



Wireless Galvanometer (P4509-GA) User Guide



Rev. WL109GV-12-2023

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

The wireless Galvanometer can measure minute electrical currents.

The Wireless Galvanometer is a sensor that can measure minute currents and has better resolution than a wireless current sensor.

Galvanometer probes can detect currents weaker than ± 12 mA. The usage range of the sensor may vary depending on each experiment, and the range can be changed to three levels: 0.12mA, 1.2mA, and 12mA. You can choose to change it yourself or have the sensor change it for you.

It is designed to measure smaller currents than a current sensor and can be used in a variety of experiments. A current sensor can be used when the current flowing through an electrical circuit is less than 12mA. A current sensor can be used in a variety of physics experiments.

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

Suggested experiments

- Bioelectric current experiment.
- Faraday's law experiment.
- Oxidation and reduction of metal plates.

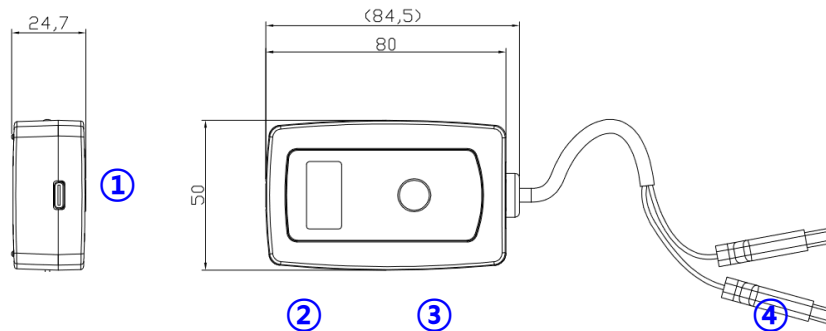
Composition

The wireless Galvanometer consists of the following.

- Wireless Galvanometer (P4509-GA)
- USB-A/C cable
- Booklet

Function of wireless sensor

Structure

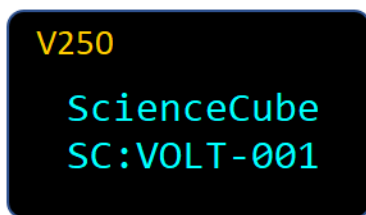


- ① USB port : Connect the sensor to a PC and use it for experiments or charging.
- ② OLED Display : Displays measured sensor values, sensor type, sensor ID, and remaining battery level.
- ③ Power/Function Button : It has functions such as power ON/OFF, measurement sensor change and calibration, etc.
- ④ Sensing part : Using an alligator clip connected to the sensor.

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.

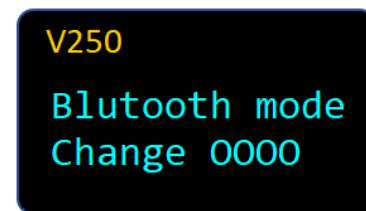
Start screen



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)

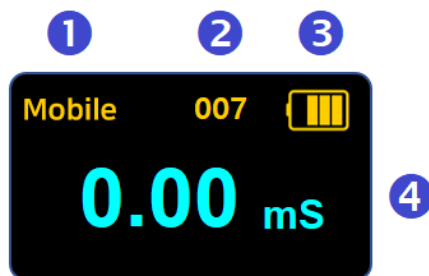
Mode change



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 micro-current Clip Red + Black - Connection Serial connection only for current measurement When zero point is set, the value is stored temporarily.
Uses	Support all Bluetooth Classic, Low Energy Available in dedicated apps (Science#)

Detail

Contents	Detailed description
Measurement	0.12/1.2/12 mA (3-level : manual or automatic change)
Resolution	0.001mA
Sampling Rate	Max.100 samples/second
Interface	Windows PC (USB or Bluetooth) Android Device (Bluetooth)
Application	Science#
Operating Environment	-20 ~ 60°C, Max 85%RH
Connection	Bluetooth 5.0 or USB (Type-C)
Power	Li-Po Rechargeable Battery (700mAh) Operating time approximately 14 hours when the battery is fully charged (depending on usage conditions)

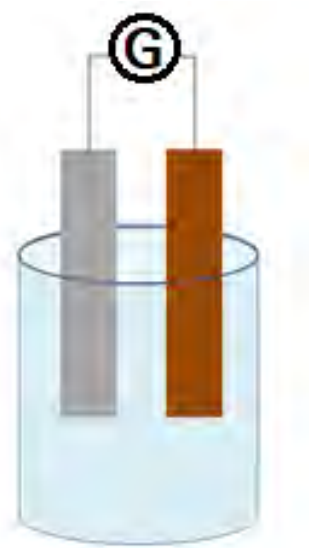
CAUTION: Do not use the instrument beyond the measurement range or in conditions that exceed the short-term exposure limits. Prolonged exposure beyond the maximum permissible range can cause serious damage to the sensor.

Guide for science experiments

Experimental example: Oxidation-reduction of metal plate screen

Method

- ① Run Science# and connect the galvanometer sensor.
- ② Add 50mL of 0.1M hydrochloric acid to the beaker and connect the galvanometer sensor to the zinc plate and copper plate, respectively.
- ③ Experiment settings: [Automatic collection] [Line chart] [Data collection interval 20Hz] [Experiment time 5 minutes]
- ④ Click Start Experiment.
- ⑤ Repeat the above process using 0.5M hydrochloric acid and 1M hydrochloric acid.



Result

- ① Draw the direction of movement of electrons.
- ② Let's write down the parts where oxidation and reduction occurred.
- ③ Let's write down how the value of the galvanometer sensor changed over time and why the value changed so much.

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



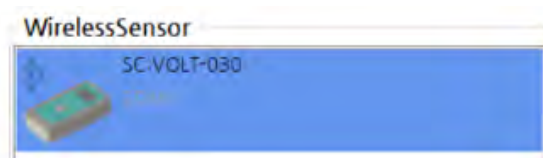
Features

- 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.

Rev. WL109GV-12-2023

Copyright (c) Korea Science Digital Co., Ltd. All rights reserved. The contents of this manual are for informational purposes only and we cannot be held responsible for errors or misleading information that may appear in this manual. The specifications and functions of the product are subject to change without prior notice.



and ScienceCube are registered trademark of Korea Digital Co., Ltd.

Science Cube Light, Science Cube Pro, Free Linker, and Max are trademarks of Korea Digital Co., Ltd.

Windows and Excel are registered trademarks or trademarks of MicroSoft.

All other trademarks are the property of their respective owners.