

Wireless Oxygen Gas Sensor

PS-3217

Introduction

The Wireless Oxygen Gas Sensor measures oxygen gas concentration in percent (%) and parts per million (ppm) oxygen. The sensor also measures temperature, relative humidity, and absolute humidity. It can be used to study cellular respiration, photosynthesis, air quality, oxygen cycling, and the rate of oxygen production in chemical reactions.

Components

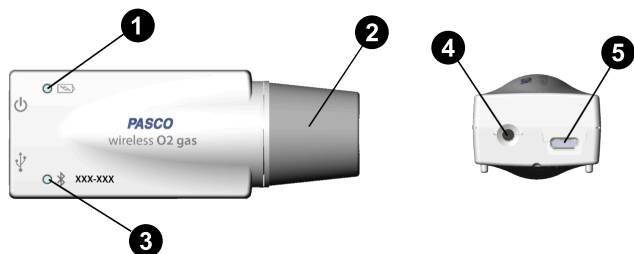
Included hardware:

- Wireless Oxygen Gas Sensor (PS-3217)
- Oxygen Gas Sensing Element (PS-3606), in storage bottle
- 250 mL Sample Bottle (SE-6938)
- Micro USB cable (PS-3584)

Required equipment:

- PASCO Capstone or SPARKvue data collection software

Features:



1 Battery Status LED

Indicates the charge level and status of the sensor's battery.

Battery LED	Status
Red blink	Low power
Yellow ON	Charging
Green ON	Fully charged

2 Stopper


Used to firmly connect the sensor to the bottle containing the sample, allowing measurements to be taken without contaminating the sample.

3 Bluetooth Status LED

Indicates the status of the sensor's Bluetooth connection.

Bluetooth LED	Status
Red blink	Ready to pair
Green blink	Connected
Yellow blink	Logging data

For more information on remote data logging, see the PASCO Capstone or SPARKvue online help.

 **NOTE:** The Bluetooth Status LED is disabled when the sensor is connected to a computer via micro USB cable.

4 ON/OFF button

Press to turn the sensor on. Press and briefly hold to turn the sensor off. To preserve battery, the sensor automatically turns itself off after several minutes of inactivity if not connected.

5 Micro USB port

Use this with the included micro USB cable to connect the sensor to a USB charger. The port and cable can also be used to directly connect the sensor to a computer without the use of Bluetooth. Note that this connection message is not supported by iOS.


Get the software

You can use the sensor with SPARKvue or PASCO Capstone software. If you're not sure which to use, visit [pasco.com/products/guides/software-comparison](https://www.pasco.com/products/guides/software-comparison).

SPARKvue is available as a free app for Chromebook, iOS, and Android devices. We offer a free trial of SPARKvue and Capstone for Windows and Mac. To get the software, go to [pasco.com/downloads](https://www.pasco.com/downloads) or search for **SPARKvue** in your device's app store.


If you have installed the software previously, check that you have the latest update:

 **SPARKvue:** Main Menu  > Check for Updates


 **PASCO Capstone:** Help > Check for Updates

Check for a firmware update

SPARKvue

1. Press the power button until the LEDs turn on.
2. Open SPARKvue, then select **Sensor Data**.

3. From the list of available devices, select the sensor that matches your sensor's device ID.
4. A notification will appear if a firmware update is available. Click **Yes** to update the firmware.
5. Close SPARKvue once the update is complete.

PASCO Capstone

1. Press the power button until the LEDs turn on.
2. Open PASCO Capstone and click **Hardware Setup** in the Tools palette.


3. From the list of available wireless devices, select the sensor that matches your sensor's device ID.
4. A notification will appear if a firmware update is available. Click **Yes** to update the firmware.
5. Close Capstone once the update is complete.

Using the sensor for the first time

Perform the steps below when using the sensor for the first time. Detailed steps of each procedure are found in subsequent sections.

1. Install the sensing element.
2. Charge the battery.
3. Connect the sensor to PASCO Capstone or SPARKvue.
4. Calibrate the sensor.

Install the sensing element

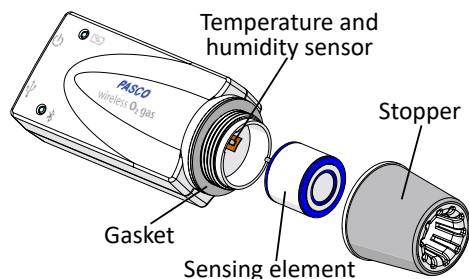


Figure 1. Installing the sensing element.

1. Turn the stopper counterclockwise to remove the stopper from the sensor. Keep the gasket attached to the sensor. (See Figure 1.)
2. Remove the sensing element from the storage bottle, then connect it to the sensor. Do NOT touch the membrane on top of the sensing element.

NOTE: Make sure that the temperature and humidity sensor does not get wedged under the sensing element! The temperature and humidity sensor should sit between the sensing element and the circular wall of the sensor.

3. Attach the stopper back onto the sensor.

Charge the battery

Charge the battery by connecting the micro USB port to any standard USB charger. The Battery Status LED is solid yellow while charging. When fully charged, the LED changes to solid green.

Set up the software

SPARKvue


Connecting the sensor to a tablet or computer via Bluetooth:

1. Turn on the Wireless Oxygen Gas Sensor. Check to make sure the Bluetooth Status LED is blinking red.
2. Open SPARKvue, then click **Sensor Data**.
3. From the list of available wireless devices on the left, select the device which matches the device ID printed on your sensor.

Connecting the sensor to a computer via micro USB cable:


1. Open SPARKvue, then click **Sensor Data**.
2. Connect the provided micro USB cable from the micro USB port on the sensor to a USB port or powered USB hub connected to the computer. The sensor should automatically connect to SPARKvue.

Collecting data using SPARKvue:


1. Select the measurement you intend to record from the **Select measurements for templates** column by clicking the check box next to the relevant measurement's name.
2. Click **Graph** in the **Templates** column to open the Experiment Screen. The graph's axes will auto-populate with the selected measurement versus time.
3. Click **Start**  to begin collecting data.

PASCO Capstone



Connecting the sensor to a computer via Bluetooth:

1. Turn on the Wireless Oxygen Gas Sensor. Check to make sure the Bluetooth Status LED is blinking red.
2. Open PASCO Capstone, then click **Hardware Setup**  in the **Tools** palette.
3. From the list of **Available Wireless Devices**, click the device which matches the device ID printed on your sensor.

Connecting the sensor to a computer via micro USB cable:

1. Open PASCO Capstone. If desired, click **Hardware Setup**  to check the connection status of the sensor.
2. Connect the provided micro USB cable from the micro USB port on the sensor to a USB port or powered USB hub connected to the computer. The sensor should automatically connect to Capstone.

Collecting data using Capstone:

1. Double-click the **Graph**  icon in the **Displays** palette to create a new blank graph display.
2. In the graph display, click the **<Select Measurement>** box on the y-axis and select an appropriate measurement from the list. The x-axis will automatically adjust to measure time.
3. Click **Record**  to begin collecting data.

Calibrate the sensor

The sensor should be calibrated before being used for the first time, as well as if the O₂ Concentration reading for an atmospheric sample ever differs from 20.9% by more than $\pm 1\%$. Other than this, it is not necessary to calibrate the sensor each time the sensor is used.


NOTE: For a more detailed calibration guide, see the PASCO Capstone or SPARKvue online help.

SPARKvue

1. Connect the sensor to SPARKvue and set up data collection as described previously. Ensure that **O₂ Concentration** is the selected measurement.
2. Collect an atmospheric air sample (see **Collecting samples**).

- From the Live Data Bar in the bottom left of the Experiment Screen, click **O₂ Concentration**, then select **Calibrate measurement** from the list.
- Make sure the following options are selected, then click **Continue**.
 - Sensor:** Wireless Oxygen Gas Sensor
 - Measurement:** O₂ Concentration (%)
 - Calibration Type:** 1 point (Adjust Slope Only)
- The sample should contain a known concentration of 20.9% oxygen. Enter **20.9** into the **Standard Value** box, then click **Set Calibration**.
- Review your new calibration, then click **OK**.

PASCO Capstone


- Connect the sensor to Capstone as described previously.
- Collect an atmospheric air sample (see **Collecting samples**).
- Click **Calibration**  in the **Tools** palette. Select **Concentration** from the dropdown list, then click **Next**.
- Ensure that **One Standard (1 point slope)** is selected from the list of calibration options, then click **Next**.
- The sample should contain a known concentration of 20.9% oxygen. Enter **20.9** into the **Standard Value** box, then click **Calibrate second point**.
- Review your new calibration, then click **Finish**.

Collecting samples

The sensing element will measure stable readings under constant temperature and pressure. Avoid charging the sensor while collecting data, as the charging process generates heat.

For best results, before collecting data:

- Charge the sensor until the battery is full.
- Turn on the sensor and wait 3 minutes for it to reach equilibrium.

 **NOTE:** Do NOT allow the sensor to come into contact with liquids. Do not clean the sampling bottle in a dishwasher or autoclave.

Collecting an atmospheric air sample

Perform this procedure outside of a building to ensure that your sample contains fresh air.

- Hold the sample bottle upright and open to the air.
- Insert the stopper of the sensor into the bottle to seal the bottle.

Collecting expired air or other gas samples

- Place the sensor inside a plastic bag.
- Press as much atmospheric air as possible out of the bag.
- Using a tube, fill the bag with the gas sample.
- Seal the bag closed around the tube to contain the gas sample and exclude atmospheric air.

Storage

The lifetime of the sensing element is affected by several factors, including storage temperature, pressure, and availability of oxygen. The stopper should be covered with the included sample bottle or sensing element storage bottle when not in use. This will limit the sensing element's exposure to oxygen and thus maximize the lifetime of the sensing element.

How the sensor works

The oxygen sensing element is a galvanic fuel cell with a gas-permeable membrane at one end. The fuel cell contains an electrolyte, anode, and cathode. When oxygen enters the fuel cell through the membrane, a chemical reaction occurs between the metallic cathode and anode and the electrolyte. This chemical reaction produces a voltage, which is proportional to the concentration of oxygen present.

About the battery

The Wireless Oxygen Gas Sensor's battery is partially charged at the factory. If the battery status LED blinks red, use the micro USB cable to connect the sensor to a USB port or USB charger.

Maximizing battery life

One factor that affects battery life is the storage temperature. Therefore, to maximize battery life, avoid storing the sensor in very cold or very hot environments.

Software help

The SPARKvue and PASCO Capstone Help provide information on how to use this product with the software. You can access the help from within the software or online.

SPARKvue

Software: Main Menu > Help

Online: help.pasco.com/sparkvue

PASCO Capstone

Software: Help > PASCO Capstone Help

Online: help.pasco.com/capstone

Specifications and accessories

Visit the product page at pasco.com/product/PS-3217 to view the specifications and explore accessories. You can also download experiment files and support documents from the product page.

Experiment files

Download one of several student-ready activities from the PASCO Experiment Library. Experiments include editable student handouts and teacher notes. Visit pasco.com/freelabs/PS-3217.

Technical support

Need more help? Our knowledgeable and friendly Technical Support staff is ready to answer your questions or walk you through any issues.

-  Chat [pasco.com](https://www.pasco.com)
-  Phone 1-800-772-8700 x1004 (USA)
+1 916 462 8384 (outside USA)
-  Email support@pasco.com

Limited warranty

For a description of the product warranty, see the Warranty and Returns page at www.pasco.com/legal.

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Product end-of-life disposal



This electronic product is subject to disposal and recycling regulations that vary by country and region. It is your responsibility to recycle your electronic equipment per your local environmental laws and regulations to ensure that it will be recycled in a manner that protects human health and the environment. To find out where you can drop off your waste equipment for recycling, please contact your local waste recycle or disposal service, or the place where you purchased the product. The European Union WEEE (Waste Electronic and Electrical Equipment) symbol on the product or its packaging indicates that this product must not be disposed of in a standard waste container.

CE statement

This device has been tested and found to comply with the essential requirements and other relevant provisions of the applicable EU Directives.

FCC statement

This device complies with part 15 of the FCC Rules. Operation is subject to the following two conditions:

(1) This device may not cause harmful interference, and (2) this device must accept any interference received, including interference that may cause undesired operation.

Battery disposal



Batteries contain chemicals that, if released, may affect the environment and human health. Batteries should be collected separately for recycling and recycled at a local hazardous material disposal location adhering to your country and local government regulations. To find out where you can drop off your waste battery for recycling, please contact your local waste disposal service, or the product representative. The battery used in this product is marked with the European Union symbol for waste batteries to indicate the need for the separate collection and recycling of batteries.