



Level



Pressure



Flow



Temperature



Liquid
Analysis



Registration



Systems
Components



Services

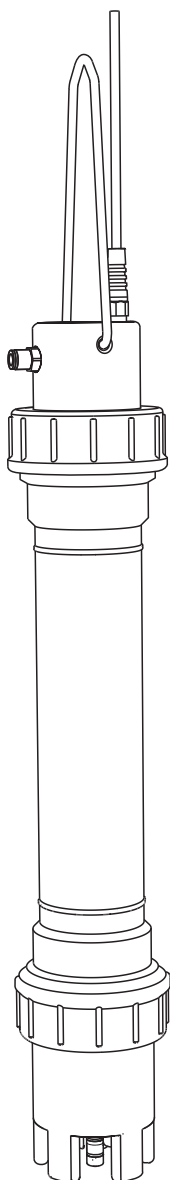


Solutions

Operating Instructions

ISEmax CAS40D

Ion-selective sensor



Notes on these instructions

Warning information and its meaning

Structure, signal words and color coding of warning information are in compliance with ANSI Z535.6 specifications ("Product safety information in product manuals, instructions and other collateral materials").

Structure of information	Meaning
 DANGER Cause (/Consequences) Consequences of non-compliance (if applicable) ► Protection measures	This note alerts you to a dangerous situation. If you do not avoid this dangerous situation, it will result in death or serious injury.
 WARNING Cause (/Consequences) Consequences of non-compliance (if applicable) ► Protection measures	This note alerts you to a dangerous situation. If you do not avoid the dangerous situation, it may result in death or serious injury.
 CAUTION Cause (/Consequences) Consequences of non-compliance (if applicable) ► Protection measures	This note alerts you to a dangerous situation. If you do not avoid the dangerous situation, it may result in minor or more serious injuries.
 NOTICE Cause/Situation Consequences of non-compliance (if applicable) ► Measure/Note	This note alerts you to situations which may result in damage to property.

Cross-references in the document

-  1 This symbol stands for a cross-reference to a specific page (e.g. Page 1).
-  2 This symbol stands for a cross-reference to a specific graphic (e.g. Fig. 2).

Other symbols

-  Additional information, tips
-  Permitted or recommended
-  Forbidden or not recommended

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1 Safety instructions

1.1 Designated use

The ion-selective sensor is designed for measuring tasks in the activated sludge basin and in the inlet to the activated sludge basin of municipal sewage treatment plants.

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

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

Any use other than that described here compromises the safety of persons and the entire measuring system and is therefore not permitted.

The manufacturer is not liable for damage resulting from improper or non-designated use.

1.2 Installation, commissioning and operation

Note the following points:

- Installation, commissioning, operation and maintenance of the measuring system must only be carried out by trained technical personnel.
The technical personnel must be authorized by the plant operator to carry out the specified activities.
- The electrical connection may only be performed by an electrical technician.
- The technical personnel must have read and understood these Operating Instructions and must follow the instructions they contain.
- Before commissioning the entire measuring point, make sure all the connections are correct. Ensure that electrical cables and hose connections are not damaged.
- Do not operate damaged products, and safeguard them to ensure that they are not operated inadvertently. Mark the damaged product as defective.
- Measuring point faults may only be rectified by authorized and specially trained personnel.
- If faults cannot be rectified, the products must be taken out of service and secured against unintentional commissioning.
- Repairs not described in these Operating Instructions may only be carried out directly at the manufacturer's or by the service organization.

1.3 Operational safety

The sensor 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.

Relevant regulations and European standards have been observed.

As the user, you are responsible for complying with the following safety conditions:

- Installation instructions
- Local prevailing standards and regulations

1.4 Return

Note the following prior to return:

- Contact your Endress+Hauser sales center for information on the different modes of dispatch.
- Enclose a completed "Declaration of contamination" form.



You will find a template for this form at the end of these instructions.

2 Identification

2.1 Nameplate

You can find the following information on the nameplate.

- Manufacturer details
- Order code
- Extended order code
- Serial number
- Operating conditions
- Safety information symbols

Compare the order code on the nameplate with your order.

2.2 Interpreting the order code

 To establish your device version, enter the order code from the nameplate into the search field at the following address: www.products.endress.com/order-ident

2.3 Scope of delivery

The scope of delivery comprises:

- 1 sensor in version as ordered
- 1 socket wrench
- 1 Operating Instructions

If you have any questions, please contact your supplier or your local sales center.

2.4 Certificates and approvals

Declaration of Conformity

The product meets the requirements of the harmonized European standards.

As such, it complies with the legal specifications of the EC directives.

The manufacturer confirms successful testing of the product by affixing to it the **CE** mark.

3 Installation

3.1 Incoming acceptance, transport, storage

- Make sure the packaging is undamaged!
- Notify the supplier of any damage to the packaging. Keep the damaged packaging until the matter has been settled.
- Make sure the contents are undamaged!
- Notify the supplier of any damage to the delivery contents. Keep the damaged products until the matter has been settled.
- Check that the scope of delivery is complete and matches your order and the shipping documents.
- Pack the product for storage and transportation in such a way that it is reliably protected against impact and moisture. The original packaging offers the best protection. Furthermore, the permitted ambient conditions must also be observed (see "Technical data").
- If you have any questions, please contact your supplier or your local sales center.

3.2 Installation conditions

3.2.1 Dimensions

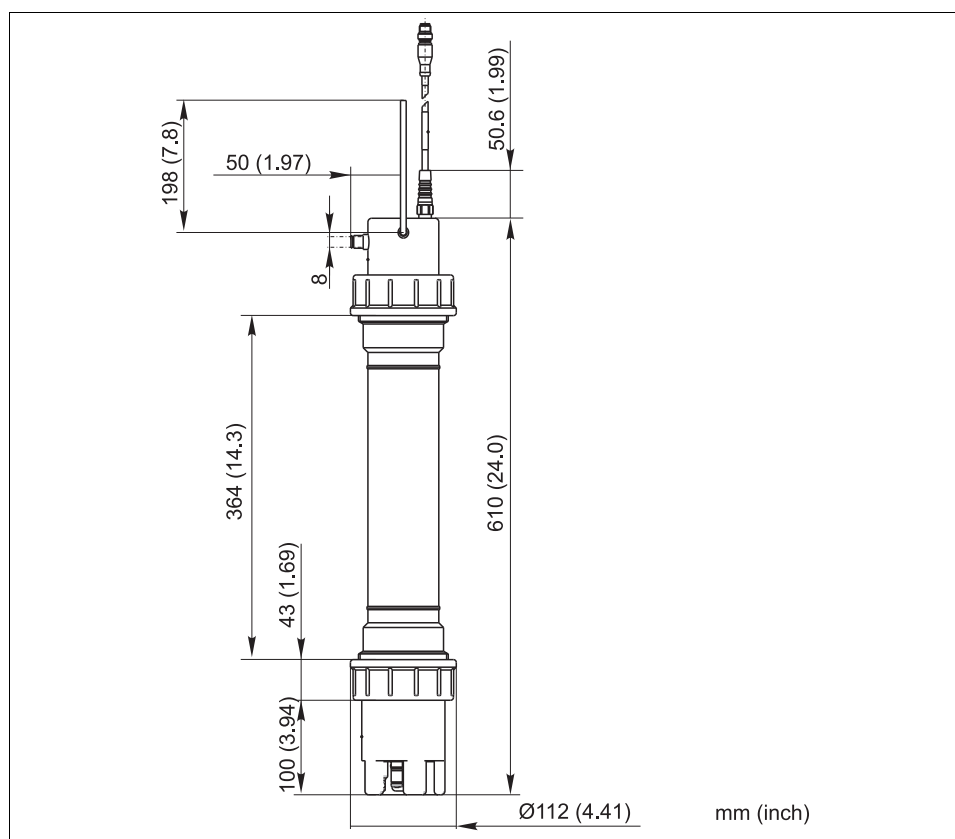


Fig. 1: CAS40D dimensions

3.2.2 Mounting location

- Choose a mounting location that can be easily accessed at a later stage.
- Ensure that upright posts and fittings are fully secured and vibration-free.

3.3 Installation instructions

3.3.1 Electrode installation

NOTICE

Electrode protection caps

Drying out of pH electrode or damage to ion-selective membrane

- ▶ Remove the protection cap from the pH electrode before immersing the sensor in the medium.
- ▶ Retain the protection cap.
- ▶ If you remove the sensor from the medium for longer than 20 minutes, replace the protection cap filled with 1–3 M KCl solution on the pH electrode. This prevents the electrode from drying out.
- ▶ pH electrodes which have dried out due to incorrect storage can be made ready for measurement again by leaving them in 3 M KCl solution for up to 12 hours.
- ▶ The ion-selective electrodes do not have a protection cap. Never put such a cap on the electrodes.

i All electrodes are installed and wired in the factory in accordance with the version ordered.

Installing an additional electrode (optional)

1. Release and remove the protection guard (→  2).
2. Unscrew the coupling nut (→  3).
3. Pull the electrode holder out of the sensor and release the electrode cable on a dummy electrode (placeholder, must be present for impermeability reasons, →  4).
4. Remove the dummy electrode using an open-end or socket wrench, SW17 (→  5).

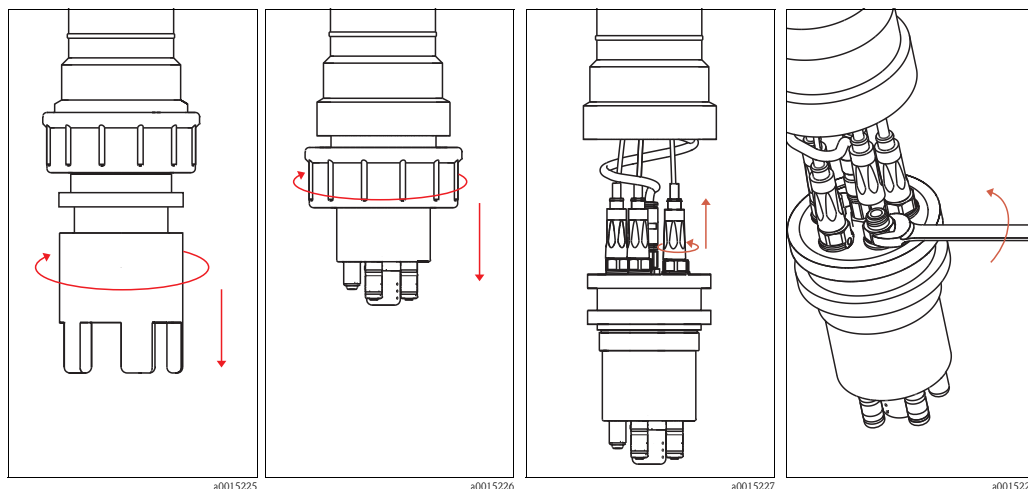


Fig. 2: Release protection guard.

Fig. 3: Remove coupling nut.

Fig. 4: Release cable.

Fig. 5: Remove electrode.

5. Screw the new electrode into the free space and hand-tighten using the open-end or socket wrench, SW17.
6. Attach the electrode connector.
7. Carefully push the electrode holder and the air hose back into the sensor.
8. Screw on the coupling nut and then the protection guard.

NOTICE

Air bubbles

Air bubbles may accumulate in the electrodes following transportation and if they have been stored in a horizontal position. These air bubbles cause measuring errors.

- ▶ Before installing the sensor, eliminate any air bubbles e.g. by shaking gently.
- ▶ Then make sure to hold the sensor in an upright position (electrodes facing downwards) at all times until the sensor is installed at the measuring point.

3.3.2 Installing at the measuring point

NOTICE**Compressed air**

Damage to the relay

- ▶ The compressed air supply must not exceed 3.5 bar (50 psi).
- ▶ The compressed air must be supplied through an air filter (5 µm). This filter is already installed in the optional cleaning unit (→ Accessories).

Installing at the measuring point

1. If need be, install additional electrodes in the sensor and connect these to the appropriate cable connector.
2. Hang the sensor onto the chain of the optional holder.
3. Adjust the chain length and the cross bearer for the holder in such a way that the sensor is immersed in the medium up to the coupling nut and is approximately 0.5 m (1.64 ft) from the basin rim.
4. Route the cables in such a way that no mechanical damage or interference influences can arise from other cables.

Connecting an optional cleaning unit or an external compressed air supply

1. Remove the watertight plug seal from the sensor's compressed air connection.
To do so, press against the black ring and pull out the metal plug seal.
2. Plug the pressure hose (AD 8) belonging to the cleaning unit or compressed air supply into the compressed air connection.
3. Only optional cleaning unit:
Connect the cleaning unit to the transmitter.

3.4 Installation example

A complete measuring system comprises:

- Sensor CAS40D
 - Ion-selective electrode(s) for ammonium, nitrate, potassium or chloride
 - pH glass electrode, Orbisint CPS11-1AT2GSA
 - Temperature sensor, CTS1
- Transmitter, e.g. Liquiline CM442

Optional

- Assembly holder, e.g. CYH112
- Weather protection cover – absolutely essential if mounting the transmitter outdoors!
- Compressed air generator (if no compressed air available on site)

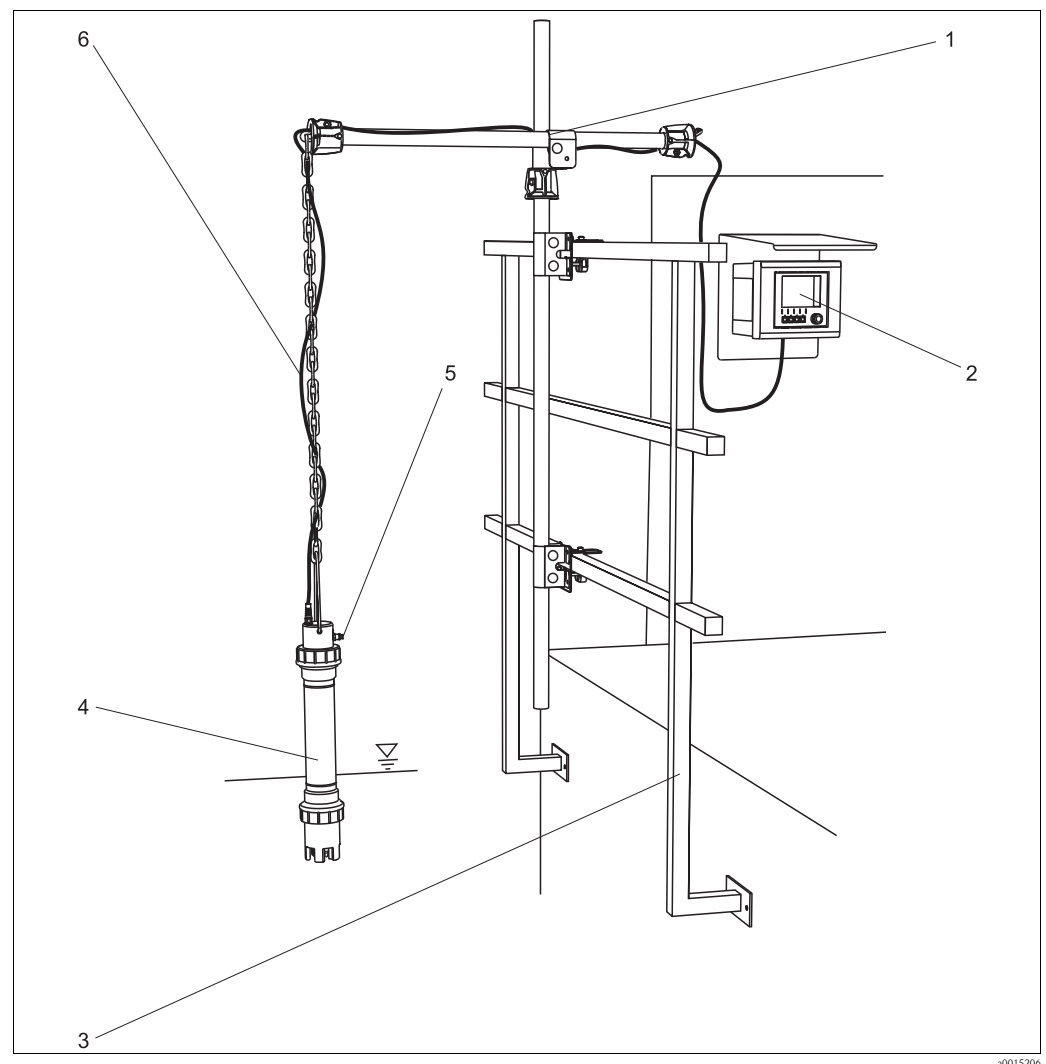


Fig. 6: Example: measuring system on basin rim

- | | | | |
|---|--|---|--|
| 1 | Wastewater assembly holder, secure to rail, with transverse pipe and chain | 4 | Sensor CAS40D with ion-selective electrodes |
| 2 | Transmitter, e.g. Liquiline CM442 (in graphic: wall-mounted with weather protection cover) | 5 | Connection for optional compressed air cleaning (not in graphic) |
| 3 | Rail | 6 | Sensor cable |

3.5 Post-installation check

- After mounting, check all the connections to ensure they are secure and leak-tight.
- Check all cables and hoses for damage.
- Check whether the cables are routed such that they are free from electromagnetic interference influences.

4 Wiring

▲ WARNING

Device is live

Incorrect connection may result in injury or death.

- ▶ The electrical connection may only be performed by an electrical technician.
- ▶ The electrical technician must have read and understood these Operating Instructions and must follow the instructions they contain.
- ▶ **Prior to commencing** the connection work, make sure no voltage is applied at any cable.

4.1 Connecting to the transmitter

The sensor is connected to the Liquiline CM442 transmitter as follows:

- using the M12 plug (version: fixed cable, M12 plug) or
- using the fixed cable at the terminal blocks (version: fixed cable, ferrules):

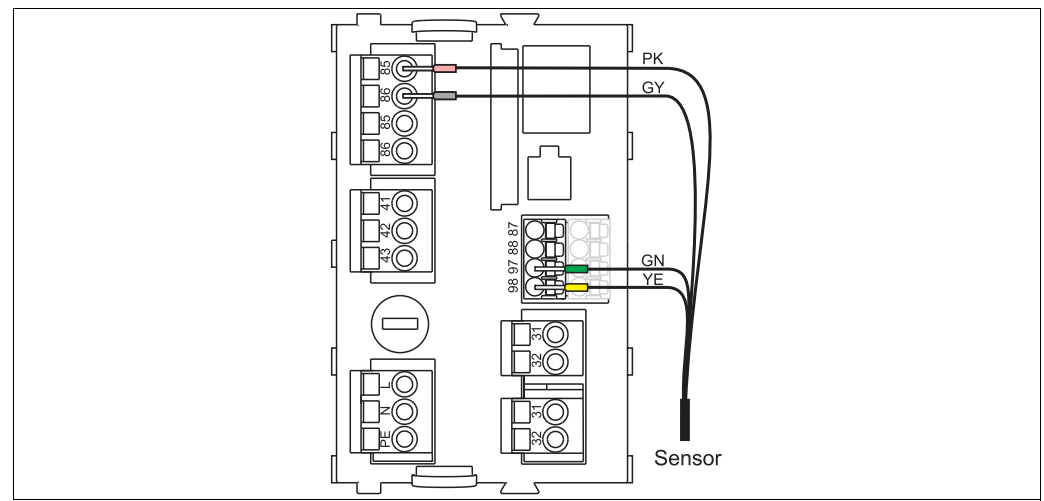


Fig. 7: Sensor connection

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

4.2 Electrode connection in the sensor:

All electrodes are connected in the factory prior to delivery.

Connecting additional electrodes:

1. Remove the sensor from the medium.
2. Take the sensor apart by unscrewing it, and pull out the sensor holder.
3. Remove a dummy electrode from the sensor to free up the space for the new electrode.
4. Install the new electrode in the free space.
5. Remove the transport guard from the electrode head.
6. Connect the new electrode to the electrode connector.
7. Fit the sensor back together, and return it to the medium.

You must then reset your electrode configuration at the transmitter.

Electrode identification

Electrode	Color of membrane ring and marking on screw head ¹⁾	Cable identification
Ammonium	RD	1, 2 or 3
Nitrate	BU	
Potassium	YE	
Chloride	GN	
pH, ORP (incl. reference)	no marking	R

1) Color codes as per IEC 757

4.3 Post-connection check

Device status and specifications	Notes
Is the exterior of the sensor, assembly, junction box or cable externally damaged?	Visual check
Electrical connection	Notes
Does the supply voltage of the transmitter match the data on the nameplate?	
Are the installed cables strain-relieved and not twisted?	
Is the cable type route completely isolated on site?	Power cables / signal lines
Are all screw terminals tightened?	Tighten
Are all cable entries mounted, tightened and sealed?	In the case of lateral cable entries: Cable loops facing downwards to allow water to drip off.
Are all cable entries facing downwards or mounted laterally?	
Are the power supply and signal lines connected correctly?	

5 Calibration

When determining ion concentrations potentiometrically, the voltage supplied by the electrochemical measuring cell (consisting of the ion-selective electrode and a reference electrode) within the "linear" or preferably "NERNST" range is proportional to the logarithm of the concentration (or activity) of the ions to be determined.

5.1 Calibration modes

The following types of calibration are possible:

- pH electrode:
 - Two-point calibration
 - Sample calibration
- Ion-selective electrodes:
 - Single-point calibration
 - Two-point calibration
 - Standard addition
 - Sample calibration
 - Data entry
- ORP sensor:
 - Single-point calibration
- Temperature adjustment by entering a reference value

5.2 Calibration and adjustment of ion-selective electrodes

5.2.1 Sequence for calibration/adjustment of measuring point

Some measured values from other electrodes or sensors are used for measured value compensation of ion-selective electrodes:

- Measured value of temperature sensor for temperature compensation
- pH measured value for pH compensation of ammonium (optional)
- Potassium or chloride measured value for compensation of interference ions in the case of ammonium or nitrate (optional)

For this reason, there is a sequence for calibration and adjustment that must be followed in order to achieve a reliable measurement:

1. Temperature adjustment
2. Calibration and adjustment of pH electrode
3. Calibration and adjustment of ion-selective compensation electrodes (potassium, chloride)
4. Calibration and adjustment of ion-selective measuring electrodes (ammonium, nitrate)

5.2.2 Specific information

In general

For sample calibration, single- and two-point calibration, the following minimum concentrations apply:

- 1 mg/l ammonium or ammonium nitrogen
- 1 mg/l nitrate nitrogen or 4 mg/l nitrate
- 5 mg/l potassium
- 10 mg/l chloride

The values are benchmarks which may change over time due to the influence of interference ions or the aging of ion-selective electrodes.

Single-point calibration

-  If you use the sensor in the inlet to the sludge activation, you have to use a higher standard concentration for the calibration, e.g. 50 mg/l.

Preparing to calibrate

1. Take 3 l (0.79 US gal.) of sample from the sewage treatment plant outlet.
2. Have some of the sample analyzed in the laboratory for the parameter to be calibrated.
3. Add 2 ml (0.068 fl.oz.) standard (1 mol/l $\approx$ 14 g/l) to 2 l (0.52 US gal.) of the sample.
Concentration of the sample with standard added [mg/l] = laboratory measured value [mg/l] + 14 mg/l.
4. Transfer the sample with the standard to a suitable container and immerse the sensor into it.
→ The measured value display increases.

Standard addition

Standard addition is particularly useful if it is not possible to determine reference values in the laboratory.

For this purpose, place the sensor in a container with approx. 1 l of sample.

Potassium and chloride compensation

Depending on the selectivity of the ion-selective electrode vis-à-vis other ions (interference ions), and the concentration of these ions, such ions could also be interpreted as part of the measuring signal and thus cause measuring errors.

When measuring in wastewater, the potassium ion which is chemically similar to the ammonium ion can cause higher measured values.

The measured values for nitrate may turn out to be too high due to high concentrations of chloride. To reduce measuring errors resulting from such cross-interference, the concentration of the potassium or chloride interference ion can be measured and compensated for with a suitable additional electrode.

5.3 Calibration

-  For calibration guidelines, see the Operating Instructions for the transmitter.

5.4 Checking the calibration

1. Immerse the sensor in a suitable container of drinking water (to check the ammonium value) or discharge water (to check the nitrate value).
2. Compare the measured value with the specifications for
 - a. Drinking water (ammonium)
→ The measured value must drop to the local concentration for drinking water (e.g. in Germany: < 0.1 mg/l.)
 - b. Discharge water (nitrate)
→ The measured value must equal that of a reference measurement.
3. If the measured value does not meet expectations:
 - a. Repeat the single-point calibration.
 - b. Carry out a two-point calibration.
 - c. Enter a manual offset at the transmitter. Use the measured value from a comparison measurement to calculate the offset.

6 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, take into account possible repercussions for process control or 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.

6.1 Maintenance schedule

	Cleaning	Membrane cap and electrolyte replacement			Crystal polishing	Replacing	
Maintenance interval	Membrane	Ammonium	Nitrate	Potassium	Chloride	pH electrode	O-ring
Fortnightly	X						
Biannually		X	X	X			
Annually					X	X	X

i The intervals indicated are average empirical values and can be shorter or longer depending on the operating conditions. You, or the plant operator, are responsible for adapting the intervals to suit your conditions.

6.2 Cleaning the membrane

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

- Do not touch the membrane with your hands.
- Use a clean tissue and water for cleaning purposes.

i The optional chloride electrode has a crystal instead of a membrane. To clean it, place some sandpaper (600-grit) on an even surface. Now rub the sensor with the crystal area facing downwards on the paper until all residues of fouling are removed (visual inspection, rubbing the sensor for a few seconds usually suffices).

6.3 Replacing membrane cap and electrolyte

NOTICE

Sensor out of medium for longer than 15 minutes and did not wait for conditioning

Results in measurement errors

- After submerging the sensor in the medium, you must allow it time for conditioning. Allow approx. 1 hour for this.

Removing the electrode

1. Remove the sensor from the medium.
2. Clean the sensor with water.
3. Release and remove the protection guard (→  8).
4. Unscrew the coupling nut (→  9).
5. Pull the electrode holder out of the sensor and release the electrode cable (→  10).
6. Remove the electrode using an open-end or socket wrench, SW17 (→  11).

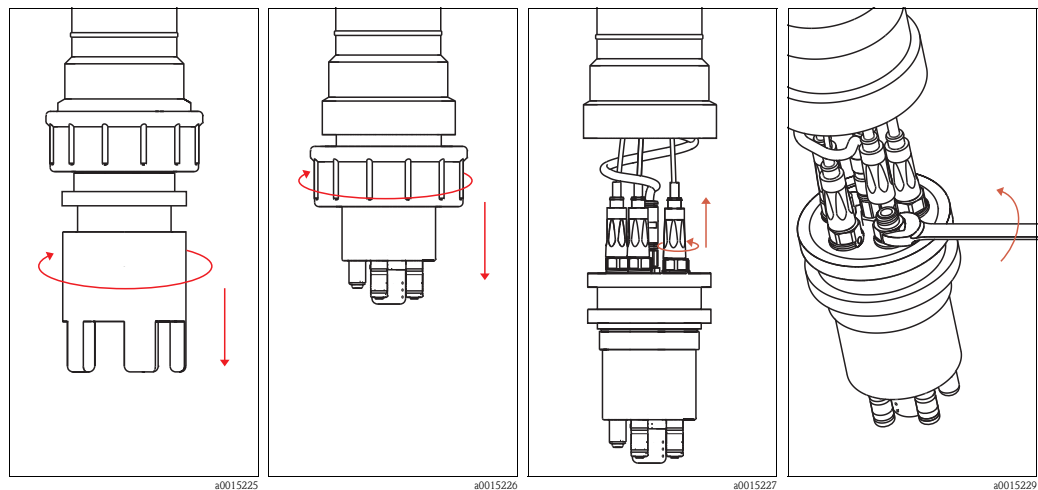


Fig. 8: Release protection guard

Fig. 9: Remove coupling nut

Fig. 10: Release electrode cable

Fig. 11: Remove electrode cable

Replacing the membrane cap and electrolyte

1. Unscrew the membrane cap from the electrode (→  12). The membrane cap is waste that you must dispose of properly.
2. Drain the electrolyte from the electrode body.
3. Extract fresh electrolyte using the pipette included in the kit, and fill the electrode body with electrolyte to approx. 2-3 mm (0.08 - 0.12") below the rim (→  13).
4. Dry the thread of the electrode carefully.
5. Continue to hold the electrode upright, with the cable connection head facing downwards, and screw on the membrane cap until it is hand-tight (→  14).
6. Turn the electrode around, and remove any air bubbles by holding the electrode vertically and shaking it vigorously several times (as in the case of a clinical thermometer).

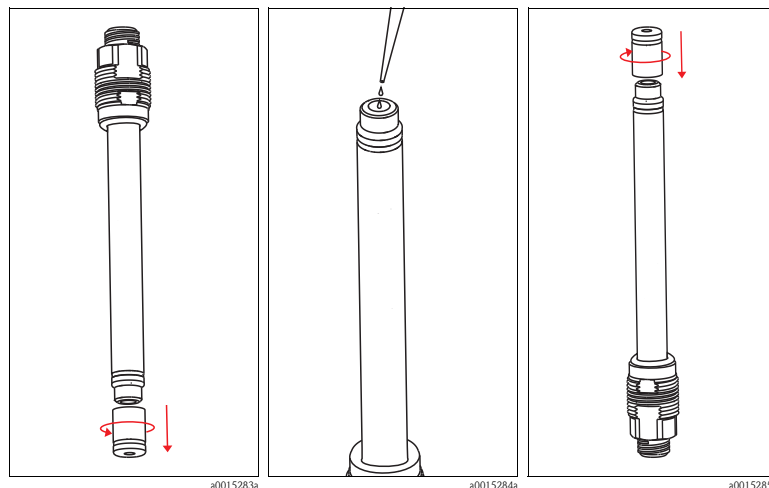


Fig. 12: Remove cap

Fig. 13: Fill with electrolyte

Fig. 14: New cap

 From now until it is installed in the process, always hold the electrode and sensor upright, to avoid the accumulation of new air bubbles on the membrane surface.

Installing the electrode

1. Screw the electrode into the electrode holder, and hand-tighten using the socket wrench, SW17, (→  11, but in the opposite direction).
2. Connect the electrode connector to the cable (→  10, opposite direction).
3. Carefully push the electrode holder and the air hose back into the sensor.
4. Screw on the coupling nut (→  9, opposite direction).
5. Screw on the protection guard (→  8, opposite direction).
6. Carry out a calibration (→ "Commissioning/Calibration").

7 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.

7.1 Assembly holder

Flexdip CYH112 holder for Flexdip CYA112 water and wastewater fittings

- Modular holder system for sensors and assemblies in open basins, channels and tanks
- The holder system works for nearly any type of fixing – fixing on the floor, wall or directly on a rail.
- Stainless steel version
- Order as per product structure (Technical Information TI430C/07/en)

7.2 Maintenance kits

Membrane kit

- 2 Membrane caps (with chloride only one membrane cap with crystal)
- Electrolyte
- Order numbers:
 - Ammonium: 71072574
 - Nitrate: 71072575
 - Potassium: 71072576
 - Chloride: 71072577

Maintenance kit for chloride electrode

- Sandpaper
- Electrolyte
- Order number: 71085727

7.3 Electrodes

Ion-selective electrode

- Electrode, complete, length 120 mm
- Order numbers:
 - Ammonium: 71109938 (color coding red)
 - Nitrate: 71109937 (color coding blue)
 - Potassium: 71109936 (color coding yellow)
 - Chloride: 71109939 (color coding green)

pH electrode with reference

- Order number: CPS11-1AT2GSA

Temperature sensor

- Order number: CTS1-A2GSA

Dummy electrode

- Order number: 71123812

7.4 Standard solutions

7.4.1 Ammonium, nitrate, potassium and chloride

	Standard solution			
	1	Ammonium nitrate, 1 molar		
	2	Potassium chloride, 1 molar		
	Container size			
	A	250 ml (8.45 fl.oz.)		
	Transport documents			
	1	Standard documents		
	2	Incl. dangerous goods sheets		
	3	Safety data sheet		
	Certificate			
	A	None		
	B	Manufacturer's certificate		
CAY40-				Complete order code

7.4.2 pH

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) and to standard reference material of NIST (National Institute of Standards and Technology) according to DIN 19266 by a DKD (German Calibration Service) accredited laboratory.

pH value				
	A	pH 2.00 (accuracy $\pm$ 0.02 pH)		
	C	pH 4.00 (accuracy $\pm$ 0.02 pH)		
	E	pH 7.00 (accuracy $\pm$ 0.02 pH)		
	G	pH 9.00 (accuracy $\pm$ 0.02 pH)		
	I	pH 9.20 (accuracy $\pm$ 0.02 pH)		
	K	pH 10.00 (accuracy $\pm$ 0.05 pH)		
	M	pH 12.00 (accuracy $\pm$ 0.05 pH)		
Quantity				
	01	20 x 18 ml (0.68 fl.oz) only buffer solutions pH 4.00 and 7.00		
	02	250 ml (8.45 fl.oz)		
	10	1000 ml (0.26 US gal)		
	50	5000 ml (1.32 US gal) canister for Topcal S		
Certificate				
	A	Buffer analysis certificate		
Version				
	1	Standard		
CPY20-				Complete order code

7.5 Compressed air cleaning

Not suitable for continuous operation!

- Operating interval: max. 3 minutes cleaning, break for at least six times the cleaning time.
- Avoid condensation in the pressurized hoses.

Cleaning unit in the housing

- 230 V or 115V, IP 65
- Conveying rate at atmospheric pressure: 50 l/min (13.2 gal/min)
- Power consumption: 240 W
- Current consumption: 1.3 A
- Overheating protection: Automatic switch off at $T > 130\text{ °C}$ (266 °F)
- Order no.
 - 230 V: 71072583
 - 115 V: 71096199
 - Hose reducer coupling AD 8/6 mm: 71082499

8 Troubleshooting

8.1 Troubleshooting instructions

For troubleshooting purposes, you must take the entire measuring point into account:

- Transmitter
- Electrical connections and cables
- Assembly
- Sensor

The possible causes of error in the following table relate mainly to the sensor.

Problem	Check	Solution
No display, no sensor reaction	Line voltage at transmitter? Sensor connected correctly? Medium flow present? Formation of build-up	Apply line voltage Make the right connection Create medium flow Clean sensor
Display value too high or too low	Gas bubbles present? Sensor calibrated?	Remove gas bubbles Calibrate
Display value fluctuating greatly	Gas bubbles present? Check mounting location.	Remove gas bubbles Select a different mounting location

-  Please observe the notes on troubleshooting in the Operating Instructions for the transmitter. If need be, carry out a test on the transmitter.

8.2 Spare parts

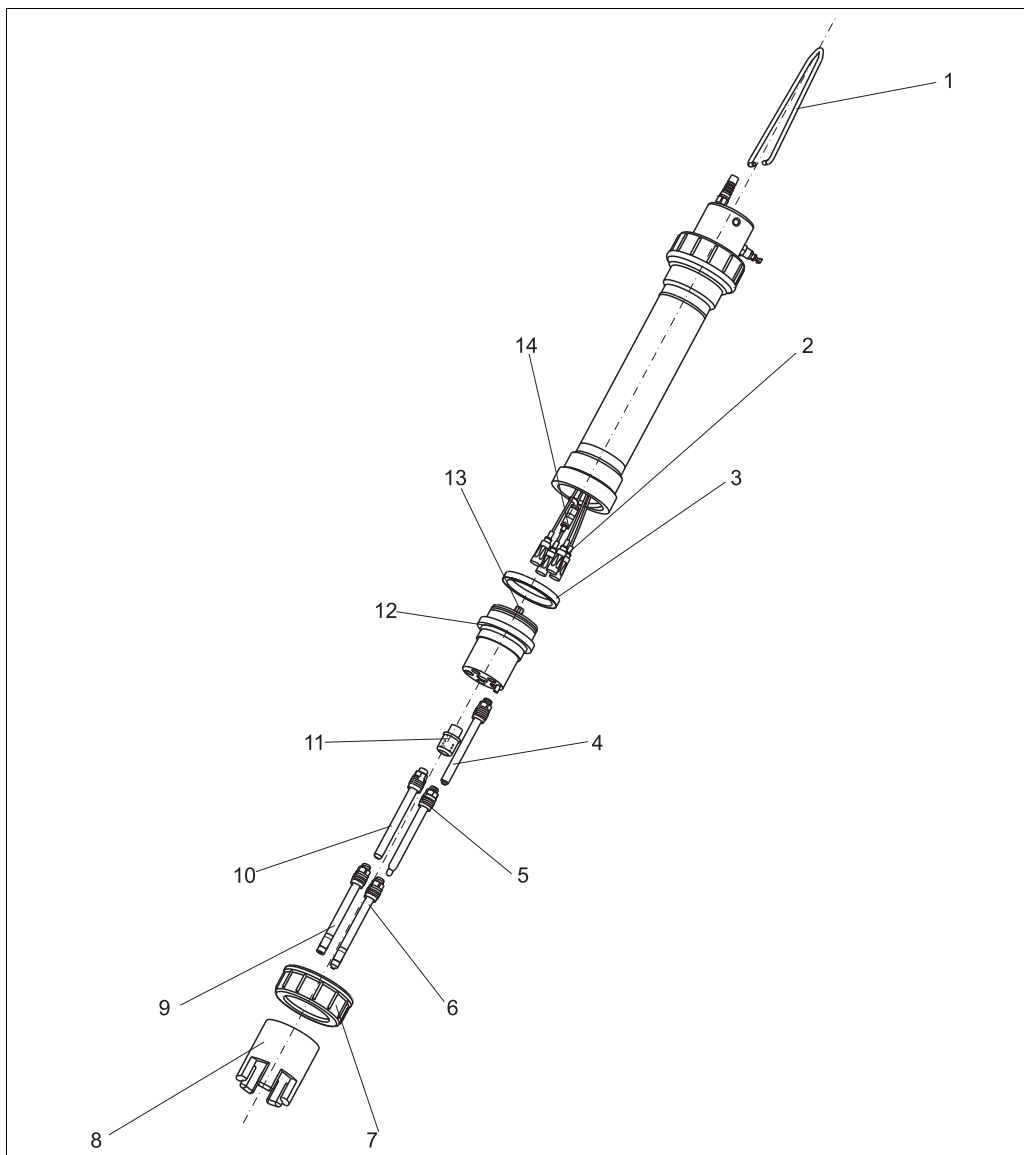


Fig. 15: Exploded view CAS40D

No.	Name	Order number
1	Kit CYH112 suspension bracket for chain	71096714
2	Kit CAS40D multi-conductor cable for electrodes	71130358
3, 7	Kit CAS40D seal set ■ Flat seal for electrode holder (3) ■ Seal for electrode holder ■ Seals for electrodes, 5x ■ Seal for cleaning nozzle ■ Coupling nut (7)	71130360
4	Temperature sensor	CTS1-A2GSA
5	pH single-rod measuring cell with reference	CPS11-1AT2GSA
6	Ion-selective chloride electrode, electrode complete, length 120 mm	71072577
8	Kit CAS40D electrode protection guard	71130354

No.	Name	Order number
9	Ion-selective electrodes, electrode complete, length 120 mm ■ Ammonium ■ Nitrate ■ Potassium	■ 71072574 ■ 71072575 ■ 71072576
10	Kit CAS40D dummy electrode (needed to seal off unused slots)	71123812
11	Kit CAS40D cleaning nozzle incl. seal	71130359
12	Kit CAS40D electrode holder ■ Electrode holder ■ Seals for electrodes ■ Connection for air hose (13, 14) ■ Cleaning nozzle (11) incl. seal ■ Seal, electrode holder	71130357

8.3 Return

Note the following prior to return:

- Contact your Endress+Hauser sales center for information on the different modes of dispatch.
- Enclose a completed "Declaration of contamination" form.

 You will find a template for this form at the end of these instructions.

8.4 Disposal

The device contains electronic components, and the product must therefore be disposed of as electronic waste.

Please observe local regulations.

9 Technical data

9.1 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]
- pH value
- Temperature

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

9.2 Performance characteristics

Response time t_{90}

- Ammonium:
< 2 min.
- Nitrate:
< 2 min.
- Potassium:
< 2 min.
- Chloride:
< 2 min.

Measured value resolution

- Ammonium, nitrate, potassium, chloride
- 0.1 to 99 mg/l:
0.01 mg/l
 - 99 to 999 mg/l:
0.1 mg/l
 - > 999 mg/l:
1 mg/l

Maximum measured error

$\pm 5\%$ of the measured value ± 0.2 mg/l

Repeatability

$\pm 3\%$ of the display value

Compensation

Sensor	Temperature	pH	Potassium ¹⁾²⁾	Chloride ¹⁾³⁾
Ammonium	2 to 40 °C (36 to 100 °F)	pH 8.3 to 10	1 to 1000 mg/l (ppm)	-
Nitrate		-	-	10 to 1000 mg/l (ppm)
Potassium		-	-	-
Chloride		-	-	-

- 1) The fluctuations in concentration, not the absolute value, are the determining factor
- 2) Recommendation: Use as compensation electrode for potassium concentrations > 40 mg/l in the case of simultaneously fluctuating values of ± 20 mg/l, or apply an offset in the case of non-fluctuating values.
- 3) 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.

Maximum operating life

Membrane and electrolyte

- Use:
approx. 0.5 years
- Storage:
2 years

Automatic cleaning

- Cleaning medium:
Air
- Pressure:
3 to 3.5 bar (45 to 50 psi)
- Volume of air required per cleaning cycle:
3 to 4 l (0.8 to 1 US gal)
- Cleaning duration:
4 to 15 s
- Cleaning intervals (at T > 10 °C (50 °F)):
Sludge activation inlet: 15 s cleaning, 30 min pause
Sludge activation: 15 s cleaning, 1 hr pause

9.3 Environment

Ambient temperature range

-20 to 50 °C (-4 to 120 °F)

Storage temperature

2 to 40 °C (36 to 100 °F)

Degree of protection

IP 68

Electromagnetic compatibility

Interference emission and interference immunity as per EN 61326, Namur NE21

9.4 Process

Process temperature range 2 to 40 °C (36 to 100 °F)

Process pressure 400 mbar (160 inH₂O) max. permitted overpressure

pH value of the medium

- Ammonium:
 - pH 5 to 8.3 (without pH compensation)
 - pH 5 to 10 (with pH compensation)
- Nitrate:
 - pH 2 to 12
- Potassium:
 - pH 2 to 12
- Chloride:
 - pH 1 to 10

9.5 Mechanical construction

Weight Approx. 3.5 kg (7.7 lbs)

Material

Sensor	
- Protection guard:	POM
- Electrode holder:	POM
- Flat seals:	Silicon
- O-rings for electrode holder and sensor head:	EPDM
- O-rings in ISE holder:	EPDM
- O-rings for air nozzle:	Viton
- Sensor pipe with coupling nut:	PP
- Retaining bracket:	Stainless steel
- Sensor head:	POM
- Temperature sensor:	Glass
- pH single-rod measuring cell with reference electrode:	Glass, PTFE
Ion-selective electrodes	
- Membrane cap:	POM
- Shaft:	POM
- Color ring:	PP
- Membrane:	PVC, plasticizer
- O-rings:	EPDM

Process connection Pg 13.5

Compressed air connection for hose with AD 8 mm

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Declaration of Hazardous Material and De-Contamination *Erklärung zur Kontamination und Reinigung*

RA No.

Please reference the Return Authorization Number (RA#), obtained from Endress+Hauser, on all paperwork and mark the RA# clearly on the outside of the box. If this procedure is not followed, it may result in the refusal of the package at our facility.
Bitte geben Sie die von E+H mitgeteilte Rücklieferungsnummer (RA#) auf allen Lieferpapieren an und vermerken Sie diese auch außen auf der Verpackung. Nichtbeachtung dieser Anweisung führt zur Ablehnung ihrer Lieferung.

Because of legal regulations and for the safety of our employees and operating equipment, we need the "Declaration of Hazardous Material and De-Contamination", with your signature, before your order can be handled. Please make absolutely sure to attach it to the outside of the packaging.

Aufgrund der gesetzlichen Vorschriften und zum Schutz unserer Mitarbeiter und Betriebseinrichtungen, benötigen wir die unterschriebene "Erklärung zur Kontamination und Reinigung", bevor Ihr Auftrag bearbeitet werden kann. Bringen Sie diese unbedingt außen an der Verpackung an.

Type of instrument / sensor
Geräte-/Sensortyp

Serial number
Seriennummer

☐ Used as SIL device in a Safety Instrumented System / *Einsatz als SIL Gerät in Schutzeinrichtungen*

Process data/ *Prozessdaten*

Temperature / *Temperatur* _____ [°F] _____ [°C]

Pressure / *Druck* _____ [psi] _____ [Pa]

Conductivity / *Leitfähigkeit* _____ [µS/cm]

Viscosity / *Viskosität* _____ [cp] _____ [mm²/s]

Medium and warnings

Warnhinweise zum Medium



	Medium / concentration <i>Medium / Konzentration</i>	Identification CAS No.	flammable <i>entzündlich</i>	toxic <i>giftig</i>	corrosive <i>ätzend</i>	harmful/ irritant <i>gesundheitsschädlich/ reizend</i>	other * <i>sonstiges*</i>	harmless <i>unbedenklich</i>
Process medium <i>Medium im Prozess</i>								
Medium for process cleaning <i>Medium zur Prozessreinigung</i>								
Returned part cleaned with <i>Medium zur Endreinigung</i>								

* explosive; oxidising; dangerous for the environment; biological risk; radioactive

* *explosiv; brandfördernd; umweltgefährlich; biogefährlich; radioaktiv*

Please tick should one of the above be applicable, include safety data sheet and, if necessary, special handling instructions.

Zutreffendes ankreuzen; trifft einer der Warnhinweise zu, Sicherheitsdatenblatt und ggf. spezielle Handhabungsvorschriften beilegen.

Description of failure / *Fehlerbeschreibung*

Company data / *Angaben zum Absender*

Company / <i>Firma</i>	Phone number of contact person / <i>Telefon-Nr. Ansprechpartner:</i>
Address / <i>Adresse</i>	Fax / E-Mail
Your order No. / <i>Ihre Auftragsnr.</i>	

"We hereby certify that this declaration is filled out truthfully and completely to the best of our knowledge. We further certify that the returned parts have been carefully cleaned. To the best of our knowledge they are free of any residues in dangerous quantities."

"Wir bestätigen, die vorliegende Erklärung nach unserem besten Wissen wahrheitsgetreu und vollständig ausgefüllt zu haben. Wir bestätigen weiter, dass die zurückgesandten Teile sorgfältig gereinigt wurden und nach unserem besten Wissen frei von Rückständen in gefahrbringender Menge sind."

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