

# Technical Information

## Orbipore CPS91D and CPS91

pH electrodes, analog or with digital Memosens technology



With open aperture for contaminated media, optionally available with integrated temperature sensor for analog sensors

### Application

- Chemical processes
- Pulp and paper industry
- Flue gas cleaning
- Contaminated media:
  - Solids
  - Emulsions
  - Precipitation reactions

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

### Your benefits

- Open aperture for use in contaminated media
- Low maintenance thanks to gel filling
- Optional: poison-resistant reference with ion trap
- Long service life thanks to new, stabilized bridging electrolyte gel
- Not affected by fluctuations in pressure and temperature
- Integrated temperature sensor for effective temperature compensation (optional for CPS91)

### Other advantages of Memosens technology

- Maximum process safety
- 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 with the Memobase Plus CYZ71D

## Function and system design

### Measuring principle

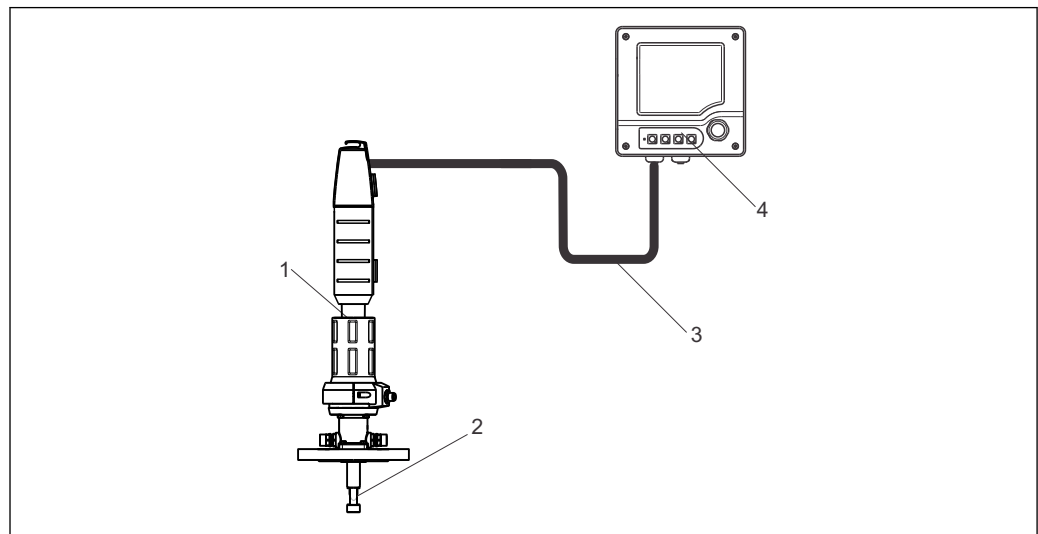
#### pH measurement

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.

### Measuring system

A complete measuring system comprises at least the following components:

- pH electrode CPS91D or CPS91
- Transmitter, e.g. Liquiline CM42, CM44x, Mycom S CPM153, Liquisys M CPM2x3
- Memosens data cable CYK10 for Memosens sensors or CPK9 for analog sensors
- Immersion, flow or retractable assembly, e.g. Cleanfit CPA871



A0025757

- 1 Example of a measuring system for pH measurement
- 1 Retractable assembly Cleanfit CPA871
- 2 pH electrode CPS91D
- 3 Memosens data cable CYK10
- 4 Liquiline M CM42 two-wire transmitter for hazardous area

## CPS91D 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)
  - Temperature offset
  - Number of calibrations
  - Serial number of the transmitter used to perform the last calibration
- Operating data
  - Temperature application range
  - pH application range
  - Date of initial commissioning
  - Maximum temperature value
  - Hours of operation under extreme conditions
  - Number of sterilizations
  - Resistance of glass membrane

You can display the abovementioned data using the Liquiline CM44x, CM42 and Memobase Plus CYZ71D.

## Dependability

---

### Reliability

#### Easy handling

Sensors with Memosens technology have an integrated electronics unit that stores calibration data and other information (e.g. total operating hours 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 using external storage media and evaluation programs, e.g. Memobase Plus CYZ71D. Thus, the current application of the sensors can be made to depend on their previous history.

---

### 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

**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:
  - Plug-in connection free from corrosion
  - Measured values cannot be distorted by moisture.
  - 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.
- Intrinsically safe electronics mean operation in hazardous areas is not a problem.

**Input****Measured variables**

pH value

Temperature

**Measuring range**

0 to 14 pH

0 to 110 °C (32 to 230 °F)



Please note the process operating conditions.

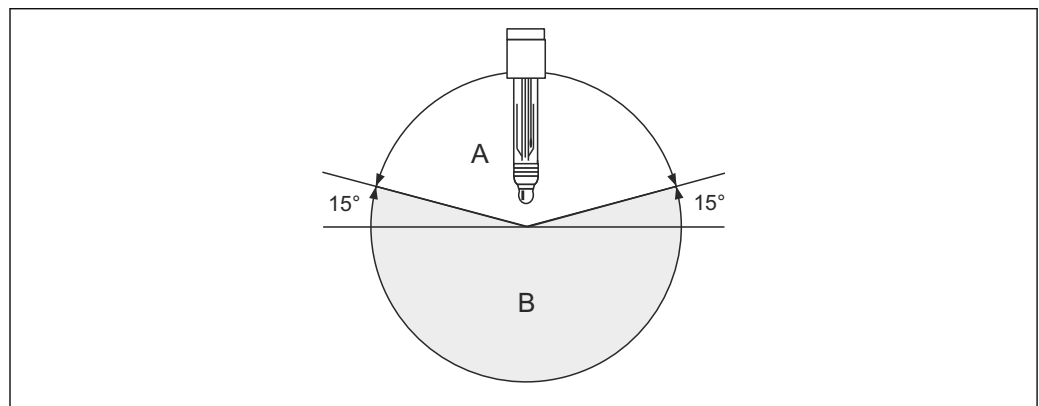
**Installation****Installation instructions**

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.

**NOTICE**

**Before screwing in the electrode, make sure the threaded connection of the assembly is clean and runs smoothly.**

- ▶ Screw in the electrode finger-tight (3 Nm)! (Data apply only if installing with Endress+Hauser assemblies.)
- ▶ Make sure to follow the installation instructions in the Operating Instructions of the used assembly.



A0024316

2 Electrode installation; installation angle at least 15° from the horizontal

A Permitted orientation

B Forbidden orientation

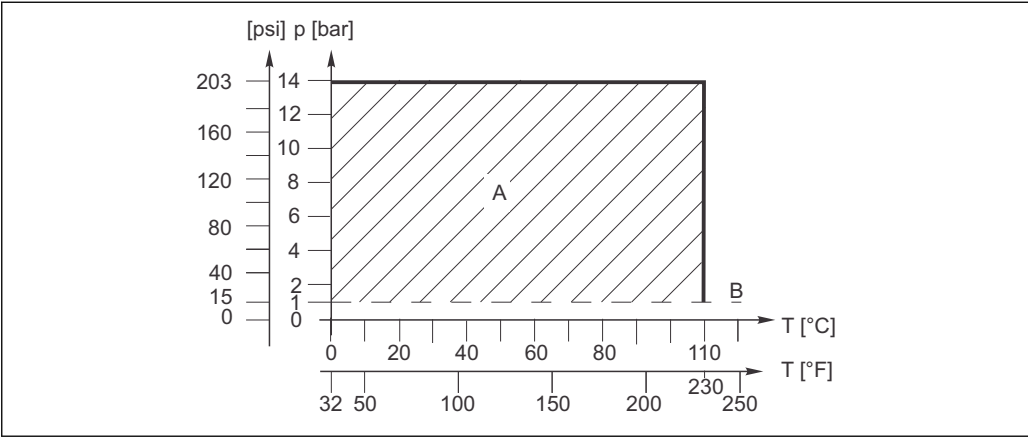
## Environment

Ambient temperature range	<b>NOTICE</b>	
	<b>Risk of damage due to frost</b> ► The sensor must not be used if the temperature drops below -15 °C (5 °F).	
Storage temperature	0 to 50 °C (32 to 122 °F)	
Degree of protection	IP 68:	Memosens plug-in head, (10 m (33 ft) water column, 25 °C (77 °F), 45 days, 1 M KCl)
	IP 68:	TOP68 plug-in head, (1 m (3.3 ft) water column, 50 °C (122 °F), 168 h)
	IP 67:	GSA plug-in head (with closed connector system)

## Process

Process temperature	0 to 110 °C (32 to 230 °F)	
Process pressure (absolute)	1 to 14 bar (15 to 203 psi)	
	<b>CAUTION</b> <b>Pressurization of sensor due to prolonged use under increased process pressure</b> Risk of injury from glass breakage ► Avoid excessive heating of such sensors if using them under reduced process pressure or under atmospheric pressure. ► When handling such sensors, wear protective goggles and suitable gloves.	

Pressure-temperature ratings



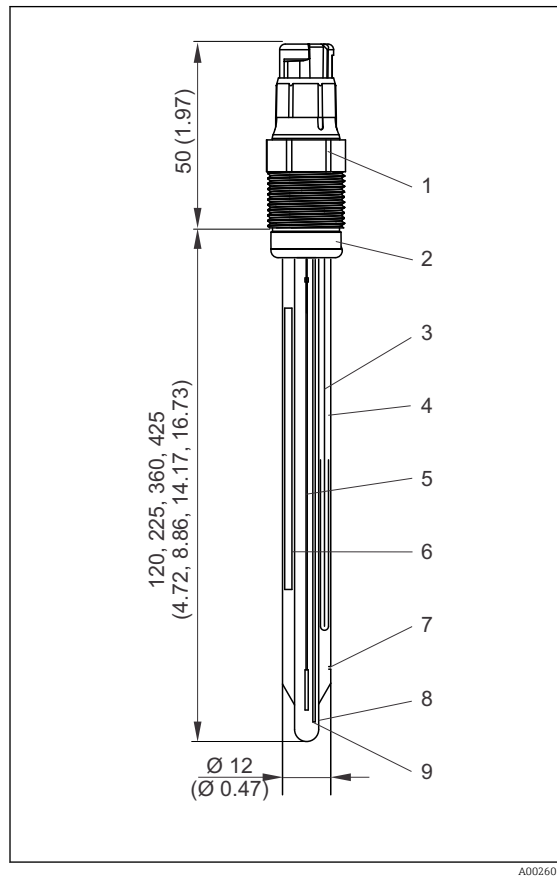
3 Pressure-temperature ratings

A Application CPS91(D)  
B Atmospheric pressure

Minimum conductivity	Min. 500 µS/cm	
pH range	0 to 14 pH	
	<b>NOTICE</b> <b>Risk of damage to electrode</b> ► Never use the electrode outside of the listed specifications!	

## Mechanical construction

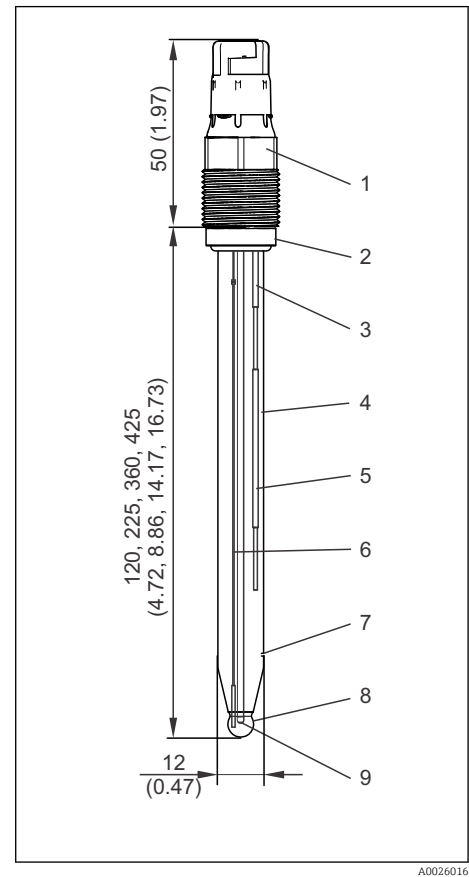
### Design, dimensions CPS91D



A0026015

4 CPS91D with Memosens plug-in head, temperature sensor

- 1 Memosens plug-in head, Pg 13.5
- 2 Viton O-ring with thrust collar
- 3 Ag/AgCl reference lead - reference
- 4 Bridging electrolyte gel
- 5 Ag/AgCl reference lead - pH
- 6 Compensator
- 7 Open aperture
- 8 pH glass membrane
- 9 Temperature sensor

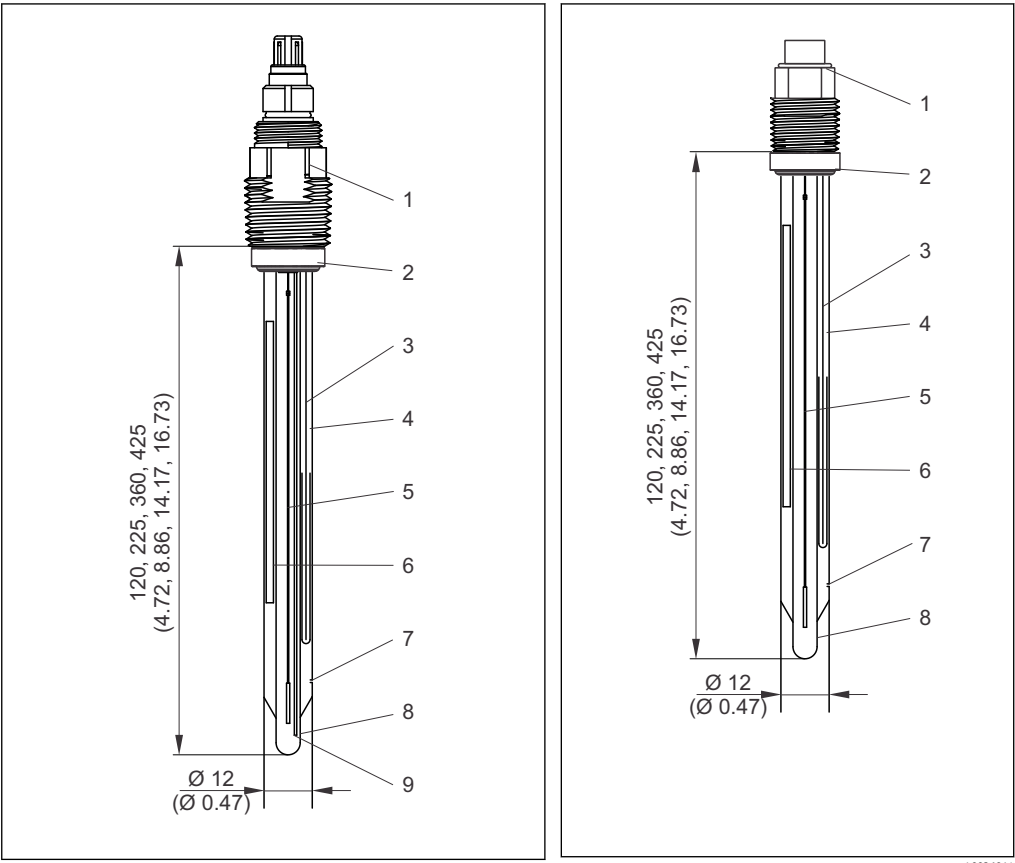


A0026016

5 CPS91D-7BTxx

- 1 Memosens plug-in head, Pg 13.5
- 2 Viton O-ring with thrust collar
- 3 Ag/AgCl reference lead - reference
- 4 Bridging electrolyte gel
- 5 Ion trap
- 6 Ag/AgCl reference lead - pH
- 7 Open aperture
- 8 pH glass membrane
- 9 Temperature sensor

Design, dimensions CPS91



6 CPS91 with TOP68 plug-in head, temperature sensor

- 1 TOP68 plug-in head, ESA, Pg 13.5
- 2 Viton O-ring with thrust collar
- 3 Ag/AgCl reference lead - reference
- 4 Bridging electrolyte gel
- 5 Ag/AgCl reference lead - pH
- 6 Compensator
- 7 Open aperture
- 8 pH glass membrane
- 9 Temperature sensor


7 CPS91 with GSA plug-in head

- 1 GSA plug-in head, Pg 13.5
- 2 Viton O-ring with thrust collar
- 3 Ag/AgCl reference lead - reference
- 4 Bridging electrolyte gel
- 5 Ag/AgCl reference lead - pH
- 6 Compensator
- 7 Open aperture
- 8 pH glass membrane

Weight	0.1 kg (0.2 lbs)	
Materials	Electrode shaft: pH membrane glasses: Metal lead: Diaphragm:	Glass to suit process Type B Ag/AgCl Open aperture junction
Process connection	Pg 13.5	
Temperature sensor	CPS91D: CPS91:	NTC30K Pt100, Pt1000
Plug-in heads	CPS91D:  CPS91:  ESA:  GSA:	Memosens plug-in head for digital, non-contact data transmission  Threaded plug-in head Pg 13.5, TOP68 for electrodes with and without a temperature sensor, 17 bar abs. (246 psi) overpressure protection (threefold), Ex Threaded plug-in head Pg 13.5 for electrodes without a temperature sensor

<b>Reference system</b>	BO version:	Ag/AgCl reference lead with reference electrolyte
	BT version:	Ag/AgCl reference lead with ion trap

## Certificates and approvals

<b>Ex approval for CPS91D</b>	<ul style="list-style-type: none"> <li>■ ATEX II 1G Ex ia IIC T4/T6 Ga</li> <li>■ FM / CSA Class I Div. 2, in conjunction with Liquiline M CM42 and Mycom S CPM153 transmitters</li> </ul>
	 Hazardous area versions of the digital sensors with Memosens technology are marked by a red-orange ring in the plug-in head.
<b>Ex approval for CPS91 (TOP68)</b>	<ul style="list-style-type: none"> <li>■ ATEX II 1G Ex ia IIC T4/T6 Ga</li> <li>■ FM Class I Div. 2, in conjunction with Liquiline M CM42 and Mycom S CPM153 transmitters</li> </ul>
<b>TÜV certificate for Memosens plug-in head</b>	Pressure resistance 16 bar rel. (232 psi), minimum three times the safety pressure
<b>TÜV certificate for TOP68 plug-in head</b>	Pressure resistance 16 bar rel. (232 psi), minimum three times the safety pressure
<b>CPS91D electromagnetic compatibility</b>	Interference emission and interference immunity as per EN 61326: 2012

## Ordering information

<b>Product page</b>	<a href="http://www.endress.com/cps91d">www.endress.com/cps91d</a> <a href="http://www.endress.com/cps91">www.endress.com/cps91</a>
<b>Product Configurator</b>	<p>The navigation area is located on the right of the product page.</p> <ol style="list-style-type: none"> <li>1. Under "Device support" click "Configure your selected product". ↳ The Configurator opens in a separate window.</li> <li>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.</li> <li>3. Export the order code as a PDF or Excel file. To do so, click the appropriate button at the top of the screen.</li> </ol>
<b>Scope of delivery</b>	<p>The scope of delivery includes:</p> <ul style="list-style-type: none"> <li>■ Sensor in the version ordered</li> <li>■ Technical Information</li> </ul>

## 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

#### Cleanfit CPA450

- Manual retractable assembly for installing 120 mm sensors in tanks and pipes
- Product Configurator on the product page: [www.endress.com/cpa450](http://www.endress.com/cpa450)



Technical Information TI00183C

#### Cleanfit CPA471

- Compact stainless steel retractable assembly for installation in tanks and pipes, for manual or pneumatically remote-controlled operation
- Product Configurator on the product page: [www.endress.com/cpa471](http://www.endress.com/cpa471)



Technical Information TI00217C

#### 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](http://www.endress.com/cpa472d)



Technical Information TI00403C

#### 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](http://www.endress.com/cpa472)



Technical Information TI00223C

#### 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](http://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](http://www.endress.com/cpa474)



Technical Information TI00345C

#### Cleanfit CPA475

- Retractable assembly for pH/ORP measurement in tanks and pipes under sterile measuring conditions
- Product Configurator on the product page: [www.endress.com/cpa475](http://www.endress.com/cpa475)



Technical Information TI00240C

#### Unifit CPA442

- Installation assembly for food, biotechnology and pharmaceuticals
- With EHEDG and 3A certificate
- Product Configurator on the product page: [www.endress.com/cpa442](http://www.endress.com/cpa442)



Technical Information TI00306C

#### 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

**Dipfit CPA140**

- pH/ORP immersion assembly with flange connection for very demanding processes
- Product Configurator on the product page: [www.endress.com/cpa140](http://www.endress.com/cpa140)



Technical Information TI00178C

**Flowfit CPA240**

- pH/ORP flow assembly for processes with stringent requirements
- Product Configurator on the product page: [www.endress.com/cpa240](http://www.endress.com/cpa240)



Technical Information TI00179C

**Flowfit CPA250**

- Flow assembly for pH/ORP measurement
- Product Configurator on the product page: [www.endress.com/cpa250](http://www.endress.com/cpa250)



Technical Information TI00041C

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



Technical Information TI00246C

**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](http://www.endress.com/cpa871)



Technical Information TI01191C

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



Technical Information TI01168C

**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](http://www.endress.com/cpy20)

**Measuring cable****CYK10 Memosens data cable**

- For digital sensors with Memosens technology
- Product Configurator on the product page: [www.endress.com/cyk10](http://www.endress.com/cyk10)



Technical Information TI00118C

**CPK9**

- Terminated measuring cable for connecting analog sensors with TOP68 plug-in head
- Selection in accordance with product structure



For more information and to order, please contact your sales office.

**CPK1**

For pH/ORP electrodes with GSA plug-in head

Ordering information is available from your sales office or at [www.endress.com](http://www.endress.com).

---

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

---