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Operating Instructions
CCS120D

Digital sensor with Memosens technology for determining total chlorine



Endress+Hauser
People for Process Automation

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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

- 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

1.2.1 Symbols on the device

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

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.
- ▶ Measuring point faults may be repaired only 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

Drinking water and industrial water must be disinfected through the addition of appropriate disinfectants such as chlorine gas or inorganic chlorine compounds. The dosing quantity must be adapted to continuously fluctuating operating conditions. If the concentrations in the water are too low, this could jeopardize the effectiveness of the disinfection. On the other hand, concentrations that are too high can lead to signs of corrosion and have an adverse effect on taste, as well as generating unnecessary costs.

The sensor was specifically developed for this application and is designed for continuous measurement of total chlorine in water. In conjunction with measuring and control equipment, it allows optimal control of disinfection.

In this context, the following compounds are referred to collectively as total chlorine:

- Free chlorine: hypochlorous acid (HOCl), hypochlorite ions (OCl^-)
- Combined chlorine (chloramines)
- Organic combined chlorine, e.g. cyanuric acid derivatives

Chloride (Cl^-) is not recorded.

The sensor is not suitable for checking the absence of chlorine.

The sensor is particularly suitable for:

- Monitoring of total chlorine content in wastewater, industrial water, process water, cooling water and pool water
- Measurement, monitoring and control of total chlorine content in fresh water and seawater during the treatment of process water, swimming pool water and whirlpool bathwater

A typical application is the disinfection of wastewater, industrial, process and cooling water with disinfectants containing chlorine, particularly at higher pH values up to 9.5. In swimming pools, the CCS120D sensor is used in combination with the CCS51E sensor for free available chlorine to monitor the amount of combined chlorine (chloramines).

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.

2.2.1 Hazardous environment as per cCSAus NI Cl. I, Div. 2 [1)]

- ▶ It is essential to observe and comply with the control drawing and the specified application conditions in the appendix of these Operating Instructions.

2.3 Workplace safety

As the user, you are responsible for complying with the following safety conditions:
- 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.
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,
  take products out of service and protect them against unintentional operation.

2.4.1 Special instructions

- ▶ Do not operate the sensor under process conditions in which components of the electrolyte can enter the process through the membrane.

Use of the sensor for its intended purpose in liquids with a conductivity of at least 10 nS/cm can be classified as safe in terms of the application.

2.5 Product safety

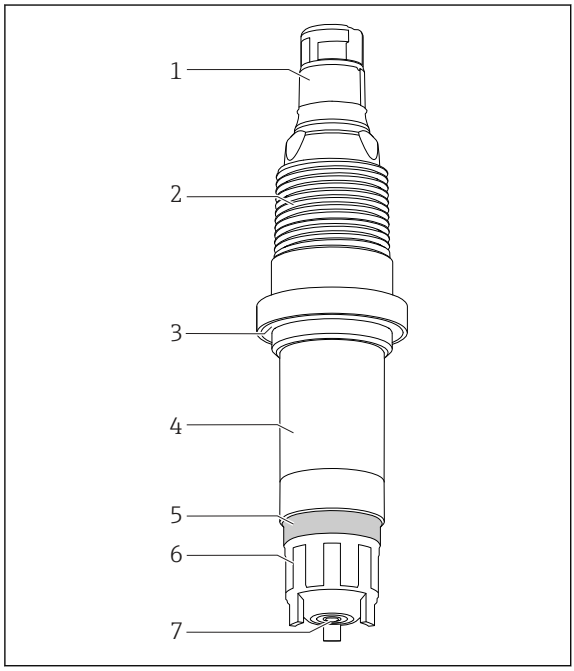
The product is designed to meet state-of-the-art safety requirements, has been tested, and left the factory in a condition in which it is safe to operate. The relevant regulations and international standards have been observed.

1) Only if connected to CM44x(R)-CD*

3 Product description

3.1 Product design

The sensor consists of the following functional units:
- Membrane cap (measuring chamber with membrane)
  - Separates the inner amperometric system from the medium
  - With robust PET membrane and pressure relief valve
  - Guarantees a defined and consistent electrolyte film between working electrode and membrane
- Sensor shaft with
  - Large counter electrode
  - Working electrode embedded in plastic
  - Embedded temperature sensor



1 *Memosens plug-in head*
2 *NPT ¾" thread*
3 *O-ring*
4 *Sensor shaft*
5 *Pressure relief valve (elastic)*
6 *Membrane cap*
7 *Sensor membrane*

1 Sensor structure

3.1.1 Measuring principle

Total chlorine levels are determined in accordance with the amperometric measuring principle.

In this context, the following compounds are referred to collectively as total chlorine:
- Free available chlorine: hypochlorous acid (HOCl), hypochlorite ions (OCl^-)
- Combined chlorine (chloramines)
- Organic combined chlorine, e.g. cyanuric acid derivatives

Chloride (Cl^-) is not recorded.

The sensor is a membrane-covered, two-electrode sensor. A platinum working electrode is used as the working electrode. A counter electrode coated in silver halide is used as the counter and reference electrode.

The membrane cap, which is filled with electrolyte, constitutes the measuring chamber. The measuring electrodes are immersed in the measuring chamber. The measuring chamber is separated from the medium by means of a microporous membrane. The chlorine compounds contained in the medium diffuse through the sensor membrane.

The constant polarization voltage present between the two electrodes causes the electrochemical reaction of the chlorine compounds at the working electrode. Electron donation at the working electrode and electron acceptance at the counter-electrode cause a current to flow. In the operational range of the sensor, this current flow is proportional to the chlorine concentration under constant conditions and is only slightly pH-dependent in the case of this sensor type. The transmitter uses the current signal to calculate the measured variable for concentration in mg/l (ppm).

3.1.2 Effects on the measured signal

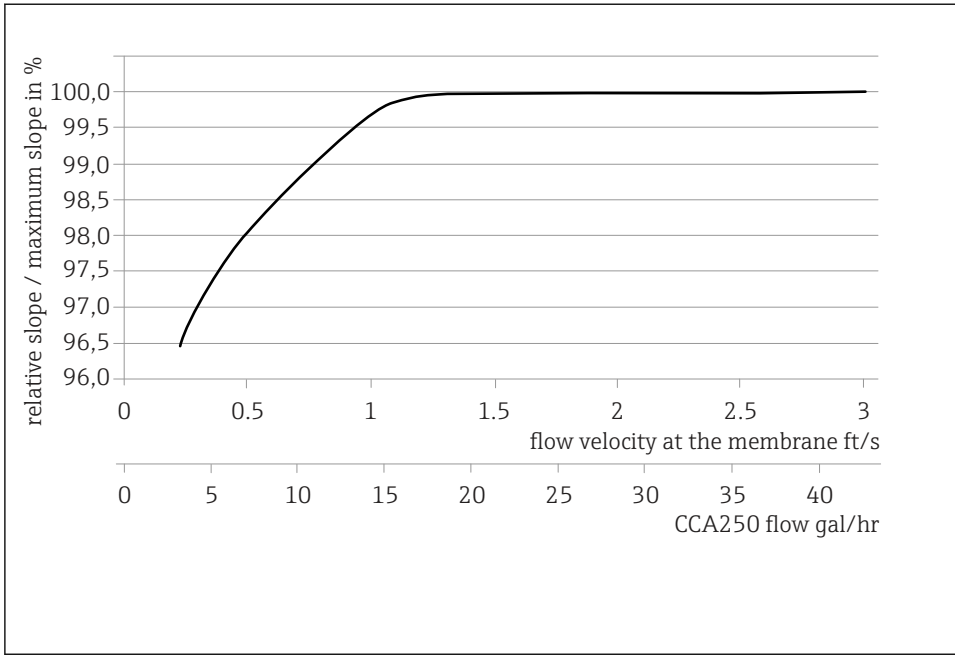
pH value

pH dependency

The sensor is specified for the pH range of pH 5.5 to 9.5. The measuring signal is practically independent within this range. However, if the pH increases from pH 7 to pH 8 the measuring signal for free chlorine is reduced by 10 %.

Flow

The flow to the membrane-covered measuring cell should be at least 15 cm/s and maximum 50 cm/s. The optimum flow velocity is in the range 20 to 30 cm/s.
When using the CCA250 flow assembly, the minimum flow velocity corresponds to a volume flow of 30 l/h (7.9 gal/h) (upper edge of float at the height of the red bar mark).



2 *Correlation between slope of electrode and flow velocity at the membrane/volume flow in assembly*

At higher flow rates, the measured signal is virtually flow-independent. However, if the flow rate falls below the specified value, the measured signal depends on the flow.

Temperature

Changes in the temperature of the medium affect the measured value:
- Increases in temperature result in a higher measured value (approx. 4 % per K)
- Decreases in temperature result in a lower measured value (approx. 4 % per K)

When used with the Liquiline, the sensor enables automatic temperature compensation (ATC). Recalibration in the case of temperature changes is not necessary.

1. If automatic temperature compensation is disabled at the transmitter, the temperature must be maintained at a constant level following calibration.
2. Otherwise, recalibrate the sensor.

In the event of normal and slow changes in temperature (0.3 K / minute), the internal temperature sensor is sufficient. In the event of very rapid temperature fluctuations with high amplitude (2 K/minute), an external temperature sensor is necessary to ensure maximum measurement accuracy.

Cross-sensitivities [2)]

Oxidants, such as bromine, iodine, ozone, chlorine dioxide, permanganate, peracetic acid and hydrogen peroxide result in higher readings than expected.

Reducing agents, such as sulfides, sulfites, thiosulfates and hydrazine, result in lower readings than expected.

2) The listed substances have been tested with different concentrations. An additive effect has not been investigated.

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

► Compare the information on the nameplate with the order.

4.2.2 Product page

www.endress.com/ccs120d

4.2.3 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.
   ↳ A new window opens. Here you fill information pertaining to your device, including the product documentation.

4.2.4 Manufacturer address

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

4.2.5 Scope of delivery

The scope of delivery comprises:
- Disinfection sensor (membrane-covered)
- Bottle with electrolyte (50 ml (1.69 fl oz)) and nozzle
- Replacement membrane cap
- Operating Instructions
- Manufacturer inspection certificate

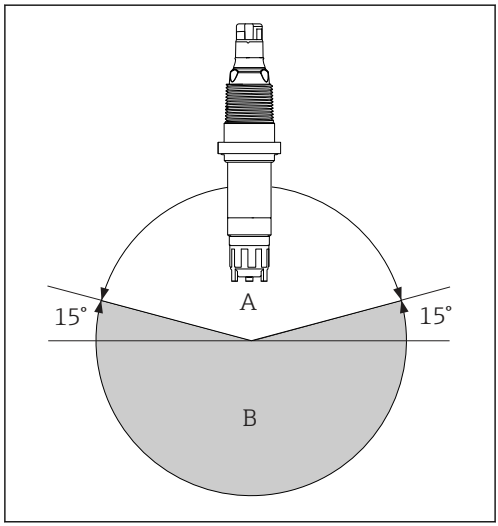
5 Installation

5.1 Installation requirements

5.1.1 Orientation

Do not install upside-down!

- ▶ Install the sensor in an assembly, support or appropriate process connection at an angle of at least 15 ° to the horizontal.
- ▶ Other angles of inclination are not permitted.
- ▶ Follow the instructions for installing the sensor in the Operating Instructions of the assembly used.

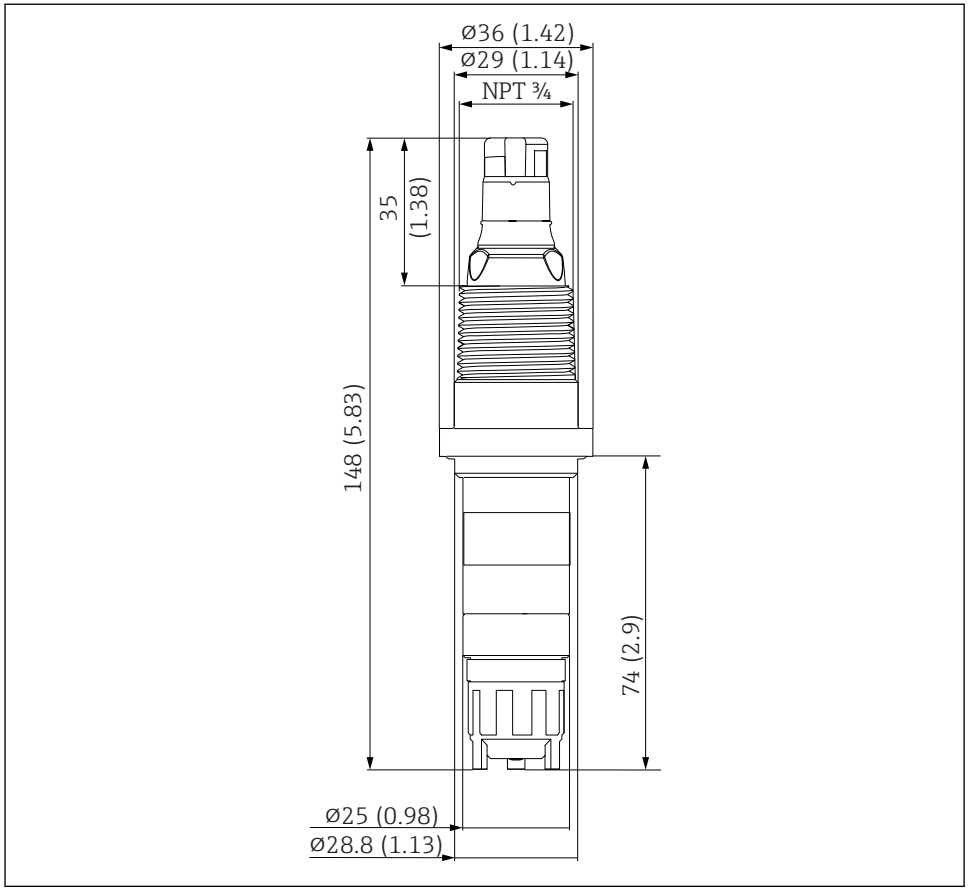


A *Permitted orientation*
B *Incorrect orientation*

5.1.2 Immersion depth

At least 70 mm (2.76 in)

5.1.3 Dimensions

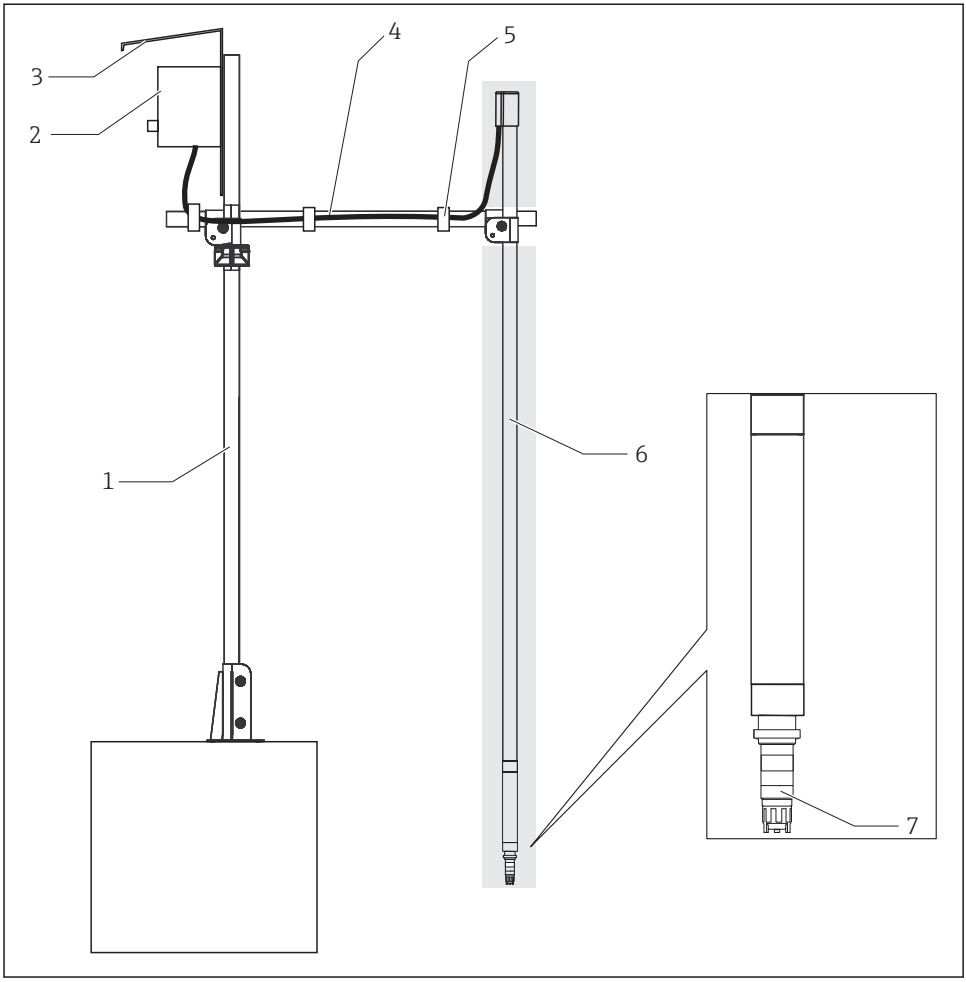


3 Dimensions in mm (in)

5.2 Installing the sensor

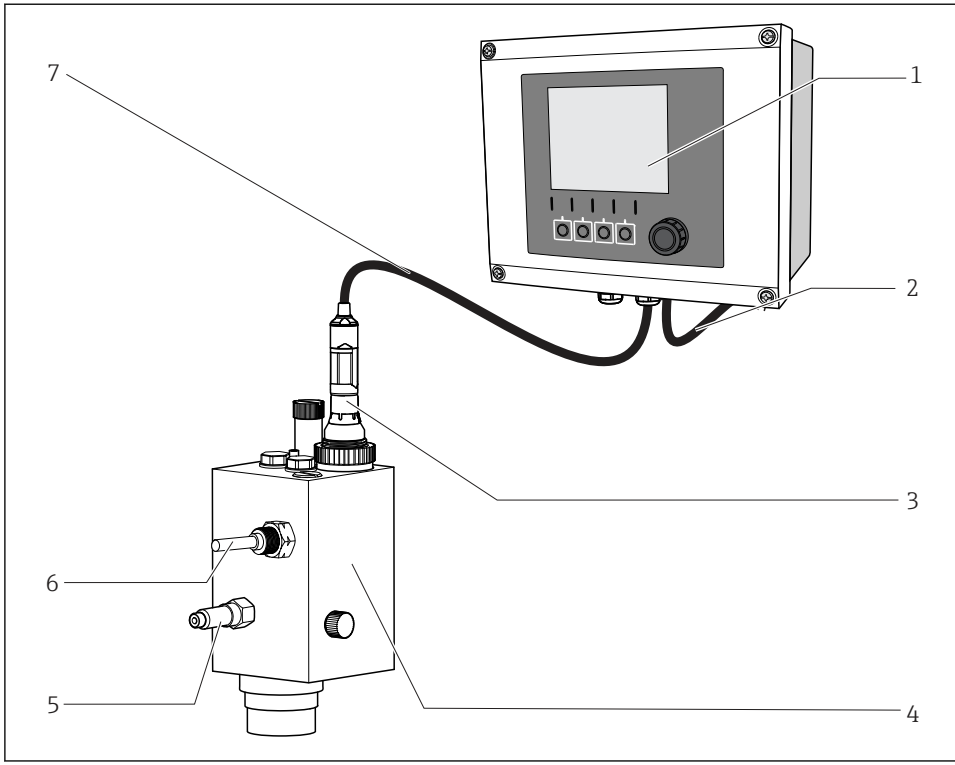
5.2.1 Measuring system

A complete measuring system comprises:
- CCS120D disinfection sensor (membrane-covered)
- Flexdip CYA112 immersion assembly
- Measuring cable CYK10, CYK20
- Transmitter, e. g. Liquiline CM44x with firmware version 01.06.08 or higher or CM44xR with firmware version 01.06.08 or higher
- Optional: extension cable CYK11
- Optional: Flowfit CCA250 flow assembly (a pH/ORP sensor can additionally be installed here)



4 *Example of a measuring system*

1 CYH112 holder, main pipe
2 Transmitter
3 Protective cover
4 CYH112 holder, transverse pipe
5 Hook-and-loop tape
6 CYA112 assembly (gray background)
7 Disinfection sensor CCS120D (membrane-covered, Ø25 mm)



5 Example of a measuring system

1 *Liquiline CM44x transmitter*
2 *Power cable for transmitter*
3 *Disinfection sensor CCS120D (membrane-covered, Ø25 mm)*
4 *Flowfit CCA250 flow assembly*
5 *Inlet to Flowfit CCA250 flow assembly*
6 *Proximity switch (optional)*
7 *Measuring cable CYK10*

5.2.2 Preparing the sensor

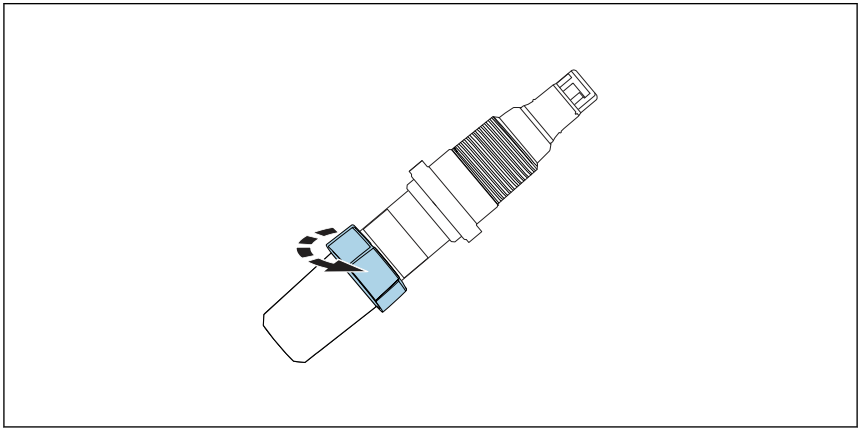
Remove protective cap from sensor

NOTICE

Vacuum causes damage to the sensor's membrane cap

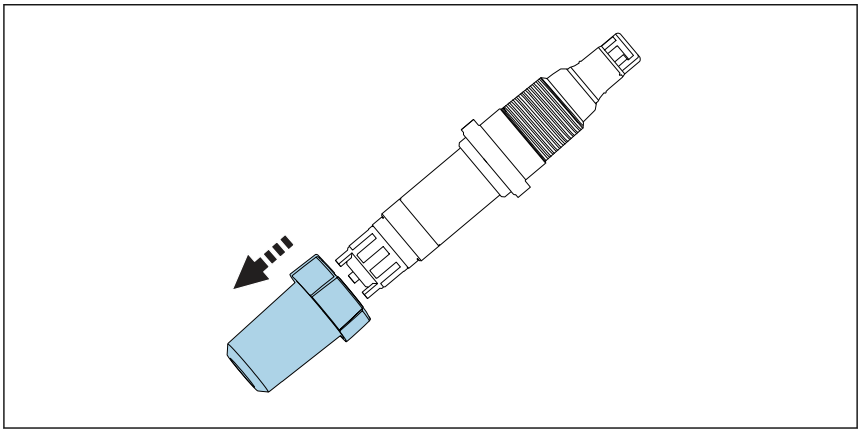
▶ If the protective cap is attached, carefully remove it from sensor.

1. When supplied to the customer and when in storage, the sensor is fitted with a protective cap: First release just the top part of the protective cap by turning it.



6 Releasing top part of protective cap by turning

2. Carefully remove protective cap from sensor.



7 Carefully remove protective cap

Filling the membrane cap with electrolyte

Please note the information on the safety data sheet to ensure safe use of the electrolyte.

NOTICE

Damage to membrane and electrodes, air bubbles

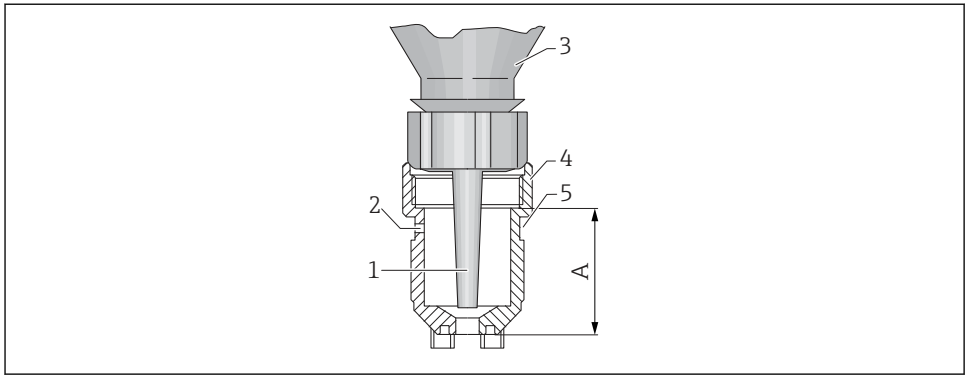
Possibility of measured errors to complete failure of the measuring point

- Avoid damage to membrane and electrodes.
- The electrolyte is chemically neutral and is not hazardous to health. Nonetheless, do not swallow it and avoid contact with eyes.
- Keep the electrolyte bottle closed after use. Do not transfer electrolyte to other vessels.
- Do not store electrolyte for longer than one year. The electrolyte must not be yellow in color. Observe the use-by date on the label.
- Avoid air bubbles when pouring electrolyte into membrane cap.
- Only use membrane cap once.
- Store the electrolyte bottle upside down (standing on its head) to ensure that the viscous electrolyte can be decanted as easily as possible with minimum bubbles. Smaller air bubbles are not a problem. Larger air bubbles rise to the upper edge of the membrane cap.

Filling the membrane cap with electrolyte

The sensor is dry when delivered from the factory. Before using the sensor, fill the membrane cap with electrolyte.

1. Open the electrolyte bottle. Screw the nozzle onto the electrolyte bottle.
2. Press out any excess air.
3. Place the electrolyte bottle on the membrane cap.
4. Using a single movement, slowly push the electrolyte into the membrane cap until it reaches the lower turn of the thread. Withdraw the electrolyte bottle smoothly.
5. Slowly screw on the membrane cap as far as the end stop . This will force excess electrolyte out at the valve and at the thread.
6. If necessary, pat the sensor and membrane cap dry using a cloth.
7. Thoroughly clean the nozzle with a clean, warm and strong jet of water to ensure that any electrolyte is removed.
8. Reset operating hours counter for electrolyte on transmitter. For detailed information, see the Operating Instructions for the transmitter.



A0037963

8 Membrane cap with electrolyte bottle

1 Nozzle
2 Ventilation hole
3 Electrolyte bottle
4 Membrane cap
5 Hose seal
A Electrolyte level

5.2.3 Installing the sensor in assembly CCA250

The Flowfit CCA250 flow assembly is designed for installing the sensor. It allows a pH and an ORP sensor to also be installed, in addition to the total chlorine sensor. A needle valve controls the flow rate in the range of 30 to 120 l/h (7.9 to 31.7 gal/h).

Please note the following during installation:
- The flow rate must be at least 30 l/h (7.9 gal/h). If the flow drops below this value or stops completely, this can be detected by an inductive proximity switch.
- If the medium is fed back into an overflow basin, pipe or similar, the resulting counterpressure on the sensor may not exceed 1 bar (14.5 psi)(2 bar abs. (29 psi abs.)) and must remain constant.
- Negative pressure at the sensor, e.g. due to medium being returned to the suction side of a pump, must be avoided.
- To avoid buildup, heavily contaminated water should also be filtered.

Additional installation instructions can be found in the Operating Instructions for the assembly.

5.2.4 Installing the sensor in other flow assemblies

When using other flow assembly, ensure:
- A minimum flow velocity of15 cm/s (0.49 ft/s) must be ensured at the membrane.
- The flow direction is upwards. Transported air bubbles must be removed so that they do not collect in front of the membrane.
- The membrane must be exposed to direct flow.

5.2.5 Installing the sensor in the CYA112 immersion assembly

Alternatively, the sensor can be installed in an immersion assembly with threaded connection G1", e.g. CYA112.

Additional installation instructions can be found in the Operating Instructions for the assembly.

5.3 Post-installation check

1. Check the membrane to ensure it is sealed and undamaged.
   ↳ Replace if necessary.
2. Is the sensor installed in an assembly and not suspended from the cable?
   ↳ The sensor may be installed only in an assembly or directly via the process connection.

6 Electrical connection

⚠ CAUTION

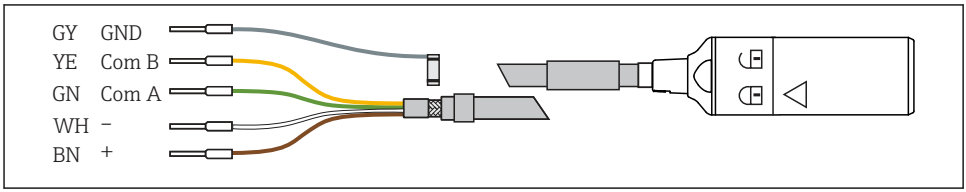
Device is live

Incorrect connection may result in injury!

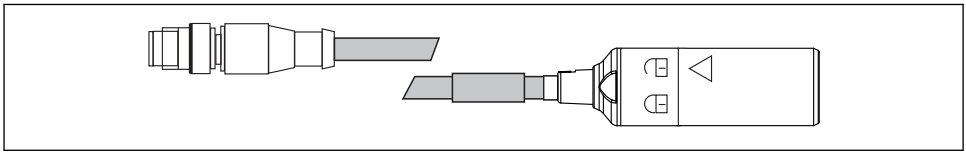
- ▶ The electrical connection may be performed only by an electrical technician.
- ▶ The electrical technician must have read and understood these Operating Instructions and must follow the instructions contained therein.
- ▶ **Prior** to commencing connection work, ensure that no voltage is present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

6.1 Connecting the sensor

The electrical connection to the transmitter is performed via Memosens data cable CYK10 or measuring cable CYK20.



9 Measuring cable CYK10/CYK20



10 CYK10 with M12 plug, electrical connection

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, assembly, or cables free from damage on the outside?	Visual inspection
Electrical connection	**Notes**
Are the mounted cables strain-relieved and not twisted?	
Is a sufficient length of the cable cores stripped, and are the cores positioned in the terminal correctly?	Check the fit (by pulling gently)
Are all the screw terminals properly tightened?	Tighten
Are all the cable entries installed, tightened and sealed?	For lateral cable entries, make sure the cables loop downwards to allow water to drip off
Are all cable entries installed downwards or mounted laterally?	

7 Commissioning

7.1 Function check

Prior to commissioning, ensure that:
- The sensor is correctly installed.
- The electrical connection is correct.
- There is sufficient electrolyte in the membrane cap and the transmitter is not displaying a warning about electrolyte depletion.

Please note the information on the safety data sheet to ensure safe use of the electrolyte.

Always keep the sensor moist after commissioning.

⚠ CAUTION

Escaping process medium

Risk of injury from high pressure, high temperatures or chemical hazards
- ▶ Before applying pressure to an assembly with cleaning system, ensure that the system has been connected correctly.
- ▶ Do not install the assembly in the process if you cannot reliably establish the correct connection.

7.2 Filling the membrane cap with electrolyte

Fill the membrane cap with electrolyte

The sensor is dry when delivered from the factory.

▶ Fill the membrane cap with electrolyte before commissioning the sensor → 19.

7.3 Sensor polarization

The voltage applied by the transmitter between the working electrode and counter electrode polarizes the surface of the working electrode. Therefore, after switching on the transmitter with the sensor connected, you must wait until the polarization time has elapsed before starting calibration.

Polarization time: → 37

7.4 Calibrating the sensor

Reference measurement according to the DPD method

To calibrate the measuring system, carry out a colorimetric comparison measurement according to the DPD-1/DPD-3 method. Chlorine reacts with diethyl-p-phenylendiamine (DPD) producing a red dye, the intensity of the red color being proportional to the chlorine content. Alternatively, the DPD 4 method can also be used.
Measure the intensity of the red color using a photometer, (e.g. PF-3 → 34) . The photometer indicates the chlorine content.

Prerequisites

The sensor reading is stable (no drifts or unsteady values for at least 5 minutes). This is normally guaranteed once the following preconditions have been met:

- The polarization time has fully elapsed.
- The flow is constant and within the correct range.
- The sensor and the medium are at the same temperature.
- The pH value is within the permitted range.

Zero adjustment

A zero adjustment is not required due to the zero point stability of the membrane-covered sensor.

Slope calibration

Always perform a slope calibration in the following cases:

- After replacing the membrane cap
- After replacing electrolyte

The slope of the sensor is strongly influenced by the application conditions. The interval for the slope calibration must be adjusted accordingly.

Repeat the slope calibration at regular intervals.

Recommended calibration intervals → 28

1. Ensure that the pH value and temperature of the medium are constant.
2. Take a representative sample for the DPD measurement. This must be done in close proximity to the sensor. Use the sampling tap if available.
3. Determine the chlorine content using the DPD method.
4. Enter the measured value into the transmitter (see Operating Instructions for transmitter).
5. To ensure greater accuracy, check the calibration several hours or a day later using the DPD method.

8 Diagnostics and troubleshooting

When troubleshooting, the entire measuring point must be taken into account. This comprises:
- Transmitter
- Electrical connections and lines
- Assembly
- Sensor

The possible causes of faults in the following table refer primarily to the sensor. Before commencing troubleshooting, ensure that the following operating conditions have been met:
- The chlorine content is within the measuring range of the sensor (check with the DPD-1/ DPD-3 method)→ 🖹 36.
- The pH value is within the pH range of the sensor → 🖹 38.
- The temperature is within the temperature range of the sensor → 🖹 37.
- The conductivity is within the conductivity range of the sensor .
- Measurement in "temperature-compensated" mode (can be configured on transmitter CM44x) or constant temperature following calibration
- Medium flow rate of at least 30 l/h (7.9 gal/h)(red bar mark when using the CCA250 flow assembly)

If the value measured by the sensor differs significantly from that of the DPD method, first consider all possible malfunctions of the photometric DPD method (see Operating Instructions for photometer). If necessary, repeat the DPD measurement several times.

Error	Possible cause	Remedy
No display, no sensor current	No supply voltage at the transmitter	▶ Establish mains connection
	Connection cable between sensor and transmitter interrupted	▶ Establish cable connection
	There is no electrolyte in the membrane cap	▶ Fill the membrane cap with fresh electrolyte → 🖹 29
	No input flow of medium	▶ Establish flow, clean filter
	Zero point has shifted	1. Check condition of counter electrode. 2. Reset transmitter to factory settings.

Error	Possible cause	Remedy
Display value too high	Polarization of the sensor not yet completed	▶ Wait for polarization to be completed
	Membrane defective	▶ Replace membrane cap
	Shunt resistance (e.g. moisture contact) in the sensor shaft	▶ Remove membrane cap, rub working electrode dry. ▶ If the transmitter display does not return to zero, there is a shunt present: replace sensor.
	Foreign oxidants interfering with sensor	▶ Examine medium, check chemicals
	DPD chemicals are too old	▶ Replace DPD chemicals.
	pH value < pH 5	▶ Stay within permitted pH range (pH 5.5 to 9.5).
Display value too low	Membrane cap not screwed on fully	▶ Fill the membrane cap with fresh electrolyte → 🖹 29 ▶ Screw membrane cap on fully
	Membrane soiled	▶ Clean the membrane → 🖹 28
	Air bubble in front of membrane	▶ Release air bubble
	Air bubble between working electrode and membrane	▶ Remove membrane cap, top up electrolyte ▶ Remove air bubble by tapping on the outside of the membrane cap ▶ Screw on membrane cap
	Input flow of medium too low	▶ Establish correct flow
	Foreign oxidants interfering with DPD reference measurement	▶ Examine medium, check chemicals
	Use of organic disinfectants	▶ Use suitable agent (e.g. as per DIN 19643) (water may need to be replaced first) ▶ Use suitable reference system.
	Polarization time is too low	▶ Wait for polarization to be completed
	pH value	▶ Stay within permitted pH range (pH 5.5 to 9.5).
	There is no electrolyte in the membrane cap	▶ Fill the membrane cap with fresh electrolyte → 🖹 29
Display fluctuates considerably	Hole in membrane	▶ Replace membrane cap
	Fluid pressure variations	▶ Adjust the process

9 Maintenance

Please note the information on the safety data sheet to ensure safe use of the electrolyte.

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.

9.1 Maintenance schedule

Interval	Maintenance work
If deposits are visible on the membrane (biofilm, limescale)	Clean sensor membrane → 29
If dirt is visible on the surface of the electrode body	Clean electrode body of sensor
Recommended calibration intervals: ▪ Drinking water, industrial water, process water, cooling water: depending on the special conditions (1 to 4 weeks) ▪ Swimming pools: weekly ▪ Whirlpools: daily	Sensor calibration
▪ If cap is replaced ▪ If the slope is too low or too high relative to the nominal slope and the membrane cap is not visibly damaged or dirty	Fill membrane cap with fresh electrolyte → 29
▪ If there are grease/oil deposits (dark or transparent spots on the membrane) ▪ If slope is too high or too low or sensor current is very noisy ▪ If it is obvious that the sensor current is significantly dependent on the temperature (temperature compensation not working).	Replace membrane cap → 29
In the event of visible silvery or white changes to the counter electrode (brown/gray or yellow/green discoloration is not a problem)	Regenerate sensor → 32

9.2 Maintenance work

9.2.1 Cleaning the sensor

Removing the sensor from the assembly CCA151

1. Remove the cable.
2. Unscrew the union nut from the assembly.
3. Pull sensor out through opening in assembly.

Cleaning the sensor membrane

If the membrane is visibly soiled, proceed as follows:

1. Remove sensor from flow assembly.
2. Only clean membrane mechanically with a gentle jet of water.

9.2.2 Filling the membrane cap with fresh electrolyte

Please note the information on the safety data sheet to ensure safe use of the electrolyte.

NOTICE

Damage to membrane and electrodes, air bubbles

Possibility of measured errors to complete failure of the measuring point

- Avoid damage to membrane and electrodes.
- The electrolyte is chemically neutral and is not hazardous to health. Nonetheless, do not swallow it and avoid contact with eyes.
- Keep the electrolyte bottle closed after use. Do not transfer electrolyte to other vessels.
- Do not store electrolyte for longer than one year. The electrolyte must not be yellow in color. Observe the use-by date on the label.
- Avoid air bubbles when pouring electrolyte into membrane cap.
- Only use membrane cap once.

Fill the membrane cap with electrolyte→ 19

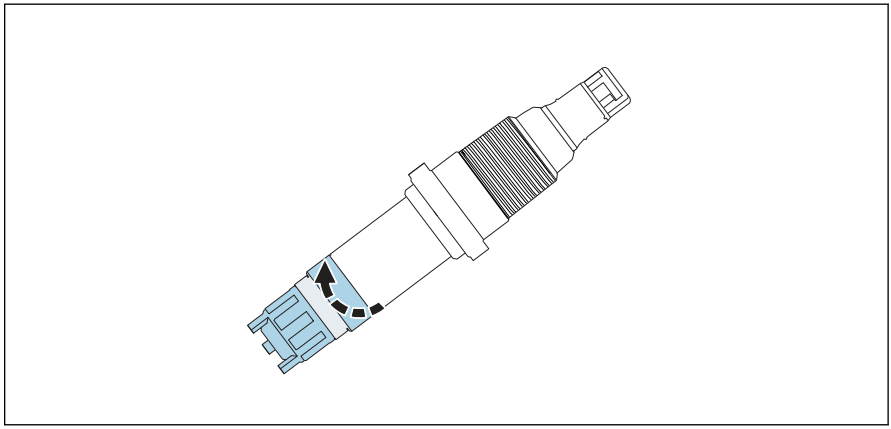
9.2.3 Replacing the membrane cap

1. Remove sensor from flow assembly.
2. Remove membrane cap → 30.
3. Fill new membrane cap with fresh electrolyte → 19.
4. Check the condition of the sealing ring and check whether the sealing ring is mounted on the shaft.
5. Screw new membrane cap onto sensor shaft → 30.
6. Reset operating hours counter for membrane cap on transmitter. For detailed information, see Operating Instructions for transmitter.

Remove membrane cap

▶ Carefully rotate membrane cap and remove.

↳



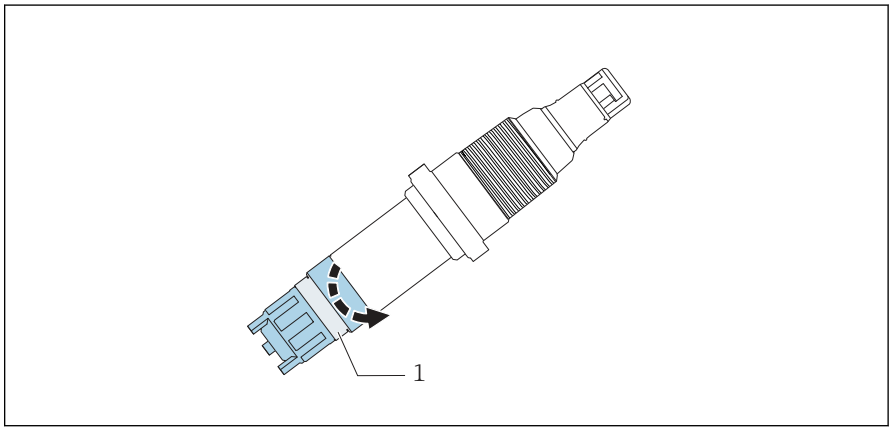
A0037888

11 *Carefully rotate membrane cap.*

Screw membrane cap onto sensor

▶ Screw membrane cap onto sensor shaft: hold sensor by the shaft. Keep valve clear.

↳



A0037889

12 *Screw on membrane cap: keep pressure relief valve clear.*

1 Pressure relief valve

9.2.4 Storing the sensor

If measurement is suspended:

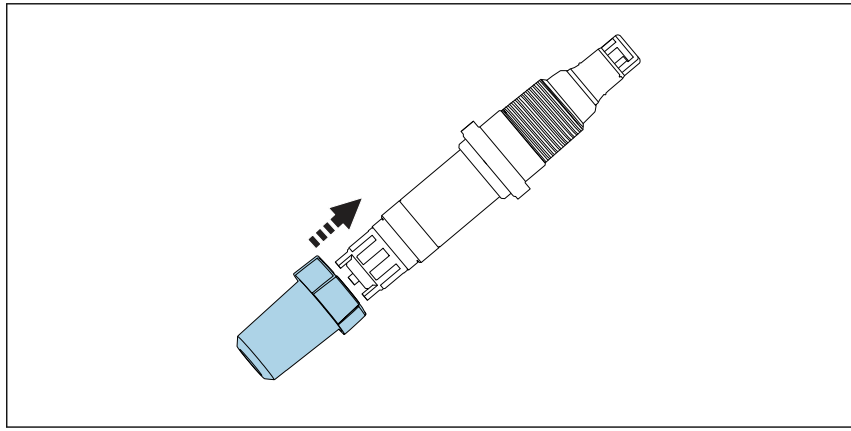
1. Remove the cable.
2. Remove sensor from assembly.

3. Unscrew membrane cap and dispose of it.
4. Rinse electrodes thoroughly with clean, warm water ensuring all residue of electrolyte is removed.
5. Allow the electrodes to dry.
6. Screw a new membrane cap loosely onto the electrodes to protect them.
7. Fit the protective cap on the sensor → 31.
8. For recommissioning, follow the same procedure as for commissioning → 24.

Ensure that no biofouling occurs during longer interruptions to measurement. Remove continuous organic deposits such as films of bacteria from media with a high concentration of chlorine.

Fit the protective cap on the sensor

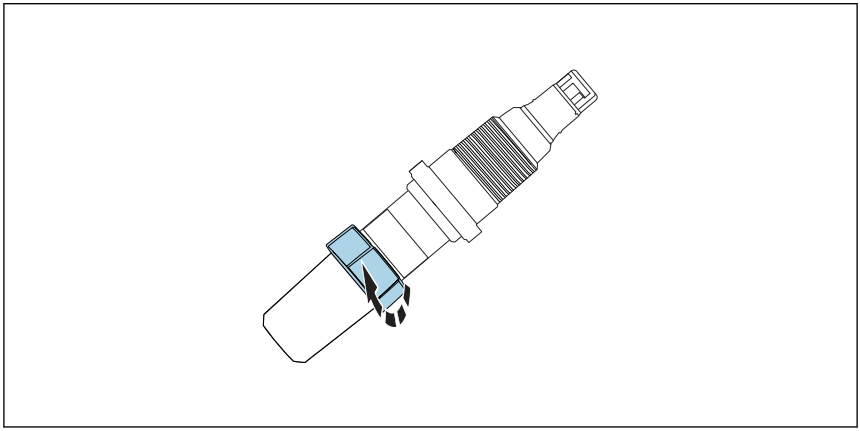
1. To keep the membrane moist after the sensor has been removed, fill the protective cap with clean water.



13 *Carefully slide the protective cap onto the membrane cap.*

2. Top part of protective cap is in the open position.
   Carefully slide the protective cap onto the membrane cap.

3. Secure protective cap by rotating the top part of the protective cap.



14 Secure the protective cap by rotating the top part.

9.2.5 Regenerating the sensor

During measurement, the electrolyte in the sensor is gradually exhausted due to chemical reactions. The gray-brown silver halide layer that is applied to the counter electrode at the factory continues to grow during sensor operation. However, this has no effect on the reaction taking place at the working electrode.

A change in the color of the silver halide layer indicates an effect of the reaction that is taking place. Carry out a visual inspection to ensure that the gray-brown color of the counter electrode has not changed. If the color of the counter electrode has changed, e.g. if it is spotted, white or silvery, the sensor must be regenerated.

- Send the sensor to the manufacturer for regeneration.

10 Repair

10.1 Spare parts

For more detailed information on spare parts kits, please refer to the "Spare Part Finding Tool" on the Internet:

www.endress.com/spareparts_consumables

10.2 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:

- Check the website www.endress.com/support/return-material for information on the procedure and general conditions.

10.3 Disposal



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 Accessories

The following are the most important accessories available at the time this documentation was issued.

Listed accessories are technically compatible with the product in the instructions.

1. Application-specific restrictions of the product combination are possible.
   Ensure conformity of the measuring point to the application. This is the responsibility of the operator of the measuring point.
2. Pay attention to the information in the instructions for all products, particularly the technical data.
3. For accessories not listed here, please contact your Service or Sales Center.

11.1 Device-specific accessories

Kit CCS120/120D, maintenance kit
- 2 x membrane caps and 1 x electrolyte 50 ml (1.69 fl.oz)
- Order number: 71412917

Kit CCS120/120D, electrolyte
- 1 × electrolyte 50 ml (1.69 fl oz)
- Order number: 71412916

Kit CCS120/120D, Viton ring set
- 2 × Viton rings
- Order number: 71105209

Memosens data cable CYK10
- For digital sensors with Memosens technology
- Product Configurator on the product page: www.endress.com/cyk10

Technical Information TI00118C

Memosens data cable CYK11
- Extension cable for digital sensors with Memosens protocol
- Product Configurator on the product page: www.endress.com/cyk11

Technical Information TI00118C

Memosens laboratory cable CYK20
- For digital sensors with Memosens technology
- Product Configurator on the product page: www.endress.com/cyk20

Flowfit CCA250
- Flow assembly for disinfection and pH/ORP sensors
- Product Configurator on the product page: www.endress.com/cca250

Technical Information TI00062C

Flexdip CYA112
- Immersion assembly for water and wastewater
- Modular assembly system for sensors in open basins, channels and tanks
- Material: PVC or stainless steel
- Product Configurator on the product page: www.endress.com/cya112

Technical Information TI00432C

Photometer PF-3
- Compact hand-held photometer for determining the reference measured value
- Color-coded reagent bottles with clear dosing instructions
- Order No.: 71257946

Complete quick fastener kit for CYA112
- Adapter, inner and outer parts incl. O-rings
- Tool for mounting and disassembly
- Order No. 71093377 or mounted accessory of CYA112

COY8
Zero-point gel for oxygen and disinfection sensors
- Disinfectant-free gel for the verification, zero point calibration and adjustment of oxygen and disinfection measuring points
- Product Configurator on the product page: www.endress.com/coy8

Technical Information TI01244C

12 Technical data

12.1 Input

12.1.1 Measured values

Total chlorine
[mg/l, µg/l, ppm, ppb]
- Free available chlorine:
  - Hypochlorous acid (HOCl)
  - Hypochlorite ions (OCl^-)
- Combined chlorine (chloramines)
- Organically combined chlorine (e.g. cyanuric acid derivatives)

Temperature
[°C, °F]

12.1.2 Measuring range

0.1 to 10 mg/l (ppm)

The sensor is not suitable for checking the absence of chlorine.

12.1.3 Signal current

2.4 to 5.4 nA per 1 mg/l (ppm)

12.2 Performance characteristics

12.2.1 Reference conditions

Temperature	30 °C (86 °F)
pH value	pH 7.2

12.2.2 Response time

T_{90} approx. 60 s (with increasing and decreasing concentration)

12.2.3 Measured value resolution of sensor

0.01 mg/l (ppm)

12.2.4 Measurement error

±2 % or 200 µg/l (ppb) of value measured (depending on which value is higher)

LOD (limit of detection) [1]	LOQ (limit of quantification) [1]
0.022 mg/l (ppm)	0.072 mg/l (ppm)

1) Based on ISO 15839. The measured error includes all the uncertainties of the sensor and transmitter (electrode system). It does not contain all the uncertainties caused by the reference material and adjustments that may have been performed.

12.2.5 Repeatability

0.008 mg/l (ppm)

12.2.6 Nominal slope

4 nA per 1 mg/l (ppm) (under reference operating conditions)

12.2.7 Long-term drift

< ±3 % per month

12.2.8 Polarization time

Initial commissioning	Up to 24 h
After replacing the membrane cap	Typically 1 to 6 h
Recommissioning	Pour approx. 4 to 24 h

12.2.9 Operating time of the electrolyte

3 to 6 months (depending on water quality)

12.2.10 Operating time of membrane cap

With electrolyte	Typically 3 to 6 months, depending on water quality
Without electrolyte	> 2 years (25 °C (77 °F))

12.3 Environment

12.3.1 Ambient temperature

5 to 45 °C (41 to 113 °F), no temperature fluctuations

12.3.2 Storage temperature

Without electrolyte	−20 to 60 °C (−4 to 140 °F)

12.3.3 Degree of protection

IP68

12.4 Process

12.4.1 Process temperature

5 to 45 °C (41 to 113 °F), no temperature fluctuations

12.4.2 Pressure

Max. 1 bar relativ (14.5 psi relativ) (2 bar abs. (29 psi abs.)), if installed in the Flowfit CCA250 assembly

12.4.3 pH range

pH5.5 to 9.5

pH dependency: increase from pH 7 to pH 8: approx. -10 % for free chlorine

12.4.4 Conductivity

0.03 to 40 mS/cm

The sensor can also be used in media with a very low conductivity, such as demineralized water.

If the salt content is high, iodine and bromine can occur; this affects the reference value.

12.4.5 Flow

CCA250

- Optimum 40 to 60 l/h (10.6 to 15.8 gal/h)
- Minimum 30 l/h (7.9 gal/h)
- Maximum 100 l/h (26.4 gal/h)

12.4.6 Flow

- Optimum 20 to 30 cm/s
- Minimum 15 cm/s
- Maximum 50 cm/s

12.5 Mechanical construction

12.5.1 Dimensions

→ 14

12.5.2 Weight

75 g (2.65 oz)

12.5.3 Materials

Sensor shaft	PVC
Membrane	PET
Membrane cap	PPE

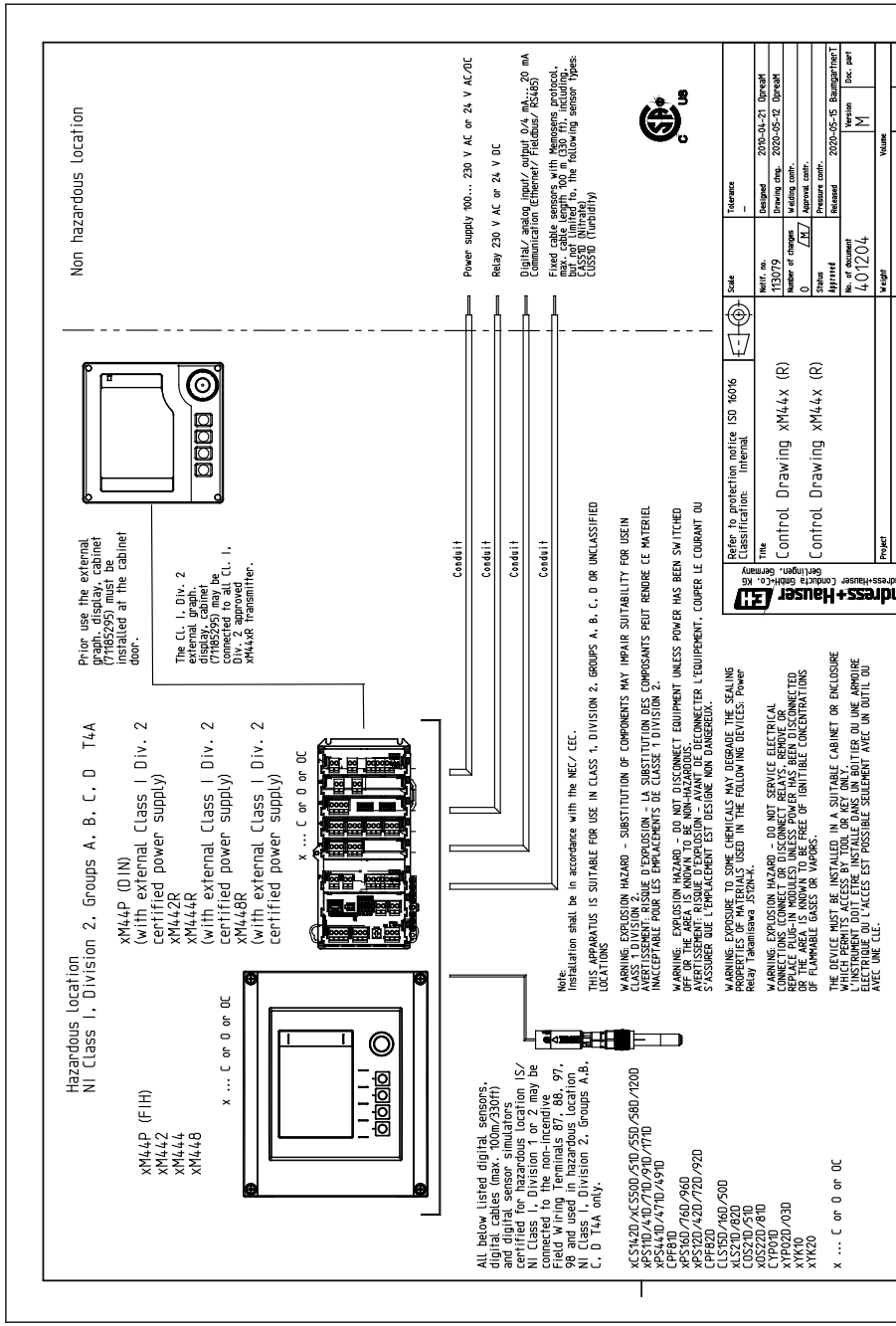
Clamping ring	PTFE
Hose seal	Silicone
Electrode body	PMMA

12.5.4 Cable specification

max. 100 m (330 ft), incl. Cable extension

13 Installation and operation in hazardous environment Class I Div. 2

Non-sparking device for use in specified hazardous environment in accordance with:
- cCSAus Class I Div. 2
- Gas group A, B, C, D
- Temperature class T6, -5 °C (23 °F) < Ta < 55 °C (131 °F)
- Control drawing: 401204


Hazardous location
NI Class I, Division 2, Groups A, B, C, D T4A
xM44P (DIN)
(with external Class I, Div. 2
certified power supply)
xM442R
xM444R
(with external Class I, Div. 2
certified power supply)
xM448R
(with external Class I, Div. 2
certified power supply)
x ... C or D or OC
xM44P (FIH)
xM442
xM444
xM448
x ... C or D or OC
Prior use the external graph. display cabinet (71185295) must be installed at the cabinet door.
The Cl. I, Div. 2 external graph. display cabinet (71185295) may be connected to all Cl. I, Div. 2 approved xM44xR transmitter.
Non hazardous location
Conduit
Conduit
Conduit
Conduit
Power supply 100... 230 V AC or 24 V AC/DC
Relay 230 V AC or 24 V DC
Digital-/ analog input-/ output 0/4 mA ... 20 mA
Communication (Ethernet-/ Fieldbus-/ RS485)
Fixed cable sensors with Memosens protocol,
max. cable length 100 m (330 ft), including
Memosens sensor types:
CCS59D (Nitrate)
CCS53D (Turbidity)
All below listed digital sensors,
digital cables (max. 100m/330ft)
and digital sensor simulators
certified for hazardous location IS/
NI Class I, Division 1 or 2 may be
connected to the non-incendive
Field Wiring Terminals 87, 88, 97,
98 and used in hazardous location,
NI Class I, Division 2, Groups A,B,
C, D T4A only.
xCS142D/xCS50D/51D/55D/58D/1200
xPS11D/41D/71D/91D/171D
xPS41D/47ID/491D
CPF81D
xPS16D/76D/96D
xPS102D/420D/720D/920D
CLS50
CLS15D/16D/50D
xLS21D/82D
COS21D/51D
xOS22D/81D
CYP01D
xYP02D/030
xYK10
xYK20
x ... C or D or OC
Note:
Installation shall be in accordance with the NEC/ CEC.
THIS APPARATUS IS SUITABLE FOR USE IN CLASS 1, DIVISION 2, GROUPS A, B, C, D OR UNCLASSIFIED LOCATIONS
WARNING: EXPLOSION HAZARD - SUBSTITUTION OF COMPONENTS MAY IMPAIR SUITABILITY FOR USE.IN CLASS 1, DIVISION 2.
AVERTISSEMENT: RISQUE D'EXPLOSION - LA SUBSTITUTION DES COMPOSANTS PEUT RENDRE CE MATERIEL INACCEPTABLE POUR LES EMPLACEMENTS DE CLASSE 1 DIVISION 2.
WARNING: EXPLOSION HAZARD - DO NOT DISCONNECT EQUIPMENT UNLESS POWER HAS BEEN SWITCHED OFF OR THE AREA IS KNOWN TO BE NON-HAZARDOUS.
AVERTISSEMENT: RISQUE D'EXPLOSION - AVANT DE DÉCONNECTER L'ÉQUIPEMENT, COUPER LE COURANT OU S'ASSURER QUE L'EMPLACEMENT EST DÉSIGNÉ NON DANGEREUX.
WARNING: EXPOSURE TO SOME CHEMICALS MAY DEGRADE THE SEALING PROPERTIES OF MATERIALS USED IN THE FOLLOWING DEVICES: Power Relay Tamamsawa 375EN-4.
WARNING: EXPLOSION HAZARD - DO NOT SERVICE ELECTRICAL CONNECTIONS CONNECT OR DISCONNECT RELAYS, REMOVE OR REPLACE FUSES UNLESS POWER HAS BEEN DISCONNECTED OR THE AREA IS KNOWN TO BE FREE OF IGNITIBLE CONCENTRATIONS OF FLAMMABLE GASES OR VAPORS.
THE DEVICE MUST BE INSTALLED IN A SUITABLE CABINET OR ENCLOSURE WHICH PERMITS ACCESS BY TOOL OR KEY ONLY.
L'INSTRUMENT DOIT ETRE INSTALLE DANS UN BOITIER OU UNE ARMOIRE ELECTRIQUE OU L'ACCES EST POSSIBLE SEULEMENT AVEC UN OUTIL OU AVEC UNE CLE.
Endress+Hauser
Conducta GmbH+Co. KG
Dieselstraße 24
D-70839 Gerlingen
Refer to protection notice ISO 16016
Classification: internal
Title
Control Drawing xM44x (R)
Control Drawing xM44x (R)
Project
Material
-
Scale
Tolerance
-
Weight
Volume
Sheet
Format
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Pressure contr.
Approval contr.
Welding contr.
Number of changes
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Drawing chng.
2020-05-12 OpHeaH
Designed
2019-04-21 OpHeaH
Modification
Date
Name
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Check
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Weight
SAP material no.
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Welt. no.
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