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Technical Information
Memosens CPS96E

pH/ORP sensor for heavily polluted media and suspended solids

Digital with Memosens 2.0 technology

Application

- Chemical processes
- Pulp and paper industry
- Flue gas cleaning
- Contaminated media:
  - Solids
  - Precipitation reactions
  - Emulsions

Your benefits

- Simultaneous measurement of pH, ORP and rH value (in rH mode)
- Open junction enables use in processes containing solids
- Low-maintenance owing to firm, stabilized gel with good chemical resistance properties
- Not affected by fluctuations in pressure and temperature
- Fast response time
- Integrated NTC 30K temperature sensor for effective temperature compensation
- Long service life thanks to poison-resistant reference with ion trap
- Platinum electrode: additional use for reference impedance measurement
- Detection of glass breakage and blockage through measurement of:
  - Glass membrane resistance
  - Reference impedance
- Various optional approvals for use in hazardous areas

Other advantages of Memosens technology

- Maximum process safety with non-contact, inductive signal transmission
- Data security thanks to digital data transmission
- Very easy to use as sensor data saved in the sensor
- Recording of sensor load data in the sensor enables predictive maintenance

Endress+Hauser
People for Process Automation

Function and system design

Measuring principle

pH measurement

The pH value is used as a unit of measurement for the acidity or alkalinity of a medium. The membrane glass of the sensor supplies an electrochemical potential depending on the pH value of the medium. This potential is generated by the selective accumulation of H^+ ions on the outer layer of the membrane. As a result, an electrochemical boundary layer with an electrical potential difference forms at this point. An integrated Ag/AgCl reference system serves as the required reference electrode.
The measured voltage is converted to the corresponding pH value using the Nernst equation.

ORP measurement

The ORP potential is a unit of measurement for the state of equilibria between oxidizing and reducing components of a medium. The ORP is measured using a platinum or gold electrode. Similar to pH measurement, an integrated Ag/AgCl reference system is used as a reference electrode.

rH measurement

The rH value is defined as the negative common logarithm of partial pressure of hydrogen in a solution. The pH value and ORP value of a solution must be measured simultaneously to calculate the rH value.
The value is calculated using the following equation:

$rH = 2 \cdot (mV/S) + 2\ pH$

pH	Measured pH value
mV	Measured ORP value in mV + 207 mV (Ag/AgCl system)
S	Slope of pH electrode

The rH value is an indicator of the oxidation or reducing power of a process solution. The measuring range runs from 0 to 42.

rH values	Process medium
0 to 9	Strong reducing power
9 to 17	Weak reducing power
17 to 25	Undetermined medium
25 to 34	Weak oxidizing power
34 to 42	Strong oxidizing power

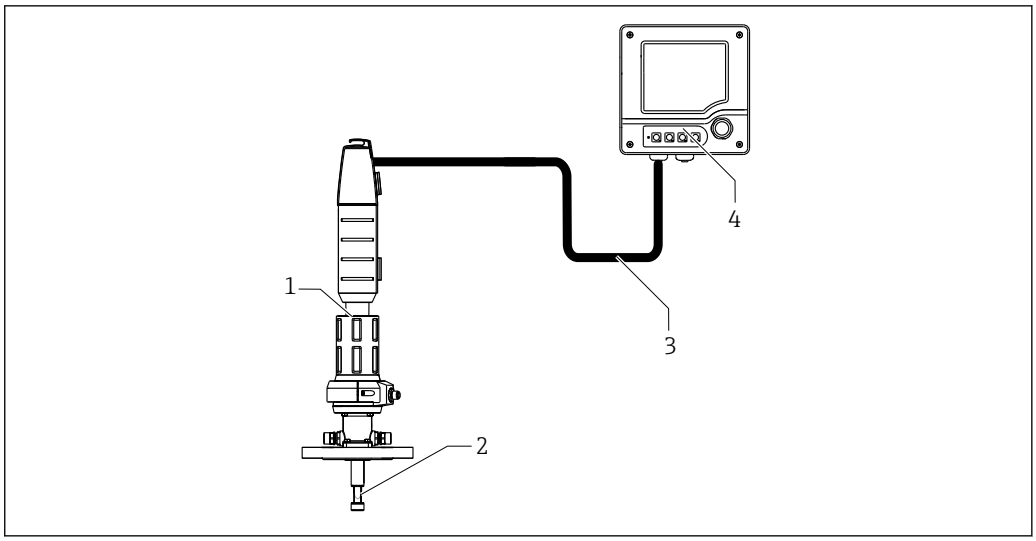
Reference impedance measurement

Monitoring the reference impedance is only practical with sensors whose junction can become blocked. Due to the small surface area, this is for example most feasible with sensors that use ceramic junctions.

Measuring system

A complete measuring system comprises:
- pH/ORP sensor CPS96E
- Memosens data cable CYK10 or CYK20
- Transmitter, e.g. Liquiline CM44, Liquiline CM42
- Assembly
  - Immersion assembly, e.g. Dipfit CPA111
  - Flow assembly, e.g. Flowfit CPA25
  - Retractable assembly, e.g. Cleanfit CPA871
  - Permanent installation assembly, e.g. Unifit CPA842

Additional options are available depending on the application:
Automatic cleaning and calibration system, e.g. Liquiline Control CDC90



1 Example of a measuring system for pH measurement

1 Retractable assembly Cleanfit CPA871
2 pH/ORP sensor CPS96E
3 Memosens data cable CYK10
4 Liquiline M CM42 two-wire transmitter for hazardous areas

Communication and data processing

Communication with the transmitter

Always connect digital sensors with Memosens technology to a transmitter with Memosens technology. Data transmission to a transmitter for analog sensors is not possible.

Digital sensors can store measuring system data in the sensor. These include the following:
- Manufacturer data
  - Serial number
  - Order code
  - Date of manufacture
- Calibration data
  - Calibration date
  - Slope at 25 °C (77 °F)
  - Zero point at 25 °C (77 °F)
  - Offset of integrated temperature sensor
  - Offset of ORP measurement
  - Number of calibrations
  - Calibration history
  - Serial number of the transmitter used to perform the last calibration or adjustment
- Operating data
  - Temperature application range
  - pH application range
  - ORP application range
  - Date of initial commissioning
  - Maximum temperature value
  - Hours of operation under extreme conditions
  - CIP counter

The data listed above can be displayed with Liquiline CM42, CM44x, and Memobase Plus CYZ71D.

Reliability

Dependability

Easy handling

Sensors with Memosens technology have integrated electronics that store calibration data and other information (e.g. total hours of operation 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.
- Thanks to the availability of the sensor data, maintenance intervals can be accurately defined and predictive maintenance is possible.
- The sensor history can be documented on external data carriers and evaluation programs, e.g. Memobase Plus CYZ71D,.
- The saved application data of the sensor can be used to determine the continued use of the sensor in a targeted manner.

Interference immunity

Data security thanks to digital data transmission

Memosens technology digitizes the measured values in the sensor and transmits the data to the transmitter via a non-contact connection that is free from potential interference. 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.

Safety

Maximum process safety
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:
  - No corrosion at the connection
  - Measured values cannot be distorted by moisture
- The transmitter is galvanically decoupled from the medium. Issues concerning "symmetrical high-impedance" or "asymmetry" or the type of impedance converter are a thing of the past.
- Electromagnetic compatibility (EMC) is guaranteed by screening measures for the digital transmission of measured values.
- Intrinsically safe electronics mean operation in hazardous areas is not a problem. Complete flexibility thanks to individual Ex approvals for all components, such as sensors, cables and transmitters.

Input

Measured variable

- pH value
- ORP
- rH value
- Temperature

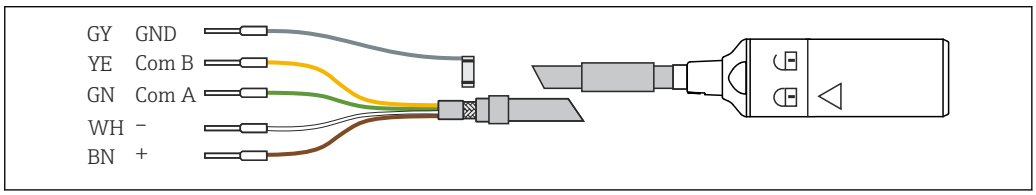
Measuring range

Application B
- pH: 0 to 14
- Temperature: 0 to 110 °C (32 to 230 °F)

Pay attention to the operating conditions in the process.

Power supply

Electrical connection



2 Measuring cable CYK10 or CYK20

► Connect the Memosens measuring cable, e.g. CYK10 or CYK20, to the sensor.

For further information on cable CYK10, see BA00118C.

Performance characteristics

Reference system

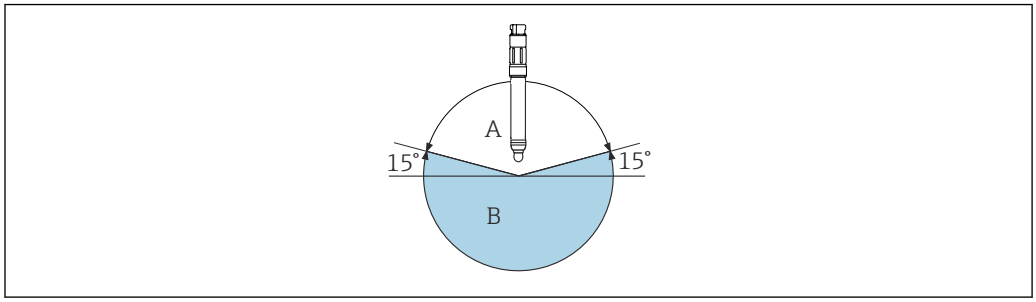
Ag/AgCl reference lead, bridging electrolyte: gel KCl, 3M, AgCl-free, stabilized bridging electrolyte gel with ion trap

Installation

Orientation

- Do not install the sensors upside-down.
- The installation angle from the horizontal must be at least 15°.

An installation angle <15° is not permitted, as otherwise an air bubble will form. Contact between the membrane glass and the reference lead will then no longer be guaranteed.



3 Installation angle at least 15° from the horizontal

A Permitted orientation
B Forbidden orientation

Installation instructions

Follow the Operating Instructions for the assembly used for detailed information on installing the assembly.

1. Before screwing in the sensor, make sure the assembly thread, the O-rings and the sealing surface are clean and undamaged and that the thread runs smoothly.
2. Hand-tighten the sensor with a torque of 3 Nm (2.21 lbf ft) (Only applies when installing in Endress+Hauser assemblies).

For detailed information on removing the moistening cap, see BA02142C

Environment

Ambient temperature range

NOTICE

Risk of damage from frost!

▶ Do not use the sensor at temperatures below −15 °C (5 °F) .

Storage temperature

0 to 50 °C (32 to 122 °F)

Degree of protection

IP 68 (10 m (33 ft) water column, 25 °C (77 °F), 45 days, 1 M KCl)

Electromagnetic compatibility (EMC)

Interference emission and interference immunity as per:
- EN 61326-1:2013
- EN 61326-2-3:2013

Process

Process temperature range

0 to 110 °C (32 to 230 °F)

Process pressure range

⚠ CAUTION

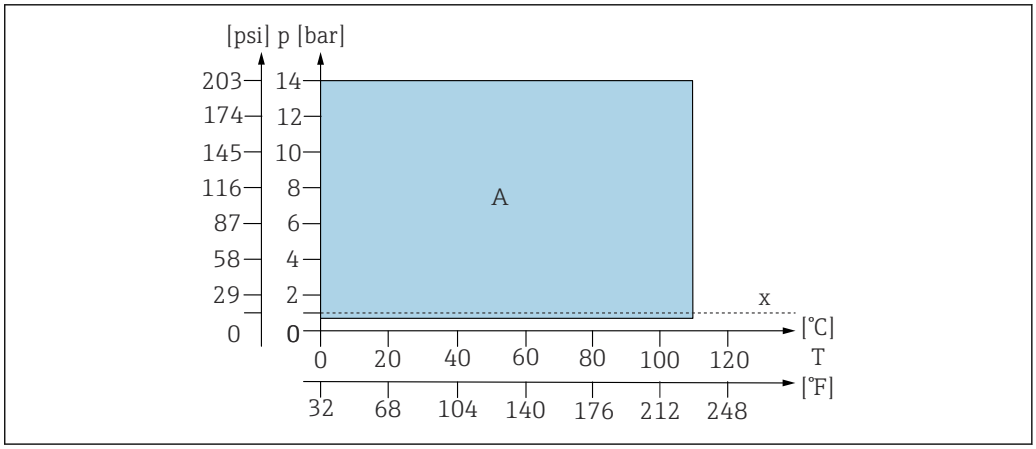
Pressurization of sensor due to prolonged use under increased process pressure
Possibility of sudden rupture and injury from glass splinters!
- ▶ Avoid fast heating of these pressurized sensors if they are used under reduced process pressure or under atmospheric pressure.
- ▶ When handling these sensors, always wear protective goggles and appropriate protective gloves.

0.8 to 14 bar (11.6 to 203 psi) absolute

Conductivity

> 500 µS/cm (minimized flow; pressure and temperature must remain constant)

Pressure-temperature ratings

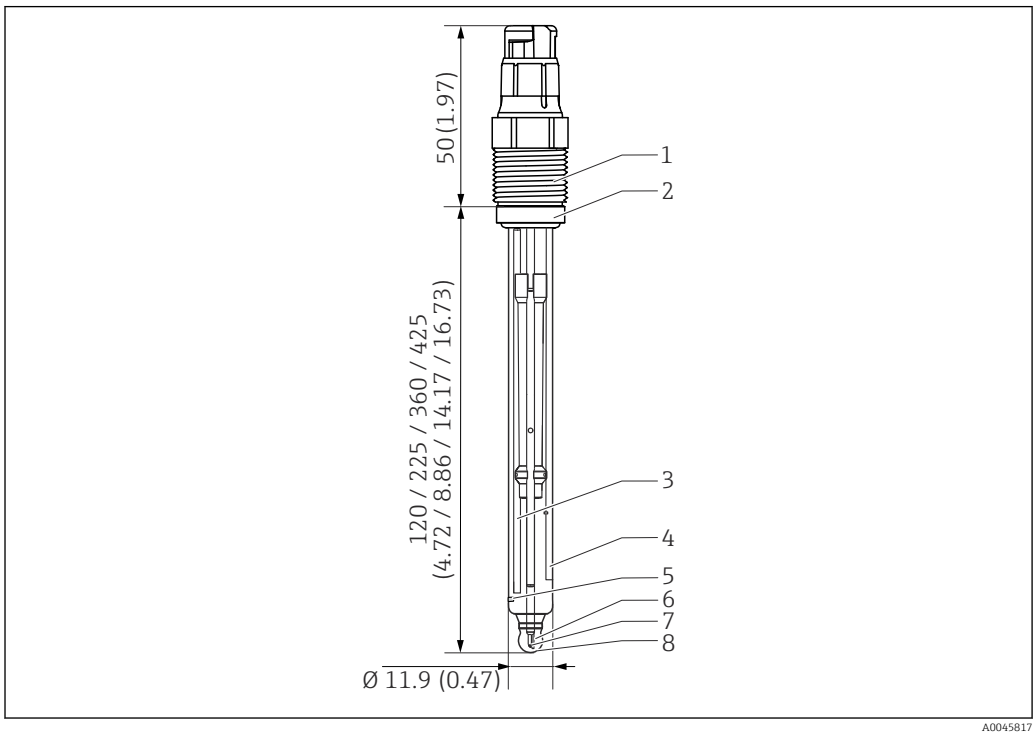


4 *Pressure/temperature diagram*

A *Application*
x *Atmospheric pressure*

Mechanical construction

Design, dimensions



5 *CPS96E with ion trap. Engineering unit: mm (in)*

1 *Memosens plug-in head with process connection*
2 *O-ring with thrust collar*
3 *Reference with ion trap*
4 *ORP measuring element*
5 *Open aperture*
6 *Temperature sensor*
7 *Ag/AgCl reference lead*
8 *pH glass membrane*

Weight

Installed length	120 mm (4.72 in)	225 mm (8.86 in)	360 mm (14.17 in)	425 mm (16.73 in)
Weight	40 g (1.4 oz)	60 g (2.1 oz)	90 g (3.2 oz)	100 g (3.5 oz)

Materials

Sensor shaft	Glass to suit process
pH membrane glass	Type B
Metal lead	Ag/AgCl
O-ring	FKM
ORP measuring element	Platinum
Process coupling	PPS fiber-glass reinforced
Nameplate	Ceramic metal oxide

Temperature sensor

NTC 30K

Plug-in head

Memosens plug-in head for digital, non-contact data transmission, pressure resistance 16 bar (232 psi) (relative)

Process connections

Pg 13.5

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-approval

ATEX
II 1G Ex ia IIC T4/T6 Ga

IECEx
Ex ia IIC T4/T6 Ga

NEPSI
Ex ia IIC T4/T6 Ga

CSA C/US
- IS CL I DIV 1, GP A, B, C, D Ex ia IIC T4/T6
- CL 1 Zone 0, AEx ia IIC T4/T6 Ga

Japan Ex
Ex ia IIC T4/T6 Ga

INMETRO
Ex ia IIC T4/T6 Ga

Korea Ex
Ex ia IIC T4/T6 Ga

EAC Ex
EAC Ex 0Ex ia IIC T4/T6 Ga X

UKCA Ex
II 1G Ex ia IIC T4/T6 Ga

Hazardous area versions of the digital sensors with Memosens technology are indicated by a red/orange ring on the plug-in head.

Pay attention to the instructions for Memosens data cable CYK10 and transmitters CM82, CM42 and CM42B.

Additional certification

TÜV certificate for Memosens plug-in head

Pressure resistance 16 bar (232 psi) relative, minimum three times the safety pressure

EAC

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

CRN

Since the sensor can be operated at a nominal pressure > 1 bar (15 psi), it has been registered in all Canadian provinces with a CRN (Canadian Registration Number) in accordance with CSA B51 (“Boiler, pressure vessel, and pressure piping code”, category F).

Ordering information

Scope of delivery

The scope of delivery comprises:
- Ordered version of the sensor
- Operating Instructions
- Safety instructions for the hazardous area (for sensors with Ex approval)
- Supplementary sheet for optionally ordered certificates

Product page

www.endress.com/cps96e

Product Configurator

1. **Configure**: Click this button on the product page.

2. Select **Extended selection**.
   ↳ The Configurator opens in a separate window.
3. Configure the device according to your requirements by selecting the desired option for each feature.
   ↳ In this way, you receive a valid and complete order code for the device.
4. **Accept**: Add the configured product to the shopping cart.

For many products, you also have the option of downloading CAD or 2D drawings of the selected product version.

5. **CAD**: Open this tab.
   ↳ The drawing window is displayed. You have a choice between different views. You can download these in selectable formats.

Accessories

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

Listed accessories are technically compatible with the product in the instructions.

1. Application-specific restrictions of the product combination are possible.
   Ensure conformity of the measuring point to the application. This is the responsibility of the operator of the measuring point.
2. Pay attention to the information in the instructions for all products, particularly the technical data.
3. For accessories not listed here, please contact your Service or Sales Center.

Device-specific accessories

Assemblies

Unifit CPA842
- Installation assembly for food, biotechnology and pharmaceutics
- With EHEDG and 3A certificate
- Product Configurator on the product page: www.endress.com/cpa842

Technical Information TI01367C

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

Dipfit CPA140
- pH/ORP immersion assembly with flange connection for very demanding processes
- Product Configurator on the product page: www.endress.com/cpa140

Technical Information TI00178C

Cleanfit CPA871
- Flexible process retractable assembly for water, wastewater and the chemical industry
- For applications with standard sensors with 12 mm diameter
- Product Configurator on the product page: www.endress.com/cpa871

Technical Information TI01191C

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

Cleanfit CPA473
- Stainless steel process retractable assembly with ball valve shutoff for particularly reliable separation of the medium from the environment
- Product Configurator on the product page: www.endress.com/cpa473

Technical Information TI00344C

Cleanfit CPA474
- Plastic process retractable assembly with ball valve shutoff for particularly reliable separation of the medium from the environment
- Product Configurator on the product page: www.endress.com/cpa474

Technical Information TI00345C

Dipfit CPA111
- Immersion and installation assembly made of plastic for open and closed vessels
- Product Configurator on the product page: www.endress.com/cpa111

Technical Information TI00112C

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

Technical Information TI00179C

Flowfit CPA25
- Flow assembly for pH/ORP measurement
- Product Configurator on the product page: www.endress.com/cpa25

Technical Information TI01710C

Ecofit CPA640
- Set comprising adapter for 120 mm pH/ORP sensors and sensor cable with TOP68 coupling
- Product Configurator on the product page: www.endress.com/cpa640

Technical Information TI00246C

Buffer solutions

High-quality buffer solutions from Endress+Hauser - CPY20
High-quality CPY20 pH buffers ensure maximum precision in pH calibrations. Available in pH 2.0, pH 4.0, pH 7.0, pH 9.0, pH 9.2, pH 10.0 and pH 12.0. They only contain FDA-listed preservatives. Further details and Product Configurator on the product page: www.endress.com/cpy20

ORP buffer solution CPY3
- 220 mV, pH 7
- 468 mV, pH 0.1

Product Configurator on the product page: www.endress.com/cpy3

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

www.addresses.endress.com

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