



***VOLTCRAFT***

® Operating Instructions

## **ET-500 Isolation Tester**

Item No. 3414443

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# 1. Overview

The product is digital high-voltage insulation resistance tester.

The product is mainly used to measure insulation resistance of cable, motor, power generator, transformer, mutual inductor, high-voltage switch, lightning arrester, and more, it is an ideal measurement meter for electric power, telecommunication, meteorology, machine room, oil field, electromechanical installation and maintenance, and power supply department of Industry and mining enterprise.

## 2. Features

1. Insulation resistance range up to  $5T\Omega$
2. Output rated voltage ranges including 250V, 500V, 1000V, 2500V, 5000V
3. Short-circuit current: Approx. 5mA
4. Insulation resistance testing (IR)
5. AC/DC voltage testing (V)
6. Capacitance testing (CAP)
7. Polarization Index (PI) and Dielectric Absorption Ratio (DAR)
8. Resistance comparison function (COMP) with upper and lower resistance limit setting and over-range indication.
9. Timer testing mode
10. Automatic current display
11. External voltage detection function to monitor live voltage of measured object.
12. Timer function to record testing time automatically.
13. Automatic discharge and high voltage alarming functions.
14. Analog bar graph to display tested insulation resistance
15. Automatic power off
16. Delete and store 999 groups of data.
17. Data upload function to enable uploading data to computer via USB cable for data analysis.
18. LCD-backlight

## 3. Delivery contents

- Insulation resistance tester
- 14.8V/5200mAh rechargeable lithium battery x 1 (installed inside the tester)
- Test lead (red, black, green:1 for each): 3pcs
- USB cable x 1pc
- Lithium battery charger x 1
- Carrying strap x 1
- Manual
- Carrying case

## 4. Safety

Thank you for purchasing the High-Voltage Insulation Resistance Tester. The product is designed, manufactured and tested in accordance with IEC61010 Safety Standard (safety requirements of electric measurement products), Double Insulation, and Overvoltage CAT IV 600V Standard. Before first use, please read and follow the safety information and the precautions in the user manual, so as to avoid electric shock or personal injury.



### Warning

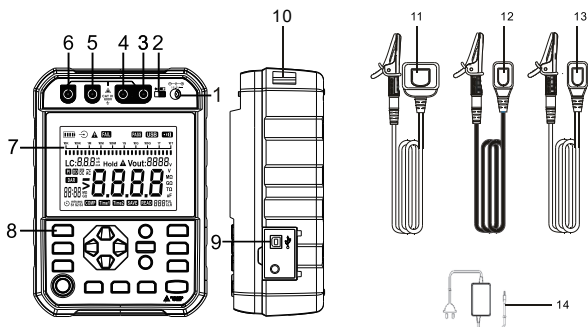
- Please read the user manual thoroughly and follow the "Safety Information" strictly.
- Keep the user manual with you for use at any time.
- Use the tester according to the operating instructions.
- Follow the operating instructions strictly, failure to follow can cause personal injury and product damage.
- Please wear insulation gloves before use.
- Do not measure circuit with voltage over 750VAC or 1000VDC.
- It is forbidden to test near inflammable environment, spark cause explosion.
- Do not perform operation with tester surface or user's hands wet.
- Please avoid short circuit occurs between metal part and test lead when measuring voltage, otherwise it may cause personal injury.
- Do not exceed the upper range when performing measurement.
- Do not start testing when the test leads are not connected properly.
- Do not open the battery cover during measurement.
- Do not touch the measured circuit during or right after insulation resistance measurement, otherwise it may cause electric shock.
- Please stop testing if dirt or carbide susceptible to damaging insulation characteristic is found with test lead or port.
- Please do not short-circuit or connect test lead when measuring insulation resistance, misoperation may accidentally cause test to be stopped or LED to be lit off. Top end of test lead will discharge when test lead is short-circuited or connected, please note that certain discharge can deteriorate the product performance.
- Please check the tester and the test lead before use for any damage or defect. Please stop using the tester if test lead or casing insulation is damaged, LCD shows nothing, or the tester cannot work normally.
- It is forbidden to use the tester without battery cover set in place, otherwise it may pose a risk of electric shock.
- Keep fingers behind the finger guard when perform measurement, do not touch exposed wire, connector, alligator clip, etc. to avoid electric shock.
- The output voltage at right position before measurement, it is forbidden to switch over the output voltage during measurement to avoid product damage.

- If the battery power indicator shows less than one “segment” of power left, please charge or replace the battery immediately to ensure measurement accuracy. Remove the battery if the product is not used for a long time. Power off the tester before opening the battery cover.
- Do not alter the internal wiring without authorization to avoid product damage and safety hazard.
- Do not store or use the tester in flammable and explosive environments, or environments with high temperature, high humidity, and strong electromagnetic field.
- Please clean the casing using soft cloth and mild detergent, do not use abrasive or solvent to avoid casing corrosion and product damage.
- If insulation on probe is damaged, replace a new one which should meet EN 61010-031 standard, rated follow parameters of the product or better.
- Before each use verify tester operation by measuring a known voltage.
- Indoor use only

## 5. Description of symbols

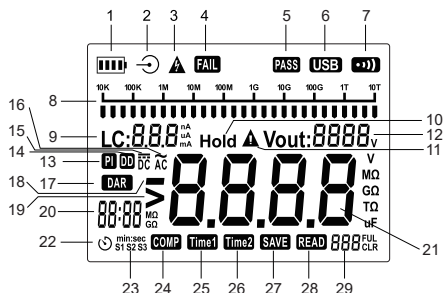
|                                                                                   |                                                                                                                          |
|-----------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------|
|  | Risk of electric shock                                                                                                   |
|  | Double-insulated or insulation-enhanced                                                                                  |
| <b>DC</b>                                                                         | Direct Current                                                                                                           |
| <b>AC</b>                                                                         | Alternating Current                                                                                                      |
|  | Grounding                                                                                                                |
|  | Warning                                                                                                                  |
|  | Battery voltage                                                                                                          |
| <b>CAT IV</b>                                                                     | It is applicable to test and measuring circuits connected at the source of the building's low-voltage MAINS installation |

## 6. Overview



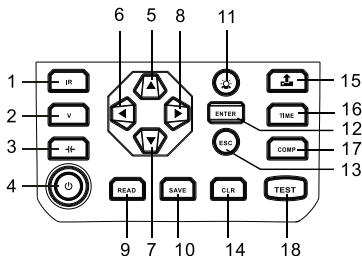
|    |                                                                    |
|----|--------------------------------------------------------------------|
| 1  | Battery charging port                                              |
| 2  | Selection switch for charging and testing modes                    |
| 3  | LINE: High-voltage output outlet (dual-plug red lead)              |
| 4  | LINE: Outlet for shielding high-voltage lead (dual-plug red lead)  |
| 5  | GUARD: Grounding protection outlet (single-plug green lead)        |
| 6  | EARTH: High resistance measurement outlet (single-plug black lead) |
| 7  | LCD segmented display screen                                       |
| 8  | Functional buttons                                                 |
| 9  | USB port                                                           |
| 10 | Carrying strap location                                            |
| 11 | Dual-plug high-voltage test lead (red)                             |
| 12 | High resistance sampling test lead (black)                         |
| 13 | Protective test lead (green)                                       |
| 14 | Lithium battery charger                                            |

## 7. Display



|    |                                                   |    |                                                |
|----|---------------------------------------------------|----|------------------------------------------------|
| 1  | Battery power                                     | 16 | AC voltage testing mode                        |
| 2  | Battery charging                                  | 17 | Dielectric absorption ratio testing mode       |
| 3  | Live measured object or risk of high voltage      | 18 | Inverted input of DC voltage testing           |
| 4  | Failed resistance comparison testing              | 19 | Over-range test result                         |
| 5  | Pass resistance comparison testing                | 20 | Comparison resistance setting or timer setting |
| 6  | USB communication                                 | 21 | Display area                                   |
| 7  | Buzzer                                            | 22 | Timer                                          |
| 8  | Analog bar graph of insulation resistance testing | 23 | Stepping indication                            |
| 9  | Current display                                   | 24 | Resistance comparison mode                     |
| 10 | Data hold                                         | 25 | Time1 of the timer                             |
| 11 | Indication of dangerous operation                 | 26 | Time2 of the timer                             |
| 12 | Monitoring display of voltage output              | 27 | Save data                                      |
| 13 | Polarization index testing mode                   | 28 | Read data                                      |
| 14 | Dielectric constant testing mode                  | 29 | Data storage capacity                          |
| 15 | DC voltage testing mode                           |    |                                                |

## 8. Button overview



|   |                                                          |    |                           |
|---|----------------------------------------------------------|----|---------------------------|
| 1 | Insulation resistance measurement                        | 10 | Save data                 |
| 2 | AC/DC voltage measurement                                | 11 | Backlight                 |
| 3 | Capacitance measurement                                  | 12 | Confirm parameter setting |
| 4 | Power on/off                                             | 13 | Return                    |
| 5 | Increase; select high range or previous group of data    | 14 | Delete saved data         |
| 6 | Decrease; adjust time and resistance; cyclically display | 15 | Upload data               |
| 7 | Decrease, select low range or next group of data         | 16 | Timer resistance test     |
| 8 | Increase; adjust time and resistance; cyclically display | 17 | Compare resistance test   |
| 9 | Read data                                                | 18 | Conduct testing           |

## 9. Button operation

| Button                                                                            | Description                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |
|-----------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|  | Press and hold to switch the power ON/OFF                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |
| IR                                                                                | Short press to switch to insulation resistance testing function.                                                                                                                                                                                                                                                                                                                                                                                                                                              |
| V                                                                                 | AC/DC voltage testing button: Without high voltage output, short press "V" button to switch to AC/DC voltage testing mode. The tester can identify AC/DC voltage automatically                                                                                                                                                                                                                                                                                                                                |
|  | Capacitance measurement button: Without high voltage output, short press "  " to switch to capacitance measurement mode.                                                                                                                                                                                                                                                                     |
| ▲                                                                                 | A. Under insulation resistance measurement or capacitance measurement condition and without testing voltage output, short press ▲ to select high-range voltage output.<br>B. For data reading, press ▲ to select last group of data.<br>C. For time or resistance setting, press ▲ to increase time or resistance.                                                                                                                                                                                            |
| ▼                                                                                 | A. Under insulation resistance measurement or capacitance measurement condition and without testing voltage output, short press ▼ to select low-range voltage output.<br>B. For data reading, press ▼ to select next group of data.<br>C. For time or resistance setting, press ▼ to decrease time or resistance.                                                                                                                                                                                             |
| ◀                                                                                 | A. Under insulation resistance measurement condition and without testing voltage output, press ▶ to progressively decrease at the step of corresponding range (decrease by 50% at a step of 10% each).<br>B. When setting time or resistance, ▶ button is used as a cursor button to adjust time and resistance.<br>C. After polarization index or absorption ratio measurement is completed, press ▶ to cyclically display polarization index or absorption ratio, insulation resistance in Time2 and Time1. |
| ▶                                                                                 | A. Under insulation resistance measurement condition and without testing voltage output, press ▶ to progressively increase at the step of corresponding range (increase by 120% at a step of 10% each).<br>B. For time or resistance setting, ▶ button is used as a cursor button to adjust time and resistance.<br>C. After polarization index or absorption ratio measurement is completed, press ▶ to cyclically display polarization index or absorption ratio, insulation resistance in Time2 and Time1. |
| READ                                                                              | Without high voltage output, short press "READ" to read latest group of saved data, and press ▲ and ▼ to select different data.                                                                                                                                                                                                                                                                                                                                                                               |
| SAVE                                                                              | Short press "SAVE" to save current displayed data. The LCD shows the symbol "FUL" and the number of group "999" to indicate full storage. To save next group of data, please clear the saved data.                                                                                                                                                                                                                                                                                                            |

| Button                                                                            | Description                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
|-----------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|  | Short press this button to turn on/off the backlight.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |
| <b>ENTER</b>                                                                      | For setting parameter in non-testing state, short press "ENTER" to confirm the setting and exit the current setting.                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
| <b>ESC</b>                                                                        | <ul style="list-style-type: none"> <li>To cancel and exit parameter setting without high voltage output, short press "ESC".</li> <li>In "TIME" and "COMP" modes, press "ESC" twice to return to continuous insulation resistance measurement.</li> </ul>                                                                                                                                                                                                                                                                                                                                          |
| <b>CLR</b>                                                                        | <p>Delete Current Data:</p> <ul style="list-style-type: none"> <li>Short press "CLR"</li> <li>Press "ENTER" to confirm deletion, or "ESC" to cancel</li> </ul> <p>Delete All Saved Data:</p> <ul style="list-style-type: none"> <li>Long press "CLR" for 2-3 seconds (the "CLR" and "2Hz" symbols will flash)</li> <li>Press "ENTER" to confirm deletion, or "ESC" to cancel</li> </ul> <p><b>Note:</b> To delete all data, use the long press method directly—don't short press "CLR" first.</p>                                                                                                 |
|  | When connected to the computer software, press and hold this button to upload all stored data to the PC.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |
| <b>TIME</b>                                                                       | <p>The default mode of the tester is continuous insulation resistance measurement mode.</p> <ul style="list-style-type: none"> <li>Under insulation resistance measurement condition and without testing voltage output, perform time setting for insulation resistance measurement mode.</li> <li>Short press "TIME" to cyclically select "Continuous Measurement", "Timer Measurement", "Polarization Index Measurement" and "Absorption Ratio Measurement"</li> <li>Press "ENTER" to confirm the selection</li> <li>Press "ESC" to unselect and return to default measurement mode.</li> </ul> |
| <b>COMP</b>                                                                       | Under insulation resistance measurement condition and without testing voltage output, short press "COMP" to select resistance comparison measurement as insulation resistance measurement mode, the default comparison value is 10MΩ.                                                                                                                                                                                                                                                                                                                                                             |
| <b>TEST</b>                                                                       | <ul style="list-style-type: none"> <li>This button is used to turn on/off insulation resistance measurement or capacitance measurement.</li> <li>Long press "TEST" for more than 2 seconds to start measurement. If current measurement function is enabled, the red warning light illuminates the background of "TEST" button.</li> <li>Short press "TEST" to exit measurement.</li> </ul>                                                                                                                                                                                                       |

## 10. Battery recharge



As a safety mechanism, the interlock engages blocks the input terminals to prevent testing and measurement when the power cable is connected.

- (1) Press power button for more than 2 seconds to turn on the tester. The tester enters default state after full symbols are displayed on LCD for approx. 1 second.
- (2) Recharge the battery if it is low (e.g., one segment).

| Battery power indicator | Battery voltage                            |
|-------------------------|--------------------------------------------|
| No segment              | <13.5V ("2Hz" flashes Power off after 10s) |
| 1 segment               | 13.6~14.3V ("1Hz" flashes)                 |
| 2 segments              | 14.4~15.1V                                 |
| 3 segments              | 15.2~15.9V                                 |
| 4 segments              | >16.0V                                     |

## 12. Insulation resistance measurement



Before Testing

- Wear: High-voltage insulation gloves and protective gear
- Verify: Measured object is completely de-energized
- NEVER: Test live equipment or circuits

During Testing

HIGH VOLTAGE OUTPUT - EXTREME CAUTION

- Ensure secure test lead connections
- Keep hands away from test clips
- DO NOT short-circuit test leads - Risk of shock, fire, equipment damage

For resistance below 1MΩ at the 250V range, the measurement duration cannot exceed 10 seconds and multiple consecutive measurements cannot be performed. For resistance below 2MΩ at the 500V range, below 5MΩ at the 1000V range, below 10MΩ at the 2500V range, and below 20MΩ at the 5000V range, the same limitations apply.

Formula:  $R = \frac{U}{I}$  (Ohm's law)

- R: Measured insulation resistance
- U: Output voltage
- I: Current of measured loop

## 13. Continuous insulation resistance measurement

When powered on, the tester starts in continuous measurement mode at 500V output voltage.

This is the quickest method for basic insulation resistance testing without time constraints.

### 1. Setup

- Connect test leads to measured object
- Press ▲ and ▼ to select voltage range (250V - 5000V)
- Press ◀ and ▶ to fine-tune voltage in 10% steps

### 2. Start Test

- Press “TEST” button

### 3. During Test - LCD Shows:

Battery power indicator, High-voltage warning symbol (flashing), Leakage current, Real-time output voltage, Measured insulation resistance, Analog bar graph, Test duration timer, Storage capacity

### 4. End Test

- Press “TEST” to stop
- Testing indicator light turns off
- Tester automatically discharges (discharge progress displayed)
- LCD maintains current measurement values

## 14. Timer measurement

For when you need to test for a specific duration (e.g., regulatory requirements, standardized procedures).

### Accessing Timer Modes

Press “TIME” button (no high voltage output) to cycle through:

1. Continuous (no timer - default mode)
2. Timer (custom countdown)
3. PI (Polarization Index - 10 min test)
4. DAR (Dielectric Absorption Ratio - 1 min test)

### Setting Up Timer Test

#### 1. Enter Timer Mode

- Press “TIME” until timer symbol appears
- LCD displays: Time1 and timer symbol
- Default time: 05:00 (flashing, ready to edit)

#### 2. Adjust Timer

- Press ◀ and ▶ to select digit to change (cursor function)
- Press ▲ and ▼ to change the selected digit value
- Press “ENTER” to save
- Press “ESC” to cancel

### 3. Start Test

- Press "TEST" button

### 4. During Test - LCD Shows:

Battery level, High-voltage warning symbol, Leakage current, Real-time output voltage, Insulation resistance, Analog bar graph, Time1 label, Countdown timer, Storage capacity.

### 5. Test Completion

- Test stops automatically when timer reaches 00:00
- Indicator light turns off
- Auto-discharge (progress displayed)
- LCD retains final measurement values

## 15. Polarization index (PI) measurement

Compares insulation resistance at 10 minutes vs. 1 minute to assess insulation quality over time.

$$PI = \frac{R_{10min}}{R_{1min}}$$

Test duration: min. 10 minute

|                         |           |       |           |           |
|-------------------------|-----------|-------|-----------|-----------|
| Polarization Index (PI) | ≥4        | 4 - 2 | 2.0 - 1.0 | <1.0      |
| Insulation condition    | Very good | Good  | Poor      | Dangerous |

### 1. Setup

- Press "TIME" button (no high voltage output)
- Select PI mode on LCD
- LCD shows: PI, Time1, Time2, timer symbol
- Default times: Time1 = 1 minute (01:00) - flashing, editable, Time2 = 10 minutes (10:00)
- Adjust if needed using ◀ and ▶ and ▲ and ▼ buttons
- After setting Time1, display automatically switches to Time2
- Press "ENTER" to confirm or "ESC" to cancel

### 2. Start Test

- Press "TEST" button
- LCD displays: battery level, voltage warning, current, output voltage, resistance (Time1 or Time2), analog graph, countdown timer, PI value, storage capacity

### 3. Results

- Test ends automatically after 10 minutes
- Indicator light turns off
- Tester auto-discharges
- Press ◀ and ▶ to cycle through: PI value, Time2 resistance (10 min), Time1 resistance (1 min)



PI testing requires the full 10-minute duration. Tests under 10 minutes are invalid for PI calculation.

## 16. Dielectric absorption ratio (DAR) measurement

Compares insulation resistance at 1 minute vs. 15 seconds to assess insulation quality.

$$DAR = \frac{R_{1min}}{R_{15s}}$$

Test duration: min. 1 minute

Results:

| Dielectric Absorption Ratio (DAR) | >1.4      | 1.25 to 1.0 | <1.0      |
|-----------------------------------|-----------|-------------|-----------|
| Insulation condition              | Very good | Good        | Dangerous |

### 1. Setup

- Press "TIME" button (no high voltage output)
- Select DAR mode on LCD
- Default times: Time1 = 15 seconds, Time2 = 1 minute, adjust if needed.
- Press "ENTER" to confirm or "ESC" to cancel

### 2. Start Test

- Press and hold "TEST" button
- LCD displays: battery level, voltage warning, current, output voltage, resistance, analog graph, countdown timer, DAR value

### 3. Results

- Test ends automatically after 1 minute
- Indicator light turns off
- Tester auto-discharges
- Press ◀ and ▶ to cycle through: DAR value → Time2 resistance → Time1 resistance



Tests under 1 minute are invalid for DAR measurement.

## 17. Comparison measurement

Compare measured insulation resistance against a preset limit value.

### 1. Enter COMP Mode

- Press “COMP” button (no high voltage output)
- LCD displays “COMP”
- Default comparison value: 10M $\Omega$  (flashing at 1Hz)

### 2. Set Comparison Value

- Press ◀ and ▶ to select digit/unit to change
- Press ▲ and ▼ to adjust resistance value and unit
- Press “ENTER” to save settings
- Press “ESC” to cancel

### 3. Perform Test

- Hold “TEST” for 2 seconds
- LCD displays test result:  
“FAIL” = Resistance < comparison value  
“PASS” = Resistance  $\geq$  comparison value

### Exit COMP Mode

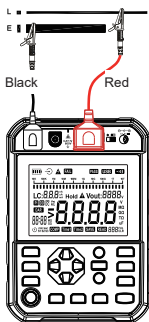
- Option 1: Press “COMP” button while in COMP mode
- Option 2: Press “ESC” twice consecutively

## 18. Voltage measurement



⚠ Risk of famage to tester. Do not measure AC power supply over 750V/AC or DC power supply over 1000V/DC.

⚠ After completing measurements, disconnect the test lead from the circuit and input terminal.



- 1) Connect red test lead with “LINE” input terminal, and black with “EARTH”.
- 2) Connect red and black alligator clips with measured circuit. For DC voltage measurement, if the voltage of red test lead is negative, the negative symbol “-” appears on the LCD.

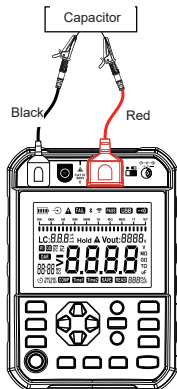
## 19. Capacitance measurement



Before measuring any capacitor:

Verify voltage rating

- Do NOT test if capacitor voltage rating is below tester output voltage
- Failure to comply will damage the capacitor
- Polarized capacitors only (wrong polarity will destroy the capacitor)
- RED lead → Negative (-) terminal
- BLACK lead → Positive (+) terminal
- Reversed polarity will destroy the capacitor



The tester measures circuit capacitance as part of insulation testing.

Setup:

- Ensure no high voltage output
- Press the capacitance measurement button (⌚)
- Default range: 500V

Available voltage ranges: 250V, 500V, 1000V only

Use ▲ and ▼ buttons to switch ranges

- The tester calculates capacitance by measuring the electrical charge (Q) and voltage (U) of the circuit.

$$\text{Calculation formula: } C = \frac{Q}{U}$$

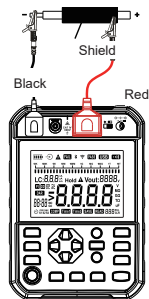
C = Capacitance

Q = Accumulated charge

U = Voltage across the measured object

## 20. Wire connection modes

### 20.1 Cable insulation resistance testing



#### A. Two-Wire Connection

Use for: Basic insulation testing

Setup: Connect red and black leads only

Limitation: Surface leakage current affects measurement, giving lower readings than actual resistance

Best for: Standard testing where highest precision isn't required

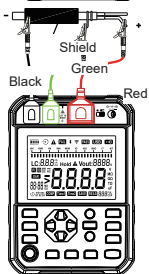


#### B. Three-Wire Connection (High Resistance)

Use for: Accurate high-resistance measurements

Setup:

- Connect red and black leads as normal
  - Wrap bare wire around cable's outer insulation
  - Connect bare wire to GUARD terminal (green lead)
- Advantage: Guard wire diverts surface leakage current away from measurement circuit for improved accuracy



#### C. Three-Wire Connection (Ultra-High Resistance)

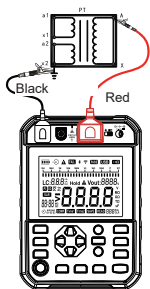
Use for: Ultra-high resistance / multi-cable testing

Setup:

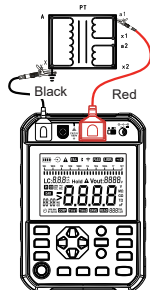
- Same as method B, plus
- Connect GUARD terminal to unused cables

Advantage: Eliminates leakage between cables AND surface leakage, measuring only the insulation resistance of the selected cable to ground

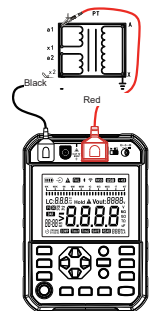
## 20.2 Transformer insulation resistance testing



A. Testing of insulation resistance between primary winding and grounding of secondary winding



B. Testing of insulation resistance between grounding of primary winding and secondary winding



C. Testing of insulation resistance between secondary windings

## 21. Cleaning and maintenance



- Do not use aggressive cleaning agents, rubbing alcohol or other chemical solutions. They damage the housing and can cause the product to malfunction.
- Do not immerse the product in water.



Regularly check the product and test leads for damage.  
Before cleaning:

- Disconnect all circuits and test leads.
  - Switch the power OFF
- Clean the product with a dry, fibre-free cloth.
  - The calibration and maintenance must be performed by qualified professional repair personnel or specified repair department

## 22. Technical specifications

- Error limit:  $\pm (a\% \text{ of reading} + b \text{ digits})$
- Environment temperature:  $23 \pm 5^\circ\text{C}$
- Environment humidity: 45~75%RH  
The humidity must be less than 50%RH when testing insulation objects with a resistance greater than  $50\text{G}\Omega$  in the parameters.
- Temperature coefficient:  
Add an error of  $\pm 0.25\%$  per degree ( $^\circ\text{C}$ ) when testing at temperature of  $>28^\circ\text{C}$  or  $<18^\circ\text{C}$ .

### 22.1 Current

| Measurement accuracy | Display accuracy                       | Range           | Remark                                                                      |
|----------------------|----------------------------------------|-----------------|-----------------------------------------------------------------------------|
| $\pm(10\%+5)$        | 0.01nA<br>0.01 $\mu\text{A}$<br>0.01mA | 0.01nA - 5.00mA | Test stops automatically if current remains at $\geq 1.00\text{mA}$ for 10s |

## 22.2 Insulation Resistance

| Rated voltage                                                                                                                           | Measurement range | Accuracy           |
|-----------------------------------------------------------------------------------------------------------------------------------------|-------------------|--------------------|
| 250V                                                                                                                                    | <0.25MΩ           | For reference only |
|                                                                                                                                         | 0.25MΩ - 4.99GΩ   | ± (5%+5)           |
|                                                                                                                                         | 5.00GΩ - 49.9GΩ   | ± (10%+10)         |
|                                                                                                                                         | 50.0GΩ - 250GΩ    | For reference only |
| 500V                                                                                                                                    | <0.50MΩ           | For reference only |
|                                                                                                                                         | 0.50MΩ - 4.99GΩ   | ± (5%+5)           |
|                                                                                                                                         | 5.00GΩ - 99.9GΩ   | ± (10%+10)         |
|                                                                                                                                         | 100GΩ - 500GΩ     | For reference only |
| 1000V                                                                                                                                   | <1.00MΩ           | For reference only |
|                                                                                                                                         | 1.00MΩ - 9.99GΩ   | ± (5%+5)           |
|                                                                                                                                         | 10.0GΩ - 199GΩ    | ± (10%+10)         |
|                                                                                                                                         | 200GΩ - 1.00TΩ    | For reference only |
| 2500V                                                                                                                                   | <2.50MΩ           | For reference only |
|                                                                                                                                         | 2.50MΩ - 24.9GΩ   | ± (5%+5)           |
|                                                                                                                                         | 25.0GΩ - 499GΩ    | ± (15%+10)         |
|                                                                                                                                         | 500GΩ - 2.50TΩ    | For reference only |
| 5000V                                                                                                                                   | <5.00MΩ           | For reference only |
|                                                                                                                                         | 5.00MΩ - 49.9GΩ   | ± (5%+5)           |
|                                                                                                                                         | 50.0GΩ - 999GΩ    | ± (15%+20)         |
|                                                                                                                                         | 1.00TΩ - 5.00TΩ   | For reference only |
| Over-range indication: >                                                                                                                |                   |                    |
| Short-circuit current: Approx. 5.0mA current with load: 1mA~1.2mA (250V, 0.25MΩ; 500V, 0.5MΩ; 1000V, 1.0MΩ; 2500V, 2.5MΩ; 5000V, 5.0MΩ) |                   |                    |

1 TΩ (Tera ohm) = 1000GΩ = 10<sup>12</sup>Ω

1 GΩ (Giga ohm) = 1000MΩ = 10<sup>9</sup>Ω

1 MΩ (Mega ohm) = 1000KΩ = 10<sup>6</sup>Ω

### Note:

For insulation resistance measurement, if the measured capacitive reactance is greater than about 100nF, it may cause reading to fluctuate significantly.

## 22.3 Output voltage

| Rated voltage | Output accuracy | Display accuracy | Output voltage | Remark                                                                                                         |
|---------------|-----------------|------------------|----------------|----------------------------------------------------------------------------------------------------------------|
| 250V          | +(0%~20%)       | 1V               | 250V - 300V    | Voltage adjustment range with step set at 10%: (50% - 120%)<br>250V cannot step down and 5000V cannot step up. |
| 500V          |                 |                  | 500V - 600V    |                                                                                                                |
| 1000V         |                 |                  | 1000V - 1200V  |                                                                                                                |
| 2500V         |                 |                  | 2500V - 3000V  |                                                                                                                |
| 5000V         |                 |                  | 5000V - 6000V  |                                                                                                                |

## 22.4 Voltage testing

| Voltage measurement | Measurement range | Accuracy | Resolution | Over-range indication | Remark                                               |
|---------------------|-------------------|----------|------------|-----------------------|------------------------------------------------------|
| DC voltage          | 30 - 1000VDC      | ± (3%+5) | 1V         | OL                    | 1. Input impedance: 200MΩ<br>2. Frequency: 50Hz/60Hz |
| AC voltage          | 30 - 750VAC       | ± (3%+5) | 1V         | OL                    |                                                      |

### Note:

"LO" is displayed if the input voltage is less than approx. 25V; the reading flashes if the input voltage is between approx. 750VAC~824VAC or 1000VDC~1099VDC; "OL" is displayed with buzzer making sound and LCD flashing if the input voltage is greater than approx. 1100VDC or approx. 825VAC.

## 22.5 Capacitance testing

| Capacitance measurement | Measurement range | Accuracy  | Over-range indication | Remark                                                                              |
|-------------------------|-------------------|-----------|-----------------------|-------------------------------------------------------------------------------------|
| 250V                    | 0.01uF - 1.00uF   | ± (15%+3) | >1.00uF               | Note the withstand voltage of capacitance shall not be less than the rated voltage. |
| 500V                    | 1.00uF - 15.0uF   |           | >15.0uF               |                                                                                     |
| 1000V                   | 1.00uF - 15.0uF   |           | >15.0uF               |                                                                                     |

### Note:

Rated voltages for capacitance measurement include 250V, 500V, and 1000V. LO is displayed if measured capacitance is 0.01uF; if object with large capacitive reactance is measured when the battery power indicator indicates the battery power is less than "2 segments", the tester may powers off for protection, in such situation, please restart the tester or connect with charger to activate the battery for powering on the tester.

## 22.6 General

|                                              |                                                                                                              |
|----------------------------------------------|--------------------------------------------------------------------------------------------------------------|
| Power supply                                 | Rechargeable lithium battery (14.8V, 5200mAh)                                                                |
| Rated voltage                                | 250V, 500V, 1000V, 2500V, 5000V                                                                              |
| Output voltage accuracy                      | + (0% - 20%)                                                                                                 |
| Continuous insulation resistance measurement | √ (default mode)                                                                                             |
| Polarization index testing                   | √ (automatic display)                                                                                        |
| Absorption ratio testing                     | √ (automatic display)                                                                                        |
| Timing measurement                           | √                                                                                                            |
| Resistance comparison measurement            | √                                                                                                            |
| Voltage testing                              | √ can automatically identify AC/DC voltage                                                                   |
| Capacitance testing                          | √                                                                                                            |
| Current display                              | Current is displayed when measuring insulation resistance.                                                   |
| Voltage stepping                             | √                                                                                                            |
| Live voltage monitoring                      | Monitors voltage on test object and discharge status after testing. Testing is blocked above 36V for safety. |
| High voltage warning                         | The warning symbol flashes if detected voltage exceeds the safety voltage.                                   |
| Timer testing                                | Record testing time automatically. Timing range: 0s 99m and 59s                                              |
| Storage function                             | Store 999 groups of data                                                                                     |
| Communication function                       | Upload testing data to computer via USB cable.                                                               |
| Battery power indication                     | Battery power indication to indicate charging when low battery occurs.                                       |
| Auto power off                               | Power off automatically in 15 minutes of inactivity and without occurrence of high voltage.                  |
| Dimensions                                   | 238 (L) x 166 (W) x 90.5 (D) mm                                                                              |
| Weight                                       | Approx. 1800g (including battery)                                                                            |
| Operating environment                        | 0°C to 35°C; <75%RH                                                                                          |
| Storage environment                          | -20°C to 60°C; <80%RH                                                                                        |
| Altitude                                     | <2000m                                                                                                       |
| Pollution degree                             | 2                                                                                                            |
| CAT rating                                   | CAT IV 600V                                                                                                  |