

# **HIOKI**

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Instruction Manual

## **SME-8311**

# **ELECTRODE FOR FLAT SAMPLE**

**HIOKI E. E. CORPORATION**

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\*600189451\*



## 1. General description

(Care in handling)

- . This is an electrode for measuring insulation resistance and used to measure the flat sample.
- . It is used in conjunction with HIOKI super megohmmeter SM-800 or SM-8200 series. Care must be fully taken to electric shock, because high voltage is handled in measurement.
- . Open or close the lid of this electrode with the lid held with hand. When opening the lid, it might lay down backward, unless it is held with hand.
- . There is a danger of pinching the finger when opening or closing the lid. Therefore, open or close the lid with the lid held with hand as mentioned in the above paragraph.
- . Please read this instruction manual in handling the electrode.

## 2. Outline

This is an electrode to measure sample surface resistance and volume resistance with a sample accommodated in the electrode. The main electrode dia is 19.6 mm and the inner and outer ring electrode dias are 24.1mm and 28.8mm, respectively. Measurable sample size is "40x40mm" to "100x100mm" and sample thickness is up to 8mm. This is same as SME-8310 except size of electrode.

## 3. Specifications

|                            |   |
|----------------------------|---|
| Size of sample             | min. approx.40 x 40mm                         |
|                            | max. approx.100 x 100mm plate sample          |
| Thickness of sample        | less than 8mm                                 |
| Ambient temperature        | 0 to 40 °C                                    |
| Diameter of main electrode | 9.6mm   |
| Electrode constant         | volume resistance $30/t$ (cm)                 |
|                            | however, T is thickness of sample, unit is mm |
|                            | surface resistance 30                         |

## 4. Operation

- . To best display the function of this electrode, it is recommended that the "SM-8000 or SM-8200 series" super megohm meter is used.
- . First, confirm that the "Charge/Discharge" switch on the SM-8000 series meter is set to "DISCHARGE", then connect the electrode to the meter.  
For best results, provided "HV-EN" (external control of measuring power supply) when using the "SSM-8000 Series".  
When "HV-EN" is proved, the measuring voltage can be controlled by cover open/close.
- . Open the cover. It can be opened when the handle is lifted by pressing the white button at center front. Fully open the cover until it is stopped. Load a sample at the center of the electrode and then close the cover. When closing, first hold the

handle with the thumb and the index and middle fingers and lower the cover until the male lock metal engages the female lock metal, and then further lower the cover while pressing the white pushbutton with thumb, remove the thumb from the white push button. Sample size is "40mmx40mm to 100mm x 100mm".

Turn the "FUNCTION" switch (see Fig.1) on the right side of this electrode to "Rs" for surface resistance measurement, and to "Rv" for volume resistance measurement. See Fig.2. Turn the same switch to "REST" during sample replacement.

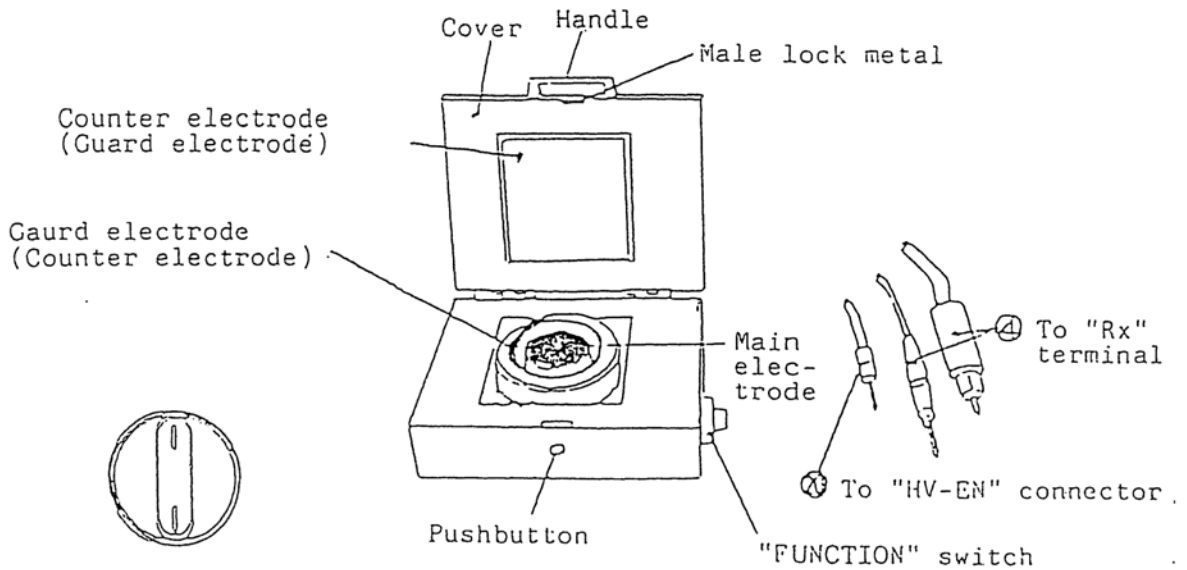


Fig.1

Fig.2

Conduct measurement in accordance with Hioki's SM-800 or SM-8200 series instruction manual.

If the cover on the SME-8311 is opened with the "Charge/Discharge" switch on the SM-8000 series meter turned to "MEASURE", measuring voltage is turned "OFF" to avoid electric shock. However, the indication on the indicator may change depending on the SM meter measuring range, because the main electrode is not disconnected even in the "MEASURE" position.

## 5. Handling precautions

- Full attention must be exercised in electrode handling including sample pre-treatment.

Avoid conducting measurement immediately on a sample stored at a cold location and then brought into the measuring room at ambient temperature.

Also, holding of a sample with the bare hands or storing many samples by stacking may exert an influence on measurement.

Some samples may generate a potential which causes reverse indicator deflection.

There is no one rule on how to handle each sample, but it is always best to select the measuring instruments, measuring conditions, measuring methods and measuring environment for comparison of measured data.

- Confirm that there are no scratches or dirt around the electrode area (conductor rubber of the main electrode and guard electrode, upper counter electrode board), and that the conductor rubber is not deteriorated. In some samples, even a small scratch may affect measurement. (See 7. Maintenance method of electrode)

The details of consideration are described in the following:

|                         |  |
|-------------------------|--|
| (Pre-treatment)         | Cut a sample to the desired size and remove any surface contamination.<br>Sample thickness measurement and recording of items noticed. |
| (Sample storage)        | Temperature control, humidity control and storage status   |
| (Sample handling)       | Specified tweezers are used.   |
| (Measuring condition)   | Measuring voltage and measuring time.  |
| (Measuring method)      | The SME-8311 is used as an electrode.  |
| (Measuring environment) | Measuring room temperature and humidity  |

It is important that these values be recorded along with the measured result (data).

External dimensions (See fig. 3)

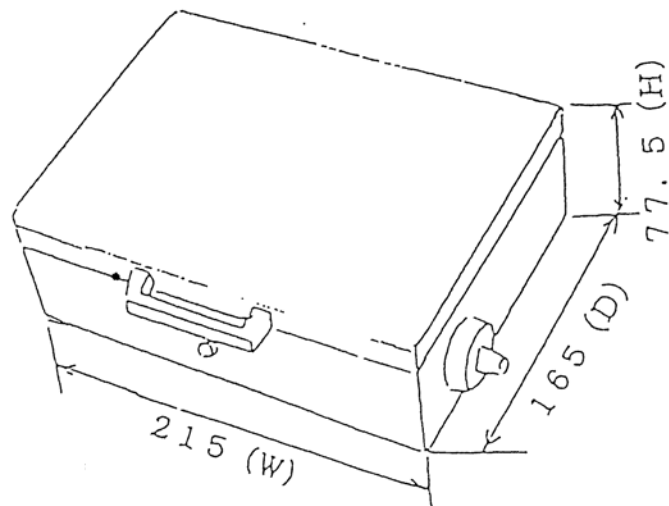


Fig. 3 External dimensions

## 6. Volume resistivity and surface resistivity

Values obtained by multiplying the measured results of volume resistance and surface resistance by cell constant are called volume resistivity ( $\rho$ ) and surface resistivity ( $\sigma$ ).

|                             |                                  |
|-----------------------------|----------------------------------|
| Main electrode dia.         | : R1 (cm) for SME-8311: 1.96(cm) |
| Inner guard electrode dia.  | : R2(cm) for SME-8311: 2.41(cm)  |
| Sample thickness            | : t (mm)                         |
| Measured volume resistance  | : RV ( $\Omega$ )                |
| Measured surface resistance | : Rs ( $\Omega$ )                |
| circular constant           | : $\pi$ (3.1415)                 |

$$\text{Volume resistivity}(\rho) = \frac{\pi \cdot R1^2}{4(t \times 0.1)} Rv \text{ (}\Omega \cdot \text{cm)} \text{----- (1)}$$

$$= K1 \times Rv \text{ (}\Omega \cdot \text{cm)} \text{----- (2)}$$

$$\text{Surface resistivity}(\sigma) = \frac{\pi(D1 + D2)}{D2 - D1} \times Rs \text{ (}\Omega) \text{----- (3)}$$

$$= K2 \times Rs \text{ (}\Omega) \text{----- (4)}$$

In equations (2) and (4), (K1) and (K2) are called cell constants.

By substituting the actual values for equations (1) and (3), the SME-8311 cell constant can be obtained.

|  |
|--|
| $\text{Volume resistivity} = \frac{30}{t} \times Rv \text{ (}\Omega \cdot \text{cm)} \text{----- (5)}$ |
| $\text{Surface resistivity} = 30 \times RS \text{ (}\Omega) \text{----- (6)}$                          |

Note: Unit . . is mm.

Equations (5) and (6) are used for the actual measured result.

## 7. Maintenance method of electrode

There is no standard of insulating material, which is influenced by temperature, humidity etc. and of which insulation resistance is varied. Once it is applied by the voltage, the influence of residual charge arises. Handling and storage method of plastics which remarkably generate static electricity are difficult.

Measuring time is naturally big element.

In actual maintenance of electrode, prepare stable sample (material) under such a state and make use of desiccator as storage method.

There is a possibility that measured value is different ever time measurement is made. Specify manage value and if it is not kept, you may understand that the influence such as contamination of electrode, etc. might occur.

### 7.1. Cleaning method

It is recommended to clean the surface of electrode by blowing dry air. If it is cleared that the electrode becomes stained, use the solvent which can clean that material. In many case, it is organic solvent but diminish the liquid volume as possible and clean it not to diffuse the stain. Clean the surface of electrode and also the dust between electrodes.

### 7.2 How to disassemble (Fig. 4 & 5)

Fig 4 shows construction. Turn the guard electrode to right by approx. 10 degree, and raise up it to disassemble. As lead wire is connected to guard electrode, care must be taken of handling it.

Cleaning can be made easily in disassembled state. Please clean the surroundings and between the electrodes.

When disassembling the electrode, use a pair of gloves, not bare hand.

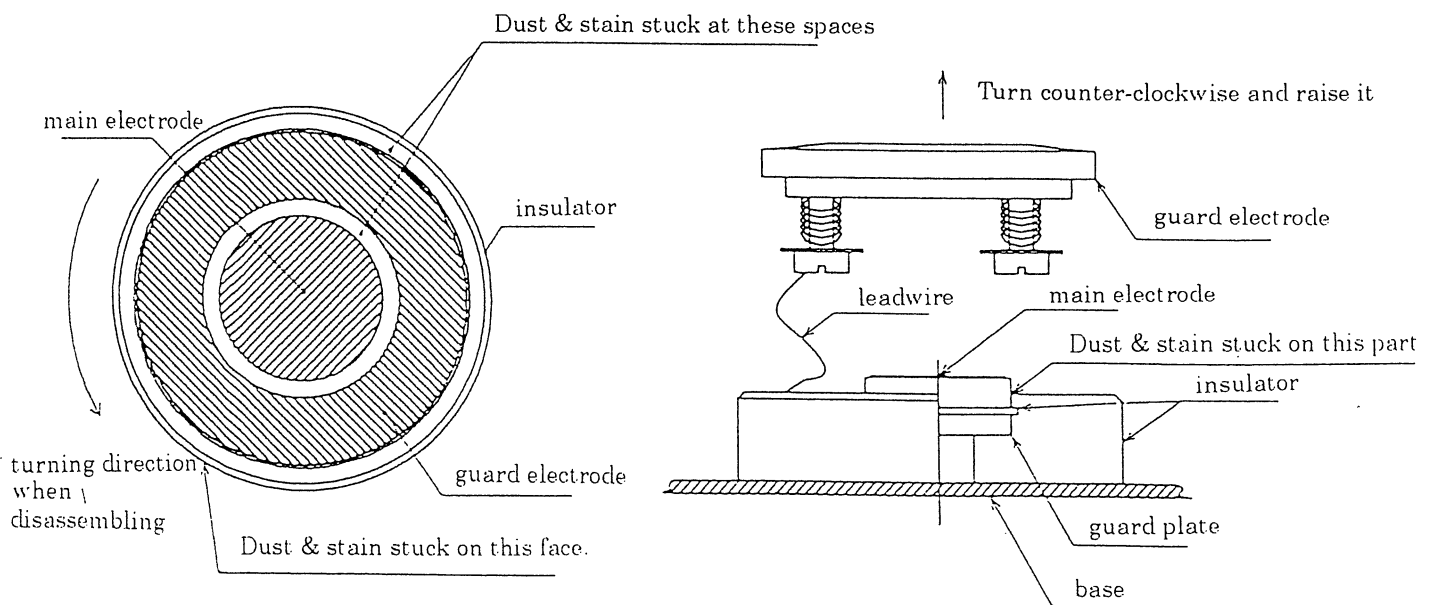


Fig.4

Fig.5

### 7.3 On red connector

When red connector is deformed and not connected firmly to Rx terminal of HI0KI super megohmmeter (SM series), measured value fluctuates, causing the measuring error. (See Fig 6)

Confirm whether its connection is poor or not.

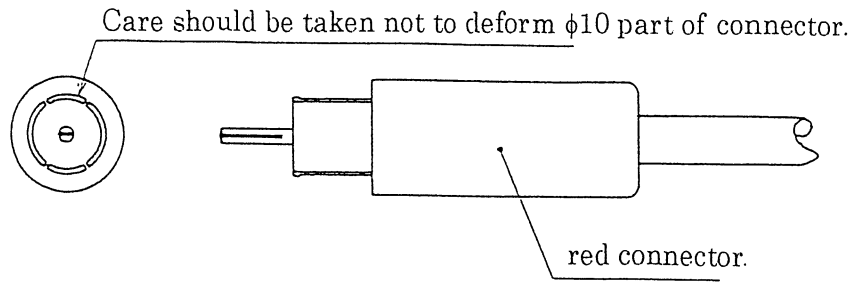


Fig.6









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