

# **HZ3251**

## **Insulation Resistance Tester**



Dear user:

Thank you for choosing HZ3251 Insulation Resistance Tester.

We hope that this instrument can make your work easier and more enjoyable, so that you can get the feeling of office automation in the test and analysis work.

Before using the instrument, please read this manual, and operate and maintain the instrument according to the manual to prolong its service life. "Just a light press, the test will be completed automatically" is the operating characteristics of this instrument.

If you are satisfied with this instrument, please tell your colleagues; if you are not satisfied with this instrument, please call (0312) 6775656 to tell you to serve you at all times-Baoding Huazheng Electric Manufacturing Co., Ltd., our company will definitely make you satisfied !

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## **I. Safety Warning**

- ◆ The safety performance of this instrument meets the provisions of IEC61010-1 standard.
- ◆ Please read this manual carefully before use and follow the safety regulations and specifications in the manual during testing.
- ◆ During the insulation resistance test, the instrument test clamp will have a dangerous voltage up to 10kV; the operator should not touch the measured circuit to avoid electric shock accident.
- ◆ Before conducting the insulation resistance test wiring, the tested product must be checked and ensured in a power off condition.
- ◆ Before testing, it is necessary to check whether the voltage tolerance value of the test line matches the highest output voltage value of the instrument used, so as to ensure the safety and test accuracy of the tester.
- ◆ After starting the insulation resistance test, do not break the test line from the test article before the measurement is completed; otherwise, the test article will not be discharged, thus causing the risk of electric shock.
- ◆ Do not test in flammable places, and the sparks generated during the test may cause an explosion.
- ◆ Performing insulation resistance testing in a damp environment may be dangerous, and it is recommended not to do so in this case.
- ◆ Do not test the dirt or carbide found by the test line or instrument output port.
- ◆ When the instrument is abnormal or damaged, please stop using it immediately.
- ◆ This instrument is a special instrument with a certain danger, do not dismantle, repair without permission.
- ◆ The built-in battery pack parameters of the instrument can match the instrument performance parameters. The user shall not replace the battery by himself to avoid abnormal operation of the instrument.
- ◆ The built-in battery pack is lithium ion battery and special charging circuit; When the instrument is not used for a long time, it should be charged once every 3 months to maintain the performance parameters of the built-in battery.

## **II. Packaging Content**

After you receive the shipping box, open the box and inspect it for damage. If the shipping container is damaged, or the instrument is damaged, please notify the shipping company and your nearest sales office of our company.

Please check that you received the following items in your kit:

Standard configuration:

- √1 tester
- √1 set of test lines (1 red high voltage test line, 1 blue shielded protection line, 1 black shielded high voltage test line)
- √1 three-core power cord
- √3 250V/2A fuses
- √1 printed user manual
- √1 certificate and warranty card
- √1 factory test report

### **III. Features**

- 3.1 The fully isolated power supply scheme is adopted, and the low-voltage circuit (battery-powered, human-computer interaction operation circuit) is completely electrically isolated from the high-voltage circuit (NC high-voltage power supply, signal sampling circuit); the isolation voltage is as high as 30kV, thereby ensuring the safety of operators.
- 3.2 It adopts an industrial-grade 7-inch color LCD screen with a high resolution of 1024×600, a viewing angle of 85°, and a brightness of 400cd/m<sup>2</sup>; it adopts a capacitive touch screen of explosion-proof glass, which has a good operating feel and a durable display.
- 3.3 It has a single-button shuttle function + buttons with color backlight, giving operators a better operating experience.
- 3.4 With 6 voltage ranges:  
100V, 250V, 500V, 1000V, 2500V, 5000V, 10000V  
Custom voltage mode 50V ~ 10000V continuously adjustable, step voltage 10V.
- 3.5 The maximum output short-circuit current is 6mA; and 1mA, 2mA, 3mA, 4mA, 5mA, 6mA are adjustable.
- 3.6 The maximum continuous output power is 55W.
- 3.7 With an independent discharge circuit, it can quickly discharge the test product after the test is completed.
- 3.8 It has the test functions of insulation resistance IR, absorption ratio DAR, polarization index PI, dielectric discharge rate DD and step voltage SV.
- 3.9 Support R600s/R30s and R600s/R15s two DAR absorption ratio calculation modes.
- 3.10 It has the functions of DC and AC voltmeters, can automatically identify DC voltage and AC voltage signals, and can measure the frequency of AC voltage signals.
- 3.11 It has the function of measuring cable length.
- 3.12 With controllable hardware filter and software filter, the anti-interference performance of the instrument is greatly improved.
- 3.13 The test time in various test modes is saved independently and does not affect each other, which is convenient for the next use.

- 3.14 It has the functions of automatic shutdown of the instrument when it is idle and automatic shutdown when the battery is low, and the automatic shutdown time can be set.
- 3.15 With USB storage function, test data can be exported to USB in batches; and it supports the function of upgrading the main control firmware and high-voltage power supply firmware through USB.
- 3.16 Built-in large-capacity lithium battery and built-in fast charger; both the instrument panel and LCD screen can indicate the current charging status.

## IV. Technical Indicators

| Insulation resistance measurement, test voltage 5kV: |            |
|------------------------------------------------------|------------|
| Resistance range                                     | resolution |
| 0~9.99kΩ                                             | 0.01kΩ     |
| 10.0~99.9kΩ                                          | 0.1kΩ      |
| 100~999kΩ                                            | 1kΩ        |
| 1.00~9.99MΩ                                          | 10kΩ       |
| 10.0~99.9MΩ                                          | 100kΩ      |
| 100~999MΩ                                            | 1MΩ        |
| 1.00~9.99GΩ                                          | 10MΩ       |
| 10.0~99.9GΩ                                          | 100MΩ      |
| 100~999GΩ                                            | 1GΩ        |
| 1.00~9.99TΩ                                          | 10GΩ       |
| 10Ω~20TΩ                                             | 100GΩ      |

**Note:** The full-scale resistance value is related  $R_{FS}$  to the test voltage  $U_N$ , and it can be calculated by referring to the following formula:

$$R_{FS} = 2 \times 10^9 \times U_N$$

$R_{FS}$  The unit of  $\Omega$  is  $\Omega$ ,  $U_N$  and the unit of  $\Omega$  is V.

| Under each test voltage, the relationship between the resistance test accuracy and the full-scale resistance |           |
|--------------------------------------------------------------------------------------------------------------|-----------|
| Resistance range                                                                                             | precision |
| $R < \frac{R_{FS}}{10}$                                                                                      | ±5%       |
| $\frac{R_{FS}}{10} \leq R \leq R_{FS}$                                                                       | ±20%      |

| The full-scale resistance value corresponding to each test voltage |                                                                                                                                                                                                                                                                   |
|--------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Test voltage                                                       | Full scale resistance value $R_{FS}$                                                                                                                                                                                                                              |
| 100V                                                               | 200GΩ                                                                                                                                                                                                                                                             |
| 250V                                                               | 500GΩ                                                                                                                                                                                                                                                             |
| 500V                                                               | 1.00 TΩ                                                                                                                                                                                                                                                           |
| 1000V                                                              | 2.00 TΩ                                                                                                                                                                                                                                                           |
| 2500V                                                              | 5.00 TΩ                                                                                                                                                                                                                                                           |
| 5000V                                                              | 10.0 TΩ                                                                                                                                                                                                                                                           |
| 10000v                                                             | 20.0TΩ                                                                                                                                                                                                                                                            |
| testing time                                                       |                                                                                                                                                                                                                                                                   |
| Setting range                                                      | Adjustable from 10 seconds to 99 minutes                                                                                                                                                                                                                          |
| Test power                                                         |                                                                                                                                                                                                                                                                   |
| Fixed test voltage                                                 | 100V, 250V, 500V, 1000V, 2500V, 5000V,10000V                                                                                                                                                                                                                      |
| Custom Test Voltage                                                | 50V~10000V<br>The minimum step voltage is 10V. When using the single-button shuttle control, the step voltage value will automatically switch between 10V, 100V, and 200V with the speed of the shuttle. The higher the speed, the higher the step voltage value. |
| Voltage output accuracy                                            | 0%~+10%                                                                                                                                                                                                                                                           |
| short circuit current                                              | 1mA~6mA, adjustable, step 1mA                                                                                                                                                                                                                                     |
| Short-circuit current accuracy                                     | ±5%                                                                                                                                                                                                                                                               |

|                                          |                                                               |
|------------------------------------------|---------------------------------------------------------------|
| continuous output power                  | 55W                                                           |
| <b>Voltmeter</b>                         |                                                               |
| Measuring range                          | AC/DC 10V~660V, $\pm(2\%+3 \text{ characters})$               |
| AC voltage frequency                     | 25Hz~85Hz, resolution 0.1Hz, accuracy $\pm 0.2\text{Hz}$      |
| <b>Output voltage measurement</b>        |                                                               |
| precision                                | $\pm(2\%+3 \text{ words})$                                    |
| <b>Capacitance measurement</b>           |                                                               |
| Measuring range                          | 10nF~25uF, test voltage $\geq 100\text{V}$                    |
| precision                                | $\pm 10\% \pm 5\text{nF}$                                     |
| <b>Capacitance sample discharge rate</b> |                                                               |
| discharge rate                           | From 10kV to 50V, $\leq 0.47\text{s/uF}$                      |
| <b>Conditions of use and shape</b>       |                                                               |
| AC power                                 | 85~264Vrms, 50/60Hz, 65VA                                     |
| Built-in battery                         | 16.8V, 4400mAH lithium battery                                |
| built-in charger                         | 16.8V 2.3A                                                    |
| battery life                             | 5kV@100M $\Omega$ load, about 6 hours                         |
| Dimensions                               | 320mm (length) $\times$ 270mm (width) $\times$ 150mm (height) |
| weight                                   | 3.9kg                                                         |
| Operating temperature                    | -10 $^{\circ}\text{C}$ ~50 $^{\circ}\text{C}$                 |

Relative  
humidity

<90%, no condensation

## V. Product Appearance



1.Capacitive touch screen.

Display size 7 inches; resolution 1024600.

2.Test the power supply "+" positive electrode output terminal.

3.GUARD(Protection ring) terminal.

4.Test power supply "-" negative electrode output terminal and the test line shield layer connection terminal.

The terminal above is the test line shield connection terminal.

The lower terminal is the negative output terminal of the test power supply "-" terminal.

5.Start and stop test button, with RGB color backlight.

Press the test for 2 seconds to start the test, and press to stop the test. When the key backlight is green, the test has stopped; if red, the test is in progress.

6.Menu button. Short press to quickly enter the main menu interface.

7.Return the button. Quickly return to the previous interface or exit the current feature.

8.Power button. Long press for 2 seconds to start power, long press for 2 seconds to shut down.

9.Single key shuttle, with RGB color backlight.

You can quickly adjust the cursor position, adjust the value, the key is equivalent to "confirm" key.

10.RS232 communication interface, optional RS485 communication interface.

11.Excellent disk interface. To store test data and instrument upgrade firmware files, use FAT or FAT 32 format disks.

12.Power interface. Built-in charger AC power input, built-in 250V 2A fuse.

13. charge lamp.

Red: in charge; green: full.

The built-in charger has the maximum charging time limit of 5 hours. Once the charging time exceeds 5 hours, the charging function will be automatically turned off, and the charging indicator light will go off.

## VI. Operation And Use Instructions

### 6.1 Test the wiring

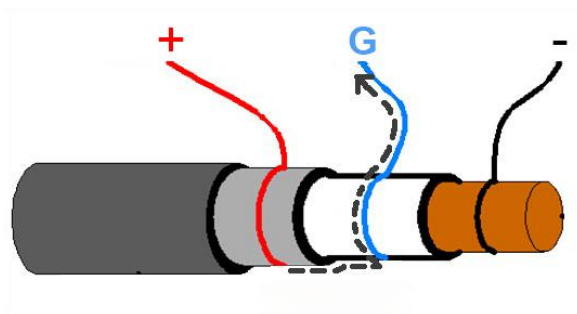
#### 6.1.1 Wiring terminals

There are three sets of test terminals here:

- They are the test power supply "+" positive electrode output terminal group, 1 wiring terminal;
- Test power supply "-" negative output terminal group, 2 terminals, the above terminal is the shielding layer terminal, the following terminal is the test power supply "-" negative output terminal, current in the test power supply "-" negative output terminal measurement;
- GUARD (protective ring) terminal set, 1 terminal, used to eliminate the influence of test surface leakage current on the test results.

#### 6.1.2 GUARD (Protection ring) for the use of the terminals

The GUARD terminal and the negative output terminal of the test power supply; because the leakage resistance is actually in parallel with the measured resistance, the GUARD (protection ring) is used to divert the leakage current through the surface of the current, so that it cannot enter the current detection circuit, thus improving the measurement

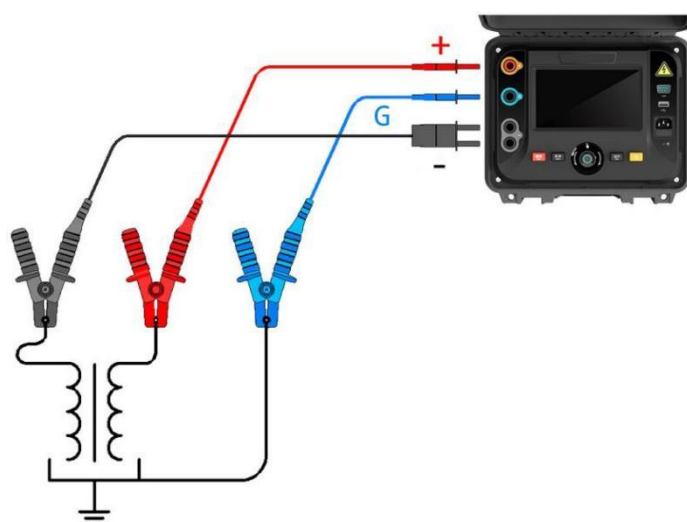


accuracy of the insulation resistance value. When the test voltage is high and the test insulation resistance is high, the GUARD terminal is recommended.

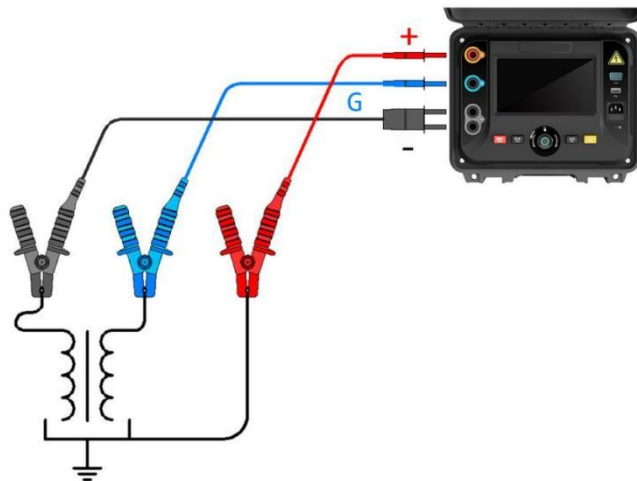
### 6.1.3 Test the wiring

In order to eliminate the influence of the surface leakage resistance of the test product such as transformer and cable, the three-line test method can be used, but do not ground the "-" terminal used for current measurement. When the test voltage is low and the insulation resistance of the test article is small, the GUARD terminal is not required.

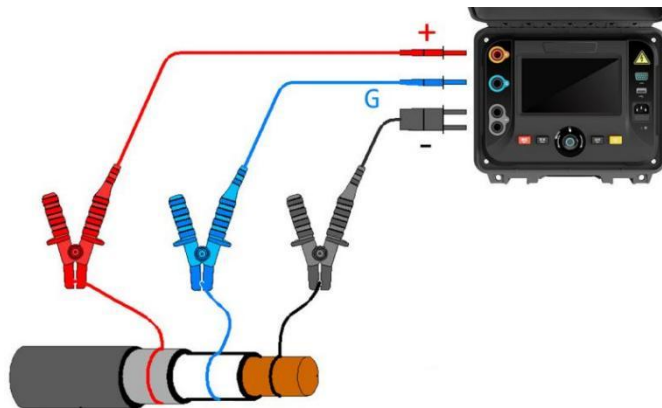
- When measuring the insulation resistance between the GUARD terminal shall be connected to the transformer oil tank.



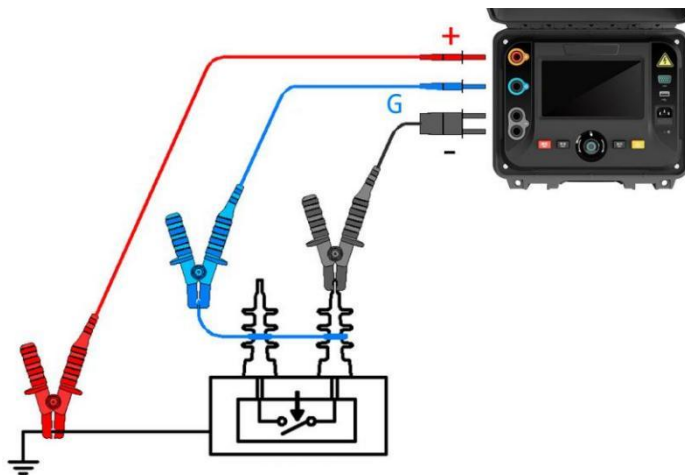
- When measuring the insulation resistance between the transformer winding and the transformer fuel tank, the GUARD terminal shall be connected to the winding not tested.



- When measuring the insulation resistance between the cable conductor and the cable sheath, see the following figure around the conductive metal foil or wire on the insulator and connect to the instrument GUARD terminal.



- When measuring the insulation resistance of the high-voltage circuit breaker, the GUARD terminal shall be connected to the terminal insulation body of the circuit breaker.



## 6.2 Use Operation

### 6.2.1, switch machine operation

- Long press the power button for 2 seconds to start up and close down.
- The instrument has automatic shutdown function, which can be closed and the automatic shutdown time can be set; start the automatic shutdown function, when the instrument is idle for a certain time.
- This instrument has the function of automatic shutdown with low power. When the battery power is exhausted, it will automatically stop the test process and automatically shutdown the operation.

**Note: In all of the above cases, the display screen will display the corresponding prompt information.**

### 6.2.2 Test operation

Press the "Test" key on the standby interface (test parameter setting interface) for 2 seconds to enter the test data display interface and start the test; press the "Test" button or "Return" button to start the test again.

### 6.2.3 Status bar

The status bar is located at the top of the display screen, and is used to display the current date, current time, peripheral working status, battery information, etc., as shown in the following figure:



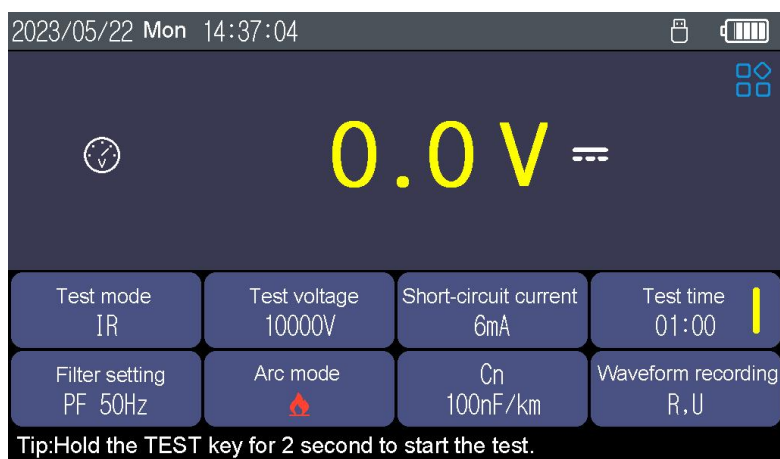
A Schematic diagram of the top status bar

| icon                                                                                | instruction                                                                                                                                                                                                                                       |
|-------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|  | Instrument control status icon. This icon is displayed when the control of the instrument is deprived by the APP.(This function is limited to instruments with APP functions)                                                                     |
|  | Test record view icon. The current instrument interface displays the icon in the test record query interface; When viewing the test record collective data, the icon flashes to remind the user that the test record data is currently displayed. |
|  | GPS positioning icon. This icon is displayed when the instrument has                                                                                                                                                                              |

|                                                                                     |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |
|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|                                                                                     | successfully received the satellite signal and located it successfully.(This function is limited to instruments with GPS positioning )                                                                                                                                                                                                                                                                                                                                                                                                                      |
|    | GPS antenna fault icon. This icon flashes up when the built-in GPS antenna fails.(This function is limited to instruments with GPS positioning )                                                                                                                                                                                                                                                                                                                                                                                                            |
|    | Successful wired communication connection icon. This icon is displayed when the instrument wired communication interface is successfully connected to the external device.                                                                                                                                                                                                                                                                                                                                                                                  |
|    | The Bluetooth connection is a successful icon. This icon is displayed when the instrument is successfully connected to the external device via the Bluetooth interface.                                                                                                                                                                                                                                                                                                                                                                                     |
|    | Disdisk insert icon. This icon is displayed when the disk is inserted into the instrument USB interface and initialized successfully.                                                                                                                                                                                                                                                                                                                                                                                                                       |
|   | Battery charging icon. This icon is displayed when the instrument is connected to the AC power supply and the charging function is normal.                                                                                                                                                                                                                                                                                                                                                                                                                  |
|  | <p>Battery level icon. Displays the current power level of the built-in battery and its charging status.</p> <p>When the battery level is low, the icon flashes.</p> <p>The outer frame is shown in red when the battery is charged.</p> <p>When the battery is full, the outer frame is green.</p> <p><b>Note: Charging is carried out in the power-on state. Due to the standby current of the instrument, the charger cannot reach the full state. At this point, after shutting down, the charger will immediately enter a fully charged state.</b></p> |

#### 6.2.4 Voltmeter function and insulation resistance test parameter setting

After the instrument is started, enter the standby interface, where the instrument works in the voltmeter mode, and the insulation resistance test parameters can be set, see the following figure:



**Single-key shuttle, touch, key to operate this display:**

**Rotate the single key shuttle can control the focus position of the display interface, and press the single key shuttle to confirm the operation.**

click  icon or short press the "menu" button to enter the main menu interface.

**Long press the "Test" key for 2 seconds to start the test process and enter the test data display interface.**

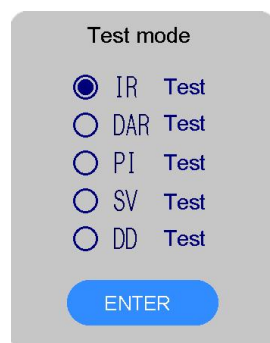
● **voltmeter:**

The voltmeter function can automatically measure the AC voltage value or the DC voltage value input by the "+" terminal and the "-" terminal;

When the measured voltage is a DC voltage, the DC voltage symbol and its positive and negative polarity are displayed;

When the measured voltage is the AC voltage, the AC voltage symbol and its frequency value are displayed; when the AC voltage signal frequency exceeds the range, the frequency is displayed as "----".

● **Set of the insulation resistance test parameters**



① **Test mode:** Select the test mode, click this option to pop up the test mode selection operation interface, see the left picture:

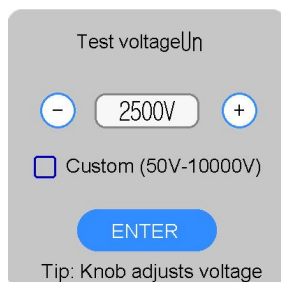
**IR test:** conventional insulation resistance test mode; automatically judge whether to conduct DAR test and PI test according to the set test time.

**DAR test:** absorption ratio test mode;

**PI test:** polarization index test mode;

**SV test:** Stepper voltage test mode;

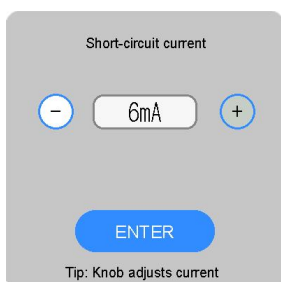
**DD test:** Dielectric discharge rate test mode.



② **Test voltage:** Set the test voltage value, click this option to pop up the test voltage setting operation interface, see the left figure:

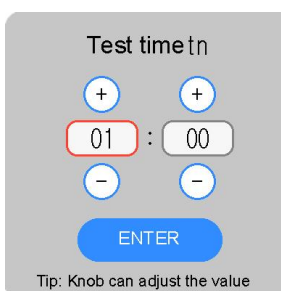
It has 7 fixed voltage test gears, namely: 100V, 250V, 500V, 1000V, 2500V, 5000V and 10000V.

When selecting the custom test voltage mode, the step voltage value of touch operation is 10V; the step voltage value of single key shuttle operation is 10V, 100V and 200V variable, the faster the single key shuttle speed, the greater the fast step value.



③ **Short circuit current:** Set the maximum output current value. Click this option to pop up the short circuit current setting operation interface, see the left figure:

The short circuit current can be adjusted from 1 mA to 6 mA and step into 1 mA.



④ **Test time:** Set the test time. Click this option to display the test time setting operation interface, see the left picture:

The test time can be adjusted in the range of 10 seconds to 99 minutes.

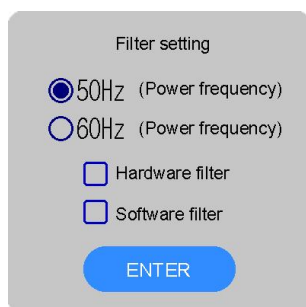
The test time in various test modes is saved independently without affecting each other for the next use.

**IR test mode:** conventional insulation resistance test mode; when the test time set is greater than or equal to DAR test, DAR test will be conducted automatically, and DAR results will be displayed after the test.

**DAR test mode:** the test time can not be set, fixed for 1 minute.

**PI Test mode:** The test time cannot be set, fixed for 10 minutes.

**Note:** When the yellow mark on this option is lit, the test time can be set; otherwise, the test time is fixed and cannot be set.



⑤ **Filter setting:** set the hardware and software filter parameters, click this option to pop up the filter setting operation interface, see the left figure:

**Power frequency setting:** set the working frequency of the power frequency power system, and the hardware filter system and software filter system will filter the frequency interference signal (50Hz fixed selection for domestic applications, and foreign applications according to the frequency value of the power system).

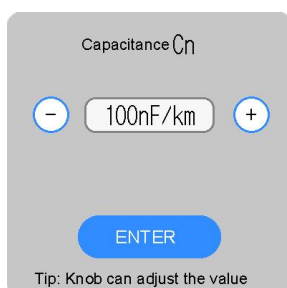
**Hardware filter:** The instrument has a built-in special hardware filter, which can be enabled when the external interference is very large or the test data is unstable.

**Software filter:** Set whether to enable the software filter to further filter out the interference signals.

⑥ **Breakdown mode, and arc burning mode:**

**Breakdown mode:** once the insulation breakdown of the test article occurs during the test process, the instrument will automatically stop the test process and prompt "test article breakdown".

**Arcing mode:** This mode is used for insulation damage positioning. During the test process, the instrument will continue to output voltage and current, generating an arc in the insulation damage position; it can be roughly located through the sound of the arc burning.



⑦ **Cn (cable rated capacity) setting:** Set the rated electric capacity per kilometer of the tested cable. Click this option to pop up the Cn setting operation interface, see the left figure:

Because the instrument has the function of measuring the electrical capacity of the test article, when the rated electric capacity of the cable per kilometer is known, the approximate length of the measured cable can be calculated according to the measured electric capacity of the test article and the rated electric capacity of the set cable per kilometer.

**⑧ waveform recording:**

To set the data type recorded by waveform recording function during insulation resistance test; choose to record insulation resistance value, voltage value (R, U), or record insulation resistance value and current value (R, I).

(The Waveform recording function is under development, so stay tuned! The instrument firmware can be upgraded through the disk.)

**6.2.5, the main menu operation**

The main menu can select four functional modules: "Insulation Test", "Record Query", "Clock Settings" and "System Settings".

Insulation test: Select this function module and enter the design interface of insulation resistance test parameters;

Record query: Select this function module for viewing, editing, and exporting the saved test data;

Clock setting: select this function module to set the built-in real-time clock;

System Settings: Select this function module to view the basic information of the instrument, instrument setting, firmware upgrade, etc.

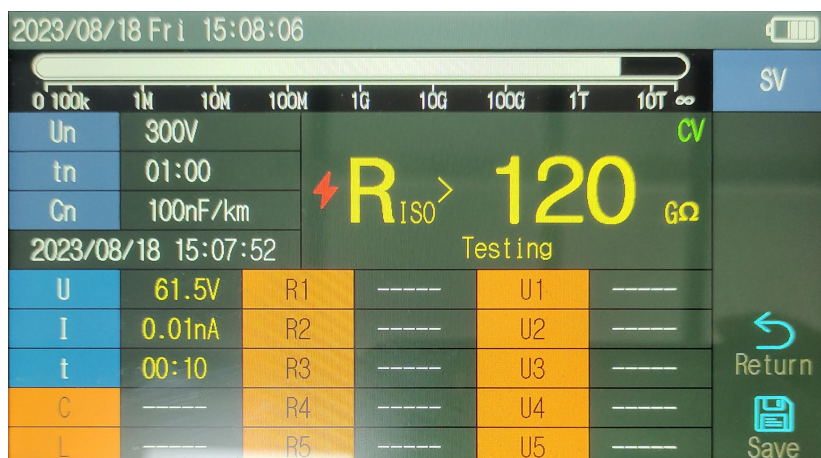
**6.2.6 Insulation resistance test****Safety tips:**

- Before the insulation resistance test wiring, it should be confirmed that the test article is charged, even if the test article has been powered off. If the induction voltage is too high, it will threaten the personal safety of the operator, and the operation must be conducted in accordance with the safety procedures.

- The instrument with a voltmeter function can be used to measure the charge of the test article, and the measured voltage value should be within the measurement range specified in the voltmeter. When the measured voltage value is too high, the instrument will seriously heat up and even cause the instrument to burn out.

- After the test is stopped or completed, switch the instrument to voltmeter mode to check the electrification of the test; the test line can be removed after the test discharge is discharged.

Press "test" for 2 seconds on the insulation resistance test parameter setting interface, then enter the test data display interface and start the test, see the following figure:



Short press Test or Return on this interface will manually stop the test; long press Test for 2 seconds will start the test again. At the beginning of the start test, the high voltage power supply is in a soft start state, the instrument discharges the external test. The test button and the single key shuttle backlight is red and the beep... sounds from the buzzer. When entering the normal test state, the "test" button and single key shuttle backlight are red and flicker once per second, and the buzzer emits a "beep..." sound per second.

#### Display the data description:

##### • Insulation resistance diagram and test mode



The current and finally measured insulation values are displayed as a analog graph, with the set test mode.

##### • Test the parameter settings

|                     |          |
|---------------------|----------|
| Un                  | 1000V    |
| tn                  | 10:00    |
| Cn                  | 100nF/km |
| 2023/05/23 14:07:50 |          |

Un: Set the test voltage value;

tn: Set up the test time of;

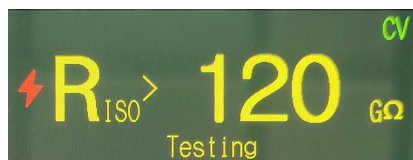
Cn: Set the rated electric capacity per kilometer of the cable;

Test start date and time.

show The data item of the icon indicates that the data item can be adjusted; after clicking the corresponding data item, the data item is displayed to indicate the value

editing state. During the normal test of the insulation resistance, the test voltage can be adjusted (single key shuttle operation) or per km (single key shuttle operation).

● **Real-time insulation resistance value and test status**



Display the measured real-time insulation resistance value, high voltage test power supply working state, insulation resistance test state and

test voltage value when the test is completed.

① When the real-time insulation resistance exceeds the full scale range, > Full scale Resistance is displayed.

② High voltage test power supply working status:

| icon | instruction                                                                                                       |
|------|-------------------------------------------------------------------------------------------------------------------|
|      | The flashing display icon indicates that the high-voltage power supply is in operation.                           |
|      | The flashing icon indicates that the insulation breakdown occurred and the test is stopped.                       |
|      | This icon indicates the insulation breakdown arc of the test article, and the test is ongoing.                    |
| CV   | This icon indicates that the high voltage test power supply is currently in a constant voltage output state.      |
| CC   | This icon indicates that the high voltage test power supply is currently in a constant current output state.      |
|      | This icon indicates that the high voltage test power supply has an overtemperature fault and the test is stopped. |

③ Display the current test status prompt information during the insulation test, and display the test voltage value when the test is completed.

● **Real-time test data and the final test data**

|   |         |       |         |     |         |
|---|---------|-------|---------|-----|---------|
| U | 0.0V    | R15s  | 1.77TΩ  | DAR | 1.10    |
| I | 0.00nA  | R60s  | 1.94TΩ  | PI  | ----    |
| t | 10:00   | R600s | >4.00TΩ | DD  | 0.03    |
| C | 5nF     |       |         | tdd | 01:00   |
| L | 0.060km |       |         | Idd | -0.18nA |

U: DC-voltage value measured in real time.

I: The real-time measured DC voltage value, the output current and the negative value are the test discharge current.

t: Test the time timer.

C: Test capacity.

L: Estimate cable length.

R15s: Test insulation resistance value of test timer at 15 seconds.

**pay attention to:When " System Settings"→"Device Settings"→"DAR pattern" set to "R60S / R30S", This identification displays "R30s" and the test time timer reaches 30 seconds.**

R60s: Test insulation resistance value of test timer at 60 seconds.

R600s: Test insulation resistance value of test timer at 600 seconds.

DAR: Absorption ratio values.

PI : polarization index.

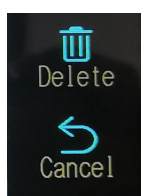
tdd: DD 1 min timer during dielectric discharge rate test.

ldd: DD Dielectric discharge rate test test discharge current value after 1 minute of discharge.

**pay attention to:**

- 1. Whether the values of R 15s, R30s, R60s, R600s, DAR, PI, DD, tdd and ldd are displayed, and whether the set test mode and the test time meet the requirements.**
- 2. When the insulation resistance values of R 15s, R30s, R60s and R600s are range, the relevant DAR and PI values cannot be calculated and "- - -" will be displayed.**
- 3. The R 1 to R 5 and U 1 to U 5 values will be displayed in the SV test mode.**

● **Operation function button**

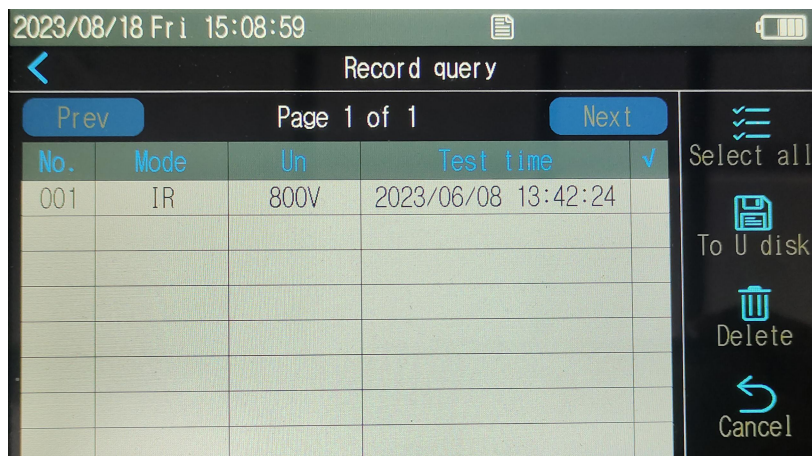


These two are only used in the test stop or the test completion; Return Settings can return to the insulation resistance test parameter setting interface; and Save data is used to save the current test data to the built-in memory or external disk.

## 6.2.7 Record query

Functions of the test record query interface:

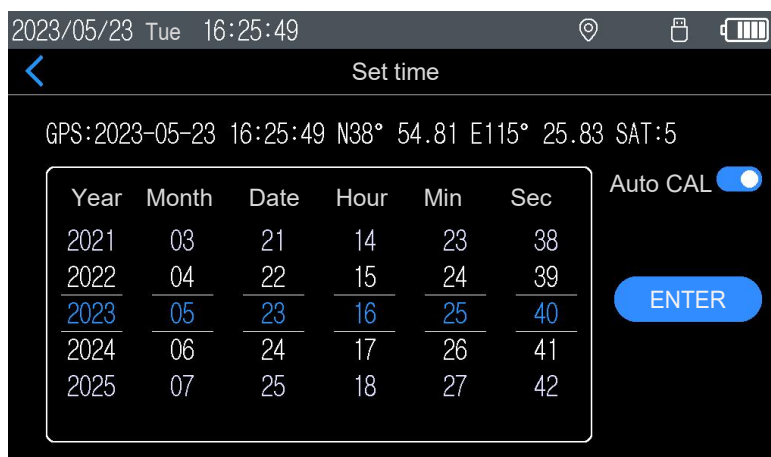
- View the saved test records;
- Batch deletion of saved test records;
- Transfer the saved test records to the external optimal disk in batch.



Click a single test record to view its detailed test data; press a single test record into edit mode, select multiple test records and delete them or save disk operation.

## 6.2.8 Clock setting

The clock setting interface is shown in the following below:



The date and time can be adjusted by touch and sliding, or by using a single-key shuttle.

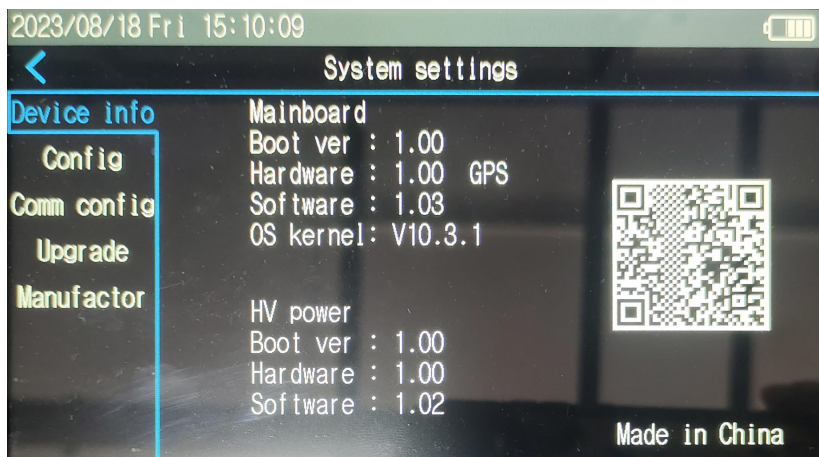
For models with GPS function, if the GPS time is obtained or located successfully, the GPS time, longitude, latitude and current number of satellites will be displayed. And, it can be set to automatically calibrate the instrument time by GPS time.

Note: If the instrument display language is set to Chinese, the default time zone UTC is East 8 and automatically calibrated at this time; If the instrument display language

is set to English, automatically calibration through the specific time zone located by GPS.

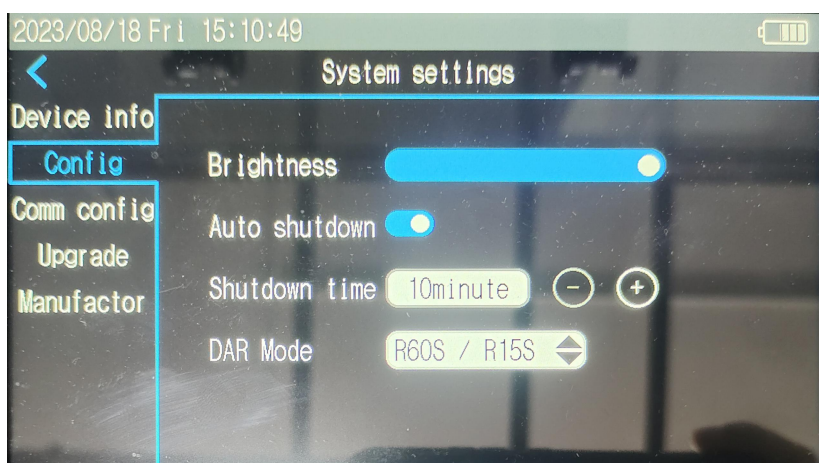
### 6.2.9 System Settings

- facility information



Can view the main control system and high voltage power supply hardware and software version number.

- **Device Settings**



Single-language models do not have a language selection option.

- Firmware upgrade is used to upgrade the main control system firmware and high voltage power firmware; the manufacturer is set up for commissioning and is not open to users.

## VII. Detailed Explanation Of The Test Mode

### 7.1 IR test mode

Conventional insulation resistance test mode; automatically judge whether to perform DAR test and PI test according to the set test time, this mode will not automatically

perform DD dielectric discharge rate test.

## 7.2 DAR absorption ratio test mode

The fixed test time of the DAR absorption ratio test mode is 1 minute, and the calculation formula of the domestic standard is:

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

Where: -- Insulation resistance value at the 15th second after the start of the test;

-- Insulation resistance value 60 seconds after the start of the test.

The following calculation formula is more popular in the world:

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

Where: -- Insulation resistance value at the 30th second after the start of the test;

-- Insulation resistance value 60 seconds after the start of the test.

The calculation mode of DAR absorption ratio can be set by "System Settings" → "Device Settings" → "DAR mode".

## 7.3 PI polarization index test mode

The PI polarization index test was 10 min and calculated by the formula:

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

Where: -- Insulation resistance value at the 60th second after the start of the test;

-- Insulation resistance at 600th second after the start of the test.

## 7.4 SV step voltage test mode

SV stepping voltage test mode divides the set test voltage value and test time into 5 equal parts, that is, stepping voltage value and stepping time value. The whole test process is divided into five steps, and the test voltage value is gradually increased according to the calculated voltage step value and time step value.

The lowest output voltage value of this instrument is 50V, so the SV stepping voltage test mode, the calculated stepping voltage value should be greater than or equal to this value; Otherwise, the initial step is tested according to the lowest 50V voltage value.

Note: When the test voltage value and test time value are calculated in 5 equal parts, they are integer operation without decimal part. In order to achieve the expected test effect, the test voltage value and test time value had better be set to an integer multiple of 5.

### 7.5 DD dielectric discharge rate test mode

The DD dielectric discharge rate test is a diagnostic insulation test performed after the insulation resistance measurement is completed. It is common to connect the insulation to the test voltage for 10 min to 30 min and then discharge it before performing the DD test. After 1 min, the discharge current was measured to detect the charge reabsorption of the insulation. A HIGH REABSORPTION CURRENT INDICATES that the insulation layer is contaminated (mainly due to moisture). This test mode is suitable for diagnosis of multi-layer insulation. It is calculated as follows.

$$DD = \frac{I_{dis\ 1min}}{U \times C}$$

In the formula:  $I_{dis\ 1min}$  --- Current value after conventional discharge for 1 min,  
unit: nA

-- Measured electrical capacity, unit: uF

-- Test voltage value, unit: V

| DD<br>numeric<br>value | < 2  | 2 - 4             | 4 - 7 | > 7      |
|------------------------|------|-------------------|-------|----------|
| Insulation<br>state    | good | Slightly<br>worse | poor  | Very bad |

## VIII. Packing List

| No. | Item                               | Qty |
|-----|------------------------------------|-----|
| 1   | Tester host                        | 1   |
| 2   | P-wire(Red, blue and black 1 each) | 3   |
| 3   | Three core power cable             | 1   |
| 4   | Fuse pipe (2A)                     | 3   |
| 5   | Instructions                       | 1   |
| 6   | Test report                        | 1   |