

HAKKO FG-450

STATIC LEVEL METER

Instruction Manual

Thank you for purchasing HAKKO FG-450 static level meter.
Please read this manual before operating the HAKKO FG-450.
Keep this manual readily accessible for reference.

Functions

The static level meter HAKKO FG-450 is a portable static electrical potential meter with digital readout, for measuring the electrical potential of charged objects. When measuring fluctuating static electricity, you can temporarily hold an indicated value, and check maximum voltages in the MAX mode.

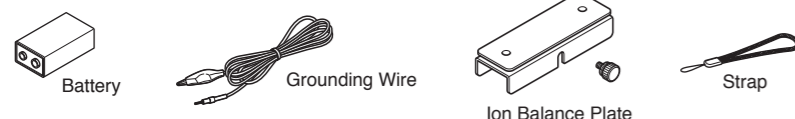
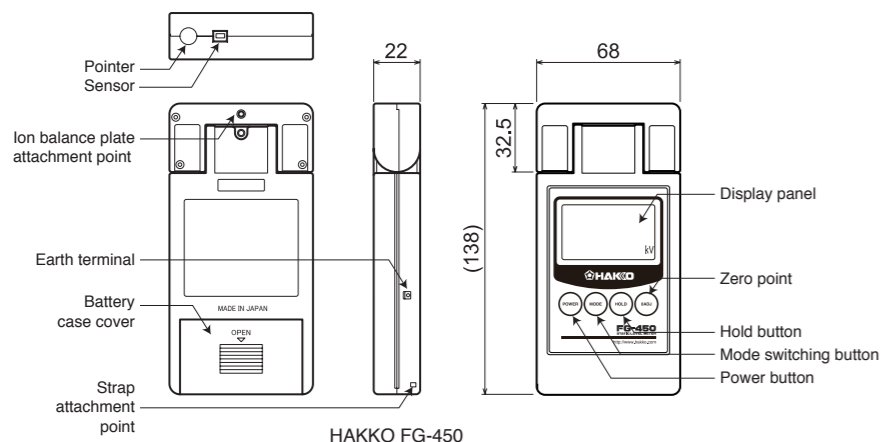
Characteristics

1. Enables you to measure surface potentials of charged bodies without coming into contact.
2. Enables you to take measurements in narrow locations by rotating the sensor head.
3. With the ion balance plate, you can carry out ionizer balance checks.

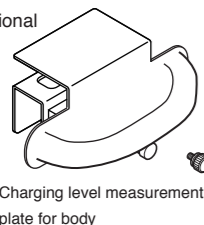
1. PACKING LIST AND PART NAMES

Please check to make sure that all items listed below are included in the package.

HAKKO FG-450 (With carrying case)	1	006P type 9V dry cell battery (For trial)	1
Grounding Wire.....	1	Ion Balance Plate (With screw)	1
Strap	1	Instruction Manual	1



Optional



2. SPECIFICATIONS

Signal detection method	Oscillating chopper method
Display refresh frequency	0.5 seconds
Measurable potential range	Normal mode: 0.00 - ±19.99kV (resolution: 0.01kV) I.B (Ion balance) mode: 0.000 - ±1.999kV (resolution: 0.001kV)
Measurement precision	±10% of reading ±2 digit
Continuous operating limit	Approximately 10 hours (with alkaline battery)
Measuring distance	30 mm (between object being measured and sensor)
Measuring distance adjustment	Red LED beam focusing method
Sensor head rotation angle	180° (stops every 45°)
Display	LCD display with built-in backlight
Polarity display	+ polarity / - polarity display
Mode switching	Switch modes by pressing MODE button
Battery check	Remaining charge displayed in display panel
Battery	DC9V alkaline rectangular dry cell battery 006P
Operating temperature/ humidity range	0 - +40°C, 20 - 70%RH, non-condensing
Dimensions	68 mm x 22 mm x 138 mm (W x D x H)
Weight	Approximately 160g (including battery)

3. SAFETY INSTRUCTIONS

This device is a precision electrical instrument. For the sake of safety, be sure to follow the instructions described in this manual. ⚠ mark are precautions that must be followed in order to use the product safely.

- ⚠ **DANGER** : This device does not conform to explosion-proof specifications. Do not install it in locations where flammable gases or solvents are handled, such as painting booths etc. Doing so may result in fire or explosion.
- ⚠ **CAUTION**: This device is a precision electrical instrument. Avoid installing it in wet, oily, hot, and humid locations. In particular, avoid locations of high humidity and condensation. There is a possibility of fire due to breakdown.

⚠ CAUTION

- Do not use this device in the following locations, as doing so may cause malfunctions.
 - Locations subject to high or low temperature, or high humidity
 - Dusty locations
 - Locations where the device may be exposed to organic solvents such as thinner
 - Locations where the device may be exposed to corrosive gas
 - Locations subject to flames or explosions
 - Locations subject to frequent vibrations
 - Locations subject to sudden changes in temperature or humidity
 - Locations subject to condensation
 - Locations where the device may be exposed to water or oil

■ Maintenance

- Regularly remove any built-up dirt etc. from the ion balance plate. Built-up dirt can cause insulation faults.
- Make sure to turn the main power of the device OFF before cleaning.

■ Handling

- Make sure to connect the grounding wire to an appropriate place. Accurate measurements are not possible if the grounding wire is not connected.
- To obtain accurate measurements, measure at an appropriate distance from the charged object.
- Do not touch or insert foreign materials into the sensor portion of this device.
- Do not blow ionized air directly into the opening of this device.
- Do not place heavy objects on the LCD display of this device.
- Do not disassemble or modify the device.
- The device may affect medical devices such as hearing aids or pacemakers.
- Do not insert any foreign objects into the device. Doing so may result in a short circuit or current leakage, and cause fire or electrocution.
- The battery discharges a small amount of electricity even when the device is turned off. If you do not intend to use this device for an extended length of time, remove the battery.
- If the device emits any abnormal odors or sounds, smoke, or heat, turn OFF the main power immediately, and contact your point of purchase. Failure to do so may result in fire or a short circuit.
- Do not remove name plates or labels.
- Do not do anything with the device that is not described in this manual.

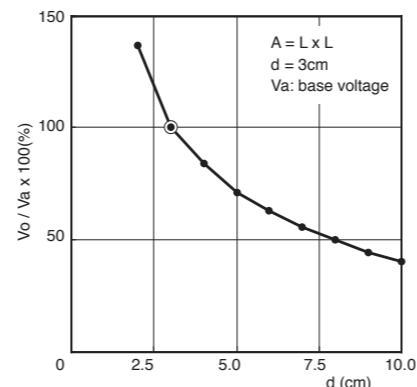
■ Important Points About Taking Measurements

● Grounding

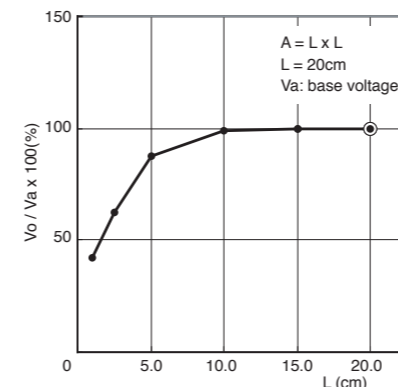
If the user's body retains an electrical charge, or highly accurate measurements are required, ground the earth terminal of this device. Also, if the charged object is expected to have a large charge, be sure to ground the device to avoid breakdown due to discharge.

● Adjusting the Measurement Distance

The strength of the electrical field of a charged object changes with the distance between the charged object and the sensor portion of the measuring instrument. This device has been calibrated with a distance of 30mm between a test charged object (200mm² metal plate) and the meter. Consequently, when measuring it is necessary to conform to a measuring distance of 30mm. Move the meter so that the illuminated point on the charged object emitted by the pointer (red LED) is sharpest. If such a distance cannot be attained, correct the potential reading according to Figure 1.



(Fig. 1) Relationship between measuring distance d and indicated value Vo of surface electrometer



(Fig. 2) Relationship between size A (length L of one edge) of (square) charged object and indicated value Vo of surface electrometer

If the distance is more than the recommended measuring distance of 30mm, and the displayed potential exceeds 19.99kV, do not move the meter any closer to the charge object.

⚠ CAUTION

If the meter is too close to the charged body, there is the danger of an electrical discharge. This may cause a breakdown of the device.

3. SAFETY INSTRUCTIONS

● Influence of the size of the charged object

The measured potential changes according to the field strength concentrated in the electrode of the sensor portion of the meter and the size of the charged object. In particular, if the charged object is smaller than the test charged object used during calibration (200mm²), there is a large discrepancy in the measured value and an error can occur in the resulting value. If this is the case, you can roughly correct the value according to Fig. 2.

● Influence of other objects

If there are other objects near or behind the charged object, the displayed measurement is smaller than the actual potential. If this is the case, correct the measurement in light of the shape of the electrical field, or put as much distance as possible between the charged object being measured and other objects.

● Influence of charged particles etc.

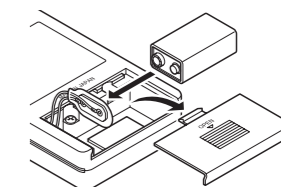
Powerfully charged objects impose a charge on particles and create an ionic space. If charged particles etc. adhere directly to the electrode of the meter, measurement errors will occur. This phenomenon occurs when a large amount of fluff adheres to the charged object or large amounts of dust are in the vicinity.

4. OPERATION

■ Preparation

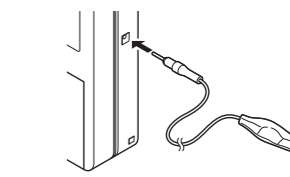
1. Insert the battery.

Remove the battery case cover and insert a 9 volt dry cell battery. Replace the cover carefully, taking care to keep the battery leads clear of the cover.



2. Connect the earth lead to the earth terminal, and reliably ground the grounding wire.

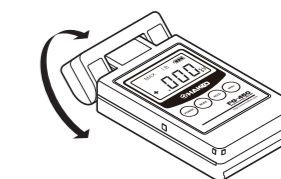
Connect the grounding wire securely to the terminal, and connect the clip on the end of the grounding wire to a grounded object. To obtain accurate measurements, the earth terminal must be grounded.



3. Rotating the Sensor Head

You can rotate the sensor head of the meter. This enables you to easily take measurements in narrow locations etc. that were previously difficult to access.

The sensor head rotates in 45° increments. When rotating the head, stop at angles where the sensor head clicks into place.



■ Measurement Procedure

● Measuring Static Electricity

1. Turn the meter on.

Press the POWER button for more than one second, until you hear a beep.



2. Set the mode you want to use.

Each time you press the mode button, the meter scrolls through the modes in the order shown in the table on the right. To measure potentials, use the normal mode.

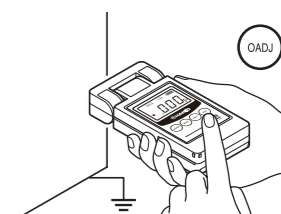
Mode	Panel display
Normal Mode	(None)
MAX Mode	MAX
I.B (Ion Balance) + MAX Mode	MAX I.B
I.B (Ion Balance) Mode	I.B

3. Zero point adjust the meter.

Point the sensor at a grounded object and press the OADJ button.

NOTE :

Zero point adjustment is reset when you turn the meter off.



4. If you want to measure a maximum potential, use the MAX mode.

Refer to step 2 for how to set modes.

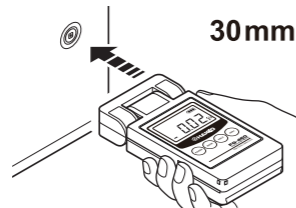
4. OPERATION

5. Point the sensor at the charged object, and gradually bring the meter closer to the object.

The distance between the sensor and the charged object should be 30mm. At about 30mm, the red LED beam (pointer) cast on the charged object should look like the image in Figure 3.

NOTE :

- If the recommended measuring distance of 30mm cannot be attained, do not bring the meter any closer if the potential displayed exceeds 19.99kV. Doing so may cause damage to the meter.
- If the display panel blinks "1", the charged voltage has exceeded the measurable range (over-range). If this occurs, stop measuring immediately, as this may cause damage to the meter.



(Fig. 3) Red LED mark

6. The value on the display panel is the measurement result (unit: kV).

7. In normal mode, you can temporarily hold the measured value by pressing the hold button.

If you press the hold button again, the stored value is removed. You cannot use the hold function in MAX mode.

8. To turn the meter off, press the POWER button for more than 1 second.

● Measuring Ion Balance

By attaching the optional ion balance plate (sold separately) to the meter, you can measure ion balance (offset voltage).

1. Turn the meter on.

Press the POWER button for more than one second, until you hear a beep.

2. Set the mode you want to use.

Each time you press the mode button, the meter scrolls through the modes in the order shown in the table on the right. To measure offset voltages, use the I.B mode.

3. Zero point adjust the meter.

Point the sensor at a grounded object and press the 0ADJ button.

NOTE :

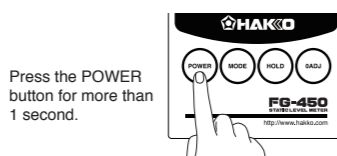
Zero point adjustment is reset when you turn the meter off.

4. Attach the ion balance plate to the meter.

Firmly screw the ion balance plate onto the meter with the screw provided, making sure that it is centered and there is no gap.

5. If you want to measure the maximum value of an offset voltage, use the MAX I.B mode.

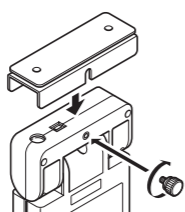
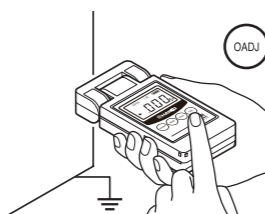
Refer to step 2 for how to set modes.



Press the POWER button for more than 1 second.



Mode	Panel display
Normal Mode	(None)
MAX Mode	MAX
I.B (Ion Balance) + MAX Mode	MAX I.B
I.B (Ion Balance) Mode	I.B



4. OPERATION

6. Point the ion balance plate at the measurement location.

The potential on the ion balance is measured.

CAUTION

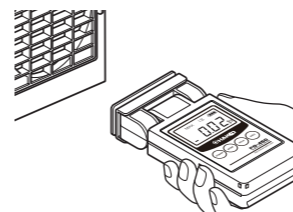
If the display panel blinks "1", the charged voltage has exceeded the measurable range (over-range). If this occurs, stop measuring immediately, as this may cause damage to the meter.

7. The value on the display panel is the measurement result (unit: kV).

8. In I.B mode, you can temporarily hold the measured value by pressing the hold button.

If you press the hold button again, the stored value is removed. You cannot use the hold function in MAX I.B mode.

9. To turn the meter off, press the power button for more than 1 second.



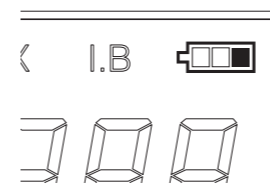
Press the POWER button for more than 1 second.



5. MAINTENANCE/CHECKING PROCEDURE

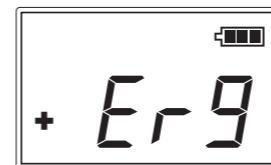
● Battery Indicator

The remaining battery charge is displayed on the upper right of the display panel. When the battery charge icon shows one unit left, replace the battery.



● Error Display

The signal detection method of the meter is an oscillating chopper method. If for some reason the sensor stop oscillating, an error message like that shown in the illustration on the right is displayed, and the meter emits a beeping sound every second. If this occurs, restart the meter. If the error message continues to be displayed after restarting the meter a number of times, the sensor may be faulty. Contact the sales office where you purchased the product.



6. TROUBLE SHOOTING GUIDE

If the device does not operate correctly, it may be the result of one of the following.

● The display panel is not active when the power is turned on.

CHECK : The battery has not been installed, or the positive and negative terminals have been connected the wrong way around.

ACTION : Correctly install the battery.

CHECK : The battery has been completely drained.

ACTION : Replace the battery with a new one.

● The display panel displays correctly, but does not zero.

CHECK : Zero point adjustment is incorrect.

ACTION : Perform zero point adjustment again.

CHECK : Structural components close to the sensor are charged.

ACTION : Wait until the charge in the components has attenuated.

● The display does not change even when approaching a charge object.

CHECK : The meter is holding a maximum value in MAX mode or ACTION : MAX I.B mode.

CHECK : Press the mode button to switch modes.

ACTION : The meter is holding a measured value in normal mode

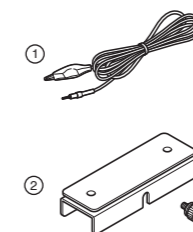
CHECK : or I.B mode.

ACTION : Press the hold button and start measuring again.

The sensor is faulty.

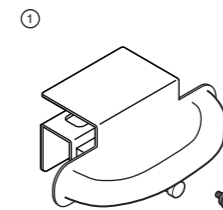
If an error message is displayed or you cannot hear an oscillating sound from the sensor, the sensor must be replaced. Contact the sales office where you purchased the product.

7. PARTS LIST



● HAKKO FG-450

Item No.	Part No.	Part Name	Specifications
①	B3584	Grounding wire	
②	B3585	Ion balance plate	with screw



● Optional parts

Item No.	Part No.	Part Name	Specifications
①	B3586	Charging level measurement plate for body	with screw

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