

# Technical Information

## Memosens CPS171D

pH electrodes for bioreactors with digital Memosens technology



For biotechnology production processes with ion trap for longtime stable reference

### Application

Hygienic and sterile applications (sterilizable, autoclavable)

- Bioreactor/fermenter
- Biotechnology
- Pharmaceutical industry
- Foods

With the necessary industrial approvals and certificates, e.g. FDA, USP and ATEX/IECEX approval for use in hazardous areas

### Your benefits

- Biocompatibility with regard to cytotoxicity and bioreactivity has been tested successfully
- Documentation to certify compliance with requirements of pharmaceutical industry with serial number of sensor (optional)
- Durable inscription on shaft, verified as non-cytotoxic
- Suitable for CIP / SIP and autoclavable, depending on version up to 140 °C (284 °F)
- Pressurized reference, specially for fermentation processes
- Integrated pressure indicator
- Longtime stable reference with ion trap, resulting in a very long service life, bridging electrolyte free of silver ions
- No change in color of gel
- Ceramic diaphragm
- Integrated temperature sensor for effective temperature compensation
- No materials derived from animals were used in the manufacture of parts in contact with the process media

### Other advantages of Memosens technology

- Maximum process safety thanks to 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 with the Memobase Plus CYZ71D

## Function and system design

### Measuring principle

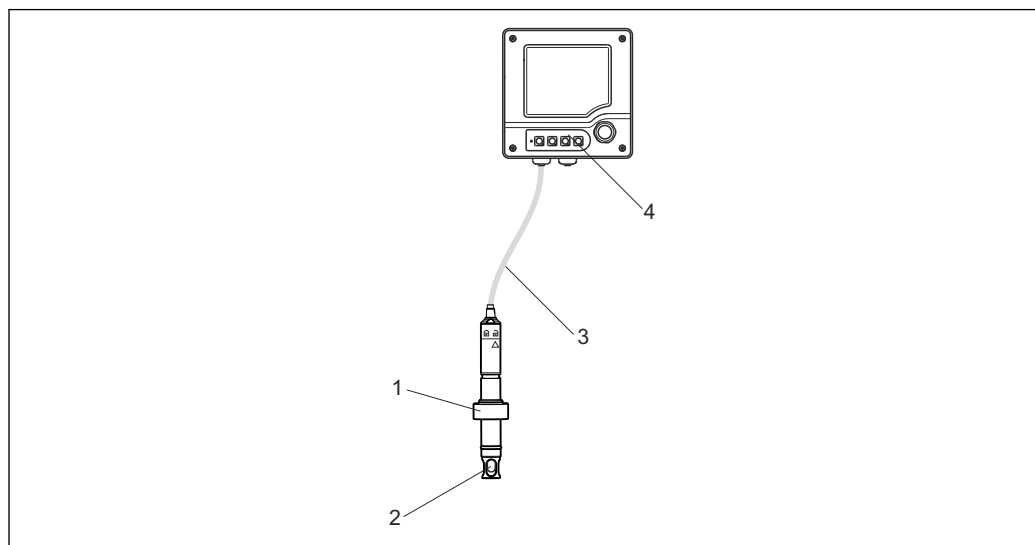
#### pH measurement

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 consists of the following components at least:

- pH electrode CPS171D
- Transmitter, e.g. Liquiline M CM42, CM44x/R
- Memosens data cable CYK10
- Assembly, e.g. Unifit CPA442



A0028291

 1 Example of a measuring system for pH measurement

- 1 Installation assembly Unifit CPA442
- 2 pH electrode CPS171D
- 3 Memosens data cable CYK10 for Memosens sensors
- 4 Transmitter Liquiline M CM42

## 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
  - Hours of operation under extreme conditions
  - Number of sterilizations
  - Resistance of glass membrane

The data listed above can be displayed using the Liquiline CM42, CM44x/R 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 on external data carriers and in 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 values**

pH value  
Temperature

---

**Measuring range**

pH: 1 to 12 pH (measuring range at 0 to 100 °C) / 0 to 14 pH (application)  
Temperature: 0 to 140 °C (32 to 284 °F)



Please note the process operating conditions.

## Installation

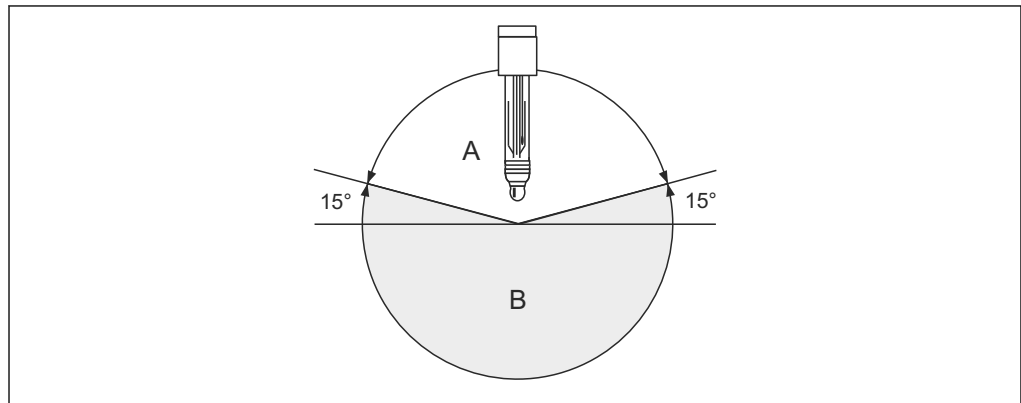
### Installation instructions

Do not install the electrodes upside down. The angle of inclination must be at least  $15^\circ$  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 assembly threaded connection is clean and runs smoothly.**

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



A0024316

2 installation angle at least  $15^\circ$  from the horizontal

A Permitted orientation

B Forbidden orientation

#### CAUTION

#### Glass electrode with pressurized reference

Possibility of sudden rupture and injury from glass splinters

- ▶ Always wear protective goggles when working with these electrodes.

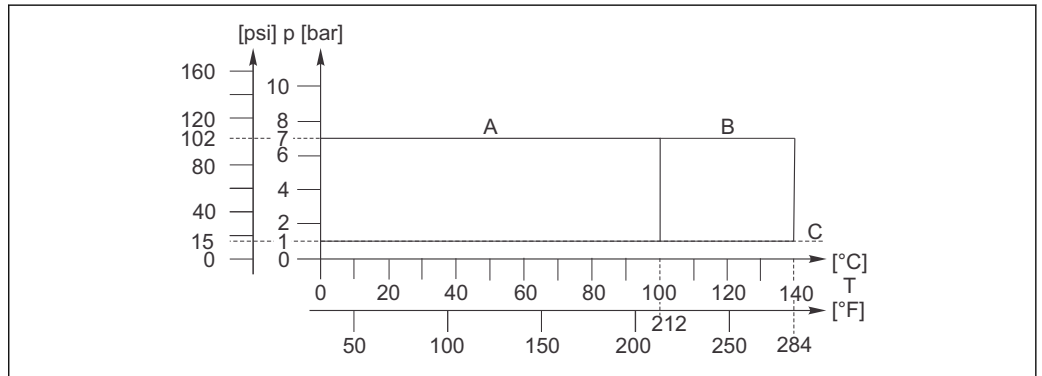
## Environment

|                                  |                                                                                                                   |
|----------------------------------|-------------------------------------------------------------------------------------------------------------------|
| <b>Ambient temperature range</b> | <b>NOTICE</b><br>Risk of damage due to frost<br>▶ The sensor must not be used at temperatures below 0 °C (32 °F). |
| <b>Storage temperature</b>       | 0 to 50 °C (32 to 122 °F)                                                                                         |
| <b>Degree of protection</b>      | IP 68: Memosens plug-in head, (10 m (33 ft) water column, 25 °C (77 °F), 45 days, 1 M KCl)                        |

## Process

|                                    |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |
|------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Process temperature</b>         | <ul style="list-style-type: none"> <li>0 to 100 °C (32 to 212 °F)<br/>(can be sterilized up to 140 °C (284 °F))</li> <li>0 to 135 °C (32 to 275 °F) for sensors with Ex approval</li> </ul>                                                                                                                                                                                                                                                                                                                                 |
| <b>Process pressure (absolute)</b> | <p>1 to 7 bar (14.5 to 101.5 psi)</p> <p><b>i</b> 0.8 bar (12 psi) abs. possible as a minimum value.</p> <p><b>CAUTION</b><br/><b>Pressurization of sensor due to prolonged use under increased process pressure</b><br/>Risk of injury from glass breakage</p> <ul style="list-style-type: none"> <li>▶ Avoid excessive heating of such sensors if using them under reduced process pressure or under atmospheric pressure.</li> <li>▶ When handling such sensors, wear protective goggles and suitable gloves.</li> </ul> |

### Pressure temperature load curve



3 Pressure temperature load curve

- A Continuous operation
- B Short-term for SIP/ autoclaving
- C Atmospheric pressure

|                             |                                                        |
|-----------------------------|--------------------------------------------------------|
| <b>Minimum conductivity</b> | Min. 100 µS/cm (at atmospheric pressure, without flow) |
|-----------------------------|--------------------------------------------------------|

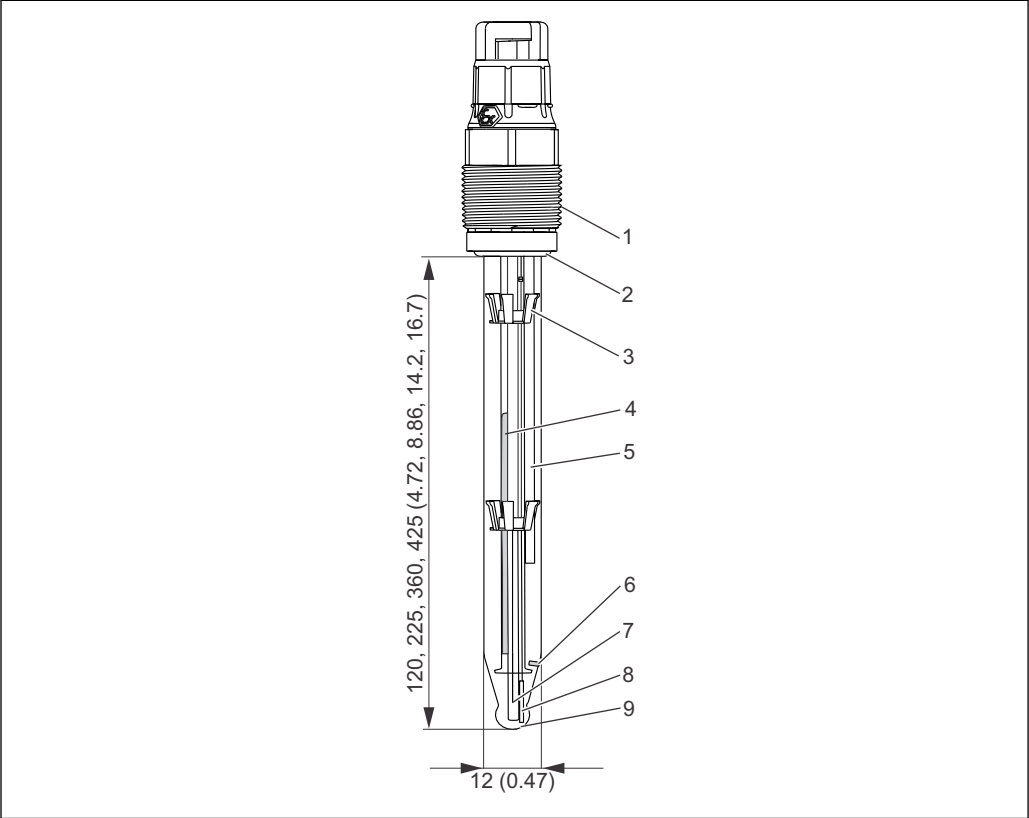
**pH range**                      Measuring range:                      1 to 12 pH  
                                          Application range:                      0 to 14 pH

**NOTICE**

**Risk of damage to electrode**  
 ▶ Never use the electrode outside of the listed specifications!

### Mechanical construction

**Design, dimensions**



4 CPS171D with Memosens plug-in head

- 1 Memosens plug-in head
- 2 FKM O-ring with thrust collar
- 3 Spacer
- 4 Pressure indicator with air bubble
- 5 Ag/AgCl reference lead with ion trap
- 6 Junction
- 7 Temperature sensor
- 8 Ag/AgCl internal reference lead
- 9 pH membrane


**Weight**                              0.1 kg (0.22 lbs) for a length of 120 mm (4.72 inch)

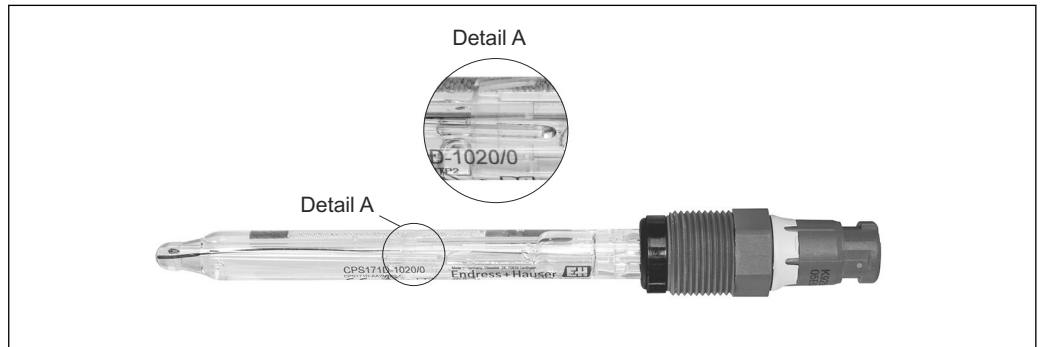
**Materials**


|                      |                                        |
|----------------------|----------------------------------------|
| Electrode shaft:     | Glass to suit process                  |
| pH membrane glasses: | Glass to suit process                  |
| Metal lead:          | Ag/AgCl                                |
| Diaphragm:           | Ceramic, sterilizable and autoclavable |
| Gel:                 | Bridging electrolyte, non-cytotoxic    |
| Nameplate:           | ceramic metal oxide                    |

**Process connection**              Pg 13.5




|                           |                                                                                                                                                                                                                                                            |                                                                                         |
|---------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------|
| <b>Temperature sensor</b> | NTC 30K                                                                                                                                                                                                                                                    |                                                                                         |
| <b>Plug-in heads</b>      | CPS171D:                                                                                                                                                                                                                                                   | Memosens plug-in head for digital, non-contact data transmission, 16 bar rel. (232 psi) |
| <b>Reference system</b>   | Ag/AgCl reference lead with ion trap, bridging electrolyte 3M KCl, non-cytotoxic, pressurized approx. 7 bar abs. (102 psi abs.); Display via pressure indicator (→  5). |                                                                                         |



 5 Pressure indicator

A0028323

## Certificates and approvals

|                    |                                                                                                                                                                                                                                                                                                                         |
|--------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Ex approval</b> | <p><b>IECEX</b><br/>Ex ia IIC T3/T4/T6 Ga</p> <p><b>ATEX</b><br/>II 1G Ex ia IIC T3/T4/T6 Ga</p> <p> Hazardous area versions of digital sensors with Memosens technology are indicated by a red-orange ring on the plug-in head.</p> |
|--------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|

|                         |                                                                                                                                                                                                                                                                                                                                                                                                  |
|-------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Biocompatibility</b> | <p>Biocompatibility verified with regard to cytotoxicity and bioreactivity:</p> <ul style="list-style-type: none"> <li>■ ISO 10993-5:2009 for ceramic diaphragm, bridging electrolyte and shaft inscription</li> <li>■ USP &lt;87&gt; for O-ring process seal, bridging electrolyte and shaft inscription</li> <li>■ USP &lt;88&gt; Class VI, 121 °C (250 °F) for O-ring process seal</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>Electromagnetic compatibility</b> | <p>Interference emission and interference immunity as per</p> <ul style="list-style-type: none"> <li>■ EN 61326-1:2013</li> <li>■ EN 61326-2-3:2013</li> <li>■ EN 61326-2-5: 2013</li> <li>■ NAMUR NE21: 2012</li> </ul> |
|--------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|

## Ordering information

|                             |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |
|-----------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Product page</b>         | <a href="http://www.endress.com/cps171d">www.endress.com/cps171d</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 delivery comprises:</p> <ul style="list-style-type: none"> <li>▪ Sensor in the version ordered</li> <li>▪ Brief Operating Instructions</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.

|                   |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |
|-------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Assemblies</b> | <p><b>Unifit CPA442</b></p> <ul style="list-style-type: none"> <li>▪ Installation assembly for food, biotechnology and pharmaceuticals</li> <li>▪ With EHEDG and 3A certificate</li> <li>▪ Product Configurator on the product page: <a href="http://www.endress.com/cpa442">www.endress.com/cpa442</a></li> </ul> <p> Technical Information TI00306C</p> <p><b>Cleanfit CPA875</b></p> <ul style="list-style-type: none"> <li>▪ Retractable process assembly for sterile and hygienic applications</li> <li>▪ For in-line measurement with standard 12 mm sensors for parameters such as pH, ORP and oxygen</li> <li>▪ Product Configurator on the product page: <a href="http://www.endress.com/cpa875">www.endress.com/cpa875</a></li> </ul> <p> Technical Information TI01168C</p> <p><b>Cleanfit CPA475</b></p> <ul style="list-style-type: none"> <li>▪ Retractable assembly for pH/ORP measurement in tanks and pipes under sterile measuring conditions</li> <li>▪ Product Configurator on the product page: <a href="http://www.endress.com/cpa475">www.endress.com/cpa475</a></li> </ul> <p> Technical Information TI00240C</p> <p><b>Dipfit CPA140</b></p> <ul style="list-style-type: none"> <li>▪ pH/ORP immersion assembly with flange connection for very demanding processes</li> <li>▪ Product Configurator on the product page: <a href="http://www.endress.com/cpa140">www.endress.com/cpa140</a></li> </ul> <p> Technical Information TI00178C</p> |
|-------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|

**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**

**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

**Memosens laboratory cable CYK20**

- For digital sensors with Memosens technology
- Product Configurator on the product page: [www.endress.com/cyk20](http://www.endress.com/cyk20)

**Software**

**Memobase Plus CYZ71D**

- PC software to support laboratory calibration
- Visualization and documentation of sensor management
- Sensor calibrations saved in the database
- Order as per product structure, [www.endress.com/cyz71d](http://www.endress.com/cyz71d)



Technical Information TI00502C

**Handheld instrument**

**Liquiline To Go CYM290, CYM 291**

- Portable multiparameter device for Memosens pH, conductivity and oxygen sensors
- Order as per product structure, [www.endress.com/cym290](http://www.endress.com/cym290), [www.endress.com/cym291](http://www.endress.com/cym291)



Technical Information TI01198C



Refer to the Operating Instructions for CYM290 or CYM291 for information on the sensors that can be connected.

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

---