

Operating Instructions

Memosens CAS41E

ISE sensor for the continuous measurement of ammonium, nitrate, potassium and chloride



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1 About this document

1.1 Safety information

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

	Additional information, tips
	Permitted
	Recommended
	Not permitted or not recommended
	Reference to device documentation
	Reference to page
	Reference to graphic
	Result of an individual step

1.3 Symbols used

	Additional information, tips
	Permitted
	Recommended
	Not permitted or not recommended
	Reference to device documentation
	Reference to page
	Reference to graphic
	Result of an individual step

1.3.1 Symbols on the device

	Reference to device documentation
	Do not dispose of products bearing this marking as unsorted municipal waste. Instead, return them to the manufacturer for disposal under the applicable conditions.

1.4 Documentation

The following manuals which complement these Operating Instructions can be found on the product pages on the Internet:

- Technical Information of the 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 explosion-hazardous areas for CSA C/US approval, XA03761C

2 Basic safety instructions

2.1 Requirements for the 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 Intended use

The ISE sensor is designed for measurements in the aeration tank of municipal wastewater treatment plants.

The following parameters can be monitored and regulated depending on the device version:

- Ammonium
- Nitrate
- Potassium (also to compensate ammonium)
- Chloride (also to compensate nitrate)

Any use other than that intended puts the safety of people and the measuring system at risk. Therefore, any other use is not permitted.

The manufacturer is not liable for harm caused by improper or unintended use.

2.3 Workplace safety

The operator is responsible for ensuring compliance with the following safety regulations:

- Installation guidelines
- Local standards and regulations

Electromagnetic compatibility

- The product has been tested for electromagnetic compatibility in accordance with the applicable international standards for industrial applications.
- The electromagnetic compatibility indicated applies only to a product that has been connected in accordance with these Operating Instructions.

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.

Procedure for damaged products:

1. Do not operate damaged products, and protect them against unintentional operation.
2. Label damaged products as defective.

During operation:

- ▶ If errors cannot be rectified,
take products out of service and protect them against unintentional operation.

CAUTION

Programs not switched off during maintenance activities.

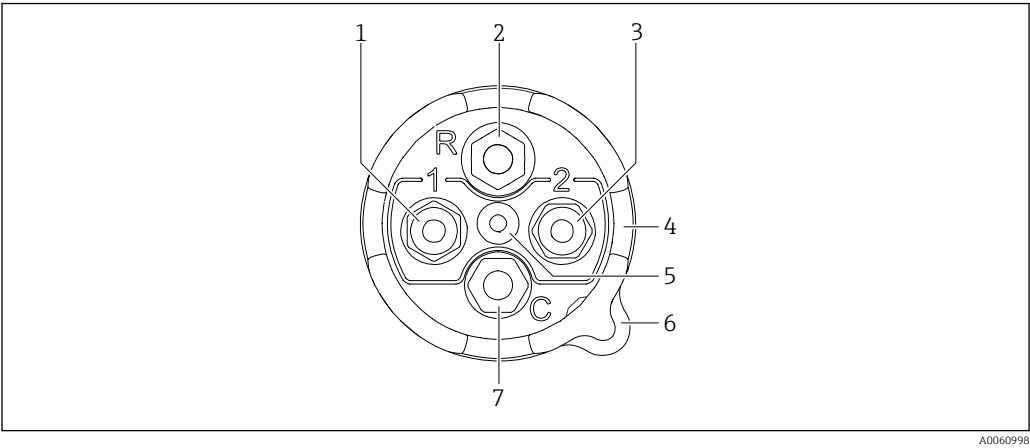
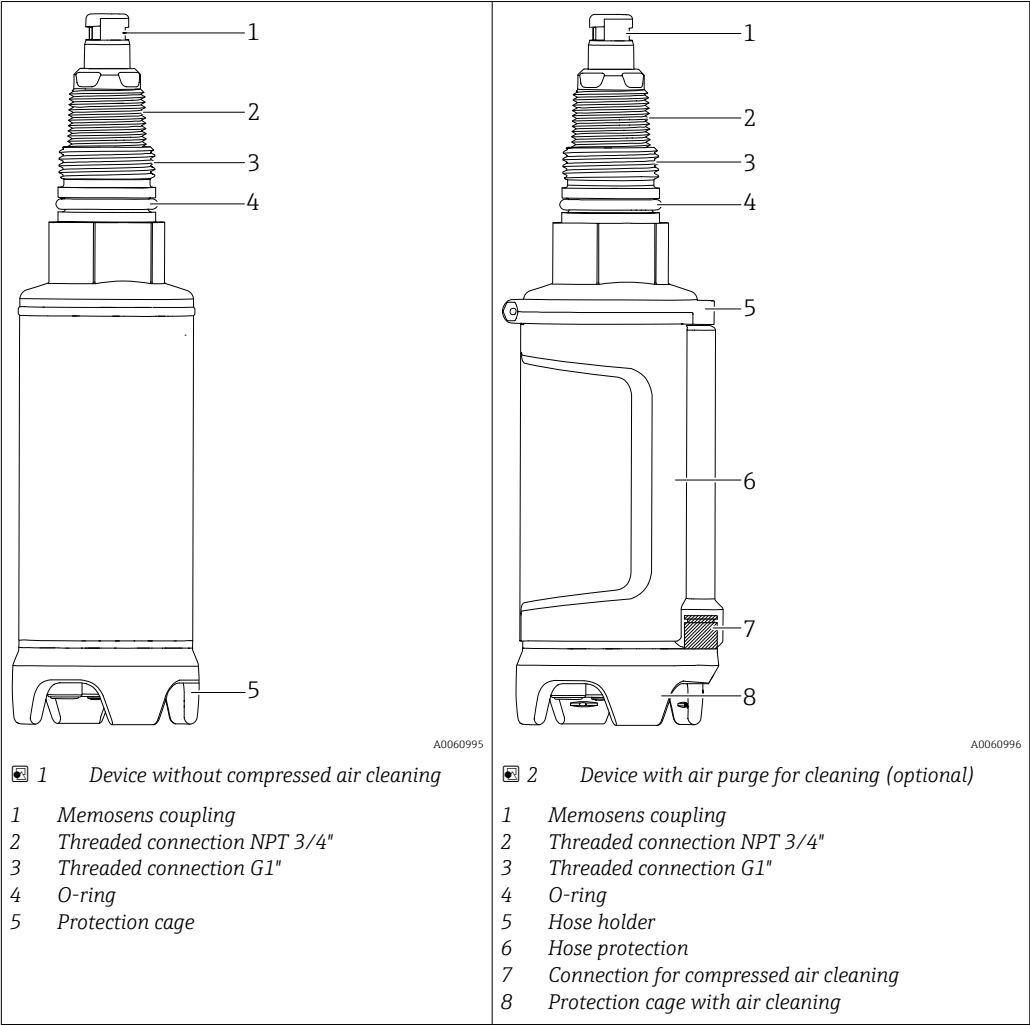
Risk of injury due to medium or cleaning agent!

- ▶ Quit any programs that are active.
- ▶ Activate the cleaning hold function.
- ▶ If testing the cleaning function while cleaning is in progress, wear protective clothing, goggles and gloves or take other suitable measures to protect yourself.

2.5 Product safety

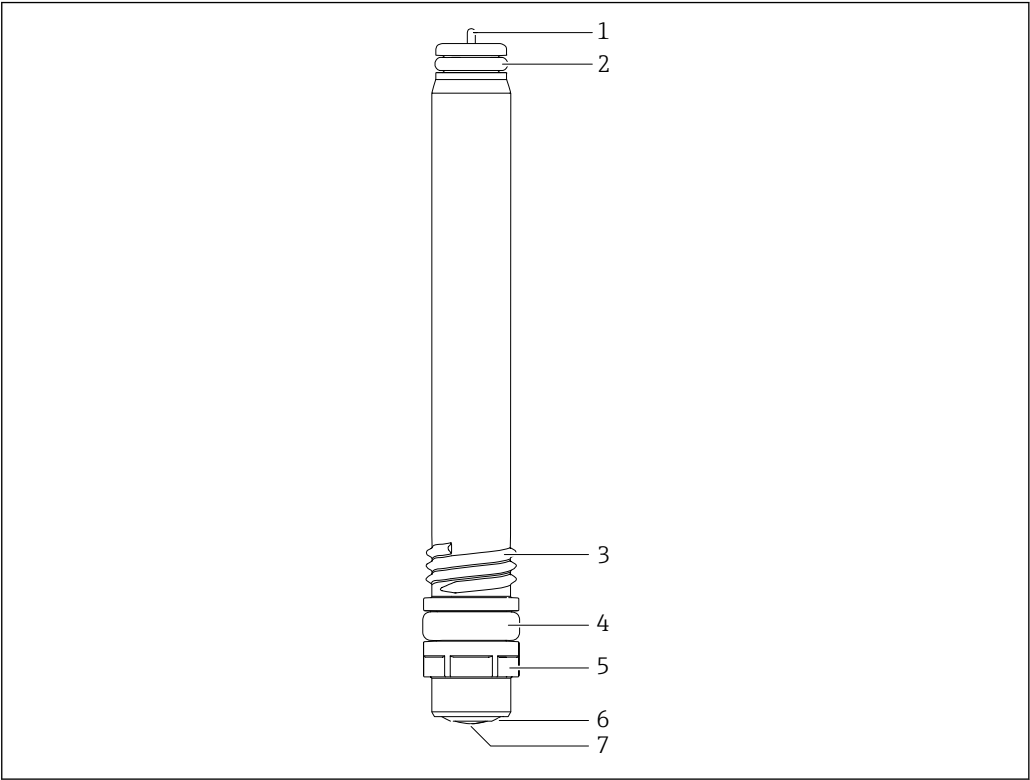
The product is designed to meet state-of-the-art safety requirements, has been tested, and left the factory in a condition in which it is safe to operate. The relevant regulations and international standards have been observed.

3 Product description



- 3** View from below
- 1 Slot 1: Nitrate electrode or ammonium electrode
2 Slot R: Reference electrode
3 Slot 2: Nitrate electrode or ammonium electrode
4 Protection cage (optionally with nozzles for compressed air cleaning)
5 Counter electrode with integrated temperature sensor
6 Connection for compressed air cleaning (optional)
7 Slot C: Potassium electrode or chloride electrode

If slots 1, 2, or C are ordered without components fitted, they are sealed with a dummy electrode.



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4 Structure of an electrode

- 1 Contact pin
- 2 O-ring
- 3 Threaded connection
- 4 O-ring
- 5 Hexagon socket
- 6 Color encoding
- 7 Membrane (for nitrate, ammonium and potassium electrodes) or crystal (for chloride electrodes). For nitrate electrodes, the membrane is covered by a grid.

The electrodes are color-coded.

Electrode	Color code
Ammonium electrode	Red
Nitrate electrode	Blue
Potassium electrode	Yellow
Chloride electrode	Black

4 Incoming acceptance and product identification

4.1 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.

4.2 Product identification

4.2.1 Nameplate

The nameplate provides you with the following information on your device:

- Manufacturer identification
- Extended order code
- Serial number
- Safety information and warnings
- Certificate information

- ▶ Compare the information on the nameplate with the order.

4.2.2 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. Page search (magnifying glass symbol): Enter valid serial number.
3. Search (magnifying glass).
 - ↳ The product structure is displayed in a popup window.
4. Click the product overview.
 - ↳ Here you will find information pertaining to your device, including the product documentation.

4.2.3 Manufacturer address

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

4.3 Scope of delivery

The scope of delivery includes:

- Memosens CAS41E as per configuration
 - Operating Instructions
 - Safety instructions for hazardous area (for Ex versions)
- If you have any queries:
Please contact your supplier or local sales center.

4.4 Certificates and approvals

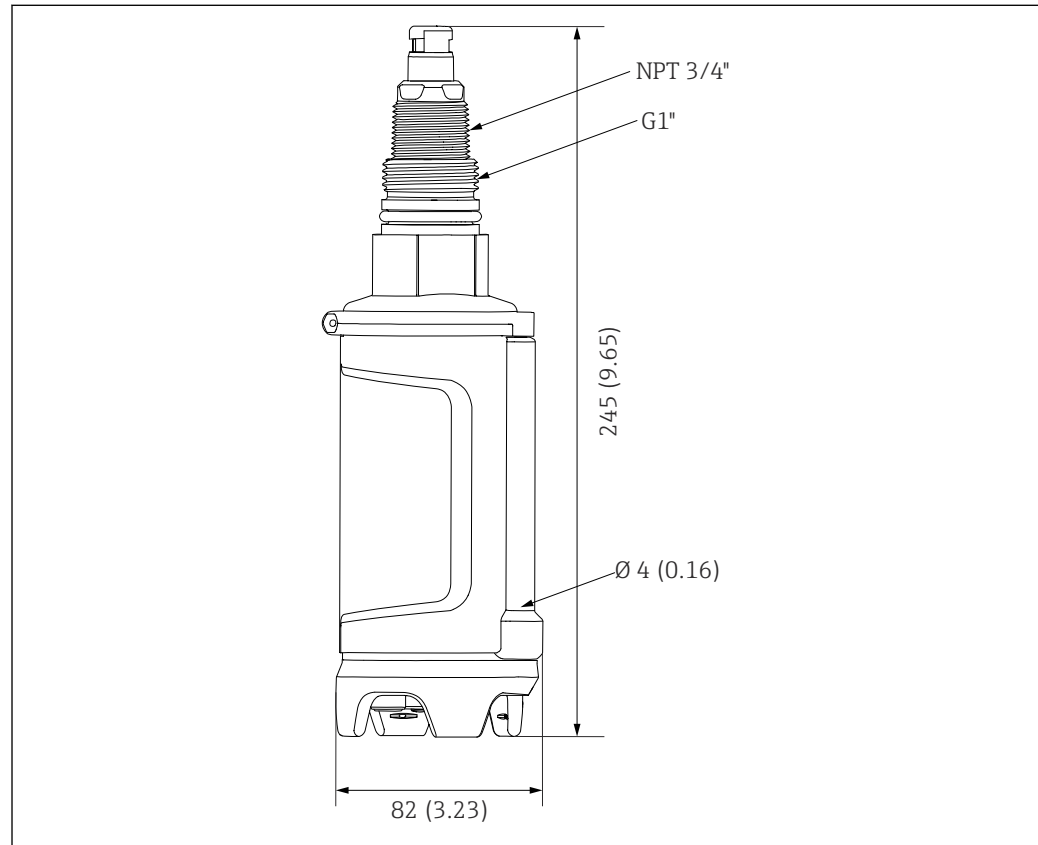
Current certificates and approvals for the product are available at www.endress.com on the relevant product page:

1. Select the product using the filters and search field.
2. Open the product page.
3. Select **Downloads**.

5 Installation

5.1 Installation requirements

5.1.1 Dimensions



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5 Dimensions in mm (inch)

5.1.2 Installation location

Choose a mounting location that can be easily accessed at a later stage.

- Ensure that upright posts and assemblies are fully secured and vibration-free.

5.2 Installing the sensor

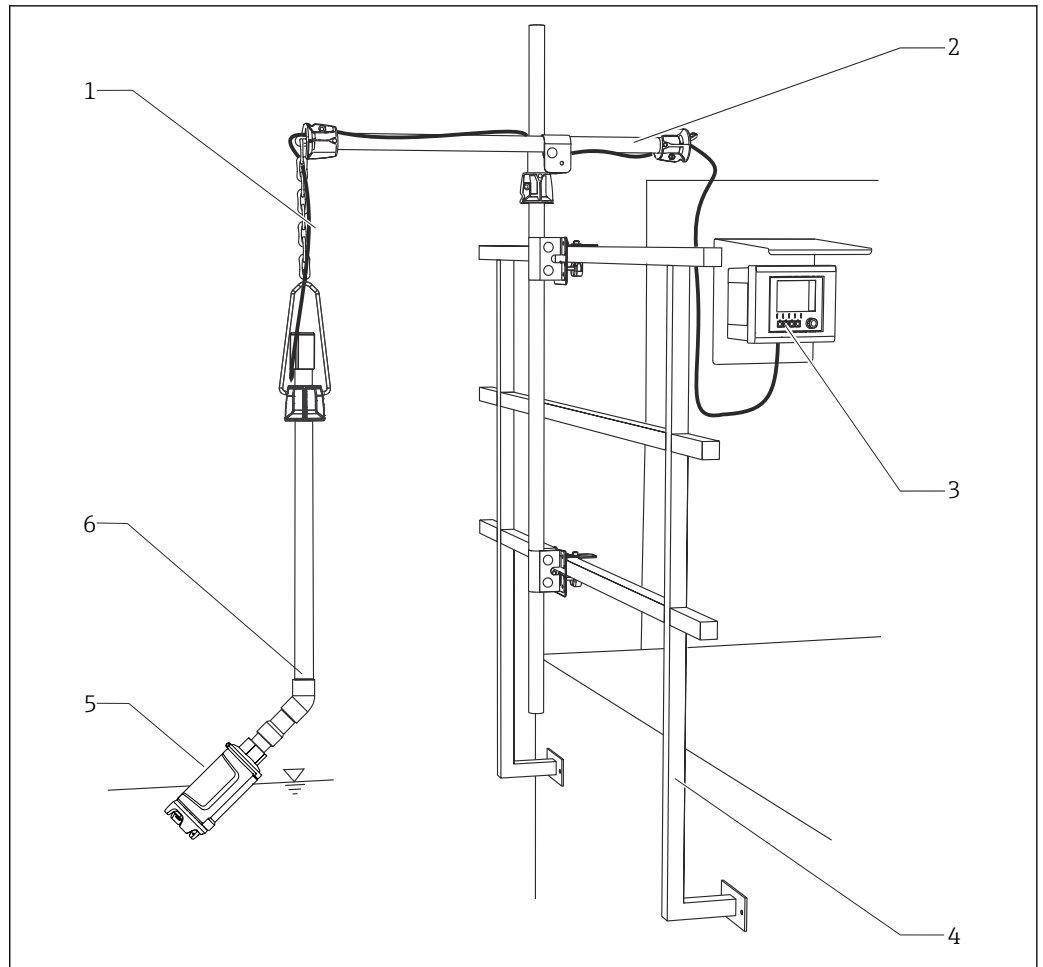
5.2.1 Installation example

A complete measuring system comprises:

- Sensor CAS41E as per order code
- Liquiline CM44x transmitter
- Memosens sensor cable
- Flexdip CYA112 assembly

Optional:

- Assembly holder, e.g. CYH112, transverse pipe, chain
- Weather protection cover required for installation of the transmitter outdoors.
- Compressed air generator (for compressed air cleaning option if no compressed air is available on site)

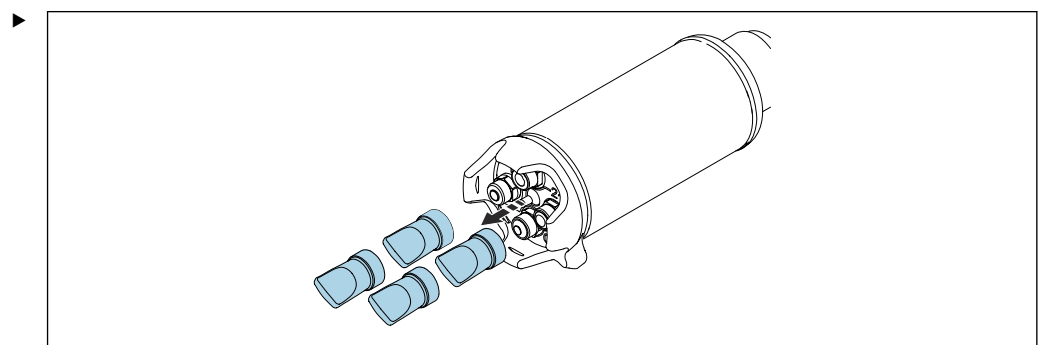


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6 Example: measuring system on basin rim

- 1 Sensor cable
- 2 Wastewater assembly holder, secure to rail, with transverse pipe and chain
- 3 Liquiline CM44x transmitter (in graphic: wall-mounted with weather protection cover)
- 4 Rail
- 5 Sensor CAS41E
- 6 Flexdip CYA112 assembly with 45° elbow piece

5.2.2 Preliminaries



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Remove the protective caps from all the electrodes.

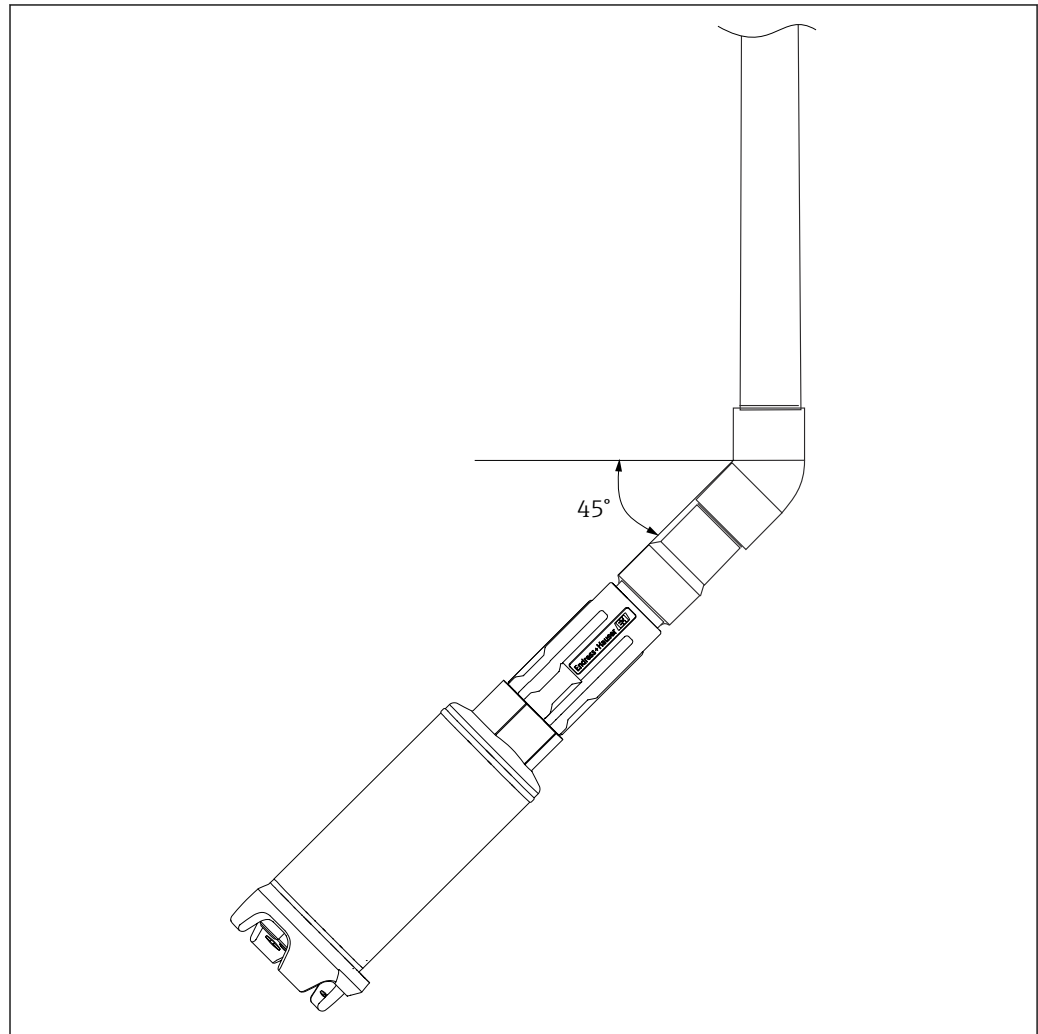
- i** The protective caps also serve as a tool to unscrew and screw in the electrodes. Therefore, keep at least one protective cap.

5.2.3 Installing at the measuring point

NOTICE**Air bubbles in the membrane area**

Measurement error

- ▶ Mount the sensor at a 45° angle to the horizontal to prevent air bubbles from accumulating near the membranes.
- ▶ Use an assembly with a suitable elbow piece for this purpose.



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 7 Sensor mounted at an angle of 45° to the horizontal

NOTICE

Exceeding the maximum immersion depth and the maximum process pressure can cause the sensor to malfunction.

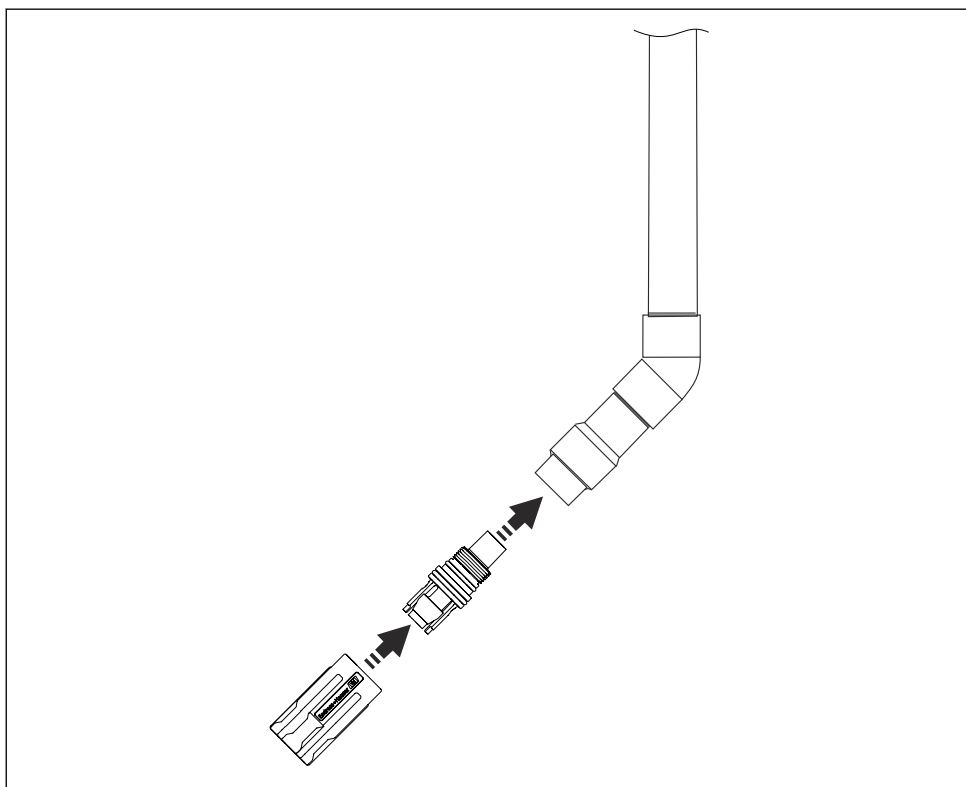
- ▶ Position the sensor as close to the surface as possible. However, it is possible to immerse the sensor fully in the medium.
- ▶ Do not exceed the max. immersion depth of 5 m (16.4 ft) and max. process pressure of 0.5 bar (7.25 psi).

Mount the sensor on the assembly

Observe also the Operating Instructions for the assembly.

1. Mount the assembly and, if necessary, the assembly holder. Observe the Operating Instructions for the assembly for this purpose.

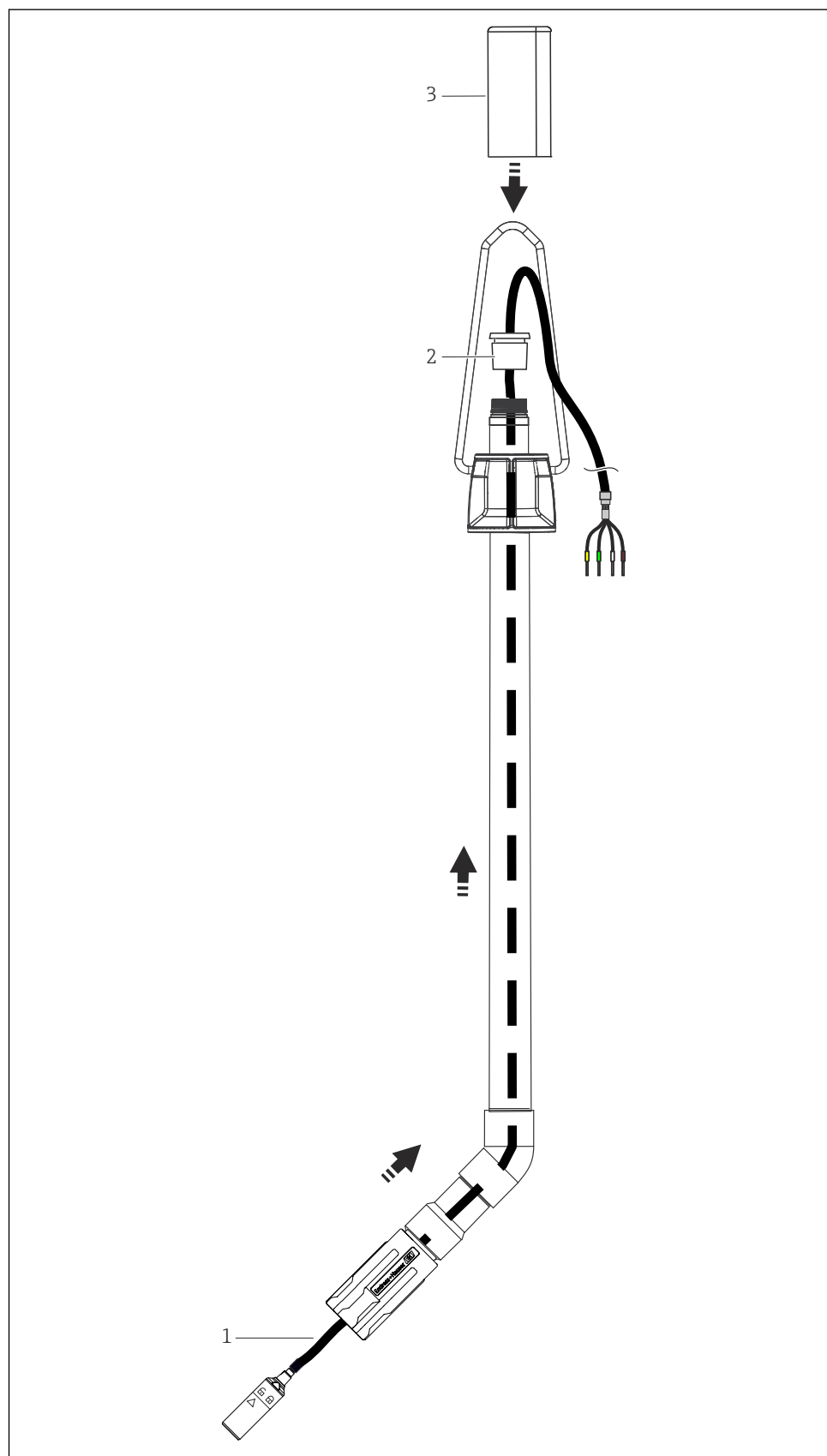
2.



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Install the quick-release coupling.

3.

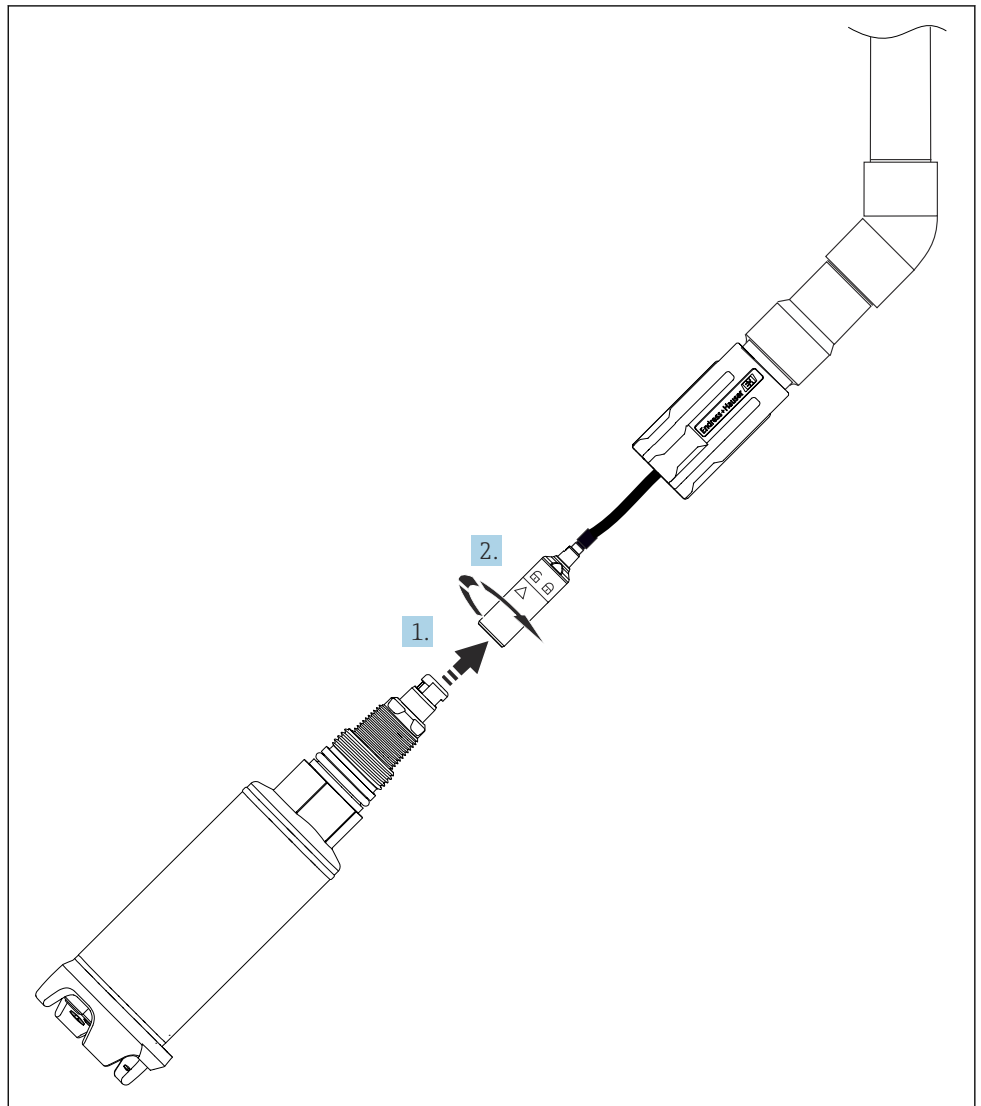


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Route the sensor cable (1) through the assembly.

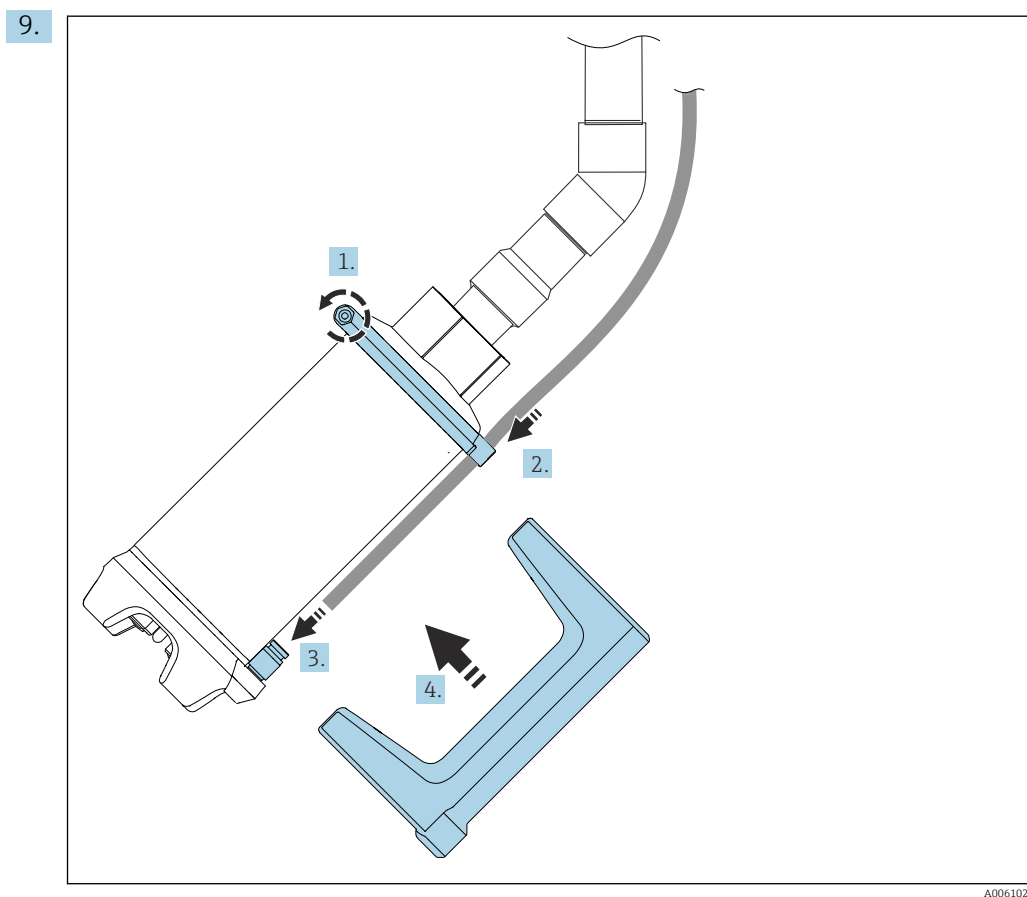
4. Thread the rubber seal (2) onto the sensor cable. If necessary, shorten the tip of the rubber seal to match the cable diameter.
5. Insert the rubber seal (2) into the assembly.

6. Route the sensor cable downwards in a loop, making sure not to bend it.
7. Attach the splash protection cap (3).
- 8.



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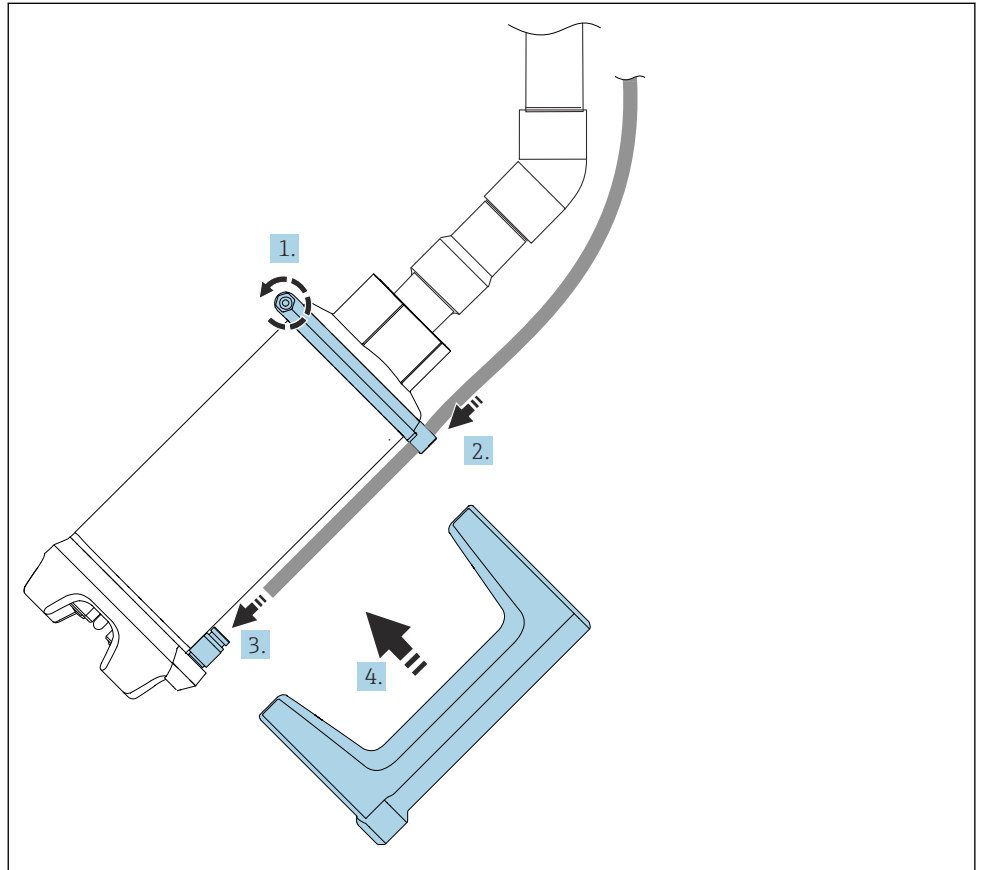
Connect the sensor cable to the Memosens sensor coupling.



Hand-tighten the sensor with the quick-release coupling. Max. torque 10 Nm.

Connect the compressed air (compressed air cleaning option)**1. NOTICE****Compressed air****Damage**

- ▶ The compressed air supply must not exceed 3.5 bar (50 psi). Optimum cleaning performance at 1.5 bar to 2 bar.
- ▶ The compressed air must be supplied through an air filter (5 µm).



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Loosen the screw of the hose bracket. Do not release the screw fully when doing this.

2. Guide the compressed air hose through the hose bracket.
3. Insert the compressed air hose into the connecting nozzle until the end stop.
4. Fit the hose protection.
5. Retighten the hose bracket screw.

Installing at the measuring point**1. NOTICE****Tension on the sensor cable.****Sensor failure due to cable damage!**

- ▶ Do not use the cable to immerse the sensor in the medium. Use a suitable holder.
- ▶ Never use the cable to pull the sensor out of the medium.

Hang the assembly with the sensor on the bracket chain.

2. Route the cable in such a way that no mechanical damage or interference influences can arise from other cables.

5.3 Post-installation check

1. After mounting, check all the connections to ensure they are secure and leak-tight.
2. Check all cables and hoses for damage.
3. Verify that the cables are routed in such a way that they are free from electromagnetic interference influences.

6 Electrical connection

⚠ WARNING

Device is live!

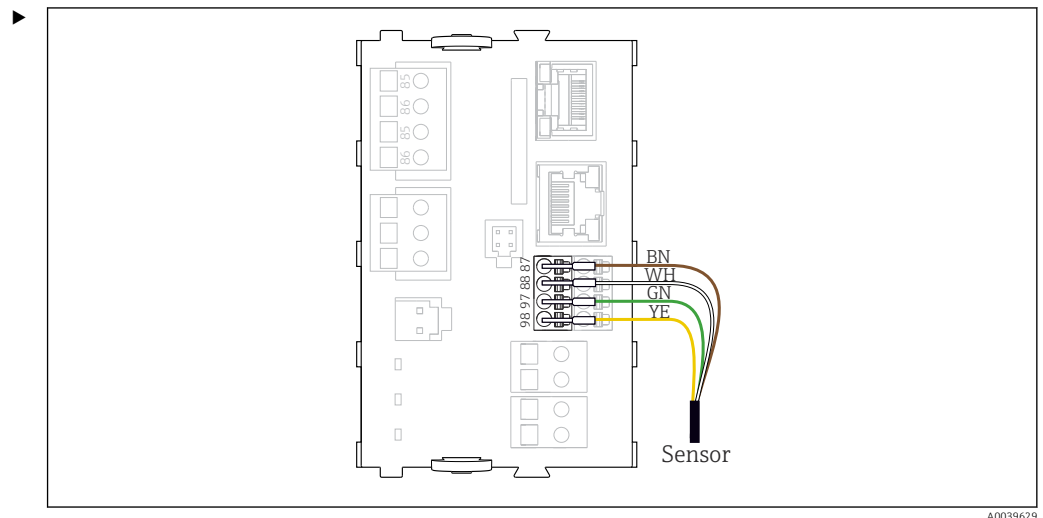
Incorrect connection may result in injury or death!

- ▶ The electrical connection may be performed only by an electrical technician.
- ▶ The electrical technician must have read and understood these Operating Instructions and must follow the instructions contained therein.
- ▶ **Prior** to commencing connection work, ensure that no voltage is present on any cable.

6.1 Connecting the sensor

The maximum cable length is 100 m (328 ft).

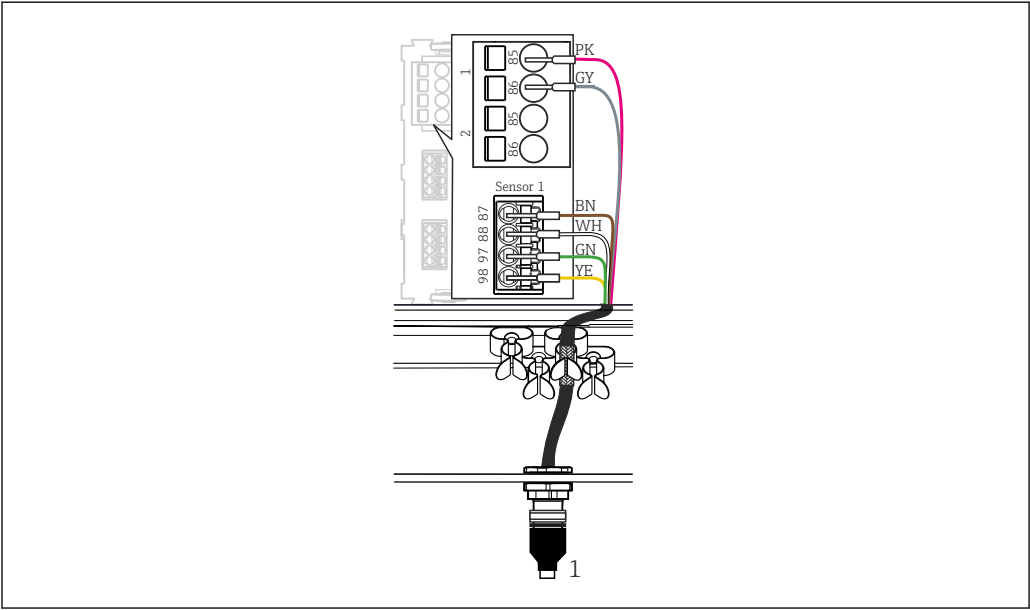
Connection via a Memosens sensor cable with ferrules



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Connect the sensor cable to a Memosens input of the transmitter. Observe the Operating Instructions for the transmitter for this.

Connection via a Memosens sensor cable with M12 socket



8 Connection on sensor module 2DS, for example

1 Sensor with M12 plug

The M12 socket is connected to a Memosens input of the transmitter.

- Connect the sensor cable to the M12 socket. Observe the Operating Instructions for the transmitter for this.

6.2 Ensuring the degree of protection

Only the mechanical and electrical connections which are described in these instructions, and which are necessary for the required intended use, may be established on the device delivered.

- Exercise care when carrying out the work.

Otherwise, the individual types of protection (Ingress Protection (IP), electrical safety, EMC interference immunity) agreed for this product can no longer be guaranteed due, for example, to covers being left off or cable (ends) that are loose or insufficiently secured.

6.3 Post-connection check

Device condition and specifications	Notes
Are the sensor and cable free from damage on the outside?	Visual inspection

Electrical connection	Notes
Does the supply voltage of the connected transmitter match the data on the nameplate?	Visual inspection
Are the installed cables strain-relieved and not twisted?	
Is the cable type run completely isolated at the point of installation?	Power cables / signal lines
Are all the cable entries installed, tightened and leak-tight?	For lateral cable entries, make sure the cables loop downwards to allow water to drip off.
Are all cable entries mounted on the side or pointing downwards?	

7 Commissioning

7.1 Function check

Prior to initial commissioning, ensure that:

- The sensor is correctly installed
- The electrical connection is correct

8 Operation

8.1 Adapting the measuring instrument to the process conditions

8.1.1 Defining stability criteria for calibration

-  Default values that work for multiple applications are defined for the stability criteria.
Only change if other stability criteria are required for the application in question.

Stability criteria:

- **Delta mV**: Permitted fluctuation of the raw measured value in mV over a defined time period (**Duration**)
Default: 3 mV
- **Duration**: Time period during which the raw measurement value must not fluctuate by more than **Delta mV**
Default: 90 s
- Navigate to: **Menu/Setup/Inputs/<Sensor channel>: ISE/Extended setup/<Slot designator> <Parameter>/Calib. settings/Stability criteria**

8.1.2 In-process calibration

- The sensor remains in the medium during calibration.
- Up to 25 calibration points are saved. A sample of the medium is taken for each calibration point and the concentration of the parameter is measured in the laboratory.
- The sensor is then adjusted to the laboratory measured values of the samples.

Define calibration points

NOTICE

If the calibration points are not set at the time of sampling, reliable calibration cannot be guaranteed.

- Set the calibration points as close as possible to the time of sampling.

1. Take a sample of the medium.
2. Set the calibration point at the time of sampling: **Menu/Setup/Inputs/<Sensor channel>: ISE/<Slot designator> <Parameter>/In process calibration/Set new calibration point**
3. Continue with the wizard and wait until the stability criteria are met.

If a laboratory measured value of the sample is already available or the measured value is known:

1. **Input ref. value = Now**
2. Continue the wizard.
3. Enter the laboratory measured value under **Edit reference concentration**:
4. Continue and complete the wizard.
↳ The calibration point is saved.

If a laboratory measured value of the sample is not yet available or the value is not known:

1. **Input ref. value = Later**

2. Continue and complete the wizard.
 - ↳ The calibration point is saved. The reference concentration is not yet saved.
3. As soon as the reference concentration (laboratory measured value) is available, enter it under **Menu/Calibration/<Sensor channel>: ISE/<Slot designator> <Parameter>/In process calibration/Complete calibration point**

Define additional calibration points

- ▶ Define a maximum of 25 values per electrode in this way.



Calibration points can be changed or corrected subsequently:

Menu/Calibration/<Sensor channel>: ISE/<Slot designator> <Parameter>/In process calibration/Edit calibration point

8.1.3 Out-of-process calibration

- The sensor is taken out of the medium for calibration.
- Calibration is performed using calibration solutions with different concentrations. A calibration point is defined for each concentration.
- The concentration is increased for each calibration point by adding stock solution. The wizard indicates the volume of stock solution required for each point in mm.

Define calibration points

Up to 10 calibration points can be defined. At least 3 calibration points are required. A reference concentration is entered for each calibration point. The calibration points can be edited or deleted.

- ▶ Navigate to: **Menu/Setup/Inputs/<Sensor channel>: ISE/Extended setup/<Slot designator> <Parameter>/Calibration settings/Reference concentration <Parameter>/Edit list**

Define the sample volume



The default sample volume is 1 liter. This setting only needs to be changed if a different sample volume is used.

- ▶ Navigate to: **Menu/Setup/Inputs/<Sensor channel>: ISE/Extended setup/<Slot designator> <Parameter>/Calibration settings/Reference concentration <Parameter>/Sample volume**

Enter the concentration of the stock solution



The concentration of Endress+Hauser stock solutions are default values.

- Ammonium: 14000 mg/l
- Nitrate: 14000 mg/l
- Chloride: 35500 mg/l
- Potassium: 39100 mg/l

Adjustment is only necessary if standard solutions with a different concentration are used.

- ▶ Navigate to: **Menu/Setup/Inputs/<Sensor channel>: ISE/Extended setup/<Slot designator> <Parameter>/Calibration settings/Reference concentration <Parameter>/Stock solution concentration**

Perform calibration

1. Navigate to: **Menu/Calibration/<Sensor channel>: ISE/<Slot designator> <Parameter>/Out of process calibration**
2. Continue the wizard.
3. If the concentration of the zero sample is known, enter the value under 'Manual Input'. Otherwise, select 'Automatic calculation'.

4. Continue the wizard.
5. Follow the instructions in the wizard.
6. Perform steps 2-5 for all the calibration points.

8.1.4 Configuring pH compensation (for ammonium electrodes)

When the pH value of the medium increases, ammonium reacts to ammonia. Compensation of the pH value is required in this case.

The following options are available for pH compensation:

- Manual entry. The pH value of the medium must be known in this case.
- Measured value of a pH sensor. A pH sensor must be connected to the transmitter for this purpose.

Configuration options

- Activate/deactivate pH compensation
 - Select: pH compensation via manually entered pH value or measured value of a connected pH sensor
 - Manual entry of the pH value or select the connected pH sensor.
- Navigate to: **Menu/Setup/Inputs/<Sensor channel>: ISE/Extended setup/<Slot designator> Ammonium/Compensation/pH compensation**

8.1.5 Controlling compressed air cleaning via the transmitter (optional)

If the transmitter used has relays, the optional compressed air cleaning system can be controlled via the transmitter. The relay triggers a valve (provided by the customer) that controls the compressed air supply.

9 Maintenance

Take all the necessary precautions in time to ensure the operational safety and reliability of the entire measuring system.

NOTICE

Effects on process and process control!

- ▶ When carrying out any work on the system, bear in mind any potential impact this could have on the process control system and the process itself.
- ▶ For your own safety, only use genuine accessories. With genuine parts, the function, accuracy and reliability are also ensured after maintenance work.

CAUTION

Contact with contaminated medium can cause infections!

- ▶ Wear suitable personal protective equipment during installation and maintenance.
- ▶ Before starting work, set the cleaning program to HOLD to avoid splashing.

9.1 Cleaning the membrane

If the membrane is very contaminated, clean it regardless of the maintenance intervals.

1. Activate the hold function to ensure that a measured value is displayed during cleaning.
2. Remove the sensor from the medium.
3. Clean the electrode membrane with water and a paper towel. Do not touch the membrane with your hands.
4. Immerse the sensor in the medium again.
5. Disable hold.

9.2 Cleaning the crystal (chloride electrodes)

The optional chloride electrode has a crystal instead of a membrane. To clean, proceed as follows:

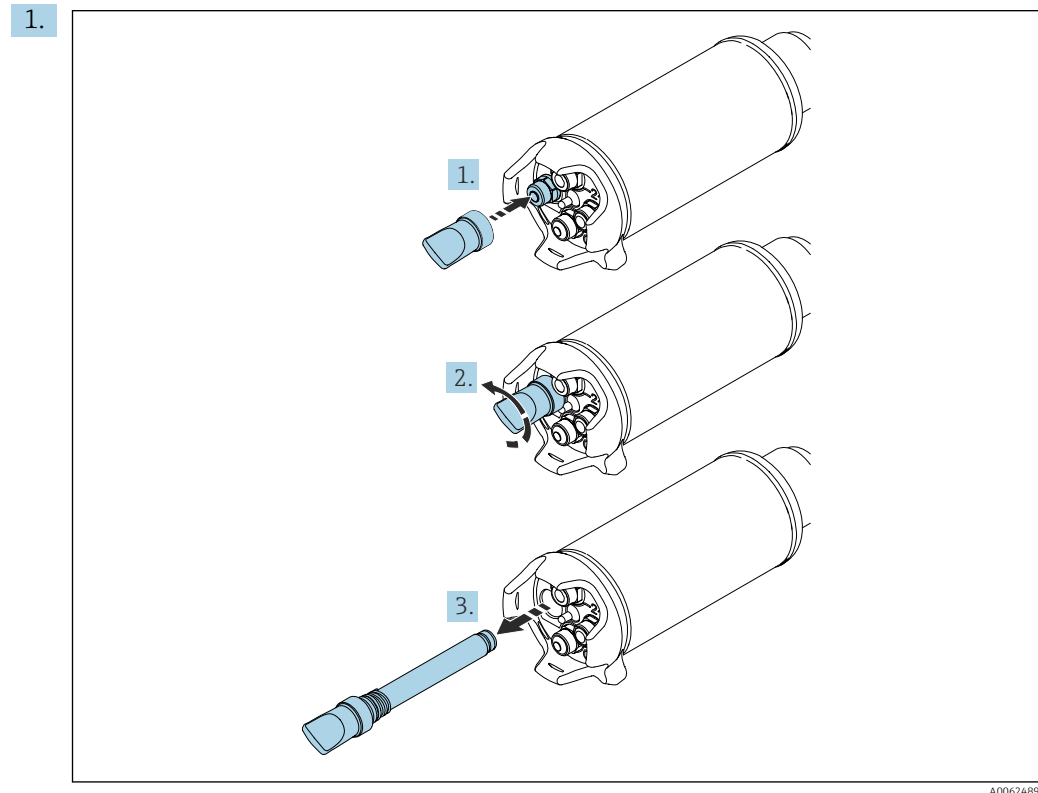
1. Activate the hold function to ensure that a measured value is displayed during cleaning.
2. Remove the sensor from the medium.
3. Remove any loose dirt with water and a brush.
4. Unscrew the chloride electrode.
5. Place some sandpaper (600-grit) on an even surface.
6. With the crystal area facing downwards, rub the electrode on the sandpaper until all residues of dirt are removed. Rubbing the electrode for a few seconds usually suffices.
7. Perform a visual inspection.
8. Screw the chloride electrode back in.
9. Immerse the sensor in the medium again.
10. Disable hold.

9.3 Replacing electrodes

Preliminaries

1. Navigate to: **Menu/Setup/Inputs/<Sensor channel>: ISE/Extended setup/<Slot designator> <Parameter>/Electrode setup/Replace electrode**
↳ The hold function is activated during the wizard.
2. Remove the sensor from the medium.
3. Clean the sensor with water and a brush.

Remove the electrode

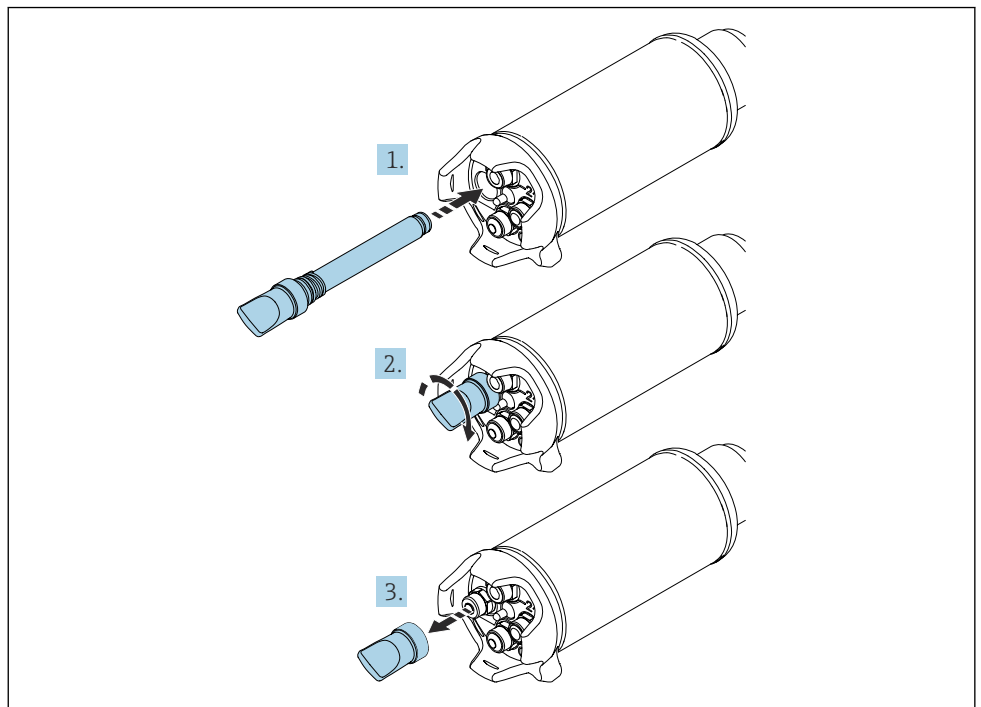


Attach the protective cap to electrode. The protective cap functions as a hexagon socket wrench.

2. Unscrew the electrode from the thread using an old protective cap.
3. Pull the electrode out of the housing.
4. Take care that no moisture or other foreign bodies penetrate the shaft.

Install the new electrode

1.



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Insert the new electrode into the electrode shaft using the protective cap.

2. Tighten the electrode using the protective cap.

3. **NOTICE**

The protective cap is filled with electrolyte.

- ▶ Hold the sensor vertically when removing the protective cap so that no electrolyte can escape.
- ▶ Wear protective gloves.

Pull the protective cap off (do not turn it!).

Putting the electrode into operation

1. Continue the wizard.

- ↳ Immerse the sensor in the medium again when you are prompted to do so.

2. Continue the wizard.

- ↳ The electrode is started up and hold is deactivated.

3. Calibrate the electrode.

9.4 Changing measuring parameters

Preliminaries

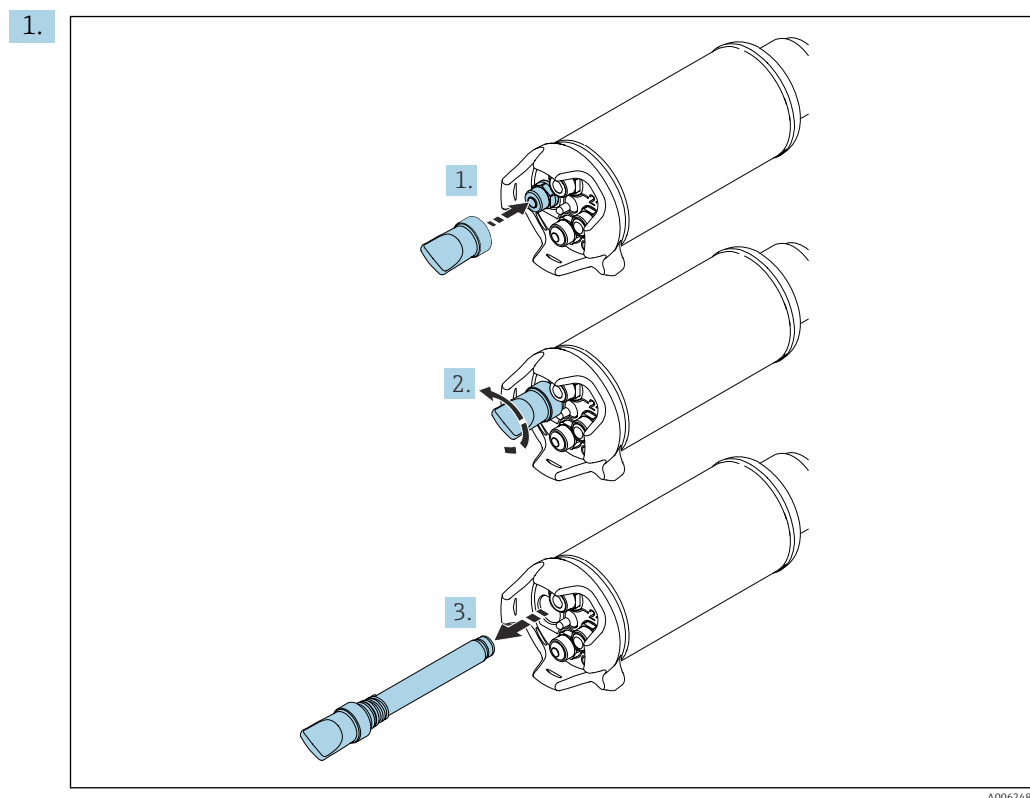
1. Navigate to: **Menu/Setup/Inputs/<Sensor channel>: ISE/Extended setup/<Slot designator> <Parameter>/Electrode setup/Exchange electrode parameter**

- ↳ The hold function is activated during the wizard.

2. Select the desired parameter under **Measured value**.

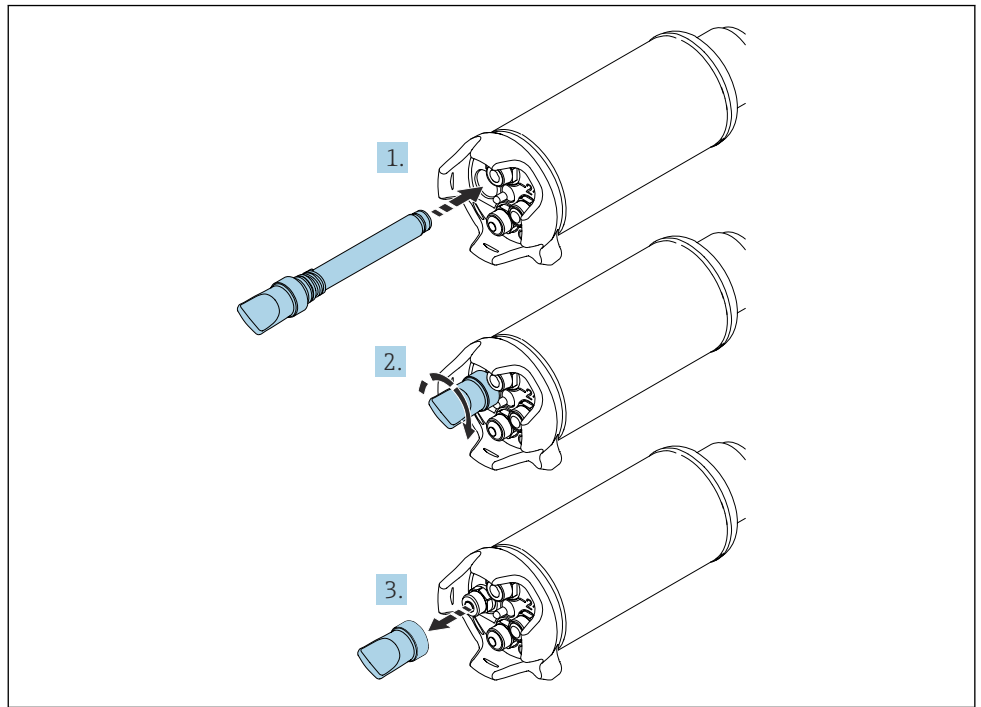
3. Remove the sensor from the medium.

4. Clean the sensor with water and a brush.

Remove the electrode

Place a protective cap on electrode. The protective cap functions as a hexagon socket wrench.

2. Unscrew the electrode from the thread using the protective cap.
3. Pull the electrode out of the housing.
4. Take care that no moisture or other foreign bodies penetrate the shaft.

Install the new electrode**1.**

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Insert the new electrode into the electrode shaft using the protective cap.

2. Tighten the electrode using the protective cap.**3. NOTICE**

The protective cap is filled with electrolyte.

- ▶ Hold the sensor vertically when removing the protective cap so that no electrolyte can escape.
- ▶ Wear protective gloves.

Pull the protective cap off (do not turn it!).

Putting the electrode into operation**1.** Continue the wizard.

↳ Immerse the sensor in the medium again when you are prompted to do so.

2. Continue the wizard.

↳ The electrode is started up and hold is deactivated.

3. Calibrate the electrode.

10 Repair

10.1 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.

www.endress.com/support/return-material

10.2 Disposal

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

- Observe the local regulations.



If required by the Directive 2012/19/EU on waste electrical and electronic equipment (WEEE), the product is marked with the depicted symbol in order to minimize the disposal of WEEE as unsorted municipal waste. Do not dispose of products bearing this marking as unsorted municipal waste. Instead, return them to the manufacturer for disposal under the applicable conditions.

11 Technical data

11.1 Input

Measured variables	Depending on version: ■ Ammonium: $\text{NH}_4\text{-N}$, NH_4^+ [mg/l] ■ Nitrate: $\text{NO}_3\text{-N}$, NO_3^- [mg/l] ■ Potassium: K^+ [mg/l] ■ Chloride: Cl^- [mg/l] ■ Temperature [$^{\circ}\text{C}$] or [$^{\circ}\text{F}$]
Measuring ranges	■ Ammonium: 0.1 to 1000 mg/l ($\text{NH}_4\text{-N}$) ■ Nitrate: 0.1 to 1000 mg/l ($\text{NO}_3\text{-N}$) ■ Potassium: 1 to 1000 mg/l ■ Chloride: 1 to 1000 mg/l

11.2 Performance characteristics

Response time t_{90} of the ISE sensors	< 2 min.
Measurement error	Ammonium: $\pm 5\%$ of reading or ± 0.5 mg/l Nitrate, potassium, chloride: $\pm 10\%$ of reading or ± 5 mg/l
Repeatability	$\pm 3\%$ of the display value

Compensation	Sensor	Temperature	pH	Potassium ^{1) 2)}	Chloride ^{3) 4)}
	Ammonium	2 to 40 °C (36 to 100 °F)	pH 7.9 to pH 10	1 to 1000 mg/l (ppm) or measuring range of the potassium electrode	-
	Nitrate		-	-	1 to 1000 mg/l (ppm) or measuring range of the chloride electrode
	Potassium		-	-	-
	Chloride		-	-	-

- 1) The concentration fluctuations, not the absolute value, are decisive
- 2) Recommendation: dynamic compensation: Use as compensation electrode for potassium concentrations > 40 mg/l in the case of simultaneously fluctuating values of ± 5 mg/l or static compensation: apply an offset in the case of non-fluctuating values.
- 3) The concentration fluctuations, not the absolute value, are decisive
- 4) Recommendation: Use as compensation electrode for chloride concentrations > 500 mg/l in the case of simultaneously fluctuating values of ± 100 mg/l, or apply an offset in the case of non-fluctuating values.

Operating time



An electrode does not fail completely after the specified time. The response time of t_{90} extends with increasing wear.

Electrode/Parameter	Service life under low load ¹⁾
Ammonium	9 months
Nitrate	9 months
Potassium	9 months
Chloride	2 to 3 years
Reference electrode	1 year

- 1) The service life values provided are recommendations based on the average load at a municipal wastewater treatment plant. The actual service life depends on the specific load in the process and can deviate from the values indicated.

Automatic cleaning

- Cleaning medium:
Air
- Pressure:
1.5 to 3.5 bar (22 to 50 psi)
- Recommended cleaning duration:
30 s
- Guideline values for cleaning intervals (at $T > 10^{\circ}\text{C}$ (50°F)):
 - Sludge activation inlet: 30 s cleaning, 30 min pause
 - Sludge activation: 30 s cleaning, 1 hr pause



Depending on the medium, different cleaning intervals may be required. The values indicated here are guideline values only.

11.3 Environment

Ambient temperature -20 to 55 °C (-4 to 130 °F)

Short-term storage temperature (max. 2 weeks) 2 to 40 °C (36 to 104 °F)

Long-term storage temperature 5 to 25 °C (41 to 77 °F)

Degree of protection IP68 (5 m water column, 25 °C, 24 h)

11.4 Process

Process temperature 2 to 40 °C (36 to 104 °F)

Process pressure Max. 0.5 bar (7.25 psi)

pH value of the medium	■ Ammonium: pH 5 to 7.9 (without pH compensation) pH 5 to 10 (with pH compensation) ■ Nitrate: pH 2 to 10 ■ Potassium: pH 2 to 10 ■ Chloride: pH 1 to 10
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11.5 Mechanical construction

Design, dimensions

Weight	Approx. 0.8 kg (1.8 lbs)
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Materials	Sensor: Memosens coupling, housing KLSS locking ring Housing ring Hose holder Hose protection Casing pipe Top housing section Bottom housing section Counter electrode Hose bracket nut and screw Protection cage with air cleaning Protection cage Hose connection O-rings ISE electrodes Membrane cap: Shaft: Color ring: Membrane: O-rings: Reference electrode Diaphragm: Shaft:	PPS-GF40 PBT-GF20 PBT-GF10 PBT-GF20 PBT-GF10 Stainless steel 1.4404 PBT-GF10 POM Stainless steel 1.4404 Stainless steel 1.4301 PA12 POM Stainless steel 1.4401 EPDM POM POM PP PVC, plasticizer EPDM PTFE PC
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Compressed air connection	For hose, OD 4 mm
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