

General Flow Sensor

PS-2222

Introduction

The General Flow Sensor is a versatile device used to measure differential pressure in air or water. To do so, the sensor measures the difference in pressure between the two input tubes.

The sensor is designed to work with the Venturi Tube (ME-2220) or the Pitot Tube (ME-2221). These tubes attach to the General Flow Sensor by way of a flexible twin hose. The connectors on the sensor are reversed from the connectors on the Venturi Tube and Pitot Tube to make sure they cannot be attached incorrectly.

Using PASCO data collection software, you can select which device is attached to the sensor and what fluid (air or water) is flowing through the device. Once these selections are made, the sensor measures pressure and calculates values of flow velocity or volumetric flow (assuming standard temperature and pressure). Both metric and non-metric units can be selected for the measurements.

Components

Included components:

- General Flow Sensor
- PASPORT Sensor Extension Cable (PS-2500)

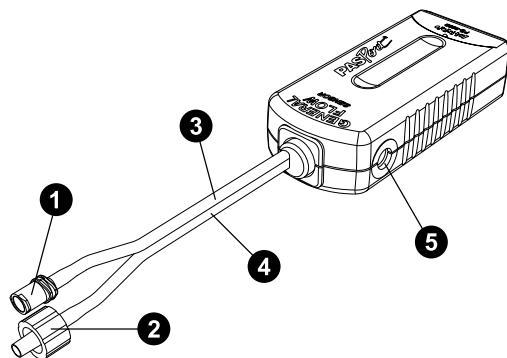
Required equipment:

- PASPORT interface
- PASCO Capstone or SPARKvue data collection software
- Either of the following accessories:
 - Venturi Tube (ME-2220)
 - Pitot Tube (ME-2221)

Recommended equipment:

- Pressure Tap (ME-2224)

Features



- 1 Luer plug, female
- 2 Luer barb, male
- 3 Low pressure tube
- 4 High pressure tube
- 5 Threaded hole (1/4-20)

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).

A browser-based version of SPARKvue is available for free on all platforms. 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 Update

Critical use considerations

Maximum operating pressure

Do not subject the sensor to gauge pressures greater than 29 pounds per square inch (psi) or 200 kilopascals (kPa). Exposure to greater pressures will cause permanent damage to the sensor. Do not use the sensor to measure flow in systems pressurized to more than 29 psi. (Note that municipal water systems normally exceed this value.)

Maximum differential pressure

The maximum differential operating pressure between the high pressure and low pressure inputs is 7.25 psi, or 50 kPa. Differential pressures greater than 7.25 psi may permanently damage the sensor, causing inaccurate measurement.

High pressure/low pressure reversal

Do NOT operate the sensor with higher pressure applied to the low pressure port than to the high pressure port. Doing so may cause permanent damage to the sensor.

Changing fluid use

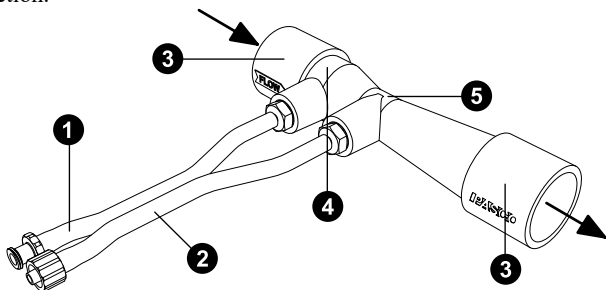
Care must be taken when changing from measurement in liquids to measurement in gases. It is normal for small amounts of liquid to migrate into the hoses during use. The chance of this can be minimized by making sure the hoses are securely attached to the sensor before liquids are introduced to the system. The large diameter of the Venturi Tube and Pitot Tube hoses minimizes capillary flow. You can also help limit fluid migration by placing a high point in the hoses above the fluid level in the systems.

After fluid use, carefully blow into the hoses from the Venturi or Pitot Tube to clear out any migrated fluid, then dry the hoses prior to using the sensor to measure a gas such as air. Fluid left in the line may obstruct flow, causing inaccurate measurement. Fluid may also vaporize during use, which would also cause inaccurate measurement of flow.

About the tubes

Venturi Tube (ME-2220)

The Venturi Tube allows the General Flow Sensor to measure the fluid pressure in two areas of different diameters and calculate the speed from the difference in pressure. The tube is designed to be used with standard 3/4-inch (1.91 cm) diameter PVC pipe. The diagram below shows the components of the Venturi Tube, with the arrows indicating the flow direction.

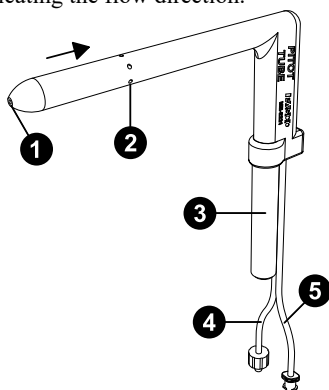


- ❶ High pressure tube (0.91 m length)
- ❷ Low pressure tube (0.91 m length)
- ❸ Slip joints
- ❹ Inlet area ($3.44 \times 10^{-4} \text{ m}^2$ cross-section)
- ❺ Throat area ($1.24 \times 10^{-4} \text{ m}^2$ cross-section)

The plastic used in the Venturi Tube is compatible with standard PVC glues. For best results, glue the tube into a piping network to measure flow rates. Alternatively, the tube may be temporarily placed in a piping network using tape.

Pitot Tube (ME-2221)

The Pitot Tube is designed to measure flow velocity in open channels. The tube has a detachable handle connected to a 1/4-20 nut. The overall hose length is six feet (1.82 m). The tube with the male luer plug is for low pressure measurement, and the other tube is for high pressure measurement. The diagram below shows the features of the Pitot Tube, with the arrow indicating the flow direction.



- ❶ Fluid inlet
- ❷ Static taps (evenly spaced around circumference)
- ❸ Handle
- ❹ Low pressure tube
- ❺ High pressure tube

Hardware setup

1. Connect the Venturi Tube, Pitot Tube, or another appropriate accessory to the General Flow Sensor.
2. Attach the tube into the system you intend to measure so that fluid can flow through it. Do not allow fluid to actually begin flowing until after the tube is securely mounted into the system.
3. Plug the General Flow Sensor into one of the PASPORT ports on your chosen PASPORT interface. (If additional range is required, you can instead plug the sensor into the included Sensor Extension Cable and plug the other end of the cable into the interface.)

Software setup

SPARKvue

1. Start SPARKvue, then select **Sensor Data**. The program will automatically detect and recognize the General Flow Sensor.
2. In the **Select Measurements for Templates** column, check the box next to the measurement for which you intend to collect data.
3. Select a template from the list of options in the **Templates** column to open the Experiment Screen. The display will automatically be populated with the chosen measurement.
4. Select the live data bar for the chosen measurement, then select **Configure Sensor**.
5. Select the box next to the **Density** parameter, then choose **Water**, **Air**, or **User Defined** from the dropdown list as needed for your experiment. The last option should only be selected if a fluid other than water or air of typical density will pass through the tube.
6. If you selected **User Defined**, enter the density of the fluid that will pass through the tube in the box below the previous field.
7. Select **OK** to return to the Experiment Screen.
8. Introduce fluid to the pipe, but do not allow it to flow freely yet.
9. Select the live data bar again and select **Zero Sensor Now** to zero the measurement. Do *not* allow fluid to flow through the pipe while zeroing. This step should be repeated before each run of data to prevent zero drift due to changes in temperature, position, or hose placement.
10. Allow fluid to begin flowing through the pipe, then select **Start** to begin collecting data.

PASCO Capstone

1. Start PASCO Capstone. The program will automatically detect and recognize the General Flow Sensor.
2. Select **Hardware Setup** from the **Tools** palette on the left, then select **Properties** next to the General Flow Sensor's name.
3. Select the box next to the **Density (kg/m^3)** parameter, then select **Water**, **Air**, or **User Defined** from the list of options as needed for your experiment. The last option should only be selected if a fluid other than water or air of typical density will pass through the tube.
4. If you selected **User Defined**, enter the density of the fluid that will pass through the tube in the box below the previous field.

5. Select **OK** to close the Properties menu.
6. Create an appropriate display for your data by selecting the desired icon from the **Displays** palette on the right. Click each **<Select Measurement>** box and choose a measurement from the displayed list.
7. Select **Zero Sensor Now**  on the **Controls** palette to zero the measurement. Do *not* allow fluid to flow through the pipe while zeroing. This step should be repeated before each run of data to prevent zero drift due to changes in temperature, position, or hose placement.
8. Allow fluid to begin flowing freely through the pipe, then select **Record**  to begin collecting data.

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 <http://pasco.com/product/PS-2222> 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 student handouts and teacher notes. Visit pasco.com/freelabs/PS-2222.

Technical support

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

 Web	pasco.com/support
 Chat	pasco.com
 Email	support@pasco.com
 Phone	1-800-772-8700 x1004 (USA) +1 916 462 8384 (outside USA)

Limited warranty

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

Copyright

This document is copyrighted with all rights reserved. Permission is granted to non-profit educational institutions for reproduction of any part of this manual, providing the reproductions are used only in their laboratories and classrooms, and are not sold for profit. Reproduction under any other circumstances, without the written consent of PASCO scientific, is prohibited.

Trademarks

PASCO and PASCO scientific are trademarks or registered trademarks of PASCO scientific, in the United States and in other countries. All other brands, products, or service names are or may be trademarks or service marks of, and are used to identify, products or services of, their respective owners. For more information visit www.pasco.com/legal.

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.