

ScienceCube



# Wireless Humidity (WL117H) User Guide



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**This product is to be used for educational purposes only. It is not appropriate for industrial, medical, research, or commercial applications.**

 **KOREADIGITAL**

*The Science Cube wireless humidity sensor measures the relative humidity and temperature of the air and displays the dew point.*

**The wireless sensor** consists of an integrated circuit containing a polymer-based capacitive humidity sensor and a bipolar junction transistor-based silicon bandgap temperature sensor. It is a semiconductor circuit that digitally displays measured values according to various relative humidity and temperature changes.

The sensor is contained within a perforated aluminum probe and senses through airflow and circulation. Typical reaction time is approximately 15 seconds in slowly flowing air at 25°C.

You can measure by remotely connecting to a smart device or PC wirelessly or wired.

## Suggested experiments

- Measurement of evaporation rate according to humidity
- Observation of optimal growth condition by relative humidity in greenhouse, etc.
- Comparison of static electricity generation according to humidity

## Composition

*The ScienceCube wireless humidity sensor consists of the following:*

- Wireless humidity sensor (WL117H)
- USB-A/C cable
- Booklet

## Feature

- Up to four Science Cube wireless sensors can be connected to a PC or smart device at the same time.
- It supports dual-mode Bluetooth, allowing you to connect not only smart devices

but also desktop and laptop PCs to conduct experiments using the **Science#** application.

- It can be connected to a PC through a USB port and experiments can be performed using the **Science#** program.



## Function of wireless sensor

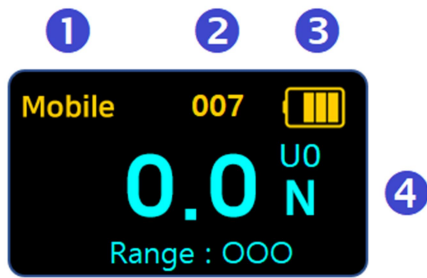
### Structure



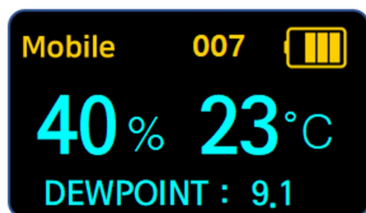
- ① USB port : Connect the sensor to a PC and use it for experiments or charging.
- ② OLED Display : Displays measured sensor values, sensor type, sensor ID, and remaining battery level.
- ③ Power/Function Button : It has functions such as power ON/OFF, measurement sensor change and calibration, etc.
- ④ Sensing part : Contains sensors that detect humidity and temperature and is protected with a metal mesh.



## Measurement screen



## Multiple sensor screen

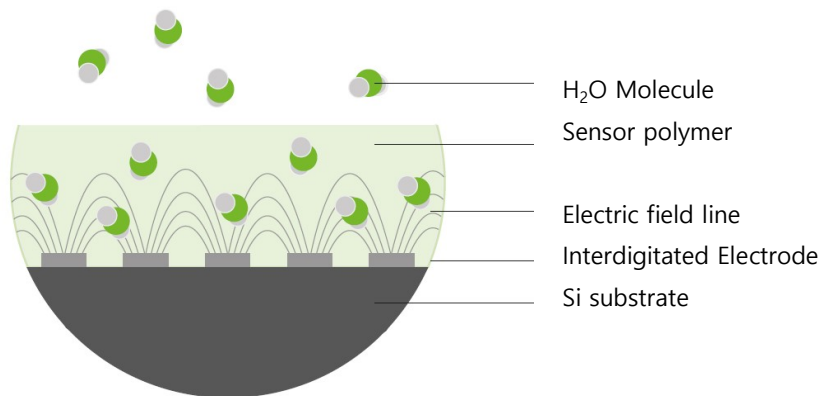


<p>① <b>Connection mode</b></p>	<p><b>Mobile</b> : Connecting Android or iOS.  <b>PC</b> : Connecting to Windows PC          ※ A long press changes the mode and turns on the sensor.</p>
<p>② <b>Sensor-ID</b></p>	<p>This is the sensor's unique number and is displayed along with the sensor name in the device name when connected via Bluetooth.</p>
<p>③ <b>Battery</b></p>	<p>Check the battery status, and when charging via USB, the display will change to charging.</p>
<p>④ <b>Value</b></p>	<p>1) Displays sensor measurement values and units in real time.          2) For <b>multiple sensors</b>, the values for each sensor type are displayed.</p>

## How it Works

Polymer-based capacitive humidity sensors are implemented with interconnected capacitor electrodes. If the space between capacitors is filled with a dielectric material that reacts well to moisture, the dielectric constant changes depending on humidity, and the electric capacitance at both ends of the electrodes also changes, allowing humidity to be inferred.

Due to the capacitive nature of these sensors, they typically have different accuracies from 0 to 80%RH and from 80 to 100%RH.



The figure above is a cross-sectional view of a capacitive humidity sensor manufactured through the CMOS process. Using a Si substrate, a thin film is used as a dielectric between the electrodes. Relative humidity may have errors depending on temperature and saturation, and generally has the following distribution.

### Dew point

The dew point of a given body of air is the temperature to which it must be cooled to become saturated with water vapor. This temperature depends on the pressure and water content of the air. When the air is cooled below the dew point, its moisture capacity is reduced and airborne water vapor will condense to form liquid water known as dew. When this occurs through the air's contact with a colder surface, dew will form on that surface.

Dew point can be calculated using the following equation:

$$T_d(T, RH) = T_n \frac{\left( \ln\left(\frac{RH}{100}\right) + \frac{mT}{T_n + T} \right)}{m - \left( \ln\left(\frac{RH}{100}\right) + \frac{mT}{T_n + T} \right)}$$

$T_d$  : Dew point temperature [°C]

$T$  : Actual temperature [°C]

$RH$  : Actual relative humidity [%]

$m$  : 17.62

$T_n$  : 243.21

## Using the Sensor

Using ScienceCube wireless humidity sensors, you can perform experiments such as:

- Measurement of evaporation amount according to humidity
- Comparison of static electricity generation according to humidity



Science# experiment screen



Transpiration rate measurement experiment

## Specifications

Item	Description	
Range	Humidity	0 ~100 %RH
	Temp.	-40 ~ 60 °C
Resolution	Humidity	0.1 %RH (When using <b>Science#</b> , 0.01 %RH)
	Temp.	1 °C (When using <b>Science#</b> , 0.01 °C)
Sampling Time	Max. 100Hz (0.01 sec.), (Typical 1Hz)	
Condition	-40 ~ 60°C, 85%RH	
Wireless Connection	Bluetooth 5.0 or Classic 2.1	
Wired Connection	USB-C	
Battery	700mAh Li-Polymer rechargeable	
Charging Time	within 2 hours	
Operating Time	Approximately 12 hours after full charge (depending on usage conditions)	
Dimension	115 x 50 x 25mm	
	65g (2.3 oz)	

**CAUTION: Do not use the instrument beyond the measurement range or in conditions that exceed the short-term exposure limits. Prolonged exposure beyond the maximum permissible range can cause serious damage to the sensor.**

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