Technical Information
Memosens CPS76D

Combination of pH and ORP electrode with Memosens technology
For process technology, hygienic and sterile applications



Poison-resistant reference with ion trap

Application

- Hygienic and sterile applications (sterilizable, autoclavable)
  - Fermenters
  - Biotechnology
  - Pharmaceutical industry
  - Foods
- Process technology and monitoring of processes with:
  - Rapidly changing pH values
  - High proportion of electrode poisons such as H_2S

With ATEX, IEC, FM and CSA approval for use in hazardous areas.

Your benefits

- Simultaneous measurement of pH, ORP and rH value (in rH mode)
- Additional electrode made of platinum, for measuring reference impedance
- Certified biocompatibility
- Newly developed acrylamide-free gel as bridging electrolyte, sterilizable and very resistant to chemical corrosion
- Suitable for CIP/SIP cleaning, autoclavable
- Version with pressurized reference specifically for fermenter applications
- Version for upside-down installation
- Integrated temperature sensor for effective temperature compensation
- Long service life thanks to poison-resistant reference with ion trap
- Glass breakage and blockage detection by measuring:
  - Resistance of glass membrane
  - Reference impedance

Other advantages of Memosens technology

- Maximum process safety owing to non-contact, inductive signal transmission
- Data security thanks to digital data transmission
- Very easy to use as sensor data saved in the sensor
- Predictive maintenance possible as sensor load data logged in the sensor

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 liquid medium. The membrane glass of the electrode supplies an electrochemical potential which is dependent upon the pH value of the medium. This potential is generated by the selective penetration of H^+ ions through the outer layer of the membrane. An electrochemical boundary layer with an electric potential forms at this point. An integrated Ag/AgCl reference system serves as the required reference electrode. The transmitter converts the measured voltage into 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 instead of the pH-sensitive glass membrane. Analog to the pH measurement, an integrated Ag/AgCl reference system is used as a reference electrode.

rH measurement
The rH value is defined as the negative 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:

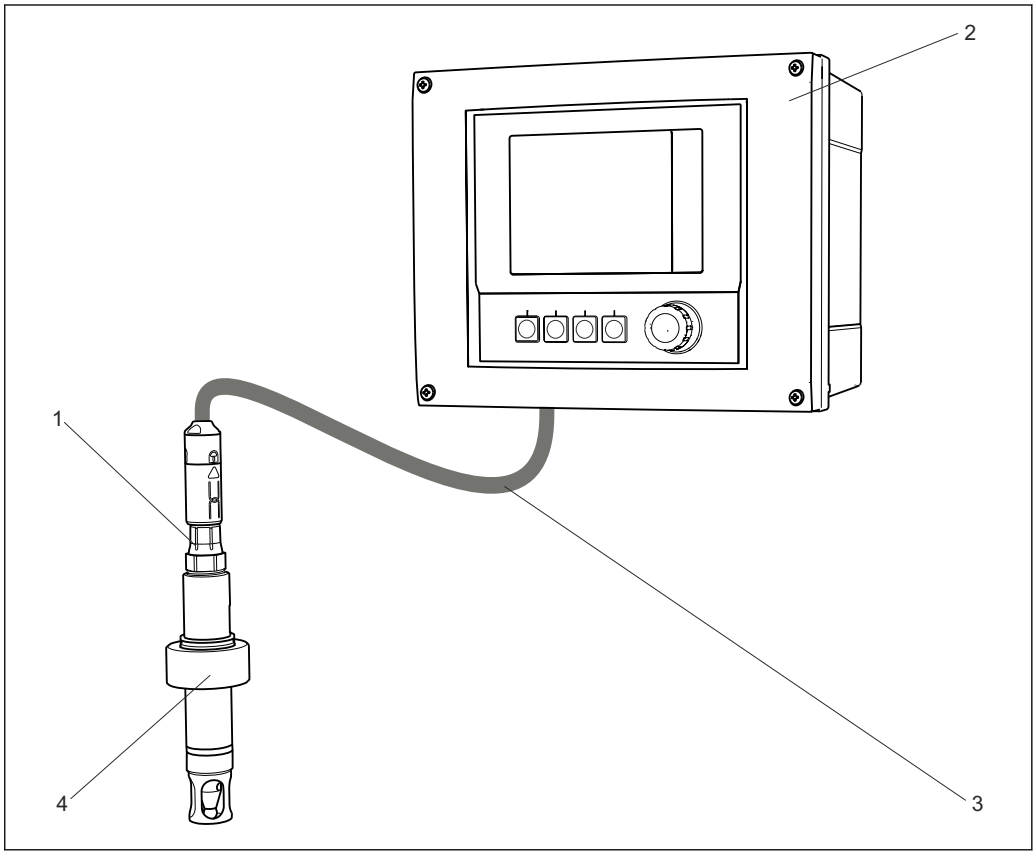
$rH = 2 \cdot (mV/S) + 2\ pH$

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 ability of a process solution. The measuring range is from 0 to 42. A process medium with rH values between 0 and 9 has a high reducing ability; a low reducing ability with rH 9-17; an indeterminate ability with rH 17-25; a low oxidation ability with rH 25-34, and a high oxidation ability with rH 34-42.

Measuring system

A complete measuring system comprises:
- pH/ORP combined electrode CPS76D
- Transmitter, e.g. Liquiline CM44x
- Measuring cable CYK10
- Immersion, fixed installation, flow or retractable assembly, e.g. CPA442



1 Example of a measuring system

1 pH/ORP combined electrode CPS76D
2 Transmitter CM44x
3 Measuring cable CYK10
4 Permanent installation assembly CPA442

Communication and data processing

Communication with the transmitter

Always connect digital Memosens sensors with a combination of pH and ORP electrode to a transmitter with the relevant functionality and Memosens technology.
Such transmitters are Liquiline CM42 (software package 9 or higher) and Liquiline CM44x (software version 01.04.00, from 4th quarter 2012). To upgrade a Liquiline CM42 to software package 9 or higher, the digital sensor input module FSDG1 with firmware version 1.01.01 or higher is required. In the case of a FSDG1 with firmware version lower than 1.01.01, the sensor input module must be replaced. Order numbers: 51518007 (non-Ex) and 51517469 (Ex). The installation of software package 9 on the CM42 is performed using DAT CY42-S1.
The transfer of data to older transmitters, including those with Memosens capability, is possible only to a limited extent (pH measurement only). In rare cases, it is possible that no data transfer is performed.

The digital sensors are able to store the following system data in the sensor.
- Manufacturing data
  - Serial number
  - Order code
  - Date of manufacture
- Calibration data
  - Calibration date
  - Calibrated slope at 25 °C (77 °F)
  - Calibrated zero point at 25 °C (77 °F)
  - Calibrated offset (ORP mV measuring mode)
  - Slope as % (ORP % measuring mode)
  - Temperature offset
  - Number of calibrations
  - Serial number of the transmitter used for the last calibration
  - Calibration database (stores the last 8 calibrations in the Memosens head)
- Application data
  - Temperature application range
  - pH application range
  - ORP application range
  - Date of first commissioning
  - Maximum temperature value
  - Operating hours at temperatures above 80 °C (176 °F) and 100 °C (212 °F)
  - Operating hours at very low and very high pH values (Nernst voltage below -300 mV, above +300 mV)
  - Number of sterilizations

Reliability

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.
  - Plug-in connection 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. Issues concerning "symmetrical high-impedance" or "asymmetry" or an impedance converter are a thing of the past.
- EMC safety is guaranteed by screening measures for the digital transmission of measured values.

Maintainability

Low-maintenance
The electrode has a sterilizable, dirt-repellent PTFE ring junction that prevents clogging, making the electrode reliable and stable over the long term.

Integrity

Data security thanks to digital data transmission
Memosens technology digitizes the measured values in the sensor and transmits the data to the transmitter using a non-contact connection that is free from potential interference. The result:
- Automatic error message if sensor fails or connection between sensor and transmitter is interrupted
- Immediate error detection increases measuring point availability

Easy handling
Sensors with Memosens technology have integrated electronics that allow for saving calibration data and further information such as total hours of operation and 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 .
- Maintenance intervals can be defined based on all stored sensor load and calibration data and predictive maintenance is possible.
- The sensor history can be documented on external data carriers and evaluation programs at any time. Thus, the current application of the sensors can be made to depend on their previous history.

Input

Measured variables

- pH value
- ORP
- rH value
- Temperature

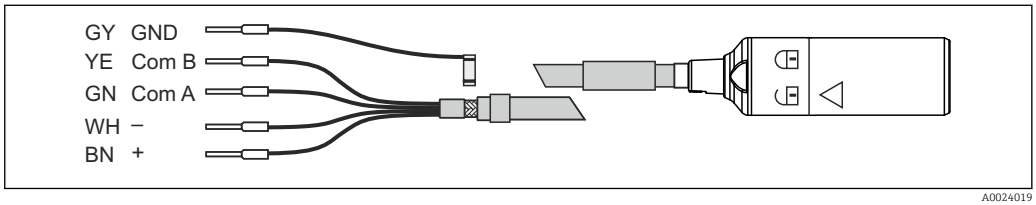
Measuring range

	pH	ORP	rH	Temperature
BB version	0 … 14	-1500 to 1500 mV	0 … 42	0 to 140 °C (32 to 280 °F)
BU version				0 to 135 °C 1) (32 to 280 °F)
Version BP (pressurized)				0 to 140 °C 2) (32 to 280 °F)

Electrical connection

Connecting to the transmitter

The electrical connection of the sensor to the transmitter takes place via special measuring cable CYK10 or CYK20.



2 *Measuring cable CYK10/CYK20*

Installation

Installation instructions

- Before screwing in the electrode, make sure the assembly thread is clean and runs smoothly.
- Screw in the electrode finger-tight (3 Nm)! (Data apply only if installing in Endress+Hauser assemblies.)
- Also pay attention to the installation instructions provided in the Operating Instructions of the assembly used.

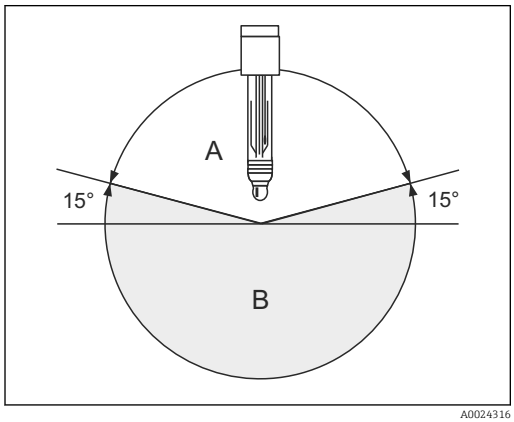
Installation angle

BB, BP electrode version

Do not install the electrodes upside down. The angle of inclination must be at least 15° from the horizontal. A smaller inclination angle is not permitted as it could cause an air bubble to form in the glass sphere and prevent the inner electrolyte from completely wetting the pH diaphragm.

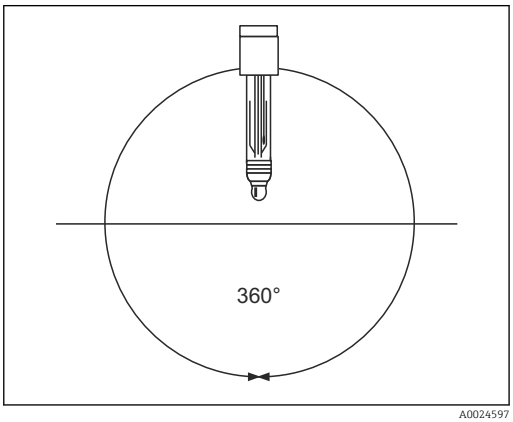
BU electrode version

This electrode is suitable for upside-down installation. You can install it at any angle.



3 *Installation angle versions BB, BP*

A Permitted orientation
B Forbidden orientation



4 *Any installation angle for BU version*

Environment

Ambient temperature

NOTICE

Risk of damage due to frost

▶ The sensor must not be used if the temperature drops below −15 °C (5 °F).

Storage temperature

0 to 50 °C (32 to 120 °F)

Degree of protection

IP 68 (10 m (33 ft) head of water at 25 °C (77 °F) over 45 days, 1 mol/l KCl)

Process

Process temperature

BB version:	0 to 140 °C (32 to 280 °F)
BU, BP version:	0 to 100 °C (32 to 212 °F), can be sterilized up to 140 °C (280 °F) for 30 minutes, at least 30 sterilization cycles

Process pressure

⚠ CAUTION

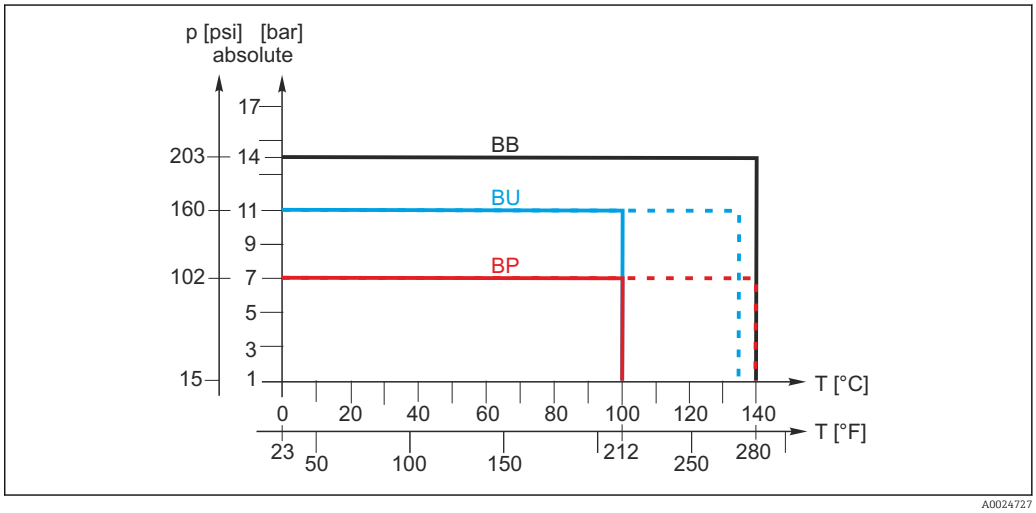
Pressurization of sensor due to prolonged use under increased process pressure

Risk of injury due to glass breakage

- ▶ Avoid excessive heating of these sensors if using them under reduced process pressure or under atmospheric pressure.
- ▶ When handling these sensors, wear protective goggles and suitable gloves.

BB version:	1 to 14 bar (15 to 203 psi)
BU version:	1 to 11 bar (15 to 160 psi)
BP version:	1 to 7 bar (15 to 102 psi)

Pressure-temperature ratings



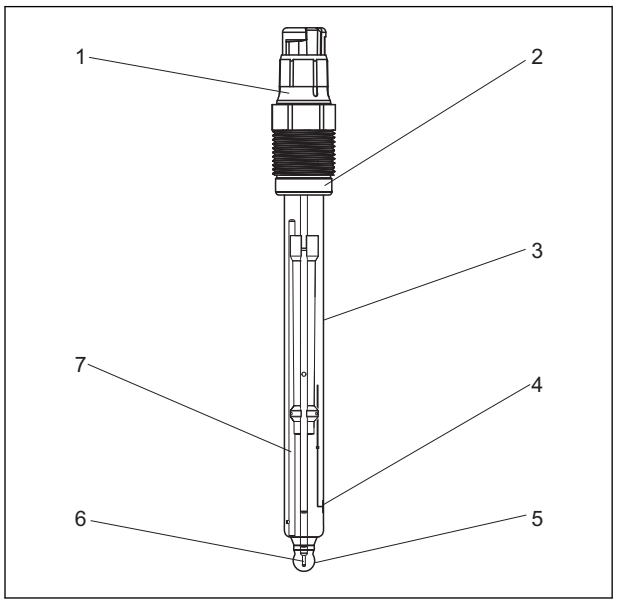
5 *Pressure-temperature ratings CPS76D*

Minimum conductivity

10 µS/cm

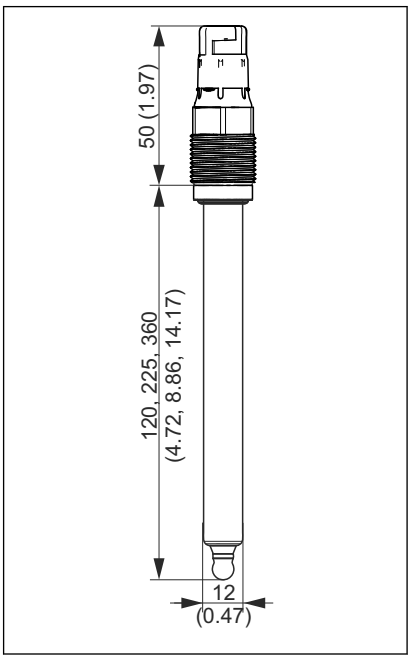
Mechanical construction

Design, dimensions



6 Design

1 Memosens plug-in head, Pg 13.5
2 Viton-O-ring with thrust collar
3 Glass shaft
4 Platinum round plate (ORP element)
5 pH glass membrane
6 Ag/AgCl reference lead - pH
7 Reference with ion trap



7 Measurements in mm (inch)

Weight

0.1 kg (0.2 lbs)

Materials

Electrode shaft	Glass to suit process
pH membrane glasses	Type B
ORP measuring element	Platinum round plate
Junction	Ceramic, sterilizable and autoclavable
Metal lead	Ag/AgCl
Gel	Bridging electrolyte, acrylamide-free

Process connection

Pg 13.5

Temperature sensor

NTC 30KΩ

Plug-in head

Memosens plug-in head for digital, non-contact data transmission

Reference system

Versions BB, BU
Ag/AgCl reference lead with Advanced Gel 3M KCl, AgCl-free, common reference for pH, ORP and rH measurement, ion trap

Version BP
Ag/AgCl reference lead with Advanced Gel 3M KCl, AgCl-free, common reference for pH, ORP and rH measurement, ion trap, pressurized 6 bar, displayed by pressure indicator

Certificates and approvals

Ex approval

- ATEX II 1G Ex ia IIC T3/T4/T6 Ga
- IECEx Ex ia IIC T3/T4/T6 Ga
- FM/CSA IS/NI Cl. I. Div 1+2, Group A-D

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

Electromagnetic compatibility

Interference emission and interference immunity as per EN 61326: 2006

Ordering information

Product page

www.endress.com/cps76d

Product Configurator

The navigation area is located on the right of the product page.

1. Under "Device support" click "Configure your selected product".
   ↳ 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 at the top of the screen.

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 office.

Assemblies

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

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

Unifit CPA442
- Installation assembly for food, biotechnology and pharmaceutics
- With EHEDG and 3A certificate
- Product Configurator on the product page: www.endress.com/cpa442

Technical Information TI00306C

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

Technical Information TI01191C

Not suitable for combined sensors with length of 120 mm.

Cleanfit CPA472
- Compact plastic retractable assembly for installation in tanks and pipes
- For manual or pneumatic, remote-controlled operation
- Product Configurator on the product page: www.endress.com/cpa472

Technical Information TI00223C

Cleanfit CPA472D
- Robust retractable assembly for pH, ORP and other industrial sensors
- Heavy-duty version made of durable materials
- For manual or pneumatic, remote-controlled operation
- Product Configurator on the product page: www.endress.com/cpa472d

Technical Information TI00403C

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

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

Technical Information TI01168C

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

Technical Information TI00183C

Flowfit CPA250
- Flow assembly for pH/ORP measurement
- Product Configurator on the product page: www.endress.com/cpa250

Technical Information TI00041C

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

Technical Information TI00179C

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

Technical Information TI00246C

Only versions CPA640-A***, CPA640-B***, CPA640-G*** and CPA640-I*** are suitable for installing combined sensors.

Buffer solutions

High-quality buffer solutions from Endress+Hauser - CPY20
The secondary buffer solutions have been referenced to primary reference material of the PTB (German Federal Physico-technical Institute) and to standard reference material of NIST (National Institute of Standards and Technology) according to DIN 19266 by a DKD (German Calibration Service) accredited laboratory.
Product Configurator on the product page: www.endress.com/cpy20

Measuring cable

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

Technical Information TI00118C

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

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