



Level



Pressure



Flow



Temperature



Liquid
Analysis



Registration



Systems
Components



Services



Solutions

Technical Information

Memosens CPS16D

Combination of pH and ORP electrode with Memosens technology
For standard applications in process technology and environmental
engineering

Resistant to poisoning reference with ion trap



Application

- Long-term monitoring or limit control in processes with stable process conditions
 - Chemical processes
 - Pulp and paper industry
 - Power stations (e.g. flue gas cleaning)
 - Incinerator plants
 - Mining
 - Wastewater
- Water treatment
 - Drinking water
 - Cooling water
 - Well water

With ATEX and IEC approval for use in hazardous areas

Your benefits

- Simultaneous measurement of pH, ORP and rH values (in rH mode)
- Platinum additional electrode to measure reference impedance
- Low-maintenance and robust electrode thanks to large PTFE ring junction
- Can be used with pressures up to 16 bar (232 psi)
- Process glass also for very alkaline applications
- Integrated temperature sensor for effective temperature compensation
- Long service life thanks to resistant to poisoning reference with ion trap
- Glass breakage and blockage detection by measuring:
 - Resistance of glass membrane
 - Reference impedance

Additional advantages offered by Memosens technology

- Maximum process safety thanks to non-contact, inductive signal transmission
- Digital data transmission ensures data security
- Very easy to use as sensor-specific data are stored in the sensor
- Recording of sensor load data in the sensor enables predictive maintenance

Function and system design

Measuring principle

pH measurement

The pH value is a measure of the acid or base character of a medium. Depending on the pH value of the medium, the electrode's membrane glass provides an electrochemical potential. This is the result of H⁺ ions selectively penetrating the outer layer of the membrane. As a result, an electrochemical boundary layer forms here with an electric potential. An integrated Ag/AgCl reference system forms the required reference electrode.

The transmitter converts the measured voltage into the corresponding pH value according to the NERNST equation.

ORP measurement

The oxidation-reduction potential (ORP) is an indicator of the balance between oxidizing and reducing components in the medium. The ORP is measured using a platinum electrode. As in the case of pH measurement, the integrated Ag/AgCl reference system is the reference electrode used.

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:

$$rH = 2 \times (mV/S) + 2 \text{ pH}$$

$$\text{pH} = \text{measured pH value}$$

$$mV = \text{measured ORP value in mV} + 207 \text{ mV (Ag/AgCl system)}$$

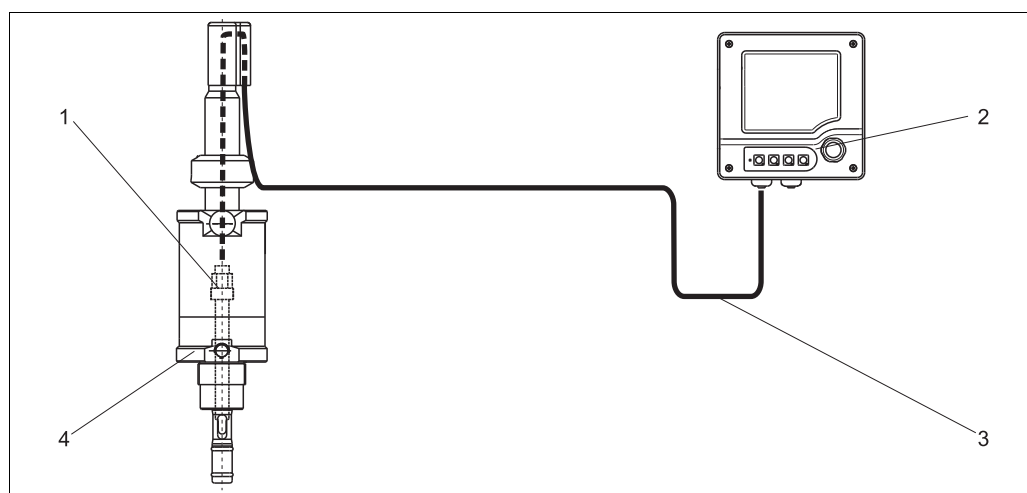
$$S = \text{slope of pH electrode}$$

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 CPS16D
- Transmitter, e.g. Liquiline M CM42
- Measuring cable CYK10
- Immersion, flow or retractable assembly, e.g. Cleanfit P CPA471



Example of a measuring system

- 1 pH/ORP combined electrode CPS16D
- 2 Transmitter Liquiline M CM42
- 3 Measuring cable CYK10
- 4 Cleanfit CPA471 retractable assembly

Communication and data processing**Communication with the transmitter**

Only connect digital Memosens sensors with a combined pH and ORP electrode to a transmitter with appropriate functionality and Memosens technology.

These are the transmitters Liquiline CM42 (software package 9 or above) 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. If the firmware version of the FSDG1 module is lower than 1:01:01, the module must be replaced. Order numbers are 51518007 (non-Ex) and 51517469 (Ex). To upload software package 9 to a CM42 use the DAT CY42-S1.

Data transmission to older, Memosens-capable transmitters is limited (pH measurement only). In some cases it may occur that no data is transmitted.

Measuring system data which digital sensors can save in the sensor include:

- Manufacturer data
 - Serial number
 - Order code
 - Date of manufacture
- Calibration data
 - Date of calibration
 - Calibrated slope at 25 °C (77 °F)
 - Calibrated zero point at 25 °C (77 °F)
 - Calibration offset (ORP mV measuring mode)
 - Slope in % (ORP % measuring mode)
 - Temperature offset
 - Number of calibrations
 - Serial number of the transmitter used to perform the last calibration
 - Calibration database (saves the last 8 calibrations in the Memosens head)
- Operating data
 - Temperature application range
 - pH and ORP application range
 - Date of initial commissioning
 - Maximum temperature value
 - Operating hours at temperatures above 80 °C / 100 °C (176 °F / 212 °F)
 - Operating hours at very low and very high pH values (Nernst voltage under -300 mV, over +300 mV)
 - Number of sterilizations

Reliability**Long service life**

The reference is immune to temperature and pressure fluctuations and is protected against poisoning by the ion trap. This results in a far longer sensor service life.

Maximum process safety

With its inductive transmission of the measured value via a non-contact plug-in connection, Memosens guarantees maximum process safety and offers the following advantages:

- All problems caused by moisture are eliminated:
 - The plug-in connection is free from corrosion
 - Moisture cannot corrupt the measured value
 - Plug-in system can even be connected under water
- The transmitter is galvanically decoupled from the medium.
- EMC safety is guaranteed by screening measures in the digital measured value transmission.
- Can easily be used in hazardous areas thanks to intrinsically safe electronics.

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**Digital data transmission ensures data security**

Memosens technology digitizes the measured values in the sensor and transmits them to the transmitter via a non-contact connection in a way that is free from any potential interference. The result:

- Automatic error message generation if the sensor fails or the connection between sensor and transmitter is interrupted
- Immediate error detection increases measuring point availability

Ease of use

Sensors with Memosens technology have integrated electronics that save calibration data and other information, such as total hours of operation and operating hours under extreme measuring conditions etc. When the sensor is connected, the sensor data are automatically sent to the transmitter and used to calculate the current measured value. Saving the calibration data makes it possible to calibrate the sensor irrespective of the measuring point. The result:

- Convenient calibration in the measuring lab under optimum external conditions improves the quality of the calibration.
- Measuring point availability is dramatically increased by the quick and easy replacement of precalibrated sensors.
- Installing the transmitter in the measuring container with integrated measuring devices reduces the amount of fastening material and cabling work required.
- The availability of the sensor data makes it possible to accurately determine the maintenance intervals of the measuring point and enables predictive maintenance.
- The sensor history can be documented with evaluation programs such as Memobase Plus.

Input

Measured variables

- pH value
- ORP
- rH value
- Temperature

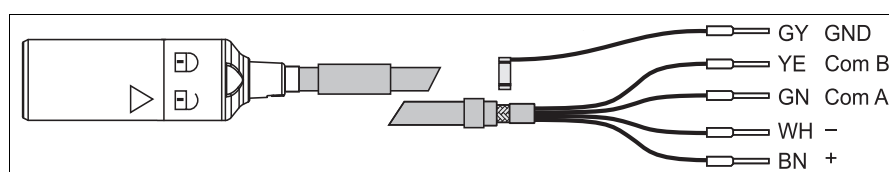
Measuring range

	pH	ORP	rH	Temperature
AT version (water/wastewater)	1 to 12	-1500 to 1500 mV	0 to 42	-15 to 80 °C (5 to 175 °F)
BT version (process)	0 to 14	-1500 to 1500 mV	0 to 42	0 to 135 °C (32 to 275 °F)

Wiring

Connecting to the transmitter

The sensor is connected to the transmitter via the measuring cable CYK10.



Measuring cable CYK10

a0003350

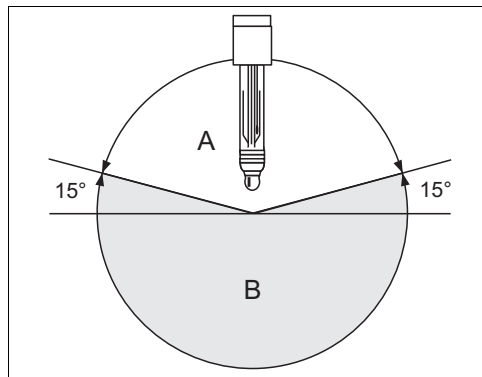
Installation

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 only applicable if installing in Endress+Hauser assemblies.)
- Also pay attention to the installation instructions provided in the Operating Instructions of the assembly used.

Installation angle

Do not install the electrodes upside down. The inclination angle 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.



Installation angle

- A Permitted orientation
B Incorrect orientation

Environment

Ambient temperature range

NOTICE

Frost can break the glass

Sensor failure

- The sensor cannot be used at temperatures below -15 °C (5 °F).

Storage temperature

0 to 50 °C (32 to 120 °F)

Degree of protection

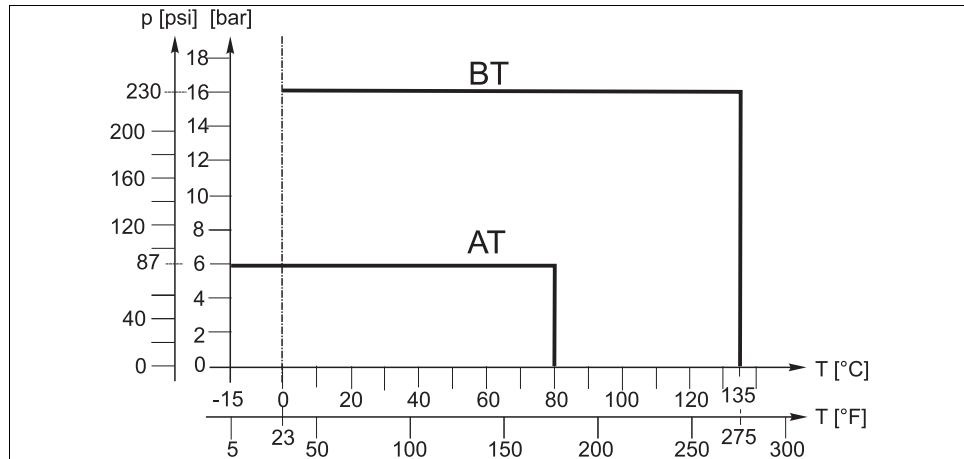
IP 68 (10 m (33 ft) water column, 25 °C (77 °F), 45 days, 1 M KCl)

Process

Process temperature range	AT version:	-15 to 80 °C (5 to 175 °F)
	BT version:	0 to 135 °C (32 to 275 °F)

Process pressure range	AT version:	0 to 6 bar (0 to 87 psi)
	BT version:	0 to 16 bar (0 to 230 psi)

Pressure-temperature ratings



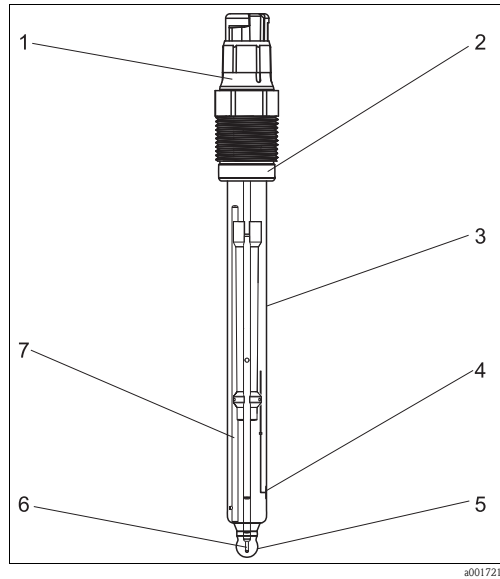
Pressure-temperature ratings CPS16D

a0017202

Minimum conductivity	50 μS/cm
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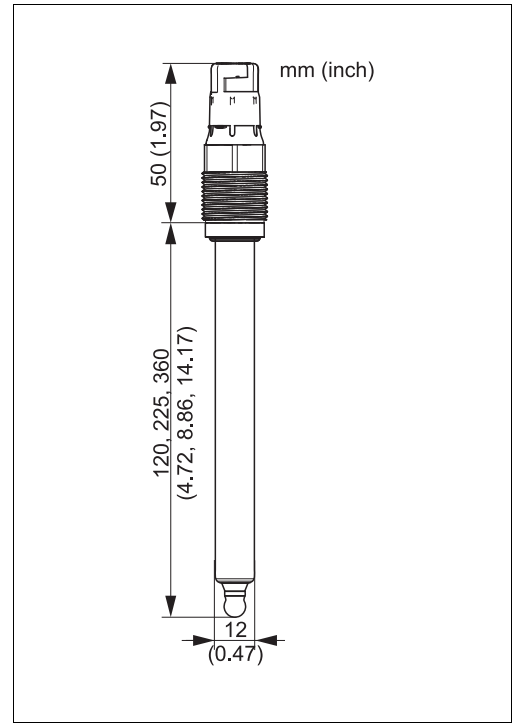
Mechanical construction

Design, dimensions



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



Dimensions

Weight 0.1 kg (0.22 lbs)

Materials	Electrode shaft	Glass to suit process
	pH membrane glasses	Type A, B
	ORP measuring element	Platinum round plate
	Junction	PTFE, ring-shaped, sterilizable
	Metal lead	Ag/AgCl

Process connection Pg 13.5

Temperature sensor NTC 30K Ω


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

Reference system Ag/AgCl reference lead with ion trap and Advanced Gel 3 M KCl

Certificates and approvals

Ex approval

- ATEX II 1G Ex ia IIC T3/T4/T6 Ga
- IECEx Ex ia IIC T3/T4/T6 Ga
- ATEX/Nepsi II 3G Ex nL IIC

 Digital sensors with Memosens technology that are suitable for use in hazardous areas have an orange/red ring in the plug-in head.

Electromagnetic compatibility

Interference emission and interference immunity as per EN 61326: 2006

Ordering information

Product page

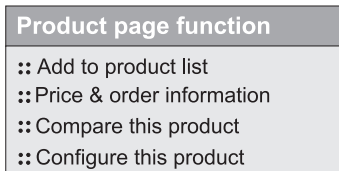
You can create a valid and complete order code on the Internet with the Configurator tool.

Link to product page:

www.products.endress.com/cps16D


Product Configurator

1. You can find the following options on the right-hand side of the product page:



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

Accessories

-  The most important accessories available at the time this document went to print are listed below. Please contact your Service Team or Sales Center for accessories that are not listed here.

Assemblies (selection)

Dipfit CPA111

- Immersion and installation assembly for open and closed containers
- Order according to product structure (→ Online Configurator, www.products.endress.com/cpa111)
- Technical Information TI00112C/07/EN

Dipfit CPA140

- pH/ORP immersion assembly with flange connection for very demanding processes
- Order according to product structure (→ Online Configurator, www.products.endress.com/cpa140)
- Technical Information TI00178C/07/EN

Unifit CPA442

- Installation assembly for food, biotechnology and pharmaceuticals, with EHEDG and 3A certificate,
- Order according to product structure (→ Online Configurator, www.products.endress.com/cpa442)
- Technical Information TI00306/C/07/EN

Cleanfit CPA471

- Pneumatic or manual retractable assembly for installation in tanks and pipes
- Order according to product structure (→ Online Configurator, www.products.endress.com/cpa471)
- Technical Information TI00217C/07/EN

Cleanfit CPA472

- Compact plastic retractable assembly for installation in tanks and pipes, for manual or pneumatically remote-controlled operation
- Order according to product structure (→ Online Configurator, www.products.endress.com/cpa472)
- Technical Information TI00223C/07/EN

Cleanfit CPA472D

- Robust retractable assembly for pH, ORP and other industrial sensors, for manual or pneumatically remote-controlled operation, heavy-duty version made from very durable materials
- Order according to product structure (→ Online Configurator, www.products.endress.com/cpa475)
- Technical Information TI00403C/07/EN

Cleanfit CPA473

- Stainless steel process retractable assembly with ball valve shutoff for particularly reliable separation of the medium from the environment
- Order according to product structure (→ Online Configurator, www.products.endress.com/cpa473)
- Technical Information TI00344C/07/EN

Cleanfit CPA474

- Plastic process retractable assembly with ball valve shutoff for particularly reliable separation of the medium from the environment
- Order according to product structure (→ Online Configurator, www.products.endress.com/cpa474)
- Technical Information TI00345C/07/EN

Cleanfit CPA475

- Retractable assembly for installation in tanks and pipes under sterile conditions
- Order according to product structure (→ Online Configurator, www.products.endress.com/cpa475)
- Technical Information TI00240/C/07/EN

Cleanfit CPA450

- Manual retractable assembly for installation of 120 mm sensors in tanks and pipes
- Order according to product structure (→ Online Configurator, www.products.endress.com/cpa450)
- Technical Information TI00183C/07/EN

Flowfit CPA250

- Flow assembly for pipe installation of pH/ORP sensors with Pg 13.5 and 120 mm (4.72") installation length
- Order according to product structure (→ Online Configurator, www.products.endress.com/cpa250)
- Technical Information TI00041C/07/EN

Flowfit CPA240

- pH/ORP flow assembly for very demanding processes
- Order according to product structure (→ Online Configurator, www.products.endress.com/cpa240)
- Technical Information TI00179C/07/EN

Ecofit CPA640

- Adapter for 120 mm pH sensors
- Order according to product structure (→ Online Configurator, www.products.endress.com/cpa640)
- Technical Information TI00264C/07/EN

Buffer solutions

Quality buffers from Endress+Hauser

Solutions which are traced by a DAkkS-accredited Endress+Hauser buffer laboratory (DAkkS = German Accreditation Body) to a primary reference material of the PTB and to standard reference material of the National Institute of Standards and Technology (NIST) in accordance with DIN 19266 are used as secondary reference buffer solutions.

pH value	
A	pH 2.00 (accuracy ± 0.02 pH)
C	pH 4.00 (accuracy ± 0.02 pH)
E	pH 7.00 (accuracy ± 0.02 pH)
G	pH 9.00 (accuracy ± 0.02 pH)
I	pH 9.20 (accuracy ± 0.02 pH)
K	pH 10.00 (accuracy ± 0.05 pH)
M	pH 12.00 (accuracy ± 0.05 pH)
Quantity	
01	20 x 18 ml (0.68 fl.oz) only buffers pH 4.00 and 7.00
02	250 ml (8.45 fl.oz)
10	1000 ml (0.26 US gal)
50	5000 ml (1.32 US gal) canister for Topcal S
Certificate	
A	Buffer analysis certificate
Version	
1	Standard

CPY20- Complete order code

Technical ORP buffer solutions

- +220 mV, pH 7, 100 ml (3.4 fl.oz.); Order No. CPY3-0
- +468 mV, pH 0.1, 100 ml (3.4 fl.oz.); Order No. CPY3-1

Measuring cable

Memosens data cable CYK10

- For digital sensors with Memosens technology
- Order according to product structure (→ Online Configurator, www.products.endress.com/cyk10)

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