HUMIDITY

databot™

Sensor Starters

Grades: 6 & Up
Time: 15 Minutes - PDQ 1 & 2
Subject: Physics, Technology
Topics: Humidity, Heat Index, Dew Point, and Capacitance.

Meet the Humidity Sensor

The humidity sensor determines the amount of water vapor present in the air. If there is a lot of water vapor in the air, the humidity is high, if there is a small amount, the humidity is low. Humidity sensors are used in incubators, sterilizers, pharmaceutical processing equipment, and extensively in weather monitoring.

What Does it Measure?

The humidity sensor measures the relative humidity in the air. Depending on the temperature, the amount of water vapor in the air varies. Warm air can hold more water vapor than cool air. Humidity can make a hot day feel even hotter. The heat index is a measure of what the temperature feels like because of humidity. The air reaches its dew point, 100% RH, at the temperature when water condenses out of the air. Relative humidity is how the air feels at your local temperature and humidity.

City	Temperature	Humidity	Heat Index
Phoenix	90°F	20%	90°F
Houston	90°F	90%	122°F

How Does it Work?

The humidity sensor is a small capacitor that consists of a dielectric material (plastic/polymer) placed in between a pair of electrodes. When the water vapor enters the dielectric layer the capacitance of the sensor changes. The capacitive type of sensor is direct and can measure relative humidity from the range of 0 to 100%.

What Are the Units for Relative Humidity?

Relative Humidity (RH) is expressed as a percentage. Relative humidity is the percentage of water vapor in the air relative to the total amount of air it can hold.

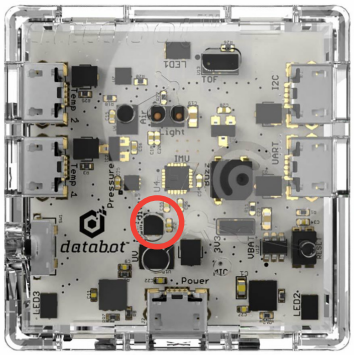
RH = (actual vapor density / maximum vapor density) X 100) %

What You Will Need/Prep

- databot™ 2.0 & a smart device (iOS or Android).
- Read the Vizeey™ Fast Start Guide and install Vizeey™.
- Scan this QR code for Humidity & its calibration if you haven't already.
- Ziploc bag - 1
- Straw - 1
- Rock Salt - 1 tbsp

Where Does it Live?

The humidity sensor is a black color square chip with a debossed circle on it. Look for the label Humidity near the databot™ logo on the databot™ PCB. Note there is a hole in the case for air to enter over the humidity sensor.



Important Terms

Capacitance: The ability of a component or circuit to collect and store energy in the form of an electrical charge.
Capacitor: A device for storing electrical energy.
Dew Point: The temperature at which water vapor condenses is called the dew point.
Heat Index: The measure of what the temperature feels like because of humidity.
Humidity: The amount of water vapor in the air. Relative humidity is the % water vapor in the air compared to the total it will hold.

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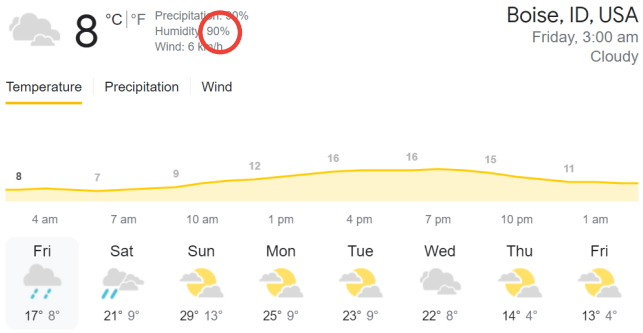
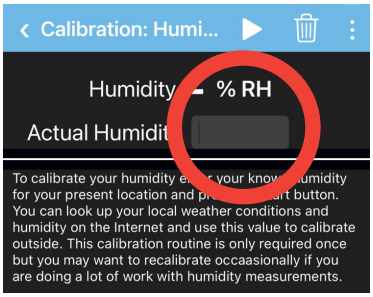
PDQ1 : Let's Get Adjusted!

Calibration is the process of aligning (calibrating) a test instrument like databot™ with a known measurement. You may have calibrated a scale before using a known weight and setting the scale to match that weight. databot™'s **humidity** sensor requires a calibration to properly set it for your local environment:

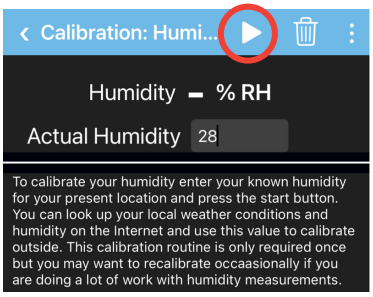
1. Let's calibrate the **humidity sensor** of databot™. You need to find the known **humidity** for your present location. You can look up your local weather conditions and **humidity** on the internet if you are not sure about it.
2. Tap on **Calibration: Humidity** in Vizeey™ to load the experiment.
3. It is best to do this outside since indoor **humidity** is different from outdoor. Enter the known **humidity** value as an input for Actual **Humidity**.
4. Use the start ▶ button and wait for the value to update.
5. That's it! Unless you update your firmware and overwrite databot™'s memory it will remember this setting. If you are doing frequent experiments or change locations re-calibrate as needed.



Humidity of current location in weather report



Enter the actual Humidity value



Use the Start button to begin experiment

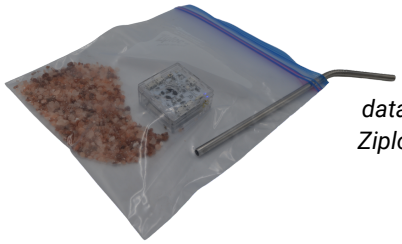
PDQ2 : Salt vs. Humidity!

databot™'s **humidity** sensor calculates the relative **humidity** based on the water vapor (moisture) in the air. Is it possible to control the moisture in the air using external agents? Let's experiment with databot™ to find out!

1. Tap on **Humidity** in Vizeey™ to load the experiment & use these icons ▶ ⏸ to start and pause the experiment.
2. Place databot™ inside a Ziploc bag with 1 tbsp rock salt. Zip the bag closed with the exception of a small space for a straw.
3. Use the straw to breathe into the bag to inflate. Remove the straw carefully without squeezing the bag.

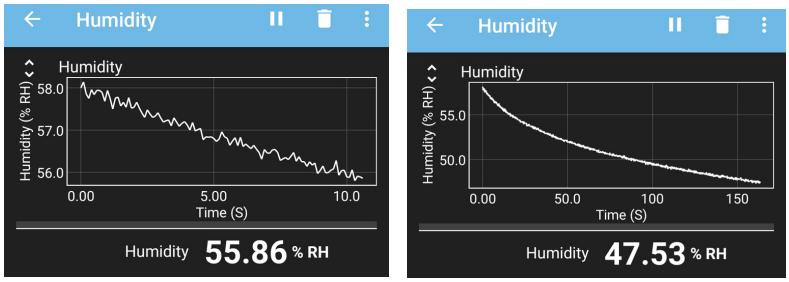
Important- your breath is loaded with water vapor so the humidity in the bag will be high.

4. Zip the bag completely and use the start button ▶ to begin the experiment.
5. Watch the data carefully. Do you see a gradual decrease in relative **humidity**? What happens to moisture in the air when it comes into contact with rock salt? Why do you suppose rock salt "dries" the air out? Can you think of real world applications where this might be useful?



databot™ placed inside a closed Ziploc bag that has rock salt and straw inserted.

Rock salt is "hygroscopic" meaning it absorbs moisture. Why?



Decrease in Relative Humidity Over Time