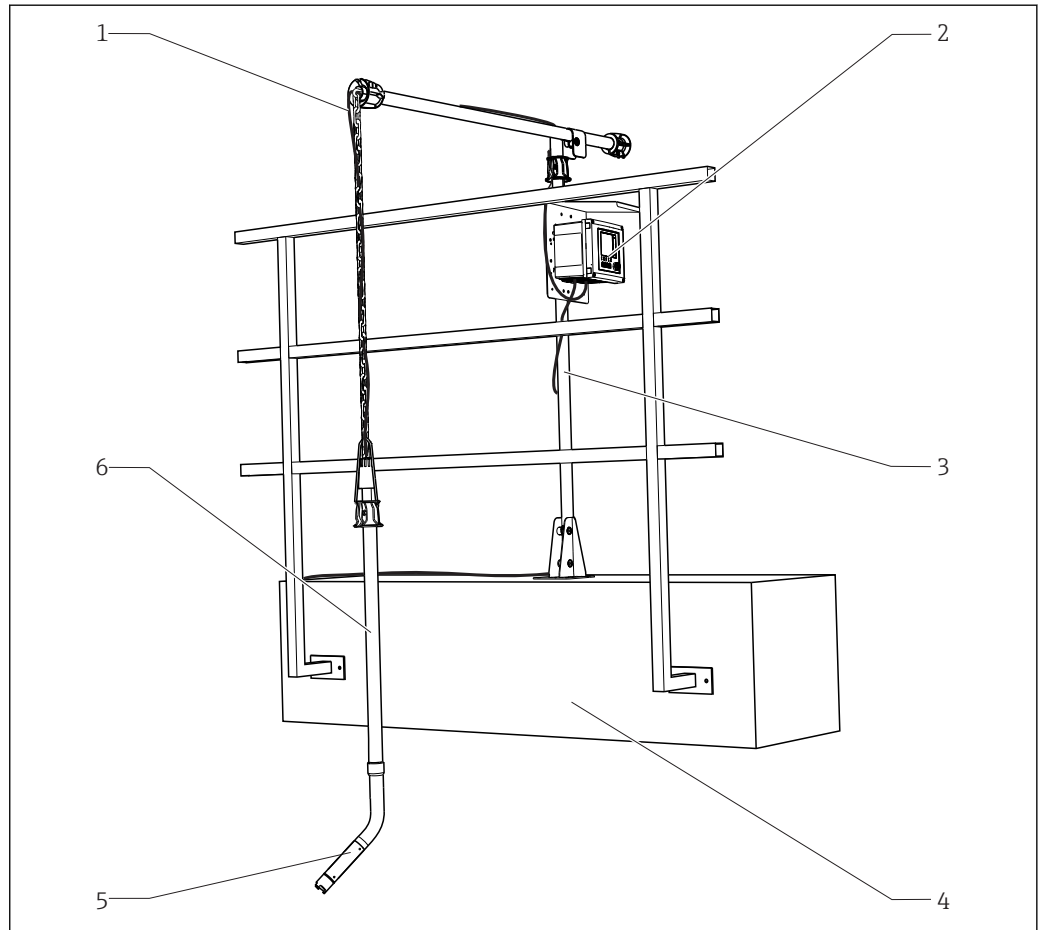
**COS61D**

A complete measuring system consists of the following components at least:

- Oxymax COS61D oxygen sensor
- Liquiline CM44x multi-channel transmitter
- Sensor cable, optionally available with M12 connector
- Assembly, e.g. flow assembly COA250, immersion assembly CYA112 or retractable assembly COA451

Optionally:

- Assembly holder Flexdip CYH112 for immersion operation
- Extension cable CYK11
- Cleaning system



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1 Example of a measuring system with COS61D

- |   |                 |   |                        |
|---|-----------------|---|------------------------|
| 1 | Sensor cable    | 4 | Basin rim with railing |
| 2 | Liquiline CM44x | 5 | Oxymax COS61D          |
| 3 | Flexdip CYH112  | 6 | Flexdip CYA112         |

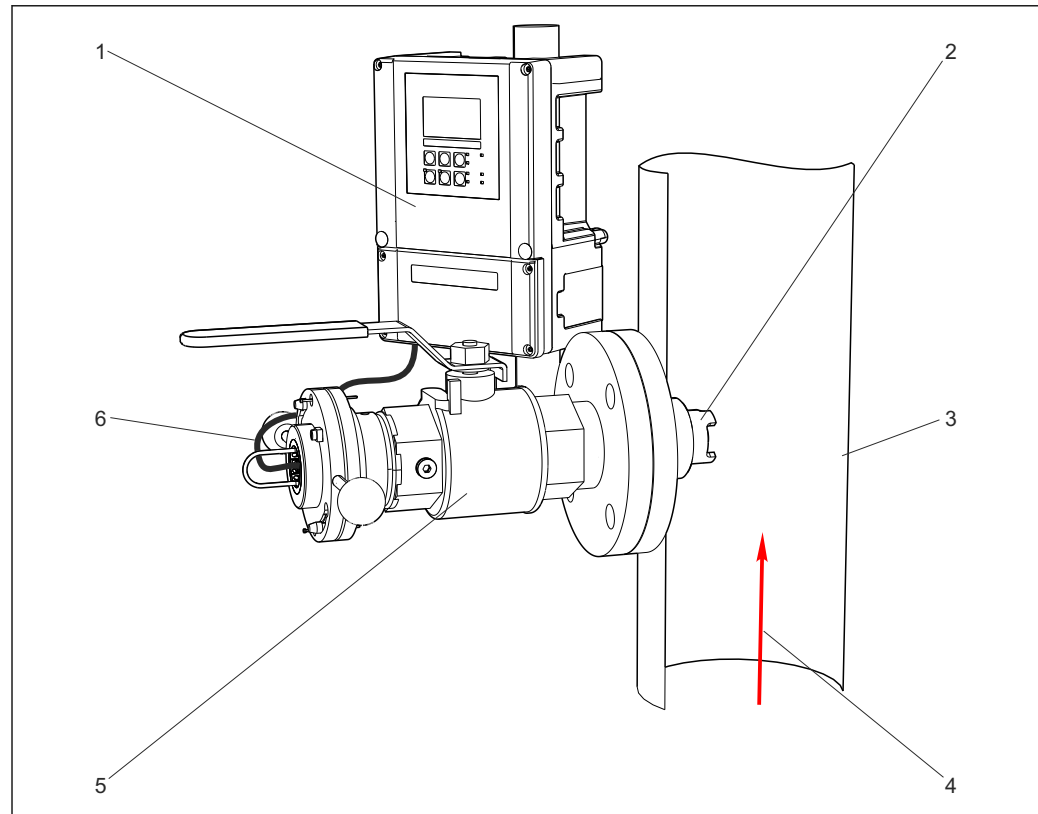
**COS61**

A complete measuring system comprises:

- Oxymax COS61 oxygen sensor
- Transmitter, e.g. Liquisys COM2x3-W
- Sensor cable
- Assembly, e.g. flow assembly COA250, immersion assembly CYA112 or retractable assembly COA451

Optionally:

- Flexdip CYH112 assembly holder for immersion operation
- VS junction box (for cable extension)
- Cleaning system



2 Example of a measuring system with COS61

1 Liquisys COM253

2 Oxymax COS61

3 Pipe (ascending pipe)

4 Direction of medium flow

5 Cleanfit COA451

6 Sensor cable

## Input

### Measured values

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

### Measuring ranges

Measuring ranges apply for 25 °C (77 °F) and 1013 hPa (15 psi)

With Liquiline CM44x, CM44xR, CM44P or with Liquisys COM2x3-W:

- 0 to 20 mg/l
- 0 to 400 hPa
- 0 to 200 % SAT

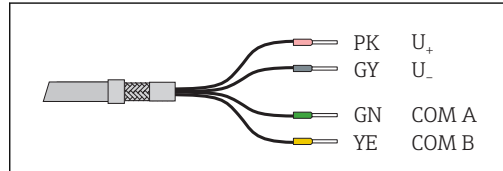
## Power supply

### Electrical connection

#### COS61D

##### Connection data

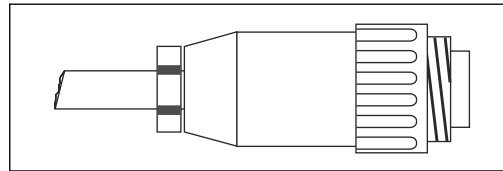
- Sensor cable connected directly to the terminal connector of the basic module
- Optional: sensor cable plug connected to the M12 sensor socket of the transmitter  
With this type of connection, the transmitter is already wired at the factory.



3 Sensor fixed cable with terminated cable cores

#### COS61 to field device

You connect the sensor directly to the transmitter via the special measuring cable with SXP connector.



4 SXP connector

#### COS61 to cabinet device

Terminal COM223	Sensor with fixed cable (OMK)		Sensor with TOP68 plug connection (CYK71)	
	Core	Assignment	Core	Assignment
87	YE	+U <sub>B</sub>	YE	+U <sub>B</sub>
0	GN	0 V	WH	0 V
96	PK	Communication (digital)	GN	Communication (digital)
97	BU	Communication (digital)	BN	Communication (digital)
88	BN	-U <sub>B</sub>	Coax, inside	-U <sub>B</sub>

1. Remove the SXP connector (transmitter side!) from the cable.
2. Refer to the table for the cable assignment and terminals of Lquisys COM223-WX/WS.
  - ↳ Please note that the cable assignment varies depending on the sensor version (fixed cable or TOP68 plug connection).

## Performance characteristics

### Response time

From air to nitrogen at reference operating conditions:  
t<sub>90</sub> : 60 s

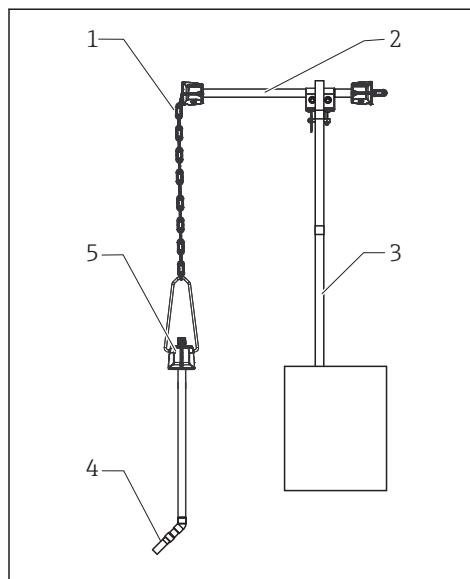
<b>Maximum measured error</b> <sup>1)</sup>	<b>COS61D</b>	<b>Measuring range</b>	<b>Maximum measured error</b>
		< 12 mg/l 12 mg/l to 20 mg/l	0.01 mg/l or $\pm 1$ % of reading $\pm 2$ % of reading
	<b>COS61</b>	<b>Measuring range</b>	<b>Maximum measured error</b>
		< 12 mg/l 12 mg/l to 20 mg/l	0.02 mg/l or $\pm 1$ % of reading $\pm 2$ % of reading
<b>Repeatability</b>	$\pm 0.5$ % of end of measuring range		
<b>Operating life of sensor cap</b>	>2 years (under reference operating conditions, protect against direct sunlight)		

## Installation

### Installation examples

#### Immersion operation

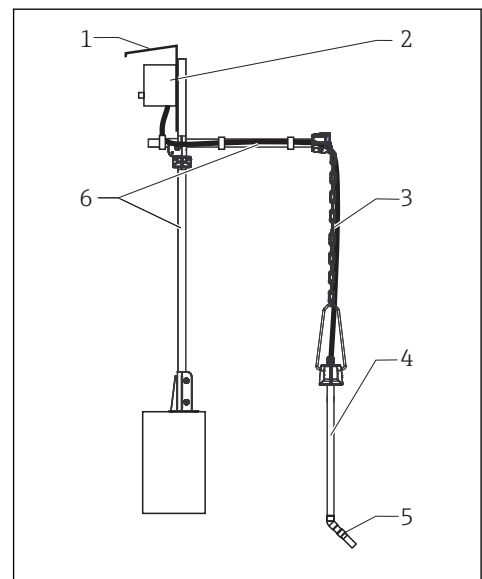
#### Universal holder and chain assembly



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5 Chain holder on railing

- 1 Chain
- 2 Holder Flexdip CYH112
- 3 Rail
- 4 Sensor Oxymax
- 5 Wastewater assembly Flexdip CYA112



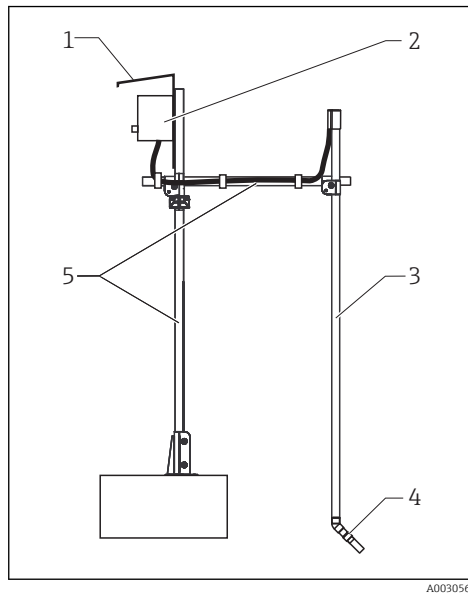
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6 Chain holder on upright post

- 1 Weather protection cover CYY101
- 2 Controller / transmitter
- 3 Chain
- 4 Wastewater assembly Flexdip CYA112
- 5 Sensor Oxymax
- 6 Holder Flexdip CYH112

1) In accordance with IEC 60746-1 at rated operating conditions

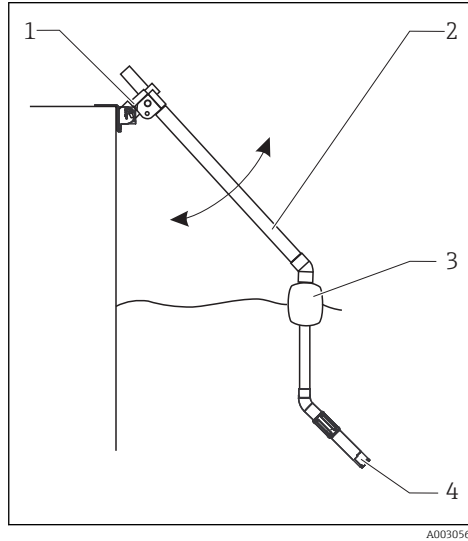
### Universal holder and fixed immersion tube



7 Assembly holder with immersion tube

- 1 Protective cover
- 2 Controller / transmitter
- 3 Flexdip CYA112 immersion assembly
- 4 Sensor Oxymax
- 5 Assembly holder Flexdip CYH112

### Basin rim mounting with immersion tube

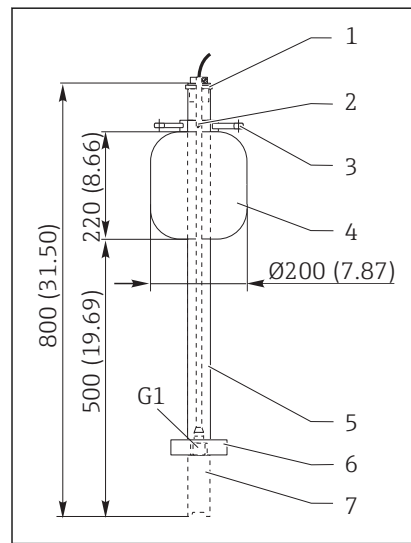


8 Basin rim mounting

- 1 Pendulum holder CYH112
- 2 Assembly Flexdip CYA112
- 3 Assembly float
- 4 Sensor Oxymax

### Float

The CYA112 float is for use in the case of large fluctuations in water level, for example in rivers or lakes.

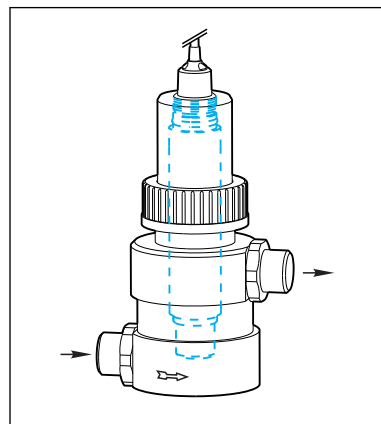


- 1 Cable run with strain relief and rain shield
- 2 Fixing ring for rope and chains with terminal screw
- 3 Eyelets Ø15, 3 x 120 ° for anchoring
- 4 Plastic float, resistant to salt water
- 5 Pipe 40 x 1, stainless steel 1.4571
- 6 Bumper and ballast
- 7 Oxygen sensor

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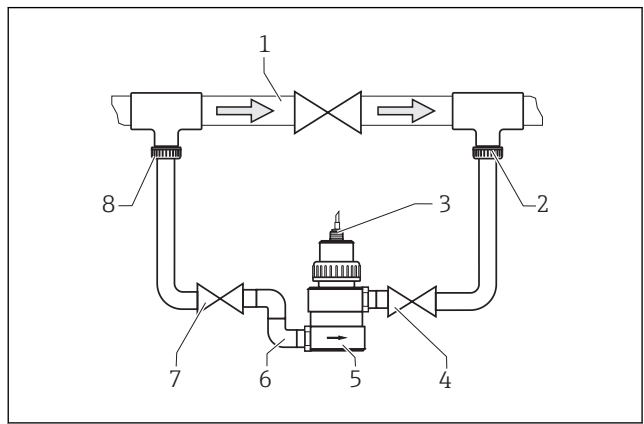
9 Dimensions in mm (inch)

### Flow assembly COA250



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10 COA250



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11 Bypass installation with manually actuated valves or solenoid valves

- 1 Main pipe
- 2 Medium return
- 3 Oxygen sensor
- 4, 7 Manually actuated or solenoid valves
- 5 Flow assembly COA250-A
- 6 90 ° pipe elbow
- 8 Medium removal

## Environment

Ambient temperature -20 to 60 °C (-4 to 140 °F)

Storage temperature -20 to 70 °C (-4 to 158 °F)  
at 95% relative air humidity, not condensating

Degree of protection **COS61D**  
IP 68 (test conditions: 10 m (33 ft) water column, at 25 °C (77 °F) over 30 days)

**COS61**

- Fixed cable versions:  
IP 68 (test conditions: 10 m (33 ft) water column at 25 °C (77 °F) over 30 days)
- Top68 plug-in head versions:  
IP 68 (test conditions: 1 m (3.3 ft) water column at 50 °C (122 °F) over 7 days)

**Electromagnetic compatibility**

**COS61D**

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

**COS61**

Interference emission and interference immunity as per EN 61326: 1997 / A1: 1998

**Process**

**Process temperature**

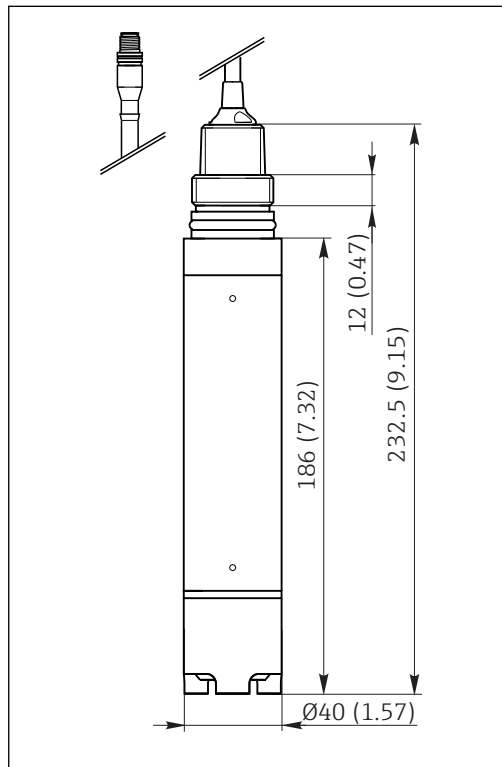
-5 to +60 °C (20 to 140 °F)

**Process pressure**

Ambient pressure ... 10 bar (... 145 psi) abs.

**Mechanical construction**

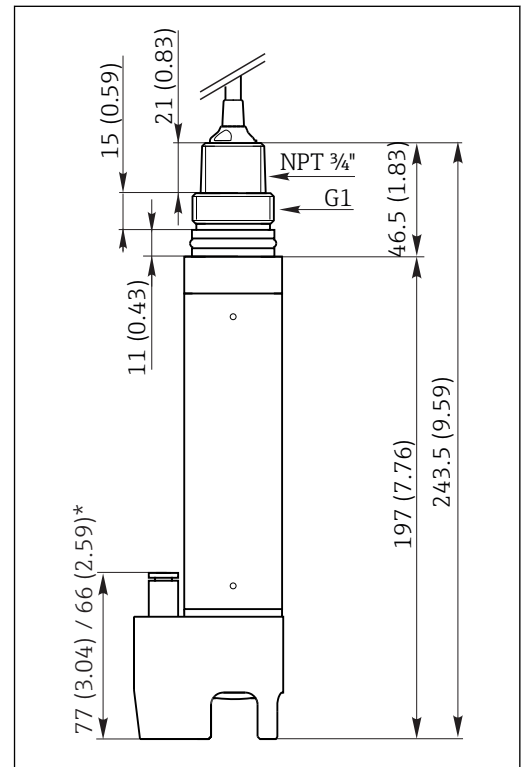
**Design, dimensions COS61D**



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12 With optional M12 connector

Dimensions in mm (inch)

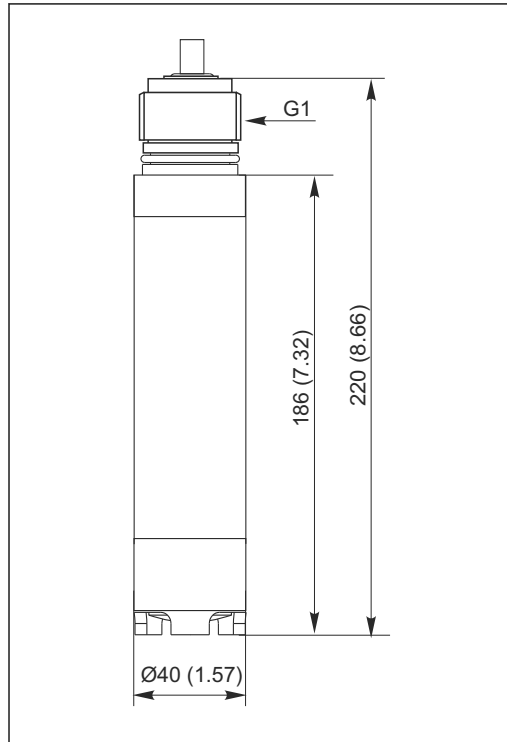


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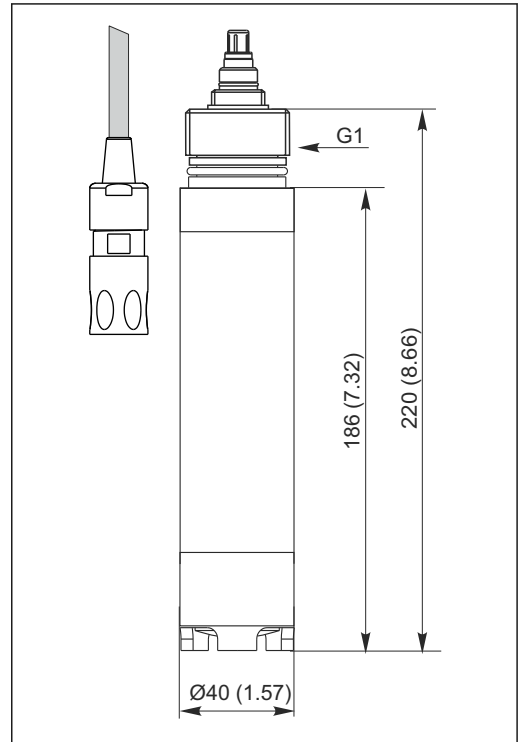
13 With optional cleaning unit

\* depending on version of cleaning unit

design, dimensions COS61



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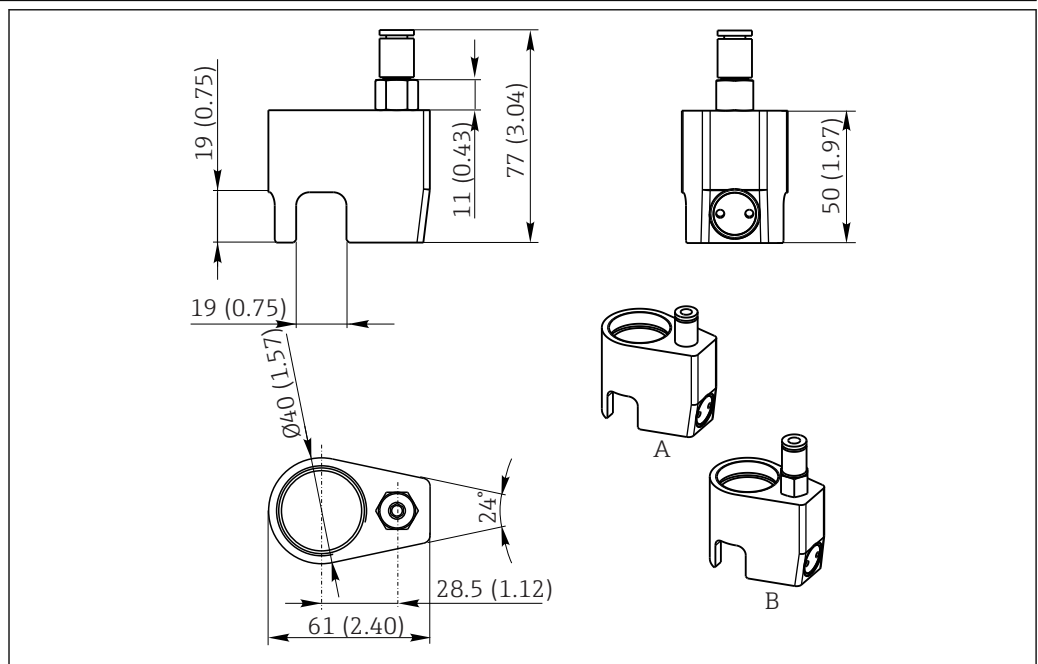


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14 Version with fixed cable  
Dimensions in mm (inch)

15 Version with TOP68 - plug-in head

Optional cleaning unit



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16 Dimensions in mm (inch)

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 connection:	0.3 kg (0.66 lbs) depending on version

Materials

Parts in contact with medium

Sensor shaft	Stainless steel 1.4435 (AISI 316L)
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Cap with fluorescence layer	POM
Fluorescence layer	Silicone

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<b>Process connection</b>	<b>COS61D</b> G1, NPT 3/4"
	<b>COS61</b> G1

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<b>Sensor cable</b>	<b>COS61D</b> Shielded 4-core fixed cable
	<b>COS61</b> Shielded 7-wire fixed cable or double-shielded coaxial cable with 4 pilot wires (with TOP68 plug connection)

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<b>Cable connection at transmitter</b>	<b>COS61D</b> <ul style="list-style-type: none"> <li>▪ Terminal connection, end ferrules</li> <li>▪ Optional: M12 connector</li> </ul>
	<b>COS61</b> <ul style="list-style-type: none"> <li>▪ SXP connector (field device)</li> <li>▪ Terminal connection (panel-mounted instrument)</li> </ul>

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<b>Maximum cable length</b>	max. 100 m (330 ft), incl. Cable extension
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<b>Temperature compensation</b>	Internal
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<b>Interface</b>	<b>COS61D</b> Memosens protocol <b>COS61</b> RS 485
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## Ordering information

<b>Product page</b>	<a href="http://www.endress.com/cos61">www.endress.com/cos61</a> <a href="http://www.endress.com/cos61d">www.endress.com/cos61d</a>
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<b>Product Configurator</b>	<p>On the product page there is a <b>Configure</b> button to the right of the product image.</p> <ol style="list-style-type: none"> <li>1. Click this button.           <ul style="list-style-type: none"> <li>↳ The Configurator opens in a separate window.</li> </ul> </li> <li>2. Select all the options to configure the device in line with your requirements.           <ul style="list-style-type: none"> <li>↳ In this way, you receive a valid and complete order code for the device.</li> </ul> </li> <li>3. Export the order code as a PDF or Excel file. To do so, click the appropriate button on the right above the selection window.</li> </ol> <p> For many products you also have the option of downloading CAD or 2D drawings of the selected product version. Click the <b>CAD</b> tab for this and select the desired file type using picklists.</p>
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<b>Scope of delivery</b>	<b>Scope of delivery of sensor</b> <ul style="list-style-type: none"> <li>▪ Oxygen sensor with protection cap or mounted cleaning system (optional)</li> <li>▪ Brief Operating Instructions</li> </ul>
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## Accessories

The following are the most important accessories available at the time this documentation was issued.

- ▶ For accessories not listed here, please contact your Service or Sales Center.

<b>Assemblies (selection)</b>	<p><b>FlexdipCYA112</b></p> <ul style="list-style-type: none"> <li>▪ Immersion assembly for water and wastewater</li> <li>▪ Modular assembly system for sensors in open basins, channels and tanks</li> <li>▪ Material: PVC or stainless steel</li> <li>▪ Product Configurator on the product page: <a href="http://www.endress.com/cya112">www.endress.com/cya112</a></li> </ul> <p> Technical Information TI00432C</p> <p><b>Flowfit COA250</b></p> <ul style="list-style-type: none"> <li>▪ Flow assembly for oxygen measurement</li> <li>▪ Product Configurator on the product page: <a href="http://www.endress.com/coa250">www.endress.com/coa250</a></li> </ul> <p> Technical Information TI00111C</p> <p><b>Cleanfit COA451</b></p> <ul style="list-style-type: none"> <li>▪ Manual retractable assembly made of stainless steel with ball valve shutoff</li> <li>▪ For oxygen sensors</li> <li>▪ Product Configurator on the product page: <a href="http://www.endress.com/coa451">www.endress.com/coa451</a></li> </ul> <p> Technical Information TI00368C</p>
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<b>Assembly holder</b>	<p><b>Flexdip CYH112</b></p> <ul style="list-style-type: none"> <li>■ Modular holder system for sensors and assemblies in open basins, channels and tanks</li> <li>■ For Flexdip CYA112 water and wastewater assemblies</li> <li>■ Can be affixed anywhere: on the ground, on the capstone, on the wall or directly onto railings.</li> <li>■ Stainless steel version</li> <li>■ Product Configurator on the product page: <a href="http://www.endress.com/cyh112">www.endress.com/cyh112</a></li> </ul> <p> Technical Information TI00430C</p>
<b>Measuring cable</b>	<p><b>Memosens data cable CYK11</b></p> <ul style="list-style-type: none"> <li>■ Extension cable for digital sensors with Memosens protocol</li> <li>■ Product Configurator on the product page: <a href="http://www.endress.com/cyk11">www.endress.com/cyk11</a></li> </ul> <p> Technical Information TI00118C</p>
<b>Zero-point gel</b>	<p><b>COY8</b></p> <p>Zero-point gel for oxygen and chlorine sensors</p> <ul style="list-style-type: none"> <li>■ Oxygen-free gel for the validation, calibration and adjustment of oxygen measuring cells</li> <li>■ Product Configurator on the product page: <a href="http://www.endress.com/coy8">www.endress.com/coy8</a></li> </ul> <p> Technical Information TI01244C</p>
<b>Junction box (COS61 only)</b>	<p><b>VS</b></p> <ul style="list-style-type: none"> <li>■ Junction box for cable extension of COS61 sensor with SXP plug-in connector</li> <li>■ With socket and 7-pin connector</li> <li>■ Degree of protection: IP 65</li> <li>■ Order number: 50001054</li> </ul>
<b>Protection guard</b>	<p><b>Membrane basket protector COY3-SK</b></p> <ul style="list-style-type: none"> <li>■ For using the sensor in fish farming tanks</li> <li>■ Order No.: 50081787</li> </ul>
<b>Cleaning unit</b>	<p><b>Compressed air cleaning for COSXX</b></p> <ul style="list-style-type: none"> <li>■ Connection: AD 6/8 mm (incl. hose reducer coupling) or AD 6.35 mm (¼")</li> <li>■ Materials: POM/V4A</li> <li>■ Order No.             <ul style="list-style-type: none"> <li>– AD 6/8 mm: 71110801</li> <li>– AD 6.35 mm (¼"): 71110802</li> </ul> </li> </ul> <p><b>Compressor</b></p> <ul style="list-style-type: none"> <li>■ For compressed air cleaning</li> <li>■ Order No.             <ul style="list-style-type: none"> <li>– 230 V AC order no. 71072583</li> <li>– 115 V AC order no. 71194623</li> </ul> </li> </ul>
<b>Calibration vessel</b>	<p><b>Calibration vessel</b></p> <ul style="list-style-type: none"> <li>■ For COS61D/61</li> <li>■ Order No.: 51518599</li> </ul>

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[www.addresses.endress.com](http://www.addresses.endress.com)

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