

# pH Sensor

## (Order Code PH-BTA)



The pH Sensor can be used for any lab or demonstration that can be done with a traditional pH meter, including acid-base titrations, monitoring pH in an aquarium, and investigating the water quality of streams and lakes.

**Note:** Vernier products are designed for educational use. Our products are not designed nor are they recommended for any industrial, medical, or commercial process such as life support, patient diagnosis, control of a manufacturing process, or industrial testing of any kind.

### What's Included

- pH Sensor
- Electrode Storage bottle, containing pH 4/KCl solution

### Compatible Software and Interfaces

See [www.vernier.com/manuals/ph-bta](http://www.vernier.com/manuals/ph-bta) for a list of interfaces and software compatible with the pH Sensor.

### Getting Started

1. Connect the sensor to the interface (LabQuest Mini, LabQuest 3, etc.).
2. Start the appropriate data-collection software (Vernier Graphical Analysis<sup>®</sup>, LabQuest<sup>®</sup> App, or Logger *Pro*<sup>™</sup>) if not already running, and choose New from File menu. The software will identify the sensor and load a default data-collection setup. You are now ready to collect data.

If you are collecting data using a Chromebook<sup>™</sup>, mobile device such as iPad<sup>®</sup> or Android<sup>™</sup> tablet, or a Vernier wireless interface, please see the following link for up-to-date connection information:

[www.vernier.com/start/ph-bta](http://www.vernier.com/start/ph-bta)

### Using the Product

1. Remove the storage bottle from the electrode by unscrewing the lid and removing the bottle and lid.
2. Thoroughly rinse the lower section of the probe, especially around the bulb-shaped tip, using distilled or deionized water.
3. Connect the sensor following the steps in the Getting Started section of this user manual.
4. When you are finished making measurements, rinse the electrode with distilled water.
5. Slide the cap onto the electrode body, and then screw the cap onto the storage bottle so the tip of the electrode is immersed in the storage solution.

**Important:** Do not fully submerge the sensor. The handle is not waterproof.

Do not leave the electrode in acids or bases with concentrations greater than 1.0 M for periods longer than 5 minutes. See [www.vernier.com/ph-sensors](http://www.vernier.com/ph-sensors) for other types of pH electrodes.

### Videos

View videos related to this product at [www.vernier.com/ph-bta](http://www.vernier.com/ph-bta)

### Calibration

For many experiments, calibrating the pH Sensor is not required. A calibration equation is stored on each pH Sensor before they are shipped, which is used as a default by Vernier.

For the most accurate measurements with this sensor, we recommend calibration. It is a simple process that takes only a few minutes.

- For instructions for pH Sensor calibration using Logger *Pro* computer software, see [www.vernier.com/til/2341](http://www.vernier.com/til/2341)
- For instructions for pH Sensor calibration using LabQuest App, see [www.vernier.com/til/3394](http://www.vernier.com/til/3394)
- For instructions for pH Sensor calibration using Graphical Analysis with a Chromebook, see [www.vernier.com/til/3631](http://www.vernier.com/til/3631)
- For instructions for pH Sensor calibration using Graphical Analysis with an iOS or Android device, see [www.vernier.com/til/3630](http://www.vernier.com/til/3630)

In order to calibrate a pH Sensor, or to confirm that a saved pH calibration is accurate, you should have a supply of pH buffer solutions that cover the range of the pH values you will be measuring. For more information about pH buffer solutions, including recipes for preparation, see [www.vernier.com/til/3625](http://www.vernier.com/til/3625)

### Specifications

Type	Sealed, gel-filled, polycarbonate body, Ag/AgCl
Temperature range	5 to 80°C (readings not compensated)
Range	pH 0–14
Accuracy	± 0.2 pH units
Isopotential pH	pH 7 (point at which temperature has no effect)
Default calibration values	slope: -3.838 intercept: 13.720
Shaft diameter	12 mm OD

### Care and Maintenance

**Short-term storage (up to 24 hours):** Place the electrode in pH 4 or pH 7 buffer solution. It should never be stored in distilled water.

**Long-term storage (more than 24 hours):** Store the electrode in a pH 4 buffer/KCl storage solution in the storage bottle. The pH electrode is shipped in

this solution. Vernier sells 500 mL bottles of pH Storage Solution (order code PH-SS), or you can prepare additional storage solution by adding 10 g of solid potassium chloride (KCl) to 100 mL of pH 4 buffer solution. Vernier sells a pH Buffer Capsule kit (PH-BUFCAP) that includes a buffer solution preservative. Storing the electrode in this solution contributes to electrode longevity and retains electrode response time when the unit is placed back into service.

If the electrode is inadvertently stored dry for a short period of time, immerse the tip in the pH 4 buffer/KCl storage solution for a minimum of 8 hours prior to use. If the readings are still not accurate after calibration or if the response is slow, try shocking the sensor as described in the Troubleshooting section.

### How the Sensor Works

The pH amplifier inside the handle is a circuit that allows the standard combination pH electrode to be monitored by a lab interface. The cable from the pH amplifier ends in a BTA plug.

The pH Sensor produces a voltage of approximately 1.75 volts in a pH 7 buffer. The voltage increases by about 0.25 volts for every pH number decrease. The voltage decreases by about 0.25 volts/pH number as the pH increases.

The Vernier gel-filled pH Sensor is designed to make measurements in the pH range of 0 to 14. The gel-filled reference half cell is sealed; it cannot be refilled.

The pH Sensor is designed to be used in aqueous solutions. The polycarbonate body of the sensor can be damaged by many organic solvents. In addition, do not use the sensor in solutions containing: perchlorates, silver ions, sulfide ions, biological samples with high concentrations of proteins, or Tris buffered solutions. Do not use the sensor with hydrofluoric acid or in acid or base solutions with a concentration greater than 1.0 molar.

### Troubleshooting

When testing a pH Sensor, it is best to measure a buffer solution because it is easier to determine if the sensor is reading correctly. Do not test your sensor by measuring distilled water. Distilled water can have a pH reading in the range of 5.5–7.0, due to varying amounts of dissolved carbon dioxide. Furthermore, due to a lack of ions, the pH values reported with the sensor in distilled water will be erratic.

If your pH Sensor is reading differently from the pH of a buffer solution (e.g., reads 6.7 in a buffer 7), you may simply need to calibrate the sensor. See the Calibration section for more information.

Examine the glass bulb. If it is broken, pH readings will be incorrect.

If your readings are off by several pH values, the pH readings do not change when moved from one buffer solution to a buffer solution of different pH, the sensor was stored dry for an extended period of time, or the sensor's response seems slow, the problem may be more serious. A method called "shocking" can be used to revive pH electrodes. To shock your pH Sensor, perform the following:

1. Soak the pH Electrode for 4–8 hours in an HCl solution of 0.1 M–0.5 M.
2. Rinse off the electrode and soak the tip in freshly prepared long term storage solution (recipe above) for 30–60 minutes.
3. Rinse the electrode and test it with buffer solutions of known pH.

Occasionally, mold will grow in the pH 4 buffer/storage solution. Mold will not harm the electrode and can easily be removed using a mild detergent solution. Mold growth in the storage solution can be inhibited by adding a buffer preservative.

For additional troubleshooting and FAQs, see [www.vernier.com/til/1361](http://www.vernier.com/til/1361)

### Repair Information

If you have watched the related product video(s), followed the troubleshooting steps, and are still having trouble with your pH Sensor, contact Vernier Technical Support at [support@vernier.com](mailto:support@vernier.com) or call 888-837-6437. Support specialists will work with you to determine if the unit needs to be sent in for repair. At that time, a Return Merchandise Authorization (RMA) number will be issued and instructions will be communicated on how to return the unit for repair.

### Accessories/Replacements

Item	Order Code
Electrode Storage Solution, 500 mL	PH-SS
pH Buffer Capsules (3×10) kit	PH-BUFCAP
Storage Solution Bottles, pkg of 5	BTL

### Warranty

Vernier warrants this product to be free from defects in materials and workmanship for a period of five years from the date of shipment to the customer. This warranty does not cover damage to the product caused by abuse or improper use. This warranty covers educational institutions only. Additionally, the warranty does not cover accidental breakage of the glass bulb of the pH Sensor.



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