

Technical Information

Ceragel CPS71D and CPS71

pH single-rod measuring cells, analog or with digital Memosens technology



For chemical process, hygienic and sterile applications with an ion trap for poison-resistant reference

Application

- Aggressive chemical and hygienic applications
 - Chemical industry
 - Foods
 - Fermenters
 - Biotechnology
 - Pharmaceutical industry
- Process technology and monitoring of processes with:
 - Rapidly changing pH values
 - High proportion of electrode poisons such as H₂S

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

Your benefits

- Poison-resistant reference with ion trap, resulting in a very long service life, bridging electrolyte free of silver ions
- TP version with pressurized reference, for chemical and fermentation processes
- TU version for upside-down installation, solidified gel in the internal reference lead
- Integrated temperature sensor for effective temperature compensation
- Suitable for CIP/SIP cleaning, autoclavable
- Biocompatibility: reference electrolyte with certified non-cytotoxic gel
- Acrylamide-free reference and bridging electrolyte

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

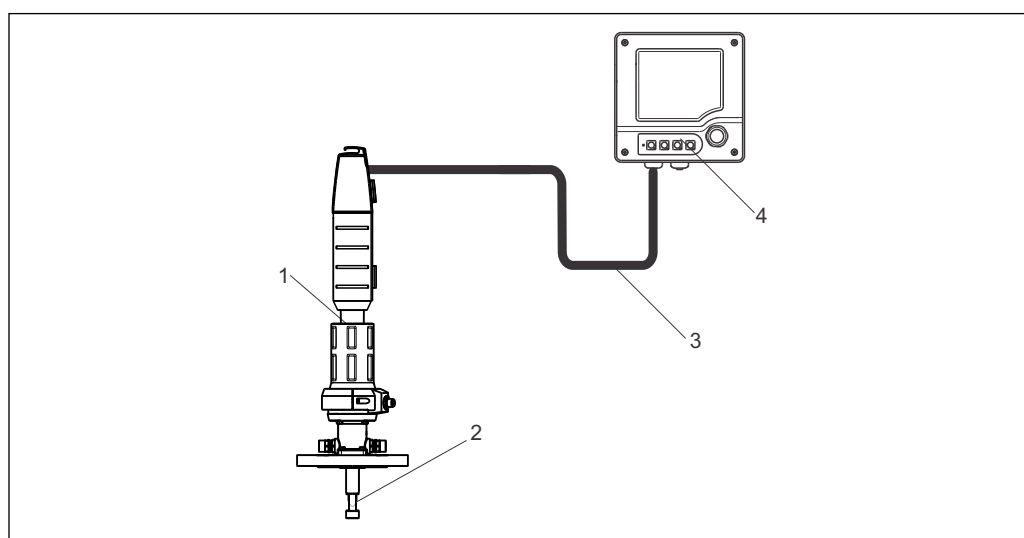
pH measurement

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 CPS71D or CPS71
- Transmitter, e.g. Liquiline CM42, CM44x/R, 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 CPA871/875



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- 1 Example of a measuring system for pH measurement
- 1 Retractable assembly Cleanfit CPA871
- 2 pH electrode CPS71D
- 3 Memosens data cable CYK10
- 4 Liquiline M CM42 two-wire transmitter for hazardous area

Communication and data processing CPS71D

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	Electrode version TB, TC: pH:0 to 14 pH Temperature: 0 to 140 °C (32 to 284 °F) 0 to 135 °C (32 to 275 °F) for sensors with Ex approval and analog sensors Electrode version TP (pressurized reference): pH:0 to 12 pH Temperature: 0 to 140 °C (32 to 284 °F) (140 °C (284 °F) only for sterilization) 0 to 135 °C (32 to 275 °F) for sensors with Ex approval and analog sensors (135 °C (275 °F) only for sterilization) Max. 100 °C (212 °F) in continuous operation due to increasing pressure loss at T > 100 °C (212 °F) Electrode version TU: pH:0 to 14 pH Temperature: 0 to 140 °C (32 to 284 °F) (140 °C (284 °F) only for sterilization) 0 to 135 °C (32 to 275 °F) for sensors with Ex approval and analog sensors (135 °C (275 °F) only for sterilization) Max. 100 °C (212 °F) in continuous operation due to liquefaction of gel-based inner electrolyte at T > 100 °C (212 °F)  Please note the process operating conditions.

Installation

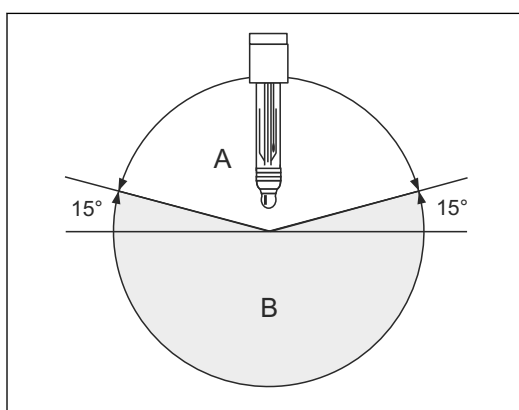
Installation instructions

- Electrode versions TB, TC and TP
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.
- Electrode version TU
This electrode is suitable for upside-down installation. You can install it at any angle.

NOTICE

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

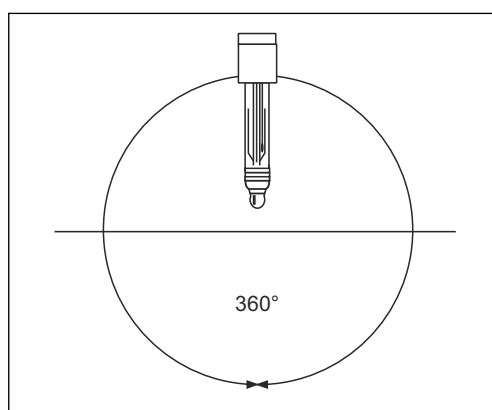
- ▶ Screw in the electrode finger-tight (3 Nm)! (Data apply only if installing with Endress+Hauser OPA assemblies.)
- ▶ Make sure to follow the installation instructions in the Operating Instructions of the used assembly.



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2 Installation of electrode versions TB, TC, TP; installation angle at least 15° from the horizontal

A Permitted orientation
B Forbidden orientation



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3 Installation of electrode version TU; any installation angle

Installation instructions for electrode version TP

CAUTION

Sudden rupture and flying glass splinters from the glass electrode with pressurized reference (approx. 7 bar abs. internal pressure)

- ▶ Always wear protective goggles when working with these electrodes
- ▶ Be particularly careful when removing the silicone seal on the reference junction. Here, a knife is used to activate the electrode for measuring operation.

Before commissioning the electrode, you must remove the silicone seal from the junction. The pH value can only be measured properly once the seal has been removed.

To do this, proceed as follows:

1. Using the knife supplied, completely remove the silicone seal from the junction.
2. To ensure optimum accuracy with this as with all pH electrodes, place the electrode in a calibration standard buffer solution with a pH of between 4 and 9 for 15-20 minutes prior to calibration.
3. Put the electrode into operation.

Environment

Ambient temperature range	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:	ESA 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	Electrode version TB, TC:	0 to 140 °C (32 to 284 °F) 0 to 135 °C (32 to 275 °F) for sensors with Ex approval and analog sensors
	Electrode version TP, TU:	0 to 100 °C (32 to 212 °F) (sterilizable up to 140 °C (284 °F) / 135 °C (275 °F) for sensors with Ex approval and analog sensors)

Process pressure (absolute)	Electrode version TB, TC:	1 to 14 bar (15 to 203 psi)
	Electrode version TU:	1 to 11 bar (15 to 159 psi)
	Electrode version TP:	1 to 7 bar (15 to 101 psi)
 Minimum 0.8 bar abs. is possible. Be aware of quick KCl consumption.		

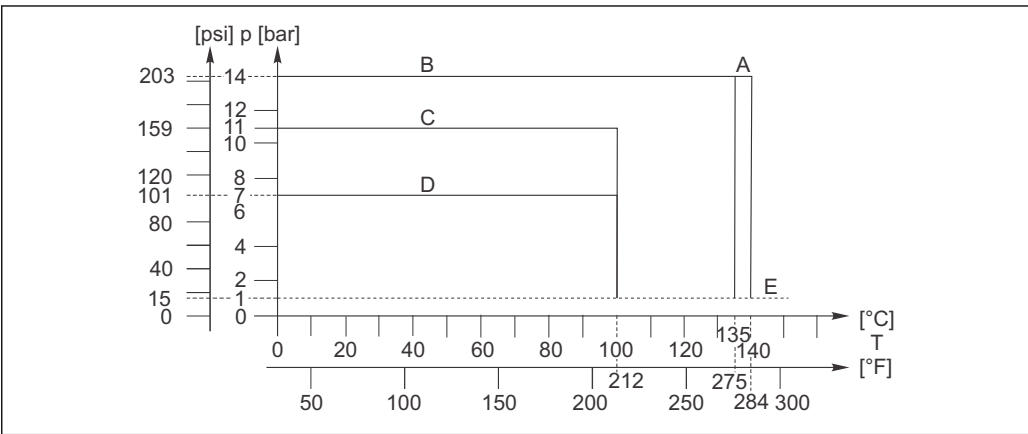
CAUTION

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



 4 Pressure-temperature ratings

- A Version TB, TC
- B Version TB, TC with Ex approval and analog sensors
- C Version TU
- D Version TP
- E Atmospheric pressure

Minimum conductivity	10 µS/cm (at atmospheric pressure, without flow)
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pH range

Electrode version TB, TC, TU: 0 to 14 pH

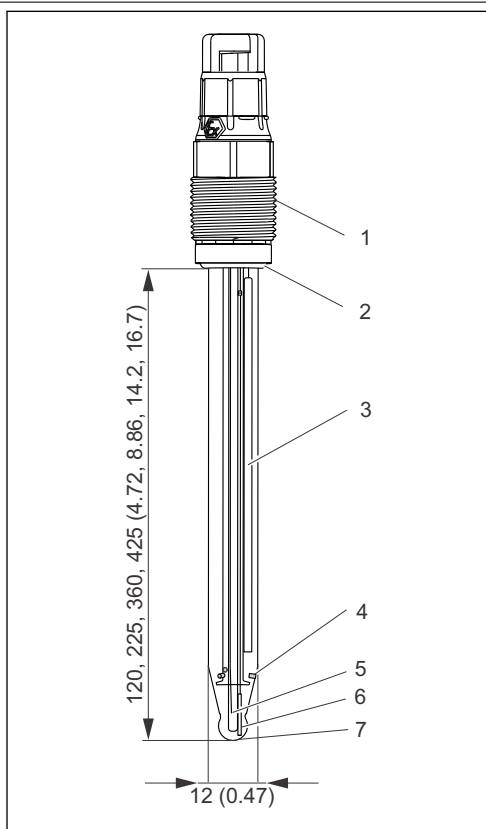
Electrode version TP: 0 to 12 pH

NOTICE**Risk of damage to electrode**

- Never use the electrode outside of the listed specifications!

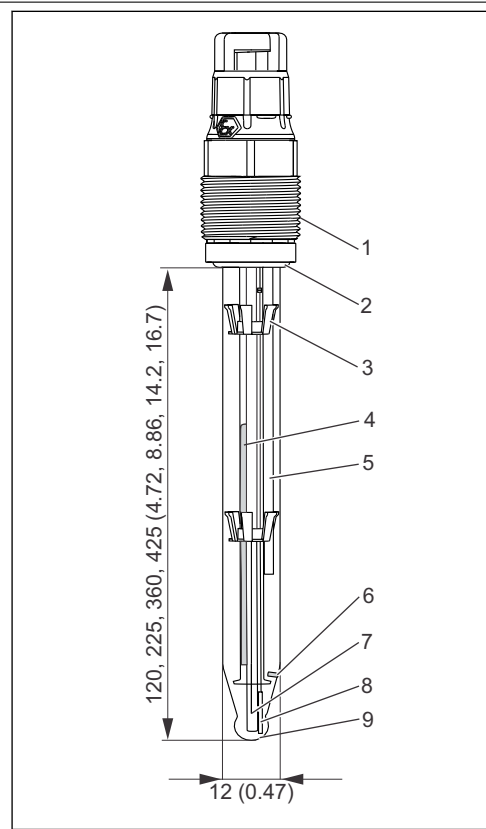
Mechanical construction

Design, dimensions CPS71D



5 CPS71D with Memosens plug-in head, TB

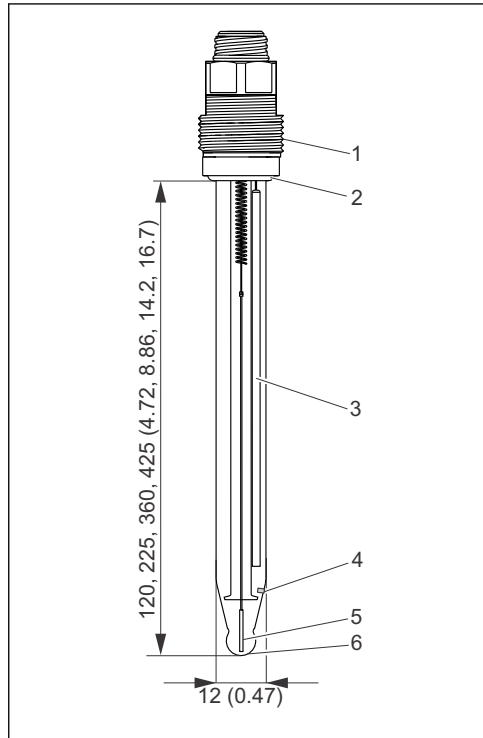
- 1 Memosens plug-in head
- 2 Viton O-ring with thrust collar
- 3 Ag/AgCl reference lead with ion trap
- 4 Junction
- 5 Temperature sensor
- 6 Ag/AgCl internal reference lead - pH
- 7 pH glass membrane



6 CPS71D with Memosens plug-in head, TP

- 1 Memosens plug-in head
- 2 Viton 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 - pH
- 9 pH glass membrane

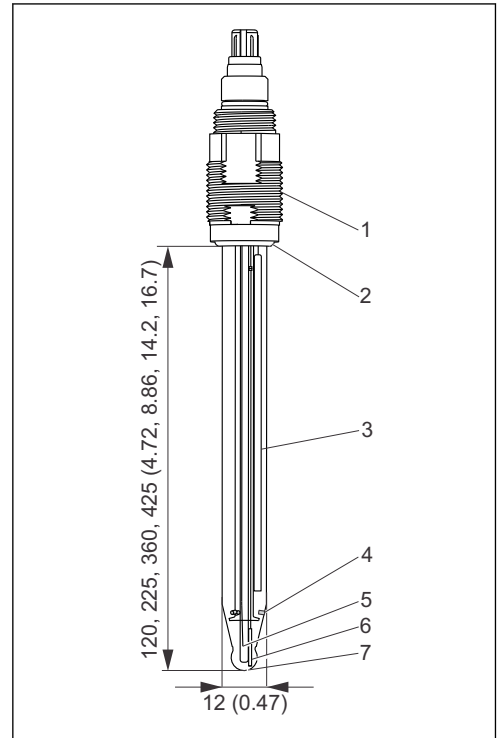
Design, dimensions CPS71



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7 CPS71 with GSA plug-in head, TB

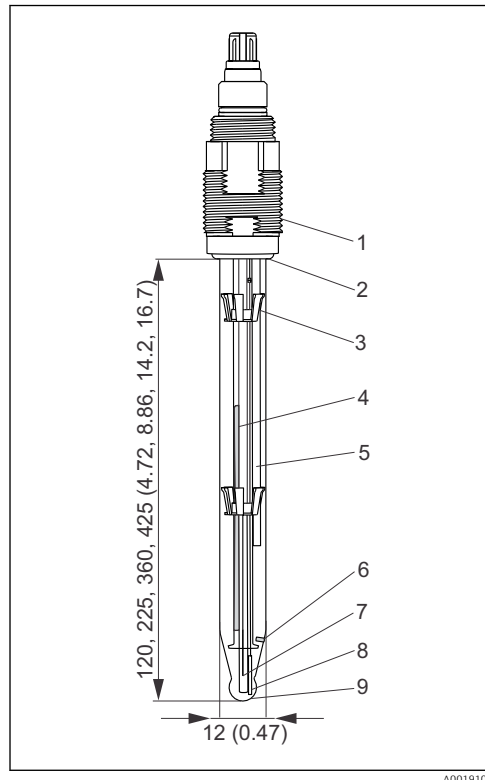
- 1 GSA electrode plug-in head, Pg 13.5
- 2 Viton O-ring with thrust collar
- 3 Ag/AgCl reference lead with ion trap
- 4 Junction
- 5 Ag/AgCl internal reference lead - pH
- 6 pH glass membrane



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8 CPS71 with ESA plug-in head, TC

- 1 ESA electrode plug-in head, Pg 13.5
- 2 Viton O-ring with thrust collar
- 3 Ag/AgCl reference lead with ion trap
- 4 Junction
- 5 Temperature sensor
- 6 Ag/AgCl internal reference lead - pH
- 7 pH glass membrane



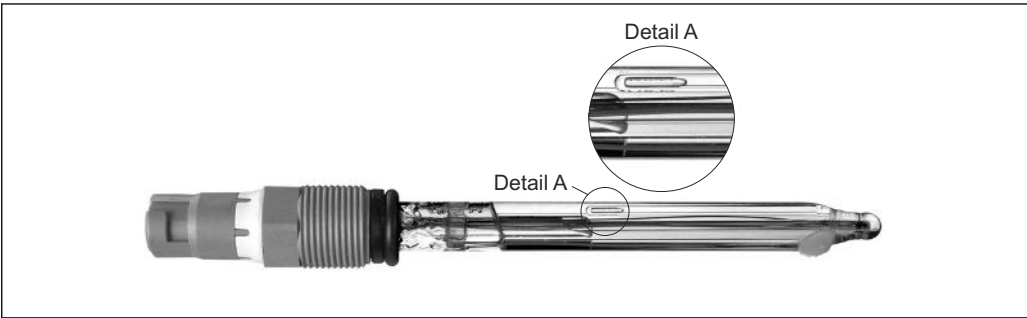
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9 CPS71 with ESA plug-in head, TP

- 1 ESA electrode plug-in head, Pg 13.5
- 2 Viton 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 - pH
- 9 pH glass 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:	Type B
	Metal lead:	Ag/AgCl
	Diaphragm:	Ceramic, sterilizable and autoclavable
	Reference and bridging electrolyte gel:	Acrylamide-free
Process connection	Pg 13.5	
Temperature sensor	CPS71D:	NTC30K
	CPS71:	Pt100, Pt1000
Plug-in heads	CPS71D:	Memosens plug-in head for digital, non-contact data transmission, 17 bar abs. (246 psi), Ex or non-Ex
	CPS71:	
	ESA:	Threaded plug-in head Pg 13.5, TOP68, 17 bar abs. (246 psi), Ex
	GSA:	Threaded plug-in head Pg 13.5, non-Ex

Reference system	Electrode version TB, TC:	Ag/AgCl reference lead with ion trap, reference and bridging electrolyte 3 M KCl, acrylamide-free, non-cytotoxic
	Electrode version TP:	Ag/AgCl reference lead with ion trap, reference and bridging electrolyte 3 M KCl, acrylamide-free, non-cytotoxic, pressurized ion trap 7 bar abs.; indicated by pressure indicator (→  10).
	Electrode version TU:	Ag/AgCl reference lead with ion trap, reference and bridging electrolyte 3 M KCl, acrylamide-free



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 10 Pressure indicator of electrode version TP

Certificates and approvals

Ex approval CPS71D and CPS71 (ESA)	ATEX/NEPSI II 1G Ex ia IIC T3/T4/T6 Ga
	FM/CSA IS/NI CL. I. Div 1, Group A-D
	 Hazardous area versions of the digital sensors with Memosens technology are indicated by a red-orange ring in the plug-in head.
Biocompatibility	Cytotoxicity tested to: ■ ISO 10993-5:2009 ■ USP 37: 2014, chapter <87> for reference electrolyte gel
TÜV certificate for Memosens and ESA plug-in head	Pressure resistance 16 bar rel. (232 psi), minimum three times the safety pressure
Electromagnetic compatibility CPS71D	Interference emission and interference immunity as per EN 61326: 2012

Ordering information

Product page	www.endress.com/cps71d www.endress.com/cps71
Product Configurator	The navigation area is located on the right of the product page. 1. Under "Device support" click "Configure your selected product". ↳ The Configurator opens in a separate window. 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. 3. Export the order code as a PDF or Excel file. To do so, click the appropriate button at the top of the screen.
Scope of delivery	The scope of delivery includes: ■ Sensor in the version ordered ■ Technical Information

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 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  Technical Information TI00403C 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  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  Technical Information TI01168C Cleanfit CPA450 ■ Manual retractable assembly for installing 120 mm sensors in tanks and pipes ■ Product Configurator on the product page: 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  Technical Information TI00217C
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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



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



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



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



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



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



Technical Information TI00178C

Flowfit CPA240

- pH/ORP flow assembly for processes with stringent requirements
- Product Configurator on the product page: 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



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



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



Technical Information TI00432C

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

Measuring cable**CYK10 Memosens data cable**

- For digital sensors with Memosens technology
- Product Configurator on the product page: 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.

www.addresses.endress.com
