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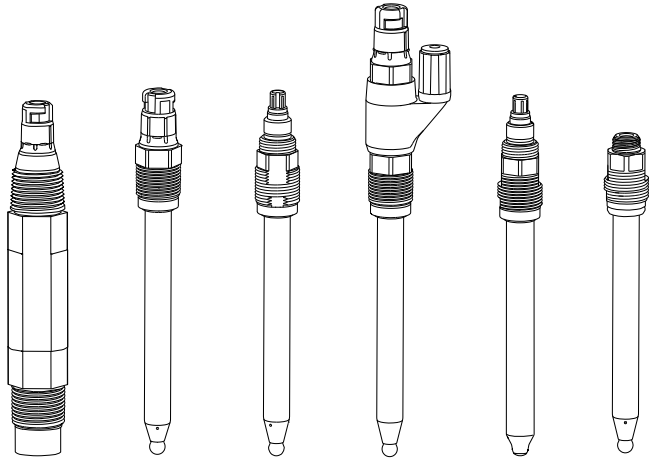
Operating Instructions
pH/ORP sensors and reference half cells

Sensors with Memosens technology and analog sensors



Endress+Hauser
People for Process Automation

1 About this document

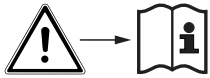
1.1 Warnings

Structure of information	Meaning
⚠ DANGER **Causes (/consequences)** If necessary, Consequences of non-compliance (if applicable) ▶ Corrective action	This symbol alerts you to a dangerous situation. Failure to avoid the dangerous situation **will** result in a fatal or serious injury.
⚠ WARNING **Causes (/consequences)** If necessary, Consequences of non-compliance (if applicable) ▶ Corrective action	This symbol alerts you to a dangerous situation. Failure to avoid the dangerous situation **can** result in a fatal or serious injury.
⚠ CAUTION **Causes (/consequences)** If necessary, Consequences of non-compliance (if applicable) ▶ Corrective action	This symbol alerts you to a dangerous situation. Failure to avoid this situation can result in minor or more serious injuries.
NOTICE **Cause/situation** If necessary, Consequences of non-compliance (if applicable) ▶ Action/note	This symbol alerts you to situations which may result in damage to property.

1.2 Symbols used

Symbol	Meaning
	Additional information, tips
	Permitted or recommended
	Not permitted or not recommended
	Reference to device documentation
	Reference to page
	Reference to graphic
	Result of a step

1.2.1 Symbols on the device

Symbol	Meaning
	Reference to device documentation

1.3 Documentation

The following manuals which complement these Operating Instructions can be found on the product pages on the Internet:
- Technical Information for the relevant sensor
- Operating Instructions for the transmitter used

In addition to these Operating Instructions, an XA with "Safety instructions for electrical apparatus in the hazardous area" is also included with sensors for use in the hazardous area.

► Please follow instructions on use in the hazardous area carefully.

Safety instructions for electrical apparatus in hazardous area, Memosens pH/ORP sensors, XA00376C

Safety instructions for electrical apparatus in hazardous area, analog pH/ORP sensors, XA00028C

Safety instructions for electrical apparatus in hazardous area, Memosens pH/ORP sensors, XA01437C

Safety instructions for electrical apparatus in hazardous area, Memosens pH/ORP sensors, XA00079C

Safety instructions for electrical apparatus in hazardous area, analog pH/ORP sensors, XA01440C

2 Basic safety instructions

2.1 Requirements for personnel

- Installation, commissioning, operation and maintenance of the measuring system may be carried out only by specially trained technical personnel.
- The technical personnel must be authorized by the plant operator to carry out the specified activities.
- The electrical connection may be performed only by an electrical technician.
- The technical personnel must have read and understood these Operating Instructions and must follow the instructions contained therein.
- Faults at the measuring point may only be rectified by authorized and specially trained personnel.

Repairs not described in the Operating Instructions provided must be carried out only directly at the manufacturer's site or by the service organization.

2.2 Designated use

The CPSx1D, CPSx1, CPS1x1D, CPFx1D and CPFx1 sensors are designed for the continuous measurement of the pH value in liquids.

The CPSx2D, CPSx2, CPFx2D and CPFx2 sensors are designed for the measurement of the oxidation-reduction potential (ORP) in liquids.

Together with the CPSx3 reference half cells, the CPSx4 and CPSx5 half cells are designed for the measurement of the pH value (CPSx4) or the ORP (CPSx5) in liquids.

A list of recommended applications is provided in the Technical Information for the relevant sensor.

Use of the device for any purpose other than that described, poses a threat to the safety of people and of the entire measuring system and is therefore not permitted.

The manufacturer is not liable for damage caused by improper or non-designated use.

2.3 Workplace safety

As the user, you are responsible for complying with the following safety conditions:
- Installation guidelines
- Local standards and regulations
- Regulations for explosion protection

2.4 Operational safety

Before commissioning the entire measuring point:

1. Verify that all connections are correct.
2. Ensure that electrical cables and hose connections are undamaged.
3. Do not operate damaged products, and protect them against unintentional operation.
4. Label damaged products as defective.

During operation:

- If faults cannot be rectified:
  products must be taken out of service and protected against unintentional operation.

2.5 Product safety

2.5.1 State-of-the-art technology

The product is designed to meet state-of-the-art safety requirements, has been tested, and left the factory in a condition in which it is safe to operate. The relevant regulations and international standards have been observed.

3 Incoming acceptance and product identification

3.1 Incoming acceptance

1. Verify that the packaging is undamaged.
   - Notify the supplier of any damage to the packaging.
     Keep the damaged packaging until the issue has been resolved.
2. Verify that the contents are undamaged.
   - Notify the supplier of any damage to the delivery contents.
     Keep the damaged goods until the issue has been resolved.
3. Check that the delivery is complete and nothing is missing.
   - Compare the shipping documents with your order.
4. Pack the product for storage and transportation in such a way that it is protected against impact and moisture.
   - The original packaging offers the best protection.
     Make sure to comply with the permitted ambient conditions.

If you have any questions, please contact your supplier or your local Sales Center.

3.2 Product identification

3.2.1 Nameplate

The nameplate provides you with the following information on your device:
- Manufacturer details
- Order code
- Serial number
- Operating conditions
- Safety information and warnings

- Compare the information on the nameplate with the order.

3.2.2 Identifying the product

Interpreting the order code

The order code and serial number of your product can be found in the following locations:
- On the nameplate
- In the delivery papers

Obtaining information on the product

1. Go to www.endress.com.
2. Call up the site search (magnifying glass).
3. Enter a valid serial number.
4. Search.
   ↳ The product structure is displayed in a popup window.
5. Click on the product image in the popup window.
   ↳ A new window (**Device Viewer**) opens. All of the information relating to your device is displayed in this window as well as the product documentation.

3.2.3 Manufacturer's address

Endress+Hauser Conducta GmbH+Co. KG
Dieselstraße 24
D-70839 Gerlingen

or

Endress+Hauser Conducta Inc.
4123 East La Palma Avenue, Suite 200
Anaheim, CA 92807 USA

3.3 Storage and transport

All sensors are individually tested and supplied in individual packs. The sensors are provided with a protection cap. The cap contains a special liquid that prevents the sensor from drying out.

Do not allow the sensor to dry out, as this can result in permanent measurement errors.

Sensors must be stored in dry rooms at temperatures of 0 to 50 °C (32 to 122 °F).

NOTICE

Freezing of internal buffer and inner electrolyte!
The sensors can crack at temperatures lower than -15 °C (5 °F).
- ▶ If transporting the sensors, make sure to package them so they are appropriately protected against frost.

3.4 Scope of delivery

The delivery comprises:
- Sensor in the version ordered
- Operating Instructions
- Safety instructions for the hazardous area (for sensors with Ex approval)

3.5 Certificates and approvals

3.5.1 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.

3.5.2 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.

3.5.3 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.

4 Installation

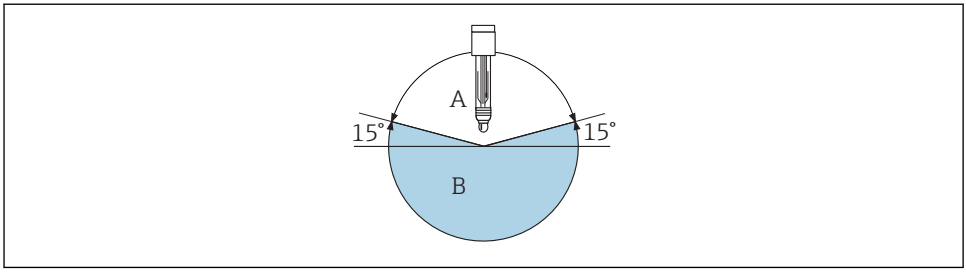
4.1 Installation conditions

- 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.
- Pay attention to the installation instructions provided in the Operating Instructions of the assembly used.

▶ 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).

4.1.1 Orientation

All sensors except CPS71(D)-*BU/TU**
- Do not install the sensors upside-down.
- The angle of inclination from the horizontal must be at least 15°.



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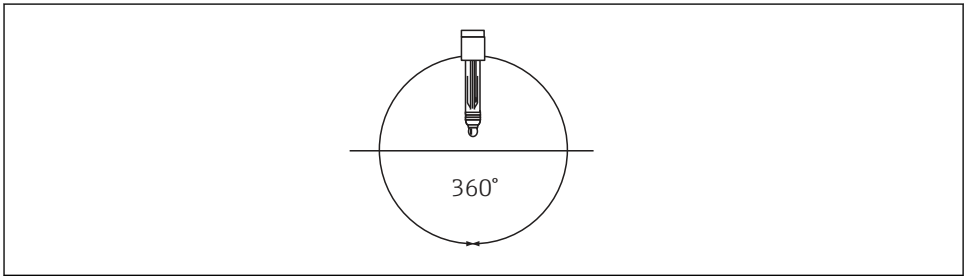
1 *Installation angle at least 15° from the horizontal*

A Permitted orientation
B Incorrect orientation

Only CPS71(D)-*BU/TU [1)]**

- The sensors are suitable for upside-down installation.
- Install the sensors at any angle.



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2 *Any installation angle*

CAUTION

Glass sensor with pressurized reference

Possibility of sudden rupture and injury from glass splinters!

- ▶ When handling these sensors, always wear protective goggles and appropriate protective gloves.

1) Upside-down installation is also possible for ORP and reference half cells with a solid gel.

Installation instructions for CPS71(D)-*TP**

⚠ CAUTION

Glass sensor with pressurized reference

Possibility of sudden rupture and injury from glass splinters!

- ▶ Always wear protective goggles when working with these sensors.
- ▶ Exercise particular care when removing the silicone seal from the reference junction. Here, a knife is used to activate the sensor for measuring operation.

For correct pH measurement:

- ▶ Before commissioning the sensor, remove the silicone seal from the junction. Use the knife supplied for this purpose.

4.2 Post-installation check

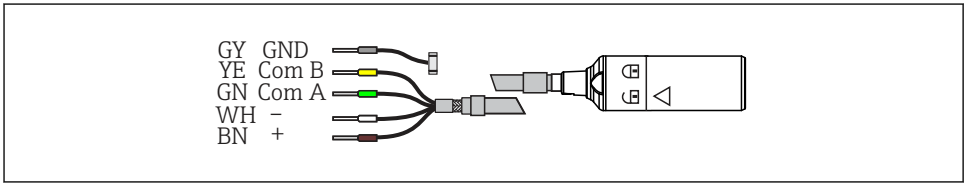
Put the sensor into operation only if you can answer "yes" to the following questions:

- Are the sensor and cable undamaged?
- Is the orientation correct?

5 Electrical connection

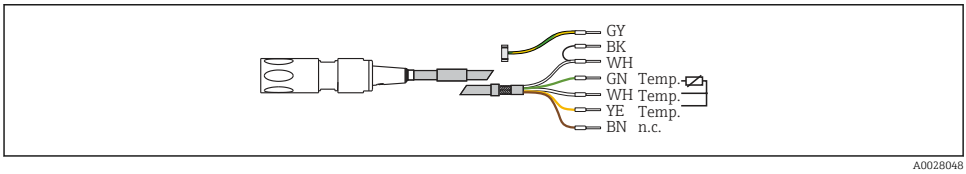
5.1 Connecting the sensor

Memosens sensors



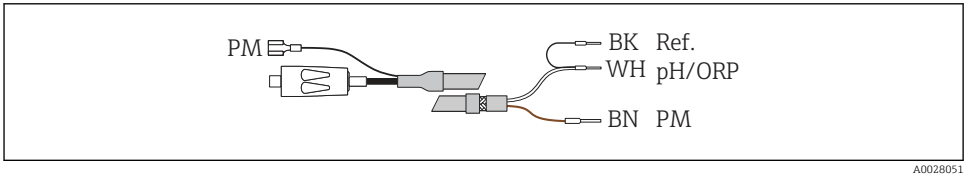
3 Measuring cable CYK10 or CYK20

Sensors with TOP68 plug-in head



4 Measuring cable CPK9

Sensors with GSA plug-in head



5 Measuring cable CPK1

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

6 Commissioning

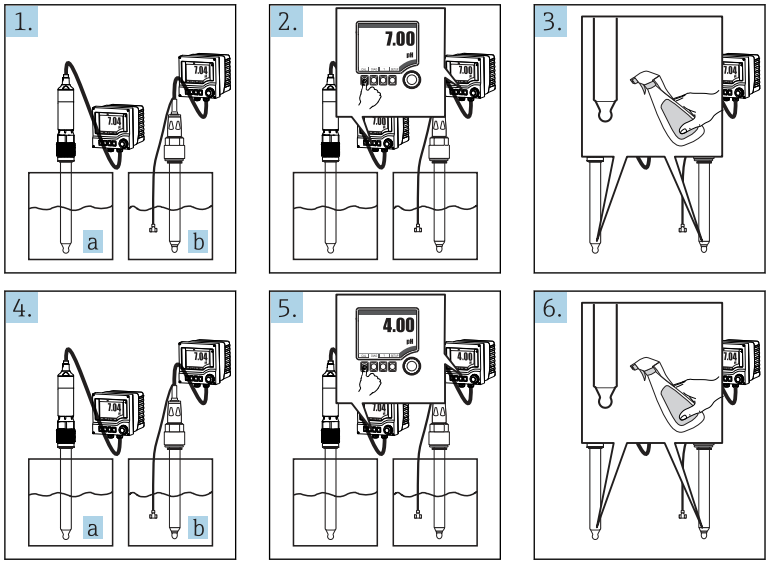
6.1 Calibration and measurement

The frequency with which a sensor calibration or sensor check is performed depends on the operating conditions, e.g. contamination and chemical load.

New pH or ORP sensors with Memosens technology do not need to be calibrated. Calibration is only required if very strict accuracy requirements must be met, or if the sensor has been in storage for longer than 3 months.

- Two-point calibration is required for pH sensors. Use a high-quality buffer from Endress+Hauser, e.g. CPY20, for this purpose.
- Single-point calibration is required for ORP sensors. Use a buffer solution with 220 mV or 468 mV from Endress+Hauser, e.g. CPY3, for this purpose.

- ▶ Remove the protection cap for calibration and measurement.
- ▶ pH/ORP sensors which are stored dry must be immersed in medium for at least 24 hours before use. Otherwise severe value drifting can be expected.
- ▶ If the protection cap is no longer used to store the sensor, store the sensor in a KCl solution (3 mol/l) or buffer solution.
- ▶ The frequency at which a sensor calibration or sensor inspection is performed depends on the operating conditions (fouling, chemical load).
- ▶ Analog pH or ORP sensors must be calibrated when they are connected for the first time.



1. Immerse the sensor into a defined buffer solution (e.g. pH 7 or 220 mV).

In the case of a symmetrical connection (b), also immerse the potential matching line (PML) into the solution. In the case of an asymmetrical connection, use a cable without a PML or cut off the PML directly after the heat shrink tube.

Connection with a PML is not necessary for pH or ORP sensors with Memosens technology (a).

2. Perform the calibration at the transmitter:

(a) In the case of pH sensors and manual temperature compensation, set the measurement temperature.

(b) Enter the pH value , or the mV value, of the buffer solution.

(c) Start calibration.

(d) The value is accepted once it has stabilized.

3. Rinse the sensor with distilled water. Do not dry the sensor!

In the case of ORP sensors, this completes the calibration and the device is adjusted to the sensor.

4. Immerse the pH sensor into the second buffer solution (e.g. pH 4).

5. Perform the calibration at the transmitter:

(a) Enter the pH value of the second buffer solution.

(b) Start the calibration.

(c) The value is accepted once it has stabilized.

The device calculates the zero point and slope and displays the values. Once the adjustment values have been accepted, the device is adjusted to the new pH sensor.

6. Rinse the pH sensor with distilled water.

7 Maintenance

7.1 Maintenance tasks

7.1.1 Cleaning the sensor

⚠ WARNING

Mineral acids and hydrofluoric acid

Risk of serious or fatal injury from caustic burns!

- ▶ Wear goggles to protect eyes.
- ▶ Wear protective gloves and appropriate protective clothing.
- ▶ Avoid all contact with the eyes, mouth and skin.
- ▶ If using hydrofluoric acid, use plastic vessels only.

⚠ WARNING

Thiocarbamide

Harmful if swallowed! Limited evidence of carcinogenicity! Possible risk of harm to the unborn child! Dangerous for the environment with long-term effects!

- ▶ Wear protective goggles, protective gloves and appropriate protective clothing.
- ▶ Avoid all contact with the eyes, mouth and skin.
- ▶ Avoid discharge into the environment.

Clean away fouling on the sensor as follows depending on the type of fouling:

1. Oily and greasy films:
   Clean with fat solvent, e.g. alcohol, or hot water and agents containing surfactants (alkaline) (e.g. dishwashing detergent).
2. Lime and metal hydroxide buildup and low solubility (lyophobic) organic buildup:
   Dissolve buildup with diluted hydrochloric acid (3 %) and then rinse thoroughly with plenty of clear water.
3. Sulfidic buildup (from flue gas desulfurization or wastewater treatment plants):
   Use a mixture of hydrochloric acid (3 %) and thiocarbamide (commercially available) and then rinse thoroughly with plenty of clear water.
4. Buildup containing proteins (e.g. food industry):
   Use a mixture of hydrochloric acid (0.5 %) and pepsin (commercially available) and then rinse thoroughly with plenty of clear water.
5. Readily soluble biological buildup:
   Rinse with pressurized water.

After cleaning, rinse the sensor thoroughly with water and then recalibrate.

8 Repair

8.1 Return

The product must be returned if repairs or a factory calibration are required, or if the wrong product was ordered or delivered. As an ISO-certified company and also due to legal regulations, Endress+Hauser is obliged to follow certain procedures when handling any returned products that have been in contact with medium.

To ensure the swift, safe and professional return of the device:

- Refer to the website www.endress.com/support/return-material for information on the procedure and conditions for returning devices.

8.2 Disposal

The device contains electronic components. The product must be disposed of as electronic waste.

- Observe the local regulations.



www.addresses.endress.com

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