

Technical Information

Memosens CPS11E

pH sensor for standard applications in process technology and environmental engineering



Digital with Memosens 2.0 technology

Application

- Long-term monitoring and limit control in processes with stable process conditions
 - Chemical industry: strong acids/bases, plastic, pulp and paper industry
 - Power plants (e.g. flue gas cleaning), oil and gas
 - Incinerator plants
- Water and wastewater treatment
 - Boiler feedwater and cooling water
 - Well water and drinking water
 - All industrial and municipal treatment plants

With ATEX, IECEx, CSA C/US, NEPSI, Japan Ex and INMETRO approvals for use in hazardous areas Zone 0, Zone 1 and Zone 2.

Your benefits

- Low-maintenance and robust thanks to large PTFE ring junction
- Can be used at pressures up to 17 bar (246.5 psi) (absolute)
- Process glass for standard applications (application A)
- Process glass also for highly alkaline applications (application B)
- Process glass for applications in media containing hydrofluoric acid (application F)
- Integrated NTC 30K temperature sensor for effective temperature compensation
- Optional: for media with low conductivity (reference systems AS and TS with salt storage)
- Optional: poison-resistant reference with improved ion trap (reference systems TA and TS)

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

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.

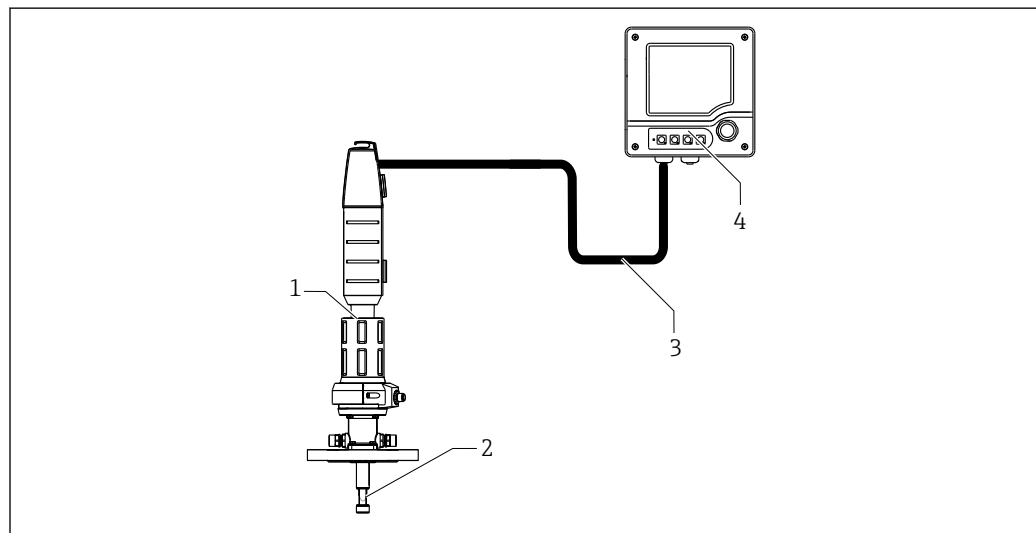
Measuring system

A complete measuring system consists of the following components at least:

- pH sensor CPS11E
- Transmitter, e. g. Liquiline CM42, CM44x
- Memosens data cable CYK10 or CYK20
- Assembly
 - Immersion assembly, e. g. Dipfit CPA111
 - Flow assembly, e. g. Flowfit CPA250
 - 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



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1 Example of a measuring system for pH measurement

- 1 Retractable assembly Cleanfit CPA871
- 2 pH sensor CPS11E
- 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
 - 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
 - Date of initial commissioning
 - Maximum temperature value
 - Hours of operation under extreme conditions
 - Number of sterilizations
 - CIP counter
 - Sensor load

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

Dependability

Reliability

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:

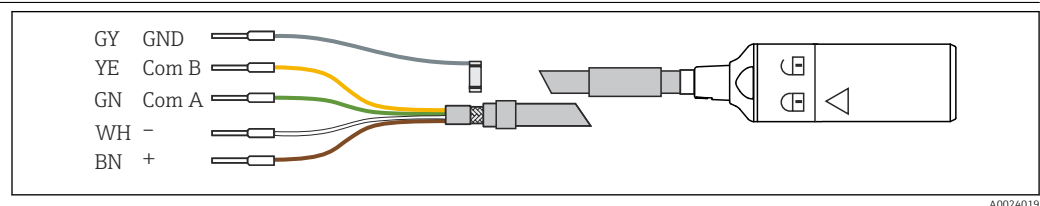
- All problems caused by moisture are eliminated:
 - No corrosion at the connection
 - Measured values cannot be distorted by moisture
- The transmitter is galvanically decoupled from the medium. Issues concerning "symmetrical high-impedance" or "asymmetry" or the type of impedance converter are a thing 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 Temperature
Measuring range	<p>Application A</p> <ul style="list-style-type: none"> ■ pH: 1 to 12 ■ Temperature: -15 to 80 °C (5 to 176 °F) <p>Application B</p> <ul style="list-style-type: none"> ■ pH: 0 to 14 ■ Temperature: 0 to 135 °C (32 to 275 °F) <p>Application F</p> <ul style="list-style-type: none"> ■ pH: 0 to 10 ■ Temperature: 0 to 70 °C (32 to 158 °F) <p> Pay attention to the operating conditions in the process.</p>


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

- AA: PTFE reference junction, bridging electrolyte: 3M KCl, Ag/AgCl lead
- AS: PTFE reference junction, bridging electrolyte: saturated KCl, Ag/AgCl lead
- TA: PTFE reference junction, Ag \pm -free, ion trap, bridging electrolyte: 3M KCl, Ag/AgCl lead
- TS: PTFE reference junction, Ag \pm -free, ion trap, bridging electrolyte: saturated KCl, Ag/AgCl lead

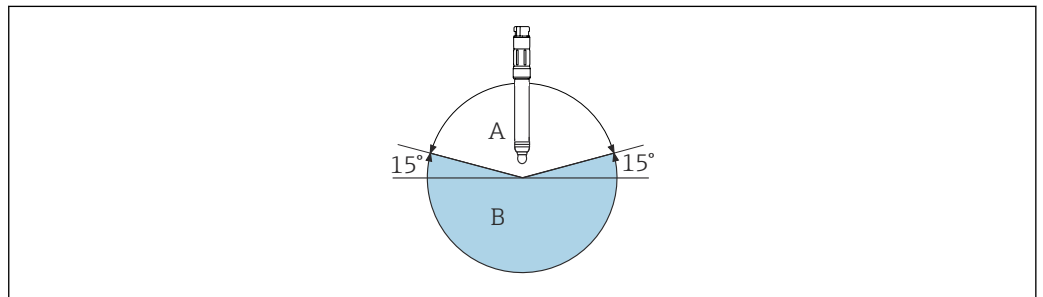
Reference system TS may display incorrect measured values in the event of rapid temperature changes such as those during CIP and autoclaving. We recommend use of the sensor for applications with temperatures that are as constant as possible.

Mounting


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.




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 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 BA01988C

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

Process

Process temperature range	Application A:	-15 to 80 °C (5 to 176 °F)
	Application B:	0 to 135 °C (32 to 275 °F)
	Application F:	0 to 70 °C (32 to 158 °F)

Process pressure range	Applications A and B:	0.8 to 17 bar (11.6 to 246.5 psi) absolute
	Application F:	0.8 to 7 bar (11.6 to 101.5 psi) absolute

⚠ CAUTION

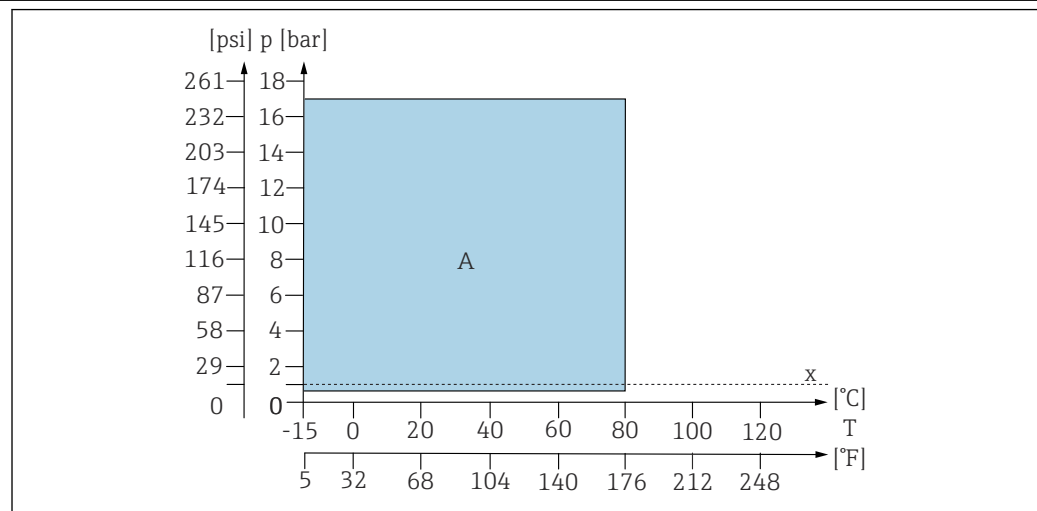
Pressurization of sensor due to prolonged use under increased process pressure

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.

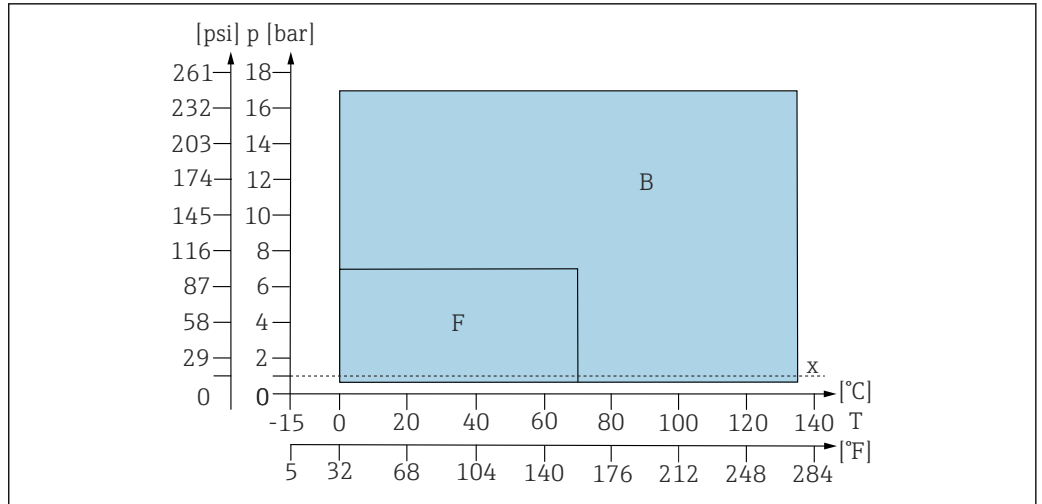
Conductivity	Reference system AA, TA:	minimum 50 µS/cm (minimized flow; pressure and temperature must remain constant)
	Reference system AS, TS:	minimum 0.1 µS/cm (stainless steel flow assembly with grounding; stable and minimized flow; pressure and temperature must be stable)

Pressure-temperature ratings



4 Pressure/temperature ratings

- A Application A
- x Atmospheric pressure



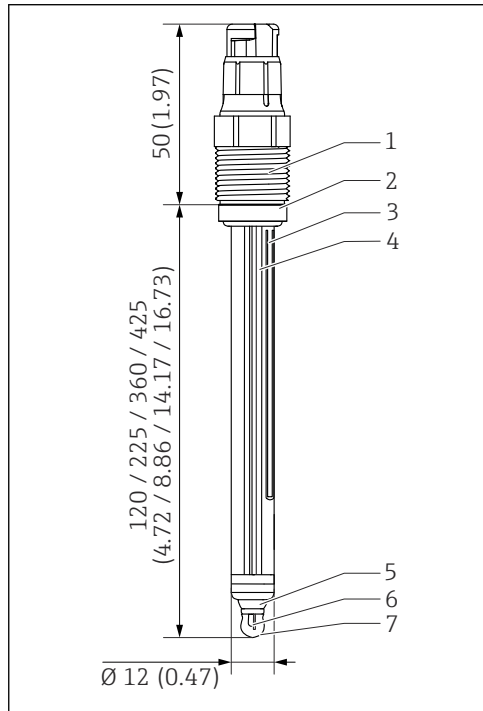
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5 Pressure/temperature ratings

- B Application B
- F Application F
- x Atmospheric pressure

Mechanical construction

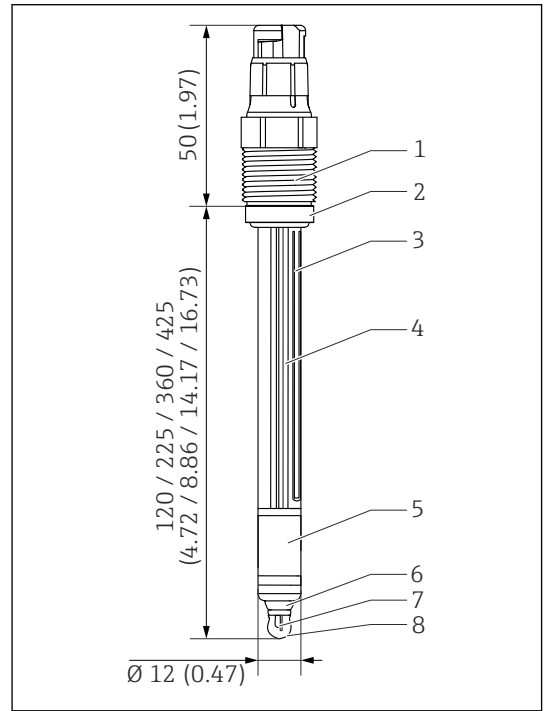
Design, dimensions



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6 CPS11E without salt storage (reference system AA). Unit: mm (in)

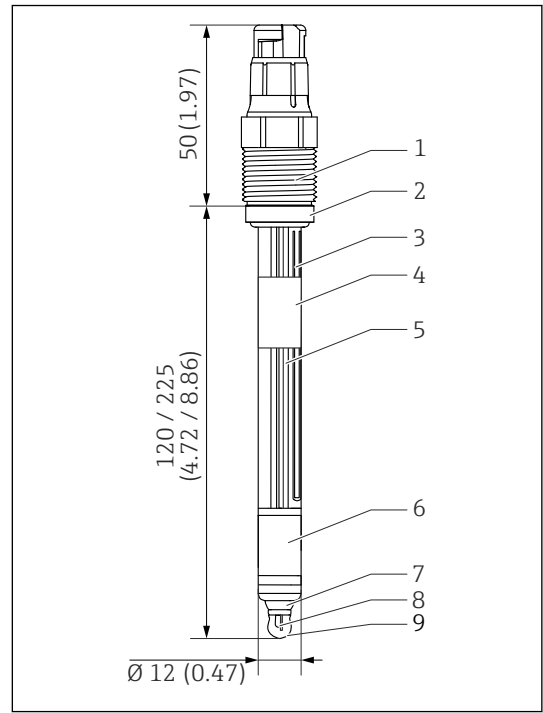
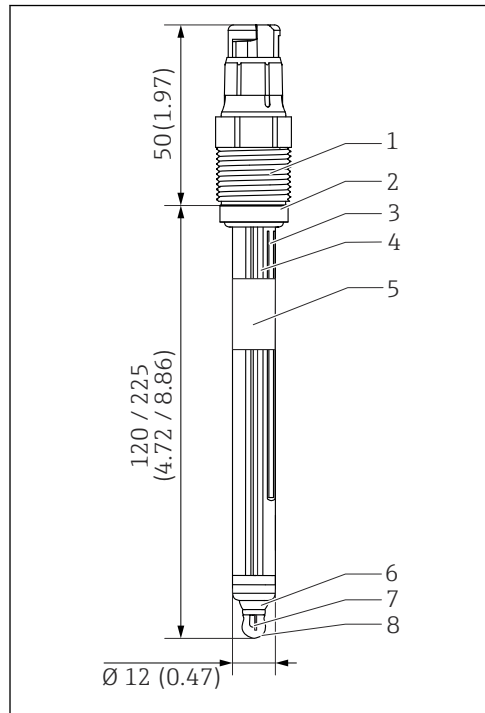
- 1 Memosens plug-in head with process connection
- 2 O-ring with thrust collar
- 3 Reference lead
- 4 pH reference lead
- 5 Junction
- 6 Temperature sensor
- 7 pH glass membrane



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7 CPS11E with ion trap (reference system TA). Unit: mm (in)

- 1 Memosens plug-in head with process connection
- 2 O-ring with thrust collar
- 3 Reference lead
- 4 pH reference lead
- 5 Ion trap
- 6 Junction
- 7 Temperature sensor
- 8 pH glass membrane



8 CPS11E with salt storage (reference system AS). Unit: mm (in)

9 CPS11E with ion trap and salt storage (reference system TS). Unit: mm (in)

- 1 Memosens plug-in head with process connection
- 2 O-ring with thrust collar
- 3 Reference lead
- 4 pH reference lead
- 5 Salt storage
- 6 Junction
- 7 Temperature sensor
- 8 pH glass membrane

- 1 Memosens plug-in head with process connection
- 2 O-ring with thrust collar
- 3 Reference lead
- 4 Salt storage
- 5 pH reference lead
- 6 Ion trap
- 7 Junction
- 8 Temperature sensor
- 9 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 A, B, F
	Metal lead	Ag/AgCl
	Open aperture	Ring-shaped PTFE junction, sterilizable
	O-ring	FKM
	Process coupling	PPS fiber-glass reinforced
	Nameplate	Ceramic metal oxide

Temperature sensor	NTC 30K
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Plug-in head	Memosens plug-in head for digital, non-contact data transmission, pressure resistance 16 bar (232 psi) (relative)
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Process connections	Pg 13.5
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