Wireless Voltage Sensor

P4501-VO

User manual

Rev.01 (Mar. 09, 2019)

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

Introduction

This Wireless voltage sensor is a sensor that measures the difference in potential between two points on an electrical circuit. The voltage is displayed as a number on the LCD panel via an analog-to-digital conversion circuit.
When using this Wireless Voltage Sensor to measure the voltage by decorating the electric circuit using various materials such as dry cell, nichrome wire resistance, carbon resistance, LED, small bulb, etc. Up to 4 sensors can be connected simultaneously, so you can use it easily in complex experiment environments.

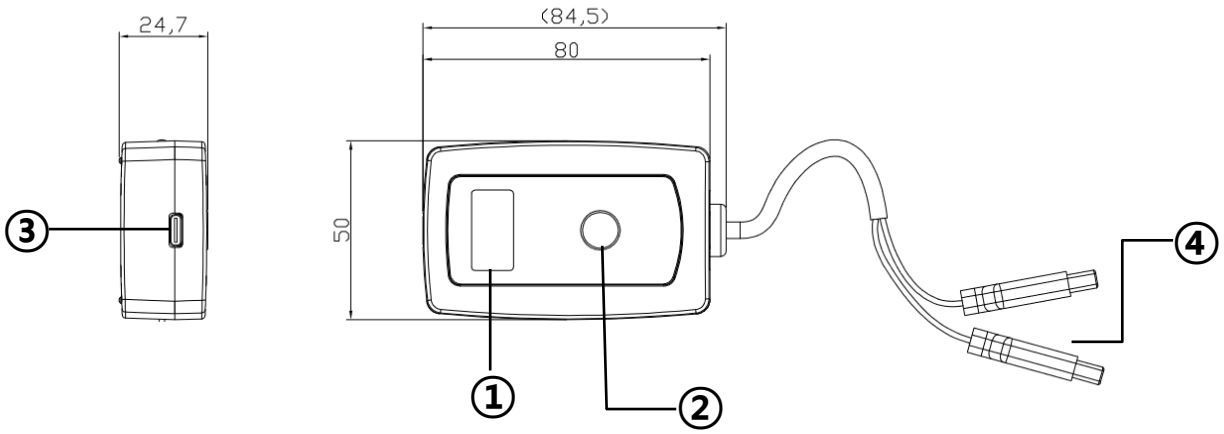
Composition & Usage

Composition

1. Wireless Voltage Sensor
2. USB-A/C cable
3. User manual

Picture

(Unit: mm)

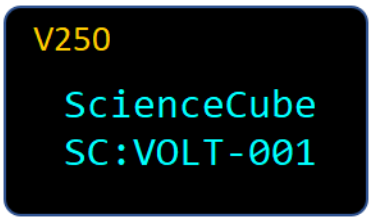


① OLED screen: Display the battery level and temperature
② Power button: Press for 5 seconds when power is off.
③ Place to connect the cable
④ Crocodile clip Black – Red+

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	Long click	■■■■■■■■	Turns off.

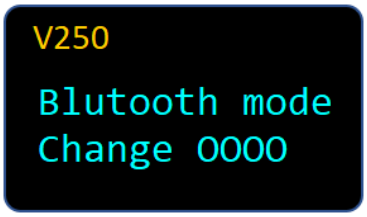
Start screen



V250 : Displays the sensor's firmware version.

SC: OOOO-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.

See last page for more information.

Measurement screen

①**Connection mode**	**Mobile :** Connecting Android or iOS **PC :** Connecting to Windows PC **:** Connected via USB cable ※ A long press changes the mode and turns on the sensor.
②**Sensor-ID**	This is the sensor's unique number and is displayed along with the sensor name in the device name when connected via Bluetooth.
③**Battery**	Check the battery status, and when charging via USB, the display will change to charging.
④**Value**	Displays sensor measurement values and units in real time.

Features and Detail

Features

Contents	Detailed description
Features	Measures voltage Electrical patch cord Two voltage clips connected Red + Black - Parallel connection for voltage measurement Deviation value is temporarily stored when setting zero point reference
uses	Support all Bluetooth Classic, Low Energy Available in dedicated apps (Science#)

Detail

Contents	Detailed description
Measurement	-15V to 15V
Resolution	2mV
Sensitivity	Typ. ±10mV Min ±5mV@<±1.0V Max ±30mV
Sampling Rate	Max. 100samples/second
Interface	Windows PC (USB or Bluetooth) Android Device (Bluetooth)
Application	Science#
Operating Environment	-40 ~ 60℃, Max 85%RH
Connection	Bluetooth 4.2 or USB (Type-C)
Power	Li-Po Rechargeable Battery (700mAh) Operating time approximately 14 hours when the battery is fully charged.

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.

Guide for scientific experiments

<Scientific experiment activities by using Voltage Sensor>

Ohm's law (Relationship between voltage and current) Charging and discharging of battery	Making Coin Cells Resistance according to the length of sharp lead	Voltage of solar cell Serial-parallel connection of resistors

<Example of test method>

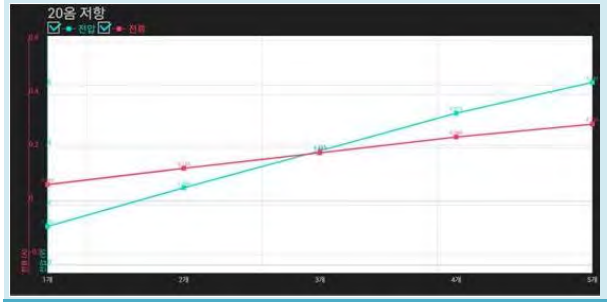
Ohm's law

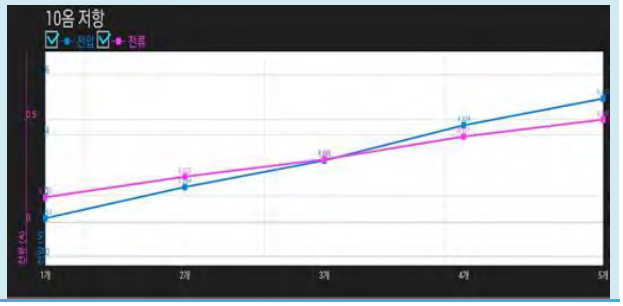
Materials

Science# programs, Wireless Voltage Sensor, Wireless Current Sensor, Nichrome Wire Resistance Plate (10Ω, 5pcs connections), Crocodile clips(2), Battery Holder(5), 1.5V Batteries (5)

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 the Bluetooth.
4. Press  to set zero point 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 50 Ω 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.





Safety Warnings

All data, analyzes and derivative works obtained with this product may be used only for the purpose of scientific experiment education and not for other purposes such as professional research or commercial purposes.

The safety precautions are intended to prevent accidents and risks by using the product safely and correctly.

Please note that this product does not have any legal liability for accidental accidents caused by user's negligence during the scientific experiment activities or for the use of other uses.

① Never separate or modify the sensor except for a professional technician.
Permanent damage to the unit may result. The sensor is permanently sealed in the process and cannot be disassembled for any purpose. In addition, please use customer support center for inspection, adjustment and repair.

② Do not try to open it in a place with high humidity or splashing water. If water enters the main body, cable or power supply unit, it may occur electric shock, fire, malfunction or deformation

③ Do not conduct experiments where heat or smoke (gas) is generated in an enclosed space.
Experimentation in an enclosed space may cause suffocation and fire. Be sure to follow the safety instructions in the well-ventilated area.

④ There is a risk of injury and safety accidents due to electric shock, fire, explosion due to electric current and voltage exceeding the allowable value. Please make sure to observe the experimental safety rules and conduct experiments under guidance. In case of an experiment in the home, parents need to be fully informed about the risk of safety accidents according to the experiment contents. For more information about the experiment, please contact the school's science teacher or the author of the experiment.

⑤ Do not use the unit beyond the operating limits or exceeding the short-term exposure limits.
If the exposure exceeds the maximum allowable range, the reliability of the sensor may be lowered.

Experimental Safety Precautions

1. Please be careful of electrical safety accidents such as electric shock and fire during the experiment.
2. Turn off the power when not doing the experiment.
3. Do not experiment with wet hands.
4. Do not mess around with sensors
5. Keep out of the reach of children

How to install Science#

- **Install Windows PC version**

Online installation file (approximately 39MB)
http://www.koreadigital.com/url/updates/sciencesharppc/setup.exe
* Internet connection is required during installation

Offline installation file (approximately 340MB)
http://www.koreadigital.com/url/updates/sciencesharppc/setup_full.exe
* Installation does not require an Internet connection, but contains large content

- **Install from a mobile smart device (Smartphone or Tablet PC)**

1. Download Science# to your smart device (Refer to QR codes below)
2. Connect using Bluetooth (See Science# documentation or refer to next page)
3. Run Science#
4. When you connect the sensor, the measurement is displayed on the Science# screen

GET IN ON Google Play

Download on the App Store

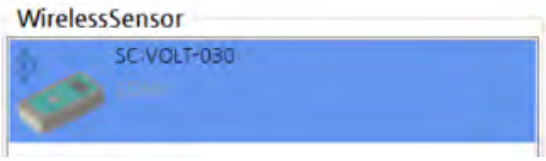
Features

- Up to four 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.

How to connect Wireless Sensor to Science# program

● Windows PC

1. Install and run Science# (Refer to previous page for installation method)
2. Power on the sensor
3. Click the  [Connect] icon and select [Bluetooth Interface] from [Select Interface]
4. [Add Bluetooth or other device] → [Bluetooth] → Add sensor number after checking the number on the backside of sensor
5. When you see like the picture, click on Wireless Sensor and connect



● Android or iOS (Smartphone or Tablet PC)

1. Install and run Science# (Refer to previous page for installation method)
2. Power on the sensor
3. Click the  [Connect] icon and select [Bluetooth Interface]
4. After selecting the device search, check the sensor number on the backside and connect

If you experience any connection issues, check Bluetooth mode on the sensor. Please refer to the next page for instructions on how to change it.

How to switch to Bluetooth mode for Android and iOS

For mobile devices (Android, iOS) Bluetooth Low Energy technology is used for wireless communication. For these devices do not pair the sensor just use it directly in the software.

Turn off the sensor. Then press and hold the power button until the text ‘Bluetooth mode Change Mobile’ is shown, then release the button. The mode is set to ‘Mobile’, meaning that Bluetooth Low Energy is used.

How to switch to Bluetooth mode for Windows

For Windows computers, Bluetooth Classic technology is used for wireless communication. Before you start to use the sensor for measurement you have to pair it. If you are asked for a PIN, enter either “1234” or “0000”.

Turn off the sensor. Then press and hold the power button until the text ‘Bluetooth mode Change PC’ is shown, then release the button. The mode is set to ‘PC’, meaning Bluetooth Classic is used.

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