DIGITAL INSULATION TESTER FOR PHOTOVOLTAIC SYSTEMS

Model MIS-PVS

INSTRUCTION MANUAL

Thank you for selecting our digital insulation tester MIS-PVS 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) Measurable insulation resistance according to the generated voltage in PV systems.
(2) Can read the displayed value in the dark by LED back light of LCD.
(3) Auto power off function enables min. power consumption in case of forgetting switch power off.
(4) Convenient structure design for the use – body cover can be contained to the bottom of instrument.
(5) 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.
(6) The insulation failure point will be displayed on LCD in PV generation system.

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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
PVL	500V	100MΩ	2MΩ
PVH	1000V	2000MΩ	50MΩ

2) Accuracy

Range	Rated Measuring Voltage/ Max. Effective Display Value	Measuring Range	Accuracy
PVL	500V/100MΩ	[First Effective Range] 0.1MΩ~50MΩ [Second Effective Range] ①0.05MΩ~0.1MΩ 50MΩ~100MΩ	less than ±5% less than ±10%
PVH	1000V/2000MΩ	[First Effective Range] 2MΩ~1000MΩ [Second Effective Range] ②1MΩ~2MΩ 1000MΩ~2000MΩ	less than ±5% less than ±10%

3) Rated Measuring Current

Range/Rated Voltage	Min. Measuring Resistance enables to keep rated voltage	Rated Measuring Current
PVL/500V	23MΩ	0.0218mA (-0%~+20%)
PVH/1000V	23MΩ	0.0435mA (-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 ±5%rdg at the center display by changing ambient temperature from 20°C to ±20°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 of Insulation Failure Point : In case that the insulation resistance is less than 1MΩ, the failure point will be displayed on LCD. This display is restricted to solar panels which will be divided equally into 10 sections from P phase to N phase. Except for solar panels, this display is invalid even in case of getting values.

10)Display Range : 3.200/32.00/320.0/3200 (auto range)

11)Min. Resolution : 0.001MΩ

12)A/D Conversion : dual integration mode

13)Display : max. 3200 count LCD with bar graph & annunciator

14)Over Range : “OL” mark on display

15)Low Battery Indication : “ B ” mark on display.

16)Data Hold : “DH” mark on display

17)Auto Power Off Function : automatically power off approx. 10 minutes after power on (to release this funciton, set the rotary switch to “OFF” and power on again.)

18)Load Discharge Function : Discharging DC electrical change by auto discharge function. Can confirm discharge by HC lamp off.

19)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 DC Voltage Measurement (DCV)

1) Measuring Method : Average value display

2) Measuring Range : DC 0V~999V (min. resolution 0.1V), Auto range.

3) Accuracy : ±1.5%rdg±10dgt

2.3 General Specification

1) Operating Temperature : 0~40^{O}C, less than 80%RH (w/o condensation)”

2) Storage Temperature : -20^{O}C~-60^{O}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 (LR6 or NR6) x 6

6) Outer Dimension : 170(W)x105(D)x52(H)mm

7) Weight : approx. 350g (without batteries)

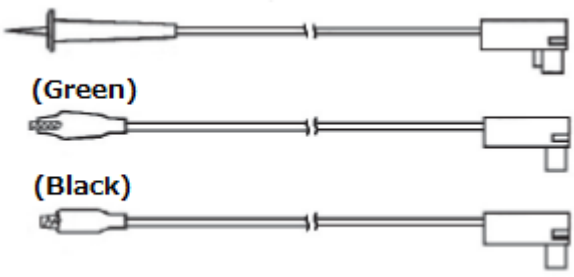
8) Accessories : earth test lead -1, line test lead - 1, N phase lead – 1, test lead case - 1, belt - 1, battery (LR6) - 6, instruction manual -1

9) Option : 20MΩ simulation resistor (with lead wire)

Line Test Lead

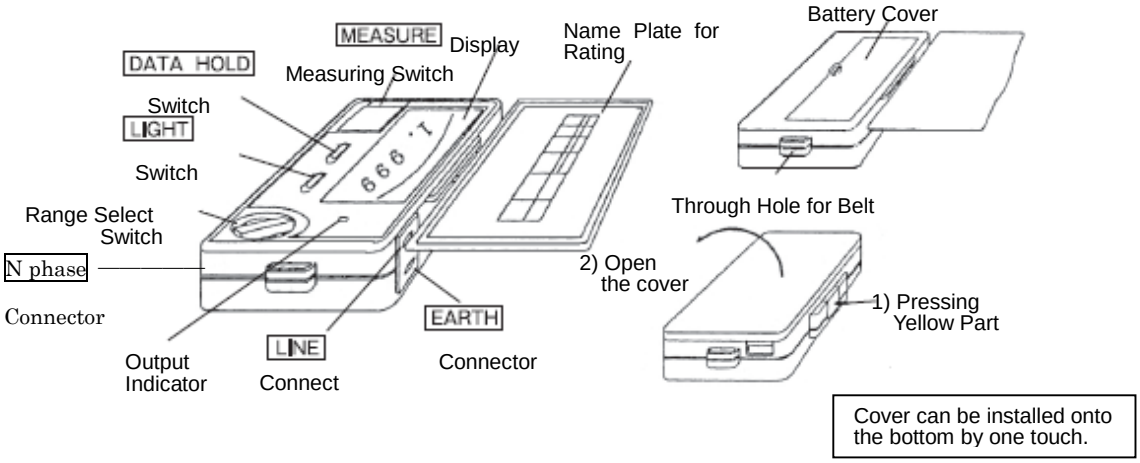
Earth Test Lead (Green)

N Phase Test Lead (Black)



3. Operation Procedure

3.1 Name of Part & Explanation



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.

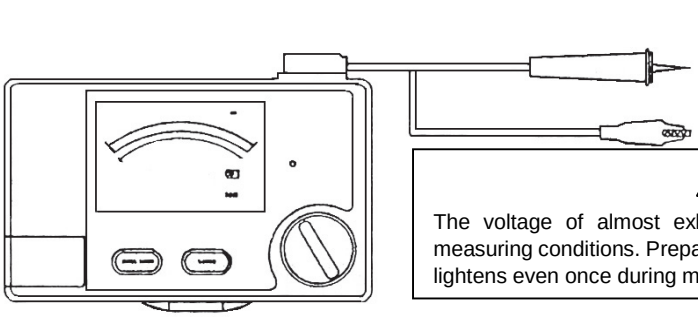
3.2 Check of Residual Battery Power

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.



Do not switch on, at resistance measuring range

⚠ CAUTION

The voltage of almost exhausted batteries is unstable according to measuring conditions. Prepare for battery replacement when B mark lightens even once during measurements.

⚠ WARNING

In case of checking B under power-on of MEASURE switch at PVL or PVH range, be careful that the measuring voltage is output.

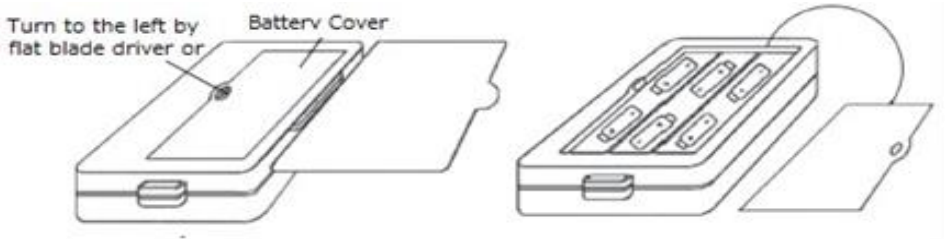
5) In case of checking the residual battery power in the condition of max. power consumption, set the range switch to PVH and check by keeping test leads shorten and pressing measuring switch.

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.

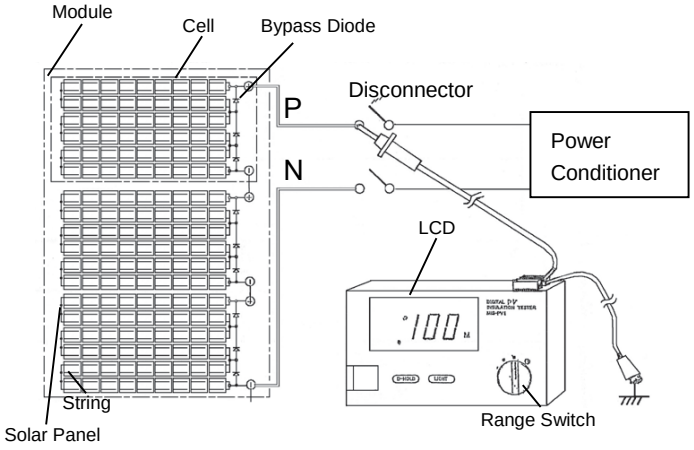
4) Dispose the used batteries to the indicated place according to the species.

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-PVS with the earth terminal of PV system.

5) Connect N Phase lead of MIS-PVS to N phase of PV system.

6) Contact LINE probe to P terminal of solar panel (at disconnector) 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).

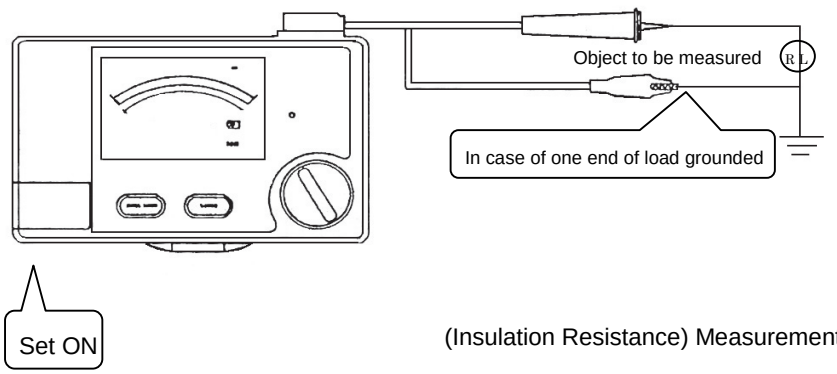
After switched on MEASURE switch, the bar graph on LCD is lightening step by step and the measured value will be displayed after all bar graph lightened and the first measurement finished. The first displayed value will be kept until finishing the second display. By pressing data hold switch once, the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

In case that the insulation resistance value is less than 1MΩ, the failure point will be displayed on LCD. This indication is divided into 10 sections and from P phase to N phase and will show which point is failed. In case of solar panel with 10 strings, each one string will be lightened and in case of 20 strings panel, each 2 strings will be lightened. In case of the insulation failure in P phase or N phase, the dot on edge will be lightened. The lightening time is until the start of next measurement. 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.

3.5 Insulation Resistance Measurement (Except for PV System)



(Insulation Resistance) Measurement)

- For measurement except for PV system, N phase probe is not used.

1) Connect the clip of EARTH probe to the grounding line, in case that the object to be measured is earthed. In case of no grounding, the connection of the clip of EARTH probe is voluntary.

2) Contact LINE probe of measuring cord to the object to be measured and set MEASURE switch on. The bar graph on LCD is lightening step by step and the measured value will be displayed after all bar graph lightened.

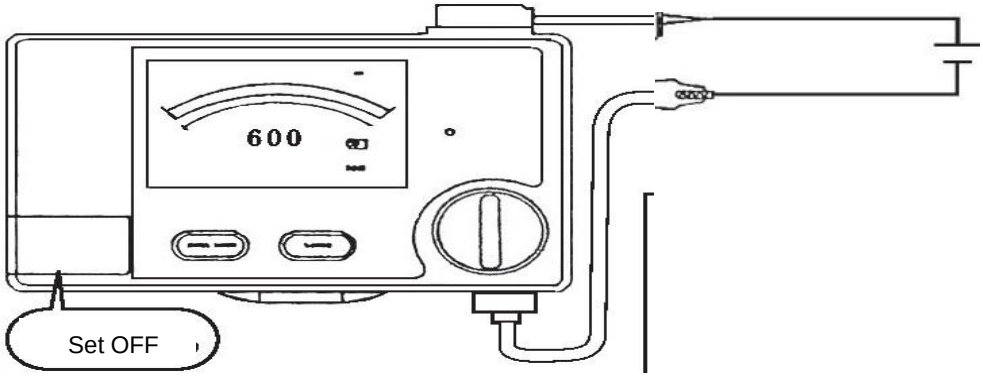
3.6 DC Voltage Measurement

1) Confirm the measuring switch MEASURE is off.

2) Set range switch to [DCV] range, which will be displayed on LCD.

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. It is possible to measure the generated voltage of PV system.



⚠ WARNING

1) Do not apply the voltage exceeding DC 1000V 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.

⚠ CAUTION FOR MEASUREMENT

- If there are plural insulation failure points, the display cannot specify the correct point theoretically.
- For the insulation resistance measurement of PV system, measure the generated voltage beforehand.
- 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 20MΩ 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 20MΩ and actual resistance.

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.