



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

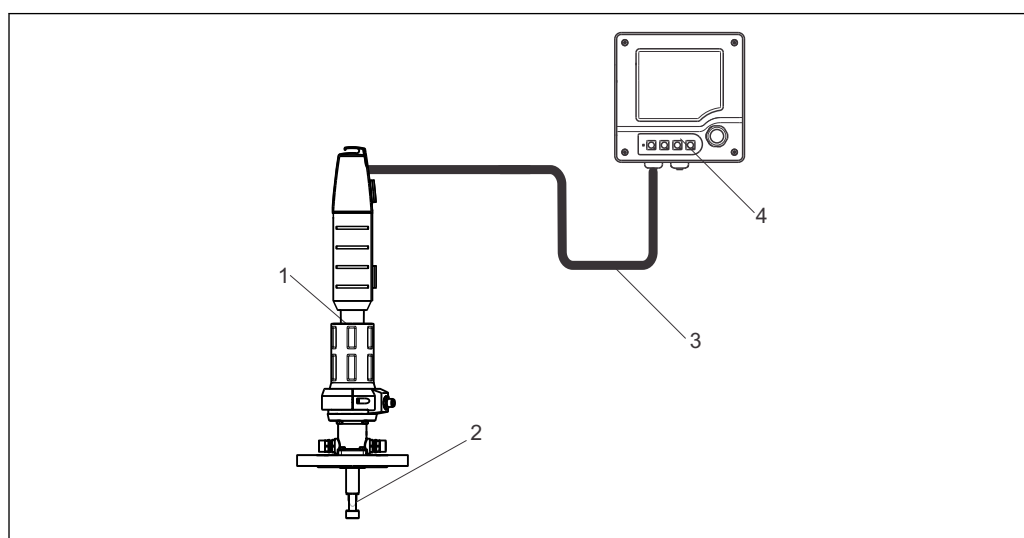
pH measurement

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

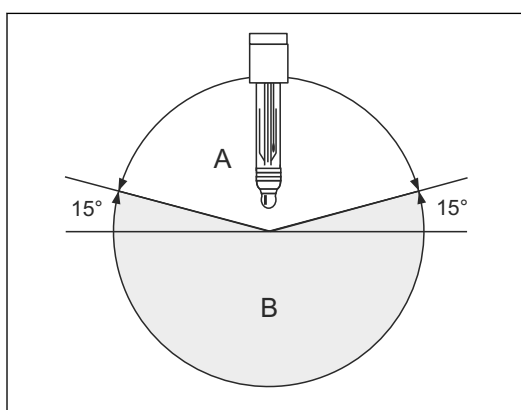
Installation instructions

- 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.

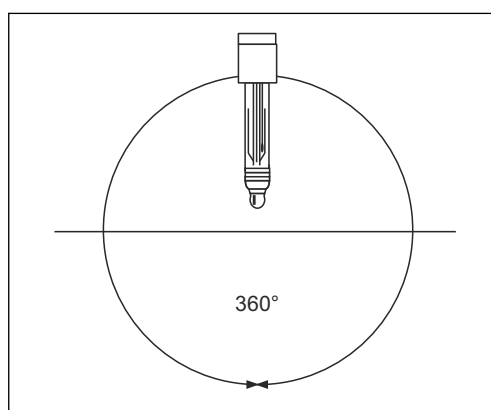
- ▶ Screw in the electrode finger-tight (3 Nm)! (Data apply only if installing with Endress+Hauser OPA assemblies.)
- ▶ Make sure to follow the installation instructions in the Operating Instructions of the used assembly.



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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

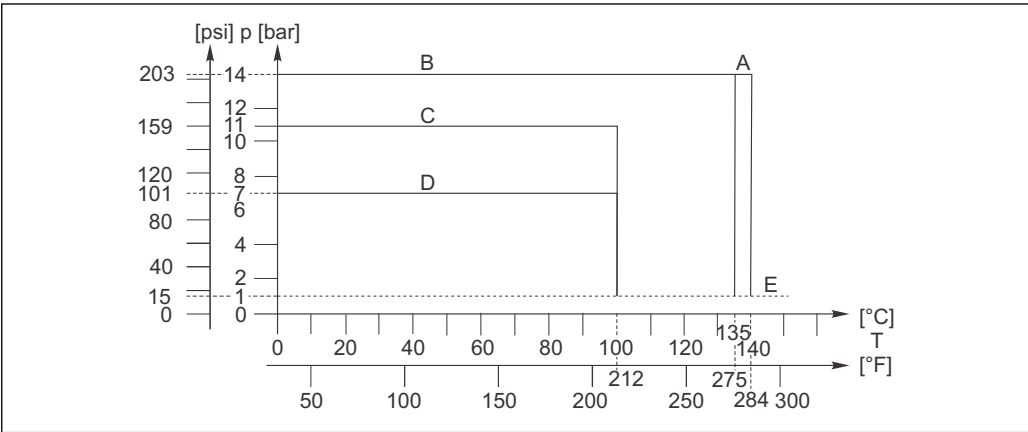
Process temperature	Electrode version TB, TC:	0 to 140 °C (32 to 284 °F) 0 to 135 °C (32 to 275 °F) for sensors with Ex approval and analog sensors
	Electrode version TP, TU:	0 to 100 °C (32 to 212 °F) (sterilizable up to 140 °C (284 °F) / 135 °C (275 °F) for sensors with Ex approval and analog sensors)

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

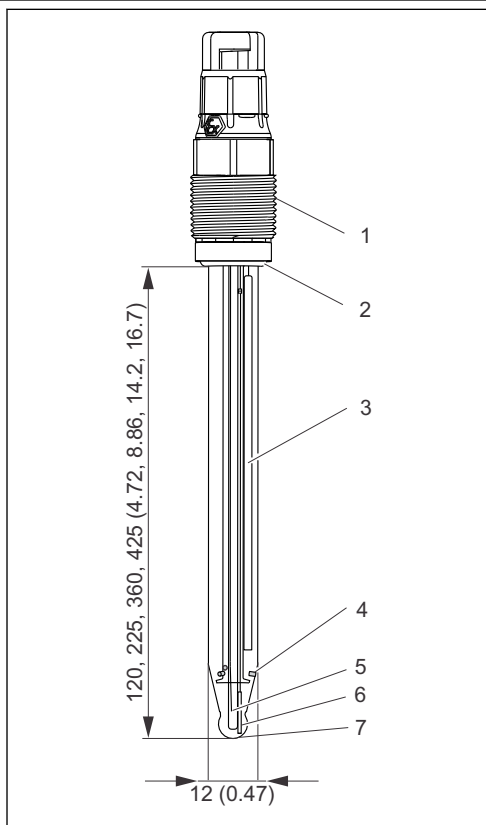
Electrode version TP: 0 to 12 pH

NOTICE**Risk of damage to electrode**

- Never use the electrode outside of the listed specifications!

Mechanical construction

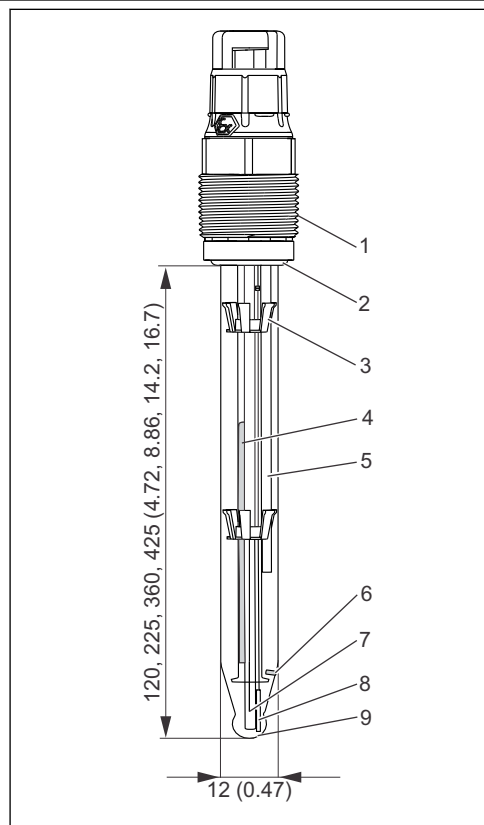
Design, dimensions CPS71D



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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

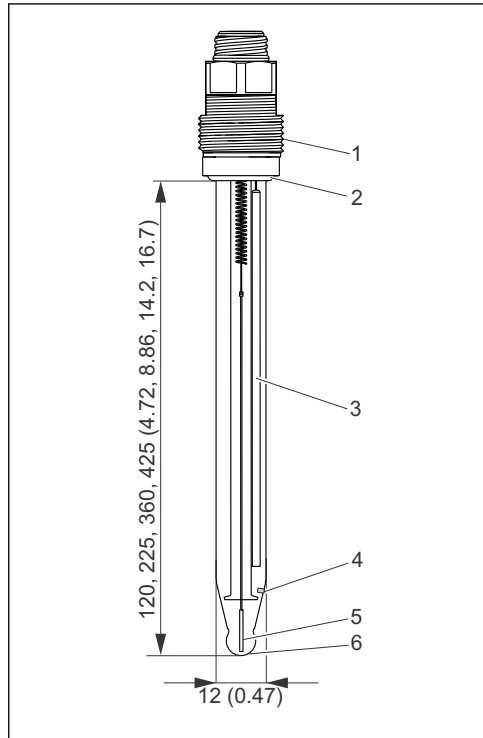


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6 CPS71D with Memosens plug-in head, TP

- 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

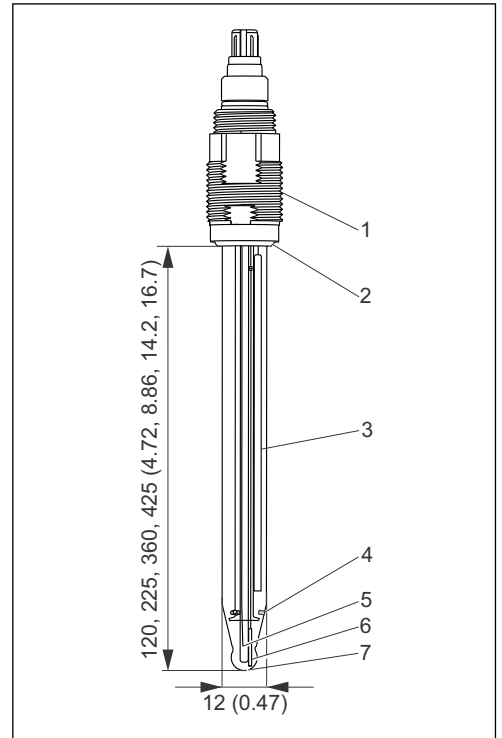
Design, dimensions CPS71



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7 CPS71 with GSA plug-in head, TB

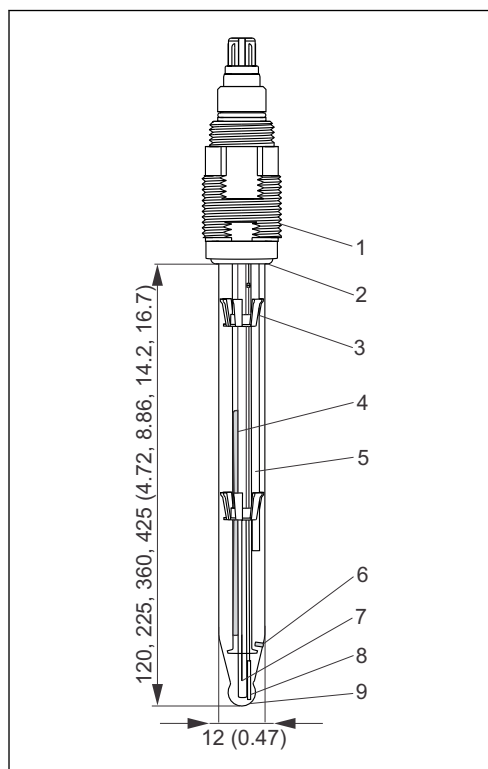
- 1 GSA electrode plug-in head, Pg 13.5
- 2 Viton O-ring with thrust collar
- 3 Ag/AgCl reference lead with ion trap
- 4 Junction
- 5 Ag/AgCl internal reference lead - pH
- 6 pH glass membrane



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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



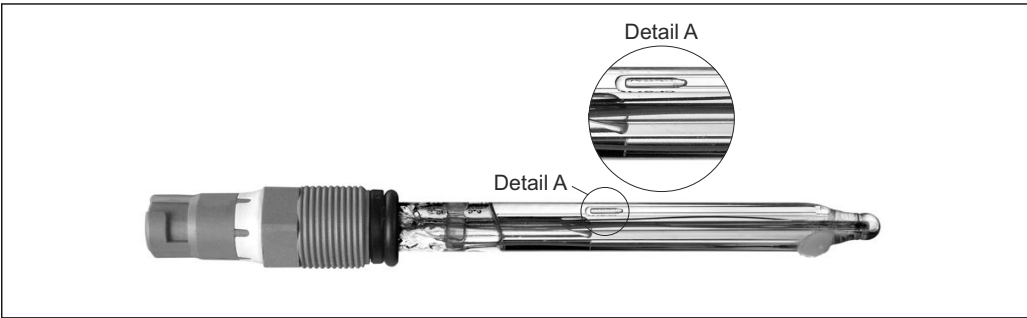
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9 CPS71 with ESA plug-in head, TP

- 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



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