

East Tester®

**ET51X Series DC Low Resistance
Tester
User Manual**

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Chapter 1 Precautions

1.1 Check Items Inside the Package

After receiving the product you've purchased, please check it first.

Please check it in accordance with the list provided. If there are any items missing, please contact our company or the distributor to protect your rights.

List	
Instrument	1 unit
Power Cord	1 piece
Test Line	1 piece
User Manual	1 copy
Certificate of Conformity/Warranty Card	1 copy

1.2 Precautions

1.2.1 Conditions of Use

- 1) Temperature and humidity range: Temperature: 5 to 40 °C, Humidity: Below 80% RH (without standing water or condensation).
- 2) Temperature and humidity range ensuring accuracy: Temperature: 23 ± 5 °C. Humidity: Below 80% RH (without standing water or condensation).
- 3) The instrument should be stored and operated away from the following environments to avoid inaccurate measurement results or instrument accidents:

Environments with excessive dust;

Excessively high or low temperatures;

Direct sunlight;

Strong electrical and magnetic fields;

Objects or attachments with electric charge or generating noise;

Environments with significant vibration;

Damp or environments with condensation/standing water;

Environments containing corrosive gases or other hazardous gases;

Environments where the instrument is prone to falling due to a

certain tilt angle;

The instrument should be used in a stable, dust-free, shaded and dry environment.

1.2.2 Power Supply

The power supply voltage ranges from 100 to 240V, with a power supply frequency of 50/60Hz and a power of <15VA.

1.2.3 Precautions during Testing

- 1) Safety should always be the top priority under any circumstances.
- 2) Do not use power sources with voltages outside the specified range.
- 3) Preheat the instrument for ten minutes before use to ensure the stability of the internal parameters of the instrument.
- 4) Do not measure objects while they are live. If measurement is necessary, please first disconnect the power supply part of the object being measured (measuring the internal resistance of the power supply is prohibited!)
- 5) Measuring with wet hands is prohibited.
- 6) Other operations that may result in instrument malfunction.

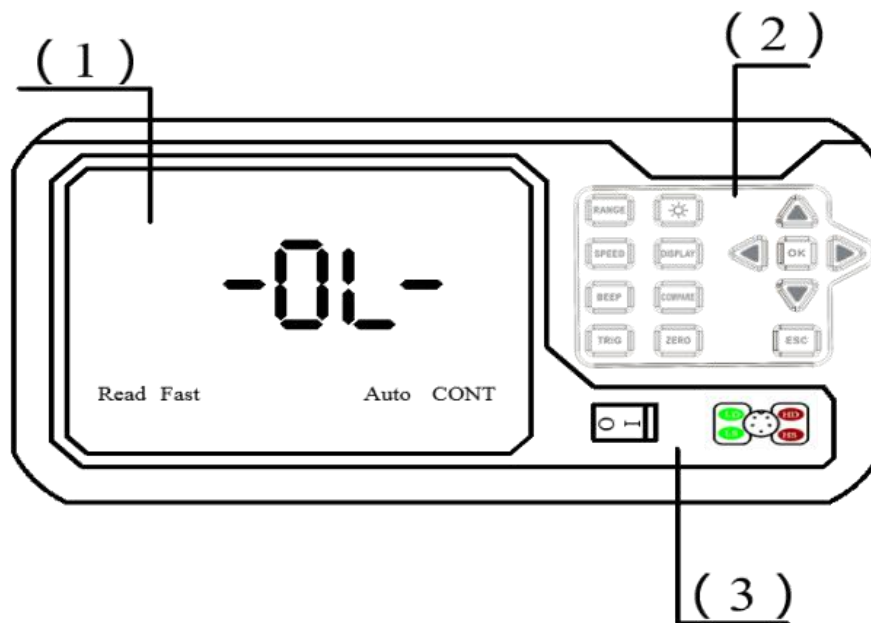
Chapter 2 Product Overview

2.1 Product Description

The ET51X series DC low resistance tester is designed for measuring various DC medium and low resistances, including winding resistances found in transformers, contact resistances in relays, conductor resistances in cables, interconnection resistances between metal components, as well as various other types of DC resistances in fuses, conductive rubber, etc. The ET51X features a large LCD display with clear readability. The measuring range spans from 20m Ω to 20k Ω (2M Ω optional), with seven ranges (nine ranges optional) adjustable. This product also comes with the sorting and sorting result output functions, making it suitable for production line testing. It also supports interface communication and control, with standard HANDLER and RS232 interfaces, facilitating communication with PCs, PLCs, and other host computers (RS485 interface available as an optional feature).

2.2 Introduction to Product Functions

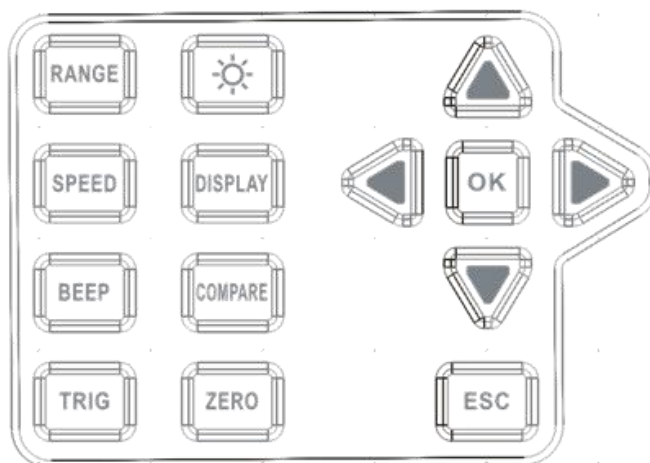
1. Introduction to the Front Area



(1) Interface Display Area

It displays measurement data and the current function status.

(2) Function Button Area



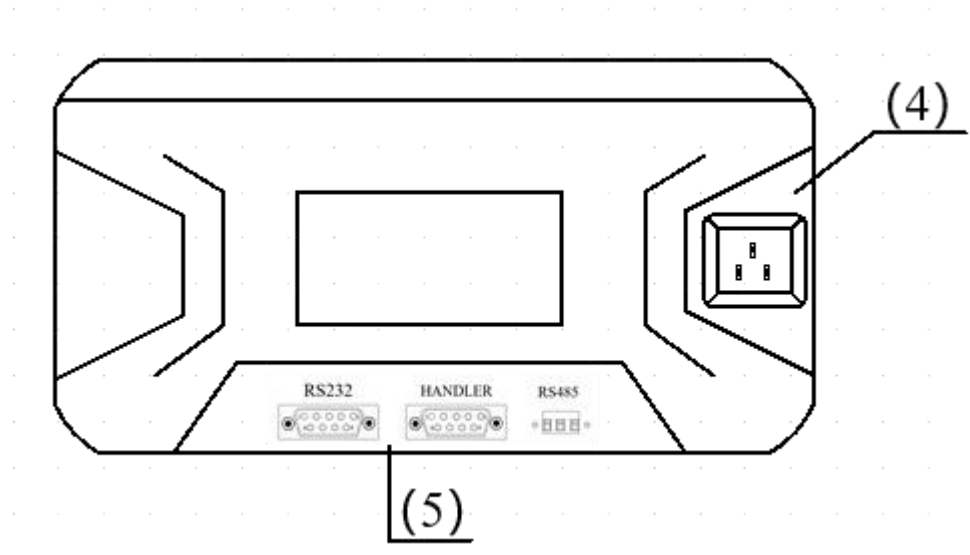
It includes Range, Backlight, direction buttons, and other function

buttons.

(3) Power and Wiring Area

Power switch and test probe terminal.

2. Introduction to the Back Area



(4) Power Terminal

It is designed for connecting three-core power cord.

(5) External Communication Interface

Available interfaces are RS232, RS485, and HANDLER, with RS485 being an optional feature.

2.3 Product Specifications

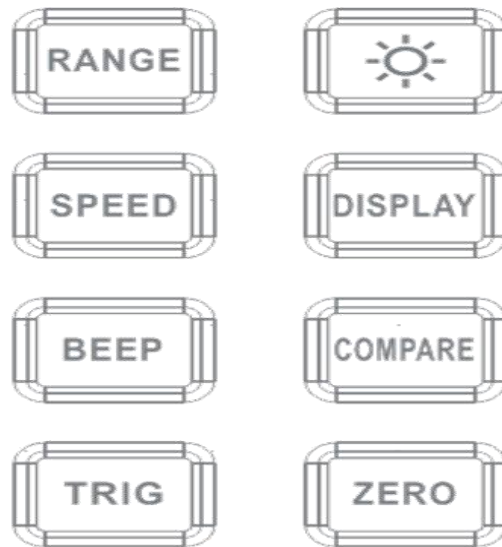
2.3.1 Technical Specifications

Model	ET510	ET511	ET512	ET513
Measurement Range	0~ 5k Ω	0~ 20k Ω	0~ 200k Ω	0~ 2M Ω
Basic Accuracy	0.1% Reading+ 3 digits (Minimum resolution: 10u Ω)			
Maximum Test Current	100mA			
Display Mode	Direct reading/percentage			
Test Speed	Slow: 8 times/s, Fast: 15times/s			
Sorting Function	Standard			
Test Method	Four-wire			
Trigger Mode	Internal/Manual/External			
Open Circuit Voltage	<5V			
Range Mode	Auto/Locked			
External Interface	Standard: RS232 interface, HANDLER interface, Optional: RS485 interface			
Operating Environment	Temperature: 5°C~40°C, Humidity: <80%RH			
Dimensions (L * W* H)	230 * 30 * 122 (unit: mm)			
Power Consumption	<15VA			

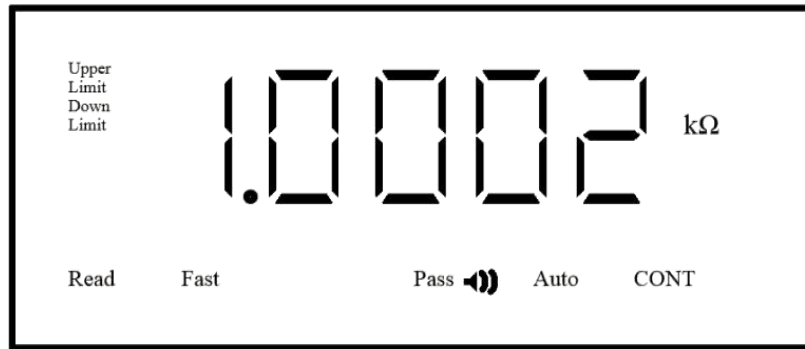
Range	20m Ω	200m Ω	2 Ω	20 Ω	200 Ω	2k Ω	5k Ω	20k Ω	200k Ω	2M Ω
Test Current	100mA	100mA	10mA	1mA	100uA	100uA	100uA	100uA	10uA	1uA
Resolution	10u Ω	10u Ω	100 u Ω	1m Ω	10 m Ω	100 m Ω	1 Ω	1 Ω	10 Ω	100 Ω

2.4 Introduction to the Button Area

2.4.1 Function Buttons




- 1) Range Button (RANGE): For choosing either the Auto or Locked mode. In the Locked mode, please adjust the range size using the left/right or up/down buttons.
- 2) Speed Button (SPEED): For switching measurement speed.
- 3) Beep Button (BEEP): For choosing whether the Buzzer sounds under U_H_Lim/Pass/D_L_Lim conditions, or disable the beep function. Note! The beep function can be enabled only after the upper and lower limits are activated. As shown in the diagram below, the beep in Pass mode is enabled.



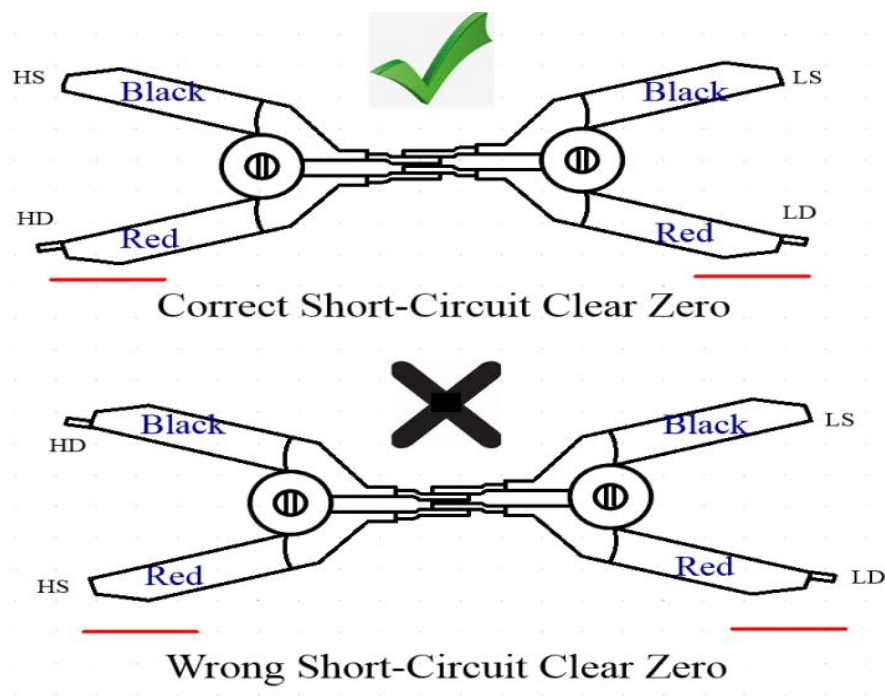
Note: "U_H_Lim" indicates values exceeding the upper limit, "Pass" indicates values falling within the upper and lower limits, and "D_L_Lim" indicates values smaller than the lower limit.

- 4) Trigger Button (TRIG): For switching between continuous and single trigger mode. Continuous triggering involves continuous measurement, while single triggering requires selection between manual and external triggering. For manual triggering, simply press the trigger button to initiate a single measurement. To switch back to continuous mode, press and hold the trigger button for 1 second. External triggering requires connection to external communication for triggering via an external signal, as detailed in the external interface section.

- 5) Backlight Button (): For enabling/disabling the backlight.
- 6) Display Button (DISPLAY): For adjusting display mode between direct reading/percentage.
- 7) Sorting (Comparison) Button (COMPARE): For setting the upper and lower limit values in the direct reading/percentage modes.

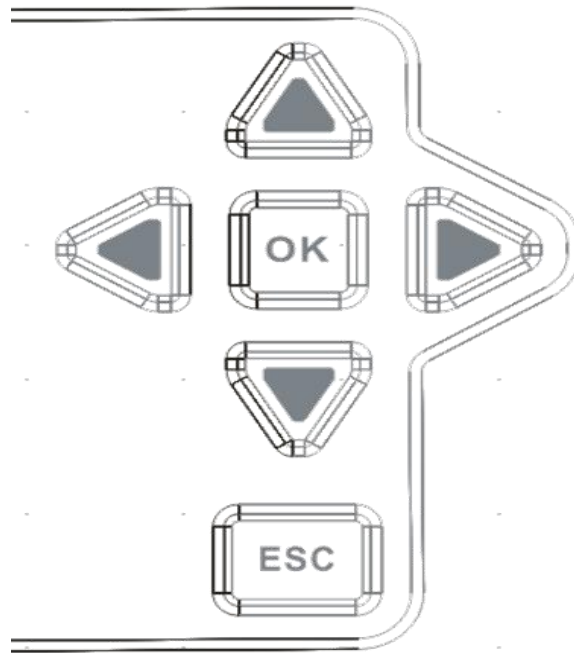
After activation, the set values are preserved even in the event of power outage, but the Sorting function must be re-enabled to start the comparison process.

- 8) Zeroing Button (ZERO): Zeroing is generally not required, but it can be activated using the ZERO button. Before pressing the button, please ensure the two test leads are connected as depicted in the diagram below:



After ensuring the wires are properly connected, press the zero key and wait a few seconds for the zeroing function to take effect.

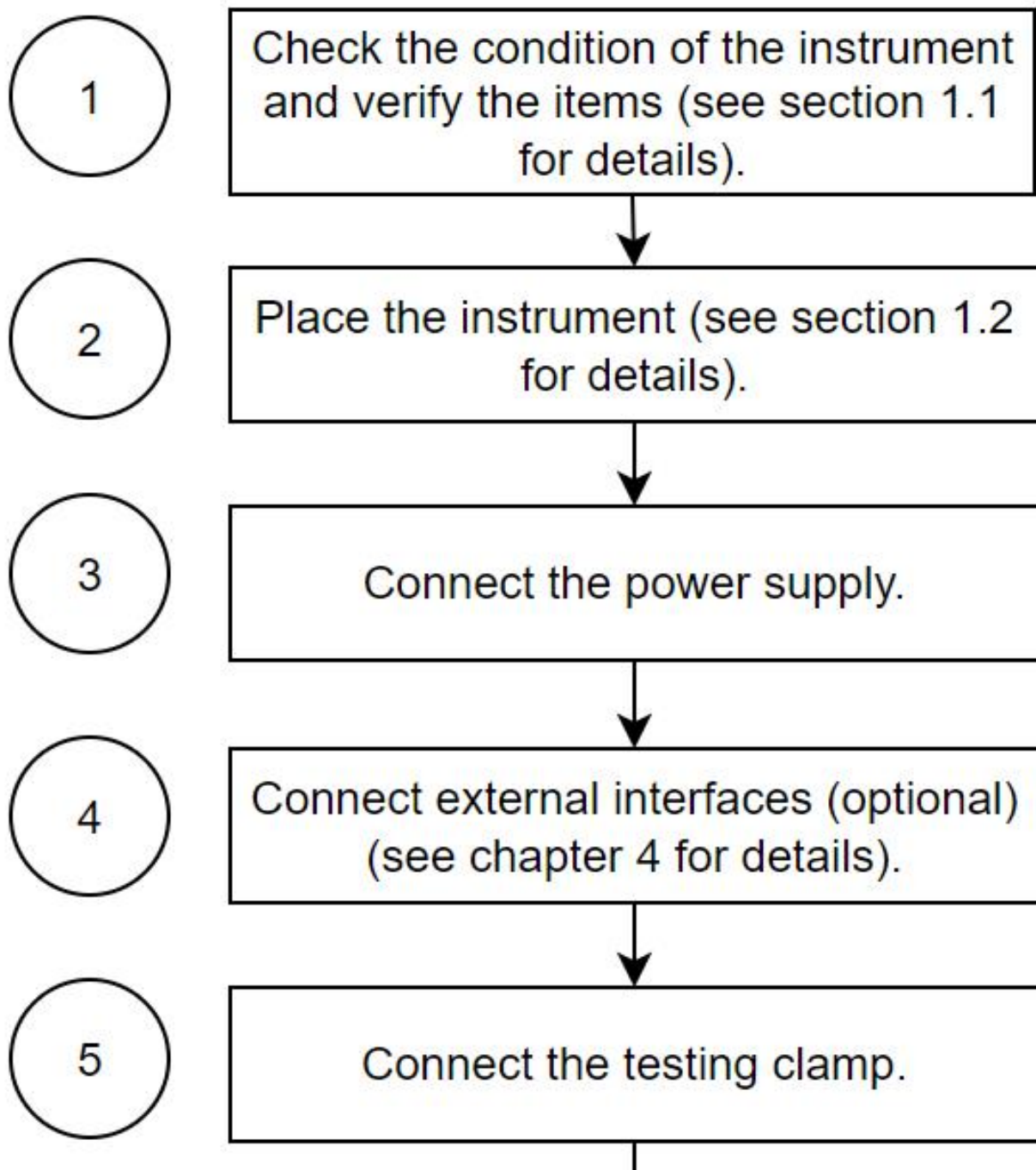
2.4.2 Direction Button Area

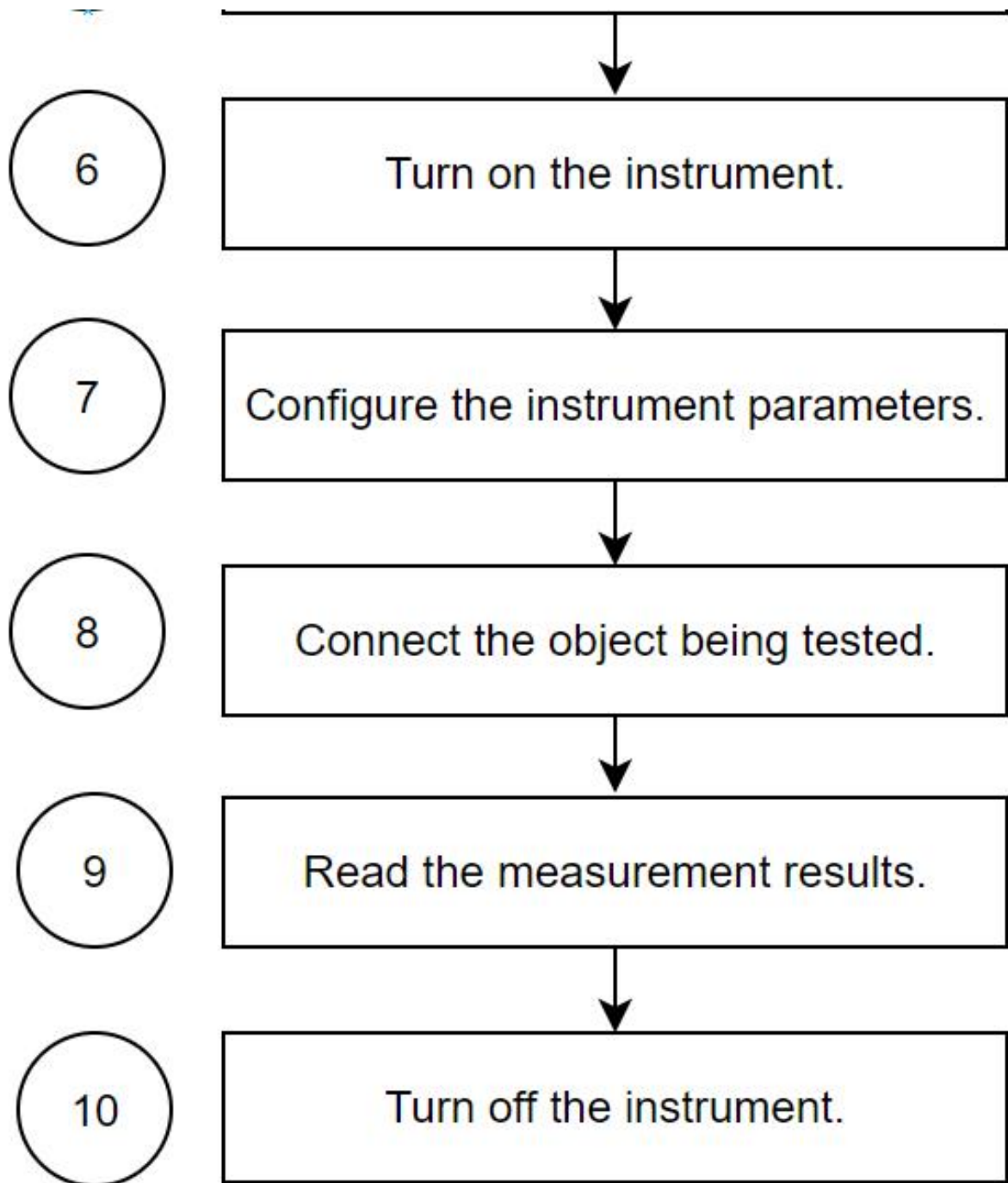


The Direction Button Area comprises direction buttons, an OK button and an ESC button. The direction buttons are designed for navigating the cursor (depicted as a triangle) in functional mode and adjusting the cursor (numerical values in flashing mode) within parameters.

Chapter 3 Measurement Operations and Sorting Settings

3.1 Test Flow Chart

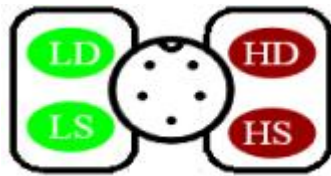




3.2 Introduction to Key Steps

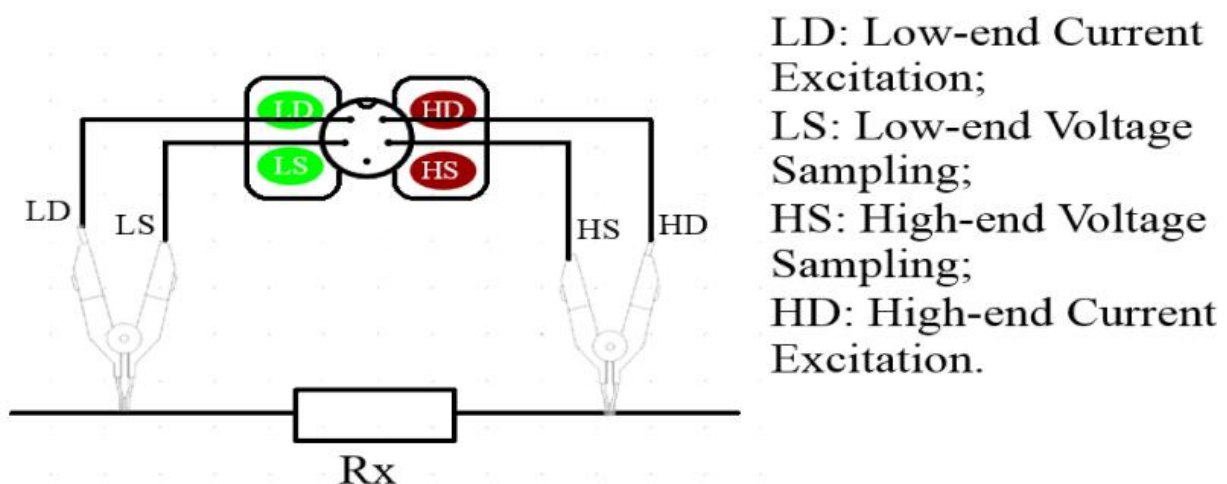
3.2.1 Connect Test Clips

Align the test lead with the notch on the test end (as depicted below) and then connect it.



3.2.2 Connect the Tested Object

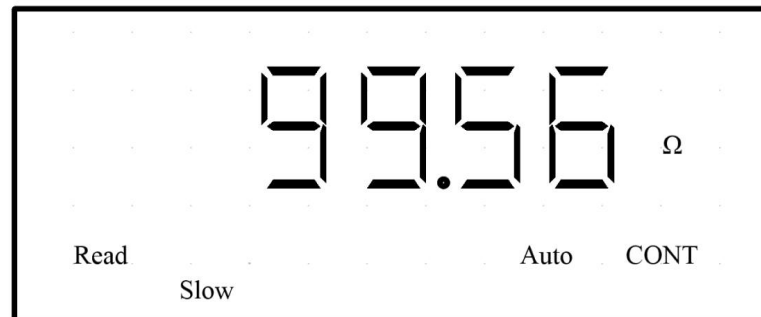
Clip the two jaws of the Kelvin clip onto both ends of the tested object (Rx), and then make the connection as illustrated in the diagram below.



Rx: The resistance of the tested object.

3.2.3 Read Measurement Results

In continuous trigger mode without the sorting function being enabled, measurement results can be read directly from the display screen as shown below:



In single trigger mode with 232/485 connected, results can be read through the obtained return values.

3.3 Sorting Settings

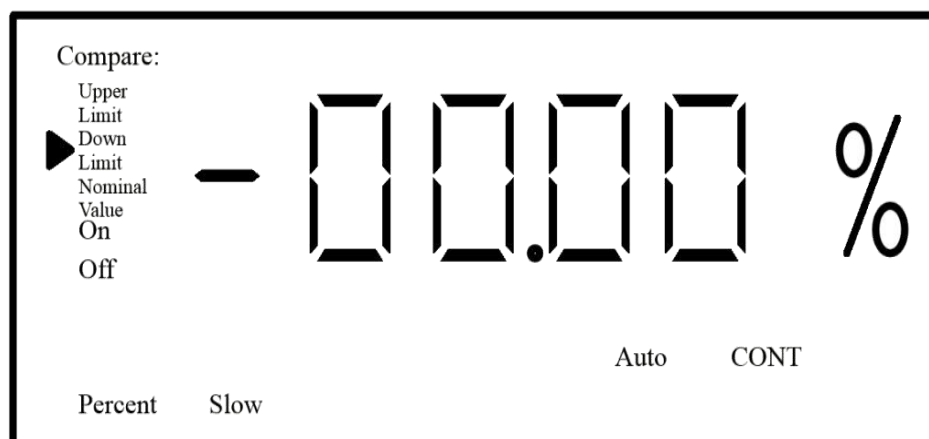
3.3.1 Data Display Status

The sorting function offers two data display modes: direct reading (direct display) and percentage (displaying relative values in percentage). The percentage mode becomes functional only after nominal values have been configured. This product also features a sorting output function (see external interface for details). Once upper and lower limits/nominal values are configured, the sorting results can be output to external devices through the interface during measurement. The percentage display range from -99.99% to 99.99%.

3.3.2 Nominal Resistance Deviation Percentage

In percentage display mode, users can set nominal resistance values to display the deviation percentage between the resistance and the nominal value, and can also set the upper and lower percentage limits within the sorting function. By default, configuration starts from the least significant bit, with the most significant bit reserved for symbol display. Positive values are displayed as " " ("_" in settings) and negative values are displayed as "-". These values are used to determine whether the deviation percentage of the measured resistance from the nominal resistance exceeds the preset upper and lower percentage limits. The formula for deviation calculation is:
$$\frac{\text{Measured Resistance} - \text{Nominal Resistance}}{\text{Nominal Resistance}} * 100\%$$

Note: This function is only accessible in percentage display mode, and the upper percentage limit must be greater than the lower percentage limit.



3.3.3 Sorting Steps

(1) Press the "Display" button to set the display mode. After selecting the percentage, it will directly navigate to the nominal value settings in the comparison function. Press the OK button to sequentially navigate the Upper Limit, Lower Limit, and Enable. In the case of direct reading mode, users need to press the sorting button.

(2) Press the "sorting" button to set the upper/lower limits, nominal value, and enable/disable the sorting function. Use the "↑" and "↓" buttons to navigate through the options, and then press the "OK" button to confirm the selection.

(3) If the upper/lower limit function/nominal value is selected, the digits in the LCD will display "00000", in which the flashing digit/unit represents the currently modified value. Press the "←" and "→" buttons to select the numerical value, decimal mark, and unit to identify the flashing position to determine which digit is being modified. Press the "↑" and "↓" buttons to modify the numerical value, decimal mark position, and unit. After settings are adjusted, press the "OK" button to navigate to Enable, and then press OK again to confirm.

3.3.4 Beep Function

The Beep function can be configured, and the "↑" and "↓" buttons can be used to select the alarm mode, as outlined below:

- (1) When the "U_H_Lim" is selected, the Buzzer will sound for 50ms if the measured resistance value is greater than the configured upper limit.
- (2) When the "Pass" is selected, the Buzzer will sound for 50ms if the measured resistance value is within the configured upper and lower limits.
- (3) When the "D_L_Lim" is selected, the Buzzer will sound for 50ms if the measured resistance value is less than the configured lower limit.
- (4) When "Disable" is selected, the whole Beep function will be disabled.

Note: Please switch to the corresponding range for faster response speed. Otherwise, switching speed will be slower in automatic range mode. Users can switch to fast mode to further improve the Beep response speed.

Chapter 4 External Interfaces

4.1 Precautions for Use

Do not plug or unplug communication cables while the instrument is powered on. If needed, or when disconnecting, please first disconnect the instrument's power to avoid instrument malfunction or other unforeseen accidents.

Do not provide power beyond the specific power supply

requirements for the interface, as this may cause damage to the interface or even the instrument.

When connecting, ensure the connectors at both ends of the communication cable are securely connected. Loose connections may lead to communication failures or other accidents.

According to the RS-232C standard, if a MODEM is not used and the symbol distortion remains below 4%, the maximum transmission distance between data communication equipment and data terminals is limited to 15m (50 feet). Therefore, when using RS232 communication, please ensure that the connection length do not exceed 15m.

4.2 RS232/RS485 Interfaces

4.2.1 RS232 Interface

RS232C (RS stands for the recommended standard, 232 for the standard number, and C for the version number) is a communication protocol developed by American organizations such as the EIA and BELL and published in 1969. In industrial control, it typically involves three lines: RXD, TXD, and GND, akin to this product.

The wiring method for the instrument's RS232 interface is as shown in the diagram below. When connecting, please use the applicable DB9 male connector. For this product, only pins 2, 3, and 5 are used. Crossover wiring should be adopted between communication ends, with

RX connected to TX, TX to RX, and GND to GND. The communication speed is fixed at 9600bps, with 8 data bits, 1 stop bit, and no parity bit.

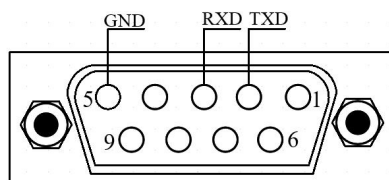


Fig. 6.1 Wiring Method for the Instrument's RS232 Interface

Signal	Abbreviation	Corresponding Pin
Transmit	TXD	2
Receive	RXT	3
Ground	GND	5

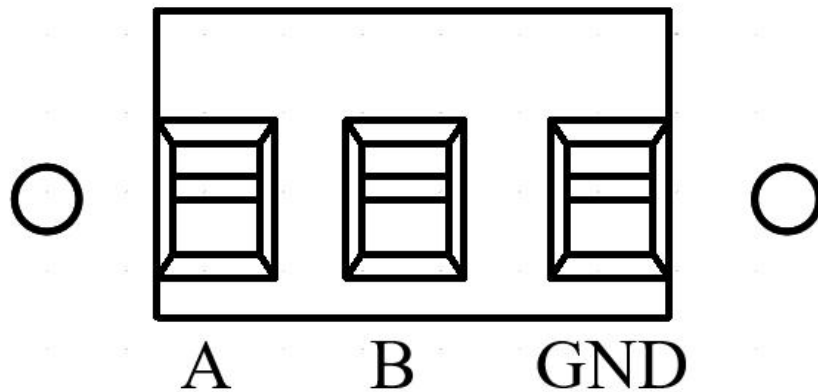
Table 6.1 Corresponding Pin Connection Table

4.2.2 RS485 Interface (Optional)

The RS485 standard defines the electrical characteristics of drivers and receivers in balanced digital multipoint systems, as defined by the Telecommunications Industry Association and the Electronic Industries Alliance. RS-485 offers both two-wire and four-wire configurations, with this product opting for the two-wire configuration.

The wiring method for the instrument's RS485 interface is as shown in the diagram below, with communication cables directly connected

between both ends. The communication speed is fixed at 9600bps, with 8 data bits, 1 stop bit, and no parity bit.



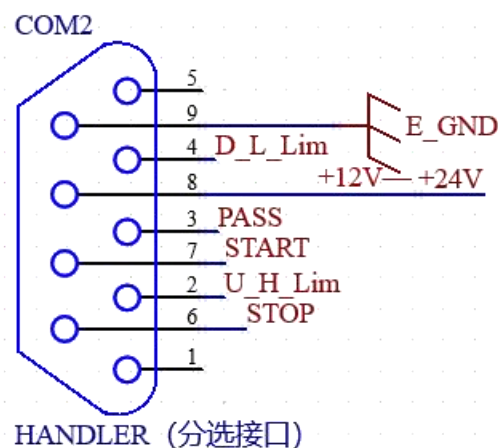
4.3 RS232/485 Commands

Refer to the SCPI Programming Manual for details.

4.4 HANDLER (Sorting) Interface

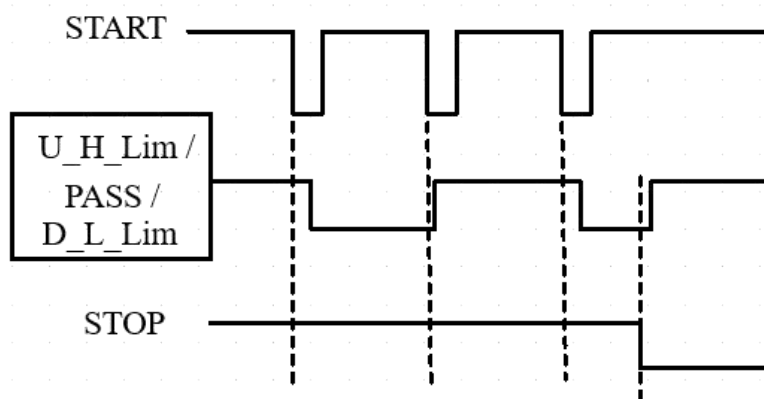
The comparison interface, also known as the HANDLER interface, enables the instrument to work in conjunction with mechanical handling systems, such as the automatic sorting system, for components.

The definition and pins of the instrument's HANDLER interface are



shown in the diagram below:

Pin	Description
1	Floating, not connected
2	Pin 2 is designed for sorting "U_H_Lim" signals, which occur when the level is active low and the sorting signal will remain active until the next Start signal occurs;
3	Pin 3 is designed for sorting "Pass" signals, which occur when the level is active low and the sorting signal will remain active until the next Start signal occurs;
4	Pin 4 is designed for sorting "D_L_Lim" signals, which occur when the level is active low and the sorting signal will remain active until the next Start signal occurs;
5	Floating, not connected
6	Pin 6, STOP, is designed for measuring STOP signals, with the measurement ceasing when the level is active low;
7	Pin 7, START, is designed for remote start (triggering) of signals, and when the level is active low, a single low level can only start the signal once;
8	Pin 8 is externally connected to power sources ranging from +12V — +24V
9	Pin 9 is externally connected to the ground



The timing of HANDLER is shown in the diagram below:

Each time the trigger signal goes low, all output signals will go high. If the conditions for above U_H_Lim/Pass/D_L_Lim are met, the corresponding pin levels will go low. When the STOP signal is received, all output signals will go high and return to the normal operation mode.