LENNTECH
WATER TREATMENT SOLUTIONS

Technical Information
Memosens CPS171D

pH electrodes for bioreactors with digital Memosens technology



For biotechnology production processes with ion trap for long-term stable reference

Application

Hygienic and sterile applications (sterilizable, autoclavable)
- Bioreactor/fermenter
- Biotechnology
- Pharmaceutical industry
- Foods

With ATEX/IECEx, FM, CSA, NEPSI, FDA and USP 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 cleaning, autoclavable, up to 140 °C (284 °F) depending on version
- Pressurized reference, specially for fermentation processes
- Integrated pressure indicator
- Long-term 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

Endress+Hauser
People for Process Automation

[Continued from front page]

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

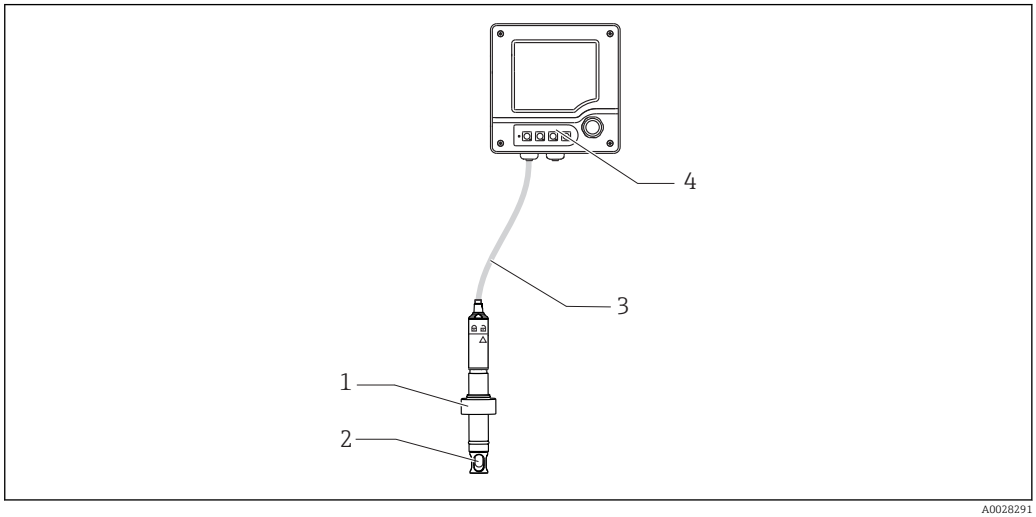
Measuring principle

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 delivers an electrochemical potential that depends on 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



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

Display the data listed above with Liquiline CM42, CM44x/R and Memobase Plus CYZ71D.

Dependability

Reliability

Easy handling
Sensors with Memosens technology have integrated electronics that store calibration data and other information (such as 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 on external data carriers and in evaluation programs, such as 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:
- 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 variable

pH value

Temperature

Measuring range

pH: 1 to 12 pH (measuring range at 0 to 100 °C (32 to 212 °F))/0 to 14 pH (application)

Temperature: 0 to 140 °C (32 to 284 °F)

Pay attention to the operating conditions in the process.

pH range

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

NOTICE

Risk of damage to electrode!

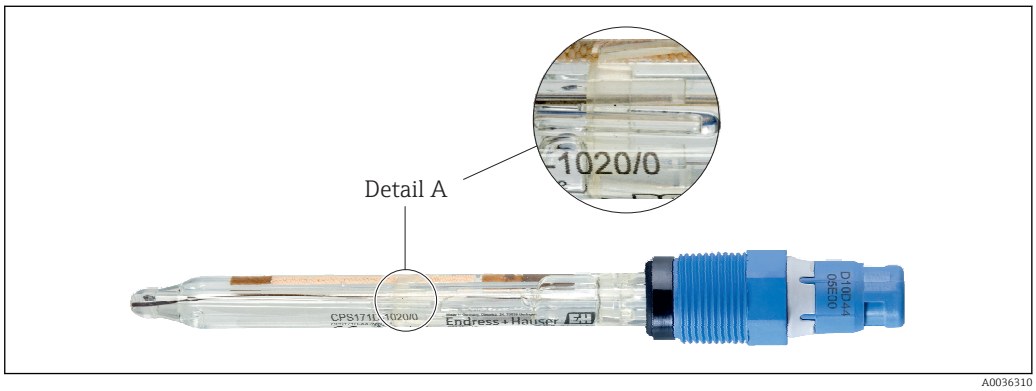
- Never use the electrode outside of the listed specifications!

Performance characteristics

Reference operating conditions

Reference system

Ag/AgCl reference lead with ion trap, bridging electrolyte 3M KCl, non-cytotoxic, pressurized approx. 7 bar (102 psi) (abs.); indicated via pressure indicator (→ 2).



2 *Pressure indicator*

Installation

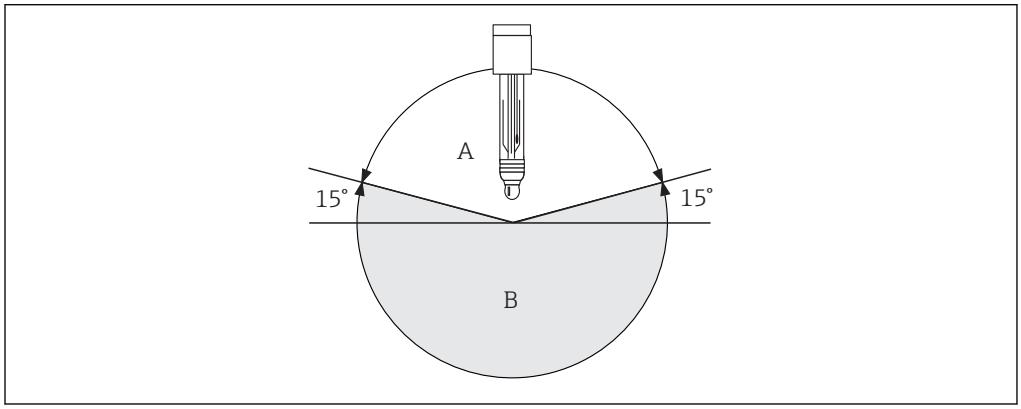
Installation instructions

Do not install the electrode upside-down.

NOTICE

The angle of inclination of the electrode must be at least 15° from the horizontal.
A smaller angle of inclination would cause an air bubble to form in the glass ball. There is then no guarantee that the pH membrane is completely covered with inner electrolyte.
► Select the installation angle of the electrode so that it does not drop below 15°.

1. Before screwing in the electrode, make sure the assembly threaded connection is clean and runs smoothly.
2. Screw in the electrode hand-tight 3 Nm (2.2 lbf ft). (Data apply only if installing with Endress+Hauser CPA assemblies.)
3. Make sure to also follow the installation instructions in the Operating Instructions of the assembly used.



3 installation angle at least 15° 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

Ambient temperature range

NOTICE

Risk of damage from frost!

- ► Do not use the sensor at temperatures below 0 °C (32 °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)

Electromagnetic compatibility

Interference emission and interference immunity as per

- EN 61326-1:2013
- EN 61326-2-3:2013
- EN 61326-2-5: 2013
- NAMUR NE21: 2012

Process

Process temperature range

- 0 to 100 °C (32 to 212 °F) (sterilizable up to 140 °C (284 °F)
- 0 to 135 °C (32 to 275 °F) for sensors with Ex approval

Process pressure range (absolute)

1 to 7 bar (14.5 to 101.5 psi) (abs.)

0.8 bar (12 psi) (abs.) is possible as minimum.

⚠ CAUTION

Pressurization of sensor due to prolonged use under increased process pressure

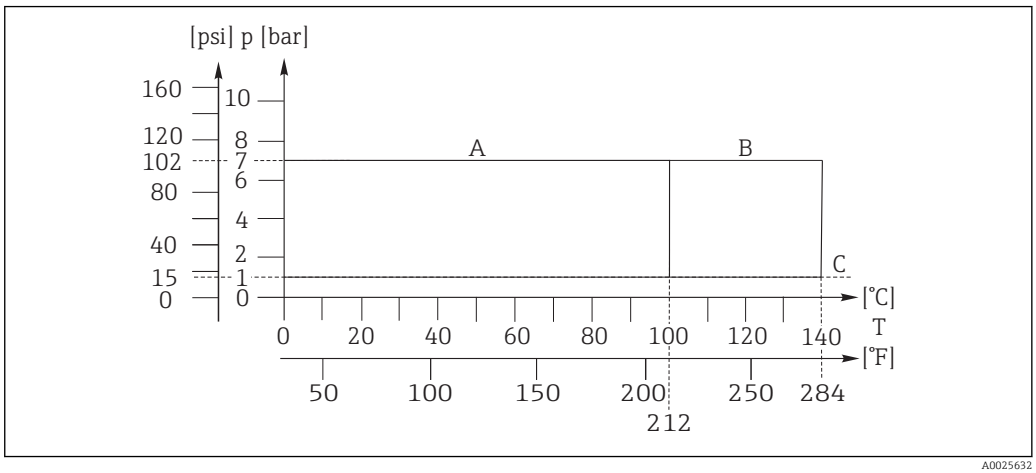
Risk of injury from glass breakage!

- ► Avoid excessive heating of sensors that are used under reduced process pressure or under atmospheric pressure.
- ► When handling these sensors, wear protective goggles and suitable gloves.

Minimum conductivity

Min. 100 µS/cm (at atmospheric pressure, without flow)

Pressure-temperature ratings

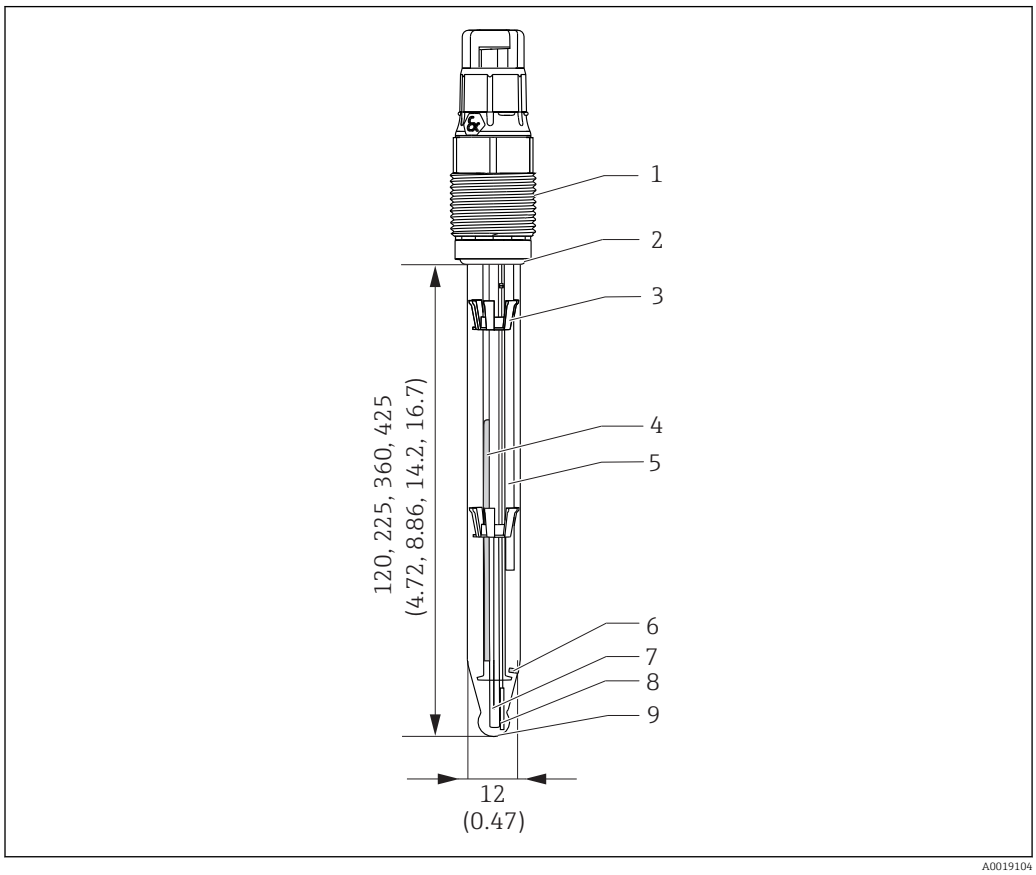


4 *Pressure temperature load curve*

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

Mechanical construction

Design, dimensions



5 CPS171D with Memosens plug-in head. Engineering unit: mm (in)

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 *Diaphragm*
7 *Temperature sensor*
8 *Ag/AgCl internal reference lead*
9 *pH membrane*

Weight

0.1 kg (0.2 lb) at a length of 120 mm (4.7 in)

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

Temperature sensor

NTC 30K

Plug-in heads

CPS171D:	Memosens plug-in head for digital, non-contact data transmission, 16 bar (232 psi) (rel.)

Process connections	Pg 13.5

Certificates and approvals

Ex approval	**IECEx** Ex ia IIC T3/T4/T6 Ga **ATEX** II 1G Ex ia IIC T3/T4/T6 Ga **NEPSI** Ex ia IIC T3/T4/T6 Ga **FM** IS/NI CL. I. Div 1, Group A-D **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 on the plug-in head.
Biocompatibility	Biocompatibility successfully tested with regard to ▪ Biological reactivity, in vitro (cytotoxicity) according to USP <87> For process-sealing O-ring, bridging electrolyte and inscription on shaft ▪ Biological reactivity, in vivo according to USP <88> Class VI, 121 °C (250 °F) For process-sealing O-ring
TÜV certificate for Memosens plug-in head	Pressure resistance 16 bar (232 psi) (rel.), minimum three times the safety pressure

Ordering information

Product page

www.endress.com/cps171d

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.

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 hazardous area

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

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

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 CPA475
- Retractable assembly for pH/ORP measurement in tanks and pipes under sterile measuring conditions
- Product Configurator on the product page: www.endress.com/cpa475

Technical Information TI00240C

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

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

Memosens laboratory cable CYK20
- For digital sensors with Memosens technology
- Product Configurator on the product page: 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
- Product Configurator on the product page: www.endress.com/cyz71d

Technical Information TI00502C

Handheld instrument

Liquiline To Go CYM290, CYM291
- Portable multiparameter device for Memosens pH, conductivity and oxygen sensors
- Product Configurator on the product page: www.endress.com/cym290, 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.

LENNTECH
Water Treatment Solutions
info@lenntech.com Tel. +31-152-610-900
www.lenntech.com Fax. +31-152-616-289

Endress+Hauser
People for Process Automation