

Ozone Sensor OZ10.1



USER MANUAL

BAMO INTERNATIONAL

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Ozone Sensor
OZ10.1

05-10-2023

M-193.22-EN-AA

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1. GENERAL INFORMATION

1.1 Product description

The sensor measures the concentration of dissolved ozone in the water being measured. The sensor is virtually insensitive to chlorine. They are 2-electrode systems for measuring the concentrations in water of the disinfectants ozone. The area of application of these sensors extends to almost all water qualities.

Warning: The sensors are not suitable for checking the absence of ozone.

A complete measuring and/or control system normally consists of the following components:

- Sensor (OZ10)
- Electrical leads and connectors
- Flow chambers and connections
- Measuring and control device as BAMOPHAR 194
- Dosing equipment
- Analytical equipment

**These operating instructions relate exclusively to the sensor
Comply with the operating instructions for the peripheral devices.**

1.2 Scope of supply



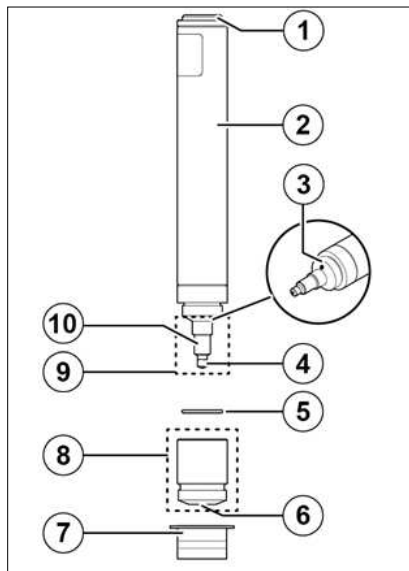
- Keep the packaging for the sensor.
- In the event of repair or warranty please return the sensor in the original packaging.
- Check that the delivery is complete and undamaged.

If it is damaged: Please contact your supplier before any operation

Components:

- 1 x Sensor with membrane cap
- 1 x Electrolyte (Bottle)
- 1 x mA hood with O-ring 20x1.5
- 1 x Special emery paper
- 1 x Operating instructions

1.3 Product overview



- 1 Electrical connection
- 2 Sensor body
- 3 Pressure compensation opening
- 4 Working electrode
- 5 O-ring 20 x 1.5
- 6 Membrane disc
- 7 Protective cap
- 8 Membrane cap
- 9 Electrode finger
- 10 Reference electrode

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2. SAFETY

The sensor is manufactured using the latest technology.

Nevertheless, improper use can give rise to the following risks:

- Effects on health
- Falsification of measured values, which can lead to dangerous dosing of incorrect quantities of the disinfectant.

→ Comply with the safety instructions in these operating instructions.

2.1 Use for the intended purpose

The sensor is intended to be used for measuring the concentration of a specific disinfectant in water.

The sensor may be used only under the following conditions:

- For the disinfectant specified in the respective data sheet
- Under the conditions of use specified on the respective data sheet
- Upright installation in a suitable flow chamber (electrical connection top).
- Restricted to the activities described in these operating instructions.
- Use only when in fault-free condition.

2.2 Use other than for the intended purpose

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

The sensor must not be used for applications beyond the intended purpose.

2.3 Personal qualifications

The user must hold the following personal qualifications:

- He must have read and understood the operating instructions.
- He must have received training in the handling of the sensor.

2.4 Rebuilding and modifications

Opening the sensor and making modifications to it which can affect the safety and functionality of the sensor may be performed only by the manufacturer.

2.5 Residual risks

2.5.1 Slippage of the sensor

If the sensor is inadequately secured, it may become loose due to the pressure of the water or due to vibration. This results in the following risks:

- Due to the pressure of the water the sensor may slip out of the flow chamber.
- The sensor may slip down into the flow chamber due to its own weight.

→ Depending on recommendation in the data sheet, use a variant with a retaining ring.

→ Make sure that the fixation of the sensor in the flow chamber cannot be loosened during operation.

→ Check the sensor regularly for secure attachment.

2.5.2 Water pressure that is high or fluctuating

The membrane may be damaged if the water pressure exceeds the maximum permissible value, or if the water pressure fluctuates greatly

→ Comply with the permissible pressure stated on the data sheet.

→ Keep the pressure constant.

2.5.3 Impacts, shocks and improper touching

Impacts or shaking of the sensor, such as by dropping it, can damage it.

→ Avoid impacts and shocks.

→ Do not allow the sensor to be dropped.

Do not touch the sensor electrodes at any time.

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, not the reference electrode.

2.5.4 Defective membrane cap

If the pressure compensation opening is full, this can damage the membrane beyond repair.

→ Empty the pressure compensation opening

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2.5.5 Electrical interference

A lack of galvanic isolation can falsify the measured value and even damage the sensor beyond repair.

→ Ensure the electrical connection has galvanic isolation.

Electrical interference on the signal lead can damage the electronics.

→ Ensure the connection is made correctly.

2.5.6 Lack of disinfectant

If for a prolonged period there is no disinfectant in the water, a film of biological matter can accumulate on the membrane. This makes the measured value incorrect, and means the membrane cap can no longer be used.

→ Make sure that the period during which there is no disinfectant present is not longer than specified on the data sheet

2.5.7 Loss of measured values when the sensor is removed

After the sensor has been removed there is no longer a measured value, which can lead to incorrect dosing of the disinfectant.

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

2.5.8 Oxidant

Oxidants in the water interfere with measurement and can lead to measuring errors.

→ Make sure there are no disruptive oxidants in the water.

→ Comply with the instructions on the data sheet.

2.5.9 Temperature and fluctuations in temperature

If the ambient temperature or the temperature of the medium lies outside the permissible range, the sensor and the electrolyte may be damaged.

→ Make sure that at all stages of the operation the permissible temperature ranges as per the data sheet are adhered to

The measured value may be incorrect if the temperature in the medium fluctuates abruptly.

→ Make sure that the temperature in the water changes only slowly.

2.5.10 Impermissible installation position

If the sensor is not installed upright the measured value can be falsified.

→ Install the sensor upright (electrical connection top).

2.5.11 Incorrect chemical analytical methods

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

→ Observe the recommended analysis methods as per the data sheet.

→ Perform analytical work in accordance with the specifications in the manufacturer's operating instructions for the analytical equipment.

3. COMMISSIONING

3.1 Installation requirements

The following installation requirements must be satisfied:

- Continuous power supply and presence of water being measured.
- Flow rate as specified on the data sheet.
- Constant through flow rate.
- There must be disinfectants present in the water being measured.
- Galvanic separation of the electrical connection.
- Make sure that the measuring water does not evolve gas at the measurement point.

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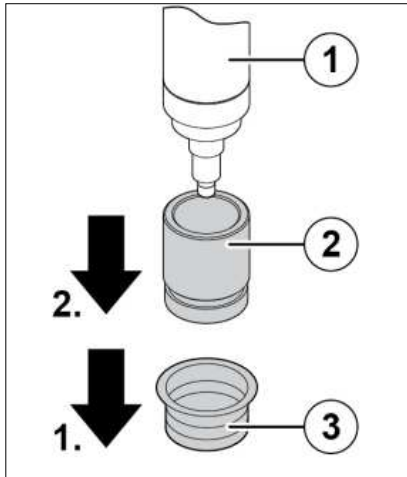
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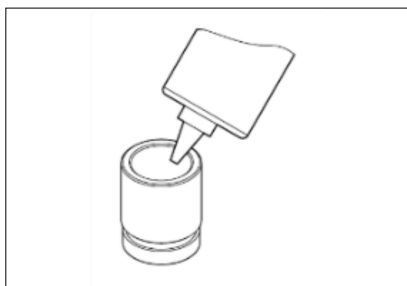
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3.2 Preparation of the sensors

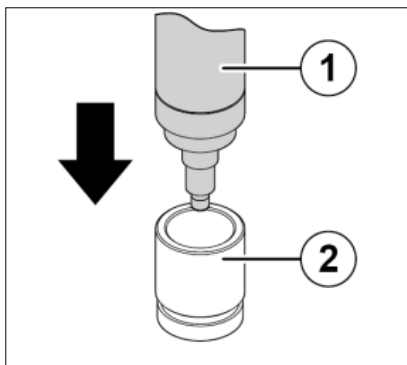


- Pull the protective cap [3] off the membrane cap [2].
- Unscrew the membrane cap [2] from the sensor body [1].

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.

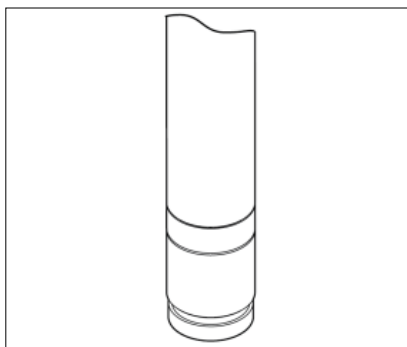


- Place the sensor body [1] upright on the membrane cap [2].
- Rotate the sensor body anticlockwise until the thread is felt to engage.

1: Sensor body
2: Membrane cap

- Slowly screw the sensor body into the membrane cap.

!! Make sure that the membrane cap is fully screwed into the sensor body, right up to the stop.



- Once the membrane cap has been fully screwed on:
- Neither touch nor strike the membrane.
- Use mains water to rinse off any electrolyte residues adhering to the sensor.

The sensor is now prepared for commissioning.

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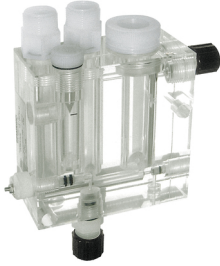
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3.3 Insertion into the flow chamber

Nota: The sensor must have been prepared for installation



→ Insert the sensor into a flow chamber of the type DF (Doc 193-95) or any other suitable flow chamber.

→ In order to insert the sensor correctly into the flow chamber: Comply with the instructions in the operating instructions for the flow chamber that is used.

3.4 Electrical connection

Nota: The sensor is inserted into the flow chamber.

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

- Insert the sensor cable through the cable gland of 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 made
- Tighten the cable gland so as to secure the cable.

3.5 Initial calibration

Nota: The sensor must have been connected electrically.

Nota: The run-in time has been complied (First start-up approx. 1 h)

- Perform calibration (see next section).
- After one day, repeat the calibration.

4. CALIBRATION

The sensor outputs 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.

- The flow rate must be constant.
- The temperature of the water being measured must be constant.
- Acclimatisation of the temperature of the sensor to that of the water being measured must be complete (this takes about 20 minutes after a change in temperature).
- The sensor must have completed running in.
- No other oxidant may be present in the water being measured.

- Take the analytical sample of the water being measured from near to the sensor.
- Using DPD methods, determine the concentration of the disinfectant in the measuring water. (DPD1+DPD3 or DPD4 with photometer for ozone)
- In the calibration menu of the measuring and control device BAMOPHAR 194, mark up the sensor signal against the value determined by the analytical procedure (see the operating instructions for the device 194-02).
- Repeat the calibration at regular intervals.
- Comply with the applicable national regulations for calibration intervals.

Nota:

- Ozone can also be determined using a photometer intended for chlorine.
- The result must be multiplied by a factor of 0.68.
- At higher concentrations of disinfectant the DPD colouration may fail to appear.



BAMOPHAR 194 M

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5. REMOVAL

Removal of the sensor can lead to an incorrect measured value at the input to the measuring and control device, 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.

6. MAINTENANCE

6.1 Maintenance overview

To ensure optimum performance of the sensor:

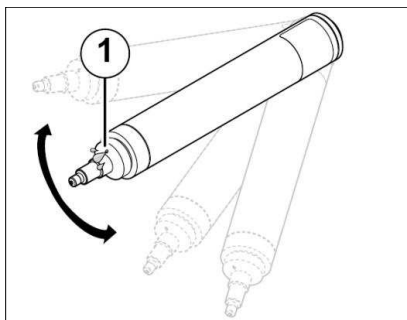
- Perform the following actions at regular intervals.

Change the electrolyte 3-6 months

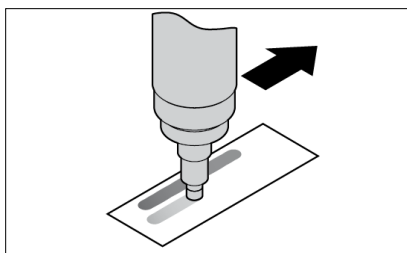
Change the membrane cap Annually

Perform calibration Weekly or after the electrolyte and/or the membrane cap has been changed

6.2 Changing the electrolyte and membrane cap



- Unscrew the membrane cap.
 - Empty the electrolyte out of the membrane cap.
 - Rinse the membrane cap with mains water.
 - Rinse the electrode finger with mains water.
 - Shake the sensor body dry several times (see image)
- This empties the pressure compensation opening [1]



- Lay a piece of special emery paper on a clean, smooth surface.
- 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.

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.

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7. TROUBLESHOOTING

Various factors in the environment can affect the sensor. If irregularities occur, it may be useful to check these factors:

- Flow rate
- Measuring cable
- Measuring and control device
- Calibration
- Dosing equipment
- Concentration of the disinfectant in the dosing container
- Suitability of the sensor for measuring the disinfectant that is being dosed
- Concentration of the disinfectant in the water being measured (determined by analytical methods)
- pH value of the water being measured
- Temperature of the water being measured
- Pressure in the flow chamber
- Analytical methods

7.1 Fault overview

7.1.1 Sensor cannot be calibrated / the measured value deviates from the analytical measurement

Cause	Corrective action
Run-in time too short	Wait until the run-in time has elapsed Repeat the calibration after a few hours.
Membrane torn	Change the membrane cap
Membrane cap damaged	Change the membrane cap
Disruptive substances in the water contents	Check the water for disruptive substances (observe data sheet). Provide remedy Consult the supplier
Short circuit / defect in the measuring lead	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 out of date	Use fresh DPD chemicals and repeat the calibration
Deposits on the membrane	Change the membrane cap
Air pockets between the G-holder/ membrane/working electrode	Unscrew the membrane cap Using tweezers, remove the G-holder from the membrane cap Repeat commissioning
Gas bubbles on the outside face of the membrane	Temporarily increase the flow rate Check the installation and modify it
No electrolyte in the membrane cap	Fill the membrane cap with electrolyte Prepare the sensor
The concentration of disinfectant exceeds the upper limit of the measuring range	Check the system Remedy the faults Repeat the calibration
Lack of galvanic isolation	Create galvanic isolation Return the sensor to the supplier for checking / reconditioning
The sensor is defective	Return the sensor to the supplier for checking / reconditioning

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7.1.2 Unstable measured value

Cause	Corrective action
Membrane torn	Change the membrane cap
Air pockets between the G-holder/membrane/working electrode	Unscrew the membrane cap Using tweezers, remove the G-holder from the membrane cap Repeat commissioning
Gas bubbles on the outside face of the membrane	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	Create galvanic isolation Return the sensor to the supplier for checking/reconditioning
The reference electrode is exhausted and/or contaminated*	Return the sensor to the supplier for checking/reconditioning

The reference electrode has a silvery sheen or is white. The usual colour on the other hand is brown/grey.

7.1.3 Overdriving

When analog signal >20 mA

Cause	Corrective action
Excessive concentration of disinfectant in the measuring water	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	Flow rate too high Reduce the flow rate
Lack of galvanic isolation	Create galvanic isolation Return the sensor to the supplier for checking/reconditioning
The sensor is defective	Return the sensor to the supplier for checking/reconditioning

7.1.4 Underdriving

When analog signal <4 mA

Cause	Corrective action
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	Create galvanic isolation Return the sensor to the supplier for checking/reconditioning
The sensor is defective	Return the sensor to the supplier for checking/reconditioning

7.1.5 No signal

Cause	Corrective action
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 supply	Provide the correct power supply
The sensor is defective	Return the sensor to the supplier for checking/reconditioning

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7.2 Special checks

7.2.1 Tightness of the membrane cap

- Unscrew the membrane cap from the sensor
- Dry the outside of the membrane cap
- Prepare the membrane cap
- When screwing the membrane cap on, watch out for liquid escaping through the membrane.

If liquid does escape through the membrane:

- Use a new membrane cap.

If the sensor does not respond:

- Return the sensor to the supplier for checking.

7.2.2 Electronics

- Unscrew the membrane cap.
- Rinse the electrode finger with mains water.
- Using a clean cloth, carefully dry the electrode finger.
- Connect the sensor to the measuring and control device.
- Connect a suitable measuring device to the original sensor signal.
- Wait five minutes.
- Read the original sensor signal at the measuring device.
- Mark up the values that were read against the following target values: approx. 4 mA

If the sensor signal approximately corresponds to the mentioned value, the electronics can be provisionally regarded as OK.

If the measured value deviates significantly from the above value:

- Return the sensor to the supplier for checking

7.2.3 Checking the zero point

Nota: The electronics must have been tested and found to be OK.

- Prepare the sensor
- Connect the sensor to the measuring and control device.
- Fill a glass beaker with mains water (without any disinfectant!).
- Stir the sensor round in the glass beaker for 30 seconds.
- Carefully put the sensor down obliquely in the glass beaker.
- Wait 30 minutes.
- Read the measured value.

If the measured value is close to the value 0, the zero point can provisionally be regarded as OK.

If the measured value deviates significantly from zero:

- Perform maintenance on the sensor and repeat the zero point test.

A freshly cleaned working electrode has a relatively high zero point.

The sensor takes a few days to settle back to its lowest zero point.

If after maintenance has been performed on the sensor measured value is not close to zero:

- Return the sensor to the supplier for checking.

This completes the zero point checking

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7.2.4 Signal

Nota: The zero point checking must have been performed successfully.

- Add the relevant disinfectant to the mains water in the glass beaker.
- Stir the sensor steadily round in the glass beaker for five minutes.
- Monitor the measured value throughout this time.

If the measured value increases, the sensor can provisionally be regarded as OK.

If the measured value does not change:

- Perform maintenance on the sensor and repeat the signal test.

This completes the signal test.

If after maintenance the sensor shows no response to the disinfectant:

- Return the sensor to the supplier for checking

8. DEINSTALLATION AND STORAGE

To deinstall a sensor and prepare it for storage, proceed as follows:

- Unscrew the membrane cap.
- Use mains water to rinse the electrolyte out of the membrane cap.
- Shake the sensor body dry several times.
- Rinse the electrode finger with mains water.
- Dry the membrane cap and sensor body 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.

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