

English



Operating Manual

ORP electrodes

GR xxx

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1 General Note

Read this document carefully and get used to the operation of the product before you use it. Keep this document within easy reach near the product for consulting in case of doubt.

2 Safety

2.1 Intended Use

The ORP (redox) electrodes are designed to determine the redox value in natural waters and disinfection facilities, in pools, and in water treatment. The voltage value is evaluated, for example, using pH meters with mV display; the underlying reference system is silver/silver chloride.

The electrodes must be used only according to its intended purpose and under suitable conditions. The electrodes must be operated with suitable measuring devices.

The safety requirements (see below) have to be observed.

The life-time and accuracy of the electrodes depends on adequate selection as well as on proper handling. Please consider therefore the chapters "Choose the right electrode", "Measuring and storing" and "Maintenance".

Use the device carefully and according to its technical data (do not throw it, strike it, etc.). Protect the device from dirt.

To be sure that there's no risk arising due to misinterpretation of measured values, the operator must have further knowledge in case of doubt - the user is liable for any harm/damage resulting from misinterpretation due to insufficient knowledge.

The manufacturer will assume no liability or warranty in case of usage for other purpose than the intended one, ignoring this manual, operating by unqualified staff as well as unauthorized modifications to the device.

2.2 Safety guidelines

This device has been designed and tested in accordance with the safety regulations for electronic devices.

However, its trouble-free operation and reliability cannot be guaranteed unless the standard safety measures and special safety advises given in this manual will be adhered to when using the device.

2.3 Safety signs and symbols

The following signs in this document highlight warnings:



Caution! This symbol warns of imminent danger, death, serious injuries and significant damage to property at non-observance.



This symbol indicates danger for living tissue as well as a variety of materials, which can be damaged or destroyed when coming into contact with this chemical. Caustic effect, protective equipment required!



This Symbol indicates dangers to all living beings that may result in death or acute or chronic health hazards when inhaled, swallowed, or absorbed through the skin of this chemical.



This Symbol indicates irritant substances that can cause inflammation on short-term, prolonged or repeated contact with the skin or mucous membranes.



Attention! This symbol warns of possible dangers or dangerous situations that can provoke damage to the device or environment at non-observance.



Note! This symbol point out processes which can indirectly influence operation, possibly cause incorrect measurement or provoke unforeseen reactions at non-observance.



This symbol instructs the use of eye protection which protects the eyes from harmful influences when working with powerful light, UV radiation, laser, chemicals, dust, splinters or weather influences.



This symbol instructs the use of protective gloves which offer protection from mechanical, thermal, chemical, biological or electrical hazards.

2.4 Foreseeable misuse

The fault-free function and operational safety of the product can only be guaranteed if generally applicable safety precautions and the device-specific safety instructions for this document are observed.

If these notices are disregarded, personal injury or death, as well as property damage can occur.



This device must not at all be used in potentially explosive environment! The usage of this device at potentially explosive areas increases danger of deflagration, explosion or fire due to sparking.



This device is not suitable for medical applications.



The device is not suitable for direct contact with food products.
Take samples and dispose them correctly after the measurement.

2.5 Safety instructions

This device has been designed and tested in accordance with the safety regulations for electronic devices.

However, its trouble-free operation and reliability cannot be guaranteed unless the standard safety measures and special safety advises given in this manual will be adhered to when using the device.

The electrodes contain 3 molar KCL, which is acidly.



First-Aid-provisions:

- Contact with eyes: rinse opened eye with sufficient water, contact oculist
- Contact with skin: clean with sufficient water
- Swallowing: drink much water. If feeling sick, contact doctor



The electrodes contain glass parts that can cause injuries when broken.
There is an elevated risk of injury in conjunction with measurements in food.

- Inspect the electrode before and after measurement!
- Always measures in samples for measurements in foods. Discard these samples after the measurement!



If there is a risk whatsoever involved in running it, the device has to be switched off immediately and to be marked accordingly to avoid re-starting.

Operator safety may be a risk if:

- there is visible damage to the device
- the device is not working as specified
- the device has been stored under unsuitable conditions for a longer time.

In case of doubt, please return device to manufacturer for repair or maintenance.



Do not use this product as safety or emergency stop devices or in any other application where failure of the product could result in personal injury or material damage.

Failure to comply with these instructions could result in death or serious injury and material damage

When interacting with chemicals at least the following points must be ensured:

1. Obey all notes on the container of chemicals.
2. Obey all notes in the safety specification sheet of chemicals.
3. Consider any statutory provisions guidelines and guidelines of chemicals when disposing!

This is also for accidentally spilled chemicals, dried residues, soiled rags or similar.

4. Always wear suitable protective clothing (e.g. protection goggles, safety gloves, face mask, etc.)!
5. Never eat, drink or smoke in the operational area of chemicals!
6. In case of problems instantly consult skilled personnel.

Suitable clean-up possibilities (eye wash, etc.) must exist within spitting distance!



Trouble-free operation and reliability of the device can only be guaranteed if the device is not subjected to any other climatic conditions than those stated under specification

3 Basics

3.1 ORP (redox) measurement

The electrode is working after the “silver / silver-chloride” frame of reference.

When comparing the measuring values with a standard hydrogen-electrode, the deviation – coming from the changed frame of reference - has to be considered!

For getting the hydrogen-electrode reference value you have to use the correction value from the following DIN-table (according to the actual medium temperature) and add this value to the measuring value of the electrode

Example:

Measuring value = 220 mV; Medium temperature 25°C

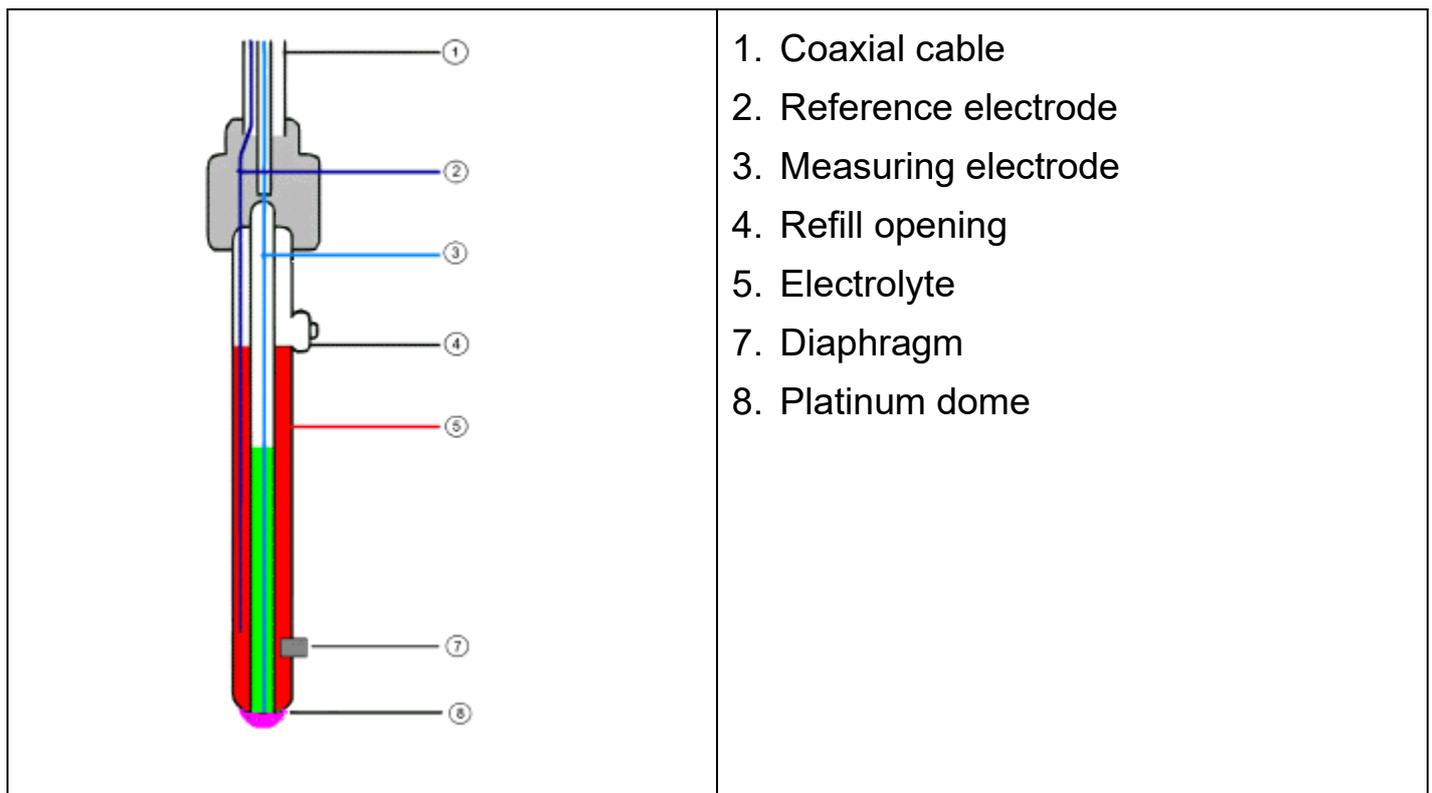
DIN-correction value (for 25°C) = 207 mV

=> ORP value according to the hydrogen-electrode = 427 mV

<u>Medium temperature</u>	<u>Correction value</u>
5°C	221mV
10°C	217mV
15°C	214mV
20°C	211mV
25°C	207mV
30°C	203mV
35°C	200mV
40°C	196mV
45°C	192mV
50°C	188mV

3.2 Design of ORP electrode

In most cases so-called combination electrodes are used. That means that all needed elements are integrated in a single electrode (including reference electrode).



The diaphragm, which establishes a connection between the electrolyte and the liquid to be measured, can be designed in different ways. Clogging or soiling of the diaphragm is a frequent cause of a malfunctioning or sluggish electrode.

The platinum dome has to be treated with care.

3.3 Further information

A ORP electrode is a wear part. If the signal is very slow or the required values are no longer observed after careful cleaning and possible regeneration, the electrode must be replaced. When using the electrodes, be aware that various substances in aqueous solutions can corrode glass and that chemicals can produce a chemical reaction with the KCl solution in the electrode, which can result in blockage of the diaphragm.

Examples:

- In solutions that contain proteins, such as for measurements in medical and biological applications, KCl can cause denaturation of the protein.
- Coagulated paints
- Solutions that contain high concentrations of silver ions

Substances that accumulate on the platinum dome or the diaphragm affect the measurement and must be removed regularly. This can be achieved for example with automatic cleaning systems.

3.4 Service life



The service life of electrodes is normally at least 8 to 10 months. When cared for properly, this can usually increase to more than 2 years. The actual life will vary depending on the particular application.

Extreme measuring values and high temperatures accelerate the aging process.

4 Operating and Maintenance

4.1 Measuring and storing

The pH-electrodes have been tested and have been subordinated strict quality controls in all manufacturing-steps

To keep the optimum efficiency and accuracy for a long time take care of the following points:

- Remove the **storing protection-cap** and rinse the shaft and the platinum electrode with distilled water.
- **Important!** The diaphragm has to be kept wet. When not in use the electrode must be stored in 3 mol/l KCl solution. If the diaphragm dried out, the performance and the responsiveness are affected.
A longer storage of a combination-electrode or a reference-electrode in distilled water will deplete them of KCl. Please refill KCl-electrolyte (saturated or 3 mol) in time.
- Before usage perform a visual check of the electrode. If there are air-bubbles in the glass-diaphragm / platinum dome or the outer reference-electrode you can get them out by shaking the electrode downward.
- For electrodes with liquid electrolytes: For continuous flow of electrolyte the **cap sleeve made of rubber**, that covers the **refill opening**, has to be removed before measurements. The opening has to be closed for storage in order to prevent running down.
- The level of the electrolyte should be over the level of the measured medium. This ensures stable measuring values and reduces pollution of the diaphragm and reference electrolyte.
- Take care that the platinum dome and the diaphragm fully contacts the media you want to measure. Minimum depth for e.g. GR 105 20 mm, maximum 80 mm
- Keep cable and plug of the electrode always clean and dry. Otherwise the electric insulation will be lost and consequently measuring errors or other subsequent errors might occur.

- The electrode has to be stored in dry rooms at temperatures between 10°C to 30°C. Below – 5°C the electrode might be damaged because of freezing of the electrolyte. We recommend to store the electrode vertically with the cable to the upper side.
- The pH-electrode should be arranged vertically upwards with the connecting cable. A slight angle of inclination does not impair the measurement

4.2 Examination (of ORP measuring systems)

There is no need to calibrate the ORP-electrode according to pH-electrodes.

An examination could be easily done using a examination solution. The measuring instrument should be configured to the configuration “mV”. The configuration “mV_H”, which is available in several devices shows the measuring according to the hydrogen-electrode value - in this case the value have to be calculated back to the “silver / silver-chloride” frame of reference.

4.3 Care and maintenance

- For electrodes with liquid electrolyte: Check level of reference electrolyte and, if necessary, refill 3 mol/l KCl solution with help of an syringe or pipette.
- Normal cleaning takes place with the GRL 100 pepsin cleaning solution into which the electrode is immersed for 5 - 10 minutes before being rinsed off with clean water.



Crystallisation of the 3 mol/l KCl solution is unavoidable. Crystallised potassium chloride on the protective cap and shaft can easily be removed with a fingernail or cloth and is therefore not a defect or grounds for complaint.

- Dirty electrodes must be cleaned. The suitable cleaning agents for the pH glass membrane are listed in the table below.

Impurities	Cleaners
General residue	Mild detergent
Inorganic coatings	common fluids for glass cleaning
Metal compounds	1 mol/l HCl solution or GRL 100 (<i>pepsin cleaning solution</i>)
Oil and grease	Special cleaner or solvent
Biological coatings with protein	1% pepsin enzyme in 0.1 molar HCl solution (GRL100)
Biological coatings with protein	Acetone
Extremely resistant residues	Hydrogen peroxide or sodium hypochloride

- Mechanical cleansing should be avoided as this might damage the electrode permanently. Therefore a chemical cleansing is preferable.
- The platinum dome of a ORP electrode can be cleaned with scrubbing powder (put some scrubbing powder on a cloth and use your finger to rub over the platinum dome with some spin) – afterwards flush the electrode well with clean water. Frequently it is also suitable to clean the dome by rubbing over a wet sheet of paper. Cleaning the dome by grinding should be done only in exceptional cases to avoid an unnecessary material removal.

The material of the pH probe must always be protected. Plastic shafts must not be cleaned in solvents, etc. If in doubt, contact the manufacturer to inquire about suitable cleaners for the existing electrode. This is also important in the case of aggressive substances or other substances that are not primarily water-based!

5 Choose the right electrode

For measurements in laboratories or on-site measurements, we recommend using the GR 105. The rugged plastic shaft protects the electrode best against mechanical stress.

For Online measurements and measurements with electrodes installed in fittings, we recommend using the GR 175.

The long-term stable pressure resistant reference system gives the possibility of a low-maintenance system, which gives solid results over a long period of time.

The GR 175 is also recommended for measurements where the plastic shaft could be chemically disordered.

	GR 105	GR 175
Sewage		
Aquarium water	X	X
Soil testing's		
Emulsions		
On-site measurements	X	
Fish farming	X	X
Photo laboratory		
Galvanic baths		
Beverages		
Low-ion media (Rain water, some aquariums, VE water)		
Cosmetics		
Food sample		
Sea water	X	X
Process chemistry		X
Online measurements		X
Swimming pool water	X	X
Suspensions		
Drinking water	X	X
Sewage		

6 Specification

	GR 105-BNC	GR 175-BNC	GR 175-S7
Operating range:	standard ORP electrode	long-term stable, low-maintenance ORP electrode	
Pressure:	±2000 mV, 0...80 °C, > 100 µS/cm	±2000 mV, 0...80 °C, > 100 µS/cm	
Reference electrolyte:	pressure less	max. 6 bar (with PG13.5 thread)	
Diaphragm type:	3 mol/l KCl	3 mol/l KCl (Gel)	
Membrane shape:	2x ceramic	2x ceramic	
Tube:	dome	dome	
Connection:	tyril, approx. Ø12 x 120 mm	glass, approx. Ø12 x 120 mm	
Operating range:	BNC	BNC	S7 connection
Cable:	1 m	1 m	-- *)

*) Note: cable GEAK-2S7-BNC or GEAK-5S7-BNC is needed for connection S7
(additional adapter GAD 1 BNC is required for measurement devices with cinch plug)

7 Reshipment and disposal

7.1 Reshipment



All devices returned to the manufacturer have to be free of any residual of measuring media and other hazardous substances.
Measuring residuals at housing or sensor may be a risk for persons or environment



Use an adequate transport package for reshipment, especially for fully functional devices. Please make sure that the device is protected in the package by enough packing materials.

Add the completed reshipment form of the GHM website
<https://www.ghm-group.de/infothek/#downloadcategory--8>

7.2 Disposal



Exhausted electrodes must be disposed via special refuse.

When delivering exhausted electrodes from our product range, free for us (sufficient post paid), we will dispose them for free.

8 Manufacturer / distributor

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