Polarimeter
PS-3237

Introduction

The Polarimeter can be used with PASCO sample cells to analyze chiral compounds. By passing plane-polarized light through a vertical sample of the compound, the optical rotation of the light by the compound can be determined.
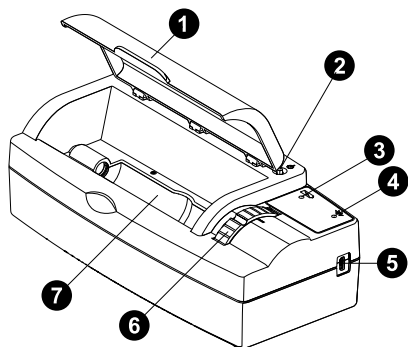
Equipment

Included equipment:

- Polarimeter
- Sample cell
- USB cable

Required item:

- SPARKvue or PASCO Capstone data collection software

Features

❶ Lid

Keep closed during data collection to block ambient light.

❷ Power button

Press and briefly hold to turn the Polarimeter on or off.

❸ Battery Status LED

Indicates the charge status of the Polarimeter's internal battery.

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

❹ Bluetooth Status LED

Indicates the status of the Bluetooth connection.

Bluetooth LED	Status
Red blink	Ready to pair
Green blink	Connected

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

❺ USB port

Use with the provided USB cable to connect the Polarimeter to a computer or USB charger.

❻ Analyzer wheel

Turn to rotate the polarization disk analyzer.

❼ Chamber

For holding the sample cell while collecting data.

Initial step: 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.

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.

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 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:** Go to Main Menu ☰ and select **Check for Updates**.

⬚ **PASCO Capstone:** Open the **Help** menu and click **Check for Updates**.

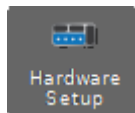## Check for a firmware update

⊡ **SPARKvue**

1. Press the power button until the LEDs turn on.

2. Open SPARKvue, then select **Sensor Data** on the Welcome Screen.

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** from 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.

Set up the software

The Polarimeter can be connected to PASCO Capstone or SPARKvue using a USB or Bluetooth connection.

> 🖉 **NOTE:** USB connection is not supported by iOS or certain Android devices.

⠿ SPARKvue

1. Turn on the Polarimeter.

2. Open SPARKvue, then click **Sensor Data**.

3. Connect the Polarimeter through one of the following methods:
   - USB: Connect the Polarimeter's USB port to your device using the provided USB cable.
   - Bluetooth: Select the sensor matching the device ID printed on your Polarimeter from the list of available wireless devices.

4. From the **Select Measurements for Templates** column, check the box next to the measurement(s) you want to display.

5. Select **Intensity vs Angle** from the **Quick Start Experiments** column.

6. Click **Start** 🟢 to begin recording data.

☁ PASCO Capstone

1. Turn on the Polarimeter.

2. Open Capstone, then select **Hardware Setup** from the **Tools** palette.

3. Connect the Polarimeter through one of the following methods:
   - USB: Connect the Polarimeter's USB port to your device using the provided USB cable.
   - Bluetooth: Select the sensor matching the device ID printed on your Polarimeter from the **Available Wireless Devices** list.

4. Select **Intensity vs Angle** from the list of Quick Start Experiments in the main window.

5. Click **Record** 🔴 to begin recording data.

Prepare the sample cell

The sample cell holds the substance to be analyzed. To prepare the sample cell:

1. Remove the cap from one end of the sample cell by rotating it counterclockwise. Pull off the quartz window holder, then remove the quartz window under the cap.

2. Fill the sample cell to the top with the substance to be analyzed.

3. Replace the quartz window on the sample cell, with the rubber ring facing *away* from the cell, then place the holder on top of the window. Place the cap on top of the holder and rotate clockwise until finger-tight.

4. Gently tap the sample cell to ensure any air bubbles in the sample move into the protuberance.

5. Place the sample cell into the chamber. Position the cell as far to the right (as close to the analyzer wheel) as possible.

> 🖉 **NOTE:** The orientation of the sample cell has a small but noticeable effect on the measured light intensity. Therefore, for repeatability, make sure the sample cells are always inserted in the same direction throughout your experiment.

Measuring optical angle of rotation

The Polarimeter is used to measure the rotation of plane-polarized light by optically active chiral compounds. The angle of rotation can be measured by finding the angle at which the maximum amount of light passes through the sample and comparing that angle to an optically inactive substance, such as distilled water. These steps provide a simple method for obtaining this value for a test solution.

1. Connect the Polarimeter to SPARKvue or PASCO Capstone. Select the **Intensity vs Angle** Quick Start Experiment.

2. Prepare and insert a sample cell containing distilled water.

3. Start data collection, then slowly rotate the analyzer to collect data between 0° and 360°. Stop data collection when you are finished.

4. Use a Gaussian fit to find the first angle of maximum intensity. To do this, follow the steps below for your chosen program:
   - ⠿ **SPARKvue:**
     a. Open the **Tools Drawer** 📈 and switch the Cursor Mode to **Select** 🔲.
     b. Draw a box over the peak of maximum intensity. Move or resize the box as needed to capture the entire peak.
     c. Select the selection box, then select **Curve Fit** 📈.
     d. Select **Gaussian Fit**, then select **OK**.
     e. The angle of the peak is indicated by the *c* parameter in the Gaussian equation. Record this value for later.
   - ☁ **PASCO Capstone:**
     a. Select the **Data Highlighter** 🖊 tool in the Graph toolbar.
     b. Move and resize the selection box to highlight the peak of maximum intensity.

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c. Click the selection box, then click **Curve Fit** 〰 and select **Gaussian**.

d. The angle of the peak is indicated by the x_0 parameter in the Gaussian equation. Record this value for later.

5. Repeat Steps 3 through 5 with a sample cell containing your test substance.

6. Calculate the difference between the two recorded angles of maximum intensity.

The difference between the angles is the *angle of rotation* of the sample. For the most accurate results, find the angle of rotation for a solution at multiple different concentrations.

Software help

The SPARKvue and PASCO Capstone Help provide information on how to use this product with the software.

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-3237 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-3237.

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

☎ 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.