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pH glass and gel electrodes

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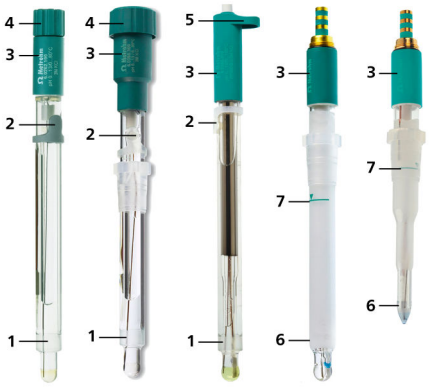

1 **Diaphragm**
2 **Filler opening**
3 **Electrode head**
4 **Protective cap**
5 **Electrode head**
6 **Twin-pore diaphragm**
7 **Shaft**

1 pH glass and gel electrodes

1.1 General

Immediately after receiving the electrode, check to make sure that it works properly (carry out a pH calibration or Metrohm electrode test).

The electrode test can be performed using the 780/781 pH/Ion Meter or a Titrando with Touch Control or tiamo. To do this, select the corresponding electrode type:

- **Standard:** Electrodes that are filled with KCl 3 mol/L.
- **Gel:** Gel electrodes and electrodes that are filled with Idrolyte.
- **Nonaqueous:** Electrodes that are filled with TEABr or LiCl in ethanol.

1.1.1 Electrodes with flexible ground-joint diaphragm

Double-junction electrode: The electrode is delivered with KCl 3 mol/L as reference and bridge electrolyte. If you need a chloride-free bridge electrolyte (to be filled into the "OUTER FILLING" opening), we recommend KNO_3 1 mol/L. Loosen the ground-joint diaphragm from time to time to ensure a flow of electrolyte solution.

1.1.2 Electrodes with built-in temperature sensor

Always plug the B plugs of the built-in temperature sensor into the temperature sensor connection sockets of the pH meter. If you are using a pH meter with only one temperature sensor connection socket, connect one of the B plugs to the connection socket for the reference electrode. Temperature sensor plugs that are not plugged in result in interfering signals.

1.1.3 pH gel electrodes

CAUTION

Remove the spearhead electrode (6.0226.100 / 6.00226.600) carefully and slowly from the storage vessel or from the sample. If you remove the electrode too quickly, the gel could tear and the sensor will become unusable.

1.2 Measuring

1.2.1 Combined electrodes

Open the closure of the filler opening (**2**) and fill reference electrolyte up to the filler opening.

1.2.2 Separate pH glass electrodes

When measuring in nonaqueous media, soak the electrode in water between measurements as often as possible.

1.2.3 Difficult sample matrix

Solutions containing proteins: Immerse the electrode in a solution of pepsin and hydrochloric acid (1% pepsin in HCl 0.1 mol/L) for several hours. Afterwards, thoroughly rinse the electrode.

Low-ion solutions: Use the Aquatrode Plus.

Solutions with ClO_4^-: Use a double-junction electrode with a potassium-free bridge electrolyte, e.g. NaCl ($KClO_4$ is sparingly soluble and may block the diaphragm).

Solutions containing substances poisoning the electrode, such as hydrogen peroxide or formaldehyde: Use a double-junction electrode and, more importantly, replace the bridge electrolyte more frequently to prevent contact between the poison and the inner reference system.

Solutions containing solids: Use the Unitrode.

Nonaqueous solutions: Use the Solvotrode.

Solutions containing sulfide: A black precipitate of silver sulfide may accumulate in the diaphragm. In this case, treat the electrode with freshly prepared 7% solution of thiourea in HCl 0.1 mol/L.

1.2.4 pH gel electrodes

The electrodes are extremely low maintenance since they are filled with a solid electrolyte and are not refillable. Over time, the gel will become transparent, starting from the diaphragm. Replace the electrode as soon as the transparent zone has reached the marking on the shaft **(7)**.

For hygroscopic samples, the electrodes must be conditioned in KCl sat. between the individual measurements in order to ensure that the electrolyte does not dry out. Take care to ensure that the twin-pore diaphragms (**6**) do not become contaminated or blocked.

1.3 Cleaning the electrode

Rinse the electrode after measuring. The tip of the electrode must remain clean (do not touch).

CAUTION

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

1.3.1 pH gel electrodes

Use only a dampened cloth to wipe the electrode (wipe off residual grease with a cloth that has been moistened with alcohol). Do not wipe the electrode with a dry cloth and do not immerse it in alcohol. The electrode may not be cleaned with the pHit kit (6.2325.000).

1.4 Storing the electrode

1.4.1 Combined pH glass electrodes

The pH glass electrodes with KCl 3 mol/L as reference electrolyte should be stored in the 6.2323.000 storage solution. This solution prevents ageing of the glass membrane, i.e., the response time of the electrode is unchanged even after long-term storage. The electrode can be used immediately without prior conditioning.

The pH glass electrodes that are filled with another reference electrolyte should be stored in that reference electrolyte in order to ensure that the electrode is ready for immediate use.

Immerse the electrode in the corresponding solution deep enough to cover the diaphragm (**1**) and close the filler opening. Do not store the electrode dry.

1.4.2 Separate pH glass electrodes

Separate pH glass electrodes require a separate reference electrode. Store the electrodes in distilled water. Do not store the electrode dry.

1.4.3 iTrode models

The memory chip that is integrated in the electrode head (**3**) enables the storage of important sensor data such as article number, serial number, calibration data and calibration history.

When the electrode is not in use, screw the protective cap (**4**) onto the electrode head to prevent contamination (water, solvent, dust, etc.) of the electrode head as well as exposure of the contact pins.

1.4.4 pH gel electrodes

Immerse and store the electrode in KCl sat. deep enough to cover the twin-pore diaphragm. They may not be stored dry under any circumstances.

1.5 Troubleshooting

1.5.1 pH glass electrodes

Air bubbles in the electrolyte: Remove air bubbles by lightly flinging the electrode downward.

Sluggish measured value setting, slope too small (< 96%): Treat the diaphragm (**1**) as described in *(see chapter 1.2.3, page 2)*.

Contaminated or dried-in reference electrolyte: Remove the electrolyte by loosening the flexible ground-joint diaphragm or, in the case of easyClean diaphragms, by pressing on the electrode head (**5**). For other diaphragms, remove the electrolyte using a syringe or a Pasteur pipette. Then refill with fresh electrolyte. Repeat this procedure, if necessary.

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.