ZX-3125A

Insulation Resistance Tester

Contents

⚠ Safety Warnings

This instrument has been designed, manufactured and tested according to IEC 61010:Ssfety requirements for Electronic Measuring apparatus, and delivered in the best condition after Passing quality control tests, This instruction manual contains Warnings and safety rules which must be observed by the user to ensure safe operation of the instrument and to maintain it in safe condition. Therefore, read through these operating instructions before using the instrument.

⚠ Warning

- Read through and understand instructions contained in this manual before starting to use the instrument.
- Keep the manual at hand to enable quick reference applications.
- Understand and follow all the safety instructions contained in the manual. It is essential the above instructions are adhered to.
- Failure to follow the above instructions may cause injury,Instrument damage and/or damage to equipment under test.

The symbol ⚠ indicated on the instrument means that the user must refer to the related parts in the manual for safe operation of the instrument. It is essential to read the instructions wherever the symbol ⚠ appears in the manual.

⚠**DANGER** is reserved for conditions and actions that are likely to cause serious or fatal injury.

⚠**WARNING** is reserved for conditions and actions that can cause serious or fatal injury.

⚠**CAUTION** is reserved for conditions and actions that can cause injury or instrument damage.

⚠ Danger

- Never make measurements under the circumstances exceeding the designed measurement category and the rated voltage of the instrument and the test leads.
- Do not attempt to make measurements in the presence of flammable gasses. Otherwise, the use of the instrument may cause sparking, which can lead to an explosion.
- Never attempt to use the instrument if its surface or your hand is wet .
- Be careful not to short-circuit the power line with the metal part of the test leads when measuring a voltage. It may cause personal injury.

- Do not exceed the maximum allowable input of any measuring ranges.
- Do not press the Test button with test leads connected to the instrument.
- Never open the Battery compartment cover during a measurement.
- To prevent possible electrical shock, do not touch the circuit under test during an insulation resistance measurement or right after a measurement.

⚠ Warning

- Never attempt to make any measurements if any abnormal conditions such as broken case and exposed metal parts are noted .
- Do not rotate the Range switch with the test leads connected to the equipment under test.
- Do not install substitute parts or make any modifications to the instrument. Return the instrument to your local KUORITSU distributor for repair or re-calibration.
- Do not try to replace the batteries if the surface of the instrument is wet.
- Insert the plug into the terminal firmly when using test leads.
- Ensure that the instrument is switched off before opening the Battery compartment cover for battery replacement.

⚠ Caution

- Before starting a measurement,confirm that the Range switch is at an appropriate position.
- Set the Range switch to “OFF” position after use, Remove the batteries if the instrument is to be stored and will not be in use for a long period.
- Do not expose the instrument to direct sunlight, high temperatures and humidity or dew.
- Use a damp cloth with alcohol for cleaning the instrument and the areas around the measuring terminals.
- When this instrument is wet, please store it after it dries.
- The Voltage warning mark is being displayed during a measurement and it starts blinking when voltages 30V(DC/AC) or more exist on the circuit under tests.

Ⅰ、Features

1. Designed to meet the following safety standards:

   IEC 61010-1,-2-30 (CAT III 600V/CAT IV 300V Pollution degree 2)

   IEC 61010-031 (Requirements for hand-held probes)

2. With auto-discharge function

When an insulation resistance like a capacitive load is measured, electric charges stored in capacitive circuits are automatically discharged after the measurement. Discharge can be checked on the voltage monitor.

3. Backlight function to facilitate working at dimly illuminated location or at nighttime work.
4. Bar graph display
5. Audible and visible LIVE circuit warning
6. With Auto-power off function

The instrument automatically will turn itself off if there is no function change or button press for 10 min to conserve battery power.

7. Auto-measurement and display of PI (Polarization Index), DAR(Dielectric Absorption Ratio)

Ⅱ、Specification

1. Measuring range and accuracy(Temperature, humidity;23±5℃,45-75%RH) <Insulation resistance tester>：

Rated voltage	250V	500V	1000V	2500V	5000V
Measure Range	0.1~100.0 MΩ	0.1~99.9MΩ 80~1000MΩ	0.1~99.9MΩ 80~999MΩ 0.80~2.00GΩ	0.1~99.9MΩ 80~999MΩ 0.80~9.99GΩ 8．0~100.0GΩ	0.1~99.9MΩ 80~999MΩ 0.80~9.99GΩ 8.0~99.9GΩ 80~20000GΩ
Display range	0.1~100.0 MΩ	0.1~1000M Ω	0.1M~2.00G Ω	0.1M~100.0G Ω	0.1M~2000 GΩ
Open circuit Voltage	DC250V +10%，-10%	DC 500V + 20%，-10%	DC 1000V + 20%，-0%	DC 2500V +20%，-0%	DC5000V +20%，-0%
Rated Current			1MΩ load 1mA~1.2mA	2.5MΩ load 1mA~1.2mA	5MΩ load 1mA~1.2mA
Short-cir	5mA±0.5mA				

cuit Current		
Accuracy	±5%±3dgt	±5%±3dgt±20%

Voltage monitor for insulation resistance range

30 – 600V (resolution 10 V): ±10%rdg±20V

This monitor is used to check whether electric charges stored no the equipment under test are discharged or not. The voltage value measured and displayed on the LCD is a reference value. Please note that the indicated value, when an external AC voltage is applied to the instrument, is not a correct value.

<Voltage measurement range>

	DC Voltage	AC Voltage
Measuring range	±30 -- ±600V	30 -- 600V(50/60Hz)
Resolution	1V	
Accuracy	±2%rdg±3dgt	

Display	Liquid crystal display insulation resistance range:(Max.1200 counts) VAC/DC range: (Max.630counts) Bar graph: Max.36points DAR/PI value:Max.9.99 Time:Max.99.59
Low battery warning	Battery symbol (in 4 levels)
Over range indication	“OL” mark appears on insulation resistance range.
Auto-ranging	Range shifts to upper range:1000 counts Range shifts to lower range:80 counts (Only on the insulation resistance range)
Auto-power-off	The instrument will be powered off if there is no switch or button operation for 10 min.(This function does not work during a measurement.)
Altitude	2000m or less
Temperature & humidity range(guaranteed	23℃±5℃/Relative humidity 85% or less(no condensation)

accuracy)	
Operating temperature & humidity range	0℃ to 40 ℃/Relative humidity 85% or less (no condensation)
Storage temperature& humidity range	-20℃ to ± 60%/ Relative humidity75% or less(no condensation)
Overload protection: Insulation resistance range	AC 1200V/10sec.
Withstand voltage	Voltage range:AC720V/10sec. AC5160V(50/60Hz)5sec.(Between electrical circuit and enclosure)
Insulation resistance	AC5160V(50/60Hz)5sec.(Between electrical circuit and enclosure)
Dimension	177（L）×226（W）×100（D）mm
Weight	1.9kg(battery included)
Power source	12.6V/6800mAh

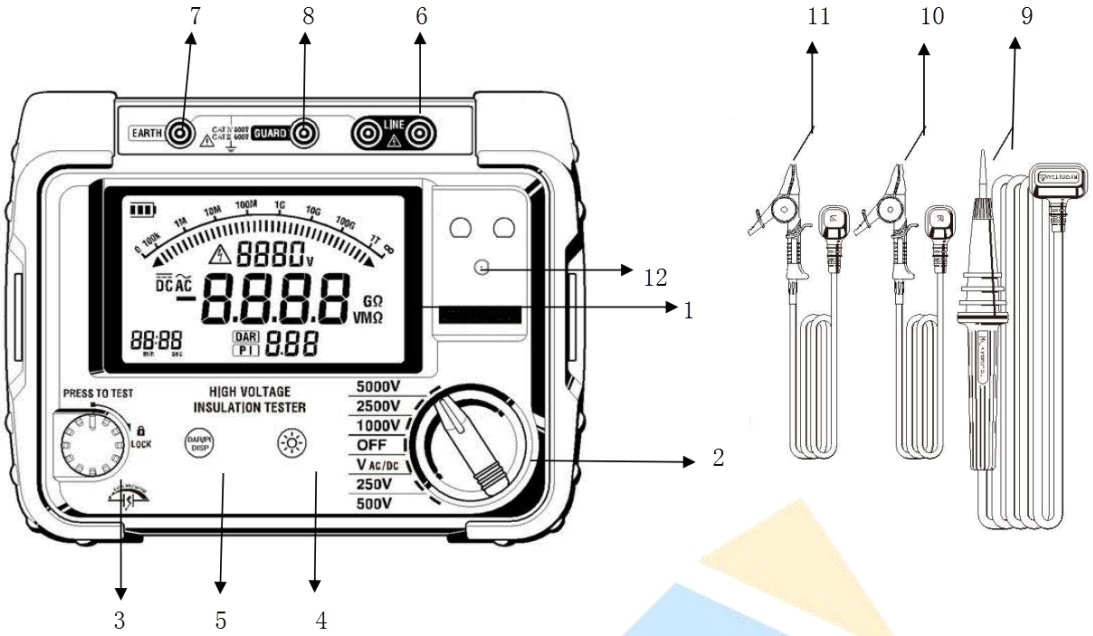
2. Current consumption (representative values at 12V of supply voltage)

Range	250V	500V	1000V	2500V	5000V	VAC/DC
Output at Short-circuit	600mA					110mA
When rated current is outputted	650mA/ 0.25MΩ	800mA/0. 5MΩ	1000mA/1 MΩ	1350mA/ 2.5 MΩ	1350mA/ 5 MΩ	
Output at open circuit	40mA	40mA	50mA	80mA	150mA	
Stand-by	25mA					
Backlight on	Increased by 40mA					

3. Measurement time: for 25hours *under a load of 100MΩ on the Insulation resistance 5000V range.

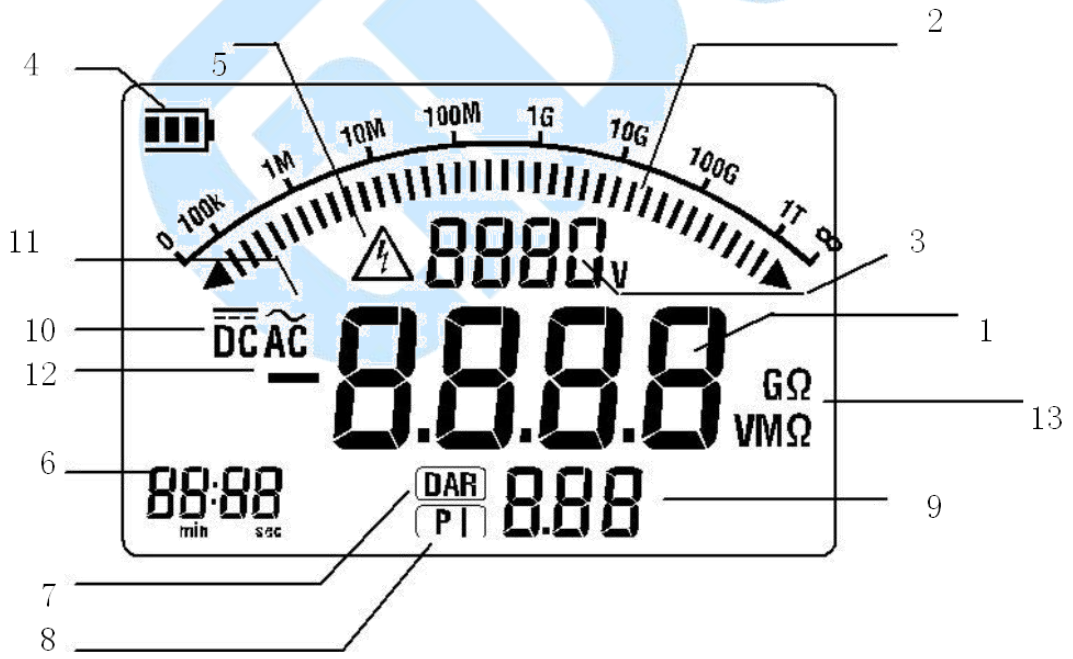
Ⅲ、Function Description

1. Panel Introduction



1	LCD display	2	Range Switch	3	Test button
4	Back Light button	5	DISP button	6	Line Terminal
7	Earth Terminal	8	Guard Terminal	9	Line Probe (red)
10	Earth Cord (black)	11	Guard Cord(green)	12 charging port	

2. LCD Display



1	Insulation resistance	2	Bar graph	3	Voltage monitor

4 Battery mark	5 Voltage warning mark	6 Timer display
7 DAR mark	8 PI mark	9 DAR/PI value
10 DC	11 AC	12 Minus display
13 Unit		

Ⅳ、Instructions

1. Start Testing

1) checking the battery voltage

Set the Range switch to any position other than ”OFF”.

When the Battery mark shown at the upper left on the LCD is last one level, the batteries are almost exhausted. Replace the batteries with new ones to perform further measurements.The instrument operates properly even if under such a low battery level, and it may not affect on the accuracy.When the empty Battery mark appears, the battery voltage is below the lower limit of the operating voltage. So the accuracy cannot be guaranteed.

2) Connecting test leads

Insert the test lead firmly to the connector terminal on the instrument. Connect the Line Probe(red) to the Line terminal. The Earth Cord(black) to the Earth terminal and the Guard Cord(green) to the Guard terminal. A Guard cord connection may not be required, if there is no need to establish a guard.

⚠ Danger

- If the Test button is pressed when the Range switch is at the insulation measurement positions, high voltage may be applied to the test leads and you may get an electric shock.

2. Measurement

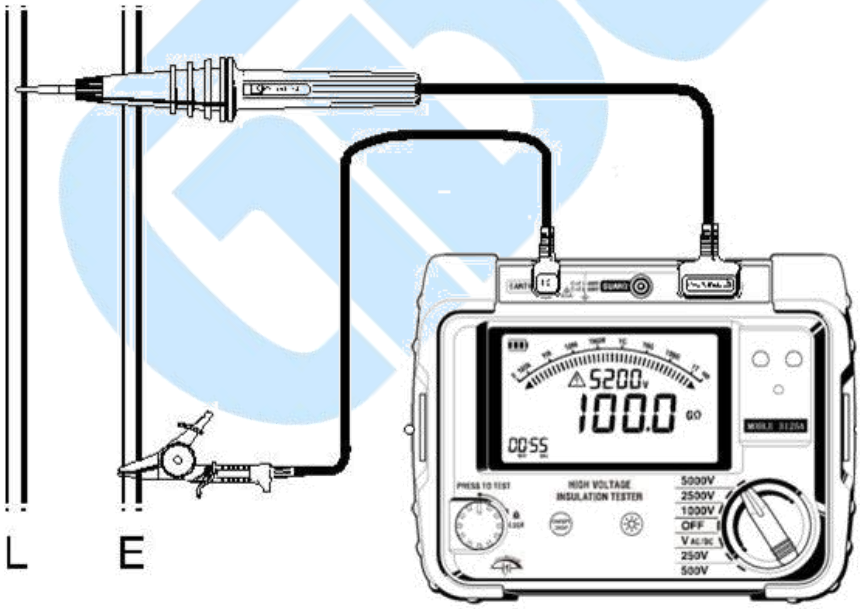
1) Mains disconnection check (Voltage measurement)

⚠ Danger

- Never make measurements under the circumstances exceeding the designed measurement category and the rated voltage of the instrument and the test leads.
- When testing installations which have large current capacities, such as a power line, be sure to make measurement on the secondary side of the circuit breaker in order to avoid getting an electrical shock.
- Extra caution should be taken to minimize the possibilities of shorting the power line with the metal tip of test lead at voltage measurement. It may cause personal injury.
- The Battery cover must be closed and screwed before starting a measurement.
- Connect the Earth cord(black)to the Earth terminal of the circuit under test.

Voltage can be measured by setting the Range switch on this instrument to “V AC/DC” position. No need to press the Test button. This instrument is equipped with an AC/DC auto-detection circuit and can measure DC voltage. During a DC voltage measurement, when applying a positive voltage to the Line Probe(red),positive values are displayed on the LCD.

Be sure to turn off the circuit breaker of the circuit under test.



① Connect the Earth Cord (black) to the earth side of the circuit under test and the Line Probe(red) to the line side respectively.

② The voltage displayed on the LCD shall be “0V”. If it is not 0V, a voltage is applied on the circuit under test. Check the circuit under test. Check the circuit under test again and turn off the circuit breaker.

2) Insulation resistance measurement

⚠ Danger

- Use a measuring apparatus, such as high voltage detector , and confirm that there is no electrical charge in the circuit under test.
- Wear a pair of insulated gloves for high voltage.
- If the Range switch is at the insulation resistance range and the Test button is being pressed down, high voltages are generated and applied to the test leads and the circuit under test continuously. Do not touch the circuit or the test leads.
- The Battery cover must be closed and screwed before starting a measurement.
- Never make measurement when thunder rumbling.
- Connect the Earth Cord (black) to the earth terminal of the circuit under test.
- When any modes other than “VOLT” is selected, live circuit warning symbol appears on the audible warning activates if a voltage is measured. MODLE3125A don ‘t start a test, even the Test button is pressed down, if the measuring voltage is 160V or higher. Before starting a test, ensure that the equipment under test is disconnected from the mains supply and not energized in order to avoid possible electrical hazards. These instruments may start a test for energized electrical circuits if the measuring voltage is less than 160V.

This instrument measures insulation resistances and check where the insulations of electrical equipments or circuits are in good condition or not, So, please check the voltage that can be applied to the equipment under test before making a measurement.

Note：

✧ The insulation resistance values of the equipments under test may not be stable, and the readings may be unstable.

✧ Bleep sound may be heard during an insulation resistance measurement, but it is not malfunction.

✧ It takes time to measure a capacitive load.

✧ At insulation resistance measurement, positive (+) voltage is outputted from the Earth terminal and negative(-)voltage is outputted from the Line terminal.

✧ Connect the Earth cord to the Earth(ground) terminal.

✧ It is recommended to connect the positive(+) pole to the earth side when measuring insulation resistance against the ground or when a part of the equipment under test is earthed.

✧ With this connection, smaller measured value can be obtained comparing with other way round.

① Check the voltage which can be applied to the circuit under rest, and set the range switch to a desired insulation resistance range.

② Connect the Earth cord(black) to the Earth terminal of the circuit under test.

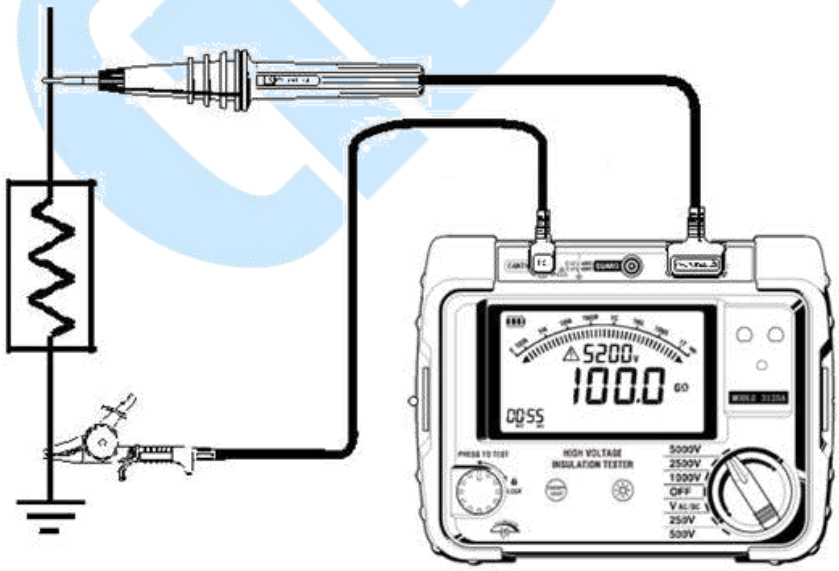
③ Place the tip of the Line probe(red) to the circuit under test. Then press the “PRESS TO TEST” button. The buzzer sounds intermittently during a measurement when a range other than 250/500V is selected.

④ The measured value will be displayed on the LCD, and it is kept displayed after the measurement.

⑤ This instrument has an auto-discharge function.

With the test leads connected to the circuit under test, release the Test button to discharge capacitances in the circuit after test. Confirm that the indication on the voltage monitor becomes ”OV”.

⚠ Caution:always turn off the breaker for the cicuit under test.



⚠ Danger

- Do not touch the circuit under test immediately after testing.Capacitances stored in the circuit may cause electric shock.
- Leave the test leads connected to the circuit and never touch the circuit until a discharge is complete.

<Auto- discharge function>

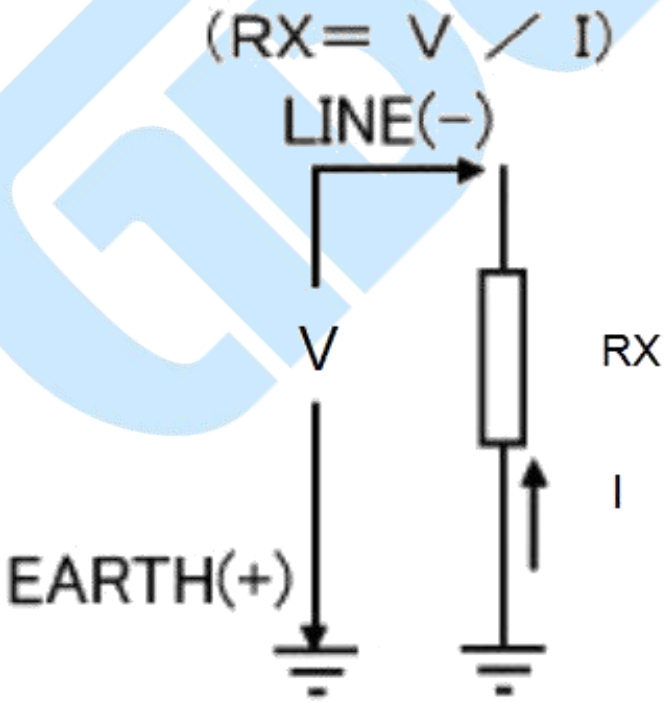
This is a function to release the capacitances stored in the circuit under test automatically after test. The voltage monitor shows the discharge condition.

This function will be disabled by disconnecting the test leads 2sec. or more before discharge is complete.

⑤ Set the Range switch to “OFF” position, and disconnect the test leads from the instrument.

Principle of Insulatin Resistance Measurement

A resistance value can be obtained by applying a certain high voltage to the resistor (insulation resistance) and measuring the flowing current.



3) Continuous Measurement

Press and turn the Test button clockwise and lock the button to measure insulation resistances continuously. Turn the button counterclockwise and set it to the initial position after a measurement.

⚠ Danger

- Be extremely careful not to get electric shock as a high voltage is present on the tip of the test leads continuously.

4) DAR/PI Measurement

① PI - Polarization index

This is to check a temporal increase of leakage currents fowing on insulations and to confirm leakage currents aren't increased as time passes.

PI is usually determined by the insulation resistances measured 1 min and 10 min after a measurement is started. PI is dependent on the shape of insulations and influenced by moisture absorption, therefore, a check of PI is important to diagnosis the insulation of cables.

$$PI = \frac{\text{Insulation resistance (10 min after a start of test)}}{\text{Insulation resistance (1 min after a start of test)}}$$

PI	4 or more	4～2	2.0～1.0	1.0 or less
Criteria	Best	Good	Warning	Bad

② DAR - dielectric absorption ratio

DAR measurement is almost the same to PI measurement in a sense that they test the time course of insulation. The only difference is that DAR measurement can get result faster than the other.

$$DAR = \frac{\text{Insulation resistance (1 min after a start of test)}}{\text{Insulation resistance (15 or 30 sec min after a start of test)}^{*1}}$$

Dar	1.4 or more	1.25～1.0	1.0 or less
Criteria	Best	Good	Bad

③ How to measure DAR/PI

DAR and PI are automatically measured during a normal continuous measurement of insulation resistances. Set the Range switch to any desired range and measure the test object continuously.

-1 min after a start of continuous measurement :LCD shows DAR value.

-10 min after a start of continuous measurement:LCD shows PI value.

When DAR/PI values are displayed as”no”:DAR and PI values are determined by Methods 1. And 2. As described above,therefore,they are displayed as “no” when the measured insulation resistances fall under any of the following cases.

(1)measured value is“0.0MΩ”

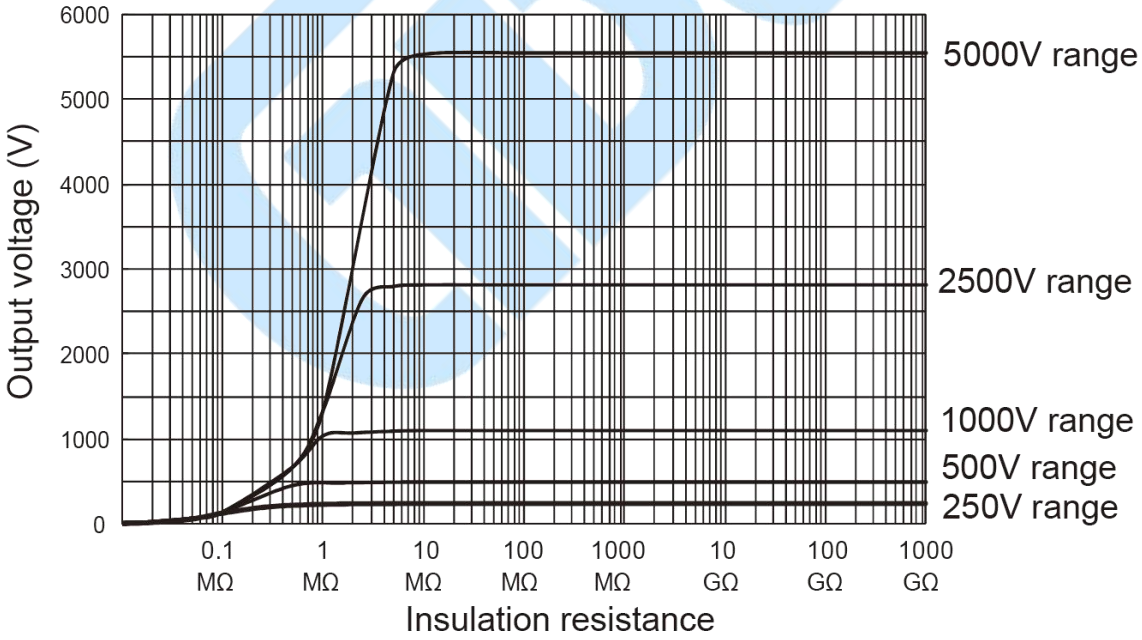
(2)measured value is“OL”

※“OL”is displayed when the measured value exceeds the upper limit of

The measuring range at each insulation resistance range.

Range	Testing range upper limted
250V	100.0MΩ
500V	1000MΩ
1000V	2.00GΩ
2500V	100.0GΩ
5000V	2000GΩ

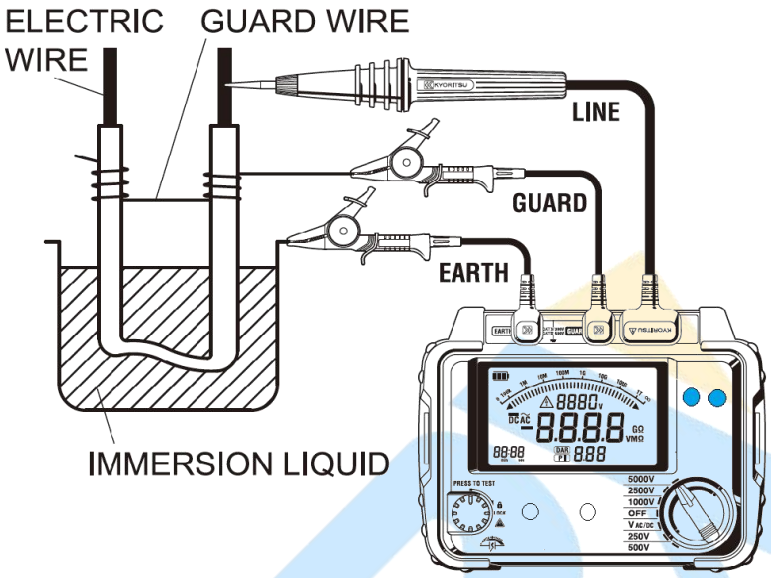
5) Voltage characteristics at measuring terminal



6) Use of protective wires

When measuring the insulation resistance of a cable, leakage current flowing on the insulator are mixed and the current flowing inside the insulator are mixed and may cause error in insulation resistance value. Ln order to prevent such error, wind a conductive wire

around the point where leakage current flows. Then connect it to the Guard terminal. This is to move out the surface leakage resistance of the cable insulation to measure only the volume resistance of insulator. Make sure to use the Guard cord supplied with this instrument to connect the instrument to Guard terminal.



- It is possible to move out the surface leakage resistance of the insulation and measure only the volume resistance by using the Guard terminal. This is helpful when performing tests in humid air.

7) Backlight function

This function to facilitate working at dimly illuminated location or at nighttime work.

Press the backlight button when the range switch is at any position other than"OFF". Then backlight will light up for about 60 sec, and then turn off automatically.(The light will not turn off automatically during a measurement.)

8) Auto-power-off function

The instrument will automatically turn itself off if there is no function change or button press for about 10 min. To return to the normal mode, turn the Range swich to OFF position once, and then to any desired position. (This function does not work during a measurement or while the instrument is giving an audible and visible live circuit warning.)

3. Battery Replacement

⚠ Danger

- Do not open the Battery compartment cover if the surfaceof the instrument is wet.
- Never open the Battery compartment cover during ameasurement.
- To avoidpossible electric shock, disconnect the test leadsand Power Adaptor from the instrument before replacingbatteries. After replacing batteries, make sure to tighten upthe screw for the Battery compartment cover.

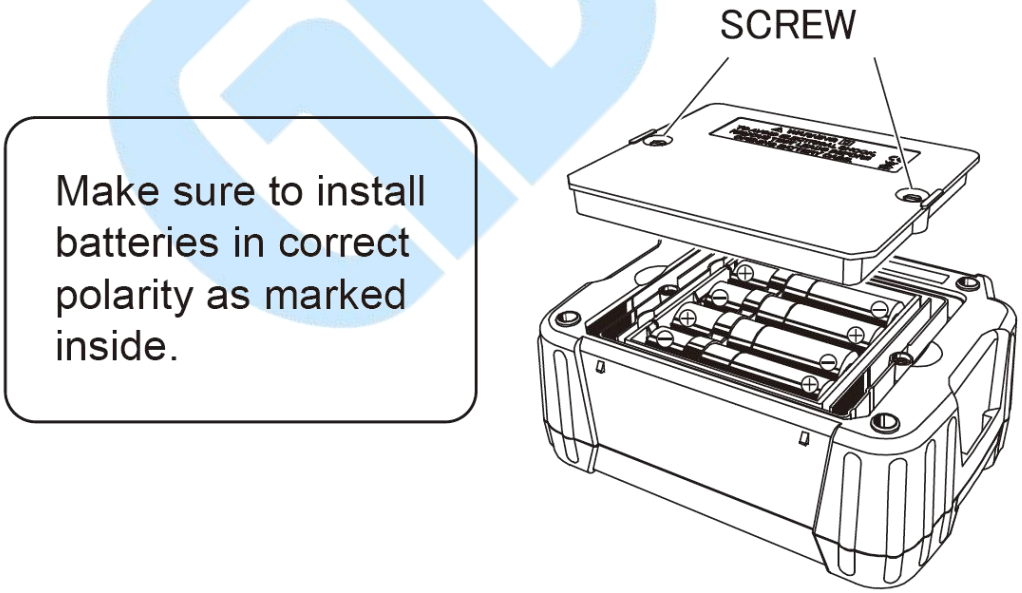
⚠ Danger

- Do not mix new and old batteries.
- Make sure to install batteries in correct polarity as markedinside.

① Set the Range switch to “OFF” position, and disconnect the test leads form the instrument.

② Loosen the Battery compartment cover-fixing screws, and remove the Battey compartment cover. Remove all eight batteries and replace them with new ones.

③ After replacing batteries, be sure to tighten up the screw for the Battery compartment cover.



Ⅴ、Packing List

No.	number	Quantity
1	Portable case	1

2	Host	1
3	HV test line (red)	1
4	Ground test lead (black)	1
5	Protection test line (green)	1
6	charger	1
7	Hook	1
8	manual	1
9	Test Report	1
10	Certificate / Warranty Card	1