

# Technical Information

## Orbisint CPS11D and CPS11

pH electrodes, analog or with digital Memosens technology

For standard applications in process and environmental technology, with dirt-repellent PTFE diaphragm, built-in temperature sensor (optional for analog sensor)



### Application

- Long-term monitoring and limit value monitoring of 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/wastewater treatment
  - Boiler feedwater and cooling water
  - Well water and drinking water
  - All industrial and municipal treatment plants

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

### Your benefits

- Low-maintenance and robust thanks to large PTFE ring junction
- Can be used at pressures up to 17 bar abs. (246 psi)
- Process glass also for very alkaline applications (BA and BT versions)
- Process glass for applications in media containing hydrofluoric acid (FA version)
- For media with low conductivity (AS version)
- Integrated NTC30K temperature sensor (Memosens) for effective temperature compensation; Pt100 or Pt1000 for analog sensors
- Optional: Poison-resistant reference with ion trap

### 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

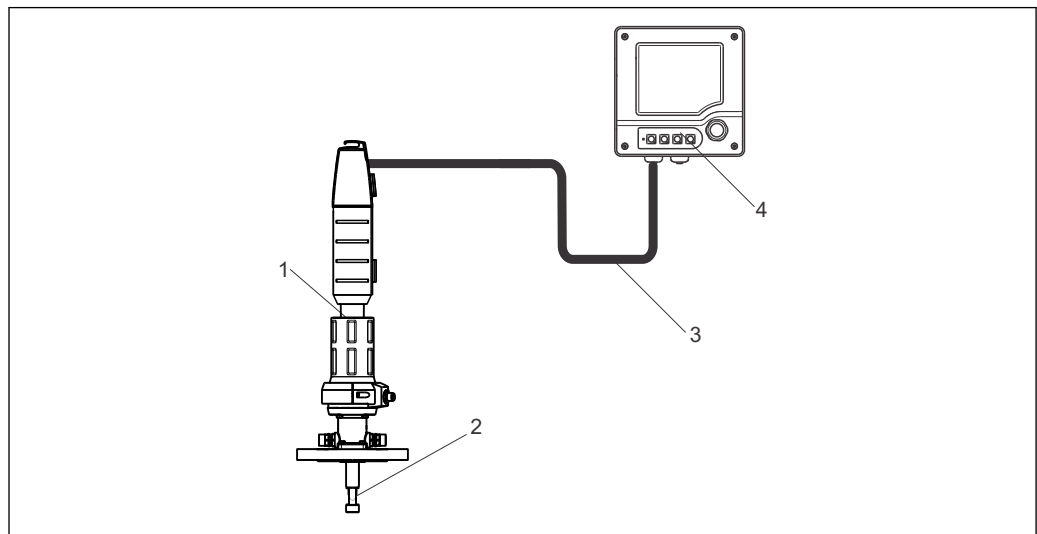
#### pH measurement

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 CPS11D or CPS11
- 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



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1 Example of a measuring system for pH measurement

- 1 Retractable assembly Cleanfit CPA871
- 2 pH electrode CPS11D
- 3 Memosens data cable CYK10
- 4 Liquiline M CM42 two-wire transmitter for hazardous area

## CPS11D 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

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### 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**

Electrode version AA (for water / wastewater), AS (for boiler feedwater):

pH: 1 to 12

Temperature: -15 to 80 °C (5 to 176 °F)

Electrode version BA (for process):

pH: 0 to 14

Temperature: 0 to 135 °C (32 to 275 °F)

Electrode version FA (for hydrofluoric acid process):

pH: 0 to 10

Temperature: 0 to 70 °C (32 to 158 °F)

Electrode version BT with ion trap (for chemicals, scrubbers, pulp and paper):

pH: 0 to 14

Temperature: 0 to 135 °C (32 to 275 °F)



Please note the process operating conditions.

## Installation

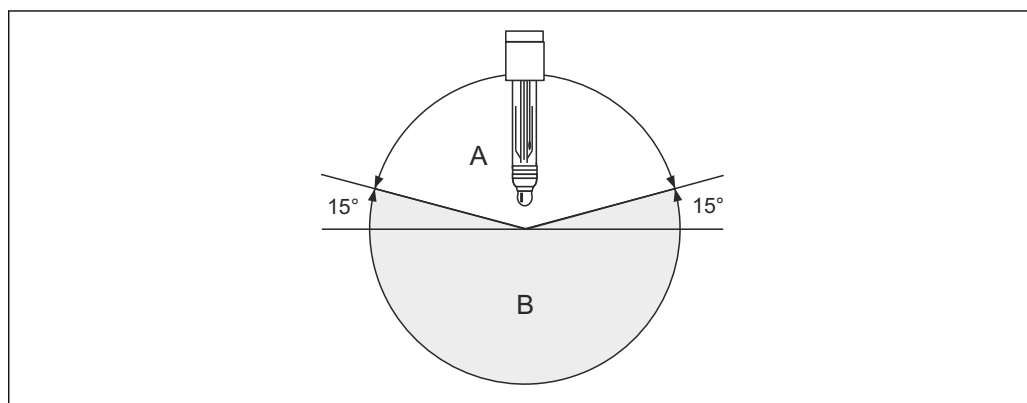
### Installation instructions

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.



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

A Permitted orientation

B Forbidden orientation

## Environment

### Ambient temperature

#### NOTICE

**Risk of damage due to frost**

- ▶ 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, autoclavable up to 135 °C (275 °F), (1 m (3.3 ft) water column, 50 °C (122 °F), 168 h)  
 IP 67: GSA plug-in head (with closed connector system)

## Process

<b>Process temperature</b>	Version AA, AS:	-15 to 80 °C (5 to 176 °F)
	Version BA, BT:	0 to 135 °C (32 to 275 °F)
	Version FA:	0 to 70 °C (32 to 158 °F)

<b>Process pressure (absolute)</b>	Version AA, AS, FA:	1 to 7 bar (15 to 101 psi)
	Version BA, BT:	1 to 17 bar (15 to 246 psi)

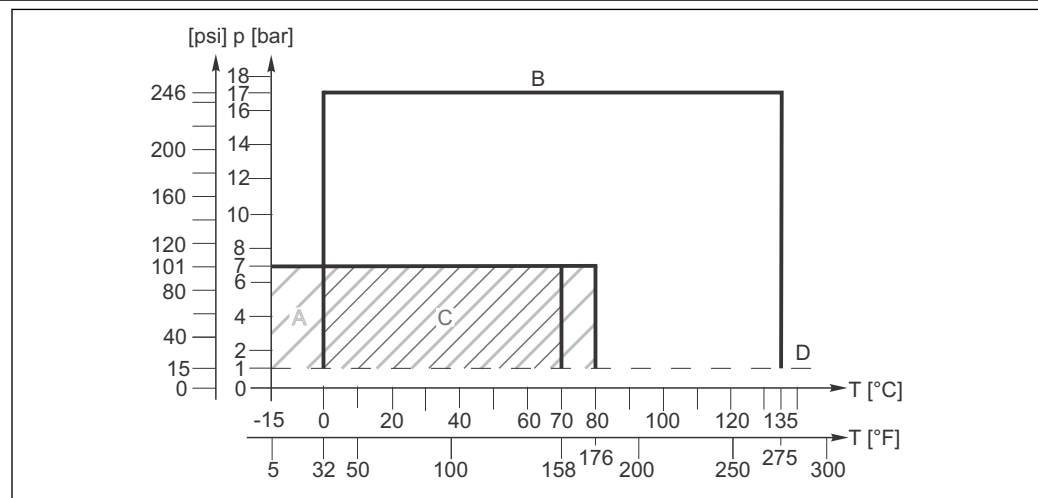
### ⚠ CAUTION

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

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 (absolute)



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3 Pressure-temperature ratings

- A Version AA, AS
- B Version BA, BT
- C Version FA
- D Atmospheric pressure

<b>Minimum conductivity</b>	Version AA, BA, BT, FA:	Min. 50 $\mu\text{S}/\text{cm}$ (minimum flow; pressure and temperature must be stable)
	Version AS:	Min. 0.1 $\mu\text{S}/\text{cm}$ (stainless steel flow assembly with grounding; stable and minimum flow; pressure and temperature must be stable)

<b>pH range</b>	Version AA, AS:	1 to 12 pH
	Version BA, BT:	0 to 14 pH
	Version FA:	0 to 10 pH

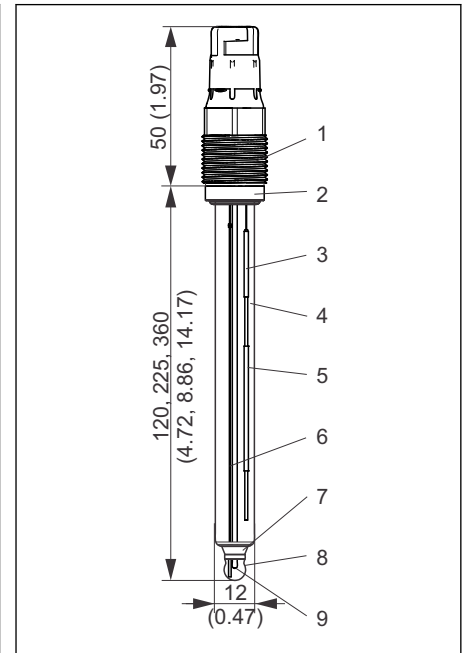
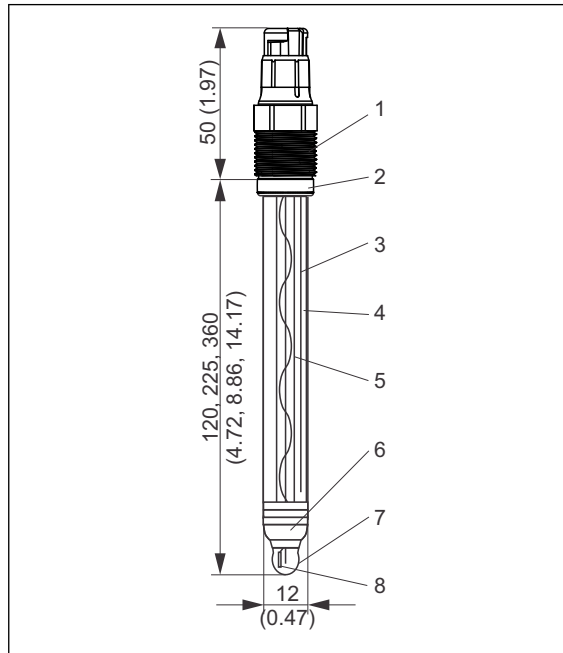
### NOTICE

#### Risk of damage to electrode

- ▶ Never use the electrode outside of the listed specifications!

## Mechanical construction

### Design, dimensions of CPS11D



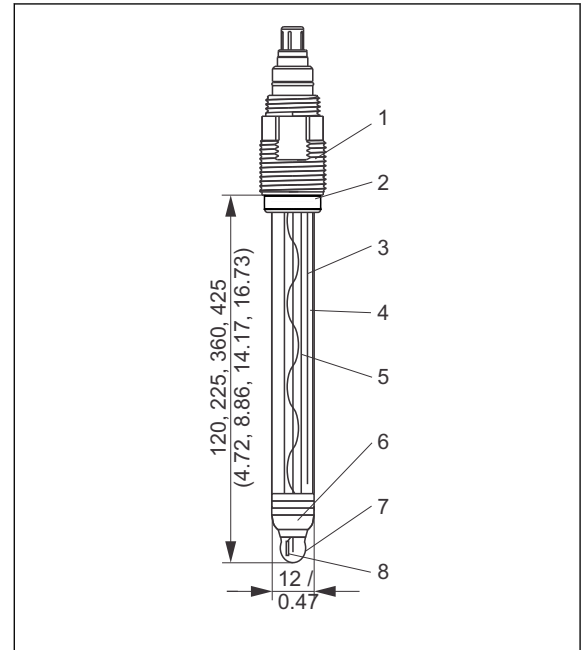
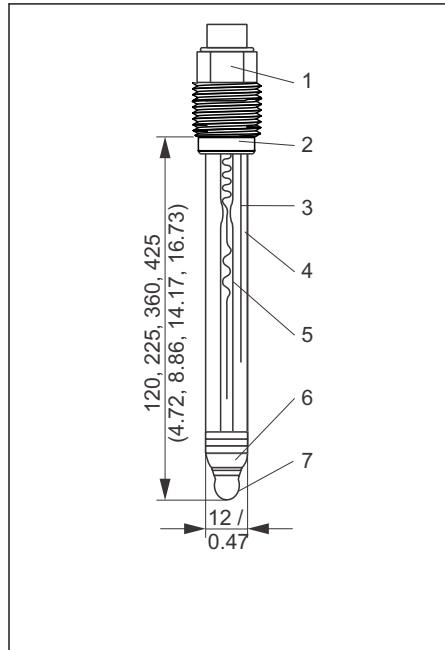
4 CPS11D with Memosens plug-in head, temperature sensor

- 1 Memosens plug-in head, Pg 13.5
- 2 Viton O-ring with thrust collar
- 3 Ag/AgCl reference lead - reference
- 4 "Advanced Gel" electrolyte
- 5 Ag/AgCl reference lead - pH
- 6 PTFE diaphragm
- 7 pH glass membrane
- 8 Temperature sensor NTC30K

5 CPS11D-7BTxx, with ion trap

- 1 Memosens plug-in head, Pg 13.5
- 2 Viton O-ring with thrust collar
- 3 Ag/AgCl reference lead - reference
- 4 "Advanced Gel" electrolyte
- 5 Ion trap
- 6 Ag/AgCl reference lead - pH
- 7 PTFE diaphragm
- 8 pH glass membrane
- 9 Temperature sensor NTC30K

Design, dimensions of CPS11



6 CPS11 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 "Advanced Gel" electrolyte
- 5 Ag/AgCl reference lead - pH
- 6 PTFE diaphragm
- 7 pH glass membrane

7 CPS11 with TOP68 plug-in head, temperature sensor

- 1 TOP68 plug-in head, Pg 13.5
- 2 Viton O-ring with thrust collar
- 3 Ag/AgCl reference lead - reference
- 4 "Advanced Gel" electrolyte
- 5 Ag/AgCl reference lead - pH
- 6 PTFE diaphragm
- 7 pH glass membrane
- 8 Temperature sensor Pt100

**Weight** 0.1 kg (0.2 lbs)

**Materials**

Electrode shaft:	Glass to suit process
pH membrane glasses:	Type A, B, F
Metal lead:	Ag/AgCl
Diaphragm:	Ring-shaped Teflon® diaphragm, sterilizable, not cytotoxic

**Process connection** Pg 13.5


**Temperature sensor**

CPS11D:	NTC30K
CPS11:	Pt100, Pt1000


**Plug-in heads**

CPS11D:	Memosens plug-in head for digital, non-contact data transmission
CPS11:	
ESA:	Threaded plug-in head Pg 13.5, TOP68 for electrodes with or without temperature sensor, 17 bar abs. (246 psi) overpressure protection (threefold), Ex
GSA:	Threaded plug-in head Pg 13.5 for electrodes without temperature sensor



<b>Reference system</b>	Version AA, BA, FA:	Ag/AgCl reference lead with Advanced Gel 3M KCl, AgCl-free
	Version AS:	Ag/AgCl reference lead with Advanced Gel, saturated KCl (> 3M KCl) with salt rings, AgCl-free
		 The following are indicative of used salt rings (fixed supply of KCl) under constant process conditions (e.g. stable temperature and flow): <ul style="list-style-type: none"> <li>▪ a continuous upward trend in the pH value (to alkaline pH values)</li> <li>▪ a continuous downward trend in the zero point (to acidic pH values) following adjustment during calibration</li> </ul>
BT version:	Ag/AgCl reference lead with ion trap and Advanced Gel 3M KCl	

## Certificates and approvals

<b>Ex approval for CPS11D</b>	<ul style="list-style-type: none"> <li>▪ ATEX II 1G Ex ia IIC T3/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 CPS11 (TOP68)</b>	<ul style="list-style-type: none"> <li>▪ ATEX II 1G Ex ia IIC T3/T4/T6 Ga</li> <li>▪ FM Class I Div. 2, in conjunction with Liquiline M CM42 and Mycom S CPM153 transmitters</li> </ul>
<b>Biocompatibility</b>	Cytotoxicity verified in accordance with: USP 2009, chapter <88> (USP Class VI) for diaphragm
<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>CPS11D 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/cps11d">www.endress.com/cps11d</a> <a href="http://www.endress.com/cps11">www.endress.com/cps11</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". <ul style="list-style-type: none"> <li>↳ The Configurator opens in a separate window.</li> </ul> </li> <li>2. Select all the options to configure the device in line with your requirements. <ul style="list-style-type: none"> <li>↳ In this way, you receive a valid and complete order code for the device.</li> </ul> </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 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

#### 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 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 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

#### 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

**Flexdip CYA112**

- Immersion assembly for water and wastewater
- Modular assembly system for sensors in open basins, channels and tanks
- Product Configurator on the product page: [www.endress.com/cya112](http://www.endress.com/cya112)



Technical Information TI00432C

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**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)

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**Measuring cables**

**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)

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