

# High Voltage Insulation Tester User Manual



**Please read this manual before switching the unit on.  
Important safety information inside.**

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## Contents

|                                                                                                                                             | Page |
|---------------------------------------------------------------------------------------------------------------------------------------------|------|
| 1.Introduction .....                                                                                                                        | 4    |
| 2.Safety Information .....                                                                                                                  | 4    |
| 3.Features .....                                                                                                                            | 6    |
| 4.Specifications .....                                                                                                                      | 7    |
| 5.General specifications .....                                                                                                              | 8    |
| 6.Accessories .....                                                                                                                         | 8    |
| 7.The Insulation Resistance Tester Structure .....                                                                                          | 9    |
| 8.Measurement Operation .....                                                                                                               | 12   |
| A.Measuring Voltages .....                                                                                                                  | 12   |
| B.Internal power source Measurement .....                                                                                                   | 13   |
| C.Low Resistance Measurement & Continuity Check .....                                                                                       | 13   |
| D.Measuring Insulation Resistance .....                                                                                                     | 14   |
| 9.Auto-discharge function ( <b>AUTO DISCHARGE</b>  ) ..... | 15   |
| 10.Principle of Insulation Resistance Measurement .....                                                                                     | 15   |
| A.Continuous Insulation Resistance Measurement .....                                                                                        | 15   |
| B.Timer Insulation Resistance Measurement .....                                                                                             | 16   |
| C.Polarization Index and Dielectric Absorption Ratios Measurement .....                                                                     | 16   |
| 11.PI Standard .....                                                                                                                        | 17   |
| 12.DAR Standard .....                                                                                                                       | 17   |
| 13.Use of Guard Terminal .....                                                                                                              | 17   |
| 14.Push buttons Operation .....                                                                                                             | 18   |
| 15.Auto Power Off .....                                                                                                                     | 19   |
| 16.Replacing the Battery .....                                                                                                              | 19   |
| 17.The Use of Power Adaptor .....                                                                                                           | 20   |
| 18.Maintenance .....                                                                                                                        | 20   |
| 19.General Service .....                                                                                                                    | 20   |

## **1.Introduction**

The high voltage insulation resistance tester is a handheld instrument designed primarily to make AC/DC voltage, resistance, Continuity test / insulation resistance measurement.

## **2.Safety Information**

This Insulation resistance tester complies with the standards IEC61010 safety measurement requirement: in pollution degree 2, overvoltage category (CAT IV 600V) and double insulation.

- Overvoltage Category I**

Equipment of Overvoltage Category I is equipment for connection to circuits in which measures are taken to limit the transient overvoltages to an appropriate low level.

**Note:**Examples include protected electronic circuits.

- Overvoltage Category II**

Equipment of Overvoltage Category II is energy-consuming equipment to be supplied from the fixed installation.

**Note:**Examples include household, office, and laboratory appliances.

- Overvoltage Category III**

Equipment of Overvoltage Category III is equipment in fixed installations.

**Note:**Examples include switches in the fixed installation and some equipment for industrial use with permanent connection to the fixed installation.

- Overvoltage Category IV**

Equipment of Overvoltage Category IV is for use at the origin of the installation.

**Note:**Examples include electricity meters and primary over-current protection equipment.

**Use the Meter only as specified in this operating manual,otherwise the protection provided by the Meter may be impaired.**

 **Danger**

identifies conditions and actions that pose hazard(s) to the user.

 **Warning**

identifies avoiding electric shock.

 **Caution**

identifies conditions and actions that may damage the Insulation resistance tester and carrying out accurate measurement.

 **Operating Caution**

identifies conditions that user needs to take extra care during operating the Insulation resistance tester.

 **Danger**

Use of instrument in a manner not specified by the manufacturer may impair safety features/protection provided by the equipment. Read the following safety information carefully before using or servicing the instrument.

- Do not apply more than 600V.
- Do not use the Insulation resistance tester around explosive gas, vapor or dust.
- Do not use the Insulation resistance tester in a wet environment.
- When using the test leads, keep your fingers away from the lead contacts. Keep your fingers behind the finger guards on the leads.
- Do not use the Insulation resistance tester with any parts or cover removed.
- When carrying out insulation measurement, do not come in contact with the circuit under test.

#### **⚠ Warning**

- Do not use the Insulation resistance tester if it is damaged or metal part is exposed. Look for cracks or missing plastic.
- Be careful when working above 30V rms. Such voltages pose a shock hazard. Discharge all loading of circuit under test after measuring high voltage.
- Do not change battery when the Insulation resistance tester is in wet environment.
- Place test leads in proper input terminals. Make sure all the test leads are firmly connected to the Insulation resistance tester's input terminals.
- Make sure the Insulation resistance tester is turned off when opening the battery compartment.

#### **⚠ Caution**

- When performing resistance tests, remove all power from the circuit to be measured and discharge all the power.
- When servicing the Insulation resistance tester, use only the same model number or identical electrical specifications of test leads and power adaptor.
- Do not use the Insulation resistance tester if the battery indicator (  ) shows a battery empty.
- Do not use or store the Insulation resistance tester in an environment of high temperature, humidity, explosive, inflammable or strong magnetic field. The performance of the Insulation resistance tester may deteriorate after dampened.
- Soft cloth and mild detergent should be used to clean the surface of the Insulation resistance tester when servicing. No abrasive or solvent should be used to prevent the surface of the Insulation resistance tester from corrosion, damage and accident.
- Dry the Insulation resistance tester before storing if it is wet.
- Be sure to set range selector switch to "OFF" position after use and remove test leads. When the instrument will not be in use for a long period, place it in storage after removing the batteries.

#### **Symbols**

-  Risk of electric shock
-  Equipment protected by double or reinforced insulation
-  DC measurement
-  AC measurement
-  Grounding
-  See manual
-  Empty of built-in battery
-  Conforms to standards of European Union

### **3.Features**

The Tester is a microcomputer controlled, High Voltage Insulation Resistance Tester with 4-range for measuring insulation resistance and AC/DC Voltage, Resistance/Continuity test.

- Designed to following safety standards:  
IEC 61010-1 (CAT IV 600V Pollution degree 2)  
IEC 61010-031 (Requirements for hand-held probes)
- Insulation test range: 0.1M $\Omega$  to 60G $\Omega$
- Insulation test voltages: 500V,1000V,1500V,5000V
- AC/DC Voltage: 0.5V to 600V
- 200mA Continuity
- Resistance: 0.1 $\Omega$  to 6k $\Omega$
- With auto-discharge function & voltage output warning function.

When insulation resistance like a capacitive load is measured, electric charges stored in capacitive circuits are automatically discharged after measuring. Discharge can be checked with live voltage graph.

- Backlight levels selector function to facilitate working at dimly illuminated location or at nighttime work.
- Live circuit warning symbols plus audible warning.
- Live circuit detection prevents insulation test if voltage >30V is detected for added user protection
- With Auto-power off function & battery check.
- With Timer measurement function  
Automatically performs a measurement at the set time.
- With Polarization index measurement (PI)  
The polarization index can be measured by the automatic measurement function of the ratio of resistance in 1min. and 10 min. two point time and automatic (Pass/Fail).
- With Dielectric absorption ratio measurement (DAR)  
The Dielectric absorption ratio measured by the automatic measurement function of the ratio of resistance in 30sec. and 1 min. two point time and automatic (Pass/Fail).
- Auto ranging with larger 6000 counts LCD display with bargraph.
- MAX/MIN, PEAK,Relative value & Data hold functions for DC/AC voltage measurements.
- Power source 1.5V x 8 (LR14/R14) Batteries.

#### 4.Specifications

| Insulation Resistance Measurement |                                                                                                                                                                                                                                                                                                                                                                                                                                |                                     |                                       |                                                                                    |
|-----------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------|---------------------------------------|------------------------------------------------------------------------------------|
| Rated Voltage                     | 500V                                                                                                                                                                                                                                                                                                                                                                                                                           | 1000V                               | 2500V                                 | 5000V                                                                              |
| Measuring Range<br>(Auto-Ranging) | 0.005 to 6.000M $\Omega$                                                                                                                                                                                                                                                                                                                                                                                                       | 0.005 to 6.000M $\Omega$            | 0.05 to 60.00M $\Omega$               | 0.05 to 60.00M $\Omega$                                                            |
|                                   | 6.01 to 60.00M $\Omega$                                                                                                                                                                                                                                                                                                                                                                                                        | 6.01 to 60.00M $\Omega$             | 60.1 to 600.0M $\Omega$               | 60.1 to 600.0M $\Omega$                                                            |
|                                   | 60.1 to 600.0M $\Omega$                                                                                                                                                                                                                                                                                                                                                                                                        | 60.1 to 600.0M $\Omega$             | 0.61 to 6.00G $\Omega$                | 0.61 to 6.00G $\Omega$                                                             |
|                                   | 0.61 to 6.00G $\Omega$                                                                                                                                                                                                                                                                                                                                                                                                         | 0.61 to 6.00G $\Omega$              | 6.1 to 60.0G $\Omega$                 | 6.1 to 60.0G $\Omega$                                                              |
| Open Circuit Voltage              | DC 500V<br>+20%,-0%                                                                                                                                                                                                                                                                                                                                                                                                            | DC 1000V<br>+20%,-0%                | DC 2500V<br>+20%,-0%                  | DC 5000V<br>+20%,-0%                                                               |
| Rated Current                     | 1 to 1.2mA<br>(at 0.5M $\Omega$ load)                                                                                                                                                                                                                                                                                                                                                                                          | 1 to 1.2mA<br>(at 1M $\Omega$ load) | 1 to 1.2mA<br>(at 2.5M $\Omega$ load) | 1 to 1.2mA<br>(at 5M $\Omega$ load,<br>Recommended<br>use of the Power<br>Adaptor) |
| Short-Circuit Current             | Approx.1mA                                                                                                                                                                                                                                                                                                                                                                                                                     |                                     |                                       |                                                                                    |
| Accuracy                          | $\pm 2.5\%$ reading $\pm 15$ digits (at 0.005 to 600.0M $\Omega$ )<br>$\pm 3\%$ reading $\pm 15$ digits (at 0.61 to 6.00G $\Omega$ )<br>$\pm 4\%$ reading $\pm 15$ digits (at 6.1 to 60.0G $\Omega$ )                                                                                                                                                                                                                          |                                     |                                       |                                                                                    |
| Voltage Monitor Range             | 5 to 6000VDC (Resolution 1V); Accuracy: $\pm 1.5\%$ reading $\pm 5$ digits<br><b>Note:</b> This monitor is used to check whether electric charge stored on the equipment under test is discharged or not. Measured voltage value displayed on the LCD is a reference value. Please be noted that the indicated value, when external AC or DC Voltage is applied to the instrument is not the correct value, is display ">30V". |                                     |                                       |                                                                                    |

| DC/AC Voltage Measurement   |               |            |                                                                                                    |
|-----------------------------|---------------|------------|----------------------------------------------------------------------------------------------------|
|                             | Range         | Resolution | Accuracy                                                                                           |
| DC Voltage                  | 0.5 to 600.0V | 0.1V       | $\pm 1.0\%$ reading $\pm 5$ digits                                                                 |
| AC Voltage<br>(40 to 400Hz) | 0.5 to 600.0V | 0.1V       | $\pm 1.0\%$ reading $\pm 5$ digits(40 to 60Hz)<br>$\pm 2.5\%$ reading $\pm 10$ digits(61 to 400Hz) |

| Low Resistance Measurement & Continuity Check |                        |                 |                                     |
|-----------------------------------------------|------------------------|-----------------|-------------------------------------|
|                                               | Range                  | Resolution      | Accuracy                            |
| Resistance                                    | 0.1 to 600.0 $\Omega$  | 0.1 $\Omega$    | $\pm 1.5\%$ reading $\pm 10$ digits |
| (Auto-Ranging)                                | 601 to 6.000k $\Omega$ | 0.001k $\Omega$ | $\pm 1.5\%$ reading $\pm 15$ digits |
| Continuity Buzzer: $\leq 50\Omega$            |                        |                 |                                     |
| Short Circuit Current: $\geq 200$ mA          |                        |                 |                                     |
| Open Circuit Test Voltage: $\geq 4.5$ V       |                        |                 |                                     |

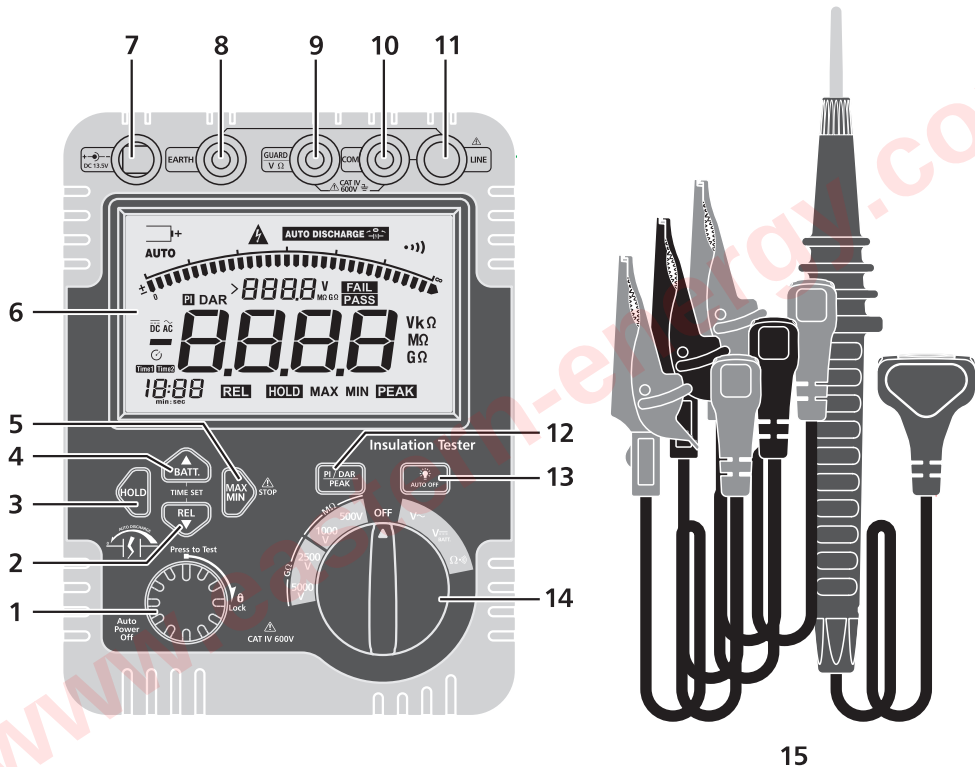
## 5. General specifications

|                             |                                                                                                               |
|-----------------------------|---------------------------------------------------------------------------------------------------------------|
| Applicable standards:       | IEC 1010 CAT IV 600V overvoltage and double insulation standard                                               |
| Display:                    | 6000 counts LCD display with bargraph                                                                         |
| Sampling rate:              | 2.5 readings per second                                                                                       |
| Over range indicator:       | "OL" displayed                                                                                                |
| Fuse:                       | 500mA/600V (ø6X32mm)ceramic 3AG Fast blow                                                                     |
| Zero adjust Automatic       |                                                                                                               |
| Auto power off:             | Power off function operates automatically after a switch remains for 20min (current consumption approx.50uA). |
| Low battery indicator:      | Low battery symbol displayed when battery voltage is low                                                      |
| Environmental Installation: | Category II, Pollution Degree 2, Altitude up to 2000 meters, Indoor use only                                  |
| Power source:               | 8 x 1.5V(R14) batteries                                                                                       |
| Operating conditions:       | 0 to 40°C(32 to 104°F); <80%RH                                                                                |
| Storage conditions:         | -10 to 60°C(14 to 140°F); <80%RH                                                                              |
| Dimensions:                 | 198(L) x 148(W) x 86(D)mm                                                                                     |
| Weight:                     | 1438g                                                                                                         |

## 6. Accessories

| Item | Description                                                                                                          | Qty      |
|------|----------------------------------------------------------------------------------------------------------------------|----------|
| 1    | User Manual                                                                                                          | 1 piece  |
| 2    | One plug test lead to one alligator clip (Black colour)                                                              | 1 piece  |
| 3    | One plug test lead to one alligator clip (Green colour)                                                              | 1 piece  |
| 4    | One plug test lead to one alligator clip (Red colour)                                                                | 1 piece  |
| 5    | Two plugs test lead to one alligator clip (Red colour)                                                               | 1 piece  |
| 6    | 1.5V Battery (LR14)                                                                                                  | 8 pieces |
| 7    | Carry case                                                                                                           | 1 piece  |
| 8    | Power adaptor (input voltage 110V to 230V, 50/60Hz, 75mA, output DC13.5V,1.0A) (Optionally, available at extra cost) | 1 piece  |

## 7.The Insulation Resistance Tester Structure

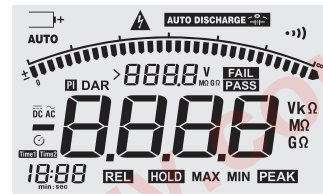


1. Insulation Resistance Test/Lock button
2. Relative & Time-down button
3. Data Hold button
4. Internal Battery Check & Time-up button
5. MAX/MIN & Insulation resistance test emergency stop button
6. LCD display
7. DC 13.5V Power adaptor Input Terminal
8. EARTH: High resistance measurement input
9. V/Ω input terminal & GUARD: Grounding protection input terminal
10. COM & High voltage line shielding input terminal
11. LINE: 500V to 5000V High voltage output terminal
12. PI/DAR, Peak Voltage measurement & Time Clear button
13. Back-light Levels button
14. Function switch
15. Test leads

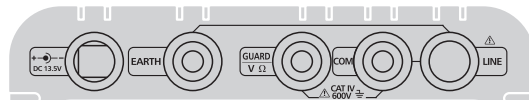


## LCD Display

| Symbols                    | Meaning                                             |
|----------------------------|-----------------------------------------------------|
|                            | Battery life indicator                              |
| <b>AUTO</b>                | Indicator for Autoranging measurement               |
|                            | Indicator high voltage output or >30V DC/AC Voltage |
|                            | Indicator for DC voltage                            |
|                            | Indicator for AC voltage                            |
| <b>AUTO DISCHARGE</b>      | Indicator for automatically discharged              |
|                            | Indicates for Continuity buzzer                     |
|                            | Indicates for negative reading                      |
| <b>Time1 Time2 min:sec</b> | Timer symbols                                       |
| <b>VkΩ MΩ GΩ</b>           | Unit symbols                                        |
| <b>PI</b>                  | Indicator for polarization index                    |
| <b>DAR</b>                 | Dielectric absorption ratio                         |
| <b>FAIL PASS</b>           | Check feature fail or pass                          |
|                            | Analogue bar graph                                  |
| <b>8.8.8.8</b>             | LCD display reading                                 |

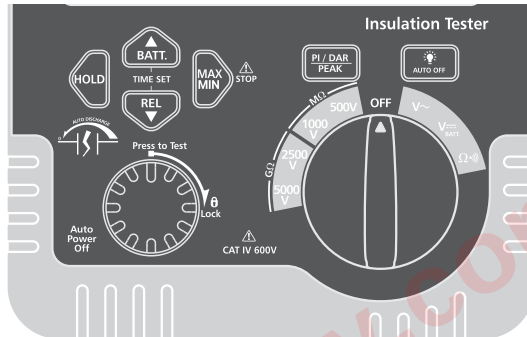


## Measurement Inputs



| Terminal                                                            | Description                                                                                                                                               |
|---------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Insulation resistance measurement</b>                            |                                                                                                                                                           |
| LINE                                                                | 500V,1000V,2500V,5000V range Insulation resistance measurement high voltage line output terminal (LINE+COM:two plugs red test lead to one alligator clip) |
| COM                                                                 | Return terminal for all measurements (LINE+COM:two plugs red test lead to one alligator clip)                                                             |
| GUARD                                                               | Grounding protection input terminal (one plug black test led to one alligator clip)                                                                       |
| EARTH                                                               | Insulation resistance measurement input terminal (one plug green test lead to one alligator clip)                                                         |
| <b>ACV/ DCV/ Low resistance measurements &amp; continuity check</b> |                                                                                                                                                           |
| V/Ω                                                                 | Input for voltage, Low resistance measurements & continuity check (one plug red test lead to one alligator clip)                                          |
| COM                                                                 | Return terminal for all measurements (one plugs black test lead to one alligator clip)                                                                    |

## Push buttons



| Button                                                    | Switch Position(Power-on)   | Function                                                                                       |
|-----------------------------------------------------------|-----------------------------|------------------------------------------------------------------------------------------------|
| HOLD                                                      | Any switch position         | The hold function freezes the reading in the display                                           |
| Backlight                                                 |                             | Turns the backlight on,makes it brighter, and turns it off or auto-off                         |
| <b>Insulation resistance measurement</b>                  |                             |                                                                                                |
| TEST/LOCK                                                 | 500V,1000V,2500V,5000V      | Press and hold to test or lock to Insulation resistance measurement                            |
| Time-up                                                   | Insulation resistance Range | Set timer time range up, This is a function to conduct a test automatically at any set time.   |
| Time-down                                                 |                             | Set timer time range down, This is a function to conduct a test automatically at any set time. |
| PI                                                        |                             | Polarization index measurement & press 2sec. clear timer function                              |
| DAR                                                       |                             | Dielectric absorption ratio measurement & press 2sec.clear timer function                      |
| STOP                                                      |                             | Emergency stop Insulation resistance measurement and high voltage output.                      |
| <b>ACV/ DCV measurements</b>                              |                             |                                                                                                |
| MAX/MIN                                                   | ACV/DCV Range               | MAX/MIN record                                                                                 |
| PEAK                                                      |                             | PEAK-MAX/PEAK-MIN capture                                                                      |
| REL                                                       |                             | Relative measurement                                                                           |
| BATT.                                                     | DCV Range                   | Check the meter Internal power source (batteries) condition                                    |
| <b>Low resistance measurements &amp; continuity check</b> |                             |                                                                                                |
| HOLD                                                      | Ω. . .))                    | The hold function freezes the reading on the display                                           |

## 8.Measurement Operation

### Preparation

- Battery voltage checking
- Scope of the range switch to any location outside of OFF
- When LCD indicates the battery sign , the accuracy could not be guaranteed if the battery voltage is below the minimum operating voltage. Please replace it with the new battery.
- Please connect test leads correctly.

### **⚠ DANGER**

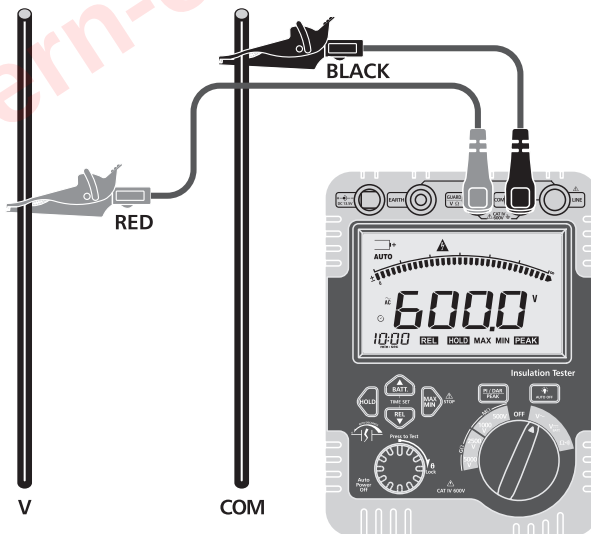
After pressing TEST button under insulation measurement, the wire will generate high voltage. To avoid electric shock, do not touch it.

### A.Measuring Voltage

#### **⚠ DANGER**

- To avoid electric shock, please do not test if voltage to ground AC/DC is over 600V, even if the line voltage is below 600V.
- Under voltage measurement, please note that the metal part of wire to avoid short circuit may lead to electric shock.
- Do not test when the battery cover opened.

### AC/DC Voltage Measurement



- 1.Set the Rotary switch to the ACV or DCV.
- 2.Connect the red test lead to VΩ terminal and the black to COM terminal.
- 3.Connect the test leads to the circuit under test.
- 4.Read the voltage value on the LCD. When measuring DC voltage, if the red test lead is negative voltage, "-" symbol will show on the display.

### B. Internal Power Source Measurement

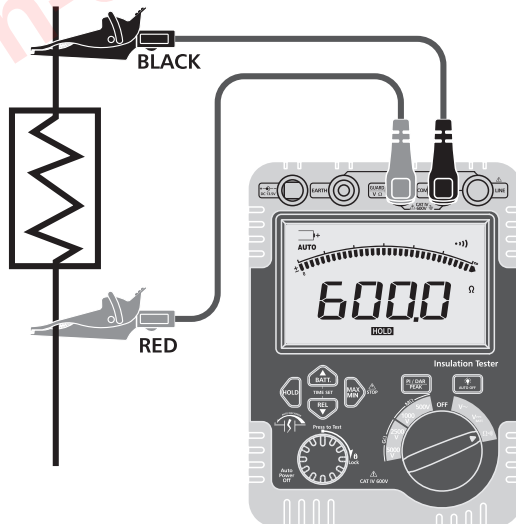
1. Disconnect the test leads.
2. Set the switch to DCV.
3. Press BATT button.
4. Read the voltage value on the LCD. After 5sec., it will auto-off or press BATT button to turn off the battery voltage function.



### C. Low Resistance Measurement & Continuity Check

#### ⚠ WARNING

Do not run this test unless ACV/DCV=0. Do not use this mode to check diodes.



1. Set the Rotary switch to the  $\Omega$  position.
2. Connect the red test lead to the  $V\Omega$  terminal and the black lead to the COM terminal.
3. Connect the tips of the test leads to the circuit under test.
4. Read the resistance value on the display. When the resistance of a circuit is less than 50 $\Omega$ , the audible tone will sound.

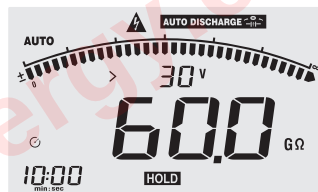
#### D.Measuring Insulation Resistance

##### ⚠ DANGER

- Make sure to check with a high voltage detector that there is no electrical charge exists on the circuit under test.
- Be sure to put on a pair of insulated gloves for high voltage.
- Be extremely careful not to get electric shock during insulation resistance measurement and "PRESS TO TEST" button is being pressed as high voltage is present on the tip of test leads and on the circuit under test continuously.
- Do not make measurement with the battery cover removed.
- Do not make measurement when thunder rumbling.
- Be sure to connect the Earth Cord (black) to the Earth terminal of the circuit under test.

##### ⚠ Caution

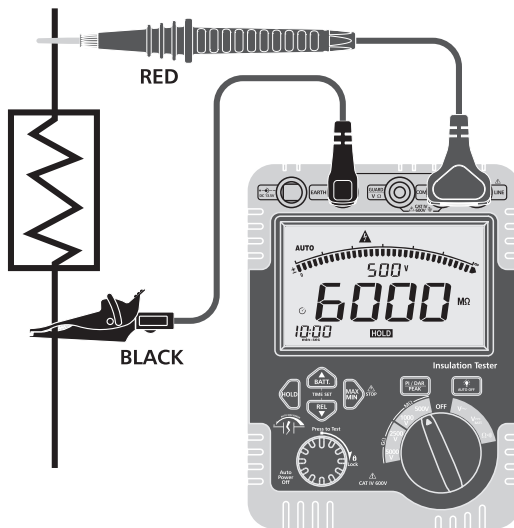
- When the live circuit warning is indicated ">30V" or the warning buzzer sounds and LCD display flash "AUTO DISCHARGE", measurement cannot be made even if "PRESS TO TEST" button is pressed.
- To check the insulation of electric equipments or electric circuits, measure their insulation resistance with the instrument.
- Be sure to check the voltage which can be applied to the equipment under test before making a measurement.



##### Note:

- Insulation resistance value of the equipment under test may not be stable, and the indication may be unstable.
- Bleep sound may be heard during insulation resistance measurement. But it is not a 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. Which this connection, smaller measured value can be obtained comparing with other way round.



- Check the voltage which can be applied to the circuit under test, and set the range switch to the desired insulation resistance range.
- Connect the Earth cord (black) to the Earth terminal of the circuit under test.
- Put the tip of the Line probe (red) to the circuit under test. Then press the "PRESS TO TEST" button. The buzzer sounds intermittently during measurement.
- The measured value will be displayed on the LCD, and it is automatically "HOLD" displayed after measurement.
- This instrument has an auto-discharge function. With the test leads connected to the circuit under test, release the "PRESS TO TEST" button to discharge capacitance in the circuit after test, LCD display flash "AUTO DISCHARGE". Check that the indication on the voltage monitor is "0 V".
- At any output voltage, when the tested resistance is less than  $10\text{M}\Omega$ , the testing time cannot exceed 10 seconds continuously.

#### **⚠ DANGER**

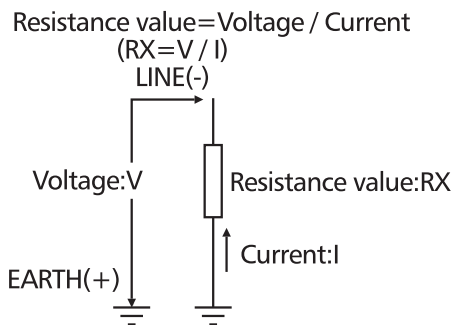
- Do not touch the circuit under test immediately after testing. Capacitance stored in the circuit may cause electric shock.
- Leave test leads connected to the circuit and never touch the circuit until the discharge is complete.

### **9. Auto-discharge function ( )**

This is a function to release capacitance stored in the circuit under test automatically after testing. Discharge condition LCD display flash "AUTO DISCHARGE" and can be checked with a live voltage monitor is "OV". This function will be released in 2sec or more after removing test leads before discharge is complete. Set the range switch to "OFF", and remove test leads from the instrument.

### **10. Principle of Insulation Resistance Measurement**

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



#### **A. Continuous Insulation Resistance Measurement**

##### **⚠ Caution**

The high voltage symbol (  &  ) along with a voltage monitor display of  $>30\text{V}$  warns if voltage over 30V AC or DC is present. High voltage inhibits the test. Insulation tests should only be performed on de-energized circuits.

- Pressing and turning the "PRESS TO TEST" button clockwise to perform a continuous measurement of insulation resistance. Then the button is locked, and continuous measurement can be performed.
- After testing, turn the button counterclockwise to initial position, beeper is on and automatically "HOLD" reding displayed approximately 10 seconds.

#### **⚠ DANGER**

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

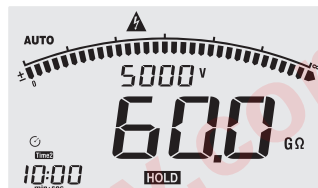
### B. Timer Insulation Resistance Measurement

This is a function to conduct a test automatically at any set time (from 1min. to 15 min.).

#### ⚠ Caution

The high voltage symbol (⚡ & AUTO DISCHARGE) along with a voltage monitor display of >30V warns if voltage over 30V AC or DC is present. High voltage inhibits the test. Insulation tests should only be performed on de-energized circuits.

1. Press time-up button to set any time from 1min. to 15min.
2. Press time-down button to set any time from 15min. to 1min.
3. Pressing and hold turning the "PRESS TO TEST" button clockwise to perform a timer measurement of insulation resistance. Then the button is locked, and timer measurement can be performed.
4. After testing, turn the button counterclockwise to the initial position, beeper is on and automatically "HOLD" reading displayed approximately 10 second.



### C. Polarization Index and Dielectric Absorption Ratios Measurement (cannot be set any time)

#### ⚠ Caution

The high voltage symbol (⚡ & AUTO DISCHARGE) along with a voltage monitor display of >30V warns if voltage over 30V AC or DC is present. High voltage inhibits the test. Insulation tests should only be performed on de-energized circuits.

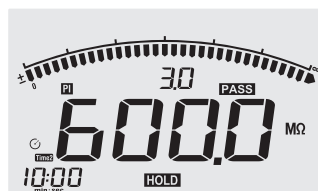
- Polarization Index (PI) is the ratio of the 10-minute insulation resistance to the 1 minute insulation resistance.

**Polarization index = resistance value measured after 10min (Time2) / resistance value measured after 1min (Time1)**

- Dielectric Absorption Ratio (DAR) is the ratio of the 1-minute insulation resistance to the 30 second insulation resistance.

**Dielectric Absorption Ratio = resistance value measured after 1min (Time2) / resistance value measured after 30sec. (Time1)**

1. Press PI/DAR to select PI or DAR Measurement.
2. LCD display PI & Time1/Time2 or DAR & Time1/Time2
3. Press and turn the "PRESS TO TEST" button clockwise to perform a timer measurement. Then the button is locked, and timer measurement can be performed.
4. After testing, turn the button counterclockwise to the initial position, beeper is on, when PI/DAR > 4 a monitor display "PASS". When PI/DAR < 1 a monitor display "FAIL" and automatically "HOLD" reading displayed approximately 10 seconds.



**NOTES:** (The following for reference only)

According to the standard IEEE 43-2000 with respect to the motor and related equipment for troubleshooting, it will be for the insulation resistance testing of the DAR or PI, to check the pollution or damp insulation properties. The instrument need to be maintained if the readings can not meet the minimum acceptable resistance. Different level of insulation materials have different temperature characteristics and polarization index (the following table: minimum acceptable polarization index value for different level).

| Minimum acceptable polarization index value |             |
|---------------------------------------------|-------------|
| Insulation Level                            | Index value |
| A                                           | 1.5         |
| B                                           | 2.0         |
| F                                           | 2.0         |
| H                                           | 2.0         |

### 11.PI Standard

| PI value               | 2~4 (typically3)                            | 1~1.5                        | 1                                                                          | 1.0 or less |
|------------------------|---------------------------------------------|------------------------------|----------------------------------------------------------------------------|-------------|
| Tested material status | Considered as good insulation (older types) | Not acceptable (older types) | (very high insulation resistance) Modern type of (good) insulation systems | Fail        |

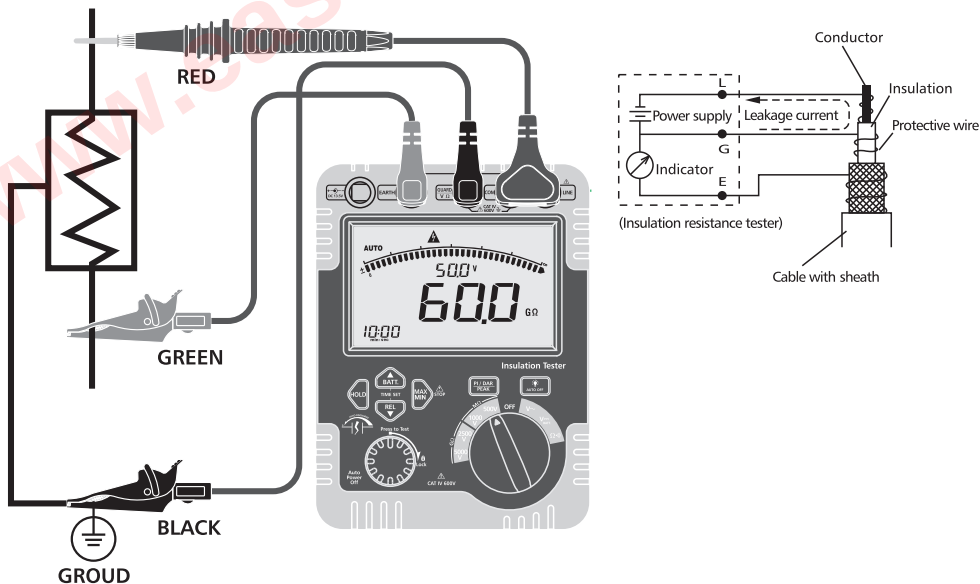
Example: If the reading of B-class insulation material is 100MΩ in 1 minute, 110MΩ in 10 minutes, polarization index is 1.1( $110\text{M}\Omega/100\text{M}\Omega=1.1$ ). As the insulating material contains too much water or seriously polluted, the polarization index is below the minimum acceptable value, you need to repair or replace parts

### 12.DAR Standard

| DAR value              | 1.6 or more | 1.25~1.6 | <1.25 or less |
|------------------------|-------------|----------|---------------|
| Tested material status | Excellent   | PASS     | Fail          |

### 13.Use of Guard Terminal

When measuring a cable, leakage current flowing on the surface of cable jacket and the current flowing inside the insulator are mixed and may cause error in value. In order to prevent such error, wind a conductive wire around the point where leakage current flows, then connect it to the Guard terminal as shown in below figure. It 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.





## 14. Push buttons Operation

### •Data Hold Button (Perform any measurement as described in the operating instructions)

The hold function freezes the reading on the display. Press the HOLD key momentarily to activate or to exit the hold function.

### •Peak Hold Button (Only for AC/DC voltage measurement, in MAX/MIN mode)

The Peak Hold function captures the peak AC/DC Voltage 0.5V~600V. The meter can capture peaks as fast as 10~100 millisecond in duration.

1. Press PEAK button, The display icon "PEAK" will appear.
2. Press MAX/MIN to activate the MAX/MIN recording mode. The display icon "MAX & PEAK" will appear. The LCD will display and hold the maximum reading and update only when a new "MAX" occurs.
3. Press MAX/MIN and "MIN" will appear The display icon "MIN & PEAK" will appear. The LCD will display and hold the minimum reading and update only when a new "MIN" occurs.
4. Press MAX/MIN and a "MAX MIN PEAK" will appear. The meter will display the present reading, but will continue to update and store the max and min readings.
5. To exit MAX/MIN-PEAK mode press and hold MAX/MIN for 2 seconds or press PEAK.

### •MAX/MIN Button (Only for AC/DC voltage measurement)

1. Press MAX/MIN to activate the MAX/MIN recording mode. The display icon "MAX" will appear. The LCD will display and hold the maximum reading and update only when a new "MAX" occurs.
2. Press MAX/MIN and "MIN" will appear The display icon "MIN" will appear. The meter will display and hold the minimum reading and update only when a new "MIN" occurs.
3. Press MAX/MIN and "MAX MIN" will appear. The meter will display the present reading, but will continue to update and store the max and min readings.
4. To exit MAX/MIN mode press and hold MAX/MIN for 2 seconds.

### •Relative Button (Only for AC/DC voltage measurement)

The relative measurement feature allows you to make measurements relative to a stored reference value. A reference voltage, current, etc. can be stored and measurements made in comparison to that value. The displayed value is the difference between the reference value and the measured value.

1. Press REL to store the reading on the display and the "REL" indicator will appear.
2. The display will now indicate the difference between the stored value and the measured value.
3. Press REL to return to normal operation.

### •Emergency Stop Button (Only for Insulation Resistance Measurement)

When you are in high-voltage insulation resistance measurements, in case of danger or short-circuit, please stop testing immediately or press "TEST" button to stop testing completely. After solving the problem, you can continue to test.

### •Backlight Button

Press the key to turn ON/OFF and select backlight levels. The backlight will automatically turn off in 60 seconds.

## 15.Auto Power Off

To reserve battery power, the tester enters into the Sleep Mode and blanks the display if no button pressed & no function changed in 20 minutes. To exit Sleep Mode, press any button or turn the tester ON again.

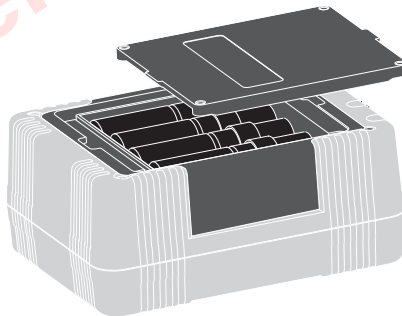
## 16.Replacing the Battery

### ⚠ Warning

To avoid electric shock, remove all the test leads from the Insulation resistance tester when replacing the batteries.

### ⚠ Operating Caution

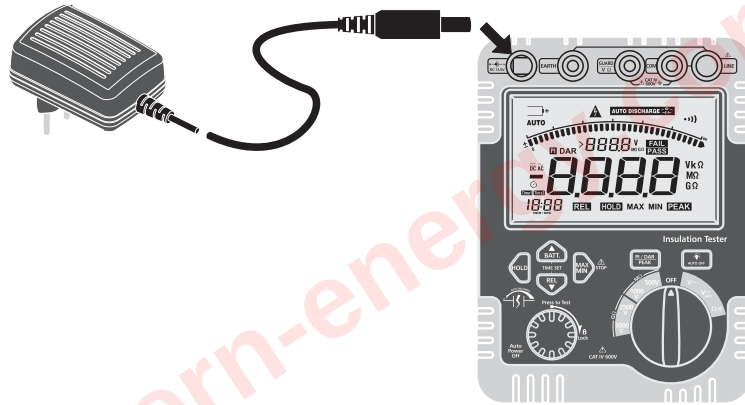
- Do not mix to use old and new batteries.
- Make sure the polarity is correct when installing batteries.
- Stop using the tester when the battery indicator (  ) displays.
- Do not carry out measuring when the battery compartment is open.



- Turn the Insulation resistance tester to OFF and remove all connections from the terminals.
- Remove the screw from the battery compartment, and separate the battery compartment from the case bottom.
- Replace with 8pcs of new 1.5V (LR14) batteries.
- Rejoin the case bottom and battery compartment, and reinstall the screw.

### 17.The Use of Power Adaptor

- Make sure the Meter is power off and insert the power adaptor to the input terminal.
- It is highly recommended to take out all the batteries when you are using the power adaptor.
- Make sure the Meter is power off when you disconnect the power adaptor from the Meter.
- It is highly recommended to use the power adaptor at  $5M\Omega$  load (when on 5kV range).



### 18.Maintenance

If the Insulation resistance tester is wet, dry it before use.

#### Warning

Do not attempt to repair or service your Insulation resistance tester unless you are qualified to do so and have the relevant calibration, performance test, and service information.

### 19.General Service

- Periodically wipe the case with a damp cloth and mild detergent. Do not use abrasives or solvents.
- To clean the terminals with cotton bar with detergent, as dirt or moisture in the terminals can affect readings.
- Turn the Insulation resistance tester to OFF when it is not in use.
- Take out the battery when it will not in use for a long time.
- Do not use or store the Insulation resistance tester in a place of humidity, high temperature, explosive, inflammable and strong magnetic field.

