dAquatrode Plus



6.00202.300

Sensor leaflet

8.0109.8003EN / v6 / 2023-03-31





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8.0109.8003EN / v6 / 2023-03-31 Technical Communication Metrohm AG CH-9100 Herisau

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Table of contents

Table of contents

1	Overview		1
	1.1	dAquatrode Plus – Product description	. 1
	1.2	dAquatrode Plus - Overview	. 1
2	Functional	description	2
	2.1	pH electrode – Functional description	. 2
3	Delivery an	d packaging	3
	3.1	Delivery	. 3
	3.2	Packaging	. 3
	3.3	Unpacking and assessing the electrode	. 3
	3.4	Storing the dAquatrode Plus	. 4
4	Installation		5
	4.1	Preparing the dAquatrode Plus	. 5
	4.2	Mounting the electrode	. 6
5	Operation a	and control	8
	5.1	Calibrating the pH electrode	8
6	Maintenan	ce	9
	6.1	dAquatrode Plus – Replacing the electrolyte	. 9
	6.2	Cleaning the pH electrode	. 9
7	Troublesho	oting	10
8	Electrode -	Disposal	12
9	Technical s	pecifications	13
	9.1	Ambient conditions	13
	9.2	pH electrode – Dimensions	13
	9.3	pH electrode – Housing	13
	9.4	pH electrode – Connectors specifications	13
	9.5	dTrodes – Display specifications	14
	9.6	dAquatrode Plus – Measurement specifications	14
	9.7	dTrode – Analog measurement connection	14

6.00202.300

Overview

1 Overview

1.1 dAquatrode Plus – Product description

The dAquatrode Plus is a combined pH glass electrode with Pt1000 temperature sensor for measurements in ion-deficient, aqueous solutions. The dAquatrode Plus is a dTrode (digital electrode) for OMNIS.

1.2 dAquatrode Plus – Overview

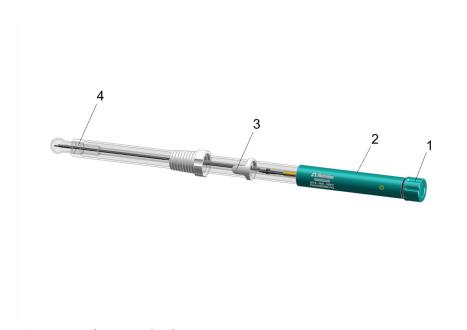


Figure 1 dAquatrode Plus

- 1 Protective cap
- 2 Electrode head
- **3 Filler opening**For bridge electrolyte

4 Fixed ground-joint diaphragm

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2 Functional description

2.1 pH electrode – Functional description

The glass membrane of the pH electrode consists of a silicate framework containing lithium ions. When the glass surface is immersed in an aqueous solution, then a thin hydrated layer (gel layer) forms on the outside and inside of the glass surface.

Because the proton concentration in the internal buffer of the pH electrode is constant (pH 7), a stationary condition arises on the internal side of the glass membrane. If the proton concentration in the measuring solution changes, an ion exchange takes place in the outer hydrated layer, thus leading to a change of potential on the glass membrane. Only when this ion exchange has reached a stationary condition, the potential of the pH electrode is also constant.

Delivery and packaging

3 Delivery and packaging

3.1 Delivery

Inspect the delivery immediately upon receipt:

- Check the delivery against the delivery note to ensure completeness.
- Check the product for damage.
- If the delivery is incomplete or damaged, contact your regional Metrohm representative.

3.2 Packaging

The product and accessories are supplied in protective special packaging. Keep this packaging to ensure safe transportation of the product. If a transport locking device is present, keep this as well for future reuse.

3.3 Unpacking and assessing the electrode

1 Unpacking the electrode

Remove the electrode with storage vessel from the packaging.

2 Removing the storage vessel

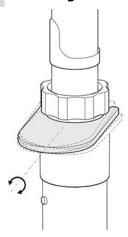


Figure 2 Releasing the electrode from the storage vessel

- Hold the electrode and storage vessel firmly in your hand so that the electrode cannot slip away.
- Position the tool between the storage vessel and SGJ sleeve.

- Carefully push the tool to the side to release the electrode. Do not tip the tool forwards!
- Avoid applying excess pressure to the tool. Otherwise, the electrode could be released too abruptly.

3 Checking the electrode for proper function

- Preparing the electrode: (see "Preparing the dAquatrode Plus", chapter 4.1, page 5)
- Calibrating the electrode: (see "Calibrating the pH electrode", chapter 5.1, page 8)
- Defective electrodes must be sent back for warranty processing within 2 months (starting from the day of delivery).

3.4 Storing the dAquatrode Plus

CAUTION

Property damage caused by dried out sensor

Destruction of the sensor due to drying out.

- Do not let the sensor dry out.
- Follow the storage instructions.

The electrode head must be stored as follows to protect it from water, solvents, dust and mechanical influences:

- Screw the protective cap (1-1) onto the electrode head (1-2).
- 2 Store the electrode in the storage vessel. When doing so, ensure that the electrode is immersed in the storage solution via the fixed ground-joint diaphragm (1-4).
 - We recommend storing electrodes with 3 mol/L of potassium chloride as a bridge electrolyte in the storage solution (6.2323.000). This prevents the glass membrane from aging and the electrode can be used without prior conditioning.

The storage solution may only be used for this electrolyte; we recommend to store all other electrolytes in the bridge electrolyte.

Close the filler opening (1-3).

4 -----

Installation -----

Installation

4.1 **Preparing the dAquatrode Plus**

1 Filling with bridge electrolyte

Open the closure of the filler opening (1-3) and, if necessary, fill the bridge electrolyte up to the filler opening.

2 Rinsing the electrode

CAUTION

Property damage caused by electrostatic charge

Useless measurement results due to electrostatically charged electrode and damage through mechanical treatment.

Never dab the electrode membrane dry.

Rinse the electrode with distilled water.

3 Connecting the electrode

connector instead.

- Unscrew the protective cap (1-1).
- Position the cable connection on the electrode head such that the slot in the cable connection is on the guide lug of the electrode
- Push the socket in the cable connection into the plug inside the electrode head.
- Push the outer ring of the cable connection over the electrode
 - Ensure that the guide lugs in the electrode head are in the grooves of the cable connection.
- Push the cable connection onto the electrode head until it snaps in place.
- To remove the cable, first release the outer ring and then carefully pull the cable connection from the electrode head. When doing so, be sure not to pull on the cable itself but the cable

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Mounting the electrode

4.2 Mounting the electrode



The electrode must sit securely in the titration head.

For automatic procedures, ensure that the cables have enough room to move.

During the titration, it is important that the solution is mixed well. The stirring rate should be high enough to form a small vortex. If the stirring rate is too high, then air bubbles will be aspirated. These may result in incorrect measured values. If the stirring rate is too low, then the solution is only mixed slowly and the reaction time or titration time increases accordingly.

In order for the measurement to be taken in a well-mixed solution after the addition of the titrant, the titration tip should be positioned where turbulence is high. Furthermore, the distance between the addition of the titrant and the electrode should be as large as possible. Therefore, take into account the stirring direction (counterclockwise or clockwise) when positioning the electrode and titration tip.

Installation

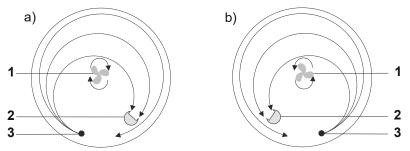


Figure 3 Diagrams showing rod stirrer, electrode and titration tip during a titration. a) clockwise stirring direction, b) counterclockwise stirring direction.

1 Rod stirrer 2 Electrode

3 Titration tip

---- 7

5 Operation and control

5.1 Calibrating the pH electrode

1 Rinse the electrode with distilled water.

Calibrating the electrode with the first buffer Immerse the electrode in buffer solution (pH 7) and start the calibration.

- After a successful measurement, remove the electrode from the buffer and rinse it with distilled water.
- 4 Calibrating the electrode with the second buffer Repeat steps 2 and 3 with the second buffer.
- **5** Calibrating the electrode with the third buffer, if necessary Repeat steps 2 and 3 with the third buffer.
- 6 Use the following information to determine if the electrode meets the requirements:
 - Slope:

95-103%

pH:

6.5 - 7.5

Offset of potential:

-30 to 30 mV

Maintenance

6 Maintenance

6.1 dAquatrode Plus – Replacing the electrolyte

- 1 Open the filler opening (1-3).
- 2 Use a plastic pipette to drain the bridge electrolyte from the electrode.
- Rinse the inside of the electrode with the new electrolyte and empty it again.
- **4** Fill the electrode with electrolyte up to the filler opening.
- Close the filler opening (1-3) if the electrode is not used immediately.
- 6 Immerse the electrode in a storage solution overnight.
 Then, the electrode is ready for use again.

6.2 Cleaning the pH electrode

Never treat the electrode in an ultrasonic bath. The electrode could become damaged.

Rinse the electrode with distilled water.

7 Troubleshooting

Problem	Cause	Remedy
The diaphragm is jam- med	The electrolyte in the storage vessel has evaporated.	Immerse the electrode in hot water (max. 70 °C). Optionally, add some dishwashing detergent to the water.
Slow response	Electrostatic charge	Do not dab the glass membrane with a towel.
	Solid deposits on mem- brane surface	Clean the electrode with a solvent/strong acid.
	Deposition of proteins on membrane surface	Clean the electrode with 5% pepsin in 0.1 mol/L of HCl.
Zero point shift	The electrode was in dry storage	Store the electrode in a storage solution overnight.
	Solid deposits on mem- brane surface	Clean the electrode with a solvent/strong acid.
	Deposition of proteins on membrane surface	Clean the electrode with 5% pepsin in 0.1 mol/L of HCl.
	Reference system contami- nated or dried out	Clean the reference system with a reference electrolyte and refill it. Then, store the electrode in storage solution.
	Ground-joint diaphragm contaminated	Clean the electrode with the pHit kit (6.2325.000).
Slope too low	Solid deposits on mem- brane surface	Clean the electrode with a solvent/strong acid.
	Deposition of proteins on membrane surface	Clean the electrode with 5% pepsin in 0.1 mol/L of HCl.

10 -----

Troubleshooting

Problem	Cause	Remedy
	Reference system contami- nated or dried out	Clean the reference system with a reference electrolyte and refill it. Then, store the electrode in storage solution.
	Ground-joint diaphragm contaminated	Clean the electrode with the pHit kit (6.2325.000).

8 Electrode – Disposal



This product is covered by European Directive, WEEE – Waste Electrical and Electronic Equipment.

The correct disposal of your old instrument will help to prevent negative effects on the environment and public health.

Proceed as follows to dispose of the electrode:

1 Draining the electrolyte

Use a plastic pipette to remove the electrolyte from the electrode.

2 Disposing of the electrolyte

Dispose of the electrolyte in accordance with the legal provisions.

3 Disposing of the electrode

Put the electrode in electronic waste recycling.

More details about the disposal of your old product can be obtained from your local authorities, from waste disposal companies or from your local dealer.

Technical specifications

9 Technical specifications

9.1 Ambient conditions

Nominal function range +5 to +45 °C at max. 80%

relative humidity, non-

condensing

Storage +5 to +45 °C

9.2 pH electrode – Dimensions

Measurements

Shaft diameter 12 mm

Maximum installation length 125 mm

9.3 pH electrode – Housing

Materials

Shaft material Glass

9.4 pH electrode – Connectors specifications

ConnectorMetrohm plug-in head
Q

9.5 dTrodes – Display specifications

Status display LED green-red

9.6 dAquatrode Plus - Measurement specifications

pH range 0–13

Temperature range 0–60 °C

Minimum immersion depth 20 mm

9.7 dTrode - Analog measurement connection

Potentiometric

Measuring range -1,900 to +1,900 mV

Resolution 1.28 µV

Measuring accuracy ±0.5 mV in the measuring range

-1,900 mV to +1,900 mV

Input resistance $\geq 1*10^{12} \Omega$

Offset current $\leq \pm 1*10^{-12} \text{ A}$

Temperature

Pt1000

Measuring range -150 to +250 °C

Resolution approx. 0.002 °C

Measuring accuracy ±0.4 °C in the measuring range

−20.0 to +150.0 °C

Reference conditions

Relative humidity ≤60%

Ambient temperature $+25 \degree C (\pm 3 \degree C)$

Instrument status min. 30 minutes in

operation

Technical specifications

Measuring accuracy

applies for all measuring ranges without sensor error, under reference conditions, measuring interval 100 ms

Valid for the measurement contacts of the analog measurement connection installed in the sensor. These connections are not accessible after installation.