Technical Information

**Oxymax COS61/ COS61D**

Dissolved oxygen measurement
Optical sensor acc. to the fluorescence quenching principle, with or without Memosens protocol

**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**

- 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 long-term 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 COM2×3W:
    - Easy measuring point changeover to optical technology
  - Compatible with COS41 with COM2×3D with conversion kit
Function and system design

Measuring principle

- Sensor design:
  - Oxygen-sensitive molecules (markers) are integrated in an optically active layer (fluorescence layer).
  - The surface of the fluorescence layer is in contact with the medium.
  - The sensor optics are directed at the underside of the fluorescence layer.
- There is an equilibrium between the oxygen partial pressure in the medium and that in the fluorescence layer:
  - If the sensor is immersed in the medium, the equilibrium is established very quickly.
- Measuring process:
  - The sensor optics send green light pulses to the fluorescence layer.
  - The markers "answer" (fluoresce) with red light pulses.
  - The duration and intensity of the response signals is directly dependent on the oxygen contents and the partial pressure.
  - If the medium is free from oxygen, the response signals are long and very intense.
  - Oxygen molecules quench the marker molecules. As a result, the response signals are shorter and less intense.
- Measurement result:
  - The sensor returns a signal that is in proportion to the oxygen concentration in the medium.
  - The medium temperature and air pressure are already taken into account calculated in the sensor.
  - In addition to the standard values of concentration, saturation index and partial pressure, the sensor also returns a raw measured value in $\mu$s. The value corresponds to the decay time of the fluorescence and is approx. 20 $\mu$s in air, and approx. 60 $\mu$s in media free from oxygen.

Sensor monitoring

- The optical signals are continuously monitored and analyzed for plausibility.
  If inconsistencies occur, an error message is output via the transmitter.
- Ageing of the sensor cap is detected. The transmitter first displays a warning for predictive maintenance and later generates an error message.
  In addition, the following fault conditions are detected in conjunction with the sensor check system of the transmitter:
  - Implausibly high or low measured values
  - Disturbed regulation due to incorrect measured values
A complete measuring system comprises:
- Oxygen sensor Oxymax COS61D
- Multi-channel transmitter Liquiline CM44x
- Sensor cable, optionally with M12 plug
- Assembly, e.g. COA250 flow assembly, CYA112 immersion assembly or COA451 retractable assembly

Optional:
- CYH112 assembly holder for immersion operation
- RM junction box (for cable extension)
- Cleaning system

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**Measuring system**

**COS61D**

![Diagram of measuring system]

1. Sensor cable
2. Transmitter Liquiline CM44x
3. Flexdip CYH112
4. Basin rim with rail
5. Oxygen sensor Oxymax COS61D
6. Flexdip CYA112
COS61

A complete measuring system comprises:

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

Optional:

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

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**Input**

<table>
<thead>
<tr>
<th>Measured variable</th>
<th>Dissolved oxygen [mg/l, % SAT, hPa]</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Temperature [°C, °F]</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Measuring range</th>
<th>With Liquisys COM 2x3-W or Liquiline CM44x:</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>0 to 20 mg/l (0 to 20 ppm)</td>
</tr>
<tr>
<td></td>
<td>0 to 200 % SAT</td>
</tr>
<tr>
<td></td>
<td>0 to 400 hPa</td>
</tr>
</tbody>
</table>
**Power supply**

### Electrical connection

**COS61D**

Connection methods

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

#### Sensor cable with terminated cable cores

**COS61 connected to field device**

Connect the sensor directly to the transmitter by using the special measuring cable with SXP plug.

#### SXP plug

**COS61 connected to 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 COM223-WX/WS.
- Please note that the cable assignment varies depending on the sensor version (fixed cable or TOP68 connection).

<table>
<thead>
<tr>
<th>Terminal COM223</th>
<th>Sensor with fixed cable (OMK)</th>
<th>Sensor with TOP68 connection (CYK71)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Core</td>
<td>Assignment</td>
<td>Core</td>
</tr>
<tr>
<td>87</td>
<td>YE</td>
<td>+Uₘ</td>
</tr>
<tr>
<td>0</td>
<td>GY</td>
<td>0 V</td>
</tr>
<tr>
<td>96</td>
<td>FK</td>
<td>Com. (digital)</td>
</tr>
<tr>
<td>97</td>
<td>BU</td>
<td>Com. (digital)</td>
</tr>
<tr>
<td>88</td>
<td>BN</td>
<td>–Uₘ</td>
</tr>
</tbody>
</table>
Installation conditions

Installation instructions

Retractable assembly COA451

Arrow 1 shows the flow direction.
The installation angle \( \alpha \) must not exceed 90°.
The recommended installation angle is 75°.
The optical windows of the sensor have to be aligned parallel to the flow direction \( (\alpha = 90°) \) or face the flow direction \( (\alpha < 90°) \).
For manual insertion/retraction of the assembly the medium pressure may not exceed 2 bar (29 psi).

Wastewater assembly CYA112

The arrow shows the flow direction.
The installation angle is 45° (recommended) or 90°.
If you use the sensor in open basins, install the sensor in a way no bubbles can build up around the optical windows.
If you use the sensor in strong aerated basins install the sensor in an installation angle of 90° to minimize the influence of bubbles.

Flow assembly COA250

The arrow on the assembly shows the flow direction.
## Environment

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Specification</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ambient temperature range</td>
<td>–20 to +60 °C (0 to 140 °F)</td>
</tr>
<tr>
<td>Storage temperature</td>
<td>–20 to +70 °C (0 to 160 °F) at 95% relative humidity, non condensing</td>
</tr>
</tbody>
</table>

### Ingress protection

**COS61D**
- Fixed cable with terminated cable cores:
  - IP 68 (test conditions: 10 m (33 ft) water column at 20 °C (68 °F) in 7 days)
- Fixed cable with M12 plug:
  - IP 68 (test conditions: 1 m (3.3 ft) water column, 3N KCl at 50 °C (122 °F) in 30 days)

**COS61**
- Fixed cable versions:
  - IP 68 (test conditions: 10 m (33 ft) water column at 25 °C (77 °F) in 30 days)
- Top 68 plug-in head versions:
  - IP 68 (test conditions: 1 m (3.3 ft) water column at 50 °C (122 °F) in 7 days)

## Process

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Specification</th>
</tr>
</thead>
<tbody>
<tr>
<td>Process temperature</td>
<td>–5 to 60 °C (20 to 140 °F)</td>
</tr>
<tr>
<td>Process pressure</td>
<td>max. 10 bar (145 psi) abs.</td>
</tr>
</tbody>
</table>

## Performance characteristics

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Specification</th>
</tr>
</thead>
<tbody>
<tr>
<td>Response time $t_{90}$</td>
<td>$t_{90}$: 60 s</td>
</tr>
</tbody>
</table>
| Maximum measured error$^1$ | **COS61D**
  - 0.01 mg/l or ±1 % of measured value (< 12 mg/l)
  - ±2 % of measured value (from 12 to 20 mg/l)
|                            | **COS61**
  - 0.02 mg/l or ±1 % of measured value (< 12 mg/l)
  - ±2 % of measured value (from 12 to 20 mg/l)
| Repeatability              | ±0.5 % of measuring range end |
| Life time of the sensor cap| >2 years [under reference operating conditions, protect against direct sun light] |

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$^1$ at 20 °C (68 °F)
Mechanical construction

Design, dimensions COS61D

Design, dimensions COS61

Fixed cable version

TOP68 version

* depending on cleaning unit version
Optional cleaning unit

**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.)

**Materials**

- Sensor shaft: stainless steel 1.4571 (AISI 316Ti)
- Cap with fluorescence layer: POM
- Fluorescence layer: Silicone

**Process connection**

- **COS61D**
  - G1, NPT 3/4"
- **COS61**
  - G1

**Sensor cable**

- **COS61D**
  - shielded 4-core fixed cable
- **COS61**
  - shielded 7-core fixed cable or double-shielded coaxial cable with 4 pilot wires (with TOP68 plug connection)

**Cable entry at transmitter**

- **COS61D**
  - Terminal connection
  - optional: M12 plug
- **COS61**
  - SXP plug (field device)
  - Terminal connection (panel mounted device)

**Cable specification**

- max. 100 m (330 ft, including cable extension)

**Temperature compensation**

- Internal

**Interface**

- **COS61D**
  - Memosens protocol
- **COS61**
  - RS 485
Certificates and approvals

EMC compatibility

COS61D

COS61

Ordering information

Product page
You can create a complete and valid order code by using the configurator on the internet product page.

Product page link:
www.products.endress.com/cos61
www.products.endress.com/cos61d

Product configurator
1. You can choose from the following options on the product page located on the right:

<table>
<thead>
<tr>
<th>Product page function</th>
</tr>
</thead>
<tbody>
<tr>
<td>Add to product list</td>
</tr>
<tr>
<td>Price &amp; order information</td>
</tr>
<tr>
<td>Compare this product</td>
</tr>
<tr>
<td>Configure this product</td>
</tr>
</tbody>
</table>

2. Click "Configure this product".
3. The configurator opens in a separate window. You can now configure your device and receive the complete order code that applies for the device.
4. Afterwards, export the order code as a PDF or Excel file. To do so, click the appropriate button at the top of the page.

Scope of delivery
The scope of delivery comprises:

- Oxygen sensor with transport protection cap or with mounted cleaning unit
- Operating Instructions, English

Accessories

Assemblies (selection)
Wastewater assembly Flexdip CYA112
- Modular assembly system for sensors in open basins, channels and tanks
- Versions in stainless steel or PVC
- Ordering per product structure (→ Online configurator, www.products.endress.com/cya112)
- Technical Information TI00432C/07/EN

Flow assembly COA250
- for sensor installation in pipe lines, PVC
- ordering acc. to product structure (Technical Information TI111C/07/en)

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)

Assembly holder
Holder system Flexdip CYH112 for water and wastewater assembly Flexdip CYA112
- Modular holder system for sensors and assemblies in open basins, channels and tanks
- The holder system CYH112 works for nearly any type of fixing – fixing on the floor, wall or directly on a rail.
- Material: stainless steel
- Ordering acc. to product structure (Technical Information TI430C/07/en)
### Measuring cable

**COS61D**
- CYK11 Memosens data cable
  - Extension cable for digital sensors with Memosens protocol
  - Ordering as per product structure (→ Online configurator, www.products.endress.com/cyk11)

**COS61**
- Measuring cable OMK
  - for use as extension cable between junction box VS and transmitter, not terminated
  - sold by the metre - order no. 50004124

### Junction box (COS61 only)

**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;
- Order no. 50001054

### Protection guard

**Membrane protection guard COY3-SK**
- for sensor use in fish ponds
- order no. 50081787

### Cleaning

**Pressurized air cleaning system for COSXX**
- Connection: 6/8 mm or 6.35 mm (¼”)
- Materials: POM/V4A
- Order numbers
  - 6/8 mm: 71110801
  - 6.35 mm (¼ʼ): 71110802

**Compressor**
- For cleaning system
- 230 V AC order number: 71072583
- 115 V AC order number: 71096199

**Chemoclean**
- Injector CYR10
- Ordering acc. to product structure
- Technical Information TI00046C/07/EN

**Chemoclean COR3**
- Spray head for sensor cleaning in immersion operation
- Material: PVC
- order no.: COR3-0

### Calibration vessel

- Calibration vessel
  - for COS61/61D
  - order no. 51518599