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# **HIOKI**

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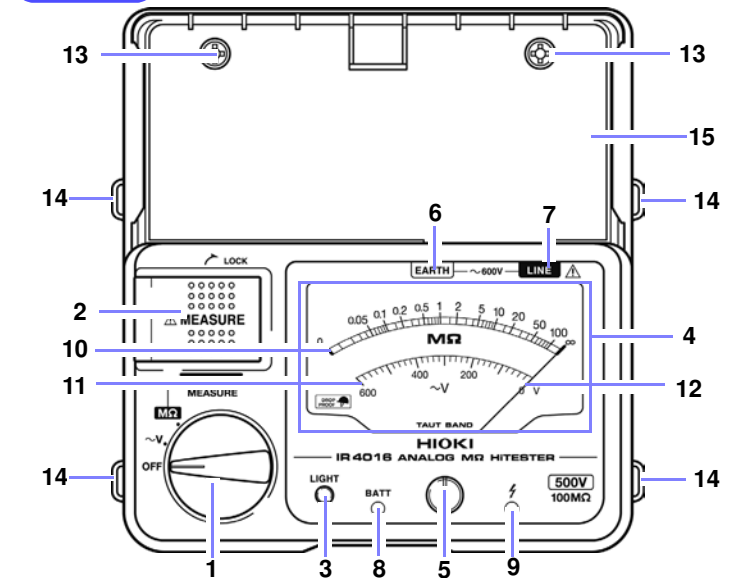


Voltage Measurement		
Measuring range	0 to 600 V	
Accuracy	±5% of maximum scale value	
Frequency range	50/60 Hz	
Input resistance	500 kΩ or more (50 Hz/60 Hz)	
Effect of temperature	±5% of maximum scale value	
Effect of position (Horizontal ±90°)	±2% of maximum scale value	
Overload protection	600 VAC	660 V AC
• Effect of temperature is applicable to the temperature range other than 18 to 28°C		
• Accuracy is applicable after adjustment by meter movement zero adjuster		

## Names and Function of Parts

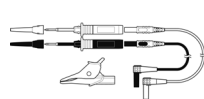
### Front

\*This figure is the IR4016.

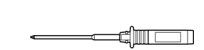


1. Function selector: Select measurement functions
2. MEASURE key: Press to measure insulation resistance.
3. LIGHT key: Press to turn on the light
4. Scale plate
5. Meter movement zero adjuster
6. EARTH terminal: Connect the black test lead
7. LINE terminal: Connect the red test lead
8. Effective battery range indicator: Green when battery power is high, red when batter power is decreasing and no light when battery is drained
9. Live circuit indicator: Lights up when voltage remains between input terminals
10. Insulation resistance scale
11. AC voltage scale
12. Indicator needle
13. Sleeve stand: Attach the sleeve removed from the tip of the test lead.
14. Strap opening: Pass the supplied strap through the opening.
15. Test lead storage space: Stores the test lead without having to remove it from the measurement terminal.

## Options

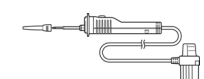


### □ L9787 Test Lead (1.2 m)



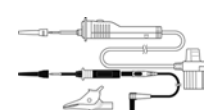
### □ L9787-91 Breaker Pin

(Pin length 70 mm and 48 mm from the tip has width 2.5 mm. The rest have width 3.8 mm.) Breaker pin for L9787.



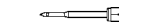
### □ L9788-10 Test Lead with Remote Switch (1.2 m)

Test lead with **MEASURE** key for the line side measurement. Measurement can be started by pressing the key. There is a light at the tip which can be switched on by pressing the LIGHT key on the IR4000 Series. Earth side lead is not attached.



### □ L9788-11 Test Lead Set with Remote Switch

Model L9788-10 with an EARTH side lead.



### □ L9788-90 Tip Pin (for Model L9788-10)

Replacement Tip Pin for L9788-10.



### □ L9788-92 Breaker Pin (for Model L9788-10)

(Pin length 123 mm and 65 mm from the tip has width 2.6 mm.) Replacement Tip Pin for the L9788-10.



### □ 9804-02 Magnetic Adapter

(Ø11 mm, Corresponding standard screw: M6 Button head screw)  
Adaptor for connecting a Test lead to the round head screw by means of magnetism. The tip of adaptor is a concave shape in order to fit the round head screw. Put an adaptor on the tip of the earth side lead of a L9787 Test Lead or L9788-11 Complete Test Lead.

L9787 Test Lead, L9788-10 Test Lead with Remote Switch and L9788-11 Test Lead Set with Remote Switch are all exclusively designed for theHIOKI IR 4000 ANALOG MΩ HiTESTER series. Do not use for any other purpose.

## Measurement Procedures

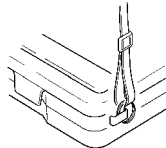


### Preparing for Measurement

1. Attach the strap.
2. Insert the batteries.
3. Remove the sleeve from the tip of the test lead.
4. Connect the test lead (connect the black test lead to the EARTH terminal, and the red test lead to the LINE terminal)
5. Adjust the needle to point to zero before measuring. With the function selector at OFF, turn the meter movement zero adjuster with a screwdriver until the needle points to the center part of the ∞ in the scale.

### Attaching the strap

Pass the ring on both ends of the supplied strap through each of the four holes in the instrument.



### Pre-measurement inspection

- **Confirming the battery power.**  
Set the function selector away from OFF and confirm the effective battery range indicator. Battery power is high when a green light is shown. Battery power is low when a red light is shown and replacement is recommended. Battery is drained when no light is shown. Please replace the batteries then.
- **Ensure that the test leads are not disconnected.**
  1. Use the function selector to select Insulation Resistance.
  2. Short the test lead tips.
  3. Confirm that the indicator needle points at 0 MΩ when pressing the MEASURE key.
- **When using the L9788-10 Test Lead with Remote Switch, please check the following as well.**

1. Turn the function selector to select the Insulation Resistance Measurement function.
2. Upon pressing the MEASURE key on the L9788-10, the MEASURE key lights up in red.

### Insulation Resistance Measurement



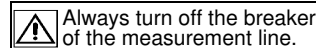
Observe the following to avoid electric shock, short circuits, and damage to the instrument.

- When measuring insulation resistance, dangerous voltage is applied to the measurement terminals. To avoid electric shock, do not touch the probe.
- Never touch the object being measured immediately after measuring. There is danger of electric shock from the charge accumulated during high voltage testing.
- Discharge the subject conductor after measurement.
- Do not attempt to measure insulation resistance on a live conductor. Doing so could damage the instrument or cause an accident that might result in injury or death. Always turn off power to the conductor being measured before starting.

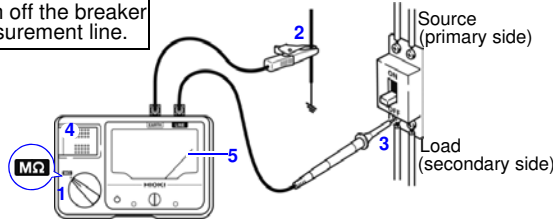
### NOTE

- Insulation resistance is the ratio of leakage current to applied voltage, and is therefore unstable. Depending on the specific object being measured, the needle may not stabilize, but this is not a meter malfunction.
- Press the MEASURE key fully down until a live circuit indicator lights up. If the button is not pressed down fully, the needle will not move from ∞ and a proper measurement cannot be made.
- Always release the MEASURE key after use.

- When inspecting on an electric power circuit including an appliance whose withstand voltage is lower than the test voltage or including an appliance or components whose withstand voltage is unknown, it is recommendable to remove that from the circuit for measurement.
- During measuring, do not switch over to the other function or rated voltage.



Always turn off the breaker of the measurement line.



1. Use the function selector to select **MΩ**.
2. Connect the black test lead to the ground side of the object being measured.
3. Connect the red test lead to the line to be measured.
4. Press the MEASURE key. (To make continuous measurements, pull the button up.)
5. Read the value after the needle has stabilized.

\*When measuring an insulation resistance that contains a capacitance element, a charge proportional to the measurement voltage accumulates, and if undischarged could lead to an electric shock accident.

6. Without removing the test leads from the item being measured, release the MEASURE key.
7. The built-in discharge circuit automatically discharges the item. During a discharge, the needle will return slowly to the infinity (∞) position.
8. The discharge is completed when the needle reaches the ∞. The time required for discharge depends on the capacitance value.

### Voltage Measurement



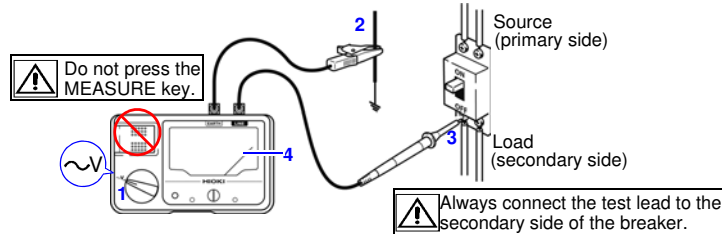
- **Test leads should only be connected to the secondary side of a breaker, so the breaker can prevent an accident if a short circuit occurs. Connections should never be made to the primary side of a breaker, because unrestricted current flow could cause a serious accident if a short circuit occurs.**
- **The maximum input voltage and maximum rated voltage to earth is 600 Vrms. If their voltages are exceeded, this device will be damaged and personal injury will result. Therefore, do not perform measurement in this case.**
- **To avoid electrical shock, be careful to avoid shorting live lines with the test leads.**



Never press the MEASURE key while measuring voltage. Doing so could damage the circuitry or cause a life-threatening accident.

### NOTE

- During measuring, do not switch over to the other function.
- For waveforms other than sine waves, some errors may occur.



1. Use the function selector to select the **~V** function.
2. Connect the black test lead to the ground side of the object being measured.
3. Connect the red test lead to the line to be measured.
4. Read the value after the needle has stabilized.

### Operation Uncertainty

The operation uncertainty and the variations of measurement value for the respective influence quantity approved by EN61557 are as follows:

	Intrinsic uncertainty/ Influence quantity	Operation range	Variation
A	Intrinsic uncertainty	Reference condition	±5%
E <sub>1</sub>	Position	Horizontal ±90°	±15%

E <sub>2</sub>	Supply voltage	4.5 V to 6.8 V	±5%
E <sub>3</sub>	Temperature	0°C to 35°C	±5%
B	Operation uncertainty		±25%
Guaranteed range of operation uncertainty			1st effective measurement range

Influencing factor non-applicable for E<sub>4</sub> to E<sub>10</sub>

### Measurement principles

#### 1. Insulation Resistance Measurement

The insulation resistance of test object Rx is obtained by supplying a voltage V to the test object and measuring the current leaking from the test object and the voltage supplied using the formula (Voltage supplied, V)/(current leakage, I).

#### 2. Voltage Measurement

This is obtained from converting the value of the current flowing from the voltage source through the instrument to a voltage value.

### Auto power save (power-saving function)

### NOTE

To avoid battery depletion, turn the function selector OFF after use. Battery may drain if the switch is not turned to OFF.

When the function selector is not at OFF, the power save function automatically kicks in 15 minutes after the last time the MEASURE key is pressed and the effective battery range indicator goes off. The automatic power save function cannot be cancelled.

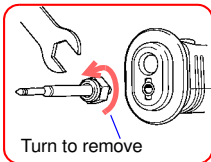
### Reviving from power save

Turn off the function selector and then return it to the original position.

### Replacing the Pin (Option)

The pin at the front of the Model L9788-10 (option) can be replaced when it has worn away or is damaged. Replacement pins are available at any Hioki dealer. (Model 9788-90 Tip Pin)

1. Turn off the power of the Insulation Resistance Tester and disconnect the test leads.
2. Rotate the socket with a spanner (7 mm width) to remove it. Remove the front pin.
3. Exchange the L9788-10 front pin with a new one, turn the socket with a spanner and attach it to the test lead. (tightening torque: 0.3N·m)
4. Check the performance. Measure an object with a known resistance. Make sure that the measured resistance is correct before using the L9788-10.



## Replacing Batteries



- **To avoid electric shock, turn OFF the function selector and disconnect the test leads before replacing the batteries or fuse.**
- **After replacing the batteries, place back the cover and tighten the screws before using the instrument.**
- **Do not mix old and new batteries, or different types of batteries. Also, be careful to observe battery polarity during installation. Otherwise, poor performance or damage from battery leakage could result.**
- **Battery may explode if mistreated. Do not short-circuit, recharge, disassemble or dispose of in fire.**
- **Handle and dispose of batteries in accordance with local regulations.**

### NOTE

- To avoid corrosion from battery leakage, remove the batteries from the instrument if it is to be stored for a long time.
- Please use only alkali batteries. Please do not use manganese, nickel-metal hydride or oxyride batteries.

1. Turn the function selector to OFF and remove the test lead from the instrument as a precaution.
2. Loosen the central fastening screw at the back of the instrument and remove the battery cover.
3. Replace all 4 batteries.
4. Slide the battery cover back into place and tighten the screw.

