



1 Reference electrodes

1.1 General

Immediately after receiving the electrode, check to make sure that it works properly. Electrodes that do not work properly must be sent back for warranty processing within 2 months (starting from the day of delivery). If the defect is proven to be due to a material or manufacturing defect, the electrode will be replaced at no charge. Shipping costs are borne by the customer.

The crystallized electrolyte solution must be rinsed off the diaphragm.

Metrohm recommends using one reference electrode for aqueous and one for nonaqueous electrolytes. Crystallized electrolyte may cause problems when you replace the electrolyte. Use a solution producing a stable potential as reference electrolyte for all reference electrodes. E.g.:

Aqueous systems: KCl 3 mol/L

Nonaqueous systems: LiCl 2 mol/L in ethanol
TEABr* 0.4 mol/L in ethylene glycol

* tetraethylammonium bromide

Table 1 Potentials of the Ag/AgCl reference electrode vs. a standard hydrogen electrode (concentration data at 25 °C):

Electrolyte	20 °C U [mV]	25 °C U [mV]
Saturated KCl	201.9	197
KCl 3 mol/L	210.5	207
Saturated LiCl in ethanol	148	143
LiCl 2 mol/L in ethanol	164	157
TEABr 0.4 mol/L in ethylene glycol	217	213

When using double-junction electrodes, the bridge electrolyte (filled into the "OUTER FILLING" filler opening) must be miscible with the reference electrolyte (usually KCl 3 mol/L, filled into the "INNER FILLING" filler opening).

1.2 Measuring and storing



CAUTION

Never treat electrodes in ultrasonic baths, as they may be damaged by such a treatment.

The filler opening (1) must be open during measurements. If necessary, refill electrolyte solution up to the filler opening.

Store the electrodes in the bridge electrolyte with closed filler opening (1).

Replace the electrolyte solutions from time to time. Always use the same electrolyte type.

If the electrode was dry for shipping, fill it with the desired electrolyte solution. Allow the electrode to stand for 24 h before the first usage.

Electrodes with flexible ground-joint diaphragm

Fill the reference electrolyte and the bridge electrolyte through the corresponding opening while avoiding air bubbles (shake electrode well downwards). Withdraw the ground-joint diaphragm (2) slightly. As soon as electrolyte begins to run out, push it back again. Do not turn it! Loosen the ground-joint diaphragm slightly after the measurement and push it back again.

Electrodes with "Long Life" reference system

These electrodes may be filled only with KCl 3 mol/L as reference electrolyte.

"LL ISE Reference" electrode

If you replace the bridge electrolyte, rinse the electrode several times with distilled water and then at least twice with the new electrolyte. The bridge electrolyte should be miscible with KCl 3 mol/L. The electrode should be allowed to condition in the electrolyte for at least 30 min before it is used again.

Electrodes with ceramic pin diaphragm

We recommend using these electrodes only in clear measuring solutions.

When working with solutions which tend to block the diaphragm, try using reference electrodes with flexible ground-joint diaphragm. Rinse a blocked diaphragm with an appropriate solvent.

If the diaphragm is blocked with silver chloride precipitate, the following treatment may help: Immerse the electrode with closed filler opening (1) in concentrated ammonia solution for approx. two hours, rinse with distilled water, replace the electrolyte solution and immerse in KCl 3 mol/L for several hours. Afterwards, replace the electrolyte again.

Ag/AgCl reference system (6.0724.140)

Place the reference system in a vessel filled with electrolyte solution. Place the vessel in a desiccator and evacuate (< 50 mbar). Then allow air to enter slowly so that the system is completely filled with electrolyte solution. Fill the electrolyte vessel with electrolyte solution as well and insert the reference system. PTFE tape or PTFE sleeves may be used to protect the ground joints.

1.3 Troubleshooting



NOTICE

There are 2 ways to loosen a jammed diaphragm:

- Immerse the electrode in hot water of up to 70 °C. Optionally, add some dishwashing detergent to the water.
- Immerse the electrode in a cup filled with cola overnight.