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Declaration

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I. Safety Information

To ensure the correct use of this instrument, please read through the user manual carefully before testing and understand its contents, especially the safety warnings labeled as "Danger, Warning, and Caution". Strict adherence to these safety tips is essential to ensure the safety of the user and the instrument.

The safety symbol “⚠” in this manual has three meanings; users should pay special attention to the operations associated with the “⚠” symbol:

⚠ **Danger:** Indicates that certain conditions or operations may likely cause severe or fatal injury.

⚠ **Warning:** Indicates that certain conditions or operations may cause severe or fatal injury.

⚠ **Caution:** Indicates that certain conditions or operations may cause minor injury or damage to the instrument.

⚠ **Danger**

- Before performing insulation resistance tests, please select the appropriate insulation test voltage.
- Do not measure in circuits exceeding AC 750V/DC 1000V.
- Do not use this instrument in the vicinity of explosive gases or vapors, or in damp environments.
- Do not operate the instrument when its surface is wet or with wet hands.
- Do not touch the conductive parts of the test probes during measurement.
- Do not contact the circuit under test during measurement.
- Do not open the battery cover or casing during measurement.
- Before opening the casing or battery cover, disconnect the test leads from the instrument.

** Warning**

- Stop using the instrument if any abnormality appears, such as a damaged casing or exposed metal parts of the test leads.
- Do not install substitute components or make any unauthorized modifications to the instrument; for repairs, send the instrument to the company or an authorized distributor.
- Do not replace the battery while the instrument is in a damp state.
- Replace the battery as soon as the low battery indicator appears.
- Never operate the instrument when it is opened or the battery cover is removed.
- When working in hazardous locations, always comply with local and national safety regulations.
- When working in hazardous areas, appropriate protective equipment must be used according to local or national regulations.

** Caution**

- When using test leads, ensure they are fully inserted into the test ports and securely connected.
- Do not leave the instrument in high-temperature, humid, dewy places, or under direct sunlight for extended periods.
- After use, set the function selector switch to OFF, and remove the battery for long-term storage.
- Clean the instrument with a damp cloth or mild detergent; do not use abrasives or solvents.
- Ensure the instrument is dry before storing it.

II. Symbol Definitions

						
Warning, danger	Double insulation	Warning, hazardous voltage, risk of electric shock	Grounding	This product must not be disposed of as household waste and must not be treated as unsorted municipal waste.	Do not use it in AC distribution systems exceeding 750V.	Comply with EU directives.

III. Overview

The MS5208 is a battery-powered digital high-voltage insulation + continuity tester. It adopts a new circuit design, microprocessor control, and is characterized by high precision, robustness, durability, and easy operation, having functions of insulation measurement, AC and DC voltage measurement, and 200mA continuity measurement functions. It is not only suitable for measuring and maintaining field power equipment and supply lines, but also for insulation resistance measurement of various electrical devices and insulating materials, including motors, transformers, cables, and electrical appliances, particularly for troubleshooting and maintenance of insulation and continuity in new energy vehicles.

Applied standards:

IEC/EN61010-1, -2-030:600V CAT IV/1000V CAT III Pollution Grade-2

IEC/EN61326-1, -2-2(EMC)

EN50581(RoHS)

Features

- The function of insulation measurement covers multiple voltage ranges' outputs (100V, 250V, 500V, 1000V, 2500V) to satisfy requirements in various application scenarios.
- The function of insulation measurement covers a comparatively wide range (up to 300GΩ at Position-2500V).
- The function of insulation measurement is featured with high precision ($\pm 3\%$ basic accuracy).
- The function of insulation measurement can automatically calculate Polarization Index (PI) and Dielectric Absorption Ratio (DAR).
- Automatic discharge: After insulation testing, the instrument can automatically discharge to protect the safety of the operator.
- Both the Position-insulation and Position-continuity modes are featured with live circuit alarm to prevent testing.
- The Position-continuity includes a ZERO function and FUSE safety protection.
- The function of insulation measurement is capable of judging AC/DC voltage.
- Storage function: it can store up to 99 sets of display data.
- Backlight function: it facilitates operation in dimly lit environments or at night.
- Low battery detection: when the battery voltage drops below approximately 7V, the LCD displays a low voltage symbol “”; please replace the battery immediately when this symbol appears.
- Automatic shutdown: it can automatically shut down after 10 minutes of inactivity to save power (except in insulation and continuity testing modes). After automatic shutdown, the function selector switch must be set to “OFF” before switching to other functions to power on.

IV. Introduction to Instrument

Panel instruction

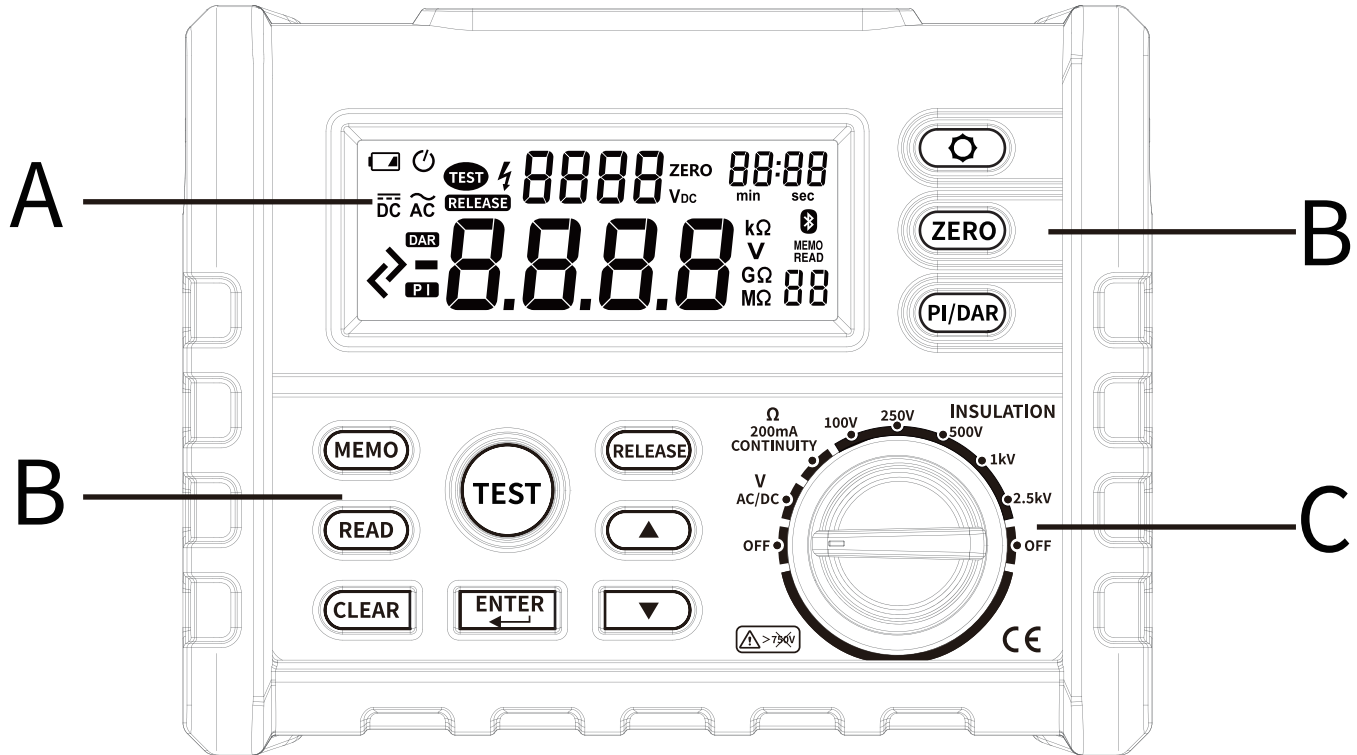


Figure 1

A. Display screen



Figure 2

Symbols	Descriptions	Symbols	Descriptions
	Low Battery		Automatic Shutdown
	Test		Hazardous Voltage
ZERO	Zeroing	V _{DC}	DC Voltage: Volts
min	Minute	sec	Second
	Direct Current		Alternative Current
RELEASE	Release Key	>	Greater Than Sign
<	Less Than Sign	DAR	Dielectric Absorption Ratio
-	Negative Sign	PI	Polarization Index
kΩ	Resistance Unit: kilo-ohm	V	Voltage Unit: Volts
GΩ	Resistance Unit: giga-ohm	MΩ	Resistance Unit: mega-ohm
MEMO	Data Storage	READ	Data Reading

B. Function Keys

① MEMO(memory) key

Pressing this key allows the instrument to store the current display data on the LCD. When the storage number >99, the LCD shows "MEMO FULL", indicating that the storage capacity is full and no additional data can be stored (the maximum storage capacity of the instrument is 99 sets of data).

② READ(reading) key

This key is used to retrieve stored data. Pressing this key can recall the stored data starting from Storage No. 1. Pressing the key again to exit the retrieval function.

③ CLEAR (clearing) key

This key is used to clear stored data. In the retrieval function mode, pressing this key can cause the LCD to display a flashing character of "CLR", reminding the user to clear the stored data. After pressing the "Confirm" key, all stored data will be cleared. When there is no stored data, the LCD will display the characters of "READ NONE".

④ TEST (testing) key

For measurement at Position-insulation (except for 1kV and 2.5kV ranges) and Position-continuity, pressing this key can start the test; pressing it again can stop the test. For measurement at Position-voltage, this key is not required. To prevent accidental application of high voltage at positions of 1kV and 2.5kV insulation ranges, a "RELEASE" key is added; the "RELEASE" key must be pressed before pressing the "TEST" key to initiate testing.

⑤ ENTER (Confirm) key

In the retrieval function mode, after pressing the "CLEAR" key, the LCD can display a flashing character of "CLR". At this point, pressing the "ENTER" key, all the stored data can be cleared.

⑥RELEASE key

For the testing at positions of 1kV and 2.5kV, this key must be pressed first before pressing “TEST” key to initiate the testing, otherwise, the test will be prohibited.

⑦▲ key

In the retrieval function mode, pressing this key can retrieve the stored data (the retrieved serial number will be selected from low to high).

⑧▼ key

In the retrieval function mode, pressing this key can retrieve the stored data (the retrieved serial number will be selected from high to low).

⑨ (Backlight) key

Pressing this key toggles the LCD backlight on and off. By default, the LCD backlight is defaulted illuminated when the device is powered on.

⑩ZERO (zeroing) key

At the Position-CONTINUITY, to eliminate the impact of test resistance, users need to short circuit the test probes before testing and press the "ZERO" key to nullify the reading. If the resistance value is $>2\Omega$, zeroing cannot be performed.

⑪PI/DAR (Polarization Index/Dielectric Absorption Ratio) key

After completing insulation testing, pressing this key allows the user to sequentially view the values of the dielectric absorption ratio and the polarization index.

C. Function Selecting Switches

Symbols	Positions	Functions
OFF	Power off	Used to shut off the instrument
VAC/DC	AC/DC voltage measurement	Used for AC/DC voltage measurement
200mA CONTINUITY	Continuity measurement	Used for continuity measurement
INSULATION 100V	Insulation measurement at 100V	Used for insulation measurement
INSULATION 250V	Insulation measurement at 250V	Used for insulation measurement
INSULATION 500V	Insulation measurement at 500V	Used for insulation measurement
INSULATION 1kV	Insulation measurement at 1kV	Used for insulation measurement
INSULATION 2.5kV	Insulation measurement at 2.5kV	Used for insulation measurement
Note: After the instrument automatically powers off, the function selection switch must be turned to the OFF position before switching to other function modes to power on the instrument.		

V. Usage of Instrument

5.1 Preparation before Measurement

Check the battery symbol in the upper left corner of the LCD. If the battery symbol displays "  ", it indicates that the battery is depleted and needs to be replaced; otherwise, the instrument cannot be used normally.

5.2 AC/DC Voltage Measurement

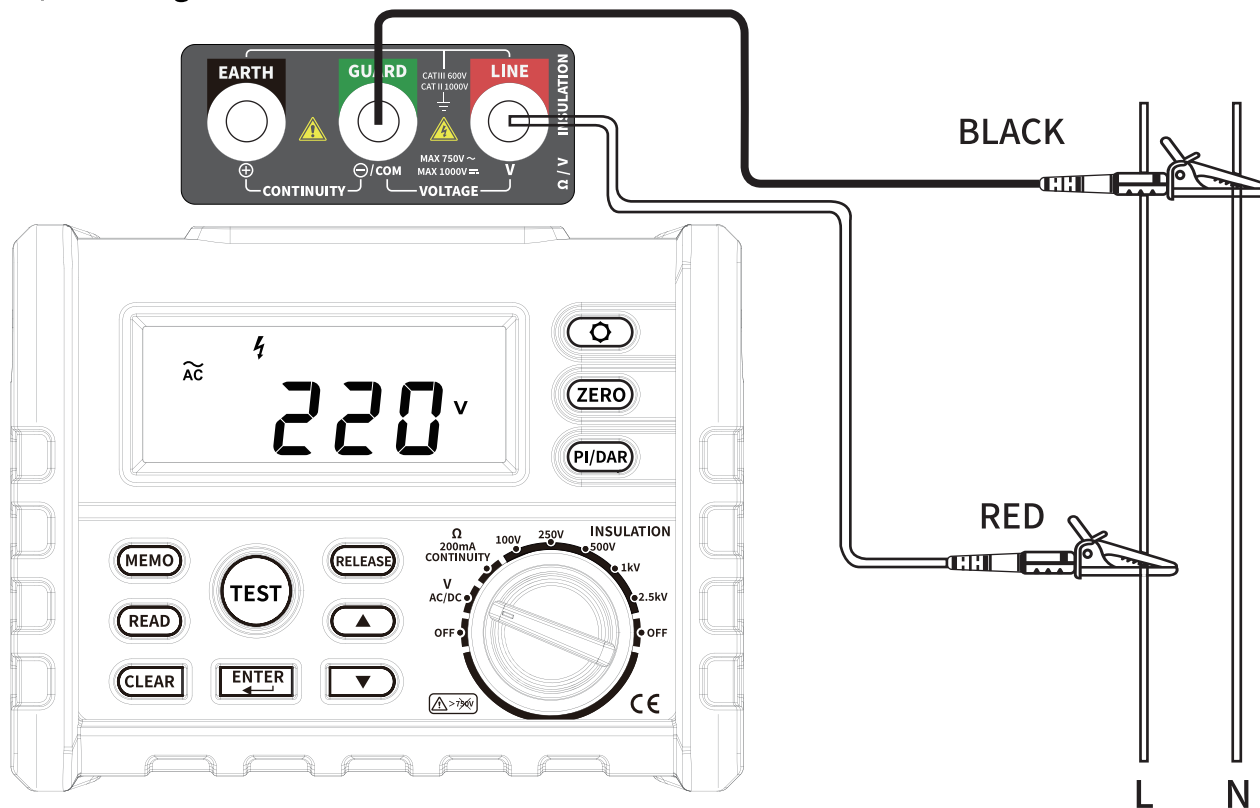


Figure 3

Danger

- ① Do not apply a DC voltage exceeding 1000V or an AC voltage exceeding 750V to avoid personal injury or damage to the instrument.
- ② Use test leads that comply with the relevant safety standards. If using leads that do not meet the same safety standards as the main unit, the lower value obtained by either safety standard shall prevail.
- ③ Do not use probe hooks to measure voltage, as exposed metal parts can pose a risk of electric shock.
- ④ Take appropriate protective measures when performing high voltage measurements, such as wearing insulated gloves.
- ⑤ After finishing measurement, please promptly disconnect the instrument from the tested circuit.

Measurement sequence:

- ① Set the function selection switch to the "**VAC/DC**" position.
- ② Insert the red test lead into the "**V**" socket and the black test lead into the "**COM**" socket.
- ③ Securely connect the two test leads in parallel to the circuit being tested.
- ④ The LCD displays the measured voltage value (no need to press the "TEST" key). When measuring DC voltage, if the red test lead is connected to the negative signal, the LCD will display "-" (negative) polarity.

Caution:

- When there is no voltage input or the input voltage is $<20\text{V}$, the LCD will display "**LoV**".
 - When the input signal is $\geq 20\text{V}$, the instrument will automatically determine whether it is AC voltage (ACV) or DC voltage (DCV).
 - Once the instrument detects a valid voltage, it will automatically disable the auto power-off function.
- ⑤ In this function mode, the "**RELEASE**", "**ZERO**", "**PI/DAR**", "**▲**", "**▼**", "**CLEAR**", and "**ENTER**" keys are disabled; other keys are enabled.

5.3 CONTINUITY Measurement

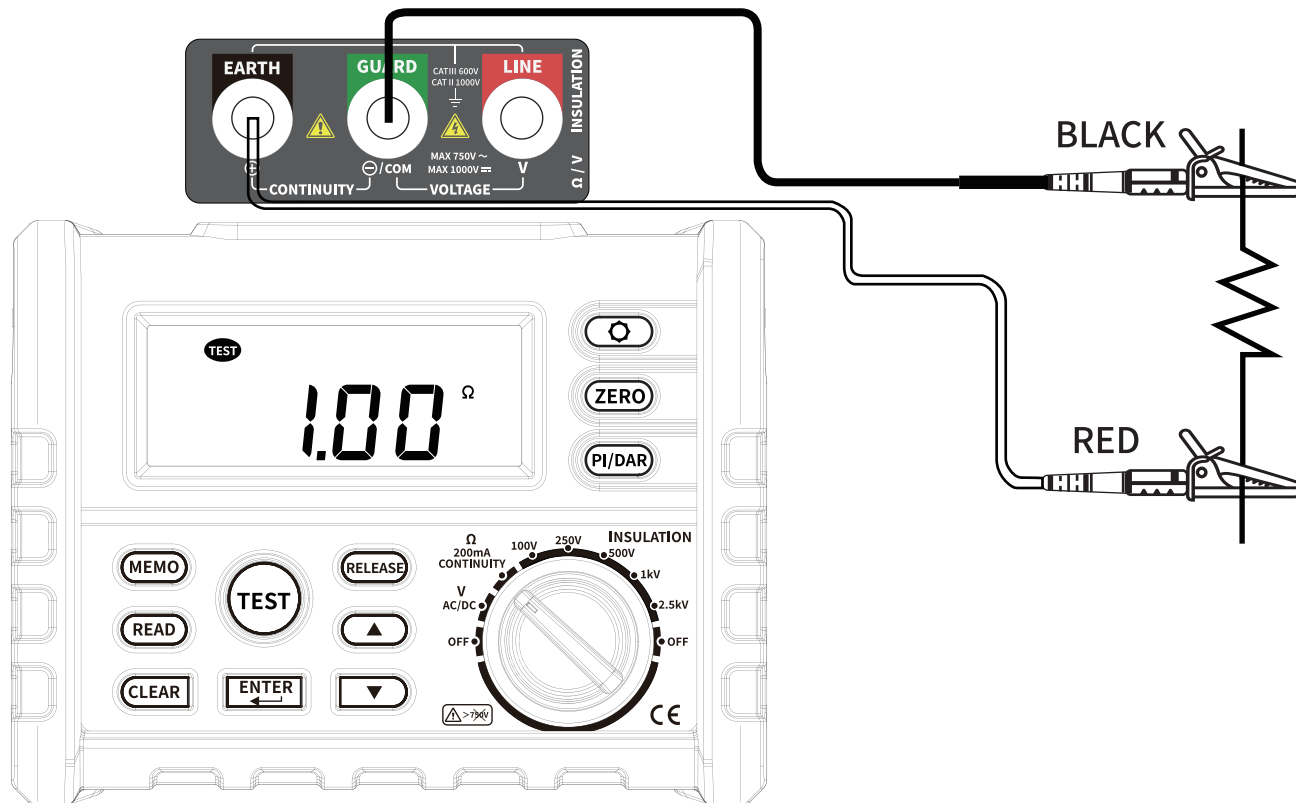


Figure 4

Danger

CONTINUITY measurement can only be performed on de-energized circuits.

Measurement sequence:

- ① Set the function selection switch to the "**CONTINUITY**" position.
- ② Insert the red test lead into the "**CONTINUITY(+)**" socket and the black test lead into the "**CONTINUITY(-)**" socket.
- ③ Perform the zeroing operation (to ensure measurement accuracy, perform a zeroing operation on the test leads before measurement to eliminate lead resistance errors): In the testing state, securely short the test leads together, and after the reading stabilizes, press the "**ZERO**" key to nullify the reading. The zeroing operation is only effective when the reading is $\leq 2.00\Omega$. After a successful zeroing operation, the LCD will display "**ZERO**"; pressing the "**ZERO**" key again, user can cancel the zeroing operation.
- ④ Connect the red and black test leads to the circuit being tested, and the resistance value can be read directly from the LCD

Caution:

- Testing is prohibited if the tested end is live: Before starting the CONTINUITY test, the instrument will automatically detect the voltage at the tested end. If the voltage (AC/DC voltage) exceeds approximately 3V, the instrument will prohibit testing, displaying "**UE-H**" on the LCD and emitting a warning beep. Please disconnect the tester and turn off the power before proceeding.
- Testing range: $0 \sim 300\Omega$; if the resistance exceeds 300Ω , the LCD will display ">**300 Ω** ".
- When the battery is low, the LCD will display "", and testing will be prohibited (the "TEST" button will be ineffective).
- ⑤ In this function mode, the "**RELEASE**", "**PI/DAR**", "**▲**", "**▼**", "**CLEAR**", and "**ENTER**" keys are disabled, while other keys remain enabled.

5.4 INSULATION Measurement

5.4.1 Low Battery Check Before Measurement:

Before measurement, please check if the battery is in a low voltage state (LCD displays “”). If in a low voltage state, the “TEST” button will be disabled.

During insulation testing at low resistance ($<10\text{M}\Omega$), the current drawn from the battery will be significant, causing the battery voltage to drop. When the battery voltage is approximately $<7\text{V}$, the LCD will display “”. Therefore, the testing time for low resistance should be minimized.

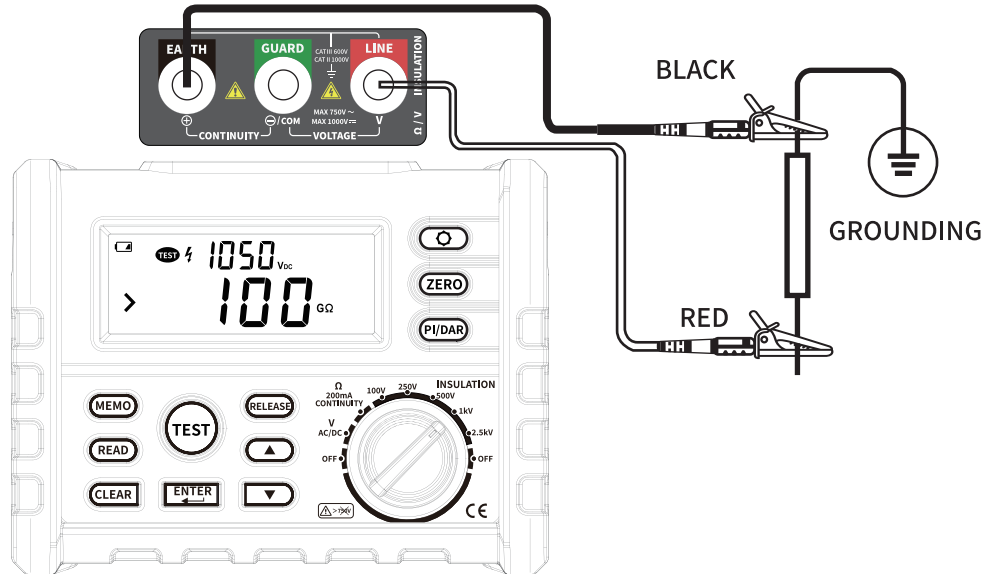


Figure 5

Warnings

- ① Do not apply any voltage to the test sockets.
- ② Wear high-voltage insulated gloves during measurement.
- ③ Before measurement, please ensure that the object (circuit) under test is de-energized and not live.
- ④ During measurement, this instrument can generate high voltage; do not touch the object (circuit) under test.
- ⑤ After measurement, the instrument can automatically discharge instead of requiring discharging manually, so as to protect the tester from electric shock hazards and improve testing efficiency.

Caution:

- ① Testing is prohibited if the measured terminal is live: Before starting insulation testing, the instrument will automatically detect the voltage at the measured terminal. If the voltage (AC/DC) is $\geq 30V$, the instrument will prohibit testing, displaying the voltage value and “UE.HI” characters on the LCD, along with a warning beep to ensure the safety of the tester.
- ② If the insulation resistance value of the object (circuit) is unstable, the measured value will also fluctuate.
- ③ When one end of the object (circuit) under test is grounded, typically the “EARTH” terminal is connected to the grounding end while the “LINE” terminal is connected to the other end of the object (circuit) under test.
- ④ To prevent measurement errors, please avoid touching the test leads, the object (circuit) under test, and the ground terminal. Especially when measuring insulation resistance above $50G\Omega$, the test leads must be kept as far apart as possible to stabilize the displayed value.
- ⑤ When the measured insulation resistance value is relatively low, the instrument will emit a faint “hissing” sound, which is actually not a fault.
- ⑥ Due to significant current draw from the battery during low resistance insulation testing, at the positions of the 1kV and 2.5kV insulation ranges, when the resistance of the circuit under test is $< 5M\Omega$, the maximum allowable

testing time is approximately 21 seconds. During testing, the instrument will indicate a low resistance value (LCD displays “<5MΩ” in flashing manner and emits a warning beep).

⑦ Except for the measurement of extremely high resistance, in most cases, testing only requires the “LINE” and “EARTH” terminals; the “GUARD” terminal does not need to be connected. The “GUARD” terminal is used when measuring insulation resistance from the core of a cable to its outer layer. At that time, the “GUARD” terminal needs to be connected to the cable's shielding layer.

⑧ In this function mode, the “ZERO”, “▲”, “▼”, “CLEAR”, and “ENTER” keys are disabled, while other keys remain enabled.

5.4.2 Measurement:

Set the function selector switch to the desired insulation voltage position, then connect the test leads to the object (circuit) under test and press the “TEST” key to measure the insulation resistance value. At this time, the LCD will display the measured voltage value and insulation resistance value. Pressing the “TEST” button again will stop the test, and the last measured value will be retained on the LCD.

To avoid accidental operation at positions of insulation 1kV and 2.5kV ranges, press the “RELEASE” key before pressing the “TEST” key to initiate testing.

5.4.3 Polarization Index (PI) Measurement:

During the testing process, the instrument will automatically calculate the polarization index (PI) value. After finishing the testing, users can press the “PI/DAR” key to view the PI value.

$$PI = (\text{Resistance value at 10 minutes after starting measurement}) / (\text{Resistance value at 1 minute after starting measurement})$$

If the polarization index cannot be measured, the LCD will display “----”; the maximum test value for the polarization index is 9.99; if exceeded, the LCD will display “OL” .

When the instrument's measurement port is open-circuited, or the measured value exceeds the maximum measurement value for that insulation range, a valid polarization index cannot be measured, and the LCD will display “no” . When the instrument is short-circuited during measurement, an incorrect polarization index will be obtained, and the LCD will display “Err” .

PI	≥ 4.0	4.0~2.0	2.0~1.0	<1.0
Standard	Best	Good	Warning	Bad

5.4.4 Dielectric Absorption Ratio (DAR) Measurement

Dielectric Absorption Ratio:

DAR = (Resistance value at 1 minute after starting measurement) / (Resistance value at 15 seconds after starting measurement)

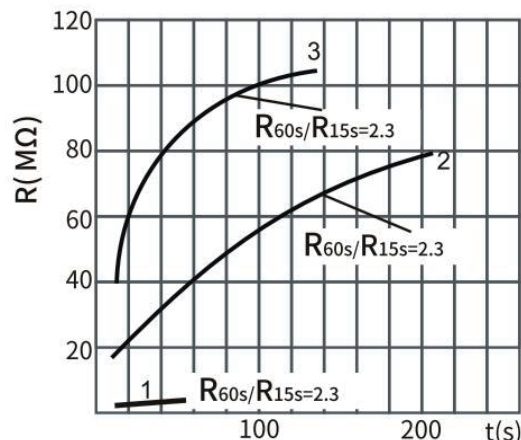
During the testing process, the instrument will automatically calculate the dielectric absorption ratio (DAR) value. Users can press the “PI/DAR” key to view the DAR value. If the DAR value cannot be measured, the LCD will display “----” ; the maximum test value for the dielectric absorption ratio is 9.99; if exceeded, the LCD will display “OL” . When the instrument's measurement port is open-circuited during measurement or the measured value exceeds the maximum measurement value for that insulation range, no valid dielectric absorption ratio can be measured, and the LCD will display “no” . When the instrument is short-circuited during measurement, an incorrect dielectric absorption ratio will be obtained, and the LCD will display “Err” .

DAR	≥ 1.4	1.4~1.0	<1.0
Standard	Best	Warning	Bad

5.3.5 Usage of PI (Polarization Index) and DAR (Dielectric Absorption Ratio):

For tested items featured with large-capacity and long absorption process, such as transformers, generators, cables, and capacitors, sometimes the absorption ratio R60S/R15S is insufficient to reflect the entire absorption process. The insulation resistance ratio obtained through a longer time can be adopted, namely the ratio of insulation resistance at 10 minutes (R10min) to insulation resistance at 1 minute (R1min), to describe the entire insulation absorption process. The PI is referred to as the polarization index of insulation. In engineering, insulation resistance and absorption ratio (or polarization index) can reflect the moisture level of insulation in equipment such as generators and oil-immersed power transformers. When insulation is damp, the absorption ratio (or polarization index) value decreases (as shown in the figure below), making it an important indicator for determining whether insulation is damp.

It should be noted that sometimes insulation may exhibit significant defects (e.g., breakdown of insulation under high voltage), yet the absorption ratio (or polarization index) value remains satisfactory. The absorption ratio (or polarization index) cannot be used to detect localized insulation defects other than moisture or contamination.



1-15°C before drying; 2-73.5°C at the end of drying; 3-cooled to 27°C after 72h operation

The figure shows the relationship between insulation resistance R and time t of a certain generator

VI. Technical Specifications

Measurement Accuracy Description: $\pm$ (Percentage of Reading + Number of Digits)

Warranty Period: One year from the Date of Manufacture.

Measurement Ambient Temperature: 23°C $\pm$ 5°C.

Measurement Ambient Humidity: 45~75% RH (unless otherwise specified).

Measurement Altitude: $\leq$ 2000 m.

VII. Technical Indicators

Insulation Resistance

Rated Voltage	100V	250V	500V	1000V	2500V
Measurement Range	0.00M Ω ~10.0G Ω	0.00M Ω ~25.0G Ω	0.00M Ω ~50G Ω	0.00M Ω ~100G Ω	0.00M Ω ~300G Ω
Open Circuit Voltage	DC100V 100%~120%	DC250V 100%~120%	DC500V 100%~120%	DC1000V 100%~120%	DC2500V 100%~120%
Output Current (Specified Load)	100k Ω load: 1mA~1.2mA	250k Ω load: 1mA~1.2mA	500k Ω load: 1mA~1.2mA	1M Ω load: 1mA~1.2mA	2.5M Ω load: 1mA~1.2mA
Accuracy	0.00M Ω ~249M Ω : $\pm(3\%+5)$ 0.25G Ω ~2.49G Ω $\pm(10\%+5)$ 2.5G Ω ~10.0G Ω $\pm 20\%$	0.00M Ω ~249M Ω : $\pm(3\%+5)$ 0.25G Ω ~2.49G Ω $\pm(10\%+5)$ 2.5G Ω ~25.0G Ω $\pm 20\%$	0.00M Ω ~249M Ω : $\pm(3\%+5)$ 0.25G Ω ~29.9G Ω $\pm(10\%+5)$ 30G Ω ~50G Ω $\pm 20\%$ (when >25G Ω , humidity $\leq$ 60%RH)	0.00M Ω ~249M Ω : $\pm(3\%+5)$ 0.25G Ω ~29.9G Ω $\pm(10\%+5)$ 30G Ω ~100G Ω $\pm 20\%$ (when >50G Ω , humidity $\leq$ 60%RH)	0.00M Ω ~249M Ω : $\pm(3\%+5)$ 0.25G Ω ~29.9G Ω $\pm(10\%+5)$ 30G Ω ~300G Ω $\pm 20\%$ (when >100G Ω , humidity $\leq$ 60%RH)
Short Circuit Current	>1.3mA				

Voltage Measurement

Voltage Type	Measurement Range	Resolution	Accuracy $\pm$ (Percentage of Reading + Number of Digits)
ACV	20~750V (50/60Hz)	1V	$\pm(2\%+3)$
DCV	$\pm 20 \sim \pm 1000V$	1V	$\pm(2\%+3)$

CONTINUITY (200mA Continuity) Measurement:

Open Circuit Output Voltage	Maximum Measurement Current	Measurement Range	Resolution	Accuracy $\pm$ (Percentage of Reading + Number of Digits)
4.8~5.3V	$\geq 200mA$	0.00~9.99 Ω	0.01 Ω	$\pm(1.5\%+5)$
		10.0~99.9 Ω	0.1 Ω	$\pm(1.5\%+5)$
		100~300 Ω	1 Ω	$\pm(1\%+5)$

VIII. General Features

- **Over-range Indication:**

Position of Voltage: LCD displays "OL".

Position of CONTINUITY: ">" sign on LCD is illuminated.

Position of Insulation Resistance: ">" sign on LCD is illuminated.

- **Temperature Coefficient:** $0.05 \times (\text{Specified Accuracy})/^{\circ}C$ ($<18^{\circ}C$ or $>28^{\circ}C$).
- **Power Supply:** AA Alkaline Battery LR6 $\times$ 6.
- **Operating Environment:**

Temperature and Humidity: 0°C ~ 40°C, ≤80% RH (no condensation).

Altitude: ≤2000 meters.

● **Storage Conditions:**

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

Altitude: ≤10000 meters.

● **Dimension:** 200mm×155mm×76mm。

● **Weight:** about 500g.

● **Accessories:**

User Manual ----- 1 copy

Shoulder Strap ----- 1 piece

Red and Black Test Leads ----- 1 set

Dedicated Alligator Clips ----- 1 set

AA Alkaline Battery LR6 ----- 6 pieces

IX. Maintenance

Caution

- **Do not use mixed new and old batteries.**
- **Pay attention to battery polarity; install according to the direction indicated in the battery compartment.**

9.1 Cleaning

Regularly clean the outer casing with a damp cloth and mild detergent; do not use corrosive agents or solvents. After cleaning, dry with a soft cloth before storing.

9.2 Battery Replacement

Warning

- To avoid electric shock and personal injury, replace the battery promptly when the voltage is low.
- When replacing the battery, ensure the instrument is turned off, and disconnect the test leads from the circuit under test.

- 1) Unscrew the fastening bolts of the instrument's battery cover and remove it.
- 2) Replace the old battery, pay attention to the battery directions indicated at the bottom of the battery compartment.
- 3) Reattach the battery cover and tighten the bolts.

①: Bolt

②: Battery

