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Technical Information
Memosens CPS61E

pH sensor for bioreactors in life sciences and for the food industry

Digital with Memosens 2.0 technology
For hygienic production processes with ion trap for long-term stable reference

Application

Hygienic and sterile applications (sterilizable, autoclavable):
- Bioreactor/fermenter
- Biotechnology
- Pharmaceutical industry
- Foods

Your benefits

- Suitable for CIP/SIP cleaning and autoclavable at temperatures up to 140 °C (284 °F)
- Pressurized reference with integrated pressure indicator, specially for fermentation processes (TP reference system)
- Choice of 1 or 3 ceramic junctions (TB and TC reference system)
- Flexible installation with upside-down mounting versions (TU and TW reference system)
- Very long service life thanks to poison-resistant reference with improved ion trap
- Biocompatibility with regard to biological reactivity in vitro (cytotoxicity) and in vivo successfully tested for the relevant parts in contact with the process medium
- Parts in contact with the process medium not made from materials derived from animals. Minimized TSE/BSE risk in accordance with EMA
- Various optional approvals for use in non-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

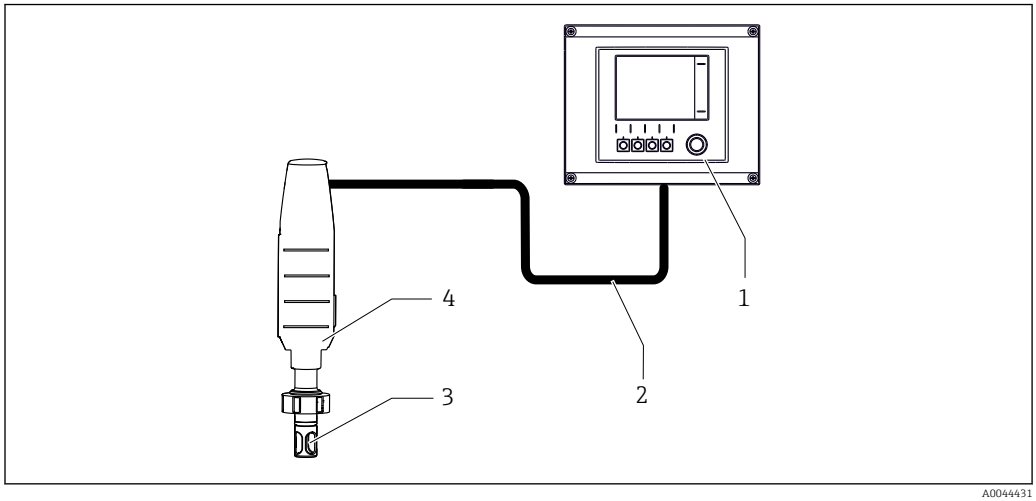
pH measurement

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.

Measuring system

A complete measuring system comprises:
- pH sensor CPS61E
- Memosens data cable CYK10 or CYK20
- Transmitter, e.g. Liquiline CM44, Liquiline CM42
- Assembly
  - Retractable assembly, e.g. Cleanfit CPA875
  - 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 Transmitter Liquiline CM44x
2 Memosens data cable CYK10
3 pH sensor CPS61E
4 Permanent installation assembly CPA842

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, CM44x/R 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

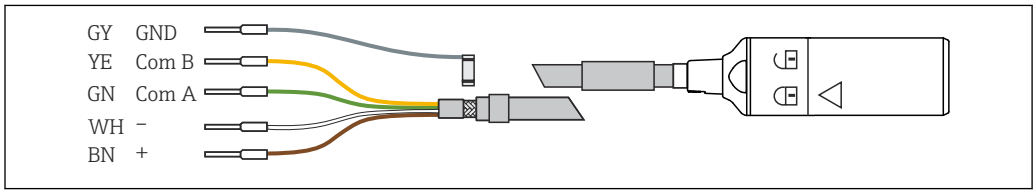
Measuring range

Application range M and N
- pH: 0 to 14
- Temperature: 0 to 100 °C (32 to 212 °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

TB reference system:	Ag/AgCl lead with ion trap, reference and bridging electrolyte 3 M KCl, acrylamide-free, flowable gel electrolyte, 1 ceramic junction for transfer
TC reference system:	Ag/AgCl lead with ion trap, reference and bridging electrolyte 3 M KCl, acrylamide-free, flowable gel electrolyte, 3 ceramic junctions for transfer
TW reference system:	Ag/AgCl lead with ion trap, reference and bridging electrolyte 3 M KCl, acrylamide-free, solidified gel electrolyte, 3 ceramic junctions for transfer

TP reference system:	Ag/AgCl lead with ion trap, reference and bridging electrolyte 3 M KCl, acrylamide-free, flowable gel electrolyte, pressurized 7 bar (102 psi) (absolute); display via pressure indicator, 1 ceramic junction for transfer
TU reference system:	Ag/AgCl lead with ion trap, reference and bridging electrolyte 3 M KCl, acrylamide-free, solidified gel electrolyte, 1 ceramic junction for transfer

Pay attention to the operating conditions in the process.

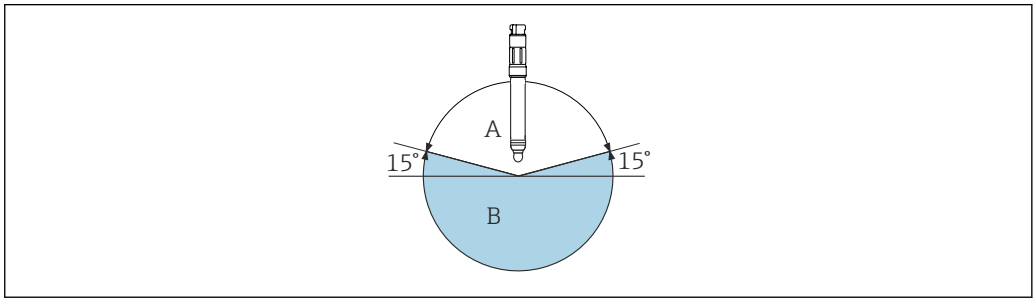
Installation

Orientation

TB, TC and TP reference system

- Do not install the sensor upside-down.
- The angle of inclination 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 reference and membrane glass is then no longer guaranteed.

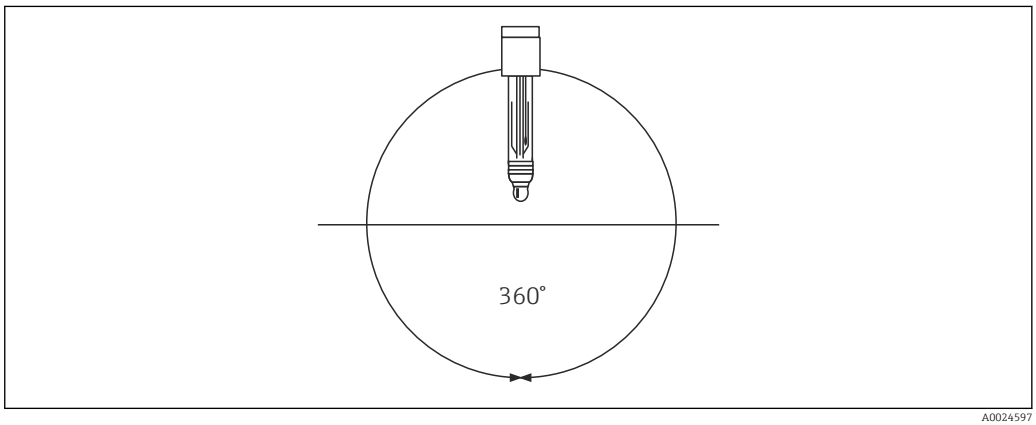


3 *Installation angle at least 15° from the horizontal*

A Permitted orientation
B Incorrect orientation

TU and TW reference system

- The sensor is suitable for upside-down installation.
- Install the sensor at any angle.



4 *Any installation angle*

Installation instructions

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

For detailed information on removing the wetting cap, see BA01988C

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).

TP reference system

⚠ CAUTION

Glass sensor with pressurized reference
Possibility of sudden rupture and injury from glass splinters!
- ▶ Always wear protective goggles when working with these sensors.

For detailed information on removing the wetting cap, see BA01988C

For correct pH measurement:

1. Before commissioning, open the protective packaging by pulling the red tear tab.
2. Completely remove the protective packaging.
3. Remove the wetting cap with bayonet connector.
4. Remove the reusable protective netting from the sensor.
5. For optimum accuracy, insert the sensor into a calibration buffer solution with a pH of 15 to 20 min for 4 to 9 before calibration.
6. Put the sensor into operation.

Hygienic requirements

Special Documentation for hygienic applications, SD02751C

The following must be observed for easy-to-clean installation that complies with 3-A or EHEDG requirements:
- Use a certified process assembly
- For 3-A-compliant applications only: Use a process assembly with a protective guard around the sensor to prevent the glass sensors from breaking in the process
- The installation must be self-draining
- Dead areas should be avoided

Environment

Ambient temperature range	**NOTICE** **Risk of damage from frost!** ▶ Do not use the sensor at temperatures below 0 °C (32 °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	Application M: 0 to 100 °C (32 to 212 °F) Up to 130 °C (266 °F) for sterilization Application N: 0 to 100 °C (32 to 212 °F)

Up to 140 °C (284 °F) for sterilization

Process pressure range

⚠ CAUTION

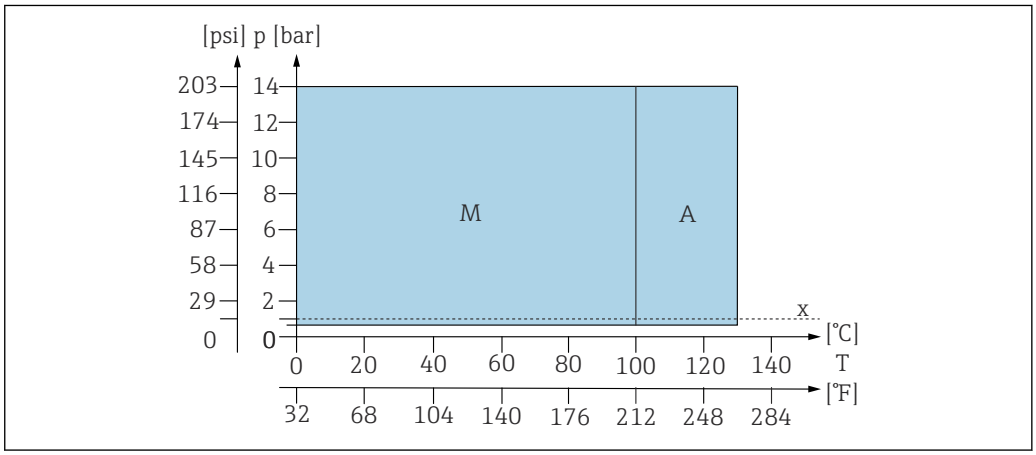
Pressurization of sensor due to prolonged use under increased process pressure
Possibility of sudden rupture and injury from glass splinters!
- ▶ Avoid fast heating of these pressurized sensors if they are used under reduced process pressure or under atmospheric pressure.
- ▶ When handling these sensors,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

Application M	0.8 to 14 bar (11.6 to 203 psi) absolute
Application N	0.8 to 7 bar (11.6 to 101.5 psi) absolute

Conductivity

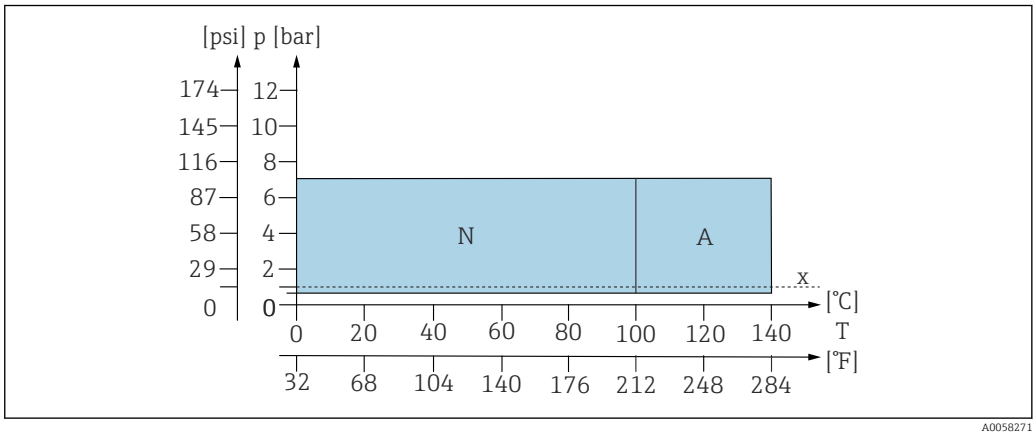
Minimum 100 µS/cm (minimized flow; pressure and temperature must remain constant)

Pressure/temperature ratings



5 *Pressure/temperature chart*

A Short periods for SIP and autoclaving for application M
M Application M
x Atmospheric pressure

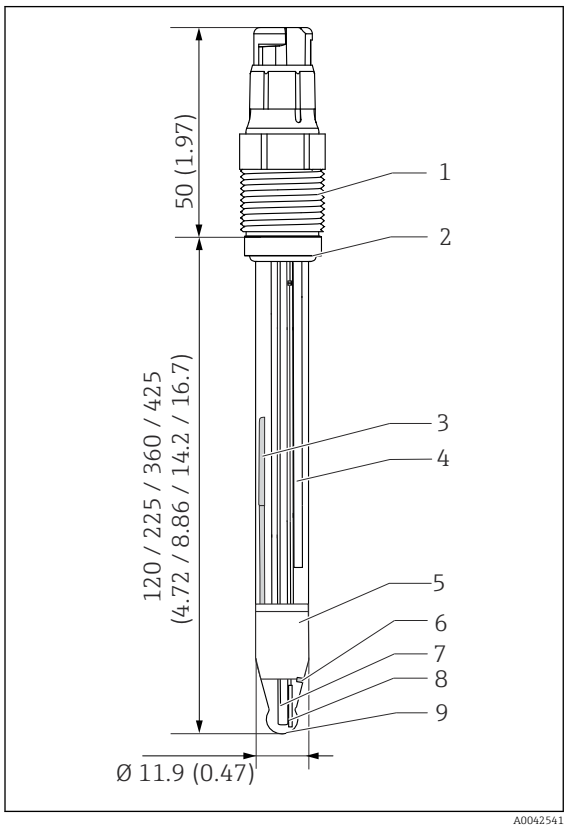


6 *Pressure/temperature chart*

A Short periods for SIP and autoclaving for application N
N Application N
x Atmospheric pressure

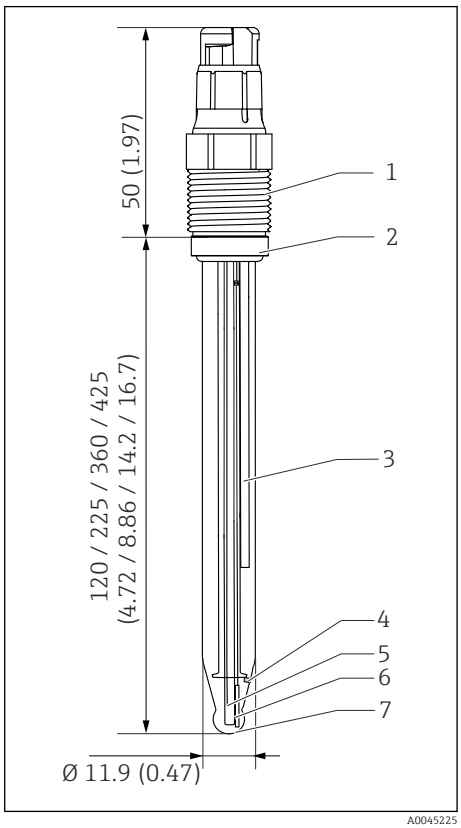
Mechanical construction

Design, dimensions



7 *CPS61E TB, TC and TP reference system. Unit: mm (in)*

1 *Memosens plug-in head with process connection*
2 *O-ring with thrust collar*
3 *Pressure indicator with air bubble (only for TP reference system)*
4 *Ag/AgCl lead*
5 *Ion trap*
6 *Ceramic junction*
7 *Temperature sensor*
8 *pH internal lead*
9 *pH glass membrane*



8 *CPS61E TU and TW reference system. Unit: mm (in)*

1 *Memosens plug-in head with process connection*
2 *O-ring with thrust collar*
3 *Ag/AgCl lead with ion trap*
4 *Ceramic junction*
5 *Temperature sensor*
6 *pH internal lead*
7 *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 N
Metal lead	Ag/AgCl
Junction	Ceramic junction, zirconium dioxide
O-ring	FKM
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 T3/T4/T6 Ga

IECEx
Ex ia IIC T3/T4/T6 Ga

NEPSI
Ex ia IIC T3/T4/T6 Ga

CSA C/US
- IS CL I DIV 1, GP A, B, C, D Ex ia IIC T3/T4/T6
- CL 1 Zone 0, AEx ia IIC T3/T4/T6 Ga

Japan Ex
Ex ia IIC T3/T4/T6 Ga

INMETRO
Ex ia IIC T3/T4/T6 Ga

Korea Ex
Ex ia IIC T3/T4/T6 Ga

EAC Ex
EAC Ex 0Ex ia IIC T3/T4/T6 Ga X

UKCA Ex
II 1G Ex ia IIC T3/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

The following tests, certificates and declarations are available for the product depending on the order version selected:
- ASME BPE CoC
- Compliance with requirements derived from cGMP
- FDA 21 CFR
- EU Food Contact Materials REG (EC) 1935/2004
- CN Food Contact Materials GB 4806
- 3-A Certificate
- EHEDG Certificate
- Substances and allergens

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

Product page

www.endress.com/cps61e

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.

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.

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

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

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 laboratory cable CYK20
- For digital sensors with Memosens technology
- Product Configurator on the product page: www.endress.com/cyk20

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