

djb microtech

pH Sensor – Black Box

Typical activities using our pH Sensor include:

studies of household acids and bases, acid-base titrations, monitoring pH change during chemical reactions or in an aquarium as a result of photosynthesis, investigations of acid rain and buffering, and investigations of water quality in streams and lochs.

Using the pH Sensor with the ALBA Interface and Logger

This sensor is intended for use with the ALBA Interface and Logger and the ALBA software.

The following comments should help you when using the pH Sensor:

- Load the Application software and follow the instructions in the on-screen notes which will direct you to use the appropriate channel.
- If you are using the Investigator software you will have control over the setup for data capture using this sensor.
- Before running an Application you could check the operation of your sensor by selecting the Meter option in the Investigator software.
- The pH Sensor is supplied with a factory calibration which will probably be satisfactory for most experiments. However if very accurate measurements are required the pH Sensor can be calibrated by selecting the *Calibration Manager* from the *Experiment* menu. Further information on calibrating sensors can be found in the Help and in the manual.

pH Electrode Specifications

Type: Sealed, gel-filled, epoxy body, Ag/AgCl

Response time: 90% of final reading in 1 second

Temperature range: 5 to 80°C

12-mm OD

Range: pH 0-14

12-bit Resolution

Isopotential pH: pH 7 (point at which temperature has no effect on output)

Output: 59.2 mV/pH at 25°C

How the pH Sensor Works

The pH Sensor will produce a voltage of 1.75 volts in a pH 7 buffer. The voltage will increase by about 0.25 volts for every pH number decrease. The voltage will decrease by about 0.25 volts/pH number as the pH increases. The gel-filled pH Sensor is designed to make measurements in the pH range of 0 to 14. An epoxy body that extends below the glass-sensing bulb of the electrode makes this probe ideal for the demands of a classroom laboratory. The gel-filled reference half cell is sealed—it never needs to be refilled.

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Preparing for Use

To prepare the electrode to make pH measurements, follow this procedure:

- Remove the storage bottle from the electrode by first unscrewing the lid, then removing the bottle and lid. Thoroughly rinse the lower section of the probe, especially the region of the bulb, using distilled or de-ionized water.
- When the probe is not being stored in the storage bottle, it can be stored for short periods of time (up to 24 hours) in pH-4 or pH-7 buffer solution. It should never be stored in distilled water.
- Connect the pH Sensor to your lab interface, load or perform a calibration (as described in the next section), and you are ready to make pH measurements.
- When you are finished making measurements, rinse the tip of the electrode with distilled water. Slide the cap onto the electrode body, then screw the cap onto the storage bottle. Note: When the level of storage solution left in the bottle gets low, you can replenish it with small amounts of tap water the first few times you use the probe (but not indefinitely!). A better solution is to prepare a quantity of pH-4 buffer/KCl storage solution (see the section on Maintenance and Storage) and use it to replace lost solution.

Buffer Solutions

In order to perform a calibration of the pH electrode, or to confirm that a saved calibration is accurate, you need to have a supply of buffer solutions that cover the range of pH values that you will be measuring.

djb microtech supply sachets of buffer solution – the values available are pH 4, pH 7 and pH 10.

You can prepare your own buffer solutions using the following recipes:

pH 4: Add 2.0 ml of 0.1 M HCl to 1000 ml of 0.1 M potassium hydrogenphthalate.

pH 7: Add 582 ml of 0.1 M NaOH to 1000 ml of 0.1 M potassium dihydrogenphosphate.

pH 10: Add 214 ml of 0.1 M NaOH to 1000 ml of 0.05 M sodium hydrogencarbonate.

Do I Need to Calibrate the pH Sensor?

For most experiments you should not have to perform a new calibration when using the pH Sensor - the factory calibration will be satisfactory in most situations. However should you require to re-calibrate the pH Sensor then use the Calibration Manager in the ALBA software.

Maintenance and Storage

Short term storage i.e. up to 24 hours – place the electrode in pH 4 or pH 7 buffer solution.

Long term storage – store the electrode in a pH 4 buffer/KCl storage solution in the storage bottle. Storage solution can be made by dissolving 1.0 g of solid KCl in 100 ml of pH 4 buffer solution.

If the electrode is accidentally stored dry, immerse the electrode in the storage solution for a minimum of eight hours prior to use. The pH electrode can be cleaned with a light detergent solution. For heavy deposits of inorganic contamination, the electrode may be cleaned with a 0.1 M solution of HCl for 30 seconds, then washed in a light detergent solution. Immediately after cleaning, rinse the electrode in distilled water. If the electrode fails to calibrate properly, or responds slowly then electrode replacement is recommended.

Do not use the electrode in solutions containing perchlorate, silver or sulphide ions.

Do not use in hydrofluoric acid or in base solutions with a concentration greater than 1.0 M. The electrode may 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 longer than 5 minutes.

Using or storing the electrode at very high temperatures or very low temperatures (near 0°C) can damage it beyond repair.

Warranty

Our pH Sensors are warranted to be free from defects in material and workmanship for a period of twelve months from purchase provided the electrode has been used in accordance with this instruction manual and used under normal laboratory conditions. The warranty does not apply when the electrode has been subjected to accident, alternate use, misuse, or abuse in any manner.

The pH Sensor is manufactured by Vernier Software and Technology. **djb microtech** wish to thank Vernier Software & Technology for permission to copy sections of the leaflet that accompanies their pH Sensor.