Manual for ORP-electrodes (combination electrodes) GR 105 / GR 175

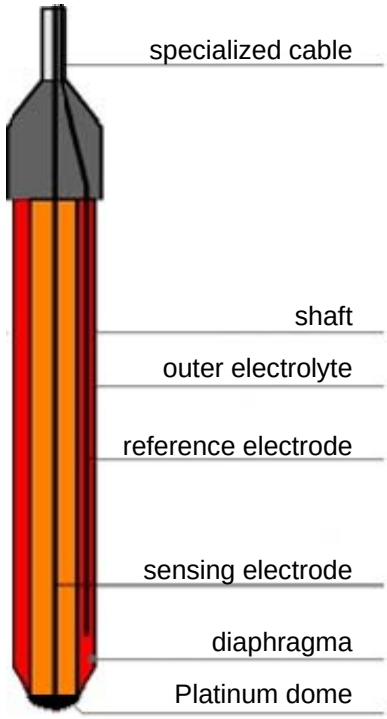
Intended use

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

The ORP electrodes must be used only according to its intended purpose and under suitable conditions. The electrodes must be operated with suitable measuring devices and be calibrated before first use and afterwards in regular intervals.

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.



Design

In most cases so-called combination electrodes are used. That means that all needed elements are integrated in a single electrode (including reference electrode). Sometimes even a temperature sensor is integrated. The picture on the right shows an electrode without temperature sensor.

There are several design types for the diaphragm, but generally said it is the connection between electrolyte and the measured solution. A blockade or soiling of the diaphragm is often the reason for the electrodes idleness and erratic behavior.

The platinum dome has to be treated with care.

⚠ *Safety regulations:*

This device was designed and tested according to the safety regulations for electronic measuring devices.
Faultless operation and reliability in operation of the measuring device can only be assured if general safety measures and the devices specific safety regulation mentioned in this user manual are considered.

1. Faultless operation and reliability in operation of the measuring device can only be assured if the device is used within the climatic conditions specified in the chapter “Specifications“.
3. When connecting the device to other devices the interconnection has to be designed most thoroughly, as internal connections in third-party devices (e.g. connection of ground with protective earth) may lead to undesired voltage potentials that can affect the connected devices, could damage them or even may destruct the devices.
4. The device must be switched off and must be marked against using again, in case of obvious malfunctions of the device which are e.g.:
   - visible damage.
   - the device is not working as prescribed.
   - storing the device under inappropriate conditions for longer time.

   In case of doubt the device should be sent to the manufacturer for repairing or servicing.
5. **Attention:** Do NOT use this product as safety or emergency stopping device, 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.
6. The electrodes contain 3 molar KCL.

First-Aid-provisions

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

7. Attention! The electrodes contain glass. If the ORP-electrode is damaged please abolish the medium being measured! If swallowed gullet and gastrointestinal tract could be injured.

GHM Messtechnik GmbH - Standort Greisinger
Hans-Sachs-Str. 26 • D-93128 Regenstauf
☎ +49 (0) 9402 / 9383-0 🖷 +49 (0) 9402 / 9383-33 info@greisinger.de

Specifications:

Type	Description	Operating range	Pressure	Reference electrolyte	Connection	Cable	Notes	Diaphragm type /Membran shape	Tube
GE 105-Cinch †)	standard ORP-elektrode (replaced by GR 105)	-2000 .. 2000 mV, 0..80°C, > 100 µS/cm	pressure-less	3mol/l KCl	Cinch	1 m		2x ceramic / dome	tyril approx. Ø12x120 mm
GE 105-BNC †)					BNC				
GR 105-Cinch	standard ORP-elektrode (equal to GE 105)	-2000 .. 2000 mV, 0..80°C, > 100 µS/cm	pressure-less	3mol/l KCl	Cinch	1 m		2x ceramic / dome	tyril approx. Ø12x120 mm
GR 105-BNC					BNC				
GR 175-BNC	long-term stable, low-maintenance ORP-electrode	-2000 .. 2000 mV, 0..80°C, > 100 µS/cm	max 6 bar	3mol/l KCl (gel)	BNC	2 m	pressure resistant up to 6 bar with PG13.5 thread	2x ceramic / dome	glass approx. Ø12x120 mm
GR 175-S7					S7 connection	- *)			

†) *no longer available*

*) *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)*

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 an 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 testings		
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
Water-based lacquers		

General

All electrodes are delivered checked and ready for measuring. The warranty period is **12 months** for appropriate treating.
ORP-electrodes are wearing parts and have to be exchanged when the demanded values are not complying with, even after thoroughly cleaning the electrode and regenerating it, depending on chemical and mechanical strain. When using please consider that different substances in aqueous solution may affect glass and that chemicals may react with the KCl solution in the electrode and could block the diaphragm.

Examples:
- protein-containing dilutions, as used in medicinal and biological measuring, the protein could be denatured by the KCl solution
- coagulated lacquers
- solutions containing higher concentration of silver-ions

Other problems could happen when measuring ion-depleted and solvent-containing mediums.
Substances that deposit on the diaphragm influence the measuring and have to be removed regularly. This can be done with the help of e.g. automatic-cleaning-facilities.

The lifetime of the electrodes is normally more than 12 month and can be prolonged to more than 2 years by good maintenance. However, accurate values cannot be stated as they depend on the specific application.

Measuring and storing

The ORP-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 pH-glass-diaphragm 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 distillated water will deplete them of KCl. Please refill KCl-electrolyte (saturated or 3 mol) in time.
- Before usage perform a visual check of the ORP-electrode. If there are air-bubbles in the outer reference-electrode you can get them out by shaking the electrode downward (like handling a quicksilver-fibre-thermometer).
- 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.
  Important! Take care that the reference system is not contaminated by intrusion of impurities (e.g. sampling solution). Never dive the electrode so deep, that the refill opening is in contact to the sample.
  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 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.
- Our pH-electrodes can be used at angles of 90° ±45° to the horizontal.
- 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 reverence value you have to use the correction value form the following DIN-table (according to the actual medium temperature) and add this value to the measuring value of the electrode.

Medium temperature	Correction value
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

Example: Measuring value = 220mV, Medium temperature 25°C
DIN-correction value (for medium temperature = 25°C) = 207mV
=> ORP value according to the hydrogen-electrode = 427mV

Examination

There is no need to calibrate the ORP-electrode according to pH-electrodes.
An examination could be easily done using the GRP 100 examination solution. The measuring instrument should be configured to the configuration “mV”. The configuration “mVH”, which is available in several devices shows the measuring according to the hydrogen-electrode value (see above) - in this case the value have to be calculated back to the “silver / silver-chloride” frame of reference.

Maintanance

- 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.
- Crystallization of the 3 mol/l KCl (3 molar KCl) is inevitable! Crystallized KCl on the protection-cap and the breech-collar can be removed with fingernails or a wet cloth. This is no defect or a reason for reclamation.
- Contaminated electrodes have to be cleaned. The suitable cleaning agents for the pH-glass-diaphragm are given in the table below. Mechanical cleansing should be avoided as this might damage the electrode permanently. Therefore a chemical cleansing is preferable.

  Standard cleaning: Put electrode into cleaning solution GRL100 (0,1 molar HCl with Pepsin) for 10 min.

contamination	cleaning agent
general deposits	mild washing agent
inorganic coatings	common fluids for glass cleaning
metallic compounds	1 mol/l HCl solution
oil, fat	special cleaning agents or solvent
biological coatings with protein	pepsin-enzyme in 0.1 molar HCl-dilution (GRL100)
resin-lignin	acetone
extremely resistant deposits	hydrogen peroxide, sodium hypochloride

The distinct materials of the electrode have to be considered when choosing the cleaning agent.
E.g. electrodes with plastics shaft must not be cleaned with solvents. In case of doubt please contact the manufacturer for further advice. The same has to be considered when using aggressive or other, non water based agents!

Disposal:

Exhausted pH-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.