

Handheld Static Sensor SK-H Series Instruction Manual

Read this instruction manual before using the product in order to achieve maximum performance.
Keep this manual in a safe place after reading it for future reference.

Introduction

This manual describes the operations of and information related to the SK Series. Read this manual carefully to ensure the safe performance and function of the SK Series.

Keep this manual in a safe place for future reference.

Ensure that the end user of this product receives this manual.

■ Symbols

The following symbols are used in this instruction manual to enable you to recognize important information at a glance.

Be sure to read this section carefully.

	Indicates a hazardous situation which, if not avoided, will result in death or serious injury.
	Indicates a hazardous situation which, if not avoided, could result in death or serious injury.
	Indicates a hazardous situation which, if not avoided, could result in minor or moderate injury.
	Indicates a situation which, if not avoided, could result in product damage as well as property damage.

 Indicates cautions and limitations that must be followed during operation.

 Indicates additional information on proper operation.

 Indicates tips for better understanding or useful information.

 Indicates the reference pages in this manual or the reference pages in separate manuals.

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Safety Precautions

Precautions for Use

WARNING	When there is a possibility of an electric discharge occurring from the measurement target to the main body, “⚡” is displayed on the screen along with an alarm sound to inform the user of the abnormally high voltage. If a grounding wire is not connected, there is a risk of receiving an electric shock from the measurement target, so make sure that a grounding wire is connected. Also, measurement beyond the specified measurement range can cause failure of the unit.
NOTICE	• Before and while operating this product, confirm that its performance and functions operate correctly. • Implement sufficient safety measures to prevent human and property damage in case this product fails. • Note that functions and performance cannot be guaranteed if the product is used outside of the standards written in the specifications or if the product is modified. • When this KEYENCE product is used in combination with other devices, functions and performance may be degraded depending on the operating conditions and environment. • Do not use this product for the purpose of protecting a human body or a part of the human body. • This product is not intended for use as an explosion-proof product. Do not use this product in a hazardous location and/or potentially explosive atmosphere.

■ Warnings and cautions specific to the SK-H Series

The SK-H Series is a high-voltage device that is not designed to be explosion proof. Before using the product, be sure to read the following warnings and cautions carefully.

CAUTION	• To avoid electric shock and to ensure accurate measurement of static electricity, be sure to completely ground the SK-H050/055's ground terminal. • Do not use the product in locations where it might catch fire or explode due to flammable solvents or particles. • High voltages are applied to the SK-H055, so ensure that fluids such as water, oil, and flammable solvents do not splash onto the SK-H055. Failure to do so may cause the electrical isolation to be destroyed, which may lead to electric shock or product breakdown. • Keep metallic objects such as tools or wires away from the metal plate of the SK-H055. Failure to do so may lead to electric shock or product breakdown. • Do not directly touch the metal plate of the SK-H055. Doing so may lead to electric shock. • Do not operate this product with wet hands. Doing so may lead to electric shock. • Be sure to turn the power off before performing maintenance or inspections. Performing these operations with the power on may lead to electric shock or product breakdown. • If you observe any abnormality in this KEYENCE product, immediately turn off the power and contact the nearest KEYENCE office. Do not try to repair the product yourself. Doing so may lead to electric shock or product breakdown.
NOTICE	• Do not touch the SK-H050's panel or operation keys with hard objects such as tools. Doing so may lead to accidents or product breakdown. • Do not drop the SK-H050 or subject it to strong impacts. Doing so may lead to accidents or product breakdown. • Prevent objects from coming in contact with the sensing unit of the SK-H050 during measurement. Contact with objects prevents the sensing unit from performing accurate measurements, which may lead to accidents or product breakdown. • Do not use the SK-H050 for any purpose other than measuring static electricity.

■ Safety precautions on laser products

- This product uses a semiconductor laser as its light source.
- Performance of procedures, controls or adjustments other than those specified herein may result in hazardous radiation exposure.
- Follow the instructions mentioned in this manual. Failure to do so may result in injury to the human body (eyes and skin).

Precautions on class 1 laser products

- Do not stare into the direct or specularly reflected beam.
- Laser emission from this product is not automatically stopped when it is disassembled. Do not disassemble this product.

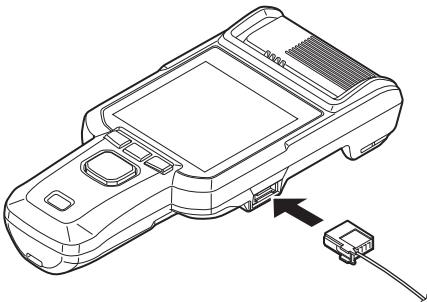
Model	SK-H050
Wavelength	660 nm
Output	Band light: 300 μW/spot light: 150 μW
Pulse width	4 ms
FDA (CDRH) part 1040.10	Class 1 laser product
IEC 60825-1	Class 1 laser product
JIS C6802	Class 1 laser product

* The laser classification is implemented on the basis of IEC 60825-1 following the requirements of Laser Notice No. 50 of the FDA (CDRH).

Grounding

A grounding wire is included with the SK-H050/055. Be sure to connect the grounding wire to the specified location.

CAUTION	For safe and proper measurements of static electricity, be sure to completely ground the SK-H050/055 with ground resistance not exceeding 100 Ω.
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■ Locations

NOTICE	To prevent product breakdown, avoid installing the product in the following locations: • Locations in which the product is directly subjected to vibrations or impacts • Locations in which the ambient temperature drops below 0°C or exceeds +40°C • Locations in which the ambient humidity drops below 10%RH or exceeds 85%RH or where condensation occurs • Locations in which the temperature changes suddenly • Locations in which the product is directly subjected to breezes from air conditioners or similar devices • Locations in which there are volatile, flammable substances or corrosive gases • Locations in which a large amount of dust, salt, metal particles, or soot is present • Locations in which liquids such as water, oil, or chemicals splash on the product • Locations in which strong magnetic or electric fields are generated
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Precautions on Regulations and Standards

■ CE marking

KEYENCE Corporation has confirmed that this product complies with the essential requirements of the applicable EC Directive, on the basis of the following specifications. Be sure to consider the following specifications when using this product in a member state of the European Union.

● EMC directive

- Applicable standard EN61326-1

These specifications do not give any guarantee that the end-product with this product incorporated complies with the essential requirements of the EMC Directive. The manufacturer of the end-product is solely responsible for confirming the compliance of the end-product itself according to the EMC Directive.

● Low-voltage directive

- Applicable standards EN60825-1, class 1 laser product

■ FDA (CDRH) regulations

This product complies with the following FDA (CDRH) regulations.

- Applicable standards FDA (CDRH) part 1040.10, class 1 laser product

The laser classification is implemented on the basis of IEC 60825-1 following the requirements of Laser Notice No. 50 of the FDA (CDRH).

■ FCC regulations

This product complies with the following EMI regulations specified by the FCC.

- Applicable standards FCC part 15 subpart B, class A digital device

This device complies with part 15 of the FCC Rules. Operation is subject to the following two conditions:

- (1) this device may not cause harmful interference, and
- (2) this device must accept any interference received, including interference that may cause undesired operation.

■ IC (Industry Canada) regulations

This product complies with the following EMI regulations specified by IC.

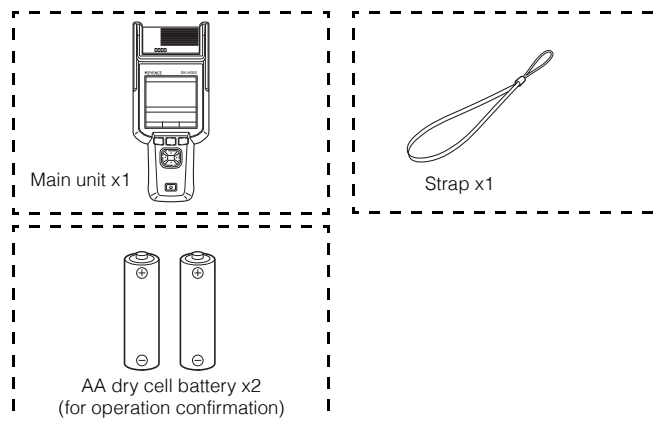
- Applicable standards ICES-003, class A digital apparatus

This Class A digital apparatus complies with Canadian ICES-003.

1. Before Use

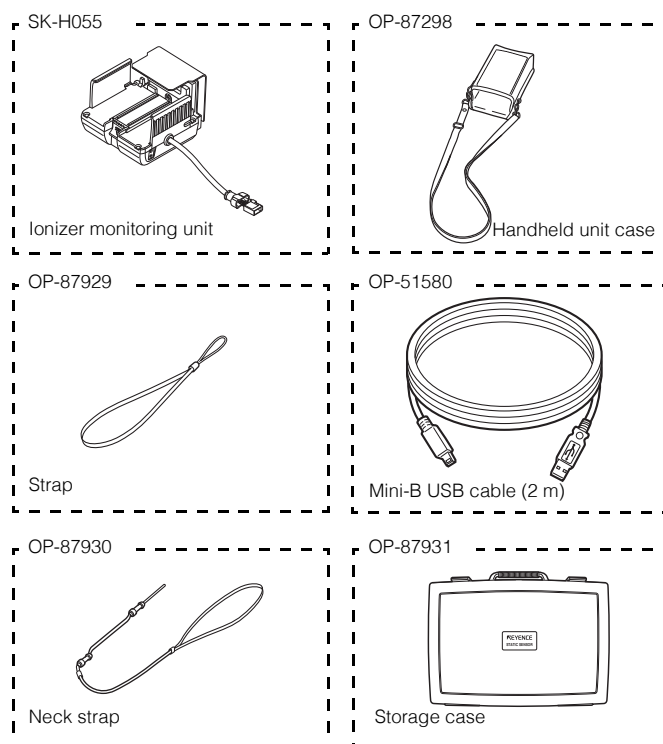
Checking the Package Contents

The following equipment and accessories are included in the package. Before using the unit, make sure that all items are included.



Grounding wire x1
Instruction manual x1 (this document)

Options



OP-87926
Grounding wire for handheld unit

OP-87927
Ion monitor unit grounding wire

PC Application Software for the SK-H

You can use PC application software to read measured data from the unit's memory to a PC.

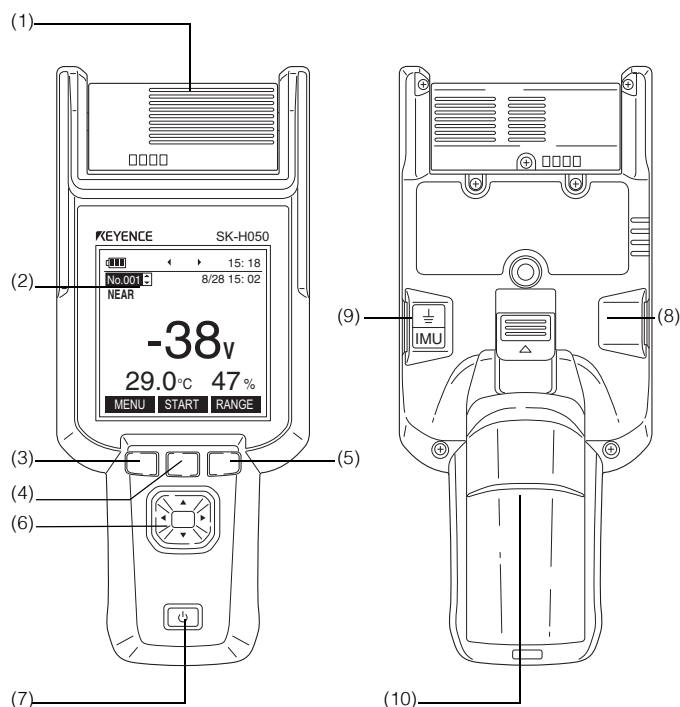
The data on the unit is read as CSV files.

You can download the software from the KEYENCE website.

(<http://www.keyence.com>)

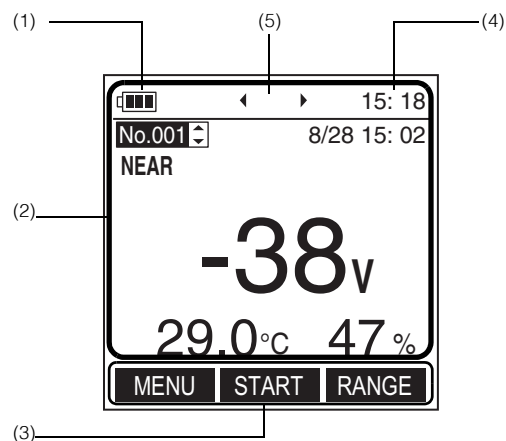
For details on the software, visit the KEYENCE website.

Part Names and Functions



Name	Description
(1) Sensing unit	This part includes the surface potential sensor and the laser emitter. The sensing unit can be rotated 180°. * The sensing unit cannot be rotated when the ionizer monitoring unit is installed.
(2) Display	Displays the measured value and each setting item.
(3) F1 key	Mainly used to display the MENU screen and to cancel settings. The operation varies depending on the screen.
(4) F2 key	Mainly used to confirm the selected item and to start/stop measurement. The operation varies depending on the screen.
(5) F3 key	Mainly used as the ZERO button and to switch the range. The operation varies depending on the screen.
(6) Arrow keys	Used to select setting items and to move the screen.
(7) Power key	Used to turn the power on and off.
(8) USB port	Connect a USB cable to this port to connect the unit to a PC.
(9) Grounding connector/IMU connector	Connect the grounding wire to this connector. When using an IMU (ion monitor unit), connect its cable to this connector.
(10) Battery compartment	Insert two AA dry cell batteries in this compartment.

Names of Parts of the Display



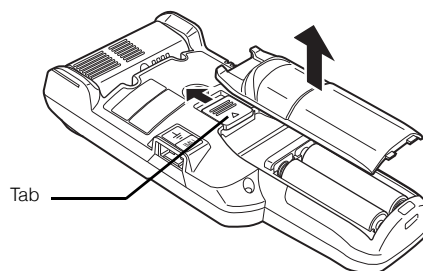
Name	Description
(1) Battery Display	Displays the remaining battery charge
(2) Main display	Displays information such as the measured value and setting items
(3) F-key operations	Displays the operations of, from the left, the F1, F2, and F3 keys
(4) Time display	Displays the date and time
(5) Title display	Displays the title of the contents shown in the main display

Preparing for Measurements

■ Replacing the batteries

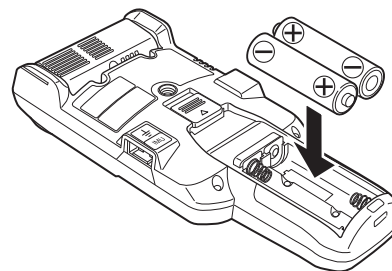
1 Remove the battery cover.

Unlock and then remove the battery cover.



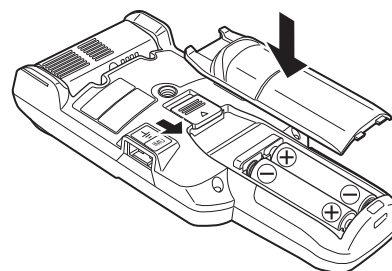
2 Replace the batteries.

Ensure that you insert the batteries in the correct position.



3 Attach the battery cover.

Attach and then lock the battery cover.



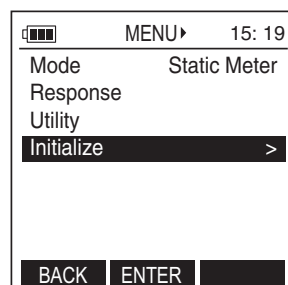
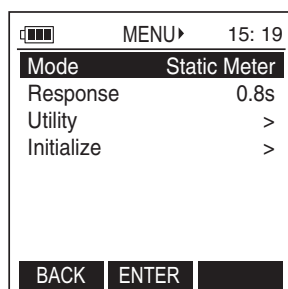
NOTICE If you will not use the unit for a long time, remove the batteries.

■ Initialization

- 1 From the measurement screen, press the "MENU" (F1) key to display the MENU screen.
- 2 Select "Initialize" and then press the "ENTER" (F2) key.
- 3 On the "Initialize" menu, the "Results" and "Factory default" items are displayed. Select the item that you want to initialize, and then press the "ENTER" (F2) key.

Results: Only the measured data will be initialized.

Factory default: The measured data and all settings other than the date and time will be reset to their default values.

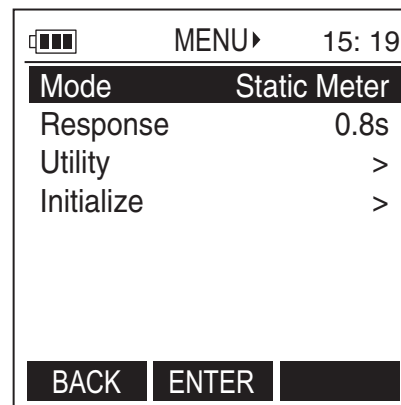


2. Operation Menus and Measurement Procedures

Setup Screen

■ Switching to the setup screen

From the measurement screen, press the "MENU" (F1) key. The MENU screen is displayed.



■ List of setting items

Setting item	Details
Mode	Select the measurement mode.
Response	Set the response time.
Utility	Configure functional settings such as the date and time, operation sound, and backlight.
Initialize	Initialize the measured data and settings.

■ Setting details

● Mode

Set the measurement mode.

Setting item	Details	Default value
Static Meter	Charge potential measurement mode: The electric charge of the target will be measured.	○
Charge Plate	Charge plate monitor mode With an IMU (ionizer monitoring unit) connected, the static elimination speed and ion balance of the static eliminator will be measured. * To use this mode, an optional ionizer monitoring unit is required.	

● Response

Set the measurement response time.

Setting item	Details	Default value
Response	0.1s/0.2s/0.4s/0.8s/1.6s/3.2s/6.4s	0.8s

* This can only be set during charging potential measurement mode.

● Utility

Configure settings such as the date and time and the operation sound - for a variety of functions.

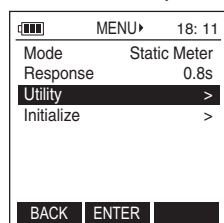
Setting item	Details	Default value
Date	Set the date and time.	
Sound	Turn the operation sound on or off. Setting item: ON/OFF	ON
Backlight	Set the display backlight. When this is set to "Auto," the backlight will remain on for a fixed length of time after an operation is performed. Setting item: Auto/ON/OFF	Auto
Sleep	When no operations are performed for the set time, the unit will automatically turn off. Setting item: OFF/3min/5min/10min/15min/30min	OFF
Laser Pointer	Turn the laser emission on or off. Setting item: ON/OFF	ON
Area Scaling	Set the area scaling. Setting Items: Near/FAR (setting range: 0.1 to 1.5)	Near: 1.0 Far: 1.0

* Area Scaling Function

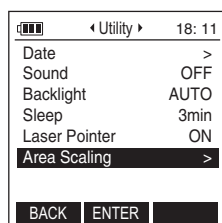
This function corrects errors in the measured value due to size differences of the measurement targets by setting a correction value according to the size of the target.

(Setting procedures)

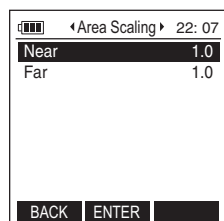
1. Press the F1 key in "MENU" and select "Utility."



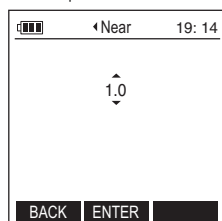
2. Select "Area Scaling."



3. Select "Near mode" or "Far mode."



4. Set a value using the ▼/▲ keys and press the "ENTER" key.



- Refer to the correction table shown below to setting the correction value.

Near mode

Measurement area	Measured value
φ20 mm	0.6
φ40 mm	0.7
φ60 mm	0.8
φ80 mm	0.9
φ120 mm	1.0

Far mode

Measurement area	Measured value
φ120 mm	0.7
φ200 mm	0.9
φ300 mm	1.0
φ400 mm	1.1
φ500 mm	1.2
φ660 mm	1.3

● Initialize

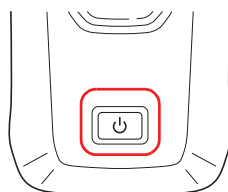
Initialize the measured data or settings.

Initialize	Details
Results	Only the measured data will be initialized.
Factory default	The measured data and all settings other than the date and time will be reset to their default values.

Procedure for Measuring Charge Potential

1 Turn the power on.

Press the power button. The main unit turns on and displays the start screen.

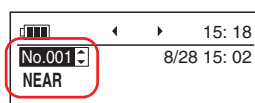


2 Press the F1 key to display "MENU."

Select "Static Meter" from "MODE."

3 Select the range.

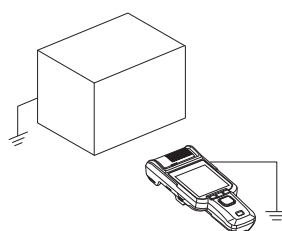
Press the "RANGE" (F3) key to select the range. Each time that you press the "RANGE" (F3) key, the range switches between "Near" and "Far."



Near (high-precision mode)	Measurement distance: 25 mm. Measurement range: 0 to ±2 kV
Far (wide-range mode)	Measurement distance: 100 mm. Measurement range: 0 to ±50 kV

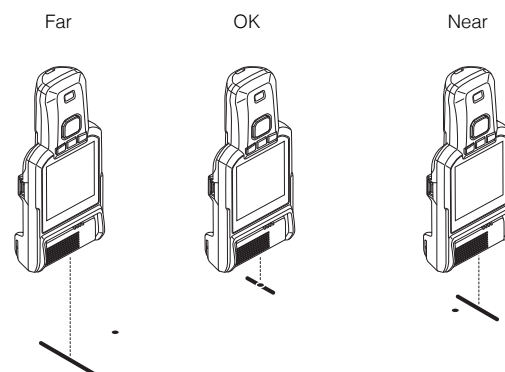
4 Perform the zero-point adjustment.

Press the "START" (F2) key to switch the unit to the measurement state. Point the unit at a grounded target, and then press the F3 key. Press the "STOP" (F2) key to stop the measurement. This completes the operation.



● Using the laser pointers to align the unit

The laser pointers are used to align the unit with the measurement distance of the selected range. Perform the alignment as shown below.

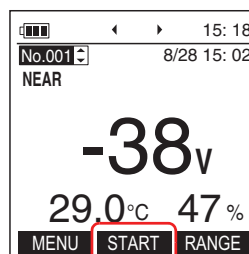


The position at which the laser line and the laser point overlap indicates the correct measurement distance.

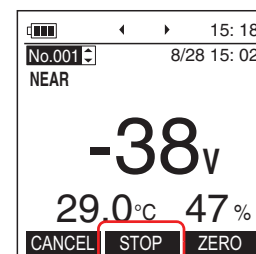
5 Perform the measurement.

Check the laser pointers to confirm that the target is at the correct measurement distance.

Press the "START" F2 key to start the measurement.



Press the "STOP" F2 key again to stop the measurement.

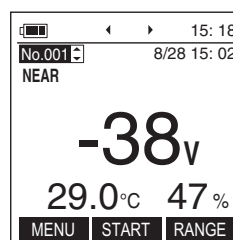


When the measurement stops, the record is automatically saved. Records are saved from number 001 to number 100. Note that if a measurement is performed with a record number in which data has already been saved, the existing data will be overwritten. If you press the "CANCEL" F1 key to cancel a measurement that has started, the unit will return to the state that it was in prior to the measurement starting. Switch to the record number that you will use, and then start the measurement.

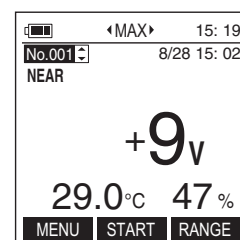
● List of screens in charging potential measurement mode

You can use the ◀ and ▶ arrow keys to switch between displays.

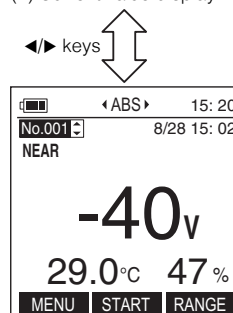
You can switch between displays regardless of whether a measurement is in progress or not.



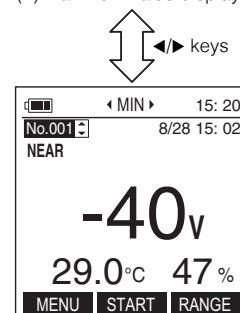
(1) Current value display



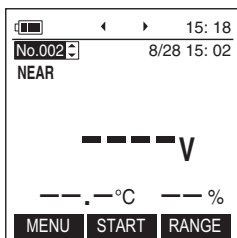
(2) Maximum value display



(4) Absolute value display



(3) Minimum value display



● Record number switching

You can use the ▲ and ▼ keys to switch the record number.

- * You can only switch between record number screens when the unit is not performing a measurement. You can switch the record number regardless of the display mode. If the record number is 100 and you continue to switch it forward, the record number will return to 1.

6 Turn the power off.

Press the power button again.
The unit turns off.

Measurement Procedure in Charge Plate Monitor Mode

In charge plate monitor mode, three types of measurements are possible: ion balance (IB), positive static elimination speed (Decay+), and negative static elimination speed (Decay-).

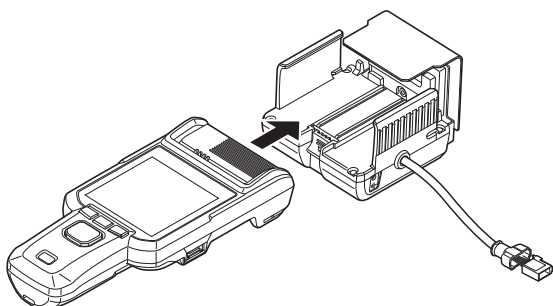
■ Measurement

Measurement	Details
Ion Balance	This mode measures the ion balance.
Decay+	This mode charges the IMU unit to a positive voltage and measures the static elimination time.
Decay-	This mode charges the IMU unit to a negative voltage and measures the static elimination time.

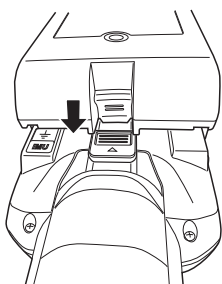
■ Connecting the ionizer monitor (SK-H055)

1 Insert the SK-H into the ionizer monitoring unit.

Insert the SK-H as far as possible.

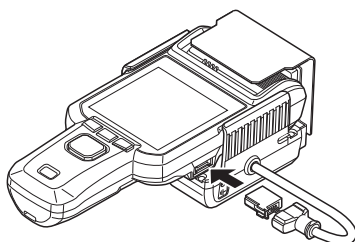


2 Slide the lock on the back of the ionizer monitoring unit until you hear a click.



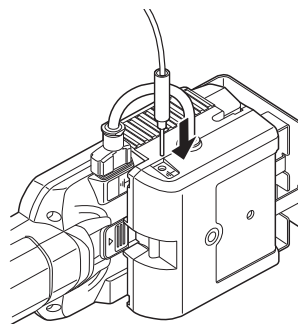
3 Insert the ionizer monitoring unit's connector cable into the connector of the SK-H until you hear a click.

Cover the connector with the lock cover to fix the cable in place.



4 Connect the grounding wire.

Connect the grounding wire to the grounding terminal on the side of the ionizer monitoring unit. Use D-class grounding.



CAUTION Before you attach the IMU unit, check that the sensor unit is facing the front. Attaching the IMU unit with the sensor unit not facing the front prevents the unit from performing accurate measurements, which may lead to product breakdown or damage.

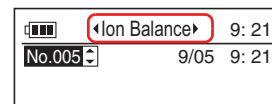
■ Ion balance measurement procedure

1 Turn the power on, and then press the "MENU" (F1) key to display the "MENU" screen.

Under "MODE," select "Charge Plate."

2 Select "Ion Balance" as the item to measure.

Use the ◀ and ▶ keys to switch between the screens until "Ion Balance" is displayed at the top of the screen.

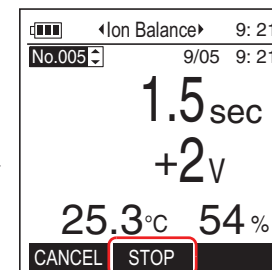
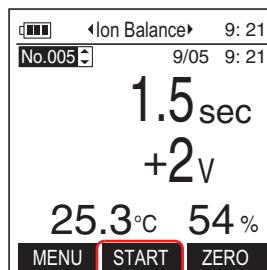


3 Perform the measurement.

Point the unit at the location to be measured.

Press the "START" (F2) key to start the measurement.

Press the "STOP" (F2) key to stop the measurement.



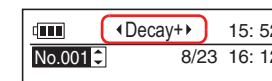
■ Static elimination time measurement procedure

1 Turn the power on, and then press the "MENU" (F1) key to display the "MENU" screen.

Under "MODE," select "Charge Plate."

2 Select "Decay+" or "Decay-" as the item to measure.

Use the ◀ and ▶ keys to switch between the screens until "Decay+" or "Decay-" is displayed at the top of the screen.

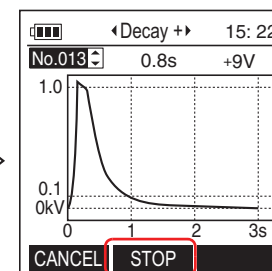
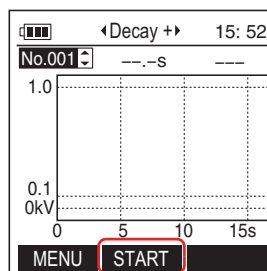


3 Perform the measurement.

Point the unit at the location to be measured.

Press the "START" (F2) key to charge the monitor and start the measurement.

When the voltage drops below 100 V, stop the measurement of the time.



Reference

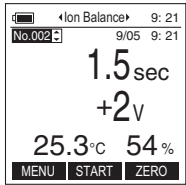
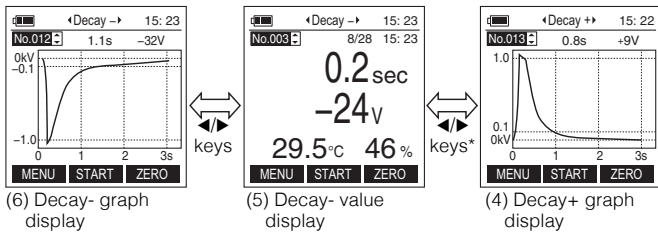
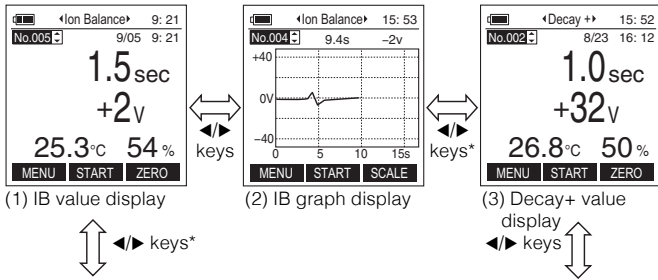
To stop the measurement, press "STOP." Alternatively, the measurement stops automatically after 99 seconds elapse.

● Saving records

When the measurement stops, the record is automatically saved. Records are saved from number 001 to number 100. Note that if a measurement is performed with a record number in which data has already been saved, the existing data will be overwritten. If you press the F1 key to cancel a measurement that has started, the unit will return to the state that it was in prior to the start of measurement. Switch to the record number that you will use, and then start the measurement.

● List of screens in charge plate monitor mode

You can use the ◀ and ▶ arrow keys to switch between the screens.



● Record number switching

You can use the ▲ and ▼ keys to switch the record number.

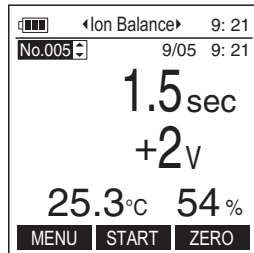
CAUTION You cannot switch to the screen marked with "*" during measurement.

Reference You can only switch between record number screens when the unit is not performing a measurement. You can switch the record number regardless of the display mode. If the record number is 100 and you continue to switch it forward, the record number will return to 1.

● How to execute zero point adjustment in charge plate monitor mode

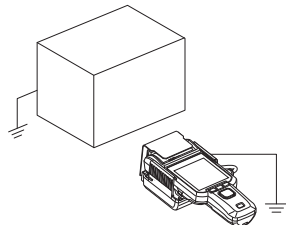
1 Select a screen on which the F3 "ZERO" key is displayed.

Switch the screen using the ◀/▶ keys, and then check that "ZERO" is displayed for the F3 key.



2 Execute zero point adjustment.

Direct the unit toward the target that is grounded, and press the F3 "ZERO" key.



3. Specifications

Specifications

			SK-H050
Charging potential measurement	Measurement mode		High-precision mode Wide-range mode
	Measurement distance		25 mm 100 mm
	Measurement range		±2 kV ±50 kV
	Measurement accuracy ^{*1}		±10 V ±100 V ^{*2}
	Minimum display unit		0 to 999 V : 1 V 1.00 to 9.99 kV : 0.01 kV 10.0 kV or more : 0.1 kV
	Sampling rate		Approx. 1.4 ms
Temperature measurement	Measurement range		0 to 40°C
	Measurement accuracy ^{*3}		±1°C
	Minimum display unit		0.1°C
	Sampling rate		1 s
Humidity measurement	Measurement range		10% to 85% RH
	Measurement accuracy ^{*3}		±5% RH
	Minimum display unit		1% RH
	Sampling rate		1 s
Charge plate monitor function ^{*4}	Ion balance measurement mode	Ion balance measurement range	±1 kV
		Measurement accuracy ^{*5}	±10 V
		Measured voltage minimum display unit	1 V
	Static elimination time measurement mode	Charge voltage	±1400 V
		Static elimination time minimum display unit	0.1 s
		Measurement time	0 to 99 s
Laser class			Class 1 (IEC60825-1:2007, FDA(CDRH) Part1040.10 ^{*6})
PC interface			USB 2.0 Full Speed
Ratings	Power supply voltage		AA alkaline dry cell battery × 2
	Operation time		8 hours (in charge potential measurement mode)
Environmental resistance	Ambient temperature		0 to 40°C (no freezing and no condensation)
	Ambient humidity ^{*7}		10 to 85%RH (no condensation)
Materials			SK-H050: PC-ABS, PC, SUS/ SK-H055: PC, SUS, PTFE, PVC
Weight			SK-H050: Approx. 240 g, SK-H055: Approx. 220 g

^{*1} When measured with a response time of 0.8s, this is ±100 V or less in high-precision mode and ±1 kV or less in wide-range mode, and ±10% (indicated value) in other ranges.

^{*2} The measurement accuracy range is ± 30 kV.

^{*3} At 25°C and with a humidity of 50%RH

^{*4} SK-H055 is necessary.

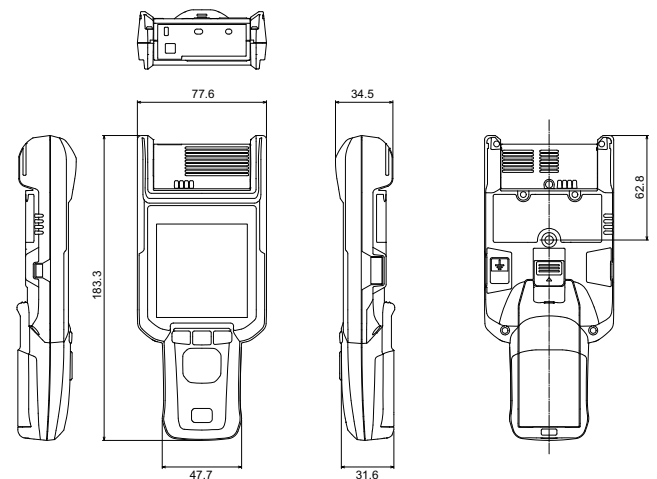
^{*5} When ±100 V or less. Other ranges are ±10% (indicated value).

^{*6} The laser classification is implemented on the basis of IEC 60825-1 following the requirements of Laser Notice No. 50 of the FDA (CDRH).

^{*7} 10 to 60%RH when using the SK-H055.

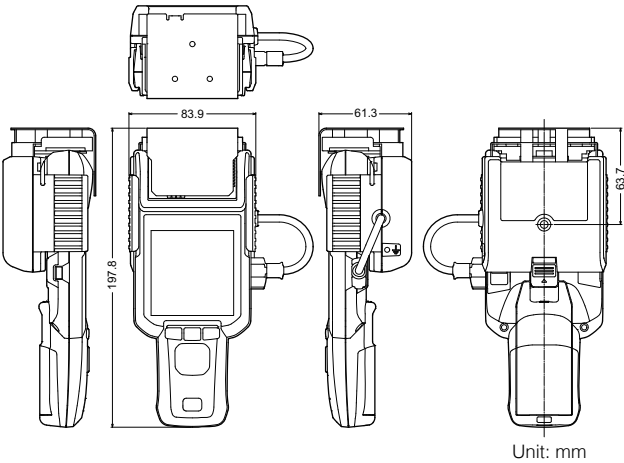
Dimensions

■ SK-H050



Unit: mm

■ With the IMU SK-H055 installed



4. Appendix

Error Messages and Corrective Actions

Error display	Error description	Corrective action
Low Battery	The remaining battery charge is insufficient.	Replace the AA batteries with new ones.
Factory value is broken.	Reading the nonvolatile memory storage data failed.	• Cycle power • If the same error occurs, contact your nearest KEYENCE office.
Please confirm wiring.	An overcurrent is flowing through the grounding wire or IMU connector.	Check that the unit has been wired correctly.
Memory error is occurred.	Reading/writing the nonvolatile memory storage data failed.	Press the F2 key to recover from the error, but the unit will reset its settings to their default values and restart.
IMU is not connected.	IMU is not connected during charge plate mode.	Press the F2 key to recover from the error. Connect IMU.
IMU is overcharged. Please discharge it.	A high voltage has been already applied to the IMU plate.	Press the F2 key to recover from the error. Discharge the charge plate, by temporarily grounding it, and then perform the operation again.
Failed to charge. Please replace batteries.	The remaining battery charge is insufficient for the charge.	Press the F2 key to recover from the error. Replace the AA batteries with new ones.
Failed to adjust zero.	An attempt was made to store a voltage that is invalid or is not within the correctable range as the zero point.	Press the F2 key to recover from the error. Check that the measured value is within the correctable range*, and then perform the zero-point adjustment again.
Hardware Error	Hardware error.	• Cycle power • If the same error occurs, contact your nearest KEYENCE office.

* Correctable range: NEAR: ± 500 V, FAR: ± 5 kV

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