# pH Electrodes

## pH Electrode (BNC cap)

***(Product No. 2253)***

## pH Electrode (wired)

***(Product No. 2251)***

Not available to purchase from February 2020


Data Harvest Group Ltd.
1 Eden Court, Leighton Buzzard,
Beds, LU7 4FY
Tel: 01525 373666
Fax: 01525 851638
e-mail: sales@data-harvest.co.uk
www.data-harvest.co.uk



DS158 No 1

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## Introduction

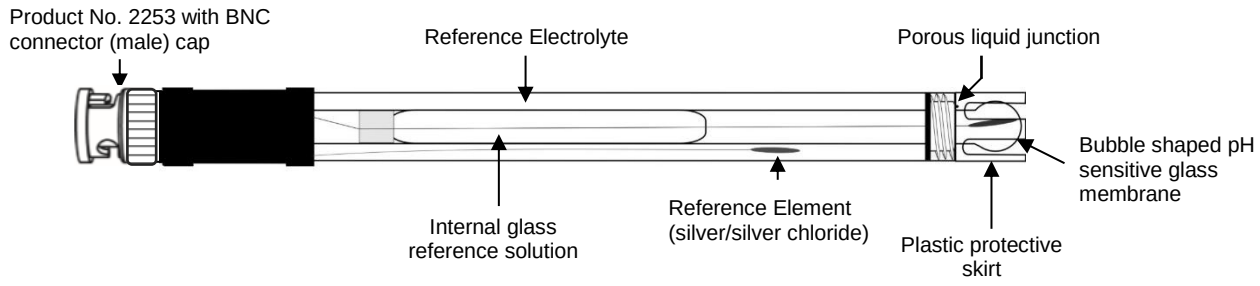
These two general-purpose pH electrodes are both plastic bodied, single junction, gel filled glass electrodes and are non-refillable. They are suitable for use with both the Wireless pH Adaptor (Product No. 1110) and the SmartQ pH Adaptor (Product No. 3125).

1. (Product No. 2253) with a BNC cap
2. (Product No. 2251) with a length of wire (approximately 87 cm long) between the electrode and BNC connector (no longer available to purchase).

**IMPORTANT:** Maintain the level of storage solution, the pH sensitive glass membrane must be kept **wet**.

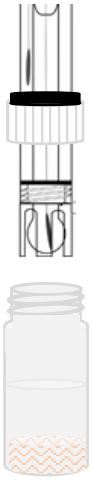
**Please Note**: Store the electrode tip in a 1:1 solution of pH 4 buffer and 4 mol $dm^{-3}$ KCl (see page 4).

## The pH electrodes




## Electrode preparation

- Remove the electrode from the storage solution bottle by unscrewing the cap **before** removing the electrode from the storage bottle.
- Wash the lower section of the electrode (especially the glass membrane area) thoroughly with de-ionised or distilled water to remove any salt deposits from the exterior of the electrode.
- Hold the electrode up to the light and check that the glass bulb tip of the electrode is full of electrolyte. If air bubbles are present they can be removed by shaking the electrode firmly in a downward motion (like a clinical thermometer).
- Screw on the clear plastic protective skirt if it's not already attached.



Unscrew the cap **before** removing the electrode

## Measurement procedure

1. Place the pH electrode in the sample to be tested, ensure the bulb is fully submerged.
2. Allow the electrode sufficient time to stabilise and then start taking readings.
3. Rinse the electrode between each measurement with either:
   - a portion of the next sample or
   - deionised or distilled water

   Excess liquid can be removed by wiping the plastic body part of the electrode with soft lint free tissue - avoid contact with the bulb tip.
4. When you finished using the electrode rinse with distilled water, slide the cap of the storage bottle onto the body of the electrode, screw the cap onto the storage bottle making sure the tip of the electrode is immersed in the storage solution.

## Practical information

- These electrodes are **non**-refillable.
- Check the condition of the storage solution on a regular basis.
- Keep the pH sensitive membrane **wet** at all times. For the ion exchange process to occur properly, the glass needs to be hydrated. Check and maintain the level of storage solution. See page 4.
- If the electrode should inadvertently become dry, place in the storage solution for several hours in an attempt to recondition the glass.
- Care should be taken to avoid handling the pH sensitive glass membrane. Any damage to the surface, such as abrasion, may cause inaccuracies and result in a slow response time.
- Stirring of a sample will achieve a faster electrode response, but the sphere shaped glass tip is very thin and requires care to prevent accidental damage. Broken glass bulbs are not covered by warranty.
- Distilled or deionised water contain little or no ions so produce a poor response and unstable inaccurate readings.
- pH electrodes have a finite lifespan due to their inherent properties. How long a pH electrode will last will depend on how it is cared for and the solutions it is used to measure. Even if the electrode is not used, it will still age.
- Always use freshly prepared pH buffers. When not in use, pH buffers should be stored in sealed containers. High pH buffers are less stable as they tend to absorb atmospheric $CO_2$ which lowers their pH. Only open the bottle of buffer to pour it into a beaker, never leave the bottle open.
- Buffers and sample solution should be at the same temperature when measuring pH. The resistance of glass electrodes partially depends on temperature. The lower the temperature, the higher the resistance. It will take more time for the reading to stabilise if temperatures are cold.

### Conditions to avoid:

- **Never** store the electrode in **deionised or distilled water,** as this will cause the migration of the electrode's fill solution.
- To maximise electrode life, avoid pH/ temperature extremes whenever possible. High temperature, strong acids or caustics (greater than 1.0 mol $dm^{-3}$) shorten electrode life. If used at high temperatures, the electrodes life is drastically reduced. The higher the range of temperature, the shorter the life of the electrode e.g. typical electrode life when used at ambient temperature is 1 – 3 years, if used at 80˚C this will be reduced to less than 4 months.

- Never expose to temperatures below -12˚C, freezing will damage the electrode.
- Coatings on the glass or junction surfaces e.g. proteins, will prevent proper operation (see maintenance). Avoid frequent or prolonged periods of use in these solutions.
- The plastic body of the sensor may be damaged by organic solvents such as acetone, chloroform, methanol, toluene and xylene.

## Electrode storage

Maintain the level of pH electrode storage solution, the pH sensitive membrane must be kept **wet**. Check the condition of the storage solution on a regular basis.

Store the electrode in equal volumes of pH 4.0 buffer and 4 mol $dm^{-3}$ Potassium Chloride (KCl) solutions (1:1 v/v).

***Recipe:*** *Add 29 g of KCl to 100 $cm^3$ of distilled water. Add 100 $cm^3$ of a pH 4 buffer solution.*

**Never** store the electrode in **deionised** or **distilled water** - this will cause migration of the electrode's fill solution.

## Electrode specifications

Sealed silver / silver chloride gel filled electrode

| | |
|---|---|
| Measuring range | 0.00 to 14.00 pH |
| Working temperature range | 0 to 80˚C |
| Sensitive glass | ASI 8 |
| E° | 0±20 mV |
| Slope (pH 4.00 – 6.86) | >95% |
| Junction Resistance | <1 kohms |
| Tube diameter | 12 to 13 mm |

## Maintenance

The glass bulb can become coated with any compound that has an affinity for glass.
After any cleaning procedure, soak the electrode in its storage solution for at least 30 minutes before use.

**General cleaning procedure**: - Soak the electrode in 0.1 mol $dm^{-3}$ Hydrochloric acid (HCl) for 10 minutes. Rinse thoroughly with distilled water. Soak in its storage solution for at least 2 hours before use.

**Inorganic coatings**: - Soak in either 0.1 mol $dm^{-3}$ Tetrasodium E.D.T.A acid solution or 1% Decon 90 solution for 1 – 2 hours.

**Oil, Grease**: - Carefully wash the electrode under warm tap water using a non-filming dish washing detergent. Do not use automatic or electric dish washing detergents. Rinse thoroughly with fresh tap water followed by a three rinses of distilled water. Soak the electrode in its storage solution for at least 30 minutes before use.

**Protein & Fatty Materials**: - Either gently wipe the bulb with a tissue soaked in propanol or soak in 1% pepsin in 0.1 mol $dm^{-3}$ HCl for at least 10 minutes. Rinse thoroughly with distilled.

**Highly resistant deposits**: - Clean with $H_2O_2$ or sodium hyperchlorite.

**Bacterial cultures**: - Chemically sterilize with ethylene oxide, soak a cloth to wipe the entire body.

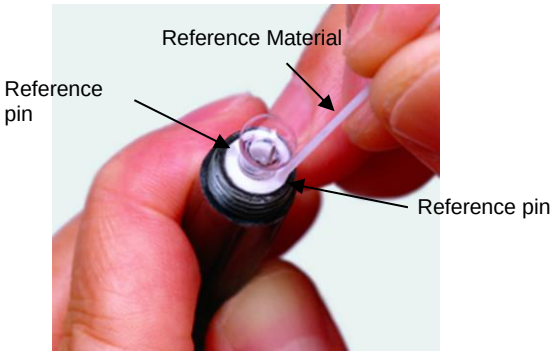
**CAUTION** - Do not use strong solvents such as halogenated hydrocarbons, petroleum ether, etc. for cleaning.

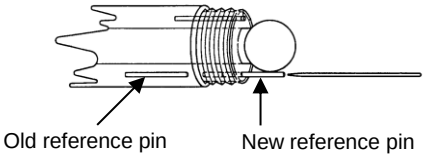
If the bottle of electrode storage solution develops mould, empty the contents, fill with a bleach solution (about 1 part bleach to 4 parts water) and leave to soak for about 10 minutes. Rinse thoroughly with warm water. Refill with a fresh solution of the pH 4.0 buffer: 4 mol $dm^{-3}$ Potassium Chloride (KCl) storage solution.

**Reference pin replacement instructions for the 2251 electrode**

If the pH electrode fails to respond to cleaning, and the electrode response becomes slow or begins to drift, then the reference pins can be replaced.

- Use clean scissor or a craft knife to cut two 12 mm (½") lengths of reference material from the spare reference pin material provided with the electrode.
- Unscrew the threaded guard that protects the glass bulb.
- Hold the electrode and identify the two reference pins that are located on either side of the pH bulb.
- Use the toothpick provided (or a similar tool) and push each of the reference pins part way out of the reference assembly and into the reference reservoir.
- Using clean tweezers, insert the new reference pins into each of the holes in the reference assembly. The old reference pins will be forced out of the reference assembly and will remain in the reference reservoir. This is normal and will not affect electrode performance.




- Ensure the new reference pins stick out about 3 mm (⅛") from the surface of the reference. If the pins protrude to far from the reference assembly, the electrode may not operate properly.
- Reinstall the threaded guard onto the end of the electrode.
- Rinse the electrode with distilled water. It will now be ready for use.

**Hints:**

1. Prepare the new reference pins and have them available before you start.
2. Use clean tools, washed thoroughly with distilled water.
3. Flat style toothpicks work better than the round style.
4. Exercise caution when installing new reference pins. The pH bulb is thin glass and is easily scratched or damaged. Broken glass bulbs are not covered by warranty.
5. Do not allow KCl gel to run out of the electrode reservoir.
6. The pins will remain inside the reference reservoir. This is normal. Do not attempt to remove them; this does not affect electrode performance.

## Trouble shooting

Wild readings, check for air bubbles in the electrode tip.

Response time and stability are affected by the condition of the electrodes glass membrane, reference junction and reference solution. Restoration to acceptable levels can often be accomplished by cleaning the electrode's glass surface.

Sluggish response, erratic readings, or a reading that will not change can indicate electrode demise.

Interference may occur between electrochemical sensors (**pH, Oxygen**, and **Conductivity)** if they are placed in the same solution at the same time and connected to the same data logger. This is because these sensors make an electrical connection to the solution; therefore an electrical path exists between the sensors through the solution. Maximise the distance between the Sensors to minimise the effect, the distance required will depend on the conductivity of the solution.

## Limited warranty

For information about the terms of the product warranty, see the Data Harvest website at: https://data-harvest.co.uk/warranty.

Damage to the pH electrodes glass bulb is **not** covered by warranty.

**Note:** Data Harvest products are designed for **educational** use and are not intended for use in industrial, medical or commercial applications.

WEEE (**W**aste **E**lectrical and **E**lectronic **E**quipment) Legislation

Data Harvest Group Ltd is fully compliant with WEEE legislation and is pleased to provide a disposal service for any of our products when their life expires. Simply return them to us clearly identified as ‘life expired’ and we will dispose of them for you.