

Thank you for selecting our 4 range digital insulation tester MIS-PV2 for PV systems.
Before using the instrument, read this instruction manual thoroughly and operate properly.
Keep this manual carefully whenever you can refer if necessary.

MAIN FEATURES

- (1) Multiple rating insulation resistance tester which can change 4 applied voltage by switch to select appropriate voltage for the object to be tested.
- (2) This digital multiple rating insulation resistance tester has big LCD window showing numerical value display and analog indicator which enable an easy reading.
- (3) Measurable insulation resistance according to the generated voltage in PV systems.
- (4) Can read the displayed value in the dark by LED back light of LCD.
- (5) Auto power off function enables min. power consumption in case of forgetting switch power off.
- (6) Convenient structure design for the use – body cover can be contained to the bottom of instrument.
- (7) The output display lamp (HV lamp) serves functions as warning of outer loading voltage and or as confirming electric discharge with superior safety and wide functionality.
- (8) Data hold function enables measurements in any field & attitude.

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1. Before use

1.1 Safety Symbol

To use this instrument safely, the following symbols and contents are displayed on instrument body and instruction manual.

	Showing careful operation. This symbol is displayed at the point where the references to instruction manual are required to protect operator & equipment.
	Showing the high voltage output more than 1000V. Touch to the terminal is dangerous.

WARNING: Indicating the matters to be attended to avoid electrical shock and accidents which may affect danger to operator's life and body.
CAUTION: Indicating the matters to be attended to avoid damage of equipment and for general points of operation.

1.2 Caution for Operation

- ! Do not drop and or throw the instrument at hard objects.
- ! Do not store the instrument at the places with high temperature more than 60°C
low temperature less than -20°C and high humidity and also, avoid the direct rays of sun.
- ! Do not apply chemicals like as thinner, acetone, etc. for cleaning.
- ! Confirm the specifications/ratings in this manual and use the instrument within the rated values,

1.3 Confirm the Accessories

After opened the box, check the appearance of instrument and confirm the accessories are contained.

2. Specifications

2.1 Insulation Resistance Measurement

1) Rating

Range	Rated Measuring Voltage	Max. Effective Display Value	Center Display Value
125V	125V	20MΩ	0.5MΩ
250V	250V	50MΩ	1MΩ
PVL	500V	100MΩ	2MΩ
PVH	1000V	2000MΩ	50MΩ

2) Accuracy

Range	Rated Measuring Voltage/ Max. Effective Display Value	Measuring Range	Accuracy
125V	125V/20M Ω	[First Effective Range] 0.02M Ω ~10M Ω [Second Effective Range] 0.01M Ω ~0.02M Ω 10M Ω ~20M Ω 20M Ω ~100M Ω	less than $\pm 5\%$ less than $\pm 10\%$ less than $\pm 30\%$
250V	250V/50M Ω	[First Effective Range] 0.05M Ω ~20M Ω [Second Effective Range] 0.02M Ω ~0.05M Ω 20M Ω ~50M Ω 50M Ω ~100M Ω	less than $\pm 5\%$ less than $\pm 10\%$ less than $\pm 30\%$
PVL (500v)	500V/100M Ω	[First Effective Range] 0.1M Ω ~50M Ω [Second Effective Range] 0.05M Ω ~0.1M Ω 50M Ω ~100M Ω	less than $\pm 5\%$ less than $\pm 10\%$
PVH (1000V)	1000V/2000M Ω	[First Effective Range] 2M Ω ~1000M Ω [Second Effective Range] 1M Ω ~2M Ω 1000M Ω ~2000M Ω	less than $\pm 5\%$ less than $\pm 10\%$

3) Rated Measuring Current

Range/Rated Voltage	Min. Measuring Resistance enables to keep rated voltage	Rated Measuring Current
125V	12M Ω	0.0105mA (-0%~+20%)
250V	12M Ω	0.0209mA (-0%~+20%)
PVL (500V)	12M Ω	0.0417mA (-0%~+20%)
PVH (1000V)	12M Ω	0.0834mA (-0%~+20%)

- 4)No-loading Voltage : less than 130% of rated voltage
- 5)Short-circuit Current : less than 2mA
- 6)Influence of Temperature : less than $\pm 5\%$ rdg at the center display by changing ambient temperature from 20°C to $\pm 20^\circ\text{C}$.
- 7)Response Time : less than 10sec.(auto range), except that the measuring values fluctuate according to capacitance volume to the ground.
- 8)Protection of Mis-input : nothing wrong when applying 120% of rated measuring voltage AC with nearby 50Hz or 60Hz sine wave for 10sec.
- 9)Display Range : 3.200/32.00/320.0/3200 (auto range)
- 10)Min. Resolution : 0.001M Ω
- 11)A/D Conversion : dual integration mode
- 12)Display : max. 3200 count LCD with bar graph & annunciator
- 13)Over Range : "OL" mark on display

- 14) Low Battery Indication : "  " mark on display.
- 15) Data Hold : "DH" mark on display
- 16) Auto Power Off Function : automatically power off approx. 10 minutes after power on (to release this function, set the rotary switch to "OFF" and power on again.)
- 17) Load Discharge Function : Discharging DC electrical charge by auto discharge function. Can confirm discharge by HC lamp off.
- 18) Back Light Function : By pressing backlight switch (LIGHT) once, back light appears and by pressing switch again. It lights off. It will become automatically approx. 10 minutes after light on.

2.2 AC Voltage Measurement (ACV)

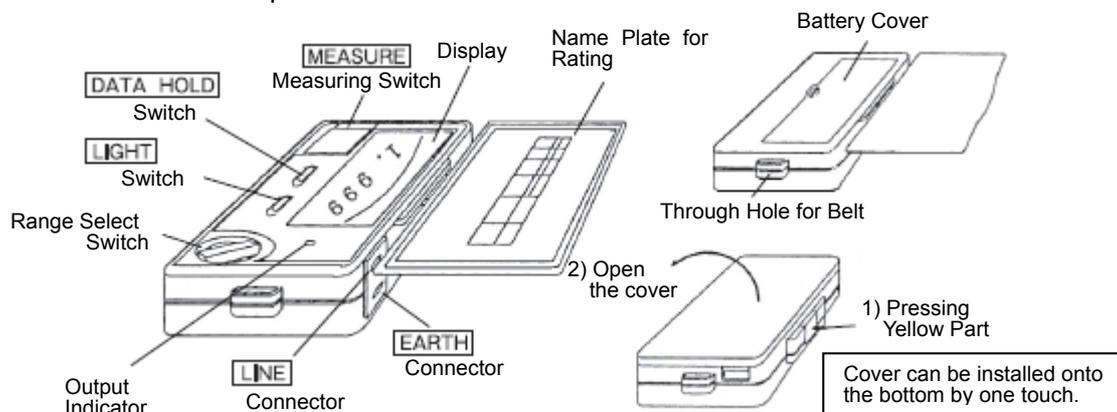
- 1) Measuring Method : Average value display
- 2) Measuring Range : AC 0V~600V (min. resolution 0.1V)
- 3) Accuracy : $\pm 1.5\% \text{rdg} \pm 10 \text{dgt}$

2.3 General Specification

- 1) Operating Temperature : 0~40°C, less than 80%RH (w/o condensation)"
- 2) Storage Temperature : -20°C~-60°C, less than 80%RH (w/o condensation)
- 3) Withstanding Voltage : AC3700V/1 minute between electric circuit and outer case
- 4) Insulation Resistance : more than 50MΩ by DC1000V insulation resistance tester
- 5) Power Supply : AA alkaline battery (LR)x6
- 6) Outer Dimension : 170(W)x105(D)x52(H)mm
- 7) Weight : approx. 350g (without batteries)
- 8) Accessories : earth test lead -1, line test lead - 1, test lead case - 1, belt - 1, battery (LR6) - 6, instruction manual -1
- 9) Option : 20MΩ simulation resistor (with lead wire)

3. Operation Procedure

3.1 Name of Part & Explanation



Line Cord



Earth Cord (Black)



- DATA HOLD : The displayed data on LCD is held by pressing this switch during measurement of insulation resistance and it will be released by pressing switch again.
- LIGHT Switch : By pressing this switch, back light LED lightens on LCD for approx. 10 minutes. (Automatic power saving function)

<REFERENCE>

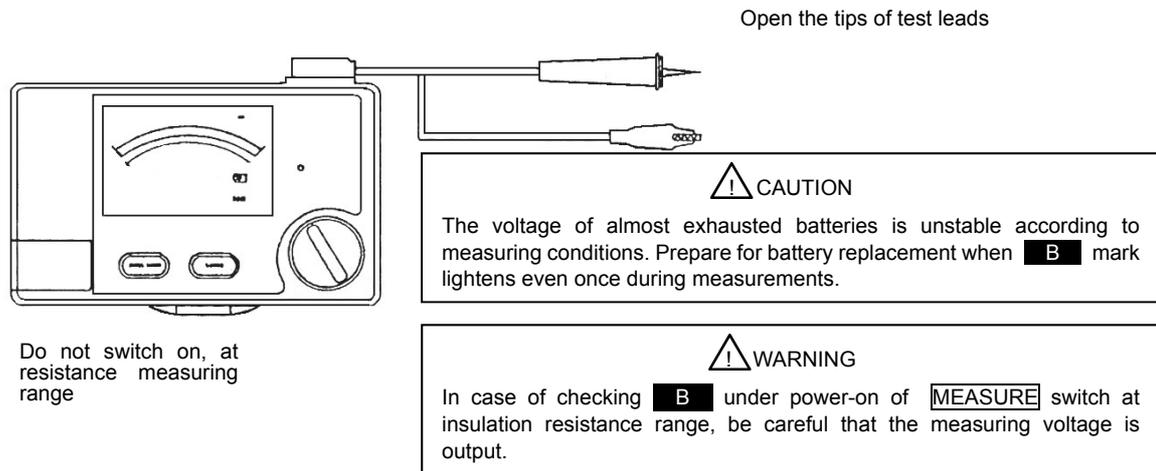
For insulation resistance measurement, the instrument is getting power-on during pressing measuring switch. By standing up this switch, it will be locked as power-on continuously.

<NOTE>

When setting power on in short time after switched off (or auto power off), the power supply would not become on sometimes. In this case, once set the range switch to off and then, power on again passing after more than 5 seconds.

3.2 Check of Residual Battery Power

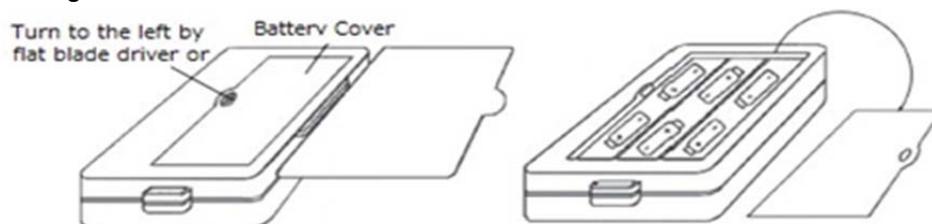
- 1) Confirm the range switch is at insulation resistance measuring range.
- 2) If **B** mark is not lightening on LCD, the instrument can be operative.
- 3) If **B** mark is lightening during insulation resistant measurement. Judge the batteries are almost exhausted.
- 4) In this case, replace all LR6 alkaline batteries with new ones.



- 5) In case of checking the residual battery power in the condition of max. power consumption, set the range switch to PVH and check by keeping test leads shorten and pressing measuring switch.

3.3 Battery Replacement

- 1) Loosen and remove the screw of battery cover by turning to the left with flat blade driver or coin.
- 2) Replace the batteries, confirming (+, -) polarity according to the directions graved in battery case.
- 3) In case of not using for a long time, remove all batteries, as it may cause exhaustion and leakage of batteries.



⚠ WARNING

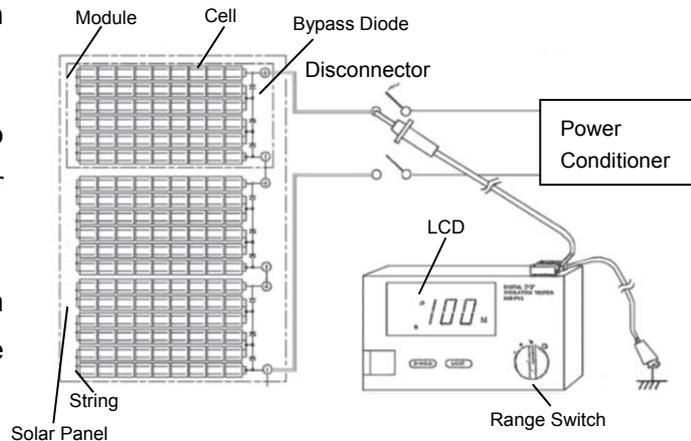
- 1) Misapplication of battery polarity may cause leakage of battery and or damage of electric circuit
- 2) Do not disassemble batteries and do not throw them into the fire by no means as it is very dangerous.
- 3) Leaving batteries with wrong polarity setting may cause exhaustion and heating of batteries and they will be damaged. Such batteries cannot be used even after correct setting.
- 4) Dispose the used batteries to the indicated place according to the species.

3.4 Insulation Resistance Measurement (In PV System)

1) Confirm the measuring switch **MEASURE** is off.

2) Set the range switch according to the generated voltage. PVL is for 500V and PVH is for 1000V.

3) Disconnect solar panel (PV) from power conditioner (PCS) at the disconnecting switch.



4) Connect EARTH lead of MIS-PV2 with the earth terminal of PV system.

5) Contact LINE probe to P terminal of solar panel (at disconnecter) and power on **MEASURE** switch. (Operate the instrument with **MEASURE** switch standing up, as it takes a long time for the measurement. By standing up the switch, it will be locked and will get power-on continuously).

After switched on **MEASURE** switch, the bar graph on LCD is lightening step by step and the measured value will be displayed after all bar graph lightened and the first measurement finished. The first displayed value will be kept until finishing the second display. By pressing data hold switch once, the display will be hold and will be released by pressing switch again.

6) After finished the measurement, set **MEASURE** switch off and rotary range switch to off.

WARNING

For insulation resistance measurement in PV systems, be sufficiently careful for electrical shock, as solar panels are generating powers successively with voltage.

CAUTION FOR MEASUREMENT

It takes longer time for measurement according to CR time constant, as there are capacitance on solar panels.

In such case, make measurement after connected 20M Ω simulation resistor between P phase and earth terminal and calculate correct resistance by computation, as the measured value will show insulation resistance in parallel connection of 20M Ω and actual resistance.

3.5 Insulation Resistance Measurement (Except PV System)

- 1) Confirm the measuring switch **MEASURE** is off.
- 2) Set range switch according to the rated voltage to be measured.

(Reference)

In case of rated circuit voltage 100V, set the range switch to [125V].

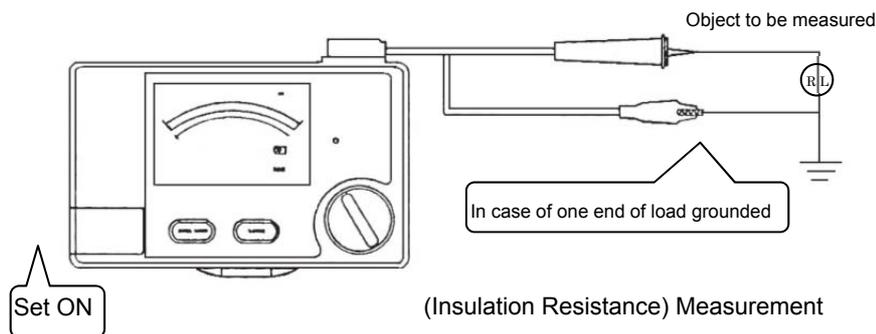
In case of rated circuit voltage 200V, set the range switch to [250V].

In case of rated circuit voltage 400V, set the range switch to [500V].

In case of high voltage circuit equipment, set the range switch to [1000V].

In case of insulation resistance measurement at the completion examination at low voltage circuit, set the range switch to [500V].

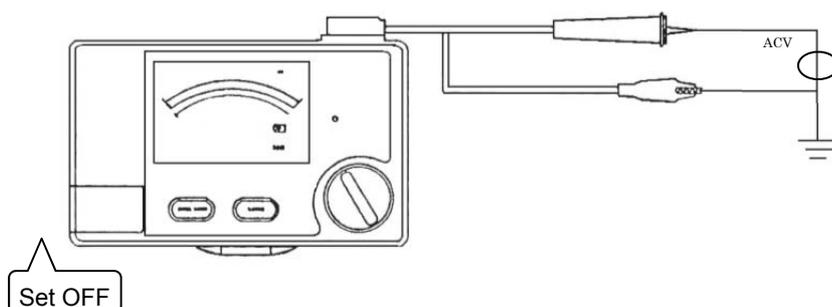
- 3) Confirm the display value is "0MΩ", after short-circuited LINE probe and EARTH clip and pressed measuring switch on.
- 4) In case that one end of the object to be measured is grounded, connect with clip at (EARTH) end.
- 5) After confirmed HV lamp is not lightened by contacting (LINE) probe to the object to be measured and pressed measuring switch on, the bar graph on LCD is lightening step by step and the measured value will be displayed after all bar graph lightened.



3.6 AC Voltage Measurement

- 1) Confirm the measuring switch **MEASURE** is off.

- 2) Set range switch to [125V] or [250V]. (By whichever range, AC 0~600V can be measured in the same way).
- 3) Contact measuring probe (LINE) and clip (EARTH) to the circuit or the live part of equipment to be measured.
- 4) Read the voltage value after the display got stable.



⚠ WARNING

- 1) Do not apply the voltage exceeding AC 600V to prevent electric failure and or burnout of the instrument.
- 2) Do not apply voltage under the condition of measuring switch **MEASURE** on, as it may cause electrical shock and or instrument damage.

4. REPAIR SERVICE

When requesting for repair service, please bring the instrument directly to the dealer where you bought.

When mailing the instrument, always pack it in its original or equivalent packing materials to avoid any damage during the transportation and also put together with documents showing your name, address, phone number and defect point.

5. WARRANTY

This instrument is sent out from our factory after the sufficient internal inspections but if you find any defect due to the fault in our workmanship or the original parts, please contact the dealer where you bought the instrument.

The warranty period is 12 months from the date of purchase and the instrument shall be repaired at free of charge, provided that we judge the cause of defect is obviously resulted from our responsibility.