Technical Information
Orbisint CPS11D and CPS11

pH sensor for standard applications in process technology and environmental engineering

Digital with Memosens technology or analog

Application

- Long-term monitoring and limit control in processes with stable process conditions
  - Chemical industry: strong acids/bases, plastic, pulp and paper industry
  - Power stations (e.g. flue gas scrubbing), oil and gas
  - Incinerator plants
- Water and 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, dirt-repellent PTFE ring junction
- Can be used at pressures up to 17 bar (246.5 psi) (absolute)
- 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 NTC 30K (Memosens) temperature sensor for effective temperature compensation
- Optional: poison-resistant reference with ion trap

Other advantages provided by Memosens technology

- Maximum process safety
- Data security thanks to digital data transmission
- Very easy to use as sensor data are saved in the sensor
- Predictive maintenance can be performed with the Memobase Plus CYZ71D by recording sensor load data in the sensor

Endress+Hauser [EH]

People for Process Automation

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 medium. The membrane glass of the electrode delivers an electrochemical potential that depends on the pH value of the medium. This potential is generated by the selective accumulation of H^+ ions on the outer layer of the membrane. As a result, an electrochemical boundary layer with an electrical potential difference forms at this point. An integrated Ag/AgCl reference system serves as the required reference electrode.

The measured voltage is converted to the corresponding pH value using the Nernst equation.

Measuring system

A complete measuring system comprises at least:
- pH sensor 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
- Assembly
  - Immersion assembly, e.g. Dipfit CPA111
  - Flow assembly, e.g. Flowfit CPA250
  - Retractable assembly, e.g. Cleanfit CPA871
  - Permanent installation assembly, e.g. Unifit CPA842

Other options are available depending on the application: automatic cleaning and calibration system, e.g. Liquiline Control CDC90
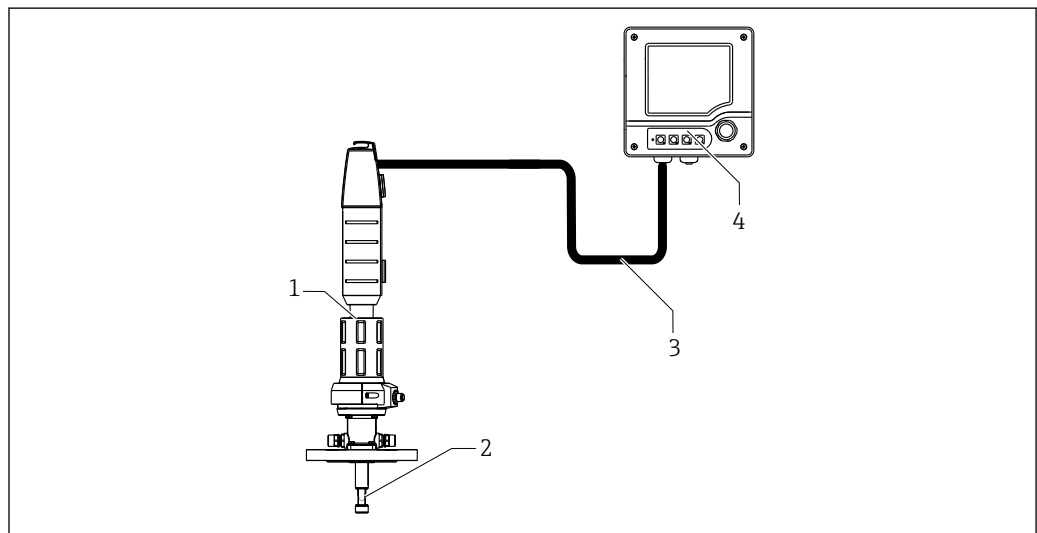
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⊡ *1 Example of a measuring system for pH measurement*

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

Communication and data processing

Communication with the transmitter

ℹ 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 ℃ (77 ℉)
  - Zero point at 25 ℃ (77 ℉)
  - Offset of integrated temperature sensor
  - Number of calibrations
  - Calibration history
  - Serial number of the transmitter used to perform the last calibration or adjustment
- Application 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
  - CIP counter

The data listed above can be displayed with Liquiline CM42, CM44x, and Memobase Plus CYZ71D.

Dependability	**Reliability**
	Easy handling

Easy handling

Sensors with Memosens technology have integrated electronics that store calibration data and other information (e.g. total hours of operation or 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.
- Thanks to the availability of the sensor data, maintenance intervals can be accurately defined and predictive maintenance is possible.
- The sensor history can be documented with external data carriers 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 via a non-contact connection that is free from potential interference. The result:
- If the sensor fails or there is an interruption in the connection between the sensor and transmitter, this is reliably detected and reported.
- The availability of the measuring point is reliably detected and reported.

Security

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	**AA and AS versions**
	• pH: 1 to 12
	• Temperature: –15 to 80 ℃ (5 to 176 ℉)
	BA version
	• pH: 0 to 14
	• Temperature: 0 to 135 ℃ (32 to 275 ℉)
	FA version
	• pH: 0 to 10
	• Temperature: 0 to 70 ℃ (30 to 158 ℉)
	BT version with ion trap
	• pH: 0 to 14
	• Temperature: 0 to 135 ℃ (32 to 275 ℉)

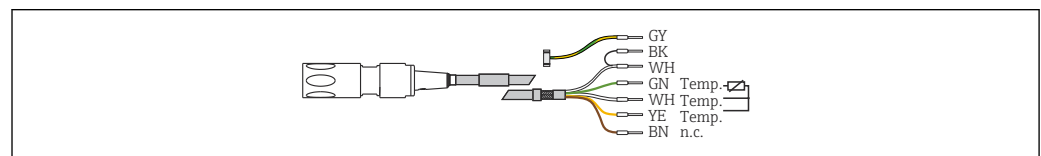Pay attention to the operating conditions in the process.

Power supply

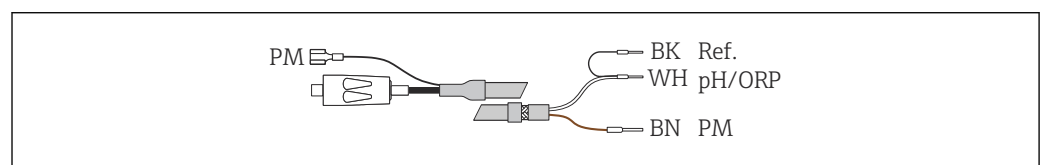**Electrical connection**

Memosens sensors

GY	GND	
YE	Com B	
GN	Com A	
WH	–	
BN	+	

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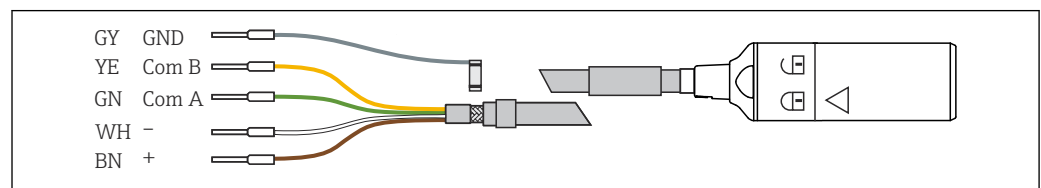
▣ *2*   *Measuring cable CYK10 or CYK20*

Sensors with TOP68 plug-in head

GY
BK
WH
GN   Temp.
WH   Temp.
YE   Temp.
BN   n.c.

A0028048

▣ *3*   *Measuring cable CPK9*

Sensors with GSA plug-in head

PM

BK   Ref.
WH   pH/ORP
BN   PM

A0028051

▣ *4*   *Measuring cable CPK1*

▶ Please follow the connection instructions contained in the Operating Instructions for the transmitter.

Plug-in head

| CPS11D: | Memosens plug-in head for digital, non-contact data transmission |

CPS11:

| ESA: | Threaded plug-in head Pg 13.5, TOP68 for electrodes with and without a temperature sensor, 17 bar (246 psi)(abs.) overpressure protection (threefold), Ex |
| GSA: | Threaded plug-in head Pg 13.5 for electrodes without a temperature sensor |

Performance characteristics

Reference system

| AA, BA, FA versions: | Ag/AgCl reference lead with advanced gel 3M KCl, AgCl-free |
| AS version: | Ag/AgCl reference lead with advanced gel, saturated KCl (> 3M KCl) with salt rings, AgCl-free |

ℹ The following are indicative of used salt rings (fixed supply of KCl) under constant process conditions (e.g. stable temperature and flow):
- a continuous upward trend in the pH value (to alkaline pH values)
- a continuous downward trend in the zero point (to acidic pH values) following adjustment during calibration

| BT version: | Ag/AgCl reference lead with ion trap and advanced gel 3M KCl |

Installation

Orientation
- Do not install the sensors upside-down.
- The installation angle from the horizontal must be at least 15˚.

An installation angle <15˚ is not permitted, as otherwise an air bubble will form. Contact between the membrane glass and the reference lead will then no longer be guaranteed.
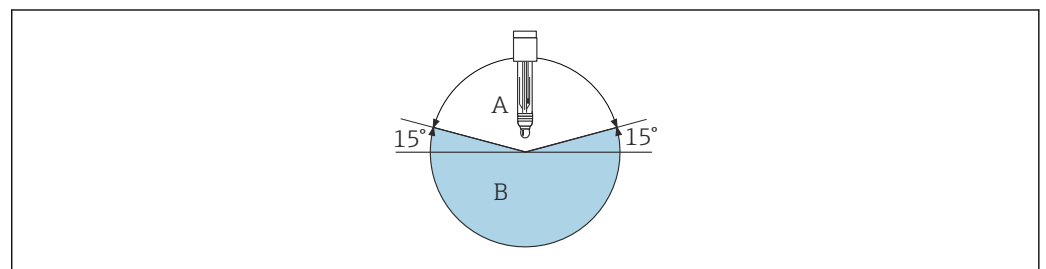
🖾 *5   Installation angle at least 15˚ from the horizontal*

A   Permitted orientation
B   Forbidden orientation

Installation instructions

📖 For detailed installation instructions for the assembly: refer to the Operating Instructions of the assembly used.

1. Before screwing in the sensor, make sure the assembly thread, the O-rings and the sealing surface are clean and undamaged and that the thread runs smoothly.

2. Screw in the sensor and tighten by hand with a torque of 3 Nm (2.21 lbf ft) (specifications only apply if installing in Endress+Hauser assemblies).

Environment

Ambient temperature range	**NOTICE**	

NOTICE

Risk of damage from frost!

▶ Do not use the sensor at temperatures below −15 ℃ (5 ℉) .

Storage temperature	0 to 50 ℃ (32 to 122 ℉)

Degree of protection	IP 68:	Memosens plug-in head (10 m (33 ft) water column, 25 ℃ (77 ℉), 45 days, 1 M KCl)
	IP 68:	TOP68 plug-in head, autoclavable up to 135 ℃ (275 ℉), 1 m (3.3 ft) water column, 50 ℃ (122 ℉), 168 h)
	IP 67:	GSA plug-in head (with closed connector system)

Electromagnetic compatibility (EMC)	Interference emission and interference immunity as per EN 61326: 2012

Process

Process temperature range	AA, AS versions:	−15 to 80 ℃ (5 to 176 ℉)
	BA, BT versions:	0 to 135 ℃ (32 to 275 ℉)
	FA version:	0 to 70 ℃ (32 to 158 ℉)

Process pressure range	AA, AS, FA versions:	1 to 7 bar (14.5 to 101.5 psi) (absolute)
	BA, BT versions:	1 to 17 bar (14.5 to 246.5 psi) (absolute)

⚠ CAUTION

Pressurization of sensor due to prolonged use under increased process pressure
Possibility of sudden rupture and injury from glass splinters!

▶ Avoid fast heating of these pressurized sensors if they are used under reduced process pressure or under atmospheric pressure.
▶ When handling these sensors, always wear protective goggles and appropriate protective gloves.

Conductivity	AA, BA, BT, FA versions:	50 µS/cm minimum (minimized flow; pressure and temperature must be stable)
	AS version:	0.1 µS/cm minimum (stainless steel flow assembly with grounding; stable and minimized flow; pressure and temperature must be stable)

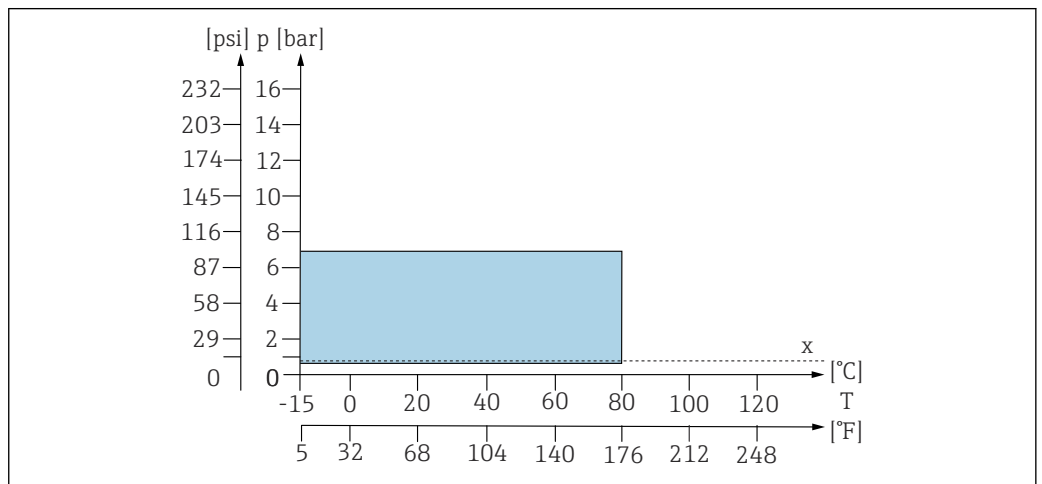**Pressure/temperature ratings**
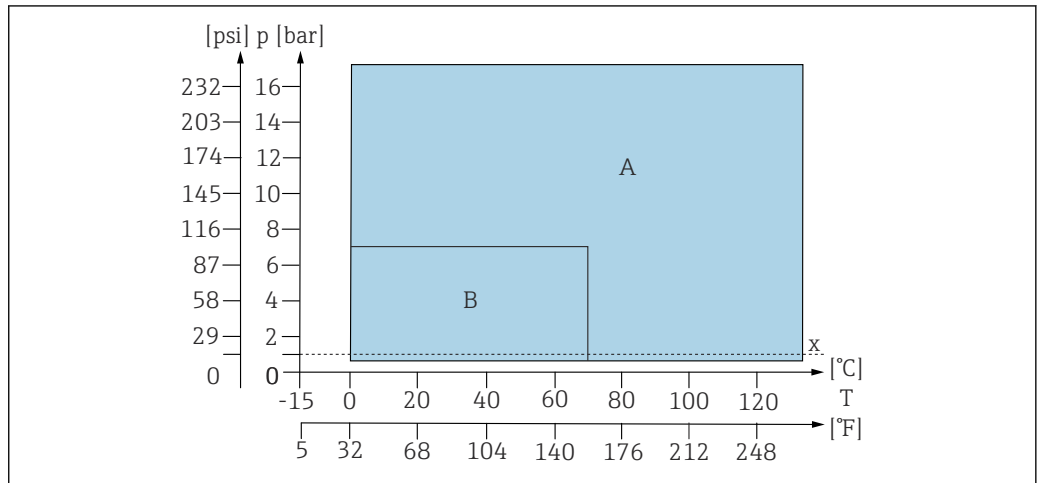
🖼 6   *Pressure/temperature chart*

A   BA, BT versions
B   FA version
x   Atmospheric pressure
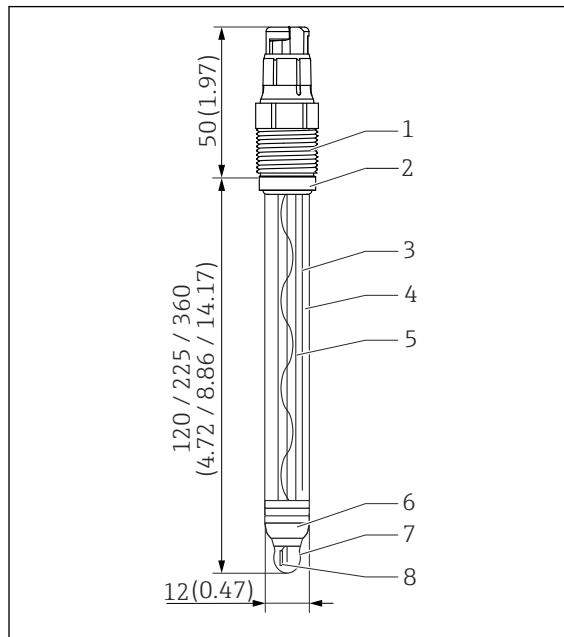

🖼 7   *Pressure/temperature chart*

A   AA, AS versions
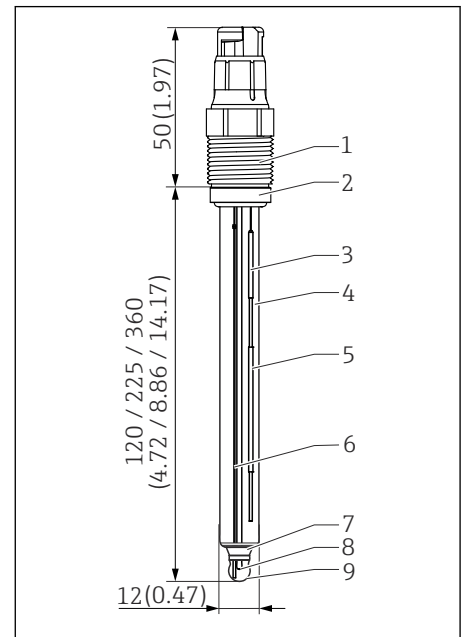*x   Atmospheric pressure*

Mechanical construction
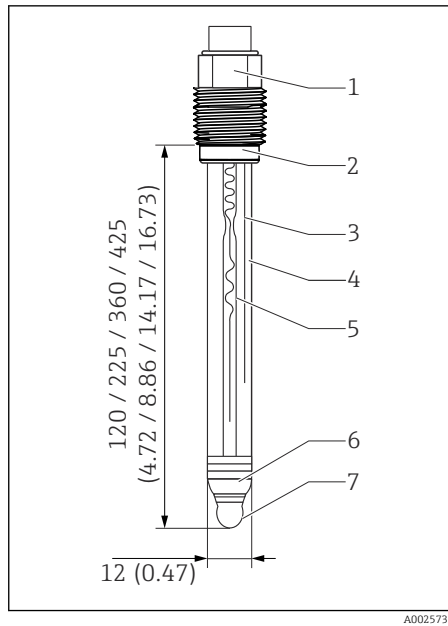
Design, dimensions

8   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 junction
7   pH glass membrane
8   Temperature sensor NTC 30K
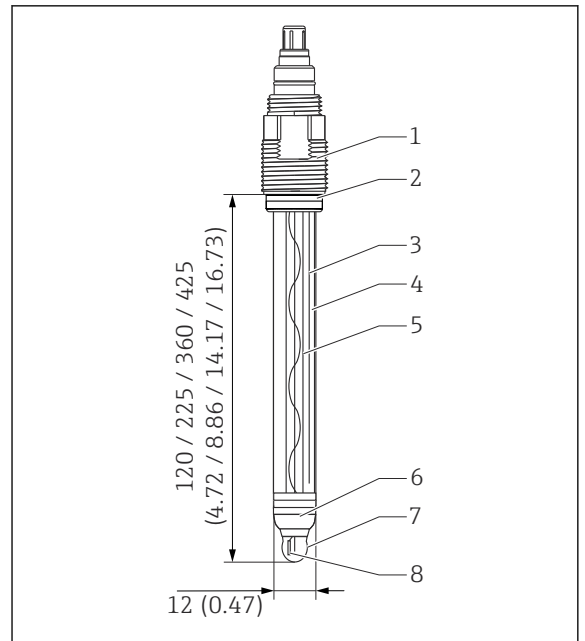

9   CPS11D-7BTxx, with ion trap

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 junction
8   pH glass membrane
9   Temperature sensor NTC 30K

10 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

11 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	Sensor shaft:	Glass to suit process
	pH membrane glass:	Type A, B, F
	Metal lead:	Ag/AgCl
	Open aperture:	Ring-shaped PTFE junction, sterilizable, not cytotoxic

Temperature sensor	CPS11D:	NTC30K
	CPS11:	Pt100, Pt1000

Process connections	Pg 13.5

Certificates and approvals

CE mark The product meets the requirements of the harmonized European standards. As such, it complies with the legal specifications of the EU directives. The manufacturer confirms successful testing of the product by affixing to it the CE mark.

Ex approval	**CPS11D** • ATEX II 1G Ex ia IIC T3/T4/T6 Ga • IECEx 1G Ex ia IIC T3/T4/T6 Ga • FM/CSA Class I Div. 2, in conjunction with the Liquiline M CM42 and Mycom S CPM153 transmitters ℹ️ Hazardous area versions of the digital sensors with Memosens technology are indicated by a red/orange ring in the plug-in head. **CPS11 (TOP68)** • ATEX II 1G Ex ia IIC T3/T4/T6 Ga • FM Class I Div. 2, in conjunction with Liquiline M CM42 and Mycom S CPM153 transmitters
Marine approvals	**Marine approvals** A selection of the devices and sensors have type approval for marine applications, issued by the following classification societies: ABS (American Bureau of Shipping), BV (Bureau Veritas), DNV-GL (Det Norske Veritas-Germanischer Lloyd) and LR (Lloyd's Register). Details of the order codes of the approved devices and sensors, and the installation and ambient conditions, are provided in the relevant certificates for marine applications on the product page on the Internet.
Additional certification	**Biocompatibility** Cytotoxicity verified in accordance with: USP 2009, chapter <88> (USP Class VI) for diaphragm **TÜV certificate for Memosens plug-in head** Pressure resistance 16 bar (232 psi) relative, minimum three times the safety pressure **TÜV certificate for TOP68 plug-in head** Pressure resistance 16 bar (232 psi) relative, minimum three times the safety pressure **EAC** The product has been certified according to guidelines TP TC 004/2011 and TP TC 020/2011 which apply in the European Economic Area (EEA). The EAC conformity mark is affixed to the product.

Ordering information

Product page	www.endress.com/cps11d www.endress.com/cps11
Product Configurator	On the product page there is a **Configure** button to the right of the product image. 1. Click this button. ↳ 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 on the right above the selection window. ℹ️ For many products you also have the option of downloading CAD or 2D drawings of the selected product version. Click the **CAD** tab for this and select the desired file type using picklists.
Scope of delivery	The delivery comprises: • Sensor in the version ordered • Operating Instructions • Safety instructions for the hazardous area (for sensors with Ex approval)

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 Center.

Assemblies	**Cleanfit CPA871**

Cleanfit CPA871
- Flexible process retractable assembly for water, wastewater and the chemical industry
- For applications with standard sensors with 12 mm diameter
- 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 sensors with 12 mm diameter, e.g. for pH, ORP, 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 CPA450
- Manual retractable assembly for installing sensors with a diameter of 12 mm and a length of 120 mm in tanks and pipes
- Product Configurator on the product page: www.endress.com/cpa450

   📖 Technical Information TI00183C

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 pharmaceutics
- 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 sensors 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
- Material: PVC or stainless steel
- 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) 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	**Memosens data cable CYK10** • For digital sensors with Memosens technology • Product Configurator on the product page: www.endress.com/cyk10 Technical Information TI00118C **Measuring cable CPK9** • Terminated measuring cable for connecting analog sensors with TOP68 plug-in head • Selection in accordance with product structure • Product Configurator on the product page: www.endress.com/cpk9 Technical Information TI00118C **CPK1** • For pH/ORP sensors with GSA plug-in head • Product Configurator on the product page: www.endress.com/cpk1 • For ordering information, contact your sales office or see www.endress.com.

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