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# Spirometer

## Product Number: ENSPR016



## Overview

The Spirometer is a breathing sensor designed to conduct physiology experiments. 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 and/or lungs volume.

The Spirometer can be connected to all types of einstein™ Tablets, einstein™LabMate™.

## Typical experiments

Biology

- Exploring the lung capacity of athletes versus non-athletes
- Compare lung capacity of smokers versus lung capacity of non-smokers
- Conduct respiratory rate 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 Flow Rate: | ± 10 L/sec |
| Volume | 0-6 L |
| Resolution(bit) | 0.005 L/sec |
| Default Sampling Rate: | 25 samples per second |

Note: sensor cables sold separately

## Technical Note

Be careful to thoroughly clean the plastic nozzle whenever changing test subjects.
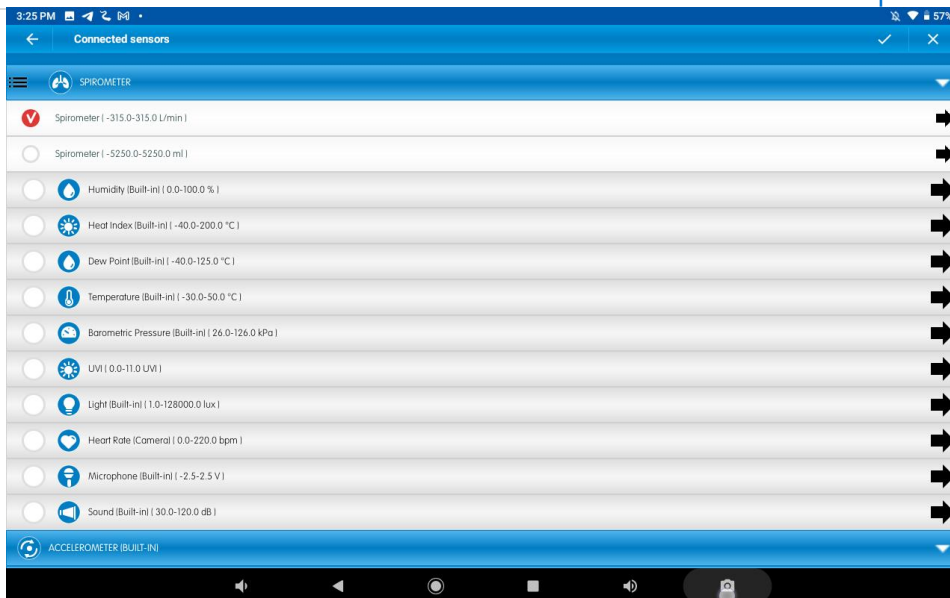
## Calibration

The device performs an automat calibration within the first 2 seconds of the experiment.
No extra calibration is required.
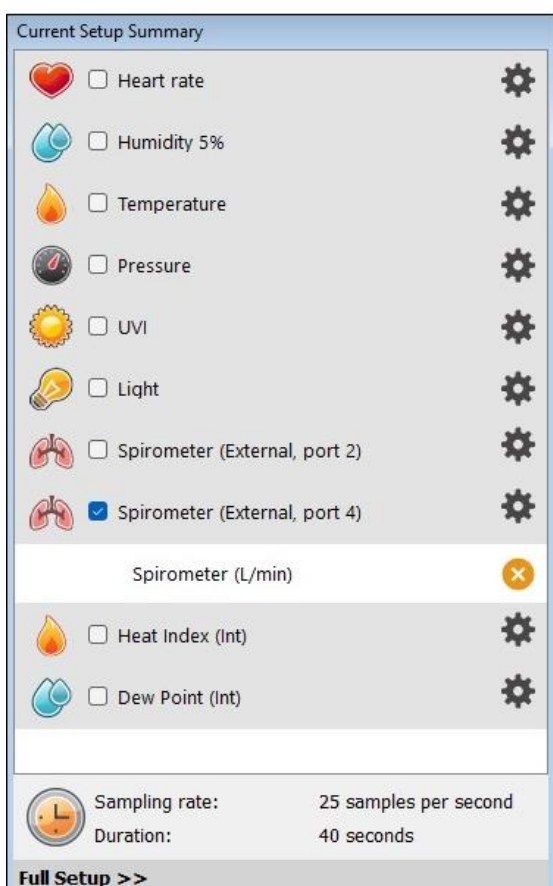
## Data logging and analysis

### Android

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 MiLABEx and then tap LAB start an Experiment
4. Go to Sensors
5. Make sure the desired measurement is selected and then tap V to save selection

6. You are ready to start an Experiment

7. Tap on Run

8. Wait 2 seconds and then exhale through the relevant pipe.

## Desktop

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 MiLABEX and then click on LAB start an Experiment

4. Make sure the sensor is selected. On the sensors list

5. Set your desired settings: the data logger's sample rate, number of samples, units of measurement, and other options

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

7. Wait 2 seconds and then exhale through the relevant pipe.

## Experiment set up

The Spirometer comes with:

- One Spirometer
- One washable plastic nozzles


## An example of using the Spirometer

### Breathing at rest compared to breathing after exertion

For this experiment you will need:

- A Spirometer
- Washable nozzle
- A test subject


The Experiment

1. Connect the Spirometer to the your einstein™ device or LabMate.
2. Set the experiment for the duration of 1 minute.
3. Select Run.
4. Wait for 2 seconds and then, Ask the subject to breathe through the plastic nozzle for one minute.
5. The experiment ends automatically after one minute.
6. The graph displayed represents the breathing rate at rest.
7. Have the subject run 100 meters.
8. Select Run.
9. Ask the subject to breathe through the plastic nozzle for one minute.
10. The experiment ends automatically after one minute.
11. The graph displayed represents the breathing rate after exertion


## Troubleshooting

If the Spirometer isn't automatically recognized by MiLABEx, 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.

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