
PH ELECTRODE 031

USER'S GUIDE



CENTRE FOR MICROCOMPUTER APPLICATIONS

<http://www.cma-science.nl>

Short description

The CMA pH Electrode (031) can be used together with the CMA pH Sensor (BT61i) to measure the pH value of a liquid in the range between pH 0 and pH 14. The electrode is connected to the amplifier by means of a coax cable and a BNC connector. The amplifier supplies an adapted amplification for the range between 0 and 5V.

The electrode will also function with any commercially available pH and/or millivolt meter, provided that the correct connector type is used.

The pH electrode is a gel-filled Ag-AgCl combination electrode. The electrode is built into a 13-cm long plastic tube (12 mm diameter) with an opening at the bottom side and is supplied with a storage bottle containing a protective solution. When the pH electrode is not being used, it must be kept in the storage bottle. During measurements the electrode must be dipped in the solution for roughly 1-cm

The pH electrode has been designed to function in a reliable and accurate manner under varied conditions. The rugged epoxy body protects the pH sensing glass bulb. The gel-filled reference electrode is sealed and so it never needs to be refilled.

Using the pH electrode

Remove the protective bottle and rinse the tip of the electrode with distilled water. If air bubbles are seen in the pH bulb, gently shake the electrode downward, like a clinical thermometer, until the bubbles disappear. Then connect the electrode to the amplifier.

For routine measurements, one buffer solution suffices. For precise calibration of the electrode two buffer solutions are required. One buffer should be close to the desired measuring range. During calibration you need to rinse with distilled water.

Maintenance and storage

In principle, the electrode can be stored dry but to guarantee a short response time and a long life, it is advisable to keep the electrode wet.

For short-term storage (up to one week) use a pH 4 buffer, or tap water. When storage exceeds 1 week, use a pH 4 buffer, to which potassium chloride (KCl, 10g/100 ml) has been added (pH-4/KCl).

CAUTION: Never store the electrode in distilled water. Using or storing the electrode at very high or very low temperatures (near 0°C) can damage it beyond repair.

To prepare additional storage solution (pH-4/KCl):

1. **pH 4.00 buffer:** add 2.0 mL of 0.1 M HCl to 1000mL of 0.1 potassium hydrogen phthalate.
2. **pH-4/KCl solution:** add 10g of solid potassium chloride (KCl) to 100mL of pH-4 solution.

Cleaning of the electrode

A dirty but mechanically intact electrode can often be restored by one of the following procedures:

- In general: soak the electrode in 0.1 M HCl for 15 minutes.
- Deposit of proteins: soak the electrode in 0.1 M HCl to which 1% of Pepsin has been added.
- Deposit of inorganic material: rinse the electrode with a 0.1 M EDTA tetrasodium solution.
- Deposit of oil or grease films: wash the electrode in a mild detergent or solvent known to attack the particular film (but not the electrode itself!).

After cleaning, soak the electrode in pH 7 buffer for 30 minutes. If none of these procedures improve response, replace the electrode.

Do not use the electrode in:

- base solution (pH > 10) for longer than a few hours. This can affect the glass of the electrode,
- hydrofluoric acid or in acid or base solution with a concentration greater than 1.0 M,
- solutions containing perchlorate, silver, or sulfide ions.

The electrode can be used to measure the pH of sodium hydroxide solutions with a concentration near 1.0 M, but should not be left in this concentration for periods of time longer than 5 minutes.

White crust on the electrode

The white crystals you might find on the electrode are formed by the Potassium Chloride (KCl) from the storage solution in the rubber boot. Remove the rubber boot, rinse the electrode with distilled water and proceed as usual.

Checking the sensor when it is malfunctioning

When the pH system is not functioning properly you can test the electrode. Without amplification, the pH electrode should give off a voltage of 0.41 V at a pH value of 7 (plus or minus 0.06 V per unit pH). This can be measured with the help of a voltmeter with a very high input resistance. When the pH electrode does not give off the required voltage any more, it must be replaced.

Technical Specifications

<i>Measurement range</i>	pH 0 - 14
<i>Type</i>	Sealed, gel-filled, epoxy body, Ag/AgCl
<i>Sensitivity</i>	0.06 V per pH unit
<i>Response time</i>	90% of final reading in 1 second
<i>Temperature range</i>	5 to 80°C
<i>Isopotential pH</i>	pH 7 (point at which temperature has no effect on output)
<i>Calibration function</i>	$\text{pH} = -4.04 * V_{\text{out}} (\text{V}) + 13.68$
<i>Connection</i>	BNC connector

Warranty:

The pH Electrode 031 is warranted to be free from defects in materials and workmanship for a period of 12 months from the date of purchase provided that it has been used under normal laboratory conditions. This warranty does not apply if the sensor has been damaged by accident or misuse.

The warranty also expires in case of:

- incompetent usage,
- use of the electrode in perchlorate, silver salt, sulphide or hydrofluoric solutions,
- use of the electrode solutions containing more than 1 M acids or bases at temperatures above 50 °C,
- regular use of the electrode at temperatures other than room temperature (higher temperatures can reduce the life time of the electrode).

Note: *This product is to be used for educational purposes only. It is not appropriate for industrial, medical, research, or commercial applications.*

Rev. 12/12/2014