

# Technical Information

## Memosens CPS31D and Ceratex CPS31

pH sensors for drinking water and swimming pool water

Digital with Memosens technology or analog  
Gel-filled reference system with ceramic junction



### Application

- Drinking water
- Swimming pool water
- pH compensation during the measurement of free chlorine

### Your benefits

- One or three ceramic junctions
- Optional salt storage for extended operating life
- Very low ion depletion of electrolyte
- Gel filling, no electrolyte refill required
- Memosens plug-in head
- ESA or GSA plug-in head

### 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

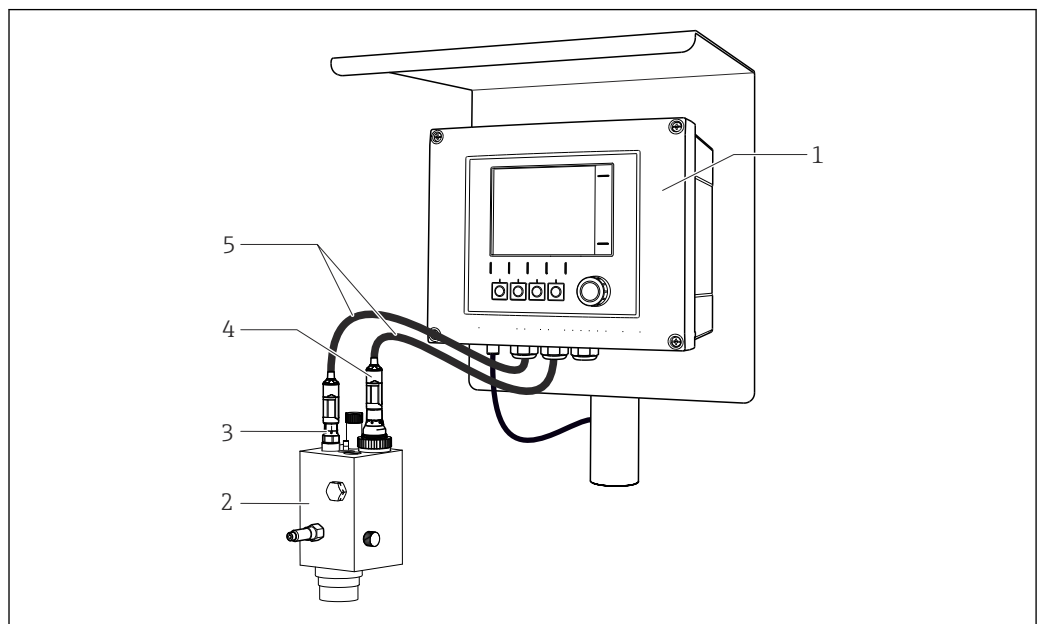
The pH value is used as a unit of measurement for the acidity or alkalinity of a medium. The membrane glass of the sensor supplies an electrochemical potential depending on the pH value of the medium. This potential is generated by the selective accumulation of H<sup>+</sup> ions on the outer layer of 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 comprises:

- CPS31D or CPS31 pH sensor
- Transmitter, e.g. Liquiline CM44x (for CPS31D with Memosens technology)
- Measuring cable, e.g. CYK10 for CPS31D
- Immersion, flow or retractable assembly, e.g. Flowfit CYA27



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1 Sample measuring system: pH compensation for chlorine measurement

- 1 Liquiline CM44x transmitter
- 2 Flowfit CYA27 assembly
- 3 CPS31D pH sensor
- 4 Memosens CCS51D chlorine sensor
- 5 Memosens data cable CYK10

**Communication and data processing (CPS31D only)**

Digital sensors are able to store the following system data in the sensor:

- Manufacturer 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)
  - Temperature offset
  - Number of calibrations
  - Serial number of the transmitter used to perform the last calibration
- Application data
  - Temperature application range
  - pH application range
  - Date of first commissioning
  - Maximum temperature value
  - Hours of operation at temperatures over 80 °C (176 °F)/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
  - Resistance of glass membrane

The data shown above can be displayed with the Liquisys CPM223, Liquiline M CM42 and Liquiline CM44x transmitters.

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**Reliability**

**Reliability (CPS31D only)**

**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.

**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.
- The saved application data of the sensor can be used to determine the continued use of the sensor in a targeted manner.

**Interference immunity**

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
- EMC safety is guaranteed by screening measures for the digital transmission of measured values

## Input

### Measured variables

pH value  
Temperature

### Measuring range

- pH: 1 to 12
- Temperature: 0 to 80 °C (32 to 176 °F)

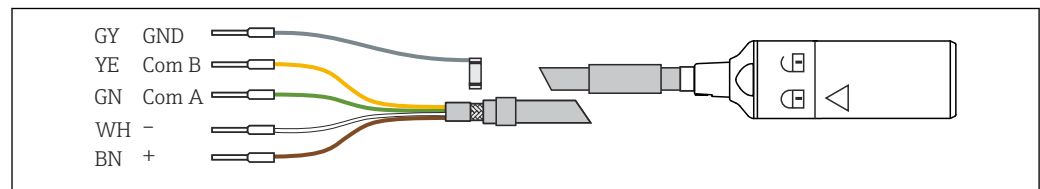


Pay attention to the operating conditions in the process.

## Energy supply

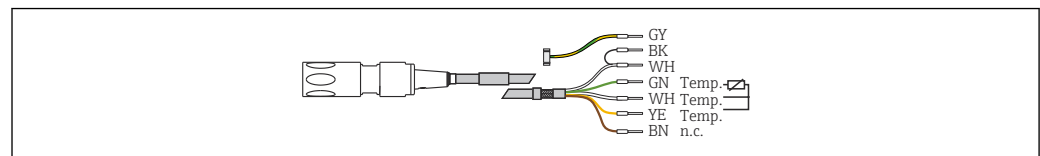
### Electrical connection

#### Memosens sensors



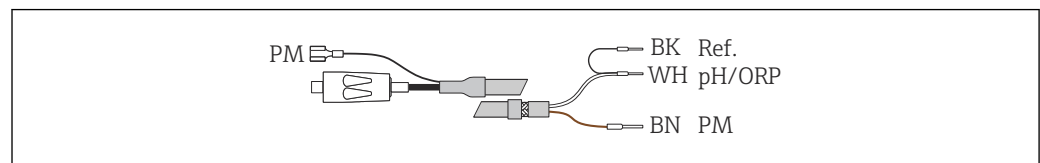
2 Measuring cable CYK10 or CYK20

#### Sensors with TOP68 plug-in head



3 Measuring cable CPK9

#### Sensors with GSA plug-in head



4 Measuring cable CPK1

- ▶ Please follow the connection instructions contained in the Operating Instructions for the transmitter.

## Installation

### Installation instructions

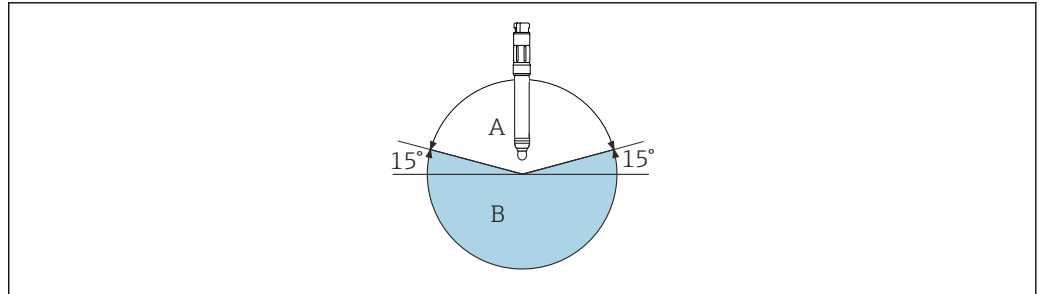
- Do not install the sensors upside-down.
- The angle of inclination from the horizontal must be at least 15°.

**NOTICE**

**Angle of inclination of the sensor less than 15°**

An air bubble forms in the glass bulb and there is then no guarantee that the pH membrane is completely covered with inner electrolyte!

- ▶ Select the installation angle of the sensor so that it does not drop below 15°.



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5 Installation angle at least 15° from the horizontal

A Permitted orientation

B Incorrect orientation

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).

## Environment

Operating 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 67: GSA plug-in head (with closed connector system)

IP 68: ESA plug-in head (1 m (3.3 ft) water column, 50 °C (120 °F), 168 h)

IP 68: Memosens plug-in head (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: 2012

## Process

Process temperature range

0 to 80 °C (32 to 176 °F)

Process pressure range

1 to 4 bar (14.5 to 58 psi) (abs.)

**⚠ CAUTION**

**Pressurization of sensor due to prolonged use under increased process pressure**

Possibility of sudden rupture and injury from glass splinters!

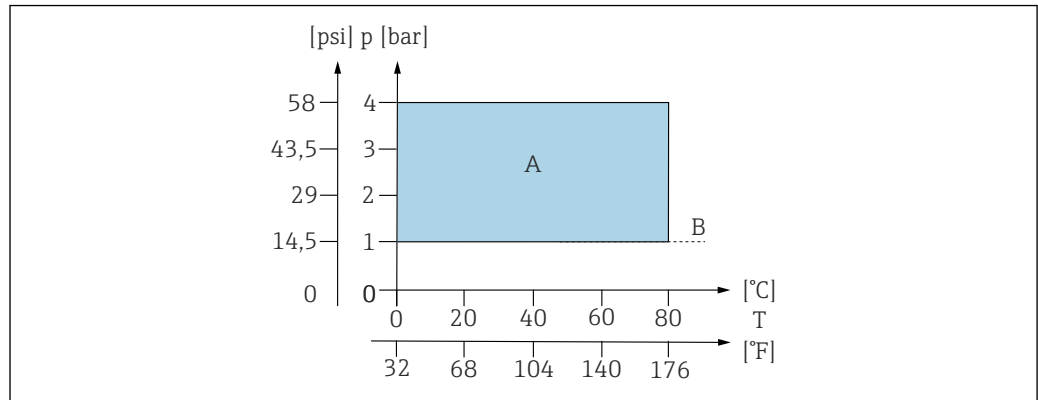
- ▶ Avoid fast heating of these pressurized sensors if they are used under reduced process pressure or under atmospheric pressure.
- ▶ When handling these sensors, always wear protective goggles and appropriate protective gloves.

**Conductivity**

Min. 100  $\mu\text{S}/\text{cm}$

Min. 50  $\mu\text{S}/\text{cm}$  for "AC" version (three junctions)

**Pressure/temperature ratings**



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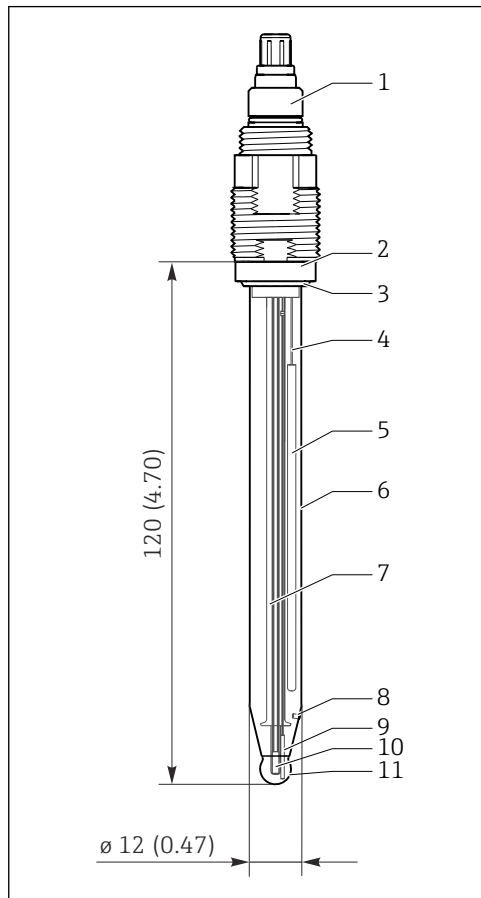
6 Pressure/temperature rating

A Application

B Atmospheric pressure

## Mechanical construction

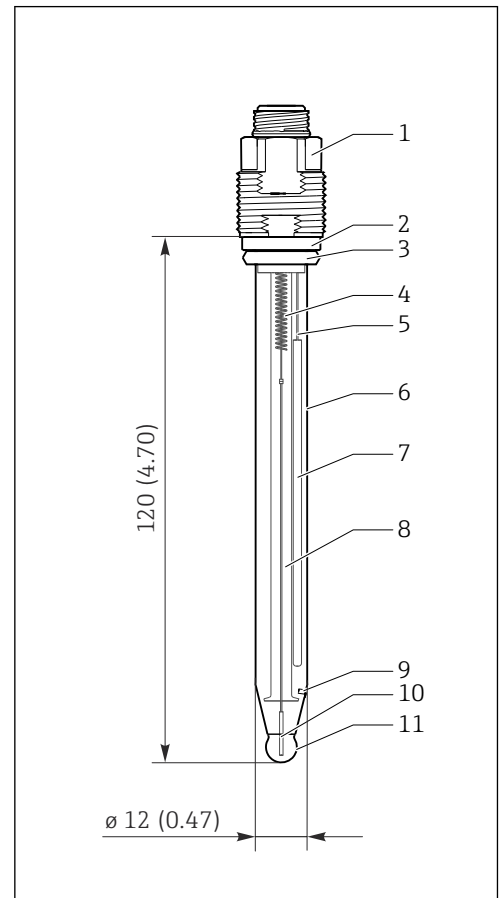
### Design, dimensions



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7 CPS31 with ESA plug-in head

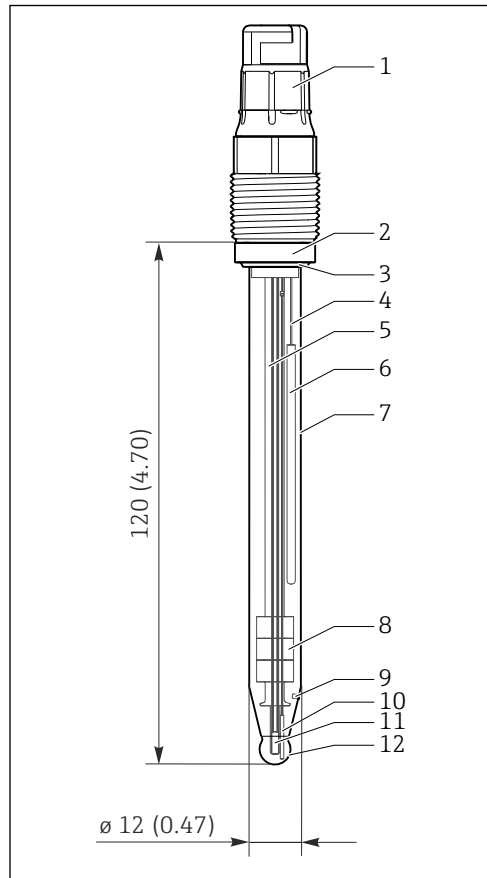
- 1 ESA electrode plug-in head, Pg 13.5
- 2 Thrust collar
- 3 O-ring
- 4 Reference lead, external
- 5 Capillary
- 6 Shaft tube
- 7 Internal pipe
- 8 Junction
- 9 Temperature sensor
- 10 Ag/AgCl internal reference lead
- 11 pH membrane glass



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8 CPS31 with GSA plug-in head

- 1 GSA electrode plug-in head, Pg 13.5
- 2 Thrust collar
- 3 O-ring
- 4 Pressure spring
- 5 Reference lead, external
- 6 Shaft tube
- 7 Capillary
- 8 Internal pipe
- 9 Junction
- 10 Ag/AgCl internal reference lead
- 11 pH membrane glass



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- 9 CPS31D
- 1 Memosens plug-in head
  - 2 Thrust collar
  - 3 O-ring
  - 4 Reference lead, external
  - 5 Internal pipe with reference leads
  - 6 Capillary
  - 7 Shaft tube
  - 8 Salt rings (optional)
  - 9 Junction
  - 10 Ag/AgCl internal reference lead
  - 11 Temperature sensor
  - 12 pH membrane glass

<b>Weight</b>	0.1 kg (0.2 lb)	
<b>Materials</b>	Electrode shaft:	Glass to suit process
	pH membrane glass:	Type A
	Metal lead:	Ag/AgCl
	Diaphragm:	Ceramic
<b>Temperature sensor</b>	CPS31D:	NTC 30K
	CPS31:	Pt 100
<b>Plug-in head</b>	CPS31D:	Memosens plug-in head for digital, non-contact data transmission
	CPS31:	ESA, GSA
<b>Process connections</b>	Pg 13.5	



**Reference system** Ag/AgCl, gel, 3M KCl  
 Optional: Salt ring, KCl saturated

## Certificates and approvals

Current certificates and approvals that are available for the product can be selected via the Product Configurator at [www.endress.com](http://www.endress.com):


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

## Ordering information

**Product page** [www.endress.com/cps31d](http://www.endress.com/cps31d)  
[www.endress.com/cps31](http://www.endress.com/cps31)

**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. **Apply:** 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. **Show details:** Open this tab for the product in the shopping cart.
  - ↳ The link to the CAD drawing is displayed. If selected, the 3D display format is displayed along with the option to download various formats.

**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

## 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.

**Assemblies** **Unifit CPA842**

- Installation assembly for food, biotechnology and pharmaceuticals
- With EHEDG and 3A certificate
- Product Configurator on the product page: [www.endress.com/cpa842](http://www.endress.com/cpa842)

 Technical Information TI00306C

**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](http://www.endress.com/cpa875)

 Technical Information TI01168C

**Dipfit CPA111**

- Immersion and installation assembly made of plastic for open and closed vessels
- Product Configurator on the product page: [www.endress.com/cpa111](http://www.endress.com/cpa111)

 Technical Information TI00112C

**Flowfit CYA27**

- Modular flow assembly for multiparameter measurements
- Product Configurator on the product page: [www.endress.com/cya27](http://www.endress.com/cya27)

 Technical Information TI01559C

**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](http://www.endress.com/cpa640)

 Technical Information TI00246C

**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) or to standard reference material of NIST (National Institute of Standards and Technology) according to DIN 19266 by a laboratory accredited by the DAkkS (German accreditation body) according to DIN 17025.

Product Configurator on the product page: [www.endress.com/cpy20](http://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](http://www.endress.com/cyk10)

 Technical Information TI00118C


**Measuring cable CPK9**

- Terminated measuring cable for connecting analog sensors with TOP68 plug-in head
- Selection in accordance with product structure
- Product Configurator on the product page: [www.endress.com/cpk9](http://www.endress.com/cpk9)

 Technical Information TI00118C

**CPK1**

- For pH/ORP sensors with GSA plug-in head
- Product Configurator on the product page: [www.endress.com/cpk1](http://www.endress.com/cpk1)
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 For ordering information, contact your sales office or see [www.endress.com](http://www.endress.com).

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[www.addresses.endress.com](http://www.addresses.endress.com)

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