TI01558C/07/EN/02.25-00
71723747
2025-09-30

Technical Information
Memosens COS81E

Hygienic optical oxygen sensor with maximum measurement stability over multiple sterilization cycles



Digital with Memosens 2.0 technology

Application

Typical applications include:
- Oxygen control in fermenters, e.g. in the pharmaceutical or biotechnology sectors
- Quality control in the food industry
- Reliable monitoring of explosive atmospheres up to an O_2 volume concentration of ≥ 2%

With ATEX, IECEx, CSA C/US, NEPSI, Korea Ex, Japan Ex and INMETRO certificates for use in hazardous areas Zone 0, Zone 1 and Zone 2 in hazardous gas environments, and Zone 20, Zone 21 and Zone 22 in hazardous dust environments

With CSA C/US approval also in hazardous areas Class I Division 1 in hazardous gas environments, and Class II Division 1 in hazardous dust environments

Your benefits

- Accurate measurements with long-term stability and permanent self-monitoring
- Can be sterilized up to 140 °C (284 °F) and autoclavable
- Stainless steel 1.4435 (AISI 316L) meets the highest demands of the pharmaceutical industry
- IP68 protection
- EHEDG-certified sensor
- Complies with the applicable requirements of the ASME-BPE standard
- Available with a certificate of conformity for pharmaceutical requirements
- Available with inspection certificate EN 10204-3.1

Other advantages provided by Memosens technology

- Maximum process safety
- Data security thanks to digital data transmission
- Very easy to use as sensor data are saved in the sensor
- Predictive maintenance can be performed by recording sensor load data in the sensor

Endress+Hauser
People for Process Automation

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Function and system design

Measuring principle

Sensor structure

Oxygen-sensitive molecules (markers) are integrated into the optically active layer (luminescence layer).
The luminescence layer, an optical insulating layer and a cover layer are applied on top of one another on the 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 luminescence layer.

Measurement process (principle of luminescence quenching)

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

1. The sensor optics send orange light pulses to the luminescence layer
2. The markers "respond" (luminesce) with darkred light pulses.
   ↳ The decay time and intensity of the response signals are directly dependent on the oxygen content and oxygen partial pressure.

If the medium is free from oxygen, the decay time is long and the signal is very intense.

Any oxygen molecules present mask the marker molecules. As a result, the decay time is shorter and the signals are less intense.

Measurement result

► The sensor calculates the measurement result on the basis of the signal intensity and decay time using the Stern-Volmer equation.

The sensor provides measured values for temperature and partial pressure as well as a raw measured value. This value corresponds to the luminescence decay time and is approx. 14 µs in air and approx. 56 µs in oxygen-free media.

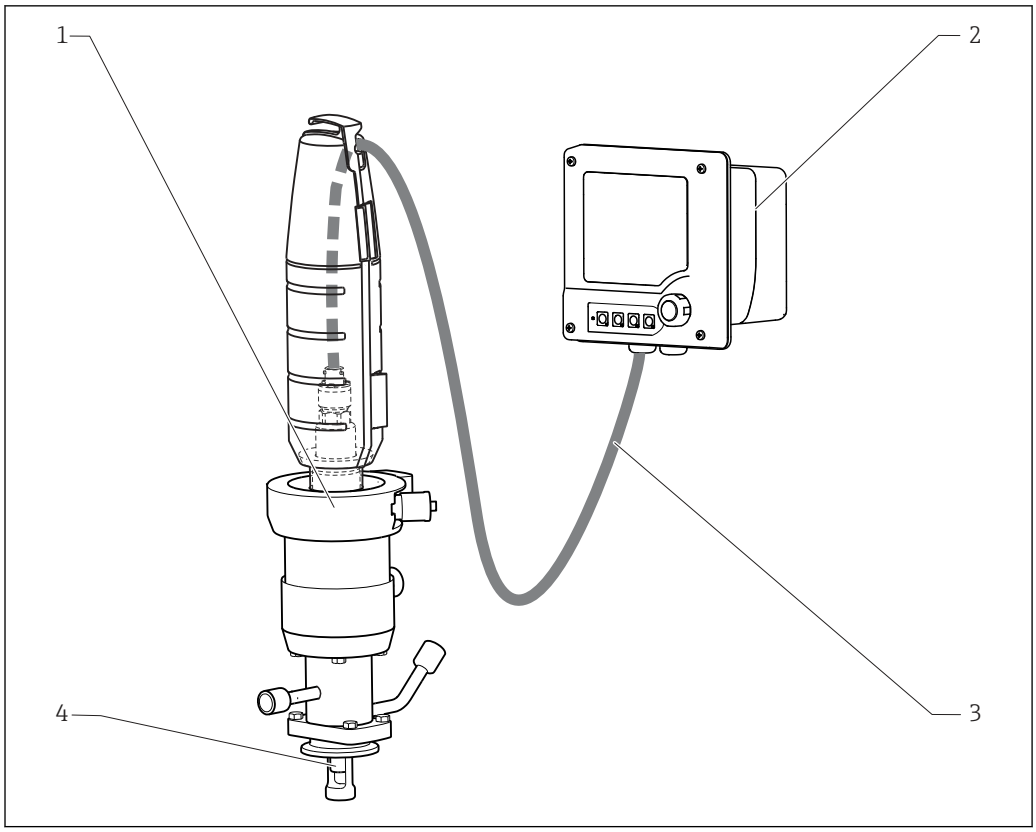
For optimum measurement results

1. During calibration, enter the current air pressure at the transmitter.
2. If the measurement is not performed at **Air 100% rh**:
   Enter the current humidity.
3. In the case of media with high salinity:
   Enter the salinity.
4. 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 Liquiline CM42, BA00381C and BA00382C

Measuring system

A complete measuring system comprises:
- a Memosens COS81E oxygen sensor
- a measuring cable e.g. CYK10
- a transmitter, e.g. Liquiline CM42, Liquiline CM44x/R, Liquiline CM44P, Liquiline Compact CM72/82, Liquiline Mobile CML18
- Optional: an assembly, e.g. permanent installation assembly Unifit CPA842, flow assembly Flowfit CYA21 or retractable assembly Cleanfit CPA875
- Optional: connection to an analog fermenter controller via Memosens analog converter CYM17



1 Example of a measuring system with Memosens COS81E

1 Retractable assembly Cleanfit CPA875
2 Liquiline CM42 transmitter
3 Measuring cable CYK10
4 Oxygen sensor Memosens COS81E

Dependability

Reliability

Memosens technology digitizes the measured values in the sensor and transmits the data to the transmitter via a . The result:
- If the sensor fails or there is an interruption in the connection between the sensor and transmitter, this is reliably detected and reported.
- The availability of the measuring point is reliably detected and reported.

Maintainability

Easy handling
Sensors with Memosens technology have integrated electronics that store calibration data and other information (e.g. total operating hours or operating hours under extreme measuring conditions). Once the sensor has been connected, the sensor data are transferred automatically to the transmitter and used to calculate the current measured value. As the calibration data are stored in the sensor, the sensor can be calibrated and adjusted independently of the measuring point. The result:
- Easy calibration in the measuring lab under optimum external conditions increases the quality of the calibration.
- Pre-calibrated sensors can be replaced quickly and easily, resulting in a dramatic increase in the availability of the measuring point.
- The availability of sensor data means that maintenance intervals can be accurately defined and predictive maintenance is possible.
- The sensor history can be documented with external storage media and evaluation programs.
- The application range of the sensor can be determined based on its previous history.

Integrity

With inductive transmission of the measured value using a non-contact connection, Memosens guarantees maximum process safety and offers the following benefits:
- All problems caused by moisture are eliminated.
  - Plug-in connection remains free from corrosion
  - Measured value distortion from moisture is not possible.
  - The plug-in system can even be connected under water.
- The transmitter is galvanically decoupled from the medium.
- EMC safety is guaranteed by screening measures for the digital transmission of measured values.

Input

Measured variables

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

Oxygen (gaseous) [hPa or %Vol]

Temperature [°C, °F]

Measuring ranges

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

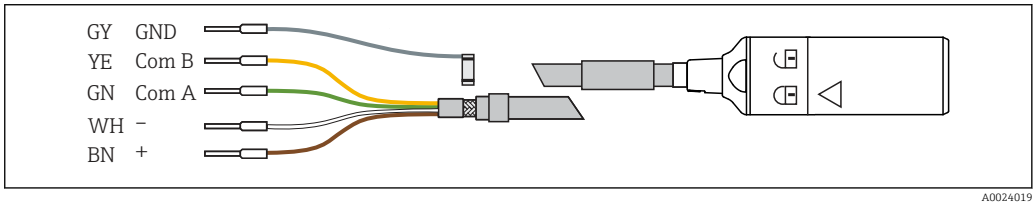
c-shaped	u-shaped
0.004 to 26 mg/l 0.05 to 285 % SAT 0.1 to 600 hPa	0.004 to 30 mg/l 0.05 to 330 % SAT 0.1 to 700 hPa

The sensor has a measuring range of up to max. 1000 hPa.

Power supply

Electrical connection

The electrical connection of the sensor to the transmitter is established using measuring cable CYK10.



2 *Measuring cable CYK10*

Performance characteristics

Response time [1)]

From air to nitrogen at reference operating conditions:
- t_{90} : < 10 s
- t_{98} : < 20 s

Reference operating conditions

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

1) Average of all sensors that have undergone a final inspection

Measurement error [2]	±1 % or ±8 µg/l (ppb)of the measured value (the higher value is relevant in each case) [3] The measurement errors indicated are reached in the optimum measuring range, but not over the entire measuring range.	
Limit of detection (LOD) [4]	COS81E	4 ppb
Limit of quantification (LOQ) [4]	COS81E	10ppb
Repeatability	2ppb	

Installation

Installation instructions

Must be installed in a suitable assembly (depending on the application).

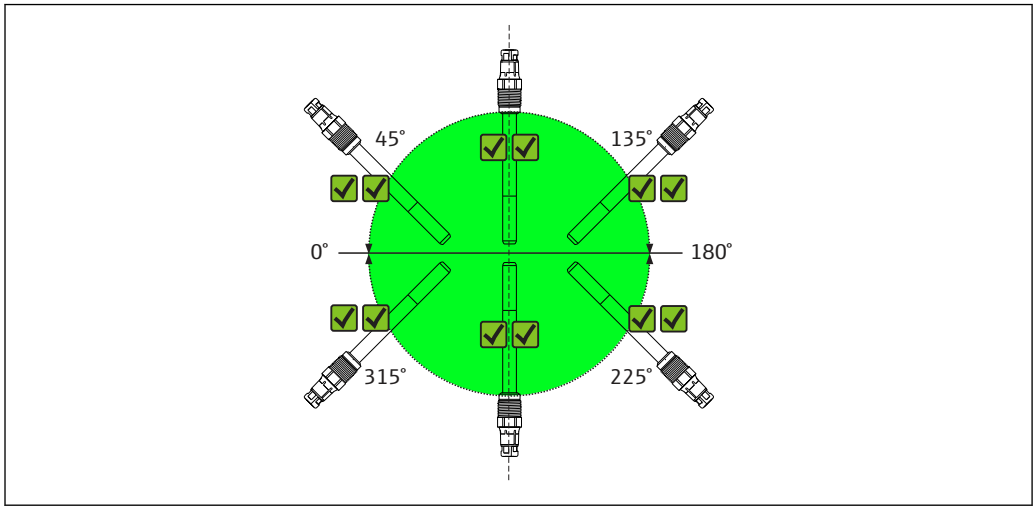
NOTICE

Installing the unit without an assembly carries the risk of cable breakage or sensor loss!

▶ Do not install the sensor freely suspended from the cable!

Orientation

COS81E-***C*** (c-shaped)**



*3 Installation angle for Memosens COS81E-*****C*** (c-shaped spot cap)*

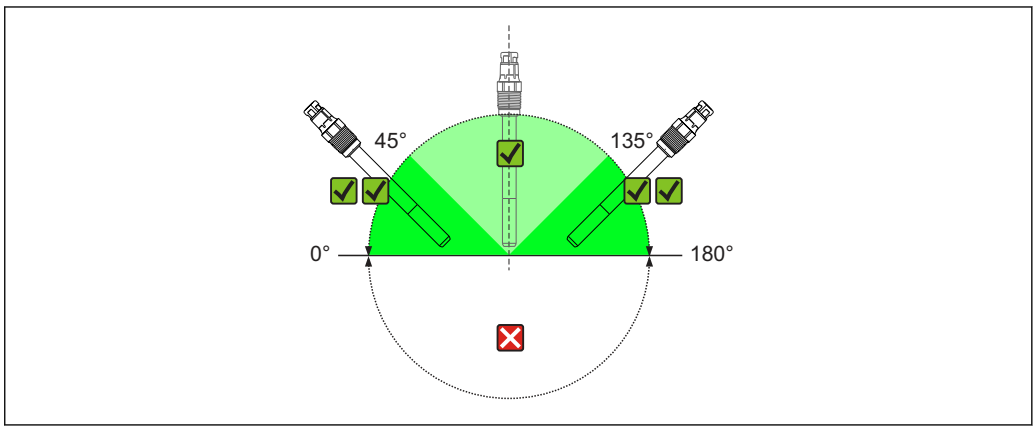
The sensor can be installed at any installation angle (0 to 360 °).

✓✓ *Recommended installation angle*

2) In accordance with IEC 60746-1 under rated operating conditions
3) In accordance with IEC 60746-1 at rated operating conditions
4) According to DIN EN ISO 15839. The measurement error contains all the uncertainties of the sensor and transmitter (measuring chain). It does not contain all the uncertainties caused by the reference material and adjustments that may have been performed.

The sensor with the c-shaped spot cap is self-draining in the recommended installation angles and can therefore be used for hygienic applications.

COS81E-***U*** (u-shaped)**



4 *Installation angle for Memosens COS81E-*****U*** (u-shaped spot cap)*

✓✓ *Recommended installation angle*

✓ *Possible installation angle*

✗ *Inadmissible installation angle*

The sensor with the u-shaped spot cap must be installed at an angle of inclination of 0 to 180 ° in an assembly, holder or a corresponding process connection. Recommended angle: 0 to 45° or 135 to 180 ° to prevent the attachment of air bubbles. At angles of inclination of 45 to 135°, air bubbles at the oxygen-sensitive membrane may increase the measured value.

Inclination angles other than those mentioned are not permitted. In order to avoid buildup and condensation on the spot, do **not** install the COS81E-*****U *** sensor upside down.

Follow the instructions for installing sensors in the Operating Instructions for the assembly used.

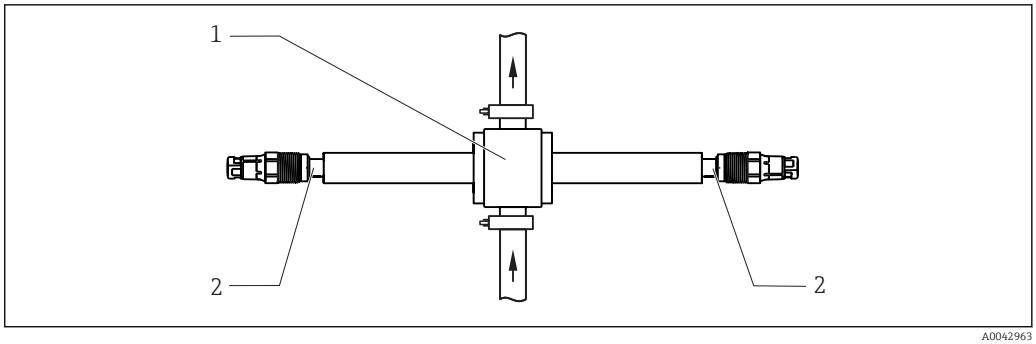
Installation examples

Permanent installation assembly Unifit CPA842

The permanent installation assembly CPA842 enables easy adaptation of a sensor to nearly any process connections from Ingold nozzles to Varivent or Tri-Clamp connections. This kind of installation is very well suited for tanks and larger pipes. This enables a defined immersion depth of the sensor into the medium in the simplest way.

Flow assembly CYA680

The flow assembly is available in various nominal diameters and materials. It can be installed both in horizontal and vertical pipes. The assembly can be operated with 1 or 2 sensors.

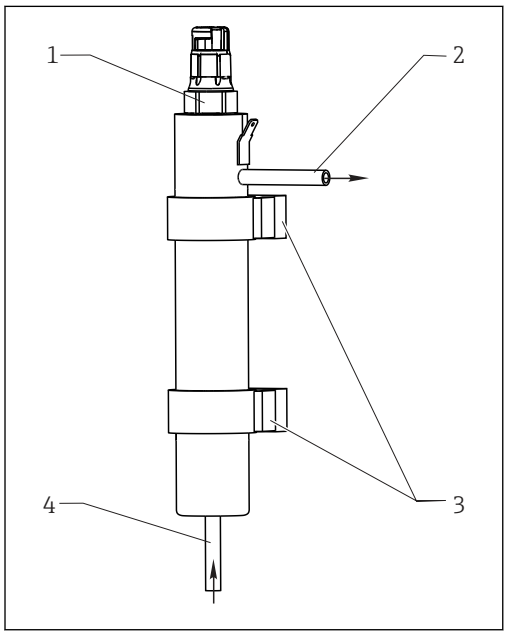


5 *Flow assembly CYA680*

1 *Flow chamber of assembly*
2 *Installed sensor Memosens COS81E*

Flow assembly Flowfit CYA21 for water treatment and processes

The compact stainless steel assembly offers space for a 12-mm sensor with a length of 120 mm. The assembly has a low sampling volume and, with the 6-mm connections, it is best suited for residual oxygen measurement in water treatments and boiler feedwater. The flow comes from below.



6 Flow assembly

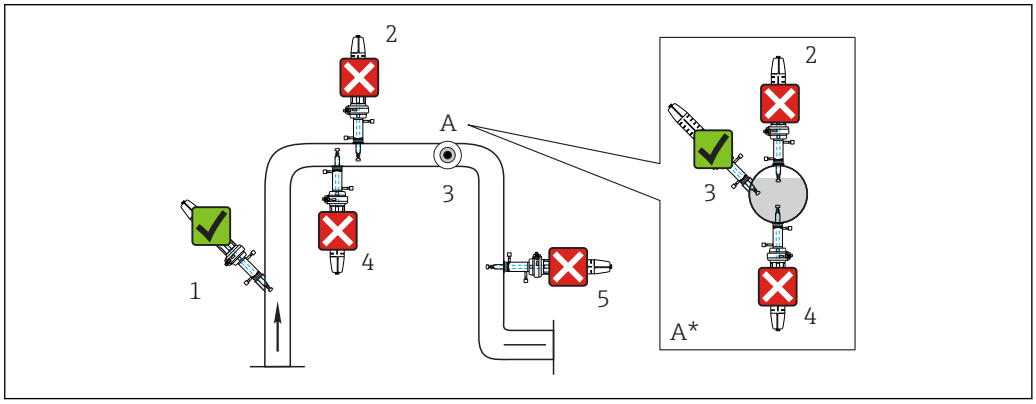
1 Installed sensor Memosens COS81E
2 Drain
3 Wall mount (clamp D29)
4 Inflow

Retractable assembly Cleanfit CPA875 or Cleanfit CPA450

The assembly is designed for installation on vessels and pipes. This requires the availability of suitable process connections.

Install the assembly in a place with uniform flow conditions. The pipe diameter must be at least DN 80.

Installation position for COS81E-****U*** (with u-shaped spot cap)



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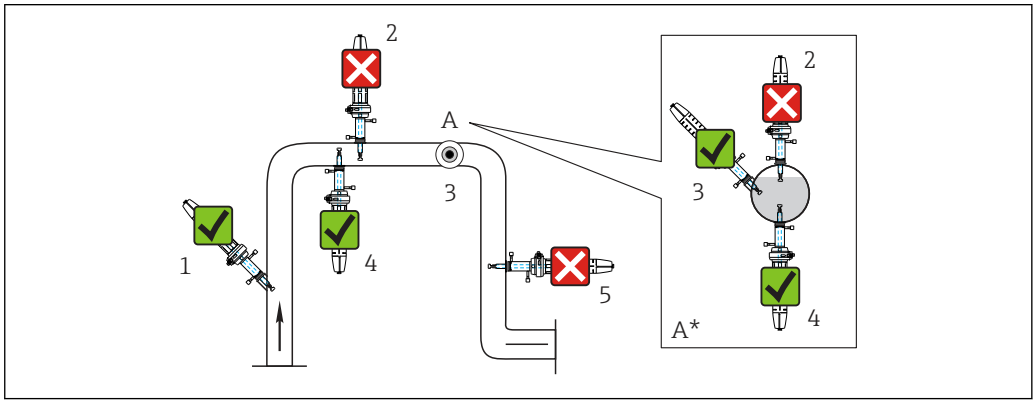
7 *Suitable and unsuitable installation positions for Memosens COS81E with u-shaped spot cap and retractable assembly*

1 Ascending pipe, best position
2 Horizontal pipe, sensor top down, impermissible due to air cushion or foam bubble forming
3 Horizontal pipe, lateral installation, with suitable installation angle
4 Upside-down installation, unsuitable
5 Down pipe, impermissible
A Detail A (top view)
A Detail A, turned by 90° (side view)*

✓ *Possible installation angle*

✗ *Inadmissible installation angle*

Installation position for COS81E-****C*** (with c-shaped spot cap)



A0042965

8 *Suitable and unsuitable installation positions for Memosens COS81E with c-shaped spot cap and retractable assembly*

1 Ascending pipe, best position
2 Horizontal pipe, sensor top down, impermissible due to air cushion or foam bubble forming
3 Horizontal pipe, lateral installation with permissible installation angle (acc. to sensor version)
4 Upside-down installation, only in conjunction with c-shaped spot cap
5 Down pipe, impermissible

✓ *Possible installation angle*

✗ *Inadmissible installation angle*

NOTICE

Sensor not fully immersed in the medium, buildup, upside-down installation
These can all cause incorrect measurements!
- ► Do not install assembly at points where air pockets or bubbles may form.
- ► Avoid buildup on the spot cap or remove it at regular intervals.
- ► Do not install sensor COS81E-****U (u-shaped) upside down.

Environment

Ambient temperature range	−5 to +100 °C (23 to 212 °F)
Storage temperature range	-25 to 50 °C (-13 to 122 °F) at 95% relative humidity, non-condensing
Degree of protection	IP68 (2 m (6.5 ft) water column, 21 °C (70 °F), 24 hours) IP69

Process

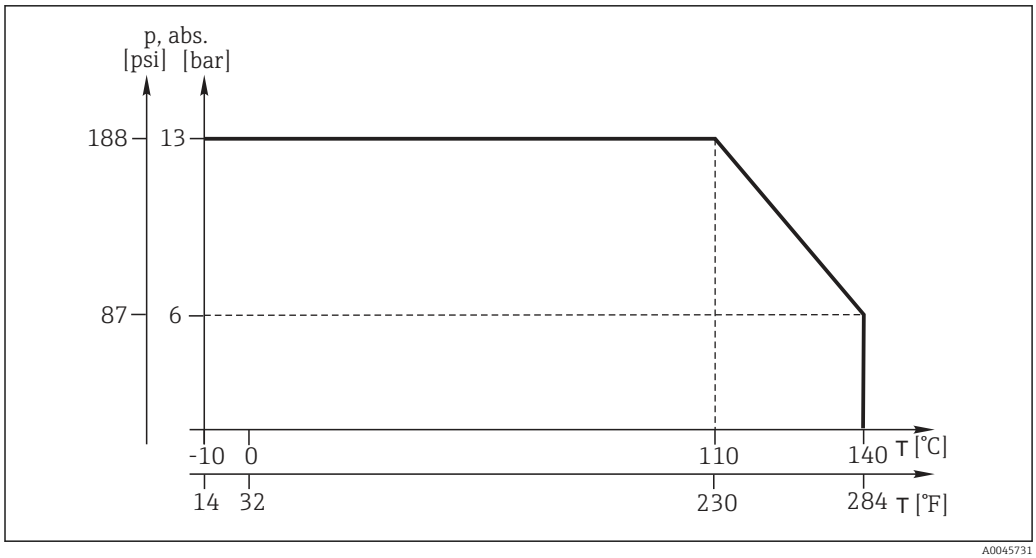
Process temperature range

Normal operation c-shaped:	0 to 60 °C (32 to 140 °F)
Normal operation u-shaped:	0 to 80 °C (32 to 175 °F)
Sterilization (max. 45 min.):	Max. 140 °C (284 °F) at 6 bar (87 psi)

Process pressure range

0.02 to 13 bar (0 to 190 psi) abs.

Temperature/pressure diagram



A0045731

Chemical resistance

NOTICE

Halogen-containing solvents, ketones and toluene

Halogen-containing solvents (dichloromethane, chloroform), ketones (e.g. acetone, pentanone) and toluene have a cross-sensitive effect and result in decreased measured values or, at worst, in the complete failure of the sensor!

▶ Use the sensor only in media that are free from halogens, ketones and toluene.

CIP compatibility

Yes

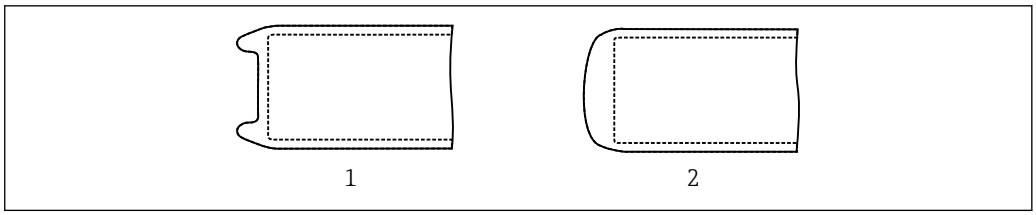
Autoclavability

Yes, max. 140 °C (284 °F)

Mechanical construction

Design

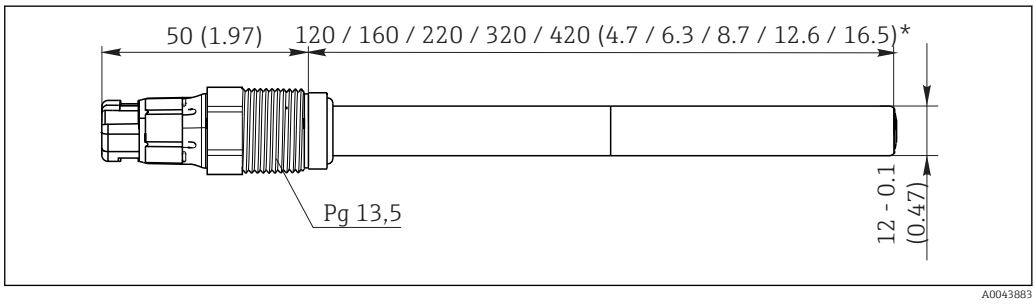
The sensor's spot cap can have either a c-shaped or u-shaped design.



9 Design of spot cap

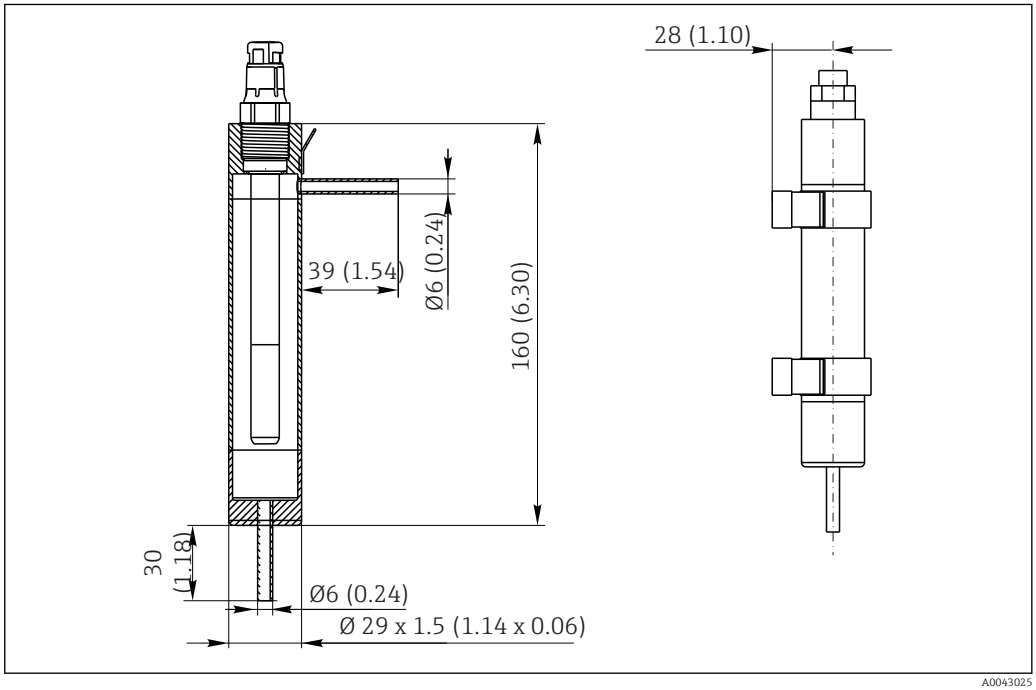
1 u-shaped
2 c-shaped

Dimensions



10 Dimensions in mm (inch)

Optional flow assembly CYA21 for sensors with Ø 12 mm (accessories)



11 Dimensions in mm (inch)

Weight

Depending on the design (length)
Example: 0.1 kg (0.20 lbs) for version with 120 mm length

Materials

Parts in contact with medium

Sensor shaft	Stainless steel 1.4435 (AISI 316L)
Process seal	FKM
Process seal for Ex versions	FKM
Seals/O-rings	EPDM FFKM

	Spot cap	Stainless steel 1.4435 (AISI 316L) or titanium or Hastelloy
	Spot layer	Silicone

Process connection

Pg 13.5
Torque max. 3 Nm

Surface roughness

R_a < 0.38 µm

Temperature sensor

Pt1000 (Class A according to DIN IEC 60751)

Certificates and approvals

Current certificates and approvals for the product are available at www.endress.com on the relevant product page:

1. Select the product using the filters and search field.
2. Open the product page.
3. Select **Downloads**.

Ex certification

ATEX
- II 1G Ex ia op is IIC T6 to T3 Ga
- II 1D Ex ia op is IIIC T90°C to T200°C Da

CSA C/US
- IS Class I Division 1 Groups A, B, C and D T6
- Ex ia IIC T6 Ga
- Class I Zone 0 AEx ia IIC T6 Ga
- IS Class II Division 1 Groups E, F and G
- Ex ia op is IIIC T90°C Da
- Zone 20 AEx ia op is IIIC T90°C Da

EAC Ex
- 0Ex ia op is IIC T6 to T3 Ga X
- 0Ex ia op is IIIC T90 °C to T200 °C Da X

IECEx
- Ex ia op is IIC T6 to T3 Ga
- Ex ia op is IIIC T90°C to T200°C Da

INMETRO
- Ex ia op is IIC T6 to T3 Ga
- Ex ia op is IIIC T90°C to T200°C Da

Japan Ex
- Ex ia op is IIC T6 to T3 Ga
- Ex ia op is IIIC T90°C to T200°C Da

Korea Ex
- Ex ia op is IIC T6 to T3 Ga
- Ex ia op is IIIC T90 °C to T200 °C Da

NEPSI
- Ex ia op is IIC T6/T4/T3 Ga
- Ex iaD op is IIIC T90°C/T135°C/T200°C Da

UK Ex
- Ex ia op is IIC T6 to T3 Ga
- Ex ia op is IIIC T90 °C to T200 °C Da

Additional certifications and declarations

The following test certificates, attestations and declarations (e.g. certificates of conformity) are available for the product depending on the selected version:
- Inspection certificate 3.1
- ASME BPE CoC
- Compliance with requirements derived from cGMP
- FDA 21 CFR

- EU Food Contact Materials REG (EC) 1935/2004
- CN Food Contact Materials GB 4806
- Surface roughness test
- EHEDG certificate
- CRN

EAC

The product has been certified according to Directive TP TC 020/2011 applicable in the Eurasian Economic Union (EAEU). The product bears the EAC mark of conformity.

Ordering information

Product page

www.endress.com/cos81e

Product Configurator

On the product page there is a **Configure** button to the right of the product image.

1. Click this button.
   ↳ The Configurator opens in a separate window.
2. Select all the options to configure the device in line with your requirements.
   ↳ In this way, you receive a valid and complete order code for the device.
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.

For many products you also have the option of downloading CAD or 2D drawings of the selected product version. Click the **CAD** tab for this and select the desired file type using picklists.

Scope of delivery

The scope of delivery comprises:
- 1 sensor, version as ordered
- 1 x Brief Operating Instructions
- Safety instructions for the hazardous area (for sensors with Ex approval)
- Supplement for optional certificates that have been ordered

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.

Device-specific accessories

Assemblies (selection)

COS81E with 220 mm length is suitable for all assemblies requiring an installation length of 225 mm.

Cleanfit CPA875
- Retractable process assembly for sterile and hygienic applications
- For in-line measurement with standard sensors with 12 mm diameter, e.g. for pH, ORP, oxygen
- Product Configurator on the product page: www.endress.com/cpa875

Technical Information TI01168C

Cleanfit CPA450
- Manual retractable assembly for installing sensors with a diameter of 12 mm and a length of 120 mm in tanks and pipes
- Product Configurator on the product page: www.endress.com/cpa450

Technical Information TI00183C

Unifit CPA842
- Hygienic installation assembly for food, biotechnology and pharmaceuticals
- For in-line measurement with standard sensors with 12 mm diameter, e.g. for pH, ORP, oxygen
- Product Configurator on the product page: www.endress.com/cpa842

Technical Information TI00306C

Flowfit CPA240
- pH/redox flow assembly for processes with stringent requirements
- Product Configurator on the product page: www.endress.com/cpa240

Technical Information TI00179C

Flowfit CYA21
- Universal assembly for analysis systems in industrial utilities
- Product Configurator on the product page: www.endress.com/CYA21

Technical Information TI01441C

CYA680
- Flow assembly for hygienic sensors
- For sensor installation in pipes
- Suitable for cleaning in place (CIP) and sterilization in place (SIP)
- Product Configurator on the product page: www.endress.com/cya680

Technical Information TI01295C

Measuring cables

Memosens data cable CYK10
- For digital sensors with Memosens technology
- Product Configurator on the product page: www.endress.com/cyk10

Technical Information TI00118C

Memosens laboratory cable CYK20
- For digital sensors with Memosens technology
- Product Configurator on the product page: www.endress.com/cyk20

Memosens data cable CYK11
- Extension cable for digital sensors with Memosens protocol
- Product Configurator on the product page: www.endress.com/cyk11

Technical Information TI00118C

Zero-point gel

COY8

Zero-point gel for oxygen and disinfection sensors
- Oxygen-free and chlorine-free gel for the verification, zero point calibration and adjustment of oxygen and disinfection measuring points
- Product Configurator on the product page: www.endress.com/coy8

Technical Information TI01244C

Transmitter

Liquiline CM44
- Modular multi-channel transmitter for hazardous and non-hazardous areas
- HART®, PROFIBUS, Modbus or EtherNet/IP is possible
- Order according to product structure

Technical Information TI00444C

Liquiline CM42
- Modular two-wire transmitter for hazardous and non-hazardous areas
- HART®, PROFIBUS or FOUNDATION Fieldbus is possible
- Order according to product structure

Technical Information TI00381C

Liquiline Mobile CML18
- Multiparameter mobile device for laboratory and field
- Reliable transmitter with display and app connection
- Product Configurator on the product page: www.endress.com/CML18

Operating Instructions BA02002C

Liquiline Compact CM82
- Configurable 1-channel multiparameter transmitter for Memosens sensors
- Ex- and non-ex applications possible in all industries
- Product Configurator on the product page: www.endress.com/CM82

Technical Information TI01397C

Liquiline Compact CM72
- 1-channel single parameter field device for Memosens sensors
- Ex- and non-ex applications possible in all industries
- Product Configurator on the product page: www.endress.com/CM72

Technical Information TI01409C

Memosens analog converter CYM17
- Converter for Memosens sensors
- Enables the simple use of digital Memosens sensors in fermentation applications in the laboratory
- Product Configurator on the product page: www.endress.com/cym17

Operating Instructions BA01833C

Memobase Plus CYZ71D
- PC software to support laboratory calibration
- Visualization and documentation of sensor management
- Sensor calibrations stored in database
- Product Configurator on the product page: www.endress.com/cyz71d

Technical Information TI00502C

Maintenance kit

Memosens COV81

- Maintenance kit for COS81E
- Scope of delivery of the Memosens COV81 maintenance kit is based on the configuration:
  - Spot cap
  - O-ring mounting tool
  - Cleaning cloth for optics
  - O-rings
  - Certificate
- Ordering information: www.endress.com/cos81e under "Accessories/spare parts"



www.addresses.endress.com

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