

Technical Information

Ceraliquid CPS41D and CPS41

pH electrodes, digital with Memosens technology, and analog

For process engineering with ceramic diaphragm and KCl liquid electrolyte, optionally available with integrated temperature sensor



Application

Media with very low conductivity or a high proportion of organic solvents or alcohol:

- Chemical industry
- Organic chemicals
- Power stations
- Food industry
- Laboratory measurements

With ATEX- and FMapproval for use in hazardous areas

Your benefits

- KCl liquid electrolyte, can therefore be used with very low conductivity values ($\geq 0.1 \mu\text{S}/\text{cm}$)
- Ceramic diaphragm with specified KCl flow rate
- If counterpressure applied, can be used up to 11 bar (160 psi) abs. pressure
- Poison-resistant thanks to separate reference capillary
- Suitable for CIP / SIP
- pH membrane glass for applications involving steam sterilization
- Four lengths: 120, 225, 360 and 425 mm
- Available with integrated Pt100, Pt1000 temperature sensor for analog sensors or NTC30K for digital sensors

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

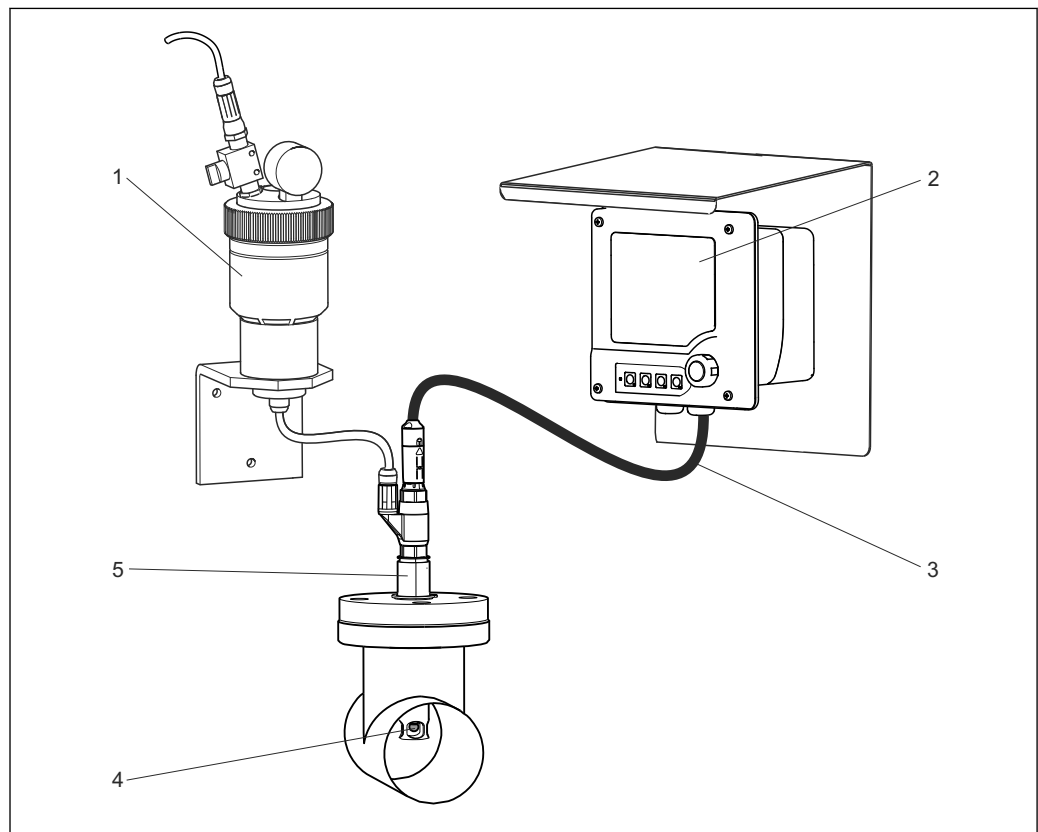
pH measurement

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 CPS41D or CPS41
- Transmitter, e.g. Liquiline CM42, CM44x/R, Mycom153, Liquisys M CPM2x3
- Memosens data cable CYK10 or CYK20 for Memosens sensors or CPK9 for analog sensors
- Immersion, flow or retractable assembly, e.g. Unifit CPA442
- Electrolyte vessel CPY7



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1 Example of a measuring system for pH measurement

- 1 Electrolyte vessel CPY7
- 2 Liquiline M CM42 two-wire transmitter for hazardous area
- 3 Memosens data cable CYK10
- 4 pH electrode CPS41D
- 5 Process assembly Unifit CPA442

Communication and data processing CPS41D

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)
 - 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 above-mentioned 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 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

Electrode version AB and AC (for water / wastewater):

pH: 1 to 12

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

Electrode version BB and BC (for process, suitable for sterilization):

pH: 0 to 14

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



Please note the process operating conditions.

Installation

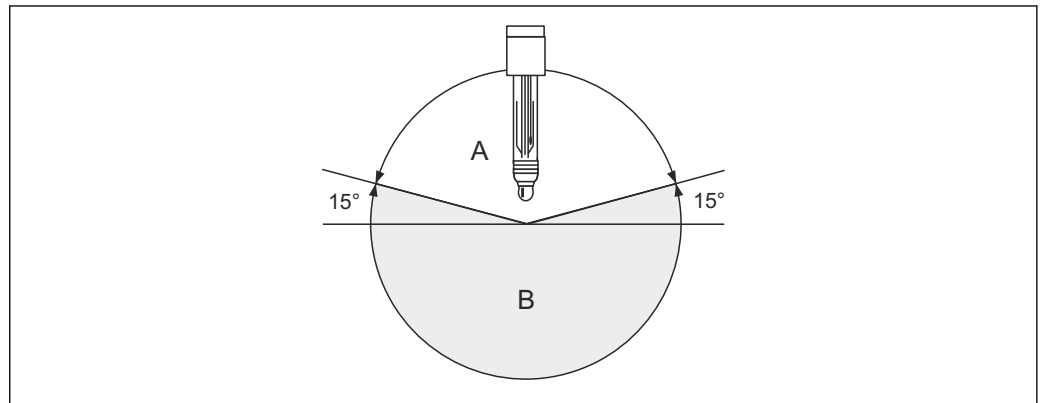
Installation instructions

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 range

NOTICE

Risk of damage due to frost

- ▶ The sensor must not be used at temperatures below -15 °C (5 °F) .
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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 (3.28 ft) water column, 50 °C (122 °F), 168 h)

IP 67: GSA and SSA plug-in head (with closed connector system)

Process

Process temperature	Version AB, AC:	-15 to 80 °C (5 to 176 °F)
	Version BB, BC:	0 to 135 °C (32 to 275 °F)

Process pressure (absolute) 1 to 11 bar (15 to 160 psi) if counterpressure applied via separate KCl vessel

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.

Minimum conductivity	AB, BB version (1 diaphragm)	Min. 5 µS/cm (flow reduced to minimum when KCl electrolyte is discharged)
	AC, BC version (3 diaphragms)	Min. 0.1 µS/cm (flow assembly made of stainless steel with grounding; flow is stable and reduced to minimum when KCl electrolyte is discharged)

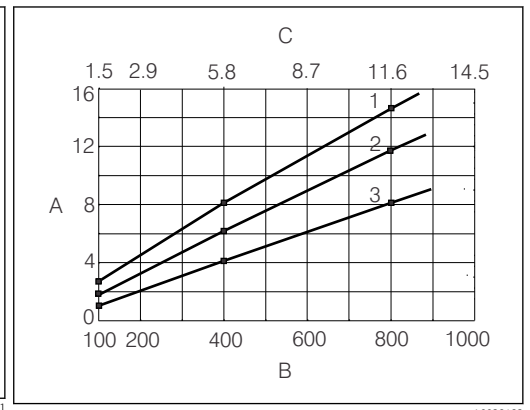
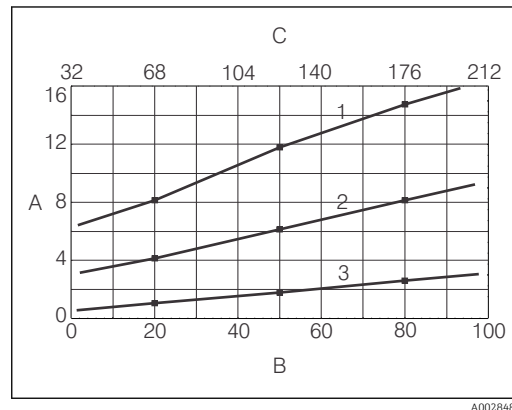
pH range	Version AB, AC:	1 to 12 pH
	Version BB, BC:	0 to 14 pH

NOTICE

Risk of damage to electrode

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

KCl consumption



3 KCl consumption as a function of temperature

- A Consumption (ml/day)
- B Temperature (°C)
- C Temperature (°F)
- 1 800 mbar (11.6 psi) over pressure
- 2 400 mbar (5.8 psi) over pressure
- 3 100 mbar (1.5 psi) over pressure

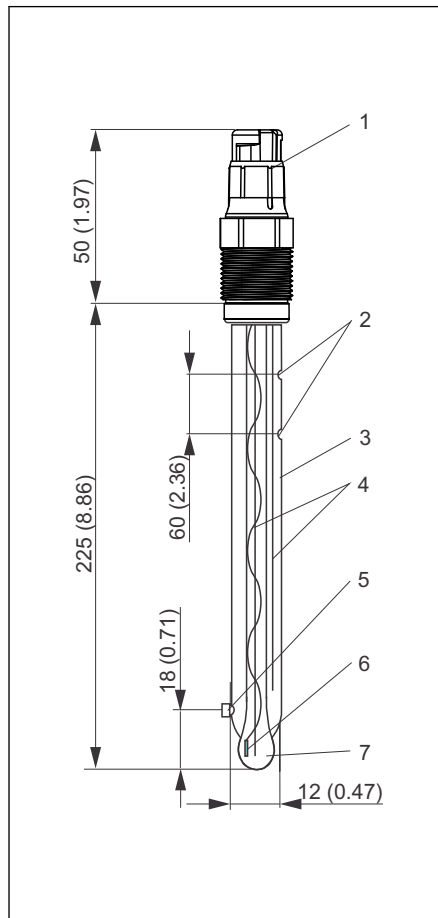
4 KCl consumption as a function of process pressure

- A Consumption (ml/day)
- B Over pressure relative to process (mbar)
- C Over pressure relative to process (psi)
- 1 Fluid temperature 80 °C (176 °F)
- 2 Fluid temperature 50 °C (122 °F)
- 3 Fluid temperature 20 °C (68 °F)

i The specified, approximated KCl consumption is based on electrodes with a single diaphragm. For electrodes with three diaphragms, KCl consumption is proportionately higher.

Mechanical construction

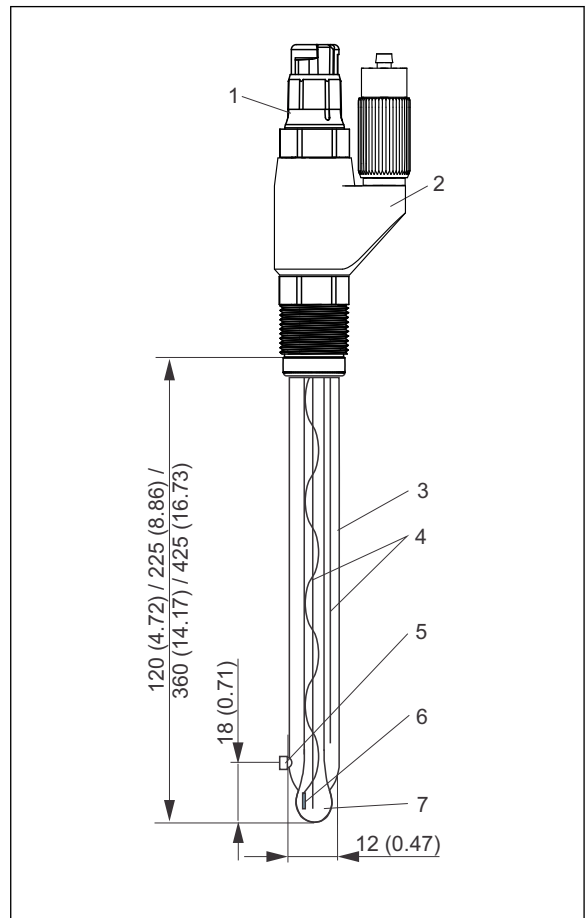
Design, dimensions CPS41D



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5 CPS41D with Memosens plug-in head for CPA441

- 1 Memosens plug-in head
- 2 KCl refill
- 3 KCl liquid electrolyte
- 4 Ag/AgCl reference lead
- 5 Ceramic diaphragm
- 6 Temperature sensor NTC 30K
- 7 pH glass membrane

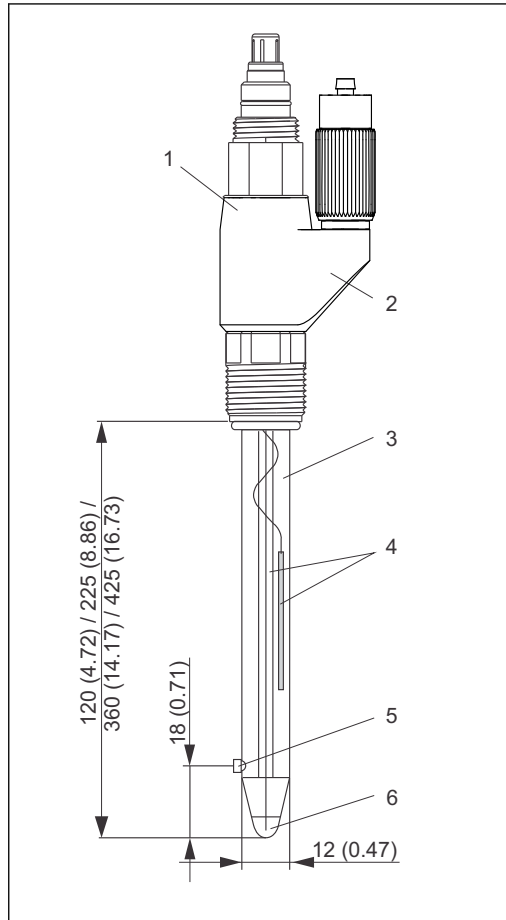


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6 CPS41D with Memosens plug-in head and Hose connection

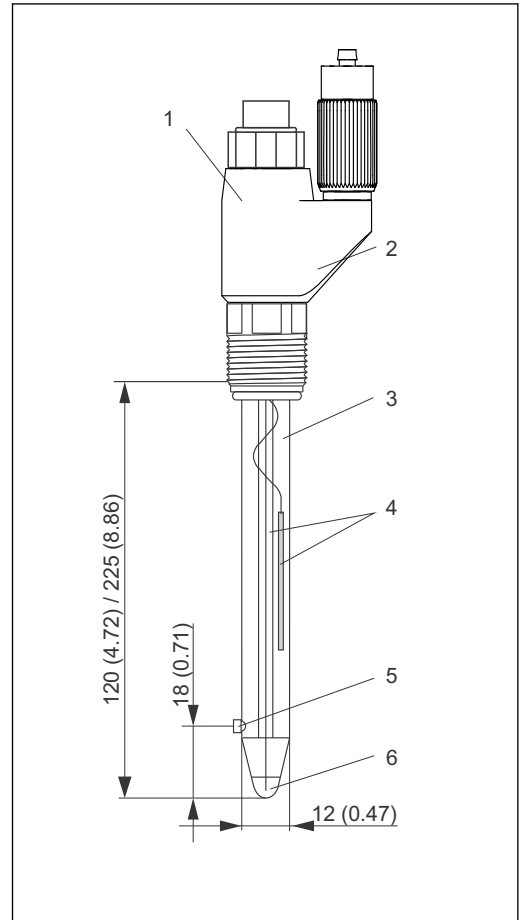
- 1 Memosens plug-in head
- 2 Hose connection for KCl refill
- 3 KCl liquid electrolyte
- 4 Ag/AgCl reference lead
- 5 Ceramic diaphragm
- 6 Temperature sensor NTC 30K
- 7 pH glass membrane

Design, dimensions CPS41



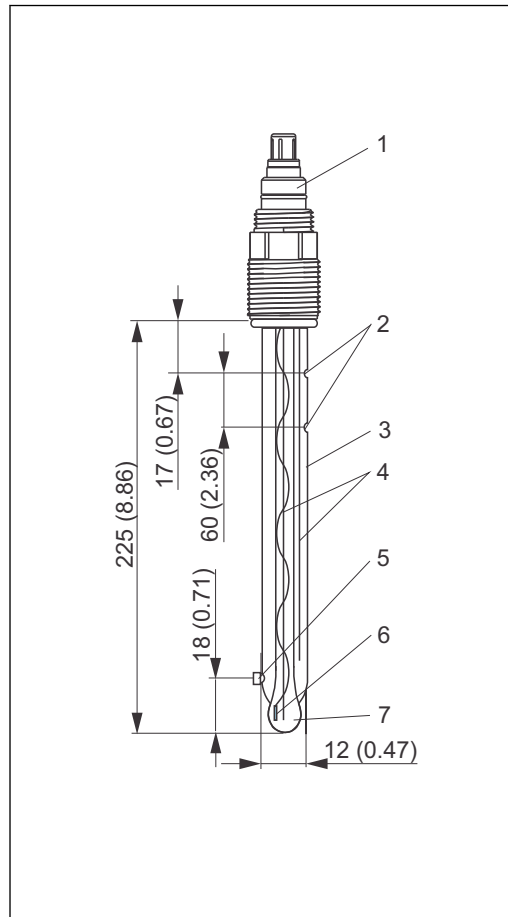
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- 7 CPS41 with ESS plug-in head
- 1 ESS electrode plug-in head, Pg 13.5
 - 2 Hose connection for KCl refill
 - 3 KCl liquid electrolyte
 - 4 Ag/AgCl reference lead
 - 5 Ceramic diaphragm
 - 6 pH glass membrane



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- 8 CPS41 with SSA plug-in head
- 1 SSA electrode plug-in head, Pg 13.5
 - 2 Hose connection for KCl refill
 - 3 KCl liquid electrolyte
 - 4 Ag/AgCl reference lead
 - 5 Ceramic diaphragm
 - 6 pH glass membrane



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9 CPS41 with ESA plug-in head for CPA441, temperature sensor

- 1 TOP68 plug-in head, Pg 13.5
- 2 KCl refill
- 3 KCl liquid electrolyte
- 4 Ag/AgCl reference lead
- 5 Ceramic diaphragm
- 6 Temperature sensor Pt100 or Pt1000
- 7 pH glass membrane

Weight	0.1 kg (0.2 lbs)	
Materials	Electrode shaft:	Glass to suit process
	pH membrane glasses:	Type A, B
	Metal lead:	Ag/AgCl
	Diaphragm:	Ceramic, suitable for sterilization
Process connection	Pg 13.5	
Temperature sensor	CPS41D:	NTC30K
	CPS41:	Pt100, Pt1000

Plug-in heads	CPS41D-****A*:	Memosens plug-in head for digital, non-contact data transmission, pressure resistance 16 bar (232 psi) rel.
	CPS41D-****B*:	Memosens plug-in head with KCl hose connection for digital, non-contact data transmission, pressure resistance 16 bar (232 psi) rel.
	CPS41	
	ESA:	Threaded plug-in head Pg 13.5, TOP68 for electrodes with and without temperature sensor, pressure resistance 16 bar (232 psi) rel.
	ESS:	Hose connection head Pg 13.5, TOP68 for electrodes with and without temperature sensor, pressure resistance 16 bar (232 psi) rel., Ex
	GSA:	Threaded plug-in head Pg 13, for electrodes without temperature sensor
	SSA:	Hose connection head Pg 13.5 for electrodes without temperature sensor
Reference system	Ag/AgCl reference lead, bridge electrolyte: liquid KCl, 3M, AgCl-free	

Certificates and approvals

Ex approval for CPS41D	ATEX	II 1G Ex ia IIC T3/T4/T6 Ga
	IECEX	Ex ia IIC T3/T4/T6 Ga
	FM	IS Class I Div. 2, in conjunction with the Liquiline M CM42 and Mycom S CPM153 transmitters
	CSA	IS Class I Div. 2, in conjunction with the Liquiline M CM42 and Mycom S CPM153 transmitters
	 Hazardous area versions of digital sensors with Memosens technology are indicated by a red-orange ring on the plug-in head.	
Ex approval CPS41 (ESA, ESS)	ATEX	II 1G Ex ia IIC T3/T4/T6 Ga
	CSA	IS Class I Div. 2, in conjunction with the Mycom S CPM153 transmitter
	FM	Class I Div. 2, in conjunction with the Mycom S CPM153 transmitter
TÜV certificate for Memosens plug-in head	Pressure resistance 16 bar rel. (232 psi), minimum three times the safety pressure	
TÜV certificate for TOP68 plug-in head	Pressure resistance 16 bar rel. (232 psi), minimum three times the safety pressure	
Electromagnetic compatibility CPS41D	Interference emission and interference immunity as per EN 61326: 2012	

Ordering information

Product page

www.endress.com/cps41d

www.endress.com/cps41

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 delivery comprises:

- Sensor in the version ordered
- Brief Operating Instructions

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



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 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 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

Electrolyte vessel

Electrolyte vessel CPY7

- Storage container for KCl electrolyte, 150 ml
- Order as per product structure, see Operating Instructions (BA00128C/07/EN)

Electrolyte solutions

KCl electrolyte solutions for topping up liquid-filled pH/ORP electrodes

- 3.0 mol, T = -10 to 100 °C (14 to 212 °F), 1000 ml (33.81 fl.oz), order no. CPY4-2
- 1.5 mol, T = -30 to 130 °C (-22 to 266 °F), 1000 ml (33.81 fl.oz), order no. CPY4-4
- 3.0 mol, T = -10 to 100 °C (14 to 212 °F), 250 ml (8.45 fl.oz), order no. CPY4-5
- 1.5 mol, T = -30 to 130 °C (-22 to 266 °F), 250 ml (8.45 fl.oz), order no. CPY4-6

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

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

Memosens laboratory cable CYK20

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

CPK1

For pH/ORP electrodes with GSA plug-in head

Ordering information is available from your sales office or at www.endress.com.**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.

www.addresses.endress.com
