

Catalogue

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Statement

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Safety instructions

In order to use this instrument correctly, please carefully read the user manual and understand its content before testing, especially the safety instructions labeled "Danger, Warning, and Attention". Please strictly follow them when using to ensure the physical safety and instrument safety.

The safety symbol " " has three meanings in this user manual, and users should pay special attention to them when reading:

-  **DANGER:** It indicates that serious or fatal injury is very likely to occur in a certain environment or operation.
-  **WARNING:** It indicates that serious or fatal injury may occur in a certain environment or operation.
-  **ATTENTION:** It indicates that less harm or damage to this instrument can occur in a certain environment or operation.

To avoid potential electric shock or physical injury, please strictly follow the following regulations:

DANGER

- Do not exceed the range during testing. Please use it in single-phase 220V (range: 180V~264V)/50Hz or

three-phase 380V (range: 360~440V)/50Hz power systems.

- Do not use the device in flammable and explosive environments, as it may generate sparks and cause fire or explosion accidents.
- During testing, it must be held behind the safety bar of the testing wire or the probe.
- During testing, do not touch any exposed wires.
- Do not connect the testing wire or probe for testing when the instrument or hands are damp.
- Do not open the battery cover during testing.

WARNING

- When the low battery indicator appears, the battery should be replaced as soon as possible. When opening the battery cover, the range switch must be set to "**OFF**".
- Before opening the casing or battery cover, please remove the testing wire from the instrument. Do not operate the instrument when it is disassembled or the battery cover is open.
- When working in hazardous places, it is essential to comply with local and national safety regulations.
- When working in hazardous areas, appropriate protective facilities should be used in accordance with the regulations of local or national authorities.

ATTENTION

- When using the testing wire, please fully insert the testing wire into the testing port.
- After use, the function selection switch must be set to OFF. When not using the device for a long time, please remove the battery.
- Please use a damp cloth or mild cleaning agent to clean this instrument, and do not use abrasives or

solvents.

- When the instrument is damp, it must be stored after drying.

Safety symbols

	Please refer to the instruction manual for important safety symbols.		Double insulation or reinforced insulation
	Comply with European Union Standard		This product must not be discarded as household waste or disposed of as unclassified urban waste.

Overview

This instrument is controlled by an intelligent micro-controller chip, which has the characteristics of high precision, ruggedness, durability, and easy operation. It can be used in 220V single-phase electric power and 380V three-phase electric power system. It is possible to test the operating time and current of RCDs. It also has wiring inspection, fault voltage (UF), and system voltage testing functions.

Application standards: IEC61010-1, IEC61010-2-030, IEC61010-2-033, IEC61557-1, IEC61557-6, EN50581(RoHS), EN61326-1, EN61326-2-2, CAT III 600V POLLUTION DEGREE 2.

Functions and their characteristics

- Testing of RCD operation time:
Rated non operating current $\times 1/2$ range, RCD should not operate;

Rated operating current $\times 1$, $\times 2$, $\times 5$ ranges, the RCD should operate, and the operation time can be tested;

- The AUTO RAMP testing can simultaneously test the operation current and time.

- Fault voltage (UF) detection:

When using grounding testing, to avoid poor grounding, during the RCD testing, the instrument will automatically detect the voltage of the grounding electrode or protective conductor.

When the voltage is $\geq 50\text{VAC}$, the testing will stop and a warning will be issued.

- Wiring inspection (only applicable to RCD testing single-phase electric power (1-PHASE) mode):

When the wiring of the tested end (single-phase and three-hole socket) is normal, the LCD screen displays L-N and L-PE.

When the power supply to the tested end (single-phase and three-hole socket) is abnormal or not connected to power, the LCD screen displays L-N and L-PE flashes.

When the tested end (single-phase and three hole socket) has no neutral wire (N), the LCD screen displays L-N and N-PE flashes.

When the tested end (single-phase and three-hole socket) has no ground wire or poor grounding, or the line wire (L) and neutral wire (N) are connected in reverse, the LCD screen displays L-N, L-PE, and N-PE flashes.

When the line wire (L) and protective earthing wire (PE) of the tested end (single-phase three-hole socket) are connected in reverse, L-PE flashes.

If the above wiring is incorrect, the instrument will be prohibited from testing to protect the safety of

testing personnel.

Note: When the neutral wire (N) and protective earthing wire (PE) are connected in reverse, the instrument cannot distinguish.

- The selection of phase angle

When testing, you can select to test starting from a positive (0°) or negative (180°) half cycle.

- Testing current options: 10, 20, 30, 100, 200, 300, 500mA.

Current multiplier options: $\times 1/2$, $\times 1$, $\times 2$, $\times 5$, It can support up to 500mA.

- Over temperature detection:

When the internal components of the instrument overheat, the symbol "🔥" on the LCD lights up, and the instrument will prohibit testing. Conduct the test when the temperature decreases and the LCD screen no longer display "🔥".

- Low battery detection

When the battery voltage is below about 7V, the LCD screen displays the low voltage symbol "🔋". Please replace the battery in time.

- Automatic shutdown

After 10 minutes of operation, the instrument will automatically shut down to save power. After the instrument automatically shuts down, it is necessary to switch the function selection button to the "OFF" position first, and then switch to other function gears to start up.

- LCD screen backlight function.

- During the testing, when the external circuit is unexpectedly disconnected or there is excessive

interference, the LCD screen displays "no ms", indicating that no valid value has been tested.

Instrument Introduction

Description of the instrument panel

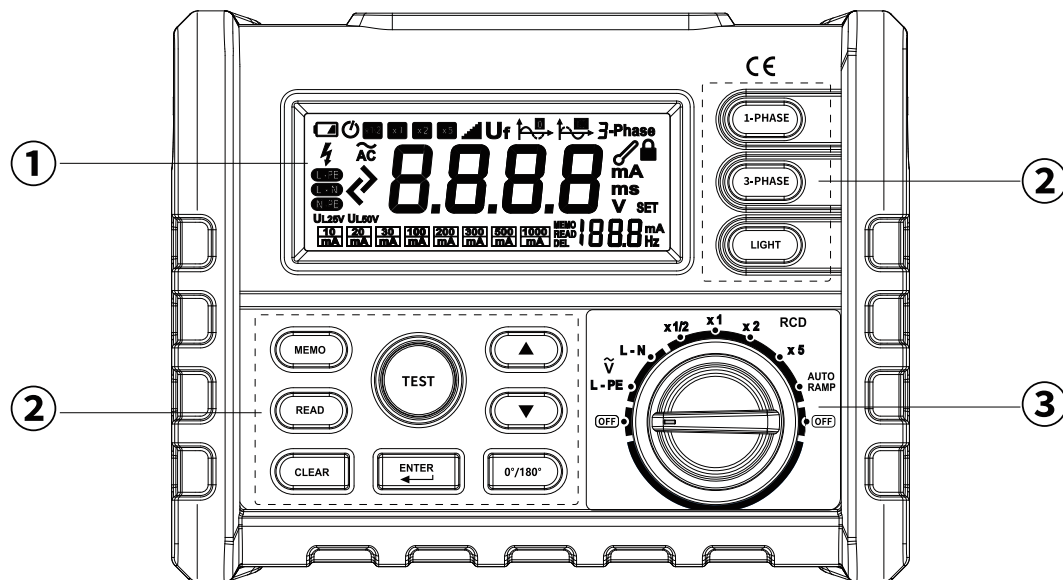


Fig. 1

① Display screen

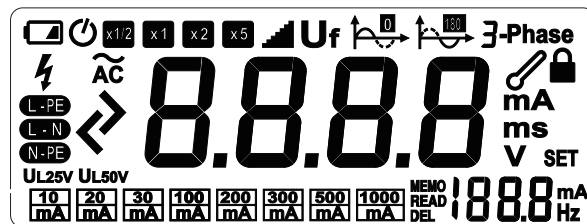


Fig. 2

Symbol	Description	Symbol	Description
	Battery under-voltage		Hazardous voltage
L-PE	Line wire to protective earthing wire	L-N	Line wire to neutral wire
N-PE	Neutral wire to protective earthing wire		AC
UL25V	Contact voltage limit 25V	UL50V	Contact voltage limit 50V
	Less than		More than
	10mA leakage current		20mA leakage current
	30mA leakage current		100mA leakage current

Symbol	Description	Symbol	Description
	200mA leakage current		300mA leakage current
	500mA leakage current		1000mA leakage current
MEMO	Memory	READ	Read
U_f	Fault voltage	mA	mA
	Over temperature prompt	ms	ms
	0° trigger		180° trigger
	Automatic shutdown	I-Phase	Single-phase testing mode
	AUTO RAMP	3-Phase	Three-phase testing mode
	Current multiplier		

② Function button

1. MEMO

Pressing this button will save the current LCD screen display data. When the memory number is >99, the LCD screen will display "**MEMO FUL**" to indicate that the memory data is full and cannot be saved any more (the instrument can save up to 99 sets of data).

2. READ

Pressing this button can read the saved data, and the data will be (starting from the NO.1 data). Pressing this button again will exit the read function.

3. CLEAR

Pressing this button can delete saved data. In the read function, press this button, and the "  " symbol flashes on the LCD screen, prompting to delete the saved data. After pressing the "ENTER" button, all saved data will be deleted. When the saved data is empty, the LCD screen displays the "READ  " symbol.

4. ENTER

In Read function mode, pressing the "CLEAR" button, the "  " symbol flashes on the LCD screen. At this time, press the "ENTER" button will delete all the saved data.

5. ▲

- ① In RCD testing function gear, press this button to select the rated operating current: 10mA/20mA/30mA/100mA/200mA/300mA/500mA (cycle selection from small to large). After startup, the default rated operating current is 30mA.
- ② In Read function mode, press this button to read the saved data (the read number is selected in a cycle from low to high).

8. ▼

- ① In RCD testing function gear, press this button to select the rated operating current: 10mA/20mA/30mA/100mA/200mA/300mA/500mA (cycle selection from large to small). After startup, the default rated operating current is 30mA.

- ② In Read function mode, press this button to read the saved data (the read number is selected in a cycle from high to low).

9. 0°/180°

Press this button to select whether to start testing from a positive (0°) or negative (180°) half cycle during testing.

10. 1-PHASE

Press this button to select single-phase mode testing. This mode uses a three pin plug testing wire and is only applicable to single-phase 220V power system. In this mode, the socket wiring will be checked before testing. If the wiring is incorrect, the instrument won't work.

11. 3-PHASE

Press this button to select the three-phase mode testing. This mode uses a red and black probe to test the wire, which can be used in both three-phase 380V power system and single-phase 220V power system.

12. LIGHT

Press this button to turn on or off the LCD backlight. The LCD backlight is on by default when the device starts up.

13. TEST

This button is only used in the RCD testing function and is used to start the testing.

③ Function selection button

Symbol	Gear	Function
OFF	Power off	Turn off the device.
L-PE	Voltage	Test the voltage of the line wire to the protective earthing wire.
L-N	Voltage	Test the voltage of the line wire to the neutral wire.
× 1/2	× 0.5	Trigger the rate of leakage current (e.g. 30mA * 0.5=15mA).
× 1	× 1	Trigger the rate of leakage current (e.g. 30mA * 1=30mA).
× 2	× 2	Trigger the rate of leakage current (e.g. 30mA * 2=60mA).
× 5	× 5	Trigger the rate of leakage current (e.g. 30mA * 5=150mA).
AUTO RAMP	AUTO RAMP	Test the operating current of the RCD.

Note: After the instrument automatically shuts down, turn the function selection button to the OFF gear first, and then turn to another function gear to startup the device.

Use of the instrument

1. Single-phase voltage measurement

VL-PE (line wire to protective earthing wire)

- ① Switch the function selection button to the **L-PE** gear, connect the red wire to jack **L**, the blue wire to jack **N**, and the green wire to jack **E**. Connect the testing wire as shown in the right figure;
- ② LCD screen displays the voltage value;
- ③ If the testing results need to be saved, please press the **MEMO** button.

VL-N (line wire to neutral wire)

- ① Switch the function selection button to the **L-N** gear, connect the red wire to jack **L**, the blue wire to jack **N**, and the green wire to jack **E**. Connect the testing wire as shown in the right figure;
- ② The LCD screen displays the voltage value;
- ③ If the testing results need to be saved, please press the **MEMO** button.

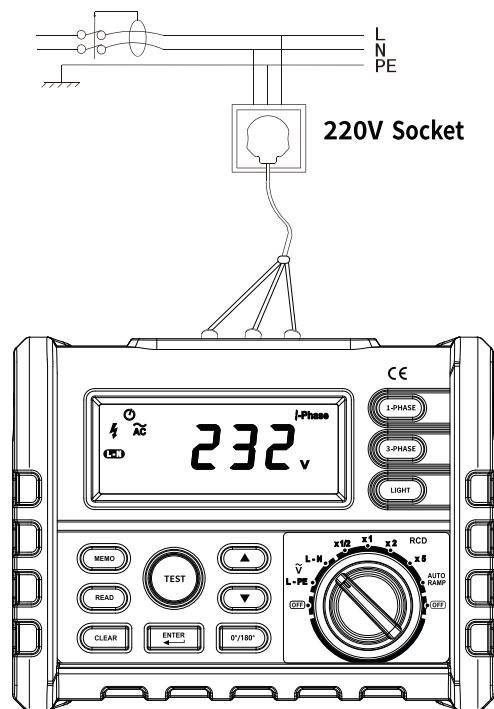


Fig.3

2. Three-phase voltage measurement

- ① Turn the function selection button to the **L-PE** gear and connect the testing wire as shown in the following figure (the red wire is connected to the load side, and the black wire is connected to the power side);
- ② The LCD screen displays the voltage value;
- ③ If the testing results need to be saved, please press the **MEMO** button.

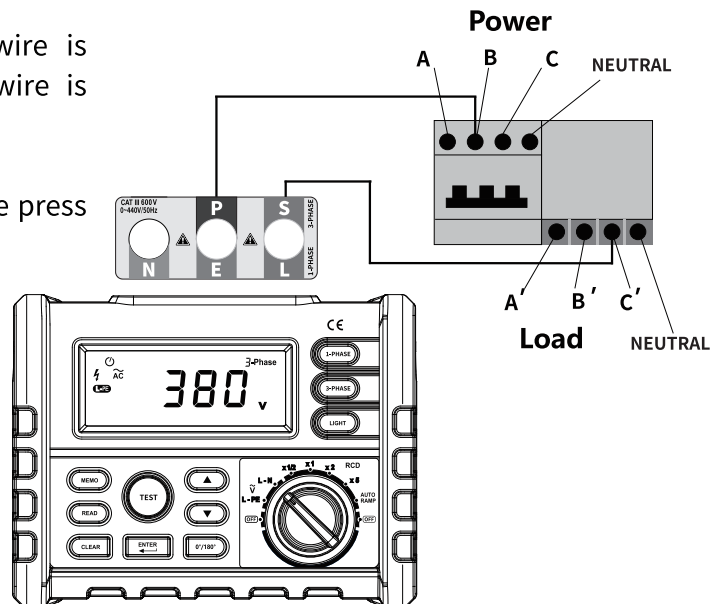


Fig.4

3. RCD testing

 DANGER

- Do not connect a circuit with voltage greater than 264V between a phase wire and protective earthing wire or a circuit with voltage greater than 440V.
- When using grounding testing, to prevent electric shock accidents caused by poor grounding, the instrument will automatically detect the voltage of the grounding electrode or protective conductor during the RCD testing.
When the voltage is $\geq 50\text{VAC}$, the LCD screen displays the "UF Hi" symbol and the instrument won't work.

 WARNING

- When the battery warning symbol " " starts to light up, please replace the battery immediately.
- When the measured current value is $\geq 300\text{mA}$, the testing interval should be greater than 3 minutes.

 ATTENTION

- Before testing the RCD , please disconnect other loads connected to it, otherwise it may affect the testing.
- When using protective conductors for testing, if there is voltage between the protective conductor and the ground, it may affect the testing. When testing in a neutral grounded circuit, please confirm the connection between the neutral wire and the grounding before conducting the testing. The voltage between the neutral wire and ground may affect the testing.
- When leakage current has already been generated in the testing circuit, it may affect the testing.
- The grounding electrode impedance of the testing circuit with a probe (additional grounding electrode) must $\leq 20 \Omega$ at the rated operating current of 100/200/300/500mA, $\leq 100\Omega$ at 30mA, and $\leq 200\Omega$ at 20mA and 10mA.
- When connecting equipment such as capacitors or motors to the load end, it may have a significant impact on the operation time.

3.1 Selection of testing function gear

Connect the power supply and turn the function selection button in the **VL-PE** function gear.

Single-phase mode testing (the wiring method is as Fig.3)

Note: The single-phase mode testing is only applicable to single-phase 220V/50Hz power system.

- ① Insert the three terminals of the three pin plug testing wire into the corresponding three ports of the instrument: L to L (line wire), E to E (earth wire), and N to N (neutral wire). After connecting the testing wire to the instrument, plug the three pin plug on the other end of the testing wire into the testing terminal (220V/50Hz power socket) (see Fig. 3 for details).
- ② Check if the voltage value displayed on the LCD screen is within the testing range (180-264V). If it is not within the range, please check if the wiring is correct. If within the range, please turn the function selection button to the required function gear:

×1/2 gear: Test the sensitivity of the RCD by using 0.5 times the rated operating current as the leakage current. If the leakage operation current of the leakage switch is 30mA, test it with a 15mA current.

×1 gear: Test the operating time of the RCD by using one time the set rated operating current as the leakage operating current.

×2 gear: Test the operating time of the RCD by using twice the set rated operating current as the leakage operating current.

×5 gear: Test the operating time of the RCD by using 5 times the set rated operating current as the leakage current.

AUTO RAMP: Test the magnitude of the operation current. The instrument will increase from 40% of the set rated operating current to 110%, in steps of 5%, to more accurately test the operating current of the RCD.

- ③ After turning the function selection button in the corresponding function gear, observe the wiring status displayed on the LCD screen:

When the wiring of the tested end (single-phase and three-hole socket) is normal, the LCD screen displays L-N and L-PE.

When the power supply to the tested end (single-phase and three-hole socket) is abnormal or not connected to power, the LCD screen displays L-N and L-PE flashes.

When the tested end (single-phase and three hole socket) has no neutral wire (N), the LCD screen displays L-N and N-PE flashes.

When the tested end (single-phase and three-hole socket) has no protective earthing wire or poor grounding, or the line wire (L) and neutral wire (N) are connected in reverse, the LCD screen displays L-N, L-PE, and N-PE flashes.

When the line wire (L) and protective earthing wire (PE) of the tested end (single-phase and three-hole socket) are connected in reverse, L-PE flashes.

Note: If the above wiring is incorrect, the instrument won't work. Please check the wiring and correct it before proceeding with the following testing.

- ④ Press "▲" button or "▼" button to adjust the operating current to match the rated operating current of the RCD being tested. The default value after startup is 30mA/0°.
- ⑤ Press "TEST" button to start the testing.
- × **1/2 gear:** The RCD should not operate.
- × **1 gear:** The RCD should operate.

×2 gear: The RCD should operate.

×5 gear: The RCD should operate.

AUTO RAMP gear: The RCD should operate. It can simultaneously test the operating current and operating time of the leakage switch.

Press the "0°/180°" button to change the phase to determine the fastest operation time within the current range of the operation.

- ⑥ After the testing is completed, please remove the testing wire from the tested end in time and then turn off the device.

Three-Phase mode testing

Note: The three-phase mode testing is not only applicable to three-phase 380V/50Hz power system, but also to single-phase 220V/50H power system.

If in single-phase mode, pressing the "3-PHASE" button will enter three-phase testing mode. Use a red and black probe testing wire for three-phase testing, and the corresponding ports are: the red probe testing wire is connected to the "Load side" port, and the black probe testing wire is connected to the "Power side" port.

Note: Conduct testing on the power and load terminals between different wires. Although various combinations of line wire A - line wire B ', line wire B - line wire C ', and line wire C - line wire A 'can be tested, the operating time may also vary due to differences in the construction of RCD in different combinations.

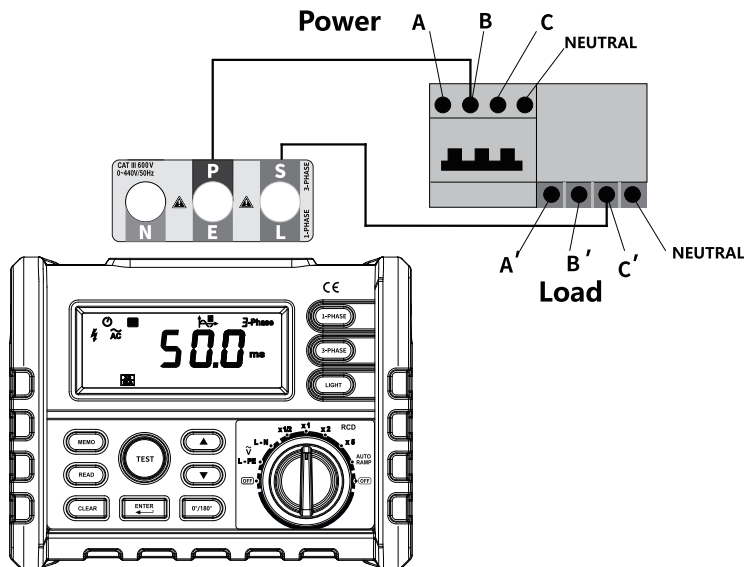


Fig. 5

Wiring diagram for testing three-phase in three-phase mode.

Note: The three-phase RCD testing can also connect the wires as the wiring methods shown in Fig.6 and 7.

In the three-phase mode testing of a three-phase 380V/50Hz power system, the power side of the instrument port is connected to the power end of the RCD, and the load side is connected to the load

end of the RCD. However, in the three-phase mode testing of a single-phase 220V/50Hz power system, it can be connected arbitrarily. The wiring method is shown in the following figure:

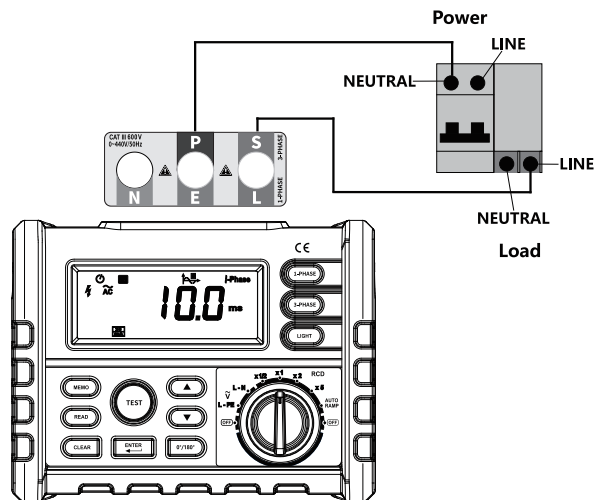


Fig.6 Wiring diagram for 1-phase testing in 3-phase mode

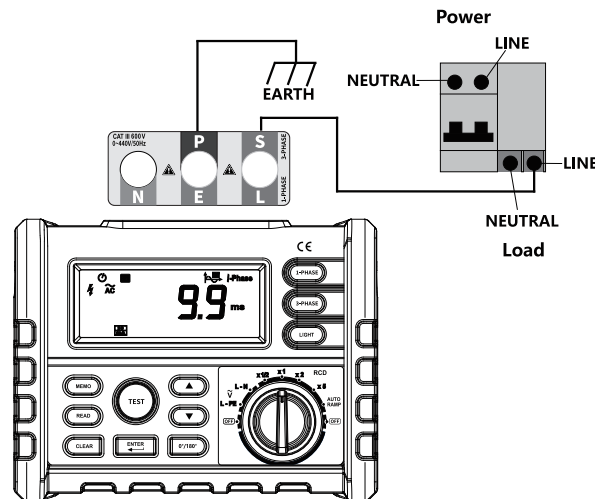


Fig.7

Due to the different specifications of the RCD, its operating time also varies. Please refer to the following table:

Type	High-speed type	Delayed type	Non-delayed type			
Testing current	Rated operating current	Rated operating current	Rated operating current	2 times the rated operating current	5 times the rated operating current	1000mA
Operation time	$\leq 100\text{ms}$	$> 100\text{ms}$ and $\leq 2000\text{ms}$	$\leq 300\text{ms}$	$\leq 150\text{ms}$	$\leq 40\text{ms}$	$\leq 40\text{ms}$

Note: In the rated non-operating current testing of $\times 1/2$ gear, the RCD should not operate.

General characteristics

- **Working voltage:**

Single-phase electric power: 180V~264V/50Hz.

Three-phase electric power: 360V~440V/50Hz.

- **Over range indication:**

Voltage (L-PE, L-N) gear: When the voltage is greater than 440V, the LCD screen displays "OL".

RCD testing gear: The ">" symbol on the LCD screen lights up.

- **Temperature coefficient:** $0.05 \times (\text{Specified accuracy}) / ^\circ\text{C}$ ($< 18^\circ\text{C}$ or $> 28^\circ\text{C}$).

- **Power supply:** AA Alkaline battery LR6 $\times 6$.

- **Working environment:**

Temperature and humidity: $0^\circ\text{C} \sim 40^\circ\text{C}$, $\leq 80\%\text{RH}$ (No condensation) .

Altitude: $\leq 2000\text{ m}$.

- **Storage conditions:**

Temperature and humidity: -20°C~ 60°C, ≤75%RH (No condensation) .

Altitude: ≤10000 m.

- **Overall dimension:** 200mm×155mm×76mm.

- **Weight:** About 500g.

- **Accessories:**

User manual×1

Shoulder strap×1

Single-phase and three terminal plug testing wire×1

Three-phase red and black lantern head testing wire×1

Special alligator clip ×1

AA Alkaline battery LR6 ×6

Technical specifications

Testing conditions: temperature 23°C±5°C; Humidity ≤75% RH; Altitude ≤2000 m.

The guarantee period for testing accuracy is within one year after leaving the factory.

AC voltage testing indicators

Testing Scope	Resolution Ratio	Accuracy
30~440V (VL-PE、VL-N)	1V	±(2% reading + 4 dgt)

Input voltage frequency: 50Hz~60Hz.

RCD testing indicators

Range	Working voltage	Rated residual current (I Δ n)	Testing Scope	Accuracy
×1/2	Single- phase: 180V~264V 50Hz	10/20/30/100/200/300/500mA	0~2000ms (0°/180°)	Testing current: -8%~0% Testing time: ±(1%+3ms)
×1		10/20/30/100/200/300mA	0~2000ms (0°/180°)	Testing current: 0%~+8% Testing time: ±(1%+3ms)
		500mA	0~200ms (0°/180°)	
×2		10/20/30/100/200/300/500mA	0~200ms (0°/180°)	Testing current: 0%~+8% Testing time: ±(1%+3ms)
×5	Three-phase: 360V~440V 50Hz	10/20/30/100/200mA	0~200ms (0°/180°)	Testing current: 0%~+8% Testing time: ±(1%+3ms)
AUTO RAMP		10/20/30/100/200/300/500mA	40%~110% of the rated leakage current in steps of 5%; Testing time: 300ms×15	Testing current: -2%~+8% Testing time: ±(1%+3ms)

Maintenance

DANGER

To prevent potential electric shock, fire, or physical injury:

- Do not open the battery cover when the instrument is damp.
- The battery cannot be replaced during testing. To avoid electric shock accidents, please turn the function selection button to OFF gear, and remove the testing wire before replacement.
- When the battery indicator shows low battery, please replace the battery to prevent incorrect measurement and misjudgment during testing.
- Do not operate this instrument when the cover is removed or the casing is open, as it may come into contact with dangerous voltage.
- Remove the testing wire before cleaning the product.
- Only recognized professional technicians can repair this product

ATTENTION

- New and old batteries cannot be used together.
- Please note the polarity direction of the battery and install it in the direction of the arrow inside the battery box.

Cleaning

Regularly clean the casing with a damp cloth and mild cleaning agent, do not use corrosive agents or solvents; After cleaning, please dry it with a cloth and store it.

Replacement of the battery

WARNING

To avoid electric shock and physical injury, please replace the battery in time when it is under voltage.

When replacing the battery, please turn the instrument switch to the Off position and disconnect the instrument testing wire from the tested circuit and remove it from the instrument

- 1) Unscrew the fastening screw of the instrument battery cover and move it away.
- 2) Replace the old battery and note the direction of the battery electrodes marked on the bottom of the battery case.
- 3) Close the battery cover and tighten the screws.

① : Screw

② : Battery

