EAGLOTEST

S431

Diagnostic Insulation Tester

USER MANUAL

CATALOG

CHAPTER 1

Safety Warnings

- Warning! Only suitably trained, certified/licensed, and evaluated persons can operate this equipment.
- Please carefully read all labels and symbols on the front and back panel of the instrument.
- Do not operate this equipment unless users are completely familiar with the user manual and the instrument.
- Before using, make sure that the instrument and accessories are in good condition and there is damage to the insulation.
- In order to protect the instrument, do not use the instrument when it is in humid environments.
- Pay attention to the measurement range and operating environment specified by this instrument
- Do not use the equipment if the back cover is not secured properly.
- Make sure that the connecting plug of the test lead is securely inserted into the terminal.
- Do not test in flammable and hazardous environments.
- Remove the clip of the test leads from the Device Under Test first, then unplug the test leads from the equipment upon the completion of discharge. Do not touch the metal part of the output jack to avoid electric shock.
- Do not use it in a strong electromagnetic environment, so as not to affect the normal operation of the instrument.
- Stop using the instrument immediately if the case or test lead is damaged.

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- Do not use or store the instrument in hazardous environments with high temperatures and humidity or under direct sunlight.
- The instrument automatically shuts down after 15 minutes of inactivity.
- Regularly maintain the instrument. Keep it clean. Do not clean it with abrasive materials or corrosive agents.
- Recharge the battery every 3 months if not using the instrument for a long time.
- If you need to replace the battery, please contact Eaglotest.
- Only authorized personnel can operate, disassemble, calibrate the instrument and conduct periodic maintenance.
- Stop using the instrument immediately in case of any danger will be caused by continuing to use it. Please securely pack the equipment and send it to an authorized organization for disposal.
- Please pay attention to the danger warning“ ”. Du⚠g the operation, users must follow the instructions for safety reasons

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CHAPTER 2

Introduction

The Diagnostic 10KV Insulation Tester S431 is designed for test and maintenance of high-voltage electrical equipment such as motors, transformers, switchboards, and cables.

Features:

- Measuring insulation resistance to 20 TΩ;
- Automatic calculation of Dielectric Absorption (DAR) and Polarization Index (PI)
- Noise filtering/rejection
- DD, SV, and DC/AC Voltage test function
- Capacitance and leakage current test
- Test voltages in 10 V steps from 250 V to 1000 V, and 20V or 30V steps from 2.5KV to 10KV.
- Compact and lightweight with a waterproof design.

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CHAPTER 3

Technical Specification

3.1 Insulation Resistance Measurement Range and Accuracy

Output Voltage	Range	Accuracy
100V（10%）DC	0.01MΩ~5.00GΩ	±3%rdg±5dgt
	5.00GΩ~200GΩ	±15%rdg±5dgt
250V（10%）DC	0.01MΩ~10.0GΩ	±3%rdg±5dgt
	10.0GΩ~500GΩ	±15%rdg±5dgt
500V（10%）DC	0.01MΩ~25.0GΩ	±3%rdg±5dgt
	25.0GΩ~1.00TΩ	±15%rdg±5dgt
1000V（10%）DC	0.01MΩ~50.0GΩ	±3%rdg±5dgt
	50.0GΩ~2.00TΩ	±15%rdg±5dgt
2.5KV（10%）DC	0.01MΩ~100GΩ	±3%rdg±5dgt
	100GΩ~5.00TΩ	±15%rdg±5dgt
5KV（10%）DC	0.01MΩ~200GΩ	±3%rdg±5dgt
	200GΩ~10.0TΩ	±15%rdg±5dgt
10KV（10%）DC	0.01MΩ to 400GΩ	±5%rdg±5dgt
	400GΩ to 20.0TΩ	±20%rdg±5dgt

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CHAPTER 3

3.2 Capacitance and Current Measurement Range and Accuracy

	Range	Accuracy
Current Measurement Range	0.01nA to 20.00mA	1.5%±5dgt
Capacitance Range	0.010uF to 100.0μF	±20%±0.005μF
AC/DC Voltage	0V to 1000V	±2%rdg±5dgt

3.3 General Specification

Functions	Insulation Resistance, Current Value, Capacitance Value, Polarization Index, Dielectric Absorption Ratio, Automatic Discharge, DD, SV, External Voltage Test; Ambient Temperature Display, Filter, Time, Data Retention
Power	DC 14.8 V, 5200mAh rechargeable Li-Battery， approx. 16.8 V in fully charged status
Test Voltage	250V, 500V, 1000V, 2500V, 5000V, 10kV
Voltage Measurement	AC/DC up to 1000V
Short Circuit Current	≥5mA
Connections	L terminal： High Voltage Terminal. Connect one end of the test leads to the L terminal, and the other end should be connected/clamped on to the device under test.

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	G terminal：Guard Terminal, it is used to provide a return path for surface leakage current and minimize its effect on the results.
	E terminal：Earth Terminal, usually connected to the ground or neutral terminal of the measured object.
Time	Max:99min and 99seconds, depending on the test method, adjustable
Resolution	Insulation Resistance：0.01MΩ Test Current：0.01nA
Capacitance test	Range:0.200μF~100.0μF Accurracy:±20%±0.005μF
Step Voltage	100V ~ 1.00kV, 10V Step； 2.50kV~ 10.00kV, 20V and 30V Step
Backlight	Adjustable backlight, high, medium, low brightness
Test Range	Press the button to set
LCD	5.6 bit Color LCD
Test Indication	While testing, an LED light will flash, and the buzzer will sound.
Charging Indication	A red light indicates that charging is in process; a green light indicates that the battery is fully charged.
Over Measurement Range	--OL--
Data Storage	Data is automatically saved upon the completion of the test, up to 1000 sets of data, including the current test data, ambient temperature, date and time and other information.

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Data View	Use the buttons to select Data View option on the main menu, and use the arrows to browse through the data.
Automatic shut-down	Instrument will automatically shut down without operation in 15 minutes.
Standard Test Leads	1 red, 1 green and 1 black test lead with clip.
Battery Voltage	Display the remaining battery in real time. Please charge in a timely manner when the battery is low. No output voltage for testing when the battery is low.
Date	Date is displayed at the top of the screen.
Ambient Temperature	Ambient temperature is displayed at the top of the screen.
Ambient humidity	Ambient humidity is displayed at the top of the screen.
Dimensions	320mm(L) ×240mm (W)×145mm(H)
Weight	Approximately 3.25kg (battery included)
Data Transmission	Computer Software:Download data through the USB port; App: Connect the Bluetooth to export data
Communication Interface	USB port, the saved data can be uploaded to the computer for saving or printing.
Cloud Service	Android APP, Bluetooth connection; upload on-site pictures, upload test data, generate test reports, generate data curves, multiple people view data at the same time, export data (in Excel format)
Computer Software	Export instrument test data, continuously record data, and display test data in rseal time
Communication Lines	USB cable， 1.5m in length

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Working Temperature and Humidity	-10℃ ~ 40℃； no condensations when below 80% RH
Storage Temperature and Humidity	-20℃ ~ 60℃; no condensation when below 70% RH,
Withstand Voltage	AC 5kV 50Hz ,1min between test leads and the housing.
Dielectric Strength	Above 500 MΩ between the test leads and the housing.
EMC	IEC61326(EMC)
Safety Standards	CAT IV 600V

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CHAPTER 4

Structure

1. LINE Terminal
2. LCD
3. GUARD Terminal
4. EARTH Terminal
5. HOLD button
6. ON/OFF
7. Arrows & Enter button
8. Filter
9. Test and Indication Light
10. Return
11. Voltage Level
12. Step Voltage Adjustment
13. Charging Port(DC)
14. USB Port

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CHAPTER 5

Operation

5.1 Basic operation

ON/OFF：

Press the“ ” button to start, and then it will automatically enter the insulation resistance test interface by default. Press the “ ” button to return to the main menu interface, and press the “ ” button again to turn off the instrument. The instrument will also shut down automatically when there has not been any operation in 15 minutes, press the “ ” button to turn it back on.

Main Menu：

Press the“ ” button to return to the main menu, where Insulation Test, Dielectric Discharge Test, Step Voltage Test, Saved Data, System Setting and External Voltage Testing can be selected by pressing the“ ” or“ ” buttons and pressing the“ ” button to confirm. Press the “ ” button to exit and return to the main menu.

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Insulation Resistance Test：

Please connect the test leads first before turning on the instrument, refer to the Set Up for Insulation Resistance Test Section for guidance.

Press the“  ” button to start, and it will automatically enter the insulation resistance testing function by default or it can be selected on the main menu.

Before starting the test, manually select a different voltage range from 100V, 250V, 500V, 1KV, 2.5KV, 5KV and 10KV.

On 100V, 250V, 500V, and 1KV settings press the V+ or V- button to increase or decrease voltage at the increment of 10V.

On 2.5KV, 5KV and 10KV settings, press the V+ or V- button to increase or decrease voltage at the increment of 20V and 30V.

After selecting the voltage, press the “  ” button or“  ” button to set the test time in minutes or seconds, and press the “  ” or“  ” buttons to increase or decrease the test time.

Press and hold the “  ” button to start testing, and press the “  ” button again while testing to stop the test manually, test data will be automatically saved. Upon the completion of the insulation resistance test, the insulation resistance, voltage level, test time, PI, DAR1, and DAR2 will be displayed. (When testing PI, DAR1, and DAR2, please refer to Description and Precautions of Polarization Index (PI) and Dielectric Absorption Ratio (DAR)). The current is displayed during the test in the lower right corner, and the capacitance is displayed after the test.

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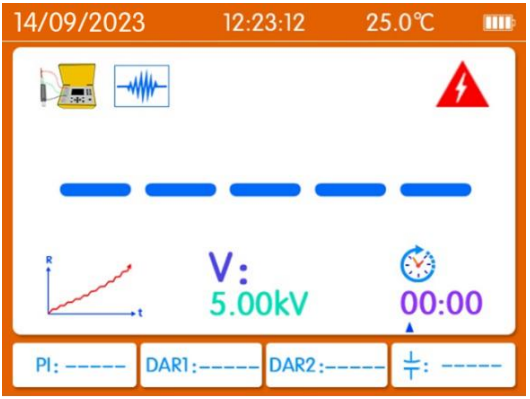
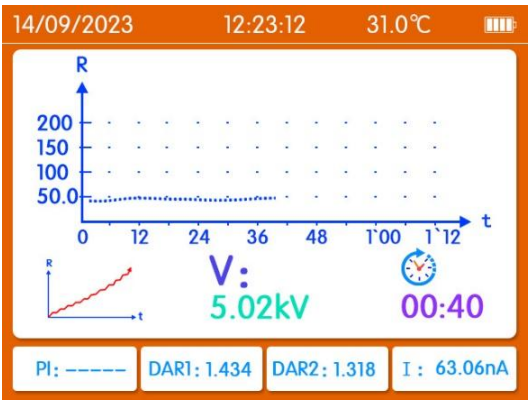


Viewing the trend graph

Press the "◀" key or "▶" key to move the cursor to select it, and press the "▲" key to enter the trend graph interface. Press the "↩" key to return and exit the trend graph interface.

The trend graph interface is as below:



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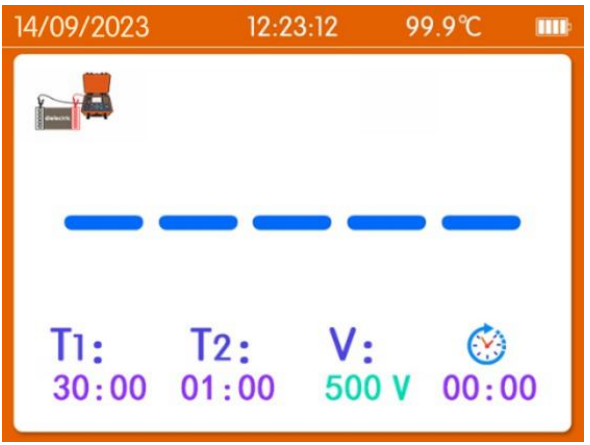
Dielectric Discharge Test (DD)

The dielectric discharge test (DD) mainly measures the insulation performance of the dielectric. It evaluates the tolerance and reliability of the dielectric by observing and measuring the discharge phenomenon in the capacitor.

The default charging time of T1 is 30min and T2 is 1min. Press the "◀" key or "▶" key to move the cursor to select it. Press the "▲" key or "▼" key to increase or decrease the test time by step value of 1. There are four voltage levels: 500V, 1kV, 2.5kV, and 5kV.

The dielectric discharge test interface is as below:



Step Voltage Test(SV)

The step voltage test mainly measures the stability of the insulation.

Test principle: It will get the same reading at any voltage under ideal insulation.

The default step value is 5, and the default time is 5 minutes. Press the "◀" key or

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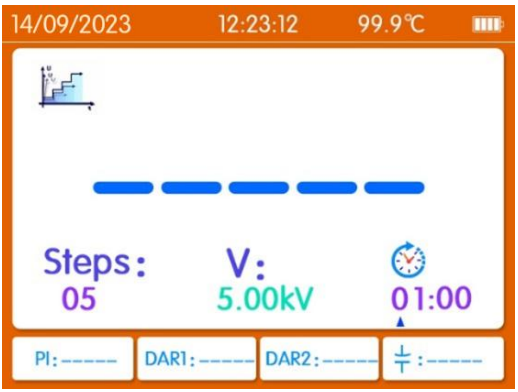
" " key to move the cursor to select it, and press the " " key or " " key to set the step value and time. The step value can be set up to 10. By default, each step will increase the output voltage by 1/5 in the 1/5 of the total time. The step voltage test interface is as below:



External Voltage Test:

The test results can be obtained by connecting the external voltage tester. The external voltage test interface is as below:

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Data View：

While the instrument is on, press the “ ” button to return to the main menu, and then press the “ ” button to enter the Data View interface. Press the “ ” or the “ ” button to browse data at the step value of 10. And press the “ ” or the “ ” button to browse data at the step value of 1.

Press the " " key to view the resistance value at 15s, 30s, 1min, and 10min time points.

System settings：

Press the “ ” button in the main menu to enter the system settings, below are functions for your selection: Language, brightness setting, time setting, delete, version, and data storage.

Language：

Press the “ ” button to switch to English or Chinese.

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Brightness Setting：

Press the “ ” button to choose high, medium, or low brightness.

Time Setting：

Press the “ ” button to enter the time setting screen, press“ the” or“ ” button to move the cursor, press the“ ” or“ button to change the value, and press the “ ” button to confirm.

Delete Data：

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On the system setting screen, press the “  ” or“  ” button to select the delete function, press the “  ” button to select delete data, and press the“  ” or“  ” button to select YES or NO. Use the “  ” button to confirm.

Note: Data cannot be recovered after deletion, please operate with caution.

Data Storage：

When finishing the test or stopping the test, the measured data will be automatically saved, up to 1000 sets of results. If it exceeds 1000 sets, it will begin to overwrite the previously stored data.

Data Hold：

During the insulation resistance test, press the “ 

” button to hold the current test data on the screen. Please be aware there are still voltage outputs, do not touch the circuit under test. Press the“ 

” button again, and it will continue to show data in real time.

Data software：

Connect one end of the USB cable to the instrument and the other end to a computer. Open the data software to view the data. The history data can also be viewed, saved or printed.

Filter：

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Press the“  ” button to select filter time of 10S, 20S, 30S or 40S, adjustable filter time is also available. It can filter interference signals to improve the stability of the test process and effectively improve the accuracy of the test result

5.2 Insulation resistance test

Warning	Warning! Only suitably trained, certified/ licensed, and evaluated persons can operate this equipment. The operator must strictly abide by the safety rules, otherwise, there is a danger of electric shock, personal injury, or equipment damage. It is necessary to wear high voltage insulating gloves for operation.
	Conduct insulation test in a DE-energized circuit. Before testing, please check whether the insulation of the test leads is in good condition and the object under test is energized. Energized circuits may cause damage to the instrument and affect measurement accuracy.
	Before testing, firstly connect the test leads to the instrument, and then connect the test leads clip to the circuit under test.
	Press and hold the“  ”button to start measuring the insulation resistance. High voltage will be generated from the instrument through the test leads and to the object under test. During the test, **do not touch** the test lead or the object to avoid electric shock.
	Do not touch the circuit immediately after the test. The stored

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	charges may cause an electric shock.
	Please connect the ground lead (black) to the grounding of the tested object
	Upon the completion of the test, **do not remove** the test lead immediately. Do not touch the circuit until discharging completes.
	Do not tangle the test leads together during the test to ensure the measurement accuracy.
	Do not touch the instrument casing during the test to ensure the measurement accuracy.

5.2.1 Principle of Insulation Resistance Testing

Insulation resistance measurement applies a voltage generator to generate voltage(V), and then voltage is applied to both ends of the resistance. Measuring the current (I) flowing across the resistance, the resistance(R) can be calculated according to the formula R=V/I. As shown below:

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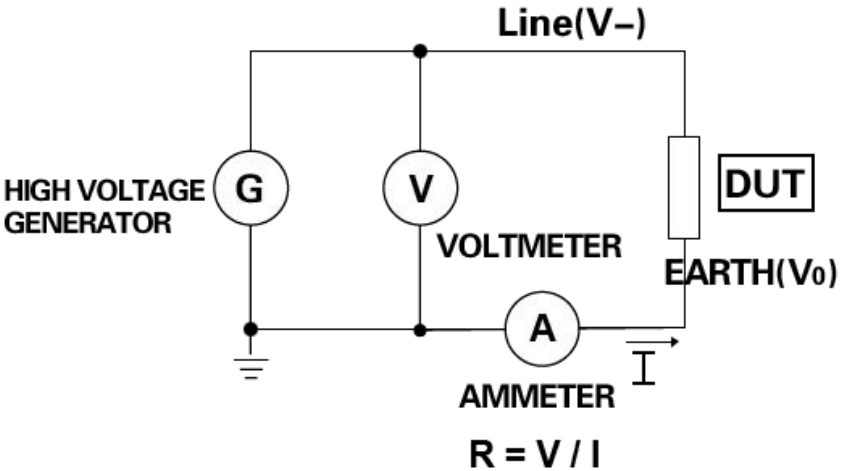

5.2.2 Connections

Note： Conduct insulation resistance test on DE-energized circuits. Before testing, please check whether the insulation of the test leads is in good condition and whether the object under test is energized. Connect each end of the object under test to the ground through a discharge rod, and the wiring can only be done after completing the safety certificate!

Before the test, connect the test leads to the instrument first, and then to the object being tested. Press the "⏻" button to start.

After finishing the test and the discharge, press the "⏻" button to shut down.

Remove the test lead clip from the object being tested, and then unplug the test Leads

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from the instrument.

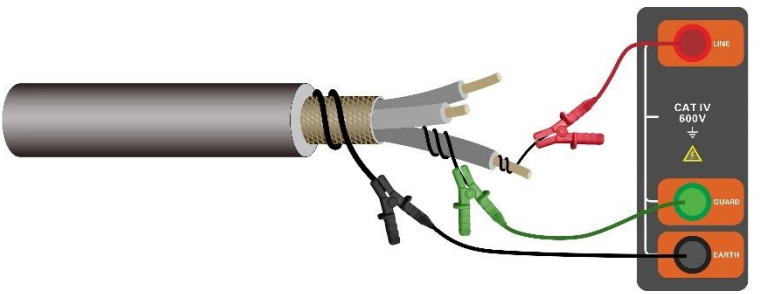
Wiring Method

To set up the test leads for insulation test, connect the red test lead to the Device Under Test or Circuit Under Test, then insert the red lead into the red LINE terminal of the instrument. Clamp the black test lead onto the grounding of the DUT or CUT and insert the black test lead into the black EARTH terminal of the instrument. Connect the green test lead to the Guard Ring to eliminate the influence of surface current leakage on the circuit under tes

Test the Insulation of Cables

●**Measure the insulation of the wire core to the insulation layer**

Clamp the red test lead (LINE Terminal) to the cable core, the black test lead (EARTH Terminal) to the cable shielding layer and the green test lead (GUARD Terminal) to the outer insulation layer where the wire core directly contacts. Connect the wiring as shown in the figure below, and then operate the instrument to start the test.



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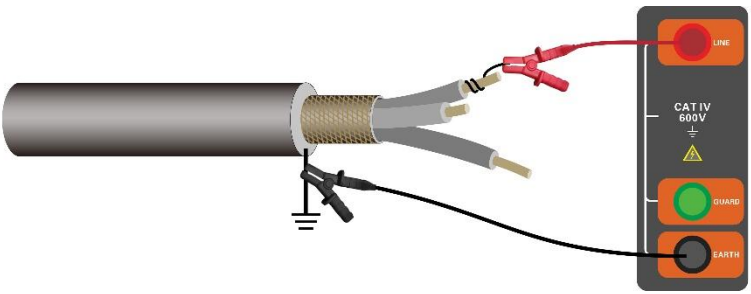
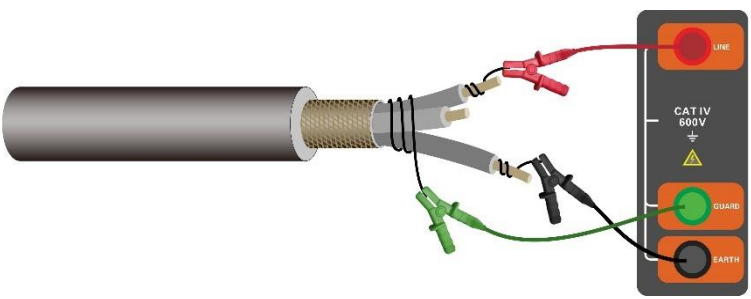
- **Measure the insulation of the cable to the ground:**

Clamp the red test wire lead (LINE Terminal) to the cable core, and the black test lead (EARTH end) to the ground wire. Connect the wiring as shown in the figure below, and then operate the instrument to start the test.



- **Measure the insulation between the core wires**

Clamp the red test lead (LINE Terminal) to one cable core, the black test lead (EARTH Terminal) to the other cable core, and the green test lead (GUARD Terminal) to the outer insulating layer of the three wire cores. Connect the wiring as shown in the figure below, and then operate the instrument to start the test.



Test the insulation of the motor

- **Test the insulation between each winding of the motor and the housing**

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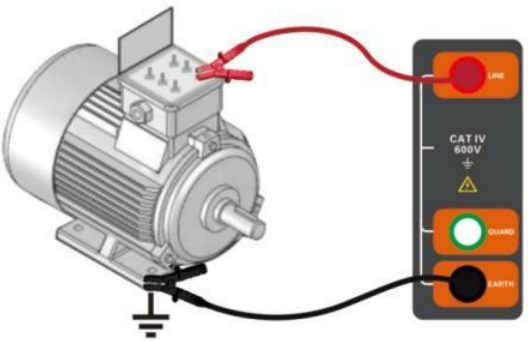
Clamp the red test lead (LINE Terminal) to the terminal of the motor winding, and the black test lead (EARTH Terminal) to the grounding wire of the motor housing. The wiring is as follows:



- **Test the insulation between each winding of the motor**

Clamp the red test lead (LINE Terminal) to the terminal of one phase of the motor winding, and the black test lead (EARTH Terminal) to the terminal of the other phase of the motor winding. The wiring is as follows:

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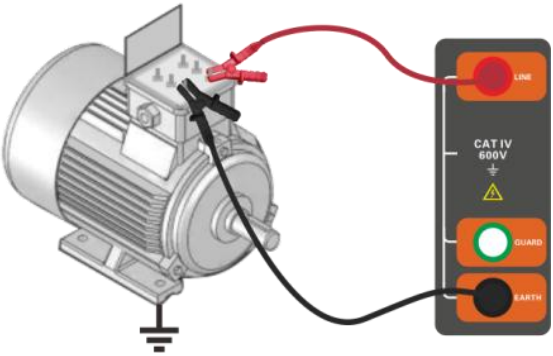
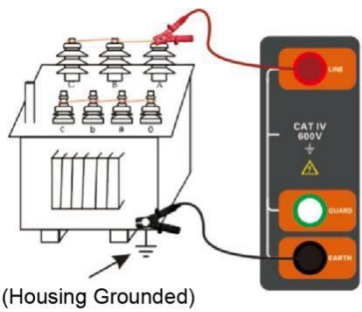


When testing the insulation resistance of a transformer, there are several test methods

- **Test the insulation of the high-voltage end of the transformer to the ground**

Clamp the red test lead (LINE Terminal) to the high-voltage end of the transformer, and the black test lead (EARTH Terminal) to the ground end of the transformer. The wiring is as follows:



- **Test the insulation of the low-voltage end of the transformer to the ground**

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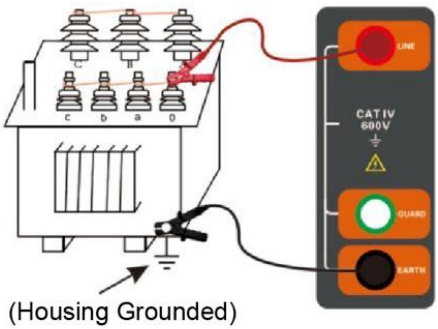
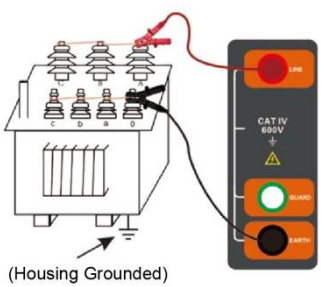
Clamp the red test lead (LINE Terminal) to the low-voltage end of the transformer, and the black test lead (EARTH Terminal) to the ground end of the transformer. The wiring is as follows:



Test the insulation resistance between the high-voltage end and the low-voltage end of the transformer: Clamp the red test lead (LINE Terminal) to the high-voltage end of the transformer, and the black test lead (EARTH Terminal) to the low-voltage end of the transformer. The wiring is as follows:



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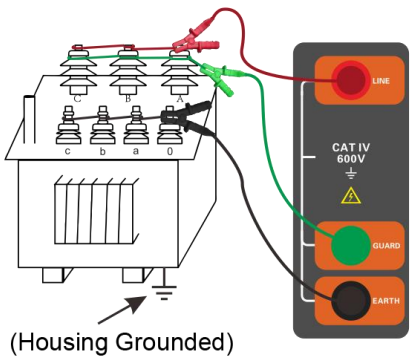
The using method of the green test lead (GUARD Terminal) of insulation tester: Use a bare copper wire to wrap a few turns on the porcelain bushing of each transformer, and clamp the bare copper with the green test lead (GUARD Terminal), which can shield interference signals during measurement. The wiring is as follows:



The Using Method of GUARD Terminal

When measuring the insulation resistance of the cable, clamp the red test lead (Line Terminal) to the core wire, the green test lead (Guard Terminal) to the protective wire of the cable insulation layer, and the black test lead (Earth Terminal) to the shielding. When the relative humidity of the air is more than 80%, or the output voltage of the

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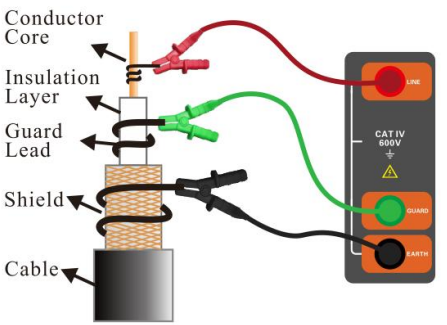
instrument is greater than or equal to 2500 V, and the resistance is higher than 20GΩ, shield the high-voltage electrode conductor exposed to the air, and clamp the green test lead clip to the device under test to collect leakage current and avoid the impact of air ionization. Wiring as shown below:

Note: When wiring, it is strictly forbidden to short-circuit the red LINE terminal and the green GUARD terminal for a long time to avoid overloading.



5.2.3 Wiring Method for External Voltage Test

Note: When testing the ground voltage, please be careful not to get electric shock or cause other equipment to trip due to leakage. The voltage measurement of the instrument is similar to a multimeter, testing both AC and DC voltages. However, the input AC/DC voltage can not exceed 1000V.

Insert the green test lead into the V red port and the black test lead into the V black port of the meter.

Clamp the green test wire to the object under test, and the black test wire to the

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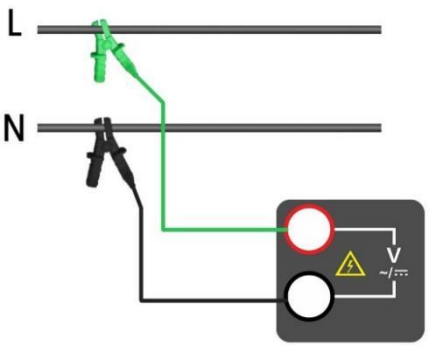
grounding system of the object under test. If it is a household cable, clamp the green test wire to the live wire and the black test wire to the neutral wire.

The meter will automatically measure the voltage and display the voltage value. If it is DC voltage, the LCD displays the "⎓ " mark; If it is AC voltage, the LCD displays the "~" mark; If the test object has no voltage, it displays 0V.

Wiring Graph as below:



5.3 Insulation resistance measurement

warning	**During the test, it is strictly forbidden to touch the exposed metal part of the test lead to avoid the danger of electric shock!**
	Do not touch the circuit or remove the test leads immediately after testing until the discharge finishes. Stored charge may cause electric shock.

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5.3.1 Measurement and Operation

After connecting the wires according to the above methods, press the Power On“  ” button.

Select the required test voltage level and set the test time.

Press and hold the “  ” button, and the red LINE terminal of the instrument will then begin to output the corresponding test voltage. LCD Displays high voltage warning symbol “  ” with flashing, actual output voltage value, and the test current value. Every 2 seconds, there is an audible alarm sound. The measurement time will begin counting from zero to the set value.

When the testing time has reached the set value or the “  ” button is pressed again, the instrument will stop the testing accompanied by two "beeping" sounds.

LCD screen will display the current test results and automatically saves it.

After the measurement, the instrument automatically saves the tested results and discharges the residual high voltage on the device under test.

Once the discharge completes, the“  ” high voltage warning symbol disappears.

Press and hold the “  ” button to conduct the next test.

5.3.2 Polarization Index (PI) and Dielectric Absorption Ratio (DAR)

The function of PI and DAR:

The polarization index (PI) and absorption ratio (DAR) are parameters to identify the condition change of the insulation over time. The instrument automatically calculates the polarization index PI and the absorption ratio DAR after measurement. Both the PI and DAR indicate the extent of the insulation resistance change of the measured object within a period after the external voltage is applied.

The differences between PI and DAR:

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For the general insulation tests, such as the tests of the case or tool handle, it can determine whether the leakage current increases significantly with the increase of applied voltage in a short time. DAR measurement is used to assess the absorption ratio over a short period (see formula below). For objects with large capacitance and high insulation resistance, the DAR is not sufficient to accurately reflect the entire absorption process. These objects include power transformers, generators, cables, capacitors, etc. The PI measurement requires longer test duration, but more accurately reflects the insulation health condition.

The value of PI and DAR can be calculated by the following formula:

$$PI = \frac{R_{600s}}{R_{60s}}$$

$$DAR_1 = \frac{R_{60s}}{R_{15s}}$$

$$DAR_2 = \frac{R_{60s}}{R_{30s}}$$

Note

R10Min= Resistance value at 10 minutes

R1Min=R60Sec= Resistance value at 1 minute

R30Sec= Resistance value at 30 seconds

R15Sec= Resistance value at 15 seconds

The calculation of DAR can be based on either 15 seconds or 30 seconds

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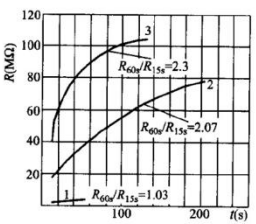
Application of PI and DAR

Insulation resistance and dielectric absorption ratio (or polarization index) can reflect the degree of moisture ingress of the power apparatus such as generators and oil-immersed power transformers. If the value of the absorption ratio (or polarization index) decreases with time (as shown in Fig. 1), it can be an indication of moisture ingress.

It should be pointed out that the dielectric absorption ratio or the polarization index cannot identify localized defects other than moisture ingress and contamination. Even in some cases, obvious insulation defects such as insulation breakdown exist, and the PI and DAR values may still be acceptable. But in reality, the insulation may already be insufficient to provide the protection as intended. Therefore, the PI/DAR and insulation resistance values shall be evaluated together for insulation condition assessment.



1-before dry 15°C；2-after dry 73.5°C；3-after running 72h;cool down to 27°C

Polarization Index Reference Value：

PI	Above 4	4 ~ 2	2.0 ~ 1.0	Below 1.0
	Excellent	Good	Questionabl	Dangerous

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			e	

Dielectric Absorption Ratio Reference Value:

DAR	Above 1.4	1.25 ~ 1.0	Below 1.0
	Excellent	Good	Poor

Viewing PI and DAR：

Upon the completion of the insulation resistance measurement, the instrument will automatically convert polarization index (PI) and dielectric absorption ratio (DAR) values. If it meets the measurement conditions (refer to the reminder below), the LCD screen will automatically display the measurement results after the test.

Reminder:

PI stands for Polarization Index;

DAR1 stands for Dielectric Absorption Ratio (R_{60s} / R_{15s});

DAR2 stands for Dielectric Absorption Ratio (R_{60s} / R_{30s});

To obtain the PI value, the test duration must be longer than 10 minutes; To obtain the DAR value, the test duration must be longer than 1 minute;

If the resistance exceeds the measurement range, the screen will display "OL"

If the PI or DAR value is more than 9999, the screen will display "OL".

5.3.3 Current and Capacitance

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Current Value：

The DC current value is displayed in real-time through the LCD screen during the measurement process.

Capacitance：

After the completion of the insulation resistance measurement, the instrument will automatically calculate the capacitance value and display the result on the LCD screen.

5.4 Dielectric Discharge Test (DD)

The device under test must be charged for a long time.

T1: the time for charging

T2: the time for discharging

Conduct discharge test for the device once the charging is completed. After the test is completed, the instrument calculates and analyzes the test current, test capacitance and voltage values to give a parameter representing the insulation quality.

$$DD = \frac{I1\min}{V \times C}$$

The DD value for qualified insulation is 0, while good multi-layer insulation can have a DD value of 2. The following table is the standard recommended value for DD test results

Insulation Performance	DD
Damage	>7
Bad	4-7

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Questionable	2-4
Good	<2
Qualified	0

5.5 Step Voltage Test (SV)

The SV test is a controlled overvoltage test that can be applied to the stator and rotor windings of synchronous and asynchronous AC motors as well as the armature and field windings of DC motors. It is recommended that a PI test be performed prior to the SV test to determine if the insulation is suitable for overvoltage testing. If the PI test confirms that the windings are suitable for overvoltage testing, the windings must first be discharged prior to the overvoltage test.

5.6 Online Upgrade

When necessary, after connecting the meter to the computer with a data cable, update the firmware of the meter through the special desktop upgrade software provided by Eaglotest.

The operation steps are shown as follows:

Make sure the instrument is normal, the battery power is more than 30%, the data cable is intact, and the computer is installed with the required serial port driver.

Turn off the meter and use the data cable to connect it firmly to the computer.

Open the special upgrade software, select ARM to upgrade, and then open the firmware to be upgraded.

Press the power button of the meter to start upgrading the firmware. After the completion of upgrade, the meter will automatically turn on.

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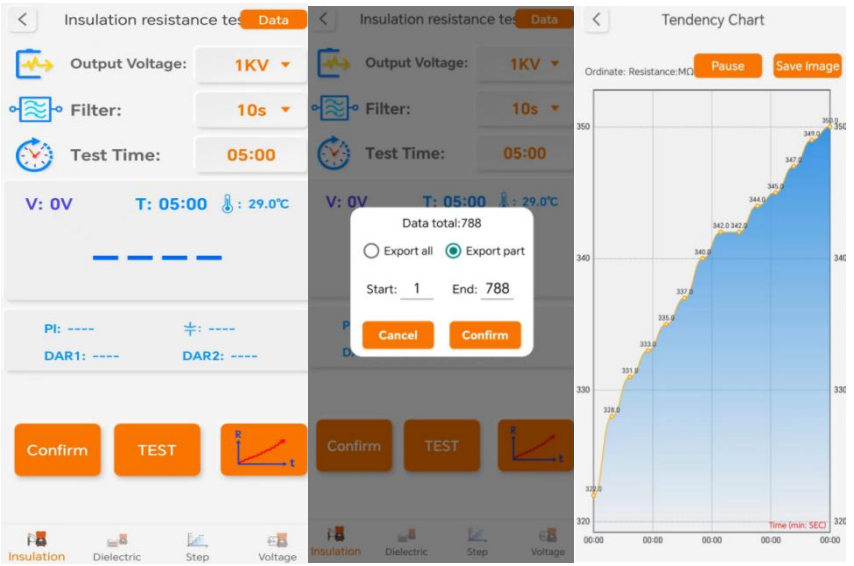
App

Application: Bluetooth connection, upload on-site pictures and test data, generate test reports and graph, and export data.

6.1 App Interface

The insulation resistance test interface and the corresponding trend chart are as follows:



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The data report is shown in the figure below. The icon in the upper right corner can be used to share and export data.

Create Report

Num	Mode	V	R	PI	DAR1	DAR2	C	TIME	R15s
616	R	10.12 kV	1.07 TΩ	0.00	0.00	0.00	0.000 uF	0:15	1.06 TΩ
617	R	10.12 kV	----	0.00	0.00	0.00	0.000 uF	0:3	----
618	R	10.13 kV	3.58 GΩ	0.00	144.9	1.459	2.01 uF	3:45	8.97 MΩ
619	R	5.97 kV	2.65 MΩ	0.00	0.00	0.00	2.29 uF	0:4	----
620	R	10.13 kV	2.89 GΩ	0.00	237.6	2.048	2.01 uF	1:56	8.88 MΩ
621	DD	1.05 kV	492 MΩ				2.17 uF	0:26	
622	DD	519 V	675 MΩ				2.19 uF	0:26	
623	DD	519 V	670 MΩ				2.20 uF	0:26	
624	DD	10.13 kV	12.5 MΩ				1.97 uF	0:26	
625	SV	5.04 kV	3.29 GΩ	0.00	0.737	2.560	2.04 uF	3:0	545 MΩ
626	SV	2.56 kV	917 MΩ	0.00	0.598	0.446	2.09 uF	2:0	526 MΩ

The interfaces of dielectric discharge test, step voltage test, and external voltage test are as shown below:

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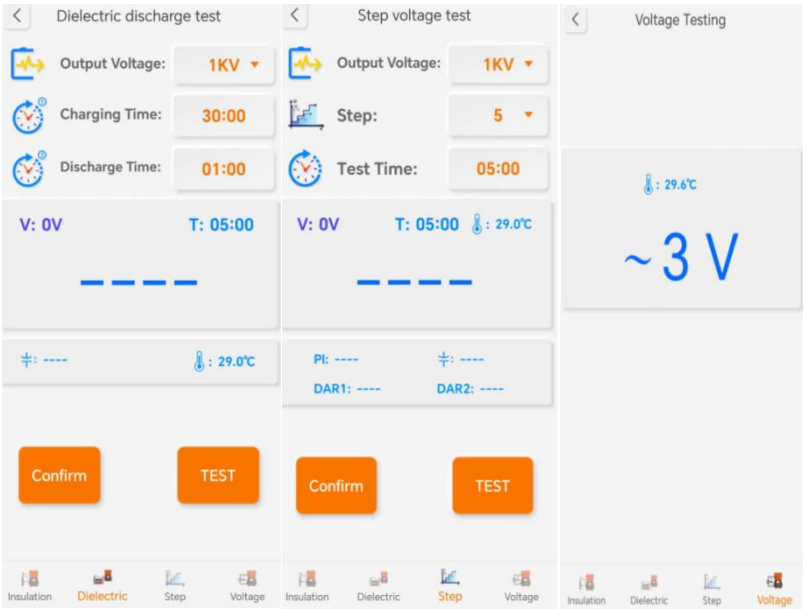

6.2 Data Export

Click the icon in the upper right corner of insulation resistance test interface to export the data in Excel table. The data of different test modes are classified in different sub-tables.

Insulation resistance test table includes the following information:

Test Mode, Test Voltage, Test Resistance, Absorption Ratio, Polarization Index 1, Polarization Index 2, Capacitance, Measurement Time, R15s Resistance, R30s Resistance, R1min Resistance, R10min Resistance, Date, Temperature, Humidity.

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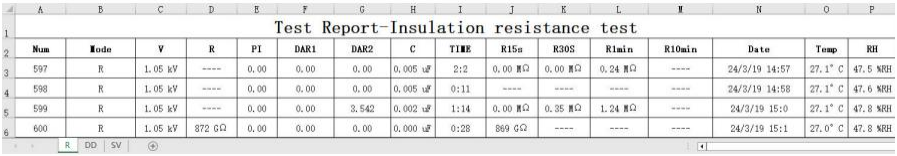
As shown below:



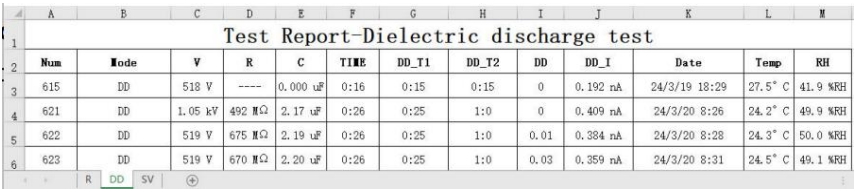
Test Report-Insulation resistance test

Num	Mode	V	R	PI	DAR1	DAR2	C	TIME	R15s	R30S	R1min	R10min	Date	Temp	RH
597	R	1.05 kV	----	0.00	0.00	0.00	0.005 uF	2:2	0.00 MΩ	0.00 MΩ	0.24 MΩ	----	24/3/19 14:57	27.1° C	47.5 %RH
598	R	1.05 kV	----	0.00	0.00	0.00	0.005 uF	0:11	----	----	----	----	24/3/19 14:58	27.1° C	47.6 %RH
599	R	1.05 kV	----	0.00	0.00	3.542	0.002 uF	1:14	0.00 MΩ	0.25 MΩ	1.24 MΩ	----	24/3/19 15:0	27.1° C	47.8 %RH
600	R	1.05 kV	872 GΩ	0.00	0.00	0.00	0.000 uF	0:28	869 GΩ	----	----	----	24/3/19 15:1	27.0° C	47.8 %RH

The dielectric discharge test table include the following information:

Test Mode, Test Voltage, Test Resistance, Capacitance, Measurement Time, DD Charging Time, DD Discharge Time, DD Value, DD Discharge Current, Date, Temperature, Humidity.

As shown below:



Test Report-Dielectric discharge test

Num	Mode	V	R	C	TIME	DD_T1	DD_T2	DD	DD_I	Date	Temp	RH
615	DD	518 V	----	0.000 uF	0:16	0:15	0:15	0	0.192 nA	24/3/19 18:29	27.5° C	41.9 %RH
621	DD	1.05 kV	492 MΩ	2.17 uF	0:26	0:25	1:0	0	0.409 nA	24/3/20 8:26	24.2° C	49.9 %RH
622	DD	519 V	675 MΩ	2.19 uF	0:26	0:25	1:0	0.01	0.384 nA	24/3/20 8:28	24.3° C	50.0 %RH
623	DD	519 V	670 MΩ	2.20 uF	0:26	0:25	1:0	0.03	0.359 nA	24/3/20 8:31	24.5° C	49.1 %RH

The step voltage test table includes the following information:

Test Mode, Test Voltage, Test Resistance, Absorption Ratio, Polarization Index 1, Polarization Index 2, Capacitance, Measurement Time, R15s Resistance, R30s Resistance, R1min Resistance, R10min Resistance, Date, Temperature, Humidity, Step Length, Test Voltage and Test Resistance for each step.

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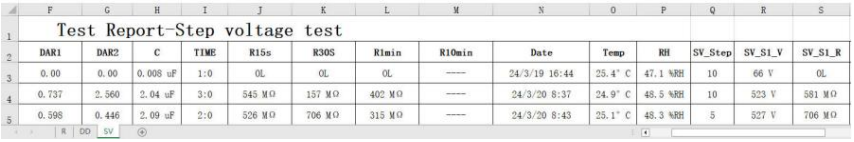
As shown below:



	F	G	H	I	J	K	L	M	N	O	P	Q	R	S
1	Test Report-Step voltage test													
2	DAR1	DAR2	C	TIME	R15s	R30S	R1min	R10min	Date	Temp	RH	SV_Step	SV_S1_V	SV_S1_R
3	0.00	0.00	0.008 uF	1:0	OL	OL	OL	----	24/3/19 16:44	25.4° C	47.1 %RH	10	66 V	OL
4	0.737	2.560	2.04 uF	3:0	545 MΩ	157 MΩ	402 MΩ	----	24/3/20 8:37	24.9° C	48.5 %RH	10	523 V	581 MΩ
5	0.598	0.446	2.09 uF	2:0	526 MΩ	706 MΩ	315 MΩ	----	24/3/20 8:43	25.1° C	48.3 %RH	5	527 V	706 MΩ

R | DD | SV

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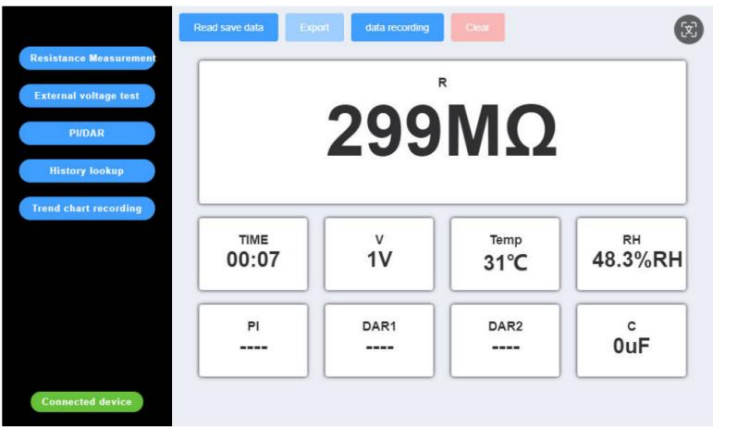
Computer Software

Export instrument test data, record test data per second, and display test resistance trend chart in real time.

Insulation resistance test interface:



Continuous data recording:

Click "Real-time data recording", select the number of seconds to record, and click "Confirm". The operation is as shown in the figure below.

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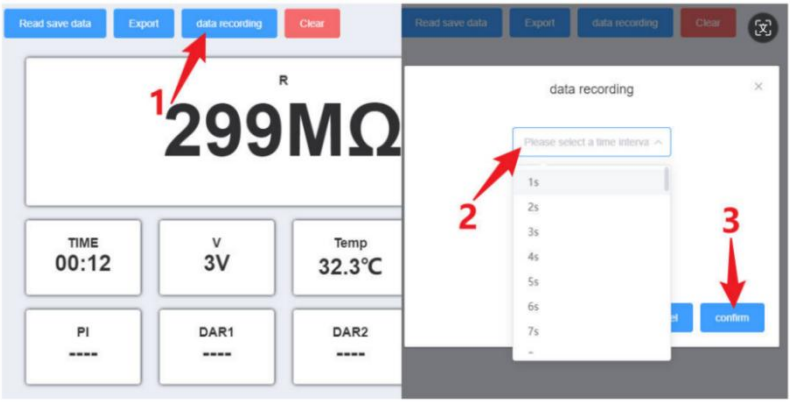
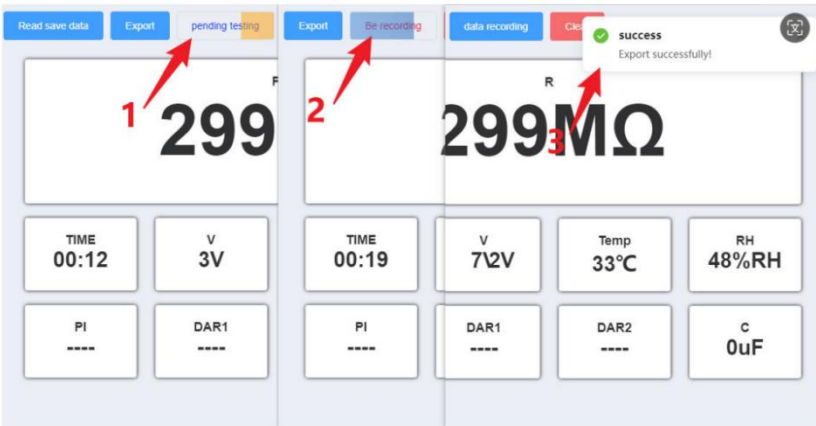


When choosing the Real-time data recording function, it will indicate waiting for test, prompting you to press the test button. When the test starts, it will indicate recording". After the test is completed, it will return to the original text, and there will be a pop-up prompt "success" to indicate data is recorded. The steps are shown in the figure below.



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S431
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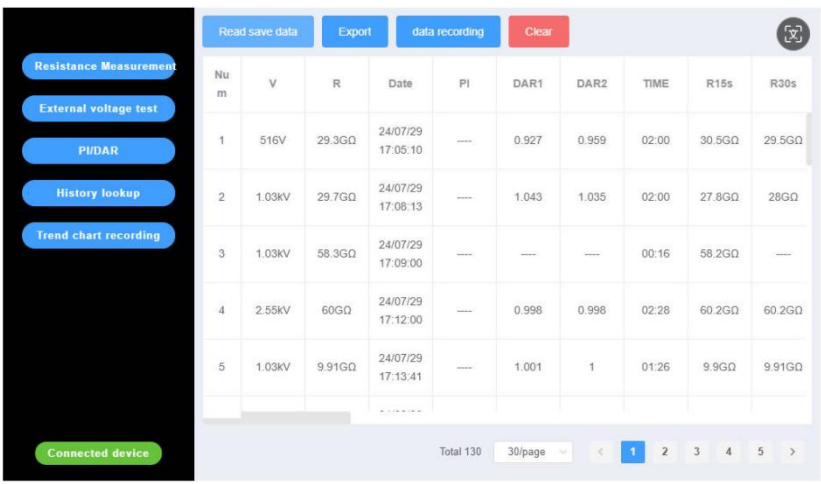
CHAPTER 7

Open the log file:

A	B	C	D	E	F	G	H	I	J	K	L	M	N
Num	V	I	R	PI	DAR1	DAR2	C	TIME	R15S	R30S	R1min	R10min	Temp
1	0V	0nA	----	----	----	----	0uF	00:02	299MΩ	299MΩ	299MΩ		33℃
2	5879V	0nA	----	----	----	----	0uF	00:03	299MΩ	299MΩ	299MΩ		32.9℃
3	5006V	0nA	----	----	----	----	0uF	00:04	299MΩ	299MΩ	299MΩ		32.9℃
4	5015V	0nA	----	----	----	----	0uF	00:05	299MΩ	299MΩ	299MΩ		32.9℃
5	5012V	0nA	----	----	----	----	0uF	00:06	299MΩ	299MΩ	299MΩ		33℃
6	5018V	0nA	----	----	----	----	0uF	00:07	299MΩ	299MΩ	299MΩ		32.9℃
7	5012V	0nA	----	----	----	----	0uF	00:08	299MΩ	299MΩ	299MΩ		32.9℃
8	5009V	0nA	----	----	----	----	0uF	00:09	299MΩ	299MΩ	299MΩ		33℃
9	4999V	16.72uA	298MΩ	----	----	----	0uF	00:10	299MΩ	299MΩ	299MΩ		33℃
10	5002V	16.73uA	299MΩ	----	----	----	0uF	00:11	299MΩ	299MΩ	299MΩ		33℃
11	5009V	16.73uA	299MΩ	----	----	----	0uF	00:12	299MΩ	299MΩ	299MΩ		33℃
12	5012V	16.73uA	299MΩ	----	----	----	0uF	00:13	299MΩ	299MΩ	299MΩ		33℃
13	5009V	16.73uA	299MΩ	----	----	----	0uF	00:14	299MΩ	299MΩ	299MΩ		32.9℃
14	5021V	16.73uA	299MΩ	----	----	----	0uF	00:15	299MΩ	299MΩ	299MΩ		33℃
15	5009V	16.73uA	299MΩ	----	----	----	0uF	00:16	299MΩ	299MΩ	299MΩ		33℃
16	5015V	16.73uA	299MΩ	----	----	----	0uF	00:17	299MΩ	299MΩ	299MΩ		32.9℃
17	5002V	16.73uA	299MΩ	----	----	----	0uF	00:18	299MΩ	299MΩ	299MΩ		32.9℃
18	5015V	16.73uA	299MΩ	----	----	----	0uF	00:19	299MΩ	299MΩ	299MΩ		33℃
19	5006V	16.73uA	299MΩ	----	----	----	0uF	00:20	299MΩ	299MΩ	299MΩ		33℃
20	5015V	16.73uA	299MΩ	----	----	----	0uF	00:21	299MΩ	299MΩ	299MΩ		33℃
21	5005V	16.73uA	299MΩ	----	----	----	0uF	00:22	299MΩ	299MΩ	299MΩ		33℃
22	5008V	16.73uA	299MΩ	----	----	----	0uF	00:23	299MΩ	299MΩ	299MΩ		33℃
23	5008V	16.73uA	299MΩ	----	----	----	0uF	00:24	299MΩ	299MΩ	299MΩ		33℃

Instrument storage data interface:



When the progress bar indicate successfully load, click "Save Data" button to export

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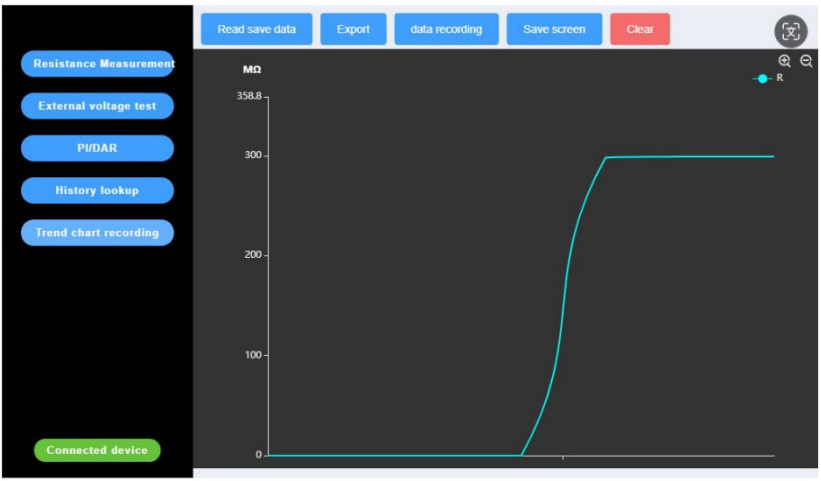
the data in EXCEL, which contains 3 sub-tables.

Trend chart interface:



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CHAPTER 8

Battery Management

	**If the instrument is not used for a long time, charge the battery every 3 months.**
	When the battery voltage is too low, please charge it in time.
	Use the standard charger to charge.

- The red light indicates charging, green indicates charging is complete.
- The symbol“ 0% ” Indicates that the battery level is low, and the instrument will automatically shut down soon. Use the charger to charge as soon as possible to maintain the battery. If the battery over-discharges, it may cause permanent damage to the battery
- Press the “ ⏻ ” button to check whether the instrument can be turned on normally. If it still cannot be turned on normally (excluding the situations of dead battery), please contact the manufacturer.
- If batteries need to be replaced, please contact the Eaglotest.

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CHAPTER 9

Packing Lis

Instrument	1
Tool bag	1
High voltage test rod(3m)	1
Test Leads with Clip (3m)	Red, Green and Black (1 each)
Charger	1 (16.8V/1A)
USB Cable	1
Manual, Warranty, and Quality Certificate	1

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CHAPTER 9

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