

CS4

Free chlorine amperometric sensor



The sensor measures the concentration of free chlorine in the water being measured, resulting from the application of inorganic chlorine products (such as chlorine gas, sodium hypochlorite solution, calcium hypochlorite solution).

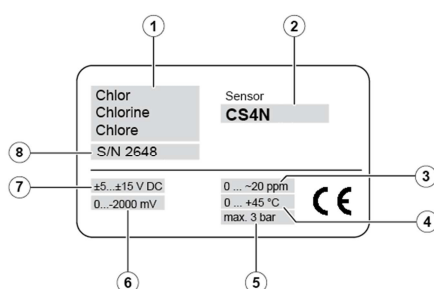
The sensor has a reduced pH dependency.

When organic chlorine products or chlorine stabilisers are used, there may be considerable differences between the DPD-1 measuring value and the signal of the chlorine sensor.

Sensor with 4...20-mA current loop output signal; complete with:

Component type for: drinkable water or sea water	Quantity
Sensor with membrane cap	1
Electrolyte	1 flask (100 ml)
mA hood with O-ring, 20 x 1.5	1
Special emery paper	1
Operating instructions	1

Identification plate



- 1 Measured variables
- 2 Sensor designation, sensor name
- 3 Nominal measuring range of the sensor
- 4 Permissible temperature range of the measuring water
- 5 Maximum permissible pressure of the water being measured
- 6 Signal transmission
- 7 Power supply
- 8 Serial number

The sensor may not be used for measurements to demonstrate the absence of disinfectant .

QUICK START UP

BAMO MESURES

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sensor

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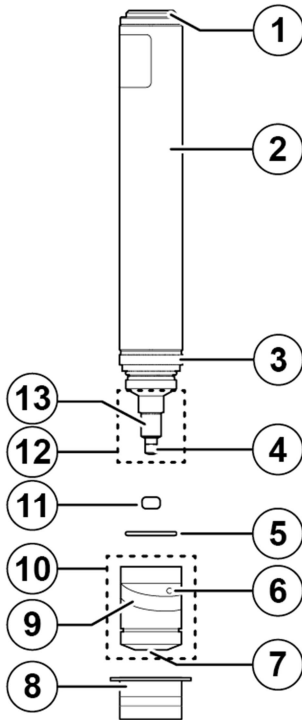
MSE

193-08

25-01-2018

193-07 M1 01 A

1 Product overview



- 1 Electrical connection
- 2 Sensor body
- 3 Counter electrode
- 4 Working electrode
- 5 O-ring 14 x 1.8
- 6 Valve opening
- 7 Membrane disc
- 8 Protective cap
- 9 Hose ring
- 10 Membrane cap
- 11 G-holder
- 12 Electrode finger
- 13 Reference electrode

2 Precautions:

- If the sensor is inadequately secured, it may become loose due to the pressure of the water or due to vibrations.
- The membrane may be damaged if the water pressure exceeds the maximum permissible value, or if the water pressure fluctuates greatly (hammer effect).
- Abrasive particles can damage the membrane. Install a filter in the system.
- Touching the reference electrode, or using emery paper on it, can damage it. Do not touch the reference electrode. Should it be necessary for maintenance work, only emery the working electrode, never the reference electrode.
- When screwing on the membrane cap, be sure that the valve is not closed off (see N°6).
- Before unscrewing the membrane cap, push the hose ring aside and keep the valve open.
- If there is insufficient disinfectant in the water for a prolonged period, a film of biological matter can accumulate on the membrane.
- After the sensor has been removed there is no longer a measuring value, which can lead to incorrect dosing of the disinfectant.
- If the pH value in the water changes or if the pH value lies outside the permissible range the measuring value may be incorrect.
- If the ambient temperature or the temperature of the medium lies outside the permissible range, the sensor and the electrolyte may be damaged.
- The measuring value may be incorrect if the temperature in the medium fluctuates abruptly. Make sure that the temperature in the water changes only slowly

Incorrect determination of the concentration of the disinfectant
will lead to incorrect calibration of the sensor.

Observe the recommended analysis methods as per directive DPD 1)

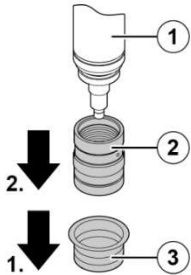
3 Commissioning

Report to specific instructions of each measuring flow cell, monitor/ controller and calibration photometer.

The following installation requirements must be satisfied:

- Continuous power supply
 - Constant flow through of water
 - There must be disinfectants present in the water
 - Galvanic separation of the electrical connection
- Make sure that the measuring water is not degassing at the measuring point.*

3.1 Sensor preparation



Pull the protective cap [3] off the membrane cap [2].

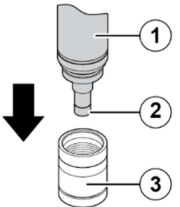
Unscrew the membrane cap [2] from the sensor body [1].

- 1 Sensor body
- 2 Membrane cap
- 3 Protective cap



Put down the membrane cap on a clean surface.

Fill the membrane cap with electrolyte to the brim, as free of bubbles as possible.



Place the sensor body [1] upright on the membrane cap [2].

Rotate the sensor body anticlockwise until the thread is felt to engage.

- 1 Sensor body
- 2 Not in use
- 3 Membrane cap

Slowly screw the sensor body into the membrane cap.

Make sure that the valve opening is not closed off (e.g. by the fingers).

*The first resistance to screwing the parts together comes from the sealing O-ring.
Screw the cap on further until it has closed up against the shaft.*

Once the membrane cap has been fully screwed on:

- Do not touch or impact the membrane.
- Use mains water to rinse off any electrolyte residues adhering to the sensor.
- The sensor is now prepared for commissioning.



4.3 Insertion into flow measuring cell

Insert the sensor into the measuring flow cell.

4.4 Electrical connection

The following types of electrical connections to the sensor are available:

Connection with 4 ... 20 mA signal output (standard)

Connection with 0...+/-2000-mV signal output (on request)

4.4.1 Connection with 4...20 mA signal output

Connection with a 2-pole screwed terminal block

The sensor is provided with a 2-pole screwed terminal block.

Insert the cable through the cable gland in the hood.

Connect the cores to the terminals in the sensor electronics.

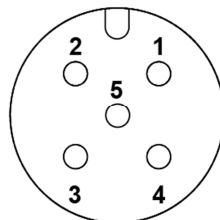
Screw the hood finger-tight into the sensor body until the O-ring seal is done.

Tighten the cable gland so as to secure the cable.

The sensor is provided with a 5-pin M12 screwed plug protected against polarity reversal.

The connection pins are assigned as follows:

- | | |
|---|----------------|
| 1 | (not assigned) |
| 2 | +U |
| 3 | -U |
| 4 | (not assigned) |
| 5 | (not assigned) |



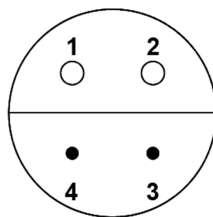
4.4.2 Connection with 0...+/-2000-mV signal output

The sensor is provided with a 4-pin socket protected against polarity reversal.

The power supply is symmetrical or unipolar.

The connection pins are assigned as follows:

- | | |
|---|--------------------------|
| 1 | Socket, +U |
| 2 | Socket, -► or power GND |
| 3 | PIN, earth or signal GND |
| 4 | PIN, measuring signal |



4.5 Initial calibration

Perform calibration (See further on).

After one day, repeat the calibration.

5 Calibration

The sensor delivers a signal proportional to the concentration of the disinfectant in the water being measured. In order to assign the value of the sensor signal to the concentration of the disinfectant in the water being measured, the sensor must be calibrated.

For any calibration routine:

The flow rate must be constant.

The temperature of the water being measured must be constant.

Sensor should be at same temperature of water. (it takes about 20 minutes after a change in temperature to balance correctly the temperatures).

No other oxidant may be present in the water being measured.

The pH value must be constant.

Take the analytical sample of the water being measured from near to the sensor (sampling valve on flow-cell).

Use appropriate methods DPD 1 to determine the concentration of the disinfectant in the measuring water (see the operating instructions of photometer you own).

In the calibration menu of the monitor you own, mark up the sensor signal against the value determined by the directive DPD

Repeat the calibration at regular intervals in order to correct the signal drift due to ageing.

Measured parameter	Recommended analytical methods	
Free chlorine	DPD-1	Photometer for chlorine
Free chlorine with iso-cyanuric acid	DPD-1	Photometer for chlorine

6 Removal

Removal of the sensor can lead to an incorrect measuring value at the input of the monitor, which can cause the control circuit to apply uncontrolled dosing.

Before removing the sensor:

Switch off the measurement and control system or switch it over to manual operation.

Close the inlet of the water being measured.

Close the outlet of the water being measured.

Remove the electrical connection.

To disconnect a sensor with a 2-pole screwed terminal block:

Undo the cable gland. *The cable is now free to move.*

Unscrew the hood with the cable gland from the sensor.

Release the cable cores from the terminals.

Undo the screw fastening and carefully pull the sensor out.

7 Maintenance

7.1 Maintenance overview

To ensure optimum performance of the sensor: Perform the following actions at regular intervals.

Maintenance task	Interval
Change the electrolyte	CS4: 12 months
Change the membrane cap	Annually
Perform calibration	Weekly and after the electrolyte and/or the membrane cap has been changed

7.2 Changing the electrolyte and membrane cap

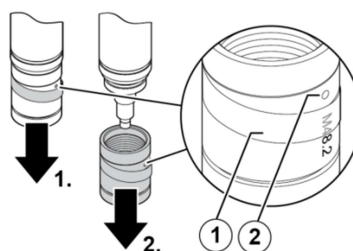
Lift the hose ring [1] sideways off the membrane cap and slide it down.

The valve opening [2] is now exposed.

Unscrew the membrane cap.

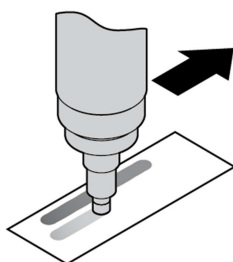
Air can now flow through the valve opening.

- 1 Hose ring
- 2 Valve opening



Empty the electrolyte out of the membrane cap.

Rinse the electrode finger with mains water.



Lay a piece of special emery paper on a paper wipe.

Hold the sensor upright.

Hold the special emery paper in place and move the tip of the working electrode over it at least twice. Use a fresh area of the emery paper for each pass.

Return the hose ring to its original position.

The valve opening is now covered.

When changing the membrane cap: Use a new membrane cap.

Perform the same operations as for commissioning.

Maintenance has now been completed and the sensor can be put back into use; Calibration routine is required.

8 Troubleshooting

Fault	Cause	Corrective action
Sensor cannot be calibrated ; Deviation of the measuring value from DPD measurement	Gas bubbles in electrolyte	<ul style="list-style-type: none"> ▶ Unscrew membrane cap and empty electrolyte. ▶ Repeat commissioning
	Run-in time too short.	▶ Repeat the calibration after a few hours.
	Membrane torn (teared)	▶ Change the membrane cap
	Membrane cap damaged	▶ Change the membrane cap
	Disruptive substances in the water contents	<ul style="list-style-type: none"> ▶ Check the water for disruptive substances ▶ Provide remedy. ▶ Report to info@bamo.fr.
	Short circuit / defect in the measuring lead	<ul style="list-style-type: none"> ▶ Locate and eliminate the short circuit / defect. ▶ Exchange the measuring lead.
	Distance between working electrode and membrane is too great.	▶ Screw the membrane cap on fully to the stop.
	The DPD chemicals are past their effectiveness date.	<ul style="list-style-type: none"> ▶ Use new DPD chemicals. ▶ Repeat the calibration
	Deposits on the membrane	▶ Change the membrane cap
	Gas bubbles on the outside of the membrane	<ul style="list-style-type: none"> ▶ Temporarily increase the flow rate. ▶ Check the installation and modify it.
	No electrolyte in the membrane cap	<ul style="list-style-type: none"> ▶ Fill the membrane cap with electrolyte. ▶ Prepare the sensor
	The concentration of disinfectant exceeds the upper limit of the measuring range.	<ul style="list-style-type: none"> ▶ Check the system. ▶ Remedy the faults. ▶ Repeat the calibration
	Lack of galvanic isolation	<ul style="list-style-type: none"> ▶ Create galvanic isolation. ▶ Return the sensor to BAMO Mesures (info@bamo.fr) for checking / reconditioning.
	The sensor is defective.	▶ Return the sensor to BAMO Mesures (info@bamo.fr) for checking / reconditioning.
Unstable measuring value	Gas bubbles in electrolyte	<ul style="list-style-type: none"> ▶ Unscrew membrane cap and empty electrolyte. ▶ Repeat commissioning
	Membrane torn (teared)	▶ Change the membrane cap
	Gas bubbles on the outside of the membrane	<ul style="list-style-type: none"> ▶ Temporarily increase the flow rate. ▶ Check the installation and modify it.
	Pressure fluctuations in the measuring water	▶ Check the type of installation and modify it.
	Lack of galvanic isolation	<ul style="list-style-type: none"> ▶ Create galvanic isolation. ▶ Return the sensor to BAMO Mesures (info@bamo.fr) for checking / reconditioning.
	The reference electrode is exhausted and/or contaminated..	▶ Return the sensor to BAMO Mesures (info@bamo.fr) for checking / reconditioning.

.../...

Before to ship any part to BAMO Mesures, please get in touch with info@bamo.fr to know how to proceed.

Fault	Cause	Corrective action
Overdriving The electronics is receiving an excessively high signal at the input from the electrochemical cell	Excessive concentration of disinfectant in the measuring water	<ul style="list-style-type: none"> ▶ Check the system. ▶ Remedy the faults. ▶ Calibrate the sensor ▶ Perform maintenance on the sensor
	Run-in time too short.	▶ Wait until the run-in time has elapsed
	The membrane is damaged.	▶ Change the membrane cap
	Flow rate too high	<ul style="list-style-type: none"> ▶ Check the system. ▶ Reduce the flow rate.
	Lack of galvanic isolation	<ul style="list-style-type: none"> ▶ Create galvanic isolation. ▶ Contact BAMO Mesures (info@bamo.fr)
	The sensor is defective.	▶ Contact BAMO Mesures (info@bamo.fr)
Underdriving. Wrong polarity at the input from the electrochemical cell	Run-in time too short.	▶ Wait until the run-in time has elapsed
	The working electrode is contaminated.	▶ Perform maintenance on the sensor
	Lack of galvanic isolation	<ul style="list-style-type: none"> ▶ Create galvanic isolation. ▶ Contact BAMO Mesures (info@bamo.fr)
	The sensor is defective.	▶ Contact BAMO Mesures (info@bamo.fr)
No signal	The sensor is connected to the measuring and control device with the wrong polarity.	▶ Connect the sensor correctly to the measuring and control device.
	The measuring lead is broken.	▶ Exchange the measuring lead.
	The sensor is not receiving any power	▶ Provide the correct power supply.
	The sensor is defective.	▶ Contact BAMO Mesures (info@bamo.fr)

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9 Dismounting and storage

To dismount a sensor and prepare it for storage:

The electrolyte must be completely removed.

Otherwise long start-up/contact times may be expected during a recommissioning.

Rinse the electrode finger with lukewarm mains water.

Dry the parts in a dust-free place.

For protection, loosely screw the dry membrane cap onto the sensor body.

Make sure that the membrane is not lying in contact with the working electrode.

If the membrane cap has been in use for one day or longer we recommend that it is not used when the sensor is recommissioned. Perform a change of membrane cap

10 Disposal

Comply with the local regulations on disposal.

11 Technical features

Information on the technical data can be found at the following Internet address:

www.bamo.eu

12 Warranty

See our general conditions and contact info@bamo.fr for any matter of service.