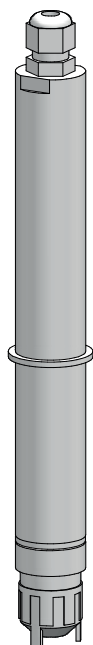


Total chlorine measuring cell GCM

Operating instructions



Read the operating manual!

The user is responsible for installation and operation related mistakes!

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1 Notes for the Reader

This operating manual contains information and behaviour rules for the safe and designated operation of the product.

Observe the following principles:

- Read the entire operating manual prior to commissioning the product.
- ensure that everyone who works with or on the product has read the operating manual and follows the instructions.
- maintain the operating manual throughout the service life of the product.
- pass the operating manual on to any subsequent owner of the product.

1.1 General non-discrimination

This operating manual uses only the masculine gender in cases in which the rules of grammar would allow for gender allocation. This approach serves the purpose of legibility. Men and women are always addressed equally.

1.2 Explanation of the signal words

Different signal words in combination with warning signs are used in this operating manual. Signal words illustrate the gravity of possible injuries if the risk is ignored:

Signal word	Meaning
DANGER	Refers to imminent danger. Ignoring this sign may lead to death or the most serious injuries.
WARNING	Refers to a potentially hazardous situation. Failure to follow this instruction may lead to death or severe injuries.
CAUTION	Refers to a potentially hazardous situation. Failure to follow this instruction may lead to minor injury or damage to property.
PLEASE NOTE	Refers to a danger which, if ignored, may lead to risk to the machine and its function.

Tab. 1: Explanation of the signal words

1.3 Explanation of the warning signs

Warning signs represent the type and source of a danger:

Warning sign	Type of danger
	General danger
	Danger from corrosive substances
	Danger of damage to machine or functional influences

Tab. 2: Explanation of the warning signs

1.4 Identification of warnings

Warnings are intended to help you recognise risks and avoid negative consequences.

This is how warnings are identified:

Warning sign	SIGNAL WORD
Description of danger. Consequences if ignored. ⇒ The arrow signals a safety precaution to be taken to eliminate the danger.	

1.5 Identification of action instructions

This is how pre-conditions for action are identified:

- ✓ Pre-condition for action which must be met before taking action.
- ✗ A resource such as a tool or auxiliary materials required to perform the operating instructions.

This is how instructions for action are identified:

➔ Separate step with no follow-up action.

1. First step in a series of steps.
2. Second step in a series of steps.
 - ▶ Result of the above action.

✓ **Action completed, aim achieved.**

1.6 Intended use

The total chlorine measuring cell (TCM) is used to determine the total chlorine content in drinking water, swimming pool water or water of a similar quality. The measuring cell is fitted to the EASYPRO water sampling stations, and the TOPAX® DE, DX or MC are used as measuring and control equipment.

1.7 Notes on product warranty

The applicable national regulations must be complied with during installation and operation, and the prescribed care, maintenance and calibration intervals must be adhered to. Always wear protective goggles and protective clothing when handling hazardous substances and solutions. The measuring equipment and its peripherals may only be operated by trained and authorised personnel. The measuring cell may only be operated within the specified measuring range. An electrolyte is used for the measuring cell. Avoid skin contact, and do not ingest the electrolyte. The electrolyte is slightly toxic and can cause damage to health.

2 General

2.1 Safety notices

The following warnings are intended to help you to eliminate the dangers that can arise while handling the product. Risk prevention measures always apply regardless of any specific action. Safety instructions warning against risks arising from specific activities or situations can be found in the respective sub-chapters.

	WARNING
Increased risk of accidents due to non-compliance with the specified working conditions! Failure to adhere to the working conditions specified in the technical data may result in a deficient measurement, resulting in incorrect dosing and a health hazard. ⇒ Adhere to the working conditions specified in the technical data.	

	CAUTION
Increased risk of accidents due to insufficient qualification of personnel! Water sampling stations as well as controllers and their accessories must only be installed, operated and maintained by personnel with sufficient qualifications. Insufficient qualification will increase the risk of accidents. ⇒ Ensure that all action is taken only by personnel with sufficient and corresponding qualifications. ⇒ Prevent access to the system for unauthorised persons.	

	PLEASE NOTE
Damage to property resulting from incorrect concentration The sensor may only be used to determine the total chlorine within certain concentration limits, otherwise it may be damaged. ⇒ Only use the sensor if it is guaranteed that the total chlorine content does not exceed/fall below the limit values.	

2.2 Personal protective equipment

Always wear personal protective equipment when handling hazardous substances and solutions.

You will require the minimum of the following personal protective equipment:

Personal protective equipment required	
	Eye protection

Tab. 3: Personal protective equipment required

Personal protective equipment required	
	Protective clothing
	Protective gloves

Tab. 3: Personal protective equipment required

Wear the following personal protective equipment when performing the following tasks:

- Installation
- Operation
- Maintenance

2.3 Hazards due to non-compliance with the safety instructions

Failure to follow the safety instructions can endanger not only persons but also the environment and the product.

The specific consequences can be:

- Failure of major device and corresponding system functions
- Failure of required maintenance and repair methods
- Risk to persons when working on the product

2.4 Working in a safety-conscious manner

Besides the safety instructions specified in this operating manual, further safety rules may apply. Always comply with all safety-relevant technical regulations and guidelines which apply at the usage location of the product. Note in particular the following items:

- Safety regulations on handling electricity and live components
- Safety regulations on handling hazardous substances
- Accident prevention regulations
- Safety and operating provisions
- Environmental protection provisions
- Other applicable directives and laws

2.5 Personnel qualification

Any personnel who work on the product must have appropriate special knowledge and skills.

Anybody who works on the product should meet the conditions below:

- Attendance at all the training courses offered by the owner
- Sufficient qualification for the respective activity
- Personal suitability for the respective activity
- Training into the handling of the device
- Knowledge of safety equipment and the way this equipment functions
- Knowledge of this operating manual, particularly of safety instructions and sections relevant for the activity
- Knowledge of fundamental regulations regarding health and safety

and accident prevention

These persons must have one of the following minimum qualifications:

- Training as specialists to carry out work on the product unsupervised
- Sufficient training that they can work on the product under the supervision and guidance of a trained specialist

These operating instructions differentiate between these user groups:

2.5.1 Specialist staff

Thanks to their professional training, knowledge, experience and knowledge of the relevant specifications, specialist staff are able to perform the job allocated to them and recognise and/or eliminate any possible dangers by themselves.

2.5.2 Trained electricians

Due to their professional training, knowledge and experience as well as knowledge of specific standards and provisions, trained electricians are able to do the electrical work assigned to them and to recognise and avoid any potential dangers by themselves.

They are specially trained for their specific working environment and are familiar with relevant standards and provisions.

They must comply with the legally binding regulations on accident prevention.

2.5.3 Trained persons

Trained persons have received training from the operator about the tasks they are to perform and about the dangers stemming from improper behaviour.

Trained persons have attended all trainings offered by the operator.

3 Product description

3.1 Application area

The total chlorine measuring cell (TCM) is a diaphragm-covered amperometric two-electrode sensor which can continuously measure the concentration of chlorine compounds that is present when chlorine is dosed as a disinfectant. It is used to determine the total chlorine content in drinking water, swimming pool water or water of a similar quality.



In this context, the term total chlorine refers to the following compounds:

- Free chlorine (Cl_2 (dissolved), HOCl , OCl^-)
- Combined chlorine (chloramines)
- Organic bound chlorine (e.g. cyanuric acid derivatives)

The measuring cell is usually fitted to the water sampling stations of the EASYPRO series, and the TOPAX® DE/DX/ MC are used as measuring and control equipment.

The desired inflow parameters which are needed for safe operation of the measuring cell can only be achieved using one of the water sampling stations in the EASYPRO series or one of its predecessor models. Air bubbles in the sample water lead to falsification of the measurement result and must be avoided. The water sampling stations must be operated in a depressurised state. A flow meter is provided to monitor the flow, which opens a contact if the flow is not present. This contact sets the control of the connected TOPAX® to 0 % and therefore prevents undefined dosing. The total chlorine measuring cell must be maintained at regular intervals, and must be checked for soiling, encrustation or air bubbles. Soiling can be removed by cleaning with a water jet.

3.2 Design and function

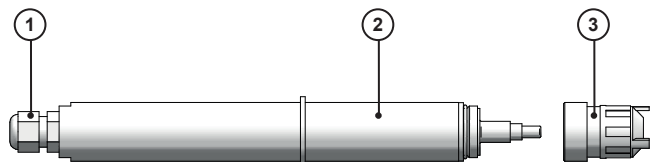


Fig. 1: Design total chlorine measuring cell GCM

The chlorine measuring cell consists of three main parts: the upper part (1), the electrode shaft (2) and the diaphragm cap (3). The diaphragm cap is filled with electrolyte and represents the measuring chamber into which the measuring electrodes are immersed. The measuring chamber is sealed off from the measuring medium by a microporous diaphragm. A platinum cathode is used as the working electrode and a silver anode as the counter-electrode and reference electrode. The chlorine compounds of the sample water diffuse through the diaphragm. The constant polarisation voltage applied between the two electrodes causes an electrochemical reaction of the chlorine compounds at the working electrode. The resulting primary current is proportional to the chlorine concentration, and only depends on the pH value to a small degree. The amplifier electronics transform the primary current into an imposed 4 – 20 mA current. The connection to the downstream measuring device is made with a two-wire cable, i.e. the voltage supply to the amplifier electronics is provided by the connected controller. The measured value is temperature-compensated on the amplifier electronics. The total chlorine, free chlorine and bound chlorine values are displayed on the TOPAX®.

4 Dimensions

All dimensions in mm

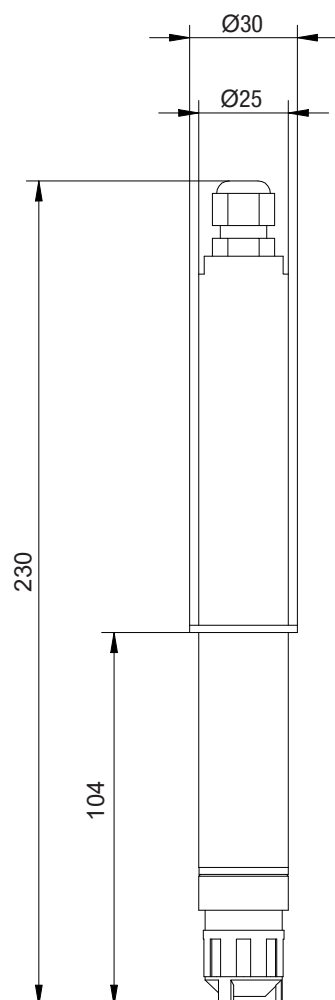


Fig. 2: Dimensions

5 Technical data

Information		Total chlorine measuring cell GCM
Measuring unit		Total chlorine (free and bound chlorine)
Measuring range	mg/l	0 – 2.0 – 5.0 – 10 (depending on the version)
Resolution	mg/l	0.02
pH-range		pH 6.5 – pH 9.5
Temperature range	°C	5 to 45 (temperature-compensated)
Storage temperature	°C	5 – 50 (frost-free)
Inflow	l/h	20 – 100, we recommend 30
Transverse sensitivities		Bromine, iodine, ozone, chlorine dioxide and permanganates as well as sulphides, sulphites, thiosulphates and hydrazine lead to measurement errors
Service life		typically 1 year, depending on water quality
Materials	Diaphragm cap	PPE
	Electrode shaft	PVC
Supply voltage		16 – 24 V DC, min. 35 mA @16 V DC
Output signal	mA	4 – 20
Protection class		IP65

Tab. 4: Technical data

6 Installation

6.1 Assembly



WARNING

Risk of burns due to electrolyte

Contact of the electrolyte with skin and eyes can cause chemical burns.

- ⇒ Always wear protective goggles and protective clothing when working with the total chlorine measuring cell.
- ⇒ Never ingest the electrolyte.
- ⇒ In the event of contact with skin and/or eyes, rinse the affected areas thoroughly with water.
- ⇒ Consult an ophthalmologist if you have red eyes.



PLEASE NOTE

Damage to the total chlorine measuring cell

Damage to the total chlorine measuring cell will result in measurement errors.

- ⇒ Never touch or damage the diaphragm and the electrodes.
- ⇒ The electrolyte is sensitive to oxidation. Always keep the electrolyte bottle closed after use, and never transfer the electrolyte into other containers.
- ⇒ Do not store the electrolyte for more than 1 year.
- ⇒ The electrolyte must not start to become yellow (see label for expiry date).
- ⇒ Add the electrolyte with as few bubbles as possible.
- ⇒ Use the diaphragm cap only once.



We recommend that you store the electrolyte bottle upside down so that the viscous electrolyte can be transferred more easily and with as few bubbles as possible. Small air bubbles do not interfere, and bigger air bubbles will rise to the upper edge of the diaphragm cap.

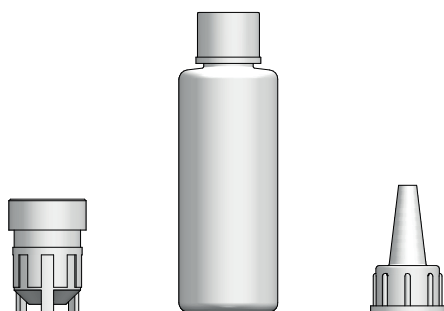


Fig. 3: Diaphragm cap with electrolyte bottle

Pre-conditions for actions:

- ✓ You are wearing your personal protective equipment.

Perform the following working steps:

1. Open the electrolyte bottle.
2. Screw the grommet onto the bottle.
3. Carefully press out the excess air.
4. Fill the diaphragm cap with electrolyte with as few bubbles as possible by placing the electrolyte bottle completely onto the diaphragm cap and slowly squeezing the electrolytes out of the bottle in one go while steadily pulling back the bottle.
 - ▶ The cap is completely full when the electrolyte reaches the lower thread.
5. Place the electrode shaft vertically onto the filled diaphragm cap.
6. Screw in the diaphragm cap in by hand as far as it will go so that there is no longer a gap between the diaphragm cap and the electrode shaft. Make sure that you do not block the vent hole below the hose seal, since excess electrolyte must escape through it.
7. Wipe off escaped electrolyte with a paper towel or the like.
8. Rinse the grommet thoroughly with clean, warm water until all electrolyte has been removed.
9. Mount the total chlorine measuring cell on the water sampling station. When doing so, comply with the operating manual of your water sampling station (section "Installing the sensors").

✓ **Chlorine measuring cell mounted.**

6.2 Electrical installation



PLEASE NOTE

Influences on the measured values

Incorrect electrical installation can lead to measuring errors and therefore incorrect dosing.

- ⇒ The supply voltage of the sensor must not drop below 16 V DC, even for a short time.
- ⇒ The power source must be capable of withstanding at least 16 V DC with at least 35 mA.
- ⇒ Since the sensor does not have galvanic separation, disruptive equalising currents must be avoided by providing galvanic separation for the third-party device and all other consumers connected to the circuit.

The total chlorine measuring cell is connected to the TOPAX® with a two-core cable. This cable supplies the amplifier electronics of the measuring cell, and simultaneously transmits the output signal of the measuring cell to the controller. When connecting, make sure that the polarity is correct (red: +; blue, purple: -).

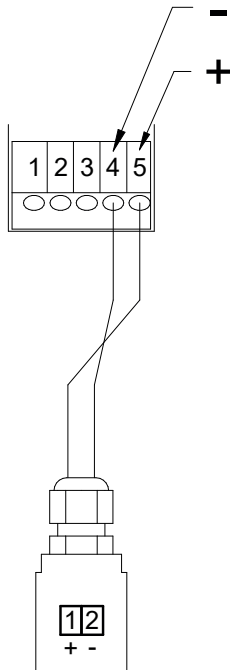


Fig. 4: Terminal connection TOPAX® MC

Perform the following working steps:

1. Turn the upper part of the measuring cell a quarter turn anti-clockwise and pull it off.
2. Remove approx. 5 cm of the outer insulation of the measuring line so that both cores are visible.
3. Undo the M 12 screw connection.
4. Insert and connect the cable, paying attention to the polarity: 1 = plus (+), 2 = minus (-)
5. Tighten the screw M12 connection.
6. Press the top part into the housing and turn it clockwise as far as it will go.

✓ **Electrical installation of the total chlorine measuring cell completed.**

7 Commissioning

	WARNING
Increased risk of accidents due to insufficient qualification of personnel! Failure to adhere to the working conditions specified in the technical data may result in a deficient measurement, resulting in incorrect dosing and a health hazard. ⇒ Adhere to the working conditions specified in the technical data.	

Please comply with the following principles for safe and correct operation:

- The voltage supply to the measuring device and the sensor must not be interrupted. The unit must be recommissioned after longer voltage interruptions of more than 2 hours.
- Do not switch off the measuring system during interval operation!
- Run in times can be expected after operating without chlorine. Switch on the dosing device, using a time delay if necessary.
- If no chlorine is going to be dosed for a long period of time, the sensor must be disconnected from the mains and stored in a dry place.
- The current signal must not exceed 20 mA, otherwise it may drop, the sensor will be damaged and erroneous dosing may be triggered. We recommend installing a monitoring device which permanently disables the chlorine control and triggers an alarm.
- The sensor must always be kept moist after commissioning.

7.1 Run-in period

To obtain a stable measured value, the sensor requires the following run in times:

- Initial start-up: 24 hours
- After replacing the diaphragm: 1 – 6 hours
- Restart: approx. 4 – 24 hours

7.2 Calibration

Please observe the following principles before calibrating:

- A slope calibration must be carried out after changing the diaphragm cap or the electrolyte
- Avoid installations which can cause air bubbles in the sample water. Air bubbles on the diaphragm reduce the measured value, which can cause overdosing.
- Repeat the slope calibration at regular intervals in order to ensure that the sensor works properly.
- Refer to the current technical regulations for the calibration intervals.

One-point calibration of the TOPAX® is required to perform measurement using the total chlorine measuring cell. To do so, the sensor must work in a stable fashion (run in time waited for, permissible and constant flow, temperature equalisation between sensor and sample water carried out, constant pH value). Determine the total chlorine content with a suitable chlorine measuring set in accordance with DPD method 4, and enter the result in the relevant menu of the TOPAX®. The calibration must be repeated at regular intervals if necessary.

Detailed information about the calibration procedure is provided in the respective operating manual of the connected controller or water sampling station.

8 Maintenance



PLEASE NOTE

Function of the total chlorine measuring cell compromised

Damage to the total chlorine measuring cell will result in measurement errors and incorrect dosing.

- ⇒ Service the sensor in accordance with the manufacturer's instructions or the requirements of the application.
- ⇒ Pay attention to the applicable national regulations relating to maintenance intervals.
- ⇒ Do not touch the electrodes.
- ⇒ Do not allow the electrodes to come into contact with fatty substances.
- ⇒ Never clean the diaphragm with acids/alkalis, detergents or mechanical aids (brush or the like).

Products by Lutz-Jesco are manufactured to the highest quality standards and have a long service life. However, some parts are subject to operational wear. This means that regular visual inspections are necessary to ensure a long operating life. Regular maintenance will protect the device from operation interruptions.

8.1 Maintenance intervals

Based on our experience, we recommend the following maintenance intervals:

- Drinking, industrial, process and cooling water depending on the specific conditions: 1 – 4 weeks
- Swimming pool: weekly
- Whirlpool: daily

8.2 Maintenance work

- Check the sensor for soiling, encrustation and air bubbles at regular intervals. Avoid contamination of the diaphragm with particles, precipitation etc. Eliminate air bubbles by increasing the flow.
- Check the display value of the sensor on the controller at regular intervals using a suitable chlorine measuring set in accordance with DPD method 4.
- If necessary, recalibrate the sensor (see section 7.2 "Calibration" on page 11).
- If calibration is no longer possible, change the diaphragm cap and then repeat the calibration (see section 6.1 "Assembly" on page 9, 7.1 "Run-in period" on page 11 and 7.2 "Calibration" on page 11).

9 Shut-down



WARNING

Risk of burns due to electrolyte

Contact of the electrolyte with skin and eyes can cause chemical burns.

- ⇒ Always wear protective goggles and protective clothing when working with the total chlorine measuring cell.
- ⇒ Never ingest the electrolyte.
- ⇒ In the event of contact with skin and/or eyes, rinse the affected areas thoroughly with water.
- ⇒ Consult an ophthalmologist if you have red eyes.



PLEASE NOTE

Damage to the total chlorine measuring cell

Damage to the total chlorine measuring cell will result in measurement errors.

- ⇒ Never touch or damage the diaphragm and the electrodes.
- ⇒ The electrolyte is sensitive to oxidation. Always keep the electrolyte bottle closed after use and never transfer the electrolyte into other containers.
- ⇒ Do not store the electrolyte for more than 1 year.
- ⇒ The electrolyte must not start to become yellow (see label for expiry date).
- ⇒ Add the electrolyte with as few bubbles as possible.
- ⇒ Use the diaphragm cap only once.

If measurement is not required for a longer period of time (e.g. winter period in outdoor swimming pools), the measuring cell must be taken out of operation.

Please observe the following principles before shutdown:

- Before removing the sensor, switch off all downstream controllers or set them to manual mode. If the sensor fails, an incorrect measured value may be present at the input of the controller/measuring device and lead to uncontrolled dosing.
- When removing the sensor, depressurise the system, otherwise liquid may escape. To do so, close the stop valves upstream and downstream of the built-in fitting.
- In an emergency, first disconnect the controller from the mains and then close the customer-side installed stop valves at the inlet and outlet.
- You must also comply with the safety instructions of the water sampling stations.

Pre-conditions for actions:

- ✓ The connected controllers have been switched off or set to manual mode.

Perform the following working steps:

1. Disconnect the sensor electronically.
2. Depressurise the system.
3. Remove the measuring cell from the fitting.
4. Unscrew the diaphragm cap.
5. Remove the electrolyte.
6. Rinse the electrodes and diaphragm with clean water and dry them in such a way that they are dust-free.
7. Loosely screw on the diaphragm to protect the electrodes.
8. Store the electrodes.

✓ **Total chlorine measuring cell has been decommissioned.**

10 Disposal

- The waste unit must be thoroughly cleaned.
- The total chlorine measuring cell must be disposed of in accordance with applicable local laws and regulations. It should not be disposed of as domestic waste!
- As the disposal regulations may differ from country to country in the European Union, please consult your supplier if necessary. In Germany, the manufacturer must provide free-of-charge disposal provided the unit has been sent in a safe manner.

11 Troubleshooting

See below for information about how to rectify faults on the device or the system. Should you not be successful in eliminating the fault, please contact the manufacturer to discuss further measures.

Error	Possible cause	Remedy
The sensor cannot be calibrated and the measured value of the sensor is greater than the DPD measurement	■ Insufficient run in time ■ Diaphragm cap damaged ■ Disruptive substances in the water (see section. 5 "Technical data" on page 8) ■ Short circuit in the measuring line ■ Diaphragm and electrode too far apart ■ DPD chemicals outdated ■ pH value lower than pH 6.5	■ See section 7.1 "Run-in period" on page 11 ■ Replace diaphragm cap, run in and adjust sensor ■ Check the water for disruptive substances and remedy. ■ Locate and remedy the short circuit ■ Screw on the diaphragm cap as far as it will go. ■ Use new DPD chemicals, re-calibrate the sensor. ■ Increase the pH value (pH must be between 6.5 and 9.5).
The sensor cannot be calibrated and the sensor measured value is smaller than the DPD measurement.	■ Insufficient run in time ■ Deposits on the diaphragm cap ■ Insufficient sample water flow ■ Air bubbles on exterior of diaphragm ■ Disruptive substances in the sample water ■ Measuring range exceeded significantly ■ Deposits have blocked the diaphragm ■ pH value greater than pH 9.5 ■ No electrolyte in the diaphragm cap	■ See section 7.1 "Run-in period" on page 11 ■ Replace diaphragm cap, run in and adjust sensor ■ Correct flow ■ Increase the flow within the permitted range ■ Consult the manufacturer ■ Replace diaphragm cap, run in and adjust sensor ■ Replace diaphragm cap, run in and adjust sensor ■ Decrease pH value (ph must range between 6.5 and 9.5) ■ Add new electrolyte, fit the measuring cell, run in and calibrate the sensor.
The measured value of the sensor is 0 ppm, and an error message is displayed on the TOPAX®	■ A sensor with incorrect polarity has been connected to the controller ■ Measuring line broken ■ Sensor damaged ■ Controller damaged	■ Connect sensor correctly ■ Replace the measuring line ■ Return the sensor ■ Contact manufacturer
The sensor measured value is 0 ppm and the sensor current is 3.0 to 4.0 mA	■ Insufficient run in time ■ Disruptive substances which use up chlorine. ■ Zero point is displaced ■ Reference electrode defective*	■ See section 7.1 "Run-in period" on page 11 ■ Check the water for disruptive substances and remedy. ■ Calibrate the zero point ■ Return the sensor for regeneration
Measured value of sensor is arbitrary and sensor current is greater than 20 mA	■ Chlorine content above the upper measuring range limit ■ Diaphragm and electrode too far apart ■ Sensor damaged	■ Check the system, rectify any errors, repeat the calibration ■ Screw on the diaphragm cap all the way ■ Return the sensor for regeneration
Measured value of sensor is unstable	■ Pressure fluctuations in the measuring line ■ Reference electrode defective	■ Check the installation location and change if necessary. It may be necessary to change the procedure. ■ Return the sensor for regeneration

Tab. 5: Troubleshooting

* If the reference electrode appears silvery and shiny or white, it must be regenerated. Brown-grey or yellow-green discolouration, however, is normal.

12 Declaration of no objection

Declaration of no objection

Please fill out a separate form for each appliance!

We forward the following device for repairs:

Device and device type: Part-no.:

Order No.: Date of delivery:

Reason for repair:

.....

Dosing medium

Description: Irritating: ☐ Yes ☐ No

Properties: Corrosive: ☐ Yes ☐ No

We hereby certify, that the product has been cleaned thoroughly inside and outside before returning, that it is free from hazardous material (i.e. chemical, biological, toxic, flammable, and radioactive material) and that the lubricant has been drained.

If the manufacturer finds it necessary to carry out further cleaning work, we accept the charge will be made to us.

We assure that the aforementioned information is correct and complete and that the unit is dispatched according to the legal requirements.

Company / address: Phone:

..... Fax:

..... Email:

Customer No.: Contact person:

Date, Signature:

13 Warranty claim

Warranty claim

Please copy and send it back with the unit!

If the device breaks down within the period of warranty, please return it in a cleaned condition with the complete warranty claim.

Sender

Company: Phone: Date:

Address:

Contact person:

Manufacturer order no.: Date of delivery:

Device type: Serial number:

Nominal capacity / nominal pressure:

Description of fault:

.....
.....
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.....
.....
.....
.....
.....
.....
.....

Service conditions of the device

Point of use / system designation:

.....
.....

Accessories used (suction line etc.):

.....
.....
.....
.....
.....

Commissioning (date):

Duty period (approx. operating hours):

Please describe the specific installation and enclose a simple drawing or picture of the chemical feed system, showing materials of construction, diameters, lengths and heights of suction and discharge lines.

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Operating instructions
Total chlorine measuring cell GCM