



Wireless Force Sensor (P4505-FA) 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 Force Sensor measures the weight and force.

Unlike conventional force sensors, it measures the force and the magnitude of the gravitational acceleration on each of the X, Y, and Z axes.

It can be widely used for acceleration, shock, vibration and inclination measurement as well.

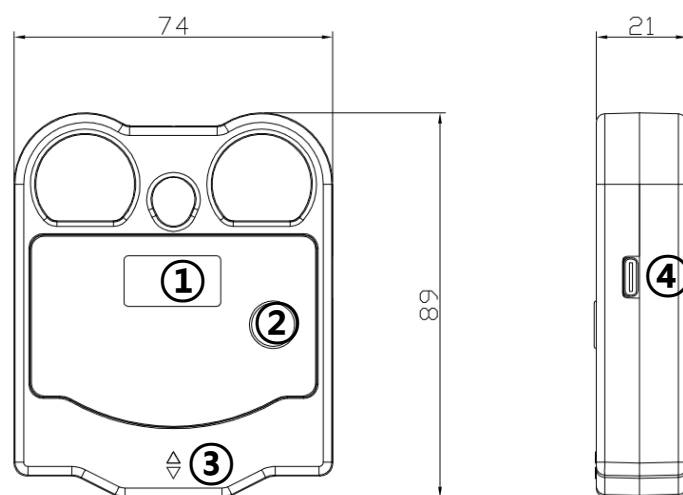
This product is wireless, so you can use it easily in complex experiment environment because you don't need a connecting cable separately, you can just connect up to 4 sensors at same time, so you can use it with other kinds of sensors together.

Composition & Usage

Composition

1. Wireless Force Sensor
2. USB-A/C cable
3. User manual
4. Rubber hammer, Ring
5. Stand fixed rod

Picture



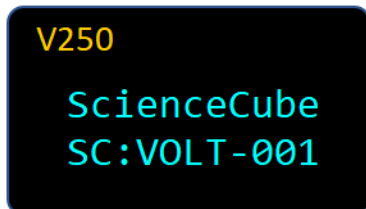
(Unit : mm)

- ① OLED screen: Display the battery level and force value (N)
- ② Power button: Press for 5 seconds when power is off.
- ③ Place to put the ring and rubber hammers
- ④ Place to connect the cable

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	Click once	■	Change sensor type or range. (Multi-sensor or range sensor only)
	Long click	■■■■■■■■■■	Turns off.

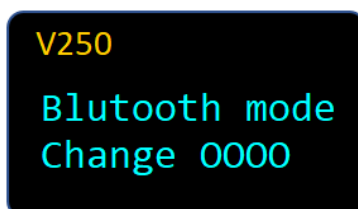
Start screen



V250 : Displays the sensor's firmware version.

SC: 0000-001 : When you search for a Bluetooth device, the device name will be displayed. (Sensor name and 3-digit serial number)

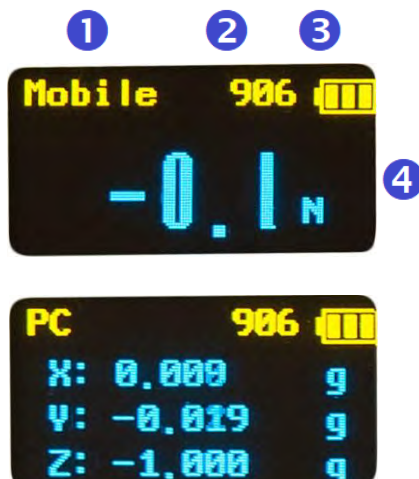
Mode change




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

1) Displays sensor measurement values and units in real time.
 2) For sensors with **multiple ranges**, the current range is displayed.

Features and Detail

Features

Contents	Detailed description
Features	<ul style="list-style-type: none">- Measures weight or force 3-axis acceleration- Pulling force + pushing force –- Connect up to 4 sensors simultaneously- Available in dedicated apps (Science#)
Uses	<ul style="list-style-type: none">- Bluetooth classic, low energy support- USB communication support- Dedicated app (Science#) available

Detail

Contents	Detailed description
Measurement	Force -80N to +80N Acceleration -16G to +16G (3-Axis)
Resolution	Force 0.012N Acceleration $\pm 0.0004g$
Sampling Rate	Max. 100 samples/second
Interface	Windows PC (USB or Bluetooth) Android Device (Bluetooth)
Application	Science#
Operating Environment	-40 ~ 60°C, Max 85%RH
Connection	Bluetooth 4.2 or USB (Type-C)
Power	Li-Po Rechargeable Battery (700mAh) Operating time approximately 13 hours when the battery is fully charged. (Depends on conditions of use.)

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 Force Sensor>

Principle of Pulley	Hook's Law	Principles of the lever
Stimulation and Reaction	Frictional force	Action reaction
Composition of Force	The law of inertia	Impulse and momentum

<Example of test method>


Action reaction

Materials

Interface, Science# program, wireless force sensor (including rubber hammer, loop) 2, thread, marker

Experimental Method

1. Connect the rubber hammer accessories to the two force sensors.
2. Run Science# and connect the two force sensors with Bluetooth.
3. Set the experiment setting to [time-domain] - [Line/scatter] - [5Hz]

4. Press one of the force sensors to set the sign inversion and set the zero point by pressing  {0 point setting} for both force sensors.

[Experiment 1] When push each other

- ① Mark the center point where the two force sensors face with post it or marker.
- ② Press [Start], put your fingers in the hooks of the two force sensors, and push them toward each other. In this case, it is important that the portion of the force sensor which is subjected to the force is not deflected in the vertical direction. Also, be careful not to leave the center line marked on the floor.
- ③ Draw a graph with slowly varying magnitude of pushing force.
- ④ Press [Exit] to end data collection, or it will be automatically terminated after the set experiment time.

[Experiment 2] When pulling each other

- ① Replace the accessories of the two force sensors with a ring device.
- ② Connect the thread rings to the rings of the two force sensors.
- ③ Once again, set both force sensors to zero point by pressing the [Set Point] button.
- ④ Press {Start}, put your fingers in the rings of the two force sensors, and pull them in opposite directions. Be careful not to give too much force at this time because the line may be cut off.
5. Graph the magnitude of the force when pushing or pulling the two force sensors and compare them.





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 put the sensor or cable in water, liquid, flame or hot place.** If water enters the main body, cable or power supply unit, it may occur electric shock, fire, malfunction or deformation.
- ③ **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.
- ④ **Do not use the unit beyond the operating limits or beyond the short term exposure limits.** If the impact is more than 80 N, the sensor may be overloaded, and if the condition exceeds the exposure limit, 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




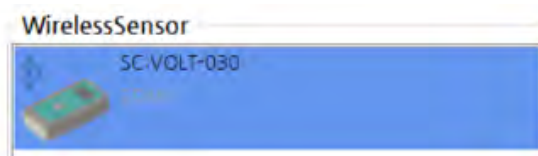
Features

- 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.01 (Mar. 09, 2019)

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