ScienceCube

sciencecube.com

Wireless Current (WL102C)

User Guide

Rev. WL102C-02-2024

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 current sensors measure the current flowing in an electrical circuit.

Wireless current sensors measure the current flowing in an electrical circuit.
The measurement principle of a wireless current sensor is to measure a wire with a unique resistance value using a voltage proportional to the current according to Ohm's law. It can be used for Ohm's law experiments using voltage sensors, or for experiments on the magnetic action of electrical resistance or current. Because it is a wireless sensor, there is no need for a separate connection cable, and up to four devices can be connected simultaneously, making it easy to use even in complex experimental environments.
Additionally, the sensor has a display window so you can immediately check the measured values, and measurements can be made by remotely connecting to a smart device or PC wirelessly or wired without a separate interface.

Suggested experiments

- Ohm’s law (relationship between voltage and current).
- Charge and discharge of battery
- Making a coin battery
- Resistance depending on the length and cross-sectional area of the sharp core

Composition

The ScienceCube wireless current sensor *consists of the following.*

- Wireless current sensor(WL102C)
- 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.

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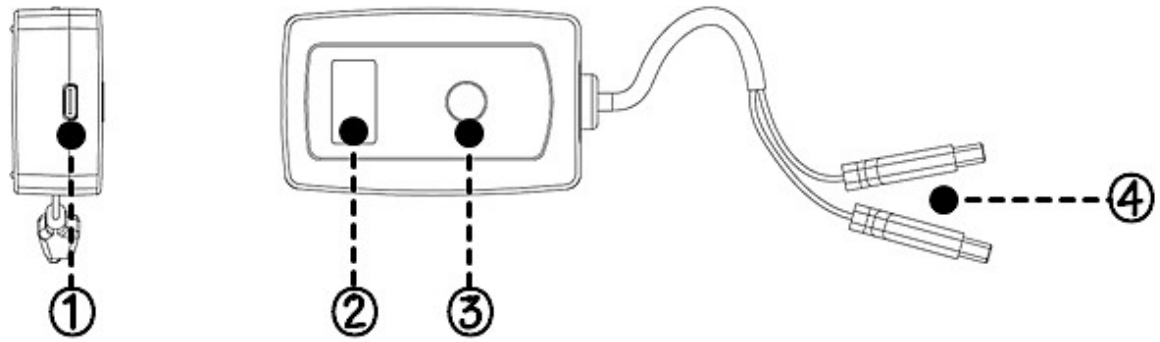
Function of wireless sensor

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.

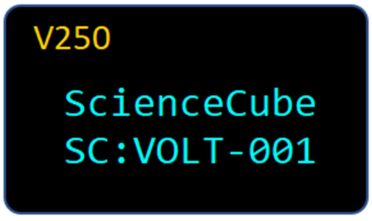
④ Sensor detection part: Has a red/black alligator clip that detects current and is protected by a plastic cover.

> **Caution** : Do not measure beyond the sensor's measurement range. Doing so can reduce the accuracy of the sensor, cause sensor malfunctions, or result in permanent damage. Please use within the safe measurement range.

Power/Function Button

Status	Turn	Action	Description
When the power is off	Click once	■	A short press turns the sensor on.
	Long click	▬▬▬	A long press changes the mode and turns on the sensor.
When it's on	Double click	■■	Performs the zero point setting function. When the zero point is applied, **U0** is displayed above the units.
	Long click	▬▬▬	Turns off.

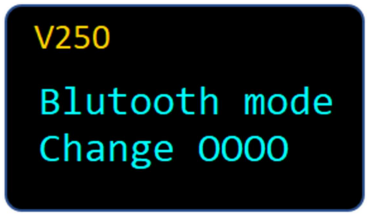
Start screen



V250 : Displays the sensor's firmware version.

SC:NAME-001 : When you search for a Bluetooth device, the device name will be displayed. (Sensor name and 3-digit serial number)

Mode change



When you press and hold the power button and turn it on, the Bluetooth connection mode changes to **Mobile** or **PC** with the following message.

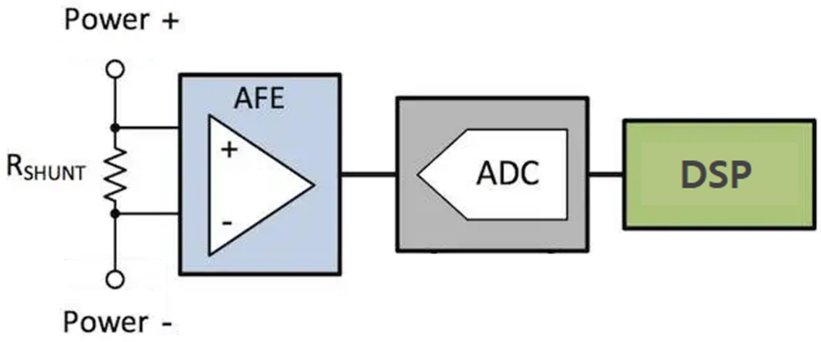
Measurement screen

①Connection mode	Mobile : Connecting an Android or iOS. PC : Connecting a Windows-based PC.  : Connected via USB cable.
②Sensor-ID	When connecting wirelessly using the sensor's serial number, this is the sensor name displayed in 'Device Name'.
③Battery	You can check the battery status, and when you connect the USB charging cable, the display changes to charging.
④Sensor Value	1) Displays sensor measurement values and units in real time. 2) When using 'Zero Point Setting', **U0** is displayed above the unit.

How it Works

Science Cube wireless current sensor is a method of detecting current using resistance using Ohm's law (V = IR), a basic principle of electricity. When a reference resistor (R_{Shunt}) is connected to the circuit being measured, a voltage drop occurs across the reference resistor according to the current flow. Generally, this reference resistance is called a

shunt resistance, and the current value can be inferred by connecting the shunt resistance in series to the circuit and measuring the voltage drop across the resistance. The measured micro-voltage goes through a signal amplifier and digital converter and is converted into a current value in a digital signal processor.



Using the Sensor

The ScienceCube wireless current sensor can be measured in the following ways

1. Run 'Science#' and connect the sensor wirelessly or wired.
2. Connect the **red clip** to the '**+**' pole and the **black clip** to the '**-**' pole of the circuit to be measured.
3. If measurement is required starting from '0', execute [Zero Setting].
4. Set the [Data Collection Interval] and [Experiment Time] in [Experiment Settings].
5. Click [Start] to start the experiment.

For more information on how to use the Science# application, see the help.

Calibration

All sensors are shipped after being precisely calibrated using standard equipment during the manufacturing process, so they can be used right away and do not require a separate calibration process.

However, if you want to display "0" in the current value for a smooth experiment, proceed with **[Zero Point Setting]**. Zero point setting can be done separately in the wireless sensor or program.

[Sensor zero point setting]

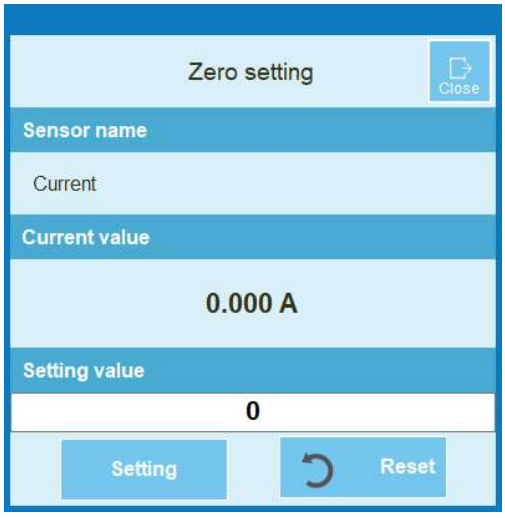
1. Press the sensor's Power/Calibrate button twice in succession.
2. **[Zero point setting]** is completed, and the word "U0" is displayed above the unit on the sensor screen.
3. To cancel, press twice again and U0 will disappear and return to the default value.

Note : [Zero point setting] is reflected temporarily and returns to the default value when the sensor is turned on again.

[Zero setting] in science#

Science#'s zero setting does not affect the sensor's zero setting and is only reflected in the values displayed in the program.

If you press the  icon in the space where the sensor value is displayed in Science #, the **[Zero point setting]** menu will appear.
Here, if you press **[Setting]**, it will change to 0.000V, and if you press **[Reset]**, it will return to the initial value.

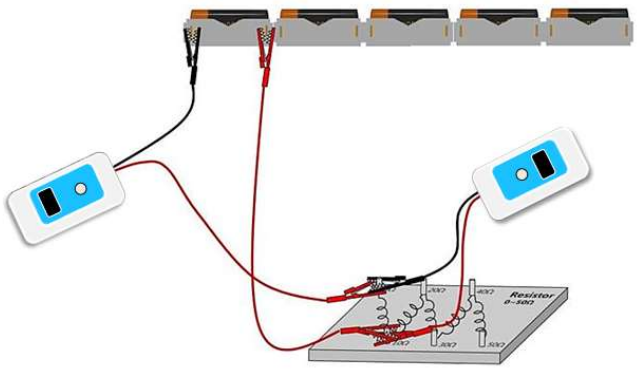


Guide for scientific experiments

Ohm's law

<Experimental Method>

1. Insert all the batteries into the five battery holders and connect one battery.
2. As shown in the picture below, the voltage sensor is connected in parallel to the 10Ω resistor and the current sensor is connected in series to the battery to form the electric circuit.
3. Run Science#, turn on the voltage sensor and connect them to the program.
4. Press  to set [Zero setting] then press START.
5. When the 10Ω resistance is constant, press  [collect] to measure the voltage and current when one battery is connected.
6. Measure and record each voltage and current while connecting up to five batteries in series.
7. Measure and record each current on the 10, 20, 30, 40 and 50Ω nichrome wire repeatedly.
8. Analyze how the current intensity (I) changes when the voltage (V) is increased or decreased when the resistance is constant and analyze what happens when the voltage is constant.



Specifications

Item	Description
Range	-3.0 ~ +3.0 A
Resolution	0.001 A
Sampling Time	Max. 100Hz (0.01 sec.)
Condition	-20 ~ 60℃, Max. 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)
EMC	CE : EN 61326-1, EN 55011, EN 55032, EN 301 ㉾ ®202-SMD070

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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- The contents of this manual are provided for informational purposes only, and product specifications and functions may be changed without prior notice to improve performance.
- This product is designed for science education. No warranty is provided and no liability is assumed for errors in industrial testing or manufacturing process controls, medical analysis or controls, or commercial design applications.

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