

Tris-Compatible Flat pH Sensor

(Order Code FPH-BTA)



The Tris-Compatible Flat pH Sensor measures the pH of a solution or semisolid. Because the glass membrane is flat instead of a bulb, it is more durable, easier to clean, and allows for flat surface measurements or smaller sample sizes. It features a sealed, gel-filled, double-junction electrode, making it compatible with Tris buffers and solutions containing proteins or sulfides.

Collecting Data with the Tris-Compatible Flat pH Sensor

This sensor can be used with the following interfaces to collect data.

- Vernier LabQuest[®] 2 or original LabQuest[®] as a standalone device or with a computer
- Vernier LabQuest[®] Mini with a computer
- Vernier LabPro[®] with a computer or TI graphing calculator
- Vernier Go![®]Link
- Vernier EasyLink[®]
- Vernier SensorDAQ[®]
- CBL 2[™]
- TI-Nspire[™] Lab Cradle

Here is the general procedure to follow when using the Tris-Compatible Flat pH Sensor:

1. Connect the Tris-Compatible Flat pH electrode to the Electrode Amplifier.
2. Connect the Electrode Amplifier to the interface.
3. Start the data-collection software.
4. The software will identify the sensor as pH and will load a default data-collection setup.
5. You are now ready to collect data.

Important: Do not completely submerge the electrode. The handle is not waterproof.

Data-Collection Software

This sensor can be used with an interface and the following data-collection software.

- **Logger Pro 3** This computer program is used with LabQuest 2, LabQuest, LabQuest Mini, LabPro, or Go!Link.
- **Logger Lite** This computer program is used with LabQuest 2, LabQuest, LabQuest Mini, LabPro, or Go!Link.
- **LabQuest App** This program is used when LabQuest 2 or LabQuest is used as a standalone device.

- **DataQuest[™] Software for TI-Nspire[™]** This calculator application for the TI-Nspire can be used with the EasyLink or TI-Nspire Lab Cradle.
- **EasyData App** This calculator application for the TI-83 Plus and TI-84 Plus can be used with CBL 2[™], LabPro, and Vernier EasyLink. We recommend version 2.0 or newer, which can be downloaded from the Vernier web site, www.vernier.com/easy/easydata.html, and then transferred to the calculator. See the Vernier web site, www.vernier.com/calc/software/index.html for more information on the App and Program Transfer Guidebook.
- **DataMate program** Use DataMate with LabPro or CBL 2[™] and TI-73, TI-83, TI-84, TI-86, TI-89, and Voyage 200 calculators. See the LabPro and CBL 2 Guidebooks for instructions on transferring DataMate to the calculator.
- **LabVIEW** National Instruments LabVIEW[™] software is a graphical programming language sold by National Instruments. It is used with SensorDAQ and can be used with a number of other Vernier interfaces. See www.vernier.com/labview for more information.

Specifications

Tris-Compatible Flat pH Electrode

Range:	pH 0–14 ¹
Electrode type:	Double-junction, sealed, gel-filled, Ag/AgCl reference, polycarbonate body
Membrane style:	Flat glass
Storage solution:	pH 4/KCl solution (10 g KCl in 100 mL buffer pH-4 solution)
Cable:	1 meter coaxial cable with BNC connector
Temperature range:	0–100°C 12 mm OD
	Impedance: ~20 kΩ at 25°C
Response time:	98% of full response in 30 s at 25°C

Electrode Amplifier (included with each Tris-Compatible Flat pH Sensor)

Calibration	slope:	-7.752
	intercept:	16.237
13-bit resolution (SensorDAQ):		0.004 pH
12-bit resolution (LabPro, LabQuest 2, LabQuest, LabQuest Mini, Go! Link, TI-Nspire [™] Lab Cradle or EasyLink):		0.008 pH
10-bit resolution (CBL 2 [™]):		0.03 pH
Power:		7 mA @ 5VDC
Input range:		-450 to 1100 mV

¹ Some sodium error in ranges greater than pH 12 due to thicker glass and higher impedance values.

NOTE: Vernier products are designed for educational use. Our products are not designed nor 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.

How the Tris-Compatible Flat pH Sensor Works

The Tris-Compatible Flat pH Sensor is a sealed, gel-filled, double-junction pH electrode and Electrode Amplifier. The double-junction pH electrode prevents silver from the Ag/AgCl gel from coming in contact with the sample. Tris buffers (tris(hydroxymethyl)aminomethane) and solutions with proteins and sulfides will react with silver to clog the reference junction, shortening the life of single-junction electrodes.

The measurement electrode is made of flat glass, making it more durable and easier to clean than a traditional glass bulb. In addition to liquids, it is ideal for measuring the pH of semisolids such as many foods and soil slurries. It also allows for flat surface measurements and the use of smaller sample sizes.

The Electrode Amplifier that is included with the sensor amplifies the electrode's mV reading into the appropriate range for the interface and provides the software with the calibration values to convert that voltage into a pH value.

This sensor is equipped with circuitry that supports auto-ID. When used with LabQuest 2, LabQuest, LabQuest Mini, LabPro, Go! Link, SensorDAQ, TI-Nspire™ Lab Cradle, EasyLink, or CBL 2™, the data-collection software identifies the sensor and uses pre-defined parameters to configure an experiment appropriate to the recognized sensor.

Optional Calibration Procedure

Not usually, but it depends on the circumstances surrounding your data collection. You have two choices: You can use the calibration stored in the sensor, or calibrate the sensor.

In most experiments done with this sensor, especially those involving a titration, the precise pH at the equivalence point is not critical; rather, the large rate of change of pH is the most important factor. As a result, we feel that you should not have to perform a new calibration for most experiments. You can simply use the appropriate calibration that is stored with this auto-ID sensor.

If you are doing water quality studies, soil testing, or food pH testing that requires a very accurate calibration, you can calibrate the Tris-Compatible Flat pH Sensor following the following procedure:

- Use the 2-point calibration option of the Vernier data-collection program. Rinse the tip of the electrode in distilled water. Place the electrode into a pH buffer solution (e.g., pH 4). When the voltage reading displayed on the screen stabilizes, enter the pH value (e.g., 4).
- For the next calibration point, rinse the electrode with distilled water and place it into the second buffer solution (e.g., pH 7). When the displayed voltage stabilizes, enter the pH value (e.g., 7).

- If you are using Logger *Pro* or LabQuest App, you can go to the Storage tab in the Calibration dialog and save your new calibration right on the sensor. Your custom calibration will automatically be used each time you use the sensor.
- Rinse the electrode with distilled water and place it in the sample.

pH Buffer Solutions

In order to do a calibration of the Tris-Compatible Flat pH Sensor, or to confirm that a saved pH calibration is accurate, you need to have a supply of pH buffer solutions that cover the range of pH values you will be measuring. We recommend buffer solutions of pH 4, 7, and 10. Vernier sells a pH buffer kit (order code PHB). The kit has 12 tablets: four tablets each of buffer pH 4, 7, and 10. Each tablet is added to 100 mL of distilled or deionized water to prepare respective pH buffer solutions.

Maintenance and Storage

Short-term storage (up to 24 hours): Place the electrode in pH 4 or pH 7 buffer solution.

Long-term storage (more than 24 hours): Store the electrode in a pH 4 buffer/KCl storage solution in the storage bottle. The electrode is shipped in this solution. Vernier sells 500 mL bottles of replacement 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 buffer pH 4 solution.

When testing the Tris-Compatible Flat pH Sensor, it is best to place it into a known buffer solution. This allows you to see if the sensor is reading correctly (e.g., in a buffer pH 7, is the sensor reading close to pH 7). Do not place your sensor into distilled water to check for readings—distilled water can have a pH reading anywhere between 5.5 and 7.0, due to variable amounts of carbon dioxide dissolved from the atmosphere. 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 slightly off of the known buffer pH (e.g., reads 6.7 in a buffer 7), you may simply need to calibrate the sensor. You can calibrate the sensor in two buffer solutions for two calibration points. Instructions can be found on Page 3.

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.

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