EAGLOTEST

S430

5KV INSULATION TEST SET



CATALOG

Safety Warnings **4**

Introduction **6**

Technical Specification **7**

3.1 Insulation Resistance Measurement Range and Accuracy **7**

3.2 Capacitance and Current Measurement Range and Accuracy **7**

3.3 General Specification **8**

Structure **11**

Operation **12**

5.1 Basic operation **12**

5.1.1 ON/OFF **12**

5.1.2 Main Menu **12**

5.1.3 Insulation Resistance Test **13**

5.1.4 Viewing the Trend Graph **15**

5.1.5 Ramp Voltage Test **15**

5.1.6 Dielectric Discharge Test (DD) **16**

5.1.7 Step Voltage Test(SV) **17**

5.1.8 External Voltage Test 19

5.1.9 Data View 19

5.1.10 System Settings 20

5.2 Insulation Resistance Test 22

5.2.1 Principle of Insulation Resistance Testing 23

5.2.2 Insulation Resistance Measurement Connections 24

5.2.2.1 Test Lead Connection Description 25

5.2.2.2 Cable Insulation Test 25

5.2.2.3 Motor Insulation Test 27

5.2.2.4 Transformer Insulation Test 28

5.2.3 Test Lead Connection Description 30

5.3 Insulation Resistance Measurement 32

5.3.1 Measurement and Operation 32

5.3.2 PI and DAR 33

5.3.3 Current and Capacitance 36

5.4 Dielectric Discharge Test (DD) 37

5.5 Step Voltage Test 38

5.6 Firmware Upgrade 39

App 40

6.1 App Interface 40

6.2 Data Export 42

PC Software 44

7.1 Software Overview 44

7.3 Continuous Data Recording 45

7.4 Data Export & Log Files 46

7.5 Trend Charts & Waveform Analysis 47

Battery Management 48

Packing List 49

Precautions 50

Safety Warnings

- Only trained and qualified personnel with appropriate national electrical certification are permitted to operate this instrument for field testing.
- Before using the instrument, carefully read and fully understand this manual. The operator must be familiar with the operation of the instrument before performing any measurement.
- Before use, verify that the instrument and all accessories are in good condition. Ensure that the insulation of the instrument and test leads is intact and that there are no exposed conductors or damaged cables.
- Do not use the instrument in wet, damp, or condensation environments, as this may damage the instrument and create safety hazards.
- Always operate the instrument within the specified measurement range and environmental conditions.
- Do not use the instrument if the rear cover is not properly installed.
- Ensure that all test lead connectors are securely inserted into the corresponding terminals before starting a measurement.
- Do not perform measurements in flammable, explosive, or hazardous environments.
- After testing, wait until the instrument has fully discharged the test voltage. Remove the test clips from the device under test before disconnecting the test leads from the instrument.
  Do not touch the metal parts of the output terminals to avoid electric shock.
- Do not operate the instrument in strong electromagnetic environments, as this may affect the accuracy and normal operation of the instrument.
- If the enclosure or test leads are damaged and internal metal parts become

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exposed, stop using the instrument immediately.

- Do not store the instrument for extended periods in environments with high temperature, high humidity, condensation, or direct sunlight.
- Perform regular maintenance and keep the instrument clean. Do not use corrosive chemicals or abrasive materials for cleaning.
- If the instrument is not used for a long period, recharge the battery at least once every three months.
- If battery replacement is required, contact the manufacturer or authorized service personnel.
- Operation, disassembly, calibration, and maintenance of this instrument must only be performed by authorized and qualified personnel.
- If a fault occurs that could lead to a hazardous condition, stop using the instrument immediately, isolate the instrument, and have it inspected by authorized service personnel.
- The ⚠ symbol on the instrument and in this manual indicates a safety hazard. Users must follow the associated instructions to ensure safe operation.

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SECTION 2

Introduction

The S430 5 kV Insulation Resistance Tester is designed for insulation testing and preventive maintenance of high-voltage electrical equipment such as motors, transformers, switchgear, cables, and other power apparatus.
The instrument integrates high-precision current measurement, a digital high-voltage generation system, and an automatic discharge circuit to provide stable and reliable insulation diagnostics.

The S430 supports multiple diagnostic test modes including Insulation Resistance (IR), Dielectric Discharge (DD), Step Voltage (SV), and external voltage measurement, enabling comprehensive evaluation of insulation condition. Measured parameters such as Polarization Index (PI) and Dielectric Absorption Ratio (DAR) help determine insulation aging and moisture contamination. The tester also supports data storage, review, and communication with PC software or mobile applications for efficient data management and analysis.

Features:

- Measuring insulation resistance up to 10 TΩ
- Automatic calculation of DAR and PI
- DD and SV diagnostic test functions
- DC/AC external voltage measurement
- Ramp voltage test function
- Measurement of capacitance and leakage current
- Built-in noise filtering / rejection for improved measurement stability
- 5.6-inch color LCD display with bilingual interface
- Compact, portable design

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SECTION 3

Specification

3.1 Insulation Resistance Measurement Range and Accuracy

Output Voltage	Range	Accuracy
100 V (±10%) DC	0.01 MΩ to 5.00 GΩ	±3%rdg±5dgt
	5.00 GΩ to 200 GΩ	±15%rdg±5dgt
250 V (±10%) DC	0.01 MΩ to 10.0 GΩ	±3%rdg±5dgt
	10.0 GΩ to 500 GΩ	±15%rdg±5dgt
500 V (±10%) DC	0.01 MΩ to 25.0 GΩ	±3%rdg±5dgt
	25.0 GΩ to 1.00 TΩ	±15%rdg±5dgt
1 kV (±10%) DC	0.01 MΩ to 50.0 GΩ	±3%rdg±5dgt
	50.0 GΩ to 2.00 TΩ	±15%rdg±5dgt
2.5 kV (±10%) DC	0.01 MΩ to 100 GΩ	±3%rdg±5dgt
	100 GΩ to 5.00 TΩ	±15%rdg±5dgt
5 kV (±10%) DC	0.01 MΩ to 200 GΩ	±3%rdg±5dgt
	200 GΩ to 10.0 TΩ	±15%rdg±5dgt
Maximum Output Voltage Deviation: ±10%		

3.2 Capacitance and Current Measurement Range and Accuracy

	Range	Accuracy
Current Measurement Range	0.01nA to 20.00mA	±1.5% ±5 dgt
Capacitance Range	0.200 µF to 100.0 µF	±20% ±0.005 µF
AC/DC Voltage	1 V to 1000 V	±2%rdg±5dgt

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3.3 General Specification

Function	Measurements: Insulation Resistance, Leakage Current, Capacitance, PI, DAR Diagnostics: SV (Step Voltage), DD (Dielectric Discharge), Ramp Test Utilities: Auto Discharge, Noise Filter, Timer, External Voltage (AC/DC), Data Storage, Ambient Temperature Display
Power	DC 14.8 V, 5200 mAh Li-ion Battery (approx. 16.8 V when fully charged)
Test Voltage	100 V, 250 V, 500 V, 1 kV, 2.5 kV, 5 kV
Voltage Measurement	AC/DC up to 1000 V
Short Circuit Current	≥ 5 mA
Connection	L (Line): High-voltage output terminal, connected to one end of the DUT G (Guard): Shielding terminal, used for 3-electrode measurement of insulation materials or cables to eliminate surface leakage current E (Earth): Ground terminal, connected to the ground of the DUT
Time	Max 99 min 99 s (adjustable, depending on test method)
Step Voltage	100 V to 1.00 kV: 10 V step 1.00 kV to 2.50 kV: 20 V step; 2.50 kV to 5.00 kV: 30 V step
Resolution	Insulation Resistance: 0.01 MΩ Capacitance: 0.001 µF
Capacitance Test	Range: 0.200 µF to 100.0 µF

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	Accuracy: ±20% ±0.005 µF
Backlight	Adjustable (High / Medium / Low)
LCD	5.6-inch color LCD
Test Indication	LED flash and buzzer alert during test
Charging Indication	Red = charging; Green = full
Data Storage	Auto-save up to 1,000 records
Data View	Built-in data view and browse function
Automatic Shut-Down	Auto power-off after 15 minutes of inactivity when on battery
Standard Test Lead	Red/Green/Black clip leads included
Battery Status	Real-time battery level display; output disabled at low battery
Display Info	Date, ambient temperature, and humidity
Dimensions	320 mm (L) × 240 mm (W) × 145 mm (H)
Weight	Approximately 3.5 kg (battery included)
Connectivity	USB (PC software) and Bluetooth (App)
Communication Interface	USB interface for PC connectivity, data upload, saving, and printing
Cloud Service	Android App (Bluetooth); supports photo uploads, data sync, test report generation, trend graphs, multi-user view, and Excel export
PC Software	Data export, real-time display, and continuous logging
USB Cable	1.5 m
Operating	−10 °C to 40 °C; ≤80% RH (non-condensing)

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Environment	
Storage Environment	−20 °C to 60 °C; ≤70% RH (non-condensing)
Dielectric Strength	5 kV AC, 50 Hz, 1 min (leads to enclosure)
Safety Standard	IEC 61010-1, Pollution Degree 2
Measurement Category	CAT IV 600 V
IP Rating	IP54
Test Range	Keypad-selectable voltage ranges
Over-range Prompt	Displays ">XX.X [Unit]" when the value exceeds the current range (e.g., ">10.0 TΩ" at 5 kV range)
Auto Discharge	Automatic discharge after test completion
Step Voltage Setting	Voltage and duration freely adjustable for each step Voltage: 100 V to 5 kV Duration: 1 s to 99 min
PI Setting	Flexible PI timing configuration (T1 / T2)

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SECTION 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
15. Voltage test port (+)
16. Voltage test port (-)

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SECTION 6

Operation

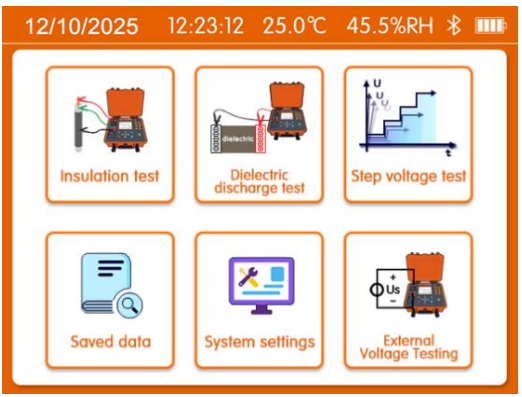
5.1 Basic operation

5.1.1 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.

5.1.2 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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5.1.3 Insulation Resistance Test

1. 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.

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

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

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

3. 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.

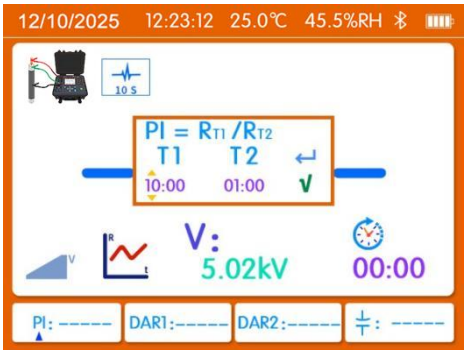
4. The PI value is, by default, the ratio of the insulation resistance at 10 minutes **(R10Min)** to that at 1 minute **(R1Min)**.

If modification is required, move the cursor to the PI position at the lower left corner and press the “  ” key to bring up the settings window.

Then press the “  ”, “  ”, “  ”, and “  ” keys to set the T1 and T2 times.

The PI value will be calculated based on the resistance values measured at the set T1 and T2 times.

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5. Press and hold the "TEST" button to start testing, and press the "TEST" 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.

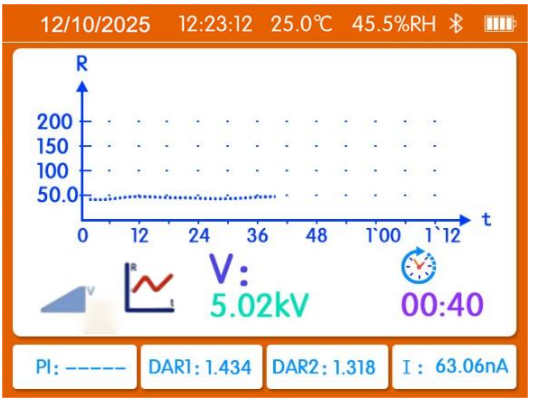


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5.1.4 Viewing the Trend Graph

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:



5.1.5 Ramp Voltage Test

Ramp voltage test is an insulation evaluation method similar to SV overvoltage detection, with the advantage of more accurate monitoring of insulation status and early identification of potential defects through linear progressive voltage increase. Compared to the sudden voltage jumps in the SV test, this slow incremental test mode effectively reduces the risk of damage to insulation materials due to sudden voltage changes and provides a more reliable basis for determining the stability of insulation performance. Press the “ ” key or “ ” key to move the cursor to select, press the “ ” key to enter the ramp function setting. Choose to turn on, or turn off the ramp voltage test function. 100V/min: 100V per minute boost.

The result displayed after the test is the final insulation resistance value, voltage and

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current. The voltage and resistance of the test process can be viewed in the access interface. Maximum 10 groups can be recorded, and each group can record at most 6000s.

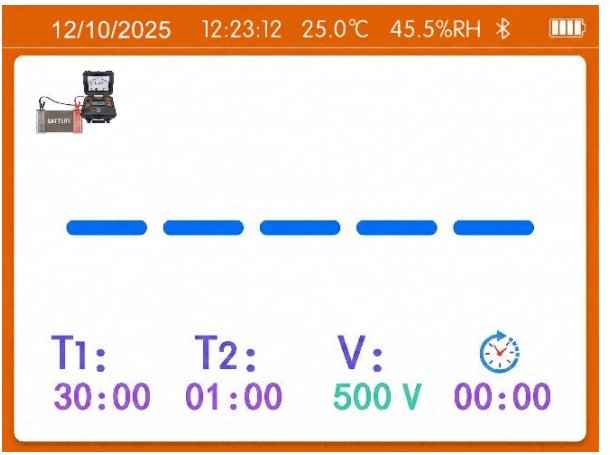
The data of the test can be exported through the upper computer, the export format is EXCEL table, and a complete curve of current, voltage and resistance can be generated.

5.1.6 Dielectric Discharge Test (DD)

The dielectric discharge test 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.

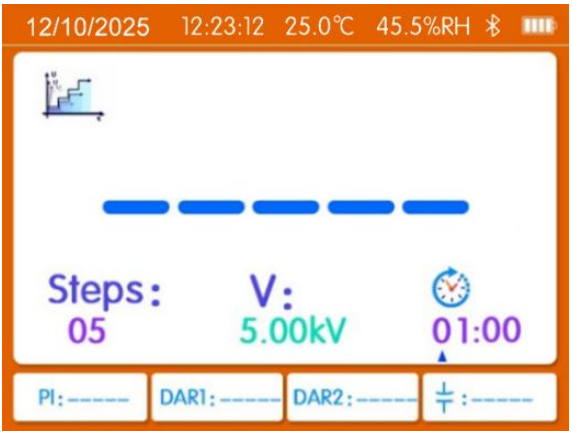
The DD test interface is as below:



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5.1.7 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 "▶" 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.

You can also independently set the step voltage for each step.Move the cursor to Steps, press the "↵" key to bring up a pop-up window "", and press the "◀" or "▶" key to disable or enable the setting "". After selecting Enable, press the "↵" key again to confirm and enter the step value setting.

Icon meanings:

- Step length setting :

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- Step number : 
- Step voltage value : 
- Duration of this step : 

When a checkmark appears below the icon , it means the setting has been saved.

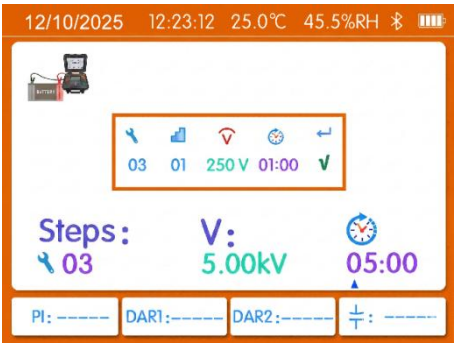
Press the “” key again to confirm and return.

Setting procedure:

- Move the cursor to the “” step length setting, press the “” key to save.
- Move the cursor to “”, use the Up/Down keys to select 01, meaning the subsequent parameter changes will apply to the first step’s voltage setting.
- Move the cursor to “”, set the step voltage value for the first step. For example, if set to 250 V, the voltage in the first step will directly rise to 250 V.
- Move the cursor to “”, set the test duration for the first step voltage. For example, 1:00 means the 250 V will be maintained for 1 minute.
- Press the “” key to save. A checkmark “” will appear “” under the icon, indicating that the save was successful.

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Then, move the cursor to “ ”, use the Up/Down keys to change the step number, and repeat the above procedure to set the voltage parameters for the subsequent steps.



5.1.8 External Voltage Test

The test results can be obtained by connecting the external voltage tester.



5.1.9 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

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points.

5.1.10 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.

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.

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Delete Data：

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 "HOLD" button to hold the current test

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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：

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	Only suitably trained, certified, and authorized personnel are permitted to operate this instrument. The operator must strictly follow all safety procedures. Failure to do so may result in electric shock, personal injury, or equipment damage. Operators should wear high-voltage insulating gloves when performing measurements.
	Perform insulation resistance tests only on de-energized circuits. Before testing, verify that the test leads are in good condition and that the device under test is not energized. Testing on energized circuits may damage the instrument and affect measurement accuracy.
	Before starting the test, first connect the test leads to the instrument, and then connect the test lead clips to the circuit under test.

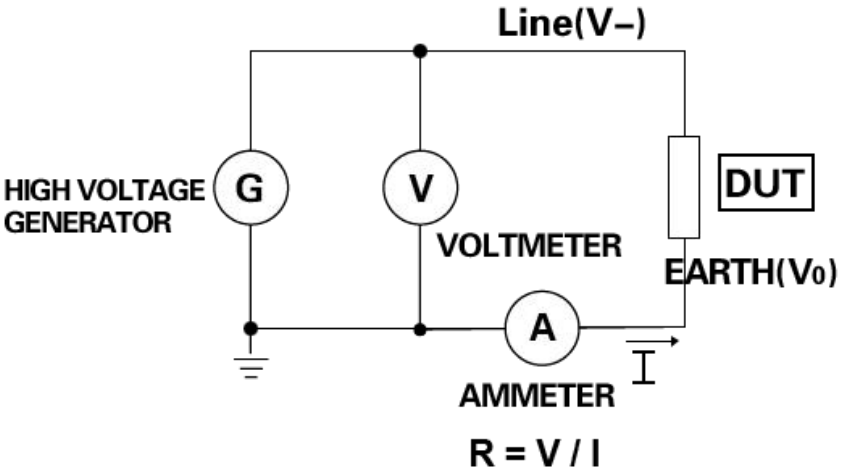
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	Press and hold the TEST button to start the insulation resistance measurement. During the test, the instrument generates high voltage through the test leads and applies it to the device under test. Do not touch the test leads or the test object during the measurement to avoid electric shock.
	Do not touch the tested circuit immediately after the test. Residual stored charge may still be present and could cause electric shock.
	Connect the ground lead (black) to the ground terminal of the device under test.
	After the test is completed, do not disconnect the test leads immediately. Wait until the instrument has fully discharged the circuit before touching the test object or removing the leads.
	Do not twist or entangle the test leads during measurement, as this may affect measurement accuracy.
	Do not touch the instrument enclosure during measurement to ensure measurement stability and 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 Insulation Resistance Measurement Connections

Insulation resistance tests must only be performed on de-energized circuits. Before testing, check that the test leads are in good condition and confirm that the circuit under test is not energized.

All terminals of the device under test must be discharged to ground using a manual discharge rod before making any connections. Only after confirming safe conditions may the test connections be made.

Before testing:

1. Connect the test leads to the instrument first.
2. Then connect the test lead clips to the device under test.
3. Press and hold the Power button to turn on the instrument.

After testing:

1. Wait until the discharge process is completed.

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2. Press the Power button briefly to turn off the instrument.

3. Remove the test lead clips from the device under test.

4. Finally, disconnect the test leads from the instrument.

5.2.2.1 Test Lead Connection Description

The red test lead (LINE terminal) should be connected to one end of the conductor or circuit under test.

The black test lead (EARTH terminal) should be connected to the other end of the tested object, ground, neutral point, or earth.

The green test lead (GUARD terminal) should be connected to the guard ring of the tested circuit, which is used to eliminate the influence of surface leakage currents during measurement.

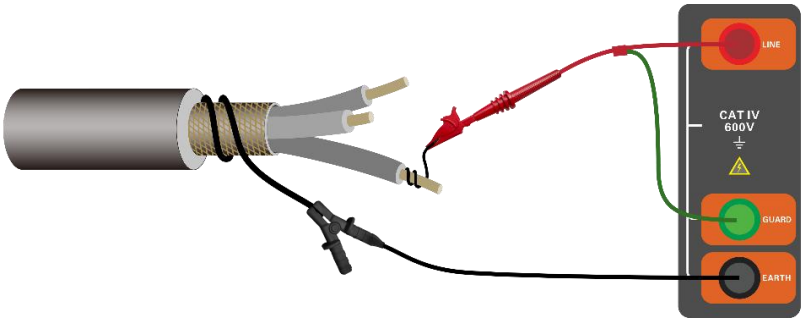
5.2.2.2 Cable Insulation Test

(1) Measuring insulation between the core and shielding

- Connect the red test lead (LINE terminal) to the cable conductor core.
- Connect the black test lead (EARTH terminal) to the cable shielding layer.
- Connect the green test lead (GUARD terminal) to the outer insulation layer that is in direct contact with the core.

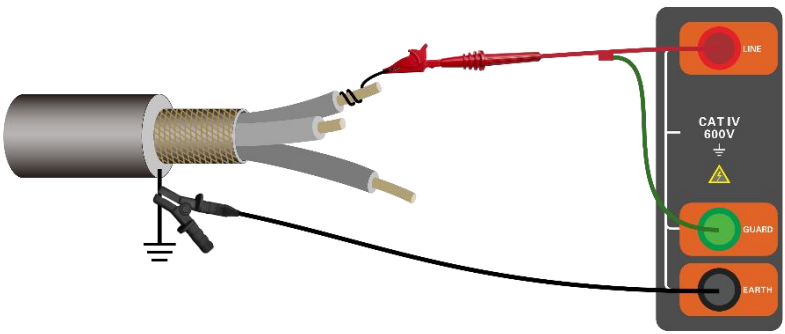
Connect the test leads as shown in the figure below, then operate the instrument to start the test.

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(2) Measuring cable-to-ground insulation

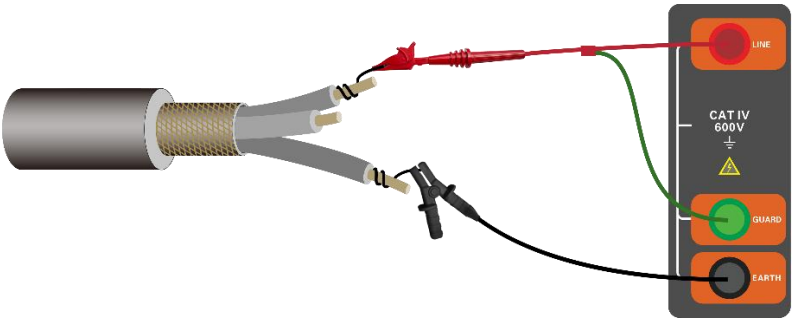
- Connect the red test lead (LINE terminal) to one cable conductor core.
- Connect the black test lead (EARTH terminal) to ground (earth).



(3) Measuring insulation between conductor cores

- Connect the red test lead (LINE terminal) to one cable conductor core.
- Connect the black test lead (EARTH terminal) to another cable conductor core.
- Connect the green test lead (GUARD terminal) to the outer insulation layer that is in direct contact with the three conductor cores.

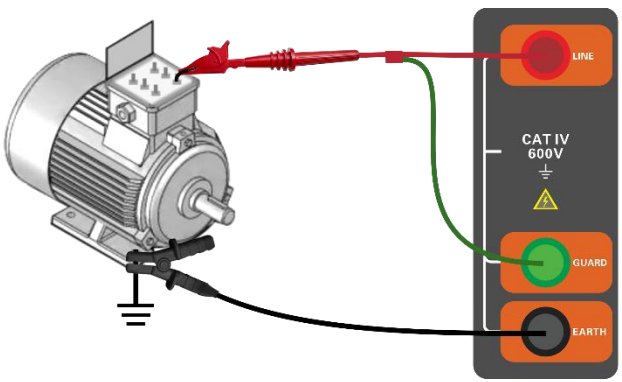
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5.2.2.3 Motor Insulation Test

(1) Each motor winding and the motor housing

- Connect the red test lead (LINE terminal) to the terminal of the motor winding.
- Connect the black test lead (EARTH terminal) to the grounding point of the motor housing.

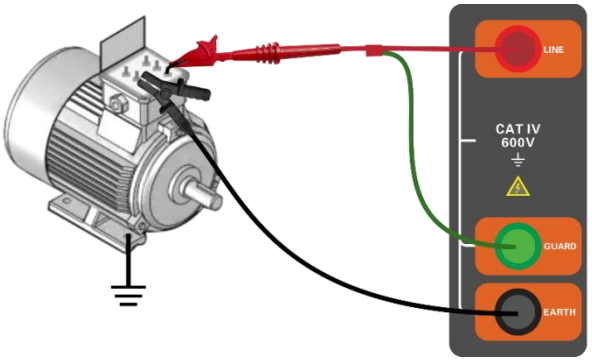


(2) Insulation test between motor windings

- Connect the red test lead (LINE terminal) to the terminal of one phase of the motor winding.

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- Connect the black test lead (EARTH terminal) to the terminal of another phase of the motor winding.

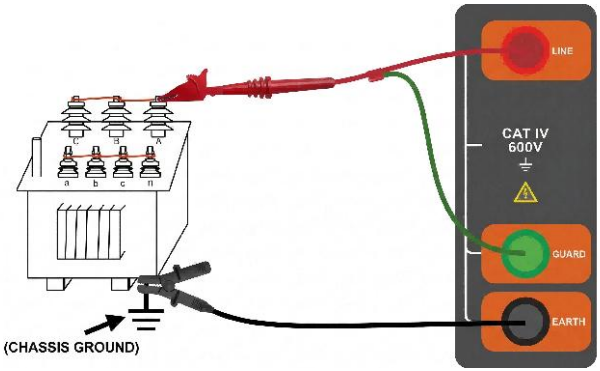


5.2.2.4 Transformer Insulation Test

(1) Insulation test between the transformer high-voltage winding and ground

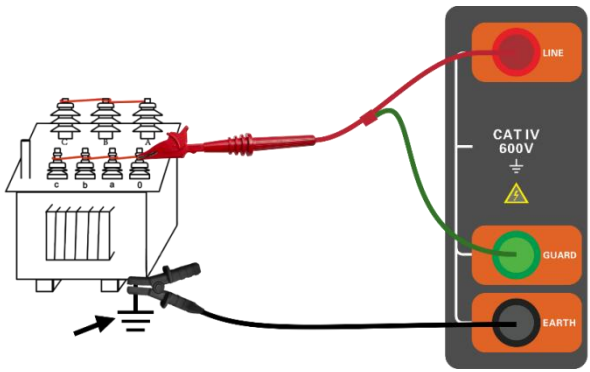
- Connect the red test lead (LINE terminal) to the high-voltage terminal of the transformer.
- Connect the black test lead (EARTH terminal) to the ground terminal of the transformer.

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(2) Insulation test between the transformer low-voltage winding and ground

- Connect the red test lead clip (LINE terminal) to the low-voltage terminal of the transformer.
- Connect the black test lead clip (EARTH terminal) to the ground terminal of the transformer.



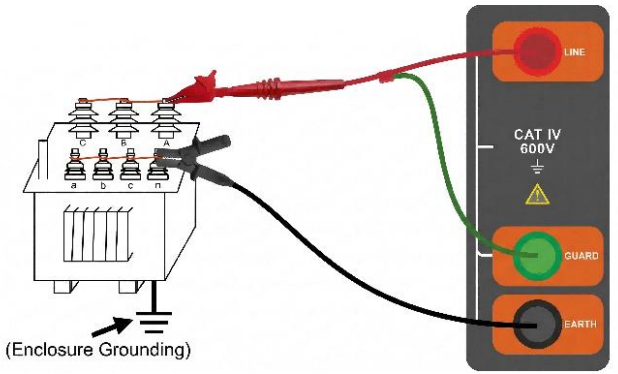
(3) Insulation test between the transformer high-voltage and low-voltage windings

- Connect the red test lead clip (LINE terminal) to the high-voltage terminal of the

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transformer.

- Connect the black test lead clip (EARTH terminal) to the low-voltage terminal of the transformer.



Note	The DC voltage input to the instrument must not exceed 1000 V
	The AC voltage input to the instrument must not exceed 1000 V

5.2.3 Test Lead Connection Description

1. Insert the green test lead plug into the red V terminal of the instrument, and insert the black test lead plug into the black V terminal of the instrument.
2. Connect the green test lead clip to the object under test, and connect the black test lead clip to the system ground of the tested object.
   For household power cables, connect the green test lead to the live wire (L) and the black test lead to the neutral wire (N).
3. The instrument will automatically detect the voltage type and display the measured voltage value.

- If DC voltage is detected, the LCD will display the "⎓" symbol, indicating DC

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voltage.

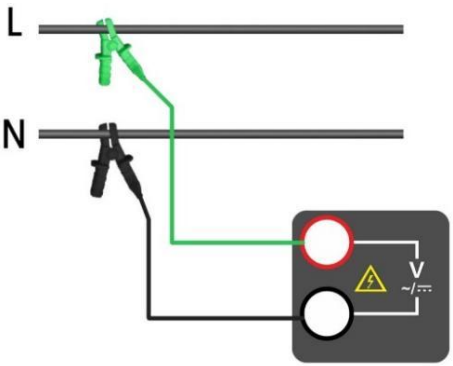
- If AC voltage is detected, the LCD will display the “~” symbol, indicating AC voltage.
- If no voltage is present on the tested object, the display will show 0 V.

Note:
When measuring voltage to ground, exercise caution to avoid electric shock or leakage trip of other equipment.

This voltage measurement function can be used similarly to a standard multimeter for AC/DC voltage measurement. Ensure that the measured voltage does not exceed:

- DC voltage: 1000 V
- AC voltage: 1000 V

Refer to the wiring diagram below for connection details.



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5.3 Insulation Resistance Measurement

Warning	**During the test, do not touch the exposed metal parts of the test leads, as this may result in electric shock.**
	After the test is completed, do not immediately touch the tested circuit or remove the test leads. Stored electrical charges may still be present and could cause electric shock. Ensure that the discharge process is fully completed before touching the tested circuit.

5.3.1 Measurement and Operation

After completing the wiring according to the procedures described above, press and hold the Power button to turn on the instrument.

In the insulation resistance test interface, manually select the required test voltage level and set the test duration. Then press and hold the TEST button to start the measurement.

The red LINE terminal will output the selected test voltage. During the test:

- The LCD displays a flashing high-voltage warning symbol.
- The actual output voltage and test current are displayed in real time.
- A beep sound occurs every 2 seconds indicating that the test is in progress.
- The measurement time starts from zero and increases until the preset test time is reached.

This indicates that the instrument is measuring the insulation resistance of the device under test.

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When the measurement time reaches the preset value, the instrument will stop the test automatically and stop outputting high voltage. A double beep will sound, and the LCD will display the current measurement result.

Alternatively, during the test, press the Power button briefly to stop the test. The instrument will display the current measurement data and automatically save the result.

After the measurement is completed, the instrument automatically stores the test result and discharges the residual high voltage on the device under test.
Once the discharge process is completed, the high-voltage warning symbol disappears from the display.

If no further operation is performed, the instrument will retain the measurement result on the screen. Press and hold the TEST button again to start the next measurement.

5.3.2 PI and DAR

Purpose of PI and DAR

The PI and DAR are diagnostic indicators used to evaluate the time-dependent behavior of insulation leakage current. These parameters help determine whether the leakage current increases during the period when test voltage is applied.

The instrument automatically calculates PI and DAR, which represent the change in insulation resistance of the tested object over time after the test voltage is applied.

Difference Between PI and DAR

For general insulation tests, such as enclosures, tool handles, and other small insulation structures, the variation of leakage current can usually be observed within a short test duration. In such cases, the Dielectric Absorption Ratio (DAR) is commonly used.

However, for equipment with large capacitance or long absorption processes, such as transformers, generators, power cables, and capacitors, the DAR value may not fully reflect the insulation absorption characteristics. In these cases, the PI, which is based

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on a longer test duration, is used to evaluate insulation condition.

The PI is defined as the ratio between the insulation resistance measured at 10 minutes and 1 minute after the test voltage is applied.

PI and DAR Calculation

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

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

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

Where:

- R10Min = Insulation resistance measured after 10 minutes of voltage application
- R1Min (R60Sec) = Insulation resistance measured after 1 minute
- R30Sec = Insulation resistance measured after 30 seconds
- R15Sec = Insulation resistance measured after 15 seconds

The DAR calculation may use either 15 seconds or 30 seconds as the reference time.

Application of PI and DAR

In engineering practice, insulation resistance together with DAR or PI can be used to evaluate the moisture condition of insulation in equipment such as:

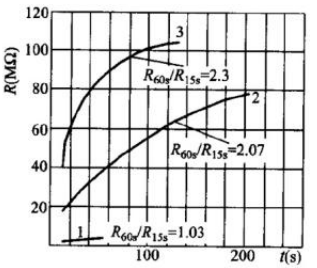
- Generators
- Oil-immersed power transformers
- Other high-voltage electrical equipment

When insulation becomes moist, the DAR or PI value typically decreases, making these

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parameters useful indicators for detecting insulation moisture conditions.

However, it should be noted that if the insulation contains significant defects, such as breakdown under high voltage, the DAR or PI value may still appear normal. Therefore, DAR and PI are mainly used to detect moisture and contamination, and may not identify all types of insulation defects.



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

Polarization Index Reference Value

PI	Above 4	4 ~ 2	2.0 ~ 1.0	Below 1.0
Judgement	Excellent	Good	Questionable	Dangerous

Dielectric Absorption Ratio Reference Value

DAR	Above 1.4	1.25 ~ 1.0	Below 1.0
Judgement	Excellent	Good	Poor

Viewing PI and DAR Results

After the insulation resistance measurement is completed, the instrument will automatically calculate the PI and DAR if the measurement conditions are satisfied (see notes below).

When the test is finished, the LCD screen will automatically display the measurement

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results.

Notes

1. PI indicates the displayed value is the Polarization Index.
2. DAR1 indicates the Dielectric Absorption Ratio calculated as R60Sec / R15Sec.
3. DAR2 indicates the Dielectric Absorption Ratio calculated as R60Sec / R30Sec.
4. To display the PI value, the insulation resistance test duration must exceed the default 10 minutes or the configured maximum test time.
5. To display the DAR value, the insulation resistance test duration must exceed 1 minute.
6. If the measured resistance exceeds the upper limit of the selected measurement range, the display format will be:
   “>XX.X [unit]”
   (for example, in the 5 kV range the display may show “>10.0 TΩ”).
7. If the calculated PI or DAR value exceeds 9999, the display will show “OL” (Over Limit).

5.3.3 Current and Capacitance

Current Value:
After the insulation resistance test starts and the preset DC test voltage is applied to the device under test, the instrument will display the measured current value in real time on the LCD screen throughout the measurement process.

Capacitance Value:
After the insulation resistance measurement is completed, the instrument will automatically calculate the capacitance value of the tested object. The calculated capacitance will then be displayed on the LCD screen together with the measurement result.

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5.4 Dielectric Discharge Test (DD)

During the DD test, the device under test must first be charged for a sufficiently long period so that the charging current decreases to a stable resistive leakage current.

After the charging period (T1) is completed, the instrument immediately performs a discharge measurement (T2).

During discharge:

- The capacitive discharge current initially starts at a relatively high value and decays rapidly. Its time constant is short, so this component normally drops to zero within a few seconds.
- The absorption current released from the insulation starts at a smaller magnitude but decays more slowly. Its time constant is longer and the decay process may last several minutes.

After the test is completed, the instrument calculates and analyzes the test current, capacitance, and voltage values to determine a parameter that represents the quality of the insulation.

$$\mathrm{DD} = \frac{\mathrm{I1min}}{\mathrm{V} \times \mathrm{C}}$$

Where:

- I_1min = Discharge current measured 1 minute after the test voltage V is removed
- V = Charging voltage
- C = Capacitance of the tested object

Interpretation of DD Results

For uniform insulation, the DD value is 0, while good multi-layer insulation systems may reach values close to 2.

The following table provides recommended reference values for DD test results:

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Insulation Condition	DD
Damage	>7
Bad	4-7
Questionable	2-4
Good	<2
Qualified	0

5.5 Step Voltage Test

The Step Voltage Test is a controlled overvoltage diagnostic test used to evaluate the integrity of insulation systems. During this test, the applied test voltage is increased in several predefined steps, and the insulation resistance is measured at each voltage level.

By observing the change in insulation resistance as the voltage increases, the SV test can reveal insulation weaknesses that may not be detected during a standard insulation resistance test.

This test method is commonly applied to:

- Stator and rotor windings of AC synchronous and asynchronous motors
- Armature and field windings of DC motors
- Transformers
- Power cables
- Other high-voltage electrical equipment

Test Principle

In a Step Voltage Test, the instrument applies incrementally increasing DC test voltages to the insulation system. At each voltage step, the instrument measures the insulation

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resistance.

For healthy insulation, the insulation resistance should remain relatively stable as the voltage increases. If the insulation contains defects such as contamination, moisture, cracks, or partial breakdown paths, the insulation resistance may decrease significantly at higher voltage levels. A rapid reduction in insulation resistance between voltage steps may indicate potential insulation deterioration.

Result Interpretation

- Stable insulation resistance across voltage steps
  → Indicates good insulation condition.
- Gradual reduction of insulation resistance with increasing voltage
  → May indicate aging or contamination of insulation.
- Sharp decrease in insulation resistance at higher voltage levels
  → Possible insulation weakness, cracks, or localized defects.

5.6 Firmware Upgrade

When necessary, the instrument firmware can be upgraded by connecting the instrument to a computer via a data cable and using the dedicated desktop upgrade software. The firmware file can be obtained from the manufacturer.

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SECTION 6

App

The S430 App is a dedicated mobile application developed for use with the S430 5 kV Insulation Resistance Test Set. It connects to the instrument via Bluetooth and provides the following functions:

(1) Instrument control — remotely operate the test set from the App.

(2) Upload on-site photos — attach field images to test records.

(3) Upload test data — sync measurement results from the instrument to the App.

(4) Generate test reports — produce formatted reports that can be shared or exported.

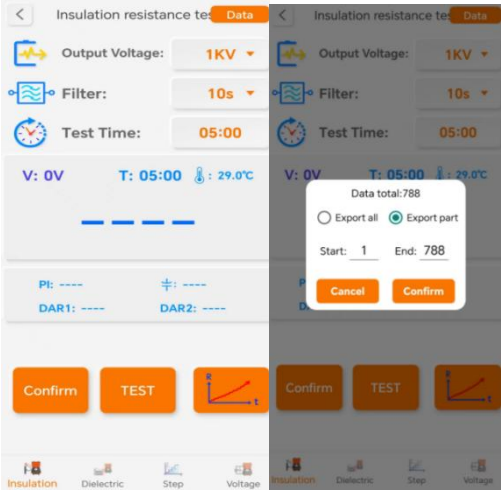
(5) Generate data trend curves — display real-time resistance trend graphs during testing.

The App is available for Android devices. To connect, enable Bluetooth on the instrument (via System Settings → Bluetooth Settings) and pair the instrument with your mobile device through the App.

6.1 App Interface

The insulation resistance (IR) test interface displays real-time test voltage, resistance value, absorption ratio (DAR), and polarization index (PI). The corresponding data trend chart and data report view are shown below:

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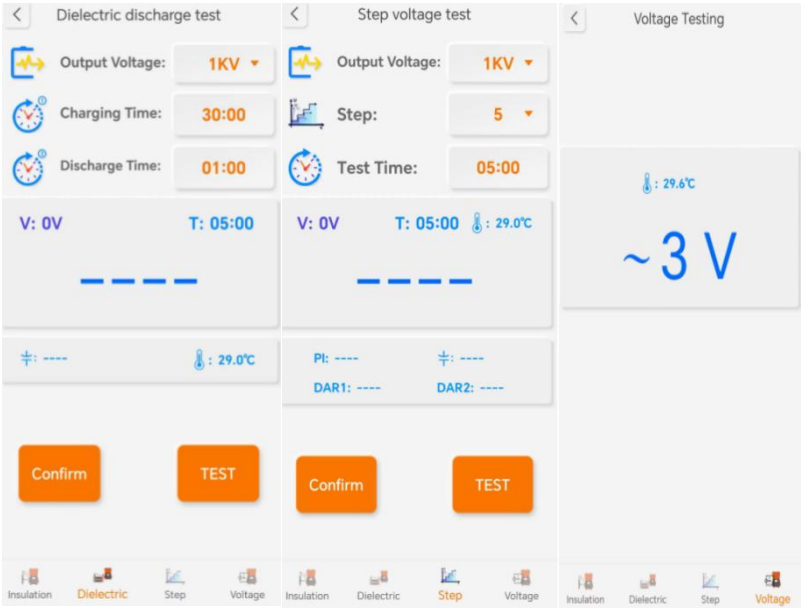
The data report view is shown below. Tap the icon in the upper right corner to share or export data.

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

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The DD (Dielectric Discharge) test, SV (Step Voltage) test, and external voltage measurement interfaces are as shown below:



6.2 Data Export

Tap the export icon in the upper right corner of the insulation resistance test interface to export data as an Excel file. Each test mode (IR, DD, SV) is saved in a separate sub-table within the same file.

The insulation resistance (IR) test sub-table includes the following fields:

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	0.35 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 DD (Dielectric Discharge) test sub-table includes the following fields:

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 SV (Step Voltage) test sub-table includes the following fields:

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.

As shown below:

Test Report-Step voltage test

DAR1	DAR2	C	TIME	R15s	R30S	R1min	R10min	Date	Temp	RH	SV_Step	SV_S1_V	SV_S1_R
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
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
0.398	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

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SECTION 8

PC Software

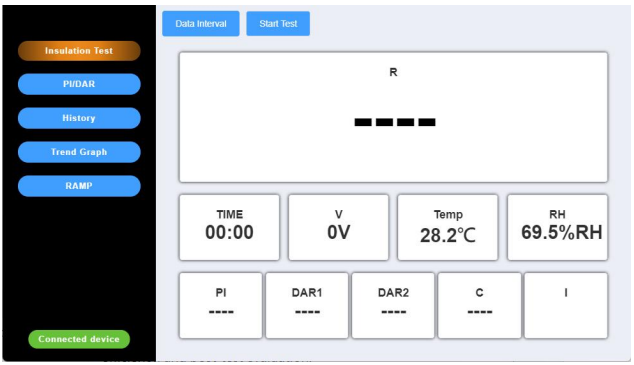
7.1 Software Overview

The S430 companion computer software is designed to enhance data management and visualization. It allows users to export instrument test data, record test data continuously at one-second intervals, and display resistance trend charts in real-time.

7.2 Main Interface & Features

The main interface provides intuitive access to real-time metrics and system functions:

- Test Mode Selection: Users can select specific test modes from the left navigation panel, including Resistance Measurement , External voltage test , and PI/DAR.
- Data Management: Access stored data via the History lookup function or visualize data using the Trend chart recording option.
- Top Menu Controls: The top navigation bar includes quick actions to "Read save data" , "Export" data , initiate "data recording" , and "Clear" the current view.
- Real-Time Dashboard: During a test, the central dashboard displays live readings, including Resistance (R) , elapsed TIME , Voltage (V) , Temperature (Temp) , Humidity (RH) , PI , DAR1 , DAR2 , and Capacitance (C).

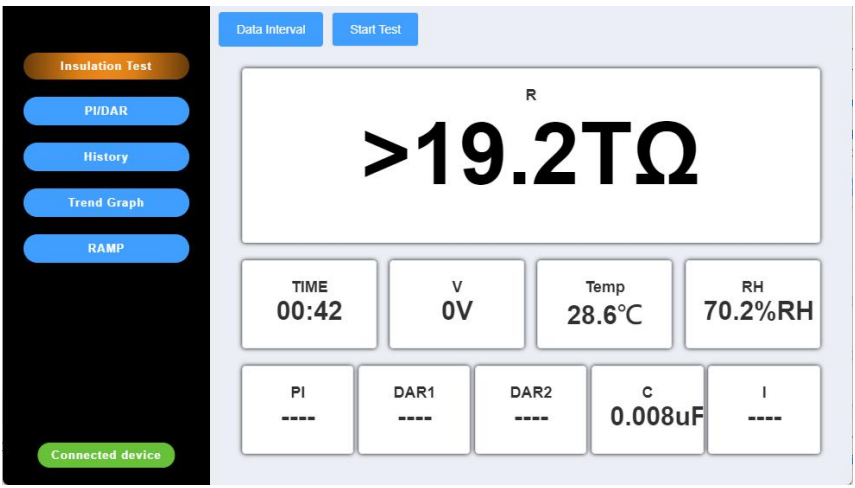


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7.3 Continuous Data Recording

To capture data incrementally during an ongoing test, follow these operational steps:

1. Click on the "Insulation Test" button in the menu.
2. A prompt will appear; select the desired recording interval in seconds from the drop-down list.
3. Click "Confirm" to lock in the interval.
4. The software will display a "Awaiting test" status, prompting you to press the physical test button on the instrument or the “test” button on the software.
5. Once the test initiates, the software status will change to "Recording".
6. Upon test completion, the display will revert to the original text, and a "success" pop-up will appear to confirm that the data was exported successfully.

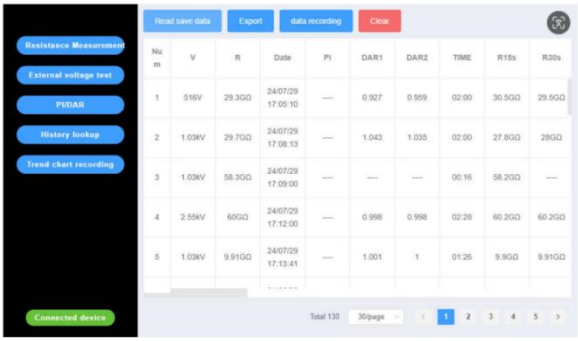


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7.4 Data Export & Log Files

Exporting Stored Data

To retrieve historical data, navigate to the "Load Saved Data" interface. Once the progress bar indicates a successful load, click the "Export" button.



Excel Structure

The data is exported as an EXCEL file containing three distinct sub-tables.

Log File Contents

The generated log file provides a comprehensive breakdown of the test, including columns for Num, Voltage (V), Resistance (R), Current (I), PI, DAR1, DAR2, Capacitance (C), TIME, R15S, R30S, R1min, R10min, and Temperature (Temp).

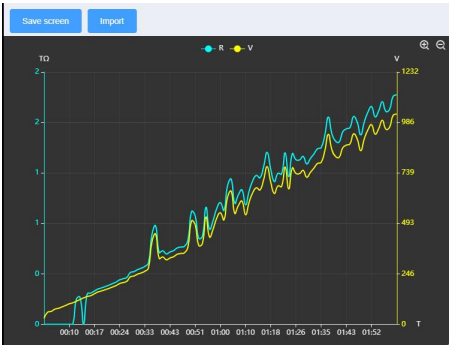
A	B	C	D	E	F	G	H	I	J	K	L	M	N
Num	V	I	R	PI	DAR1	DAR2	C	TIME	R15S	R30S	R1min	R10min	Temp
1	0V	0nA	----	----	----	----	0uF	00:02	299MΩ	299MΩ	299MΩ		33℃
2	5879V	0nA	----	----	----	----	0uF	00:03	299MΩ	299MΩ	299MΩ		32.9℃
3	5006V	0nA	----	----	----	----	0uF	00:04	299MΩ	299MΩ	299MΩ		32.9℃
4	5015V	0nA	----	----	----	----	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℃

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7.5 Trend Charts & Waveform Analysis

Saving Trend Images

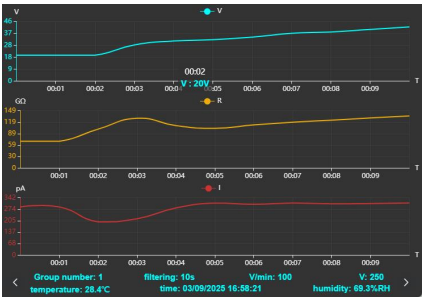
While in the Trend Graph interface, users can click "Save screen" to store a visual copy of the trend image.



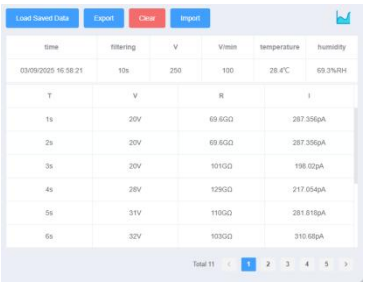
Viewing RAMP Test Data

To analyze RAMP test results, click on the specific waveform icon within the software. This feature allows users to view synchronized data waveforms for voltage, current, and resistance.

When the progress bar indicate successfully load, click "Save Data" button to export the data in EXCEL, which contains 3 sub-tables.



Ramp Test Trend Graph



Ramp Test Log

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SECTION 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“ ” 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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SECTION 9

Packing List

Instrument	1
Tool Bag	1
High-Voltage Test Rod (3m)	1 x Red
Test Leads with Alligator Clips (3m)	1 x Green and 1 x Black
Voltage Test Leads (3m)	2
Charger	1 x 16.8V/1A
USB Cable	1
Manual, Warranty, and Quality Certificate	1

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SECTION 10

Precautions

Environmental Interference Causing Inaccurate Test Data
● Check the ambient humidity to ensure it is within the working humidity range specified in the technical specifications. ● Check whether the tested cable or object has been immersed in water, as immersion will reduce insulation performance. ● During testing, check whether the test leads are being moved or touched, as this will affect the weak measured current. ● Check for interference sources around the test area during the test process.
Precautions During Testing
● Discharge the test object both before and after testing to ensure it is not energized. ● After testing, the test object must be discharged; otherwise, it will increase the probability of instrument failure. ● The instrument's output terminal only supports live-voltage indication between 50 V and 400 V. It is recommended to always use the external voltage measurement function before testing to check whether the test object is live. ● The red and black test leads must not be twisted together during testing—especially during high-voltage testing—as this will affect signal return.
Possible Reasons Why the Instrument Cannot Output
● The battery is low. When the battery level reaches 0%, the instrument will automatically stop outputting. Charge the battery first to ensure adequate power. ● Output is prohibited when external voltage exceeds 50 V. Make sure the test object is not energized before proceeding.

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Possible Reasons for Insufficient Boost Voltage

- If the load resistance is too low, the voltage will remain at a relatively low level due to power limits. However, this does not affect the accuracy of the resistance measurement.
- You can perform an open-circuit output test; if the instrument still cannot boost properly, contact the manufacturer to return it for repair.

Note:

- We are not responsible for other damages caused by the use of this product.
- The contents of this user manual do not justify the use of the product for special purpose.
- The Company reserves the right to modify the contents of the user manual. In the case of modification, no further notice will be given.

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