databot™ Sensor Starters
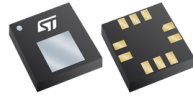
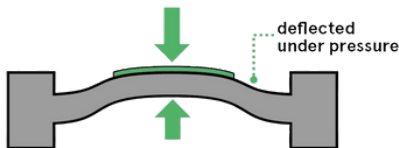Air Pressure

Meet the Air Pressure Sensor

This sensor detects **pressure** and converts it to **barometric** or **air pressure.** Various types of pressure sensors exist utilizing different materials and methods based on the pressure values to be measured. A sensor that detects **atmospheric pressure** is also called a **barometric pressure sensor**. They are commonly used in GPS applications, weather station equipment, and sports watches.

What Does it Measure?

The **air pressure** sensor measures **atmospheric pressure** also called **barometric pressure**. The atmosphere is a layer of air wrapped around the earth. This air has mass and gravity exerts an attractive force on it creating **weight.** **Air pressure** then is the weight of air pressing against everything it touches.

How Does it Work?

The **air pressure** sensing element consists of a suspended membrane. When pressure is applied the membrane deflects creating an imbalance. The onboard integrated circuit (IC) then converts the imbalance signal received into digital output representing **atmospheric pressure**. Wow!

deflected under pressure

What Are the Units for Pressure?

Atmospheric pressure is measured in **hPa** and **PSI**. hPa is the abbreviated name for hectopascal pressure units which is exactly equal to **millibar** pressure unit. **PSI** is the abbreviated name for pounds per square inch, the pressure resulting from a force of one pound applied to an area of one square inch.

PSI	hPa
1 PSI	68.95 hPa

Important Terms

Air, Atmospheric, or Barometric Pressure: The pressure generated by the amount of atmosphere above you.

HectoPascals (hPa) / Millibars: Metric units used by meteorologists to express **air pressure.**

PSI: Pounds Per Square Inch - the pressure resulting from one pound of force applied to one square inch.

Grades: 6 & Up
Time: 15 Minutes - PDQ 1 & 2
Subject: Physics, Technology
Topics: Atmospheric Pressure, Barometer, Deflection, and IC.

What You Will Need/Prep

- databot™ 2.0 & a smart device (iOS or Android).
- Read the Vizeey™ Fast Start Guide and install Vizeey™ if you haven't already.
- Scan the QR code for Air Pressure if you don't have it already.

Air Pressure
You are under pressure! Ai...
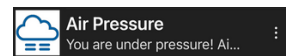
Where Does it Live?

The **air pressure** sensor is a black square chip with a tiny silver square in it. Look closely near the Temp1 port on databot™ for the Pressure label and you will see it!
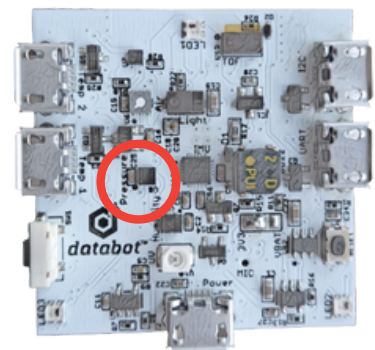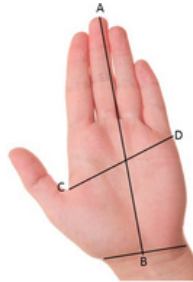
☁ Air Pressure

PDQ1 : Weight of Air!

Using the databot™ **air pressure** sensor it is possible to measure the **atmospheric pressure** and the "weight" of air on surfaces. Stretch our your palm in front of you, how much do you think the air pressing down on it weighs? Let's use databot™ and find out!

1. Tap on **Air Pressure** in Vizeey™ to load the experiment & use these icons to start and to pause the experiment: ▶ ⏸

2. Hold databot™ flat on your extended palm and record the **air pressure** in PSI.

3. Find the approximate area of your palm by measuring the length and width in inches as shown. Multiply length times width to get area!

4. Find the weight of the air on your hand. Use the form to the right using this formula:

   Area X **Air Pressure** = Weight

5. Is the number surprising?   In your own words, why don't you feel this weight on your hand?
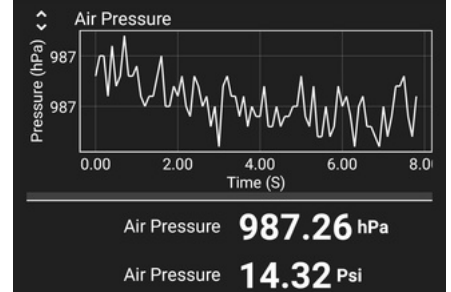
   _____

   _____

   _____

Hold databot™ flat and record the **Air Pressure** in Pounds Per Square Inch (PSI).

Take your palm measurements and calculate the area.

_____ X _____
AB   CD

Area = _____ square inches

Example of Air Pressure Displayed

Air Pressure **987.26** hPa
Air Pressure **14.32** Psi

_____ X _____
Pressure (PSI)   Area (sq. inches)

= _____
Weight of Air on Your Palm

Calculate the weight of the air pressing down on your hand.

Note: You can convert the pounds to kilograms by multiplying it by .453592

## PDQ2 : Pressure Vs Volume

In this PDQ use the **Air pressure** experiment and find the relationship between the **air pressure** and volume. Can you increase air pressure by reducing volume?

1. Turn on databot™ and place it in a zip-lock plastic bag. Zip it mostly closed with the exception of a small space for a straw to inflate it.

2. Blow up the bag with databot™ inside it, remove the straw, and seal the bag.

3. Tap on **Air Pressure** in Vizeey™ to load the experiment & connect to databot™. Use these icons to start and pause the experiment: ▶ ⏸

4. Squeeze and release the plastic bag and look at the air pressure readings. What happens to the pressure when the volume is less?

5. Challenge: with your newfound understanding of the relationship between pressure and volume, draw a city skyline in Vizeey™ using changes in **Air Pressure**!
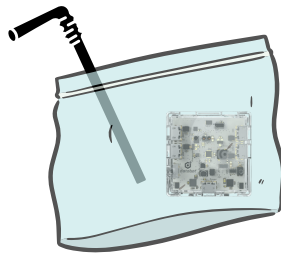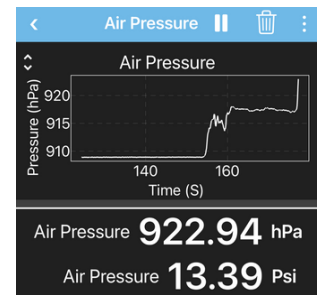
Databot placed inside a closed zip-lock plastic bag with straw inserted
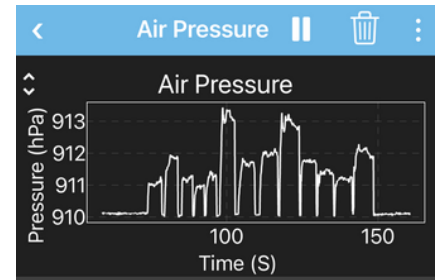
City Skyline Challenge!

Air Pressure **908.90** hPa
Air Pressure **13.18** Psi
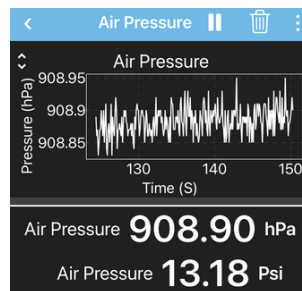
Air pressure - more volume - pre-squeeze!

Air Pressure **922.94** hPa
Air Pressure **13.39** Psi

Air pressure - less volume - the big squeeze!