Spirometer
Product Number: ENSPR-AD037

Overview
The Spirometer is a breathing sensor designed to conduct physiology experiments. Based on air speed, the Spirometer calculates the airflow rate and lung capacity of a subject who is breathing into the sensor. By default, the results are shown in liters per minute.

The Spirometer can be connected to all types of einstein™ data loggers.

Typical experiments

**Biology**
- Investigate the lung capacity of athletes versus non-athletes
- Compare lung capacity of smokers versus lung capacity of non-smokers
- Conduct respiratory experiments
How it works
The Spirometer contains an extremely sensitive pressure sensor and a unique breath sensor tube. A small disc inside the tube creates a narrow area. When air travels through the tube, pressure is created on one side of the disc and a vacuum on the other side. The pressure sensor senses this pressure and changes the output voltage. The Analog-Digital converter translates the voltage and sends this data to the software where the information is displayed and recorded. Note that when air travels through the tube in the opposite direction, the sensor will measure a negative value.

Sensor specification
| Range: | ± 315 L/min |
| Accuracy: | ±8 % over entire range |
| Resolution (12-bit): | 0.16 L/min |
| Default Sampling Rate: | 10 samples per second |

Note: sensor cables sold separately

Technical Note
Note: Be careful to thoroughly clean the plastic nozzle whenever changing test subjects.

Calibration

MiLAB
Set Zero Calibration
1. Tap the Setup button next to the sensor’s name
2. Flip the Set as Zero switch to set the current value as the zero or base value.

One Point Calibration
1. Tap the Setup button next to the sensor’s name
2. Tap Manual Calibration

3. Measure a known volume and enter this known value in the Real Reading field (A syringe is ideal for this)
4. Wait for the readings to stabilize
5. Tap the lock button
6. Tap Calibrate

**MiLAB Desktop**

*One Point Calibration*

1. Go to the Full Setup window and in the Calibrate column click Set

2. The Calibration window will appear
3. Measure a known volume and enter this known value in the Real Reading field (A syringe is ideal for this)
4. Measure the substance and wait for the readings to stabilize.
5. Click the lock icon
6. Click Calibrate

**Data logging and analysis**

**MiLAB™**

1. Take your einstein™ Tablet OR pair your einstein™LabMate with your Android or iOS tablet via Bluetooth
2. Insert the sensor cable into one of the sensor ports
3. Launch MiLAB
4. MiLAB will automatically detect the sensor and show it in the Launcher View
5. Make sure the icon next to the sensor is checked to enable it for logging
6. Tap the Setup icon to calibrate the sensor or change the units of measurement

**MiLAB™ Desktop**

www.einsteinworld.com
1. Pair your einstein™LabMate with your PC, MAC, or Linux machine via Bluetooth, or connect it via the USB cable (found in the einstein™LabMate™ box).
2. Insert the sensor cable into one of the sensor ports
3. Launch MiLAB
4. MiLAB will automatically detect the sensor and show it in the Current Setup Summary window

![Current Setup Summary](image)

5. Click Full Setup, located at the bottom of the Current Setup Summary window to program the data logger’s sample rate, number of samples, units of measurement, and other options

![Full Setup](image)

6. Click the Run button ( ) on the main toolbar of the Launcher View to start logging

**Experiment set up**
The Spirometer comes with:
- One Spirometer
- One package washable plastic nozzles

**An important note about adaptors**
When using The Spirometer, you must use an Einstein “DT-to-EN” adaptor in order to plug into einstein™ devices.

**An example of using the Spirometer**

[www.einsteinworld.com](http://www.einsteinworld.com)
Breathing at rest
For this experiment you will need:
- A Spirometer
- Washable nozzles
- A test subject

1. Connect the Spirometer to the your einstein™ device or Lab Mate.
2. Select Run.
3. Ask the subject to exhale through the plastic nozzle.
4. Select Stop.
5. Use the integral function to calculate exhaled air volume.

Troubleshooting
If the Spirometer isn’t automatically recognized by MiLAB, please contact Fourier Education’s technical support.

Technical support
For technical support, you can contact the Fourier Education’s technical support team at:
Web: www.einsteinworld.com/support
Email: support@fourieredu.com
Phone (in the US): (877) 266-4066

Copyright and Warranty
All standard Fourier Systems sensors carry a one (1) year warranty, which states that for a period of twelve months after the date of delivery to you, it will be substantially free from significant defects in materials and workmanship.
This warranty does not cover breakage of the product caused by misuse or abuse.
This warranty does not cover Fourier Systems consumables such as electrodes, batteries, EKG stickers, cuvettes and storage solutions or buffers.