

# O<sub>2</sub> Gas Sensor

## (Order Code O2-BTA)



The O<sub>2</sub> Gas Sensor can be used to monitor gaseous oxygen levels in a variety of biology and chemistry experiments. The sensor is intended for measuring gaseous, not aqueous, O<sub>2</sub> concentrations.

**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

- O<sub>2</sub> Gas Sensor
- 250 mL gas sampling bottle (Nalgene<sup>®</sup> bottle with lid)

### Compatible Software and Interfaces

See [www.vernier.com/manuals/o2-bta](http://www.vernier.com/manuals/o2-bta) for a list of interfaces and software compatible with the O<sub>2</sub> Gas Sensor.

### Quick Start

1. Plug the sensor into the interface (LabQuest 3, LabQuest Mini, etc.).
2. Connect the interface to your device.
  - If using USB, connect to the USB port on your computer.
  - If using Bluetooth<sup>®</sup> wireless technology, click your interface type and then select your device.
3. Prepare for data collection:
  - Vernier Graphical Analysis<sup>®</sup>: Launch the app, if necessary, and click Sensor Data Collection.
  - LabQuest<sup>®</sup> App: Choose New from the File menu.

The software will identify the sensor and load a default data-collection setup. You are now ready to collect data.

### Need Additional Information?

Visit the following link:

[www.vernier.com/start-lq-sensor](http://www.vernier.com/start-lq-sensor)

### Using the Product

Connect the sensor following the steps in the Quick Start section of this user manual. **Note:** For best results, keep the sensor upright as much as possible during use. Reading may drift if used in a horizontal position.

### Videos

View videos related to this product at [www.vernier.com/o2-bta](http://www.vernier.com/o2-bta)

### Calibration

For many measurements, it will not be necessary to calibrate the O<sub>2</sub> Gas Sensor. The sensor is shipped with a stored calibration. However, this calibration will drift over time, so periodic calibration is recommended.

A two-point calibration can be done following the procedure below.

1. Connect the sensor to your device following the instructions in the Getting Started section.
2. Open the Calibration menu and choose Calibrate Now.
3. Hold the sensor upright. Using a pointed object, such as a straightened paper clip, push and hold the zero button. The button is located on the side of the sensor next to CAL. The voltage should be less than 0.4 V when the button is depressed.
4. Enter a value of 0% for this reading. Select Keep.
5. Release the zero button.
6. Take a second reading. Keep the sensor upright and expose it to open air. The voltage should be 1.8 V or greater. If less than 1.8 V, see the Care and Maintenance section of this user manual.
7. Enter a value of 20.9% oxygen or a corrected value from the table in the Effect of Humidity section of this user manual. Select Keep.
8. Once finished, the sensor should now read 20.9% (or the value entered from the table).
9. Save the calibration to the sensor following the steps for the software you are using. For detailed instructions on calibration see the related links below.
  - For instructions on calibration using Logger *Pro* computer software, see [www.vernier.com/tit/2341](http://www.vernier.com/tit/2341)
  - For instructions on calibration using LabQuest App, see [www.vernier.com/tit/3394](http://www.vernier.com/tit/3394)
  - For instructions on calibration using Graphical Analysis, see [www.vernier.com/tit/3631](http://www.vernier.com/tit/3631)
  - For instructions on calibration using Graphical Analysis with an iOS or Android device, see [www.vernier.com/tit/3630](http://www.vernier.com/tit/3630)

### Effect of Humidity

Because the oxygen concentration varies with the amount of water vapor in the atmosphere, you may want to adjust your atmospheric oxygen calibration value to improve accuracy when using the O<sub>2</sub> Gas Sensor. The accepted value of 20.9% for atmospheric oxygen levels is calculated in dry air (0% humidity). If you know the relative humidity of the location at which you are calibrating, you can substitute one of the values below in place of 20.9%.

Relative humidity	0%	25%	50%	75%	100%
Oxygen in % by volume	20.9	20.7	20.5	20.3	20.1

## Specifications

Range	0–27% (0–270 ppt)
Accuracy	± 1% volume O <sub>2</sub> (at 760 mmHg)
Resolution	0.01%
Warm up time	< 5 seconds
Response time	90% of final reading in ~12 seconds
Output signal range	0.3 to 5 VDC; 2.7 to 3.8 VDC @ 21% O <sub>2</sub>
Output impedance	1 KΩ
Input voltage	5 VDC +/-0.25 VDC
Gas sampling mode	Diffusion
Normal operating temperature range	20 to 30°C
Storage temperature range	-20 to +60°C
Pressure range	0.5 to 1.5 atm
Pressure effect	Directly proportional $V_{\text{out}} = V_{\text{out}}(\text{standard}) \times (P/1013)$
Default calibration values	<ul style="list-style-type: none"><li>• slope: 6.6524 %/V</li><li>• intercept: -2.05%</li></ul>
Dimensions	Sensor tube: 45 mm length, 28 mm OD Total length: 135 mm

## Care and Maintenance

**Important:** The O<sub>2</sub> Gas Sensor must be stored upright when not in use. This is necessary to maintain the sensor. Failure to store upright will shorten the life of the sensor.

As your O<sub>2</sub> Gas Sensor ages, the readings will decrease. This is normal, as the chemicals in the electrochemical cell are depleted. It does not mean the sensor is no longer functional; rather, it simply requires that you perform a calibration and store it as described previously. Once the readings in air are below 12% prior to calibration, or 1.8 volts during calibration, the sensor should be replaced. You may choose to have your sensor refurbished and a new element installed, or you may purchase a new sensor.

For tips on how to extend the life of the O<sub>2</sub> Gas Sensor, see [www.vernier.com/til/2588](http://www.vernier.com/til/2588)

## How the Sensor Works

The Vernier O<sub>2</sub> Gas Sensor measures the oxygen concentration in the range of 0 to 27% using an electrochemical cell. The cell contains a lead anode and a gold cathode immersed in an electrolyte. Oxygen molecules entering the cell are electrochemically reduced at the gold cathode. This electrochemical reaction generates a current that is proportional to the oxygen concentration between the electrodes. The sensor output is a conditioned voltage proportional to the reaction current.

## Troubleshooting

- Even though the sensor responds rather quickly to changes in O<sub>2</sub> concentration, the gas has to diffuse into the electrochemical cell located at the top of the sensor shaft before any changes in concentration can be detected. Because the diffusion of a gas is a slow process, there can be some delay in readings.
- To collect data in a controlled environment, we recommend that you use the 250 mL Nalgene collection bottle that is included with your sensor. Place the tip of the sensor into the opening of the bottle and push the sensor into the bottle. When the sensor will go no further, you have a seal. **Very important:** Do not place the sensor into any liquid. The sensor is intended only for measuring gaseous, not aqueous, O<sub>2</sub> concentration.
- To collect data in a controlled environment and also use our CO<sub>2</sub> Gas Sensor, we recommend purchasing either the BioChamber 250 (250 mL capacity) or the BioChamber 2000 (2 L capacity). The BioChambers have two openings with grommets so that you can insert both the CO<sub>2</sub> Gas Sensor and the O<sub>2</sub> Gas Sensor to take measurements of the atmosphere inside the BioChamber simultaneously.

For more troubleshooting and FAQs, see [www.vernier.com/til/1421](http://www.vernier.com/til/1421)

## Repair Information

If you have watched the related product video(s), followed the troubleshooting steps, and are still having trouble with your O<sub>2</sub> Gas 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.

For information on common repairs for the O<sub>2</sub> Gas Sensor, see [www.vernier.com/til/1605](http://www.vernier.com/til/1605)

## Accessories/Replacements

Item	Order Code
BioChamber 250	BC-250
BioChamber 2000	BC-2000
250 mL Nalgene Bottle w/Lid	CO2-BTL

The BioChambers have two openings with grommets so that you can insert both the CO<sub>2</sub> Gas Sensor and the O<sub>2</sub> Gas Sensor to take measurements of the atmosphere inside the BioChamber simultaneously.

## Warranty

Warranty information for this product can be found on the Support tab at [www.vernier.com/o2-bta](http://www.vernier.com/o2-bta)

General warranty information can be found at [www.vernier.com/warranty](http://www.vernier.com/warranty)



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