



MaxiEV ITS100
DIGITAL INSULATION TESTER
USER MANUAL

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1. Safety Instructions

This style of Digital Insulation Tester is designed according to the safety requirements of the international electrical safety standard IEC61010-1 for electronic test instruments. It is designed and manufactured in strict compliance with the 1000V CAT III and pollution level 2 regulations of IEC61010-1.

1.1 Warning



WARNING! To avoid possible electric shock or personal injury, follow these guidelines:

- Please strictly follow the instructions in this manual to operate the tester, otherwise, the protection function provided by the tester may be destroyed.
- Do not use if the tester or test leads are damaged, or if the tester cannot operate properly. If in doubt, please contact the manufacturer.
- Before connecting the tester to the tested circuit, users must ensure to select the correct test terminals and switch positions.
- Before measuring, use the tester to measure the known voltage to verify whether the tester is operating normally.
- The voltage applied between the test terminals or between any terminal and earth ground must not exceed the rated voltage marked on the tester.
- Be careful when operating with a voltage exceeding 30Vac RMS, 42Vac PEAK, or 60Vdc as they pose a risk of electric shock.
- Replace the battery as soon as the low battery indicator  appears.
- Cut off the power supply and discharge all high-voltage capacitors before performing the resistance test.
- Do not use the tester near explosive gas or steam.

- When using test leads, keep your fingers behind the finger guard.
- Remove test leads from the tester before opening the tester case or battery cover.
Never operate the tester with the tester disassembled or with the battery cover open.
- Comply with local and national safety regulations when operating in hazardous locations.
- Comply with proper protections by local and national authority regulations when operating in hazardous areas.

1.2 Warranty

The warranty period of the tester is one year from the date of receipt, and the warranty does not cover artificial damage. This warranty does not apply to fuses and disposable batteries.

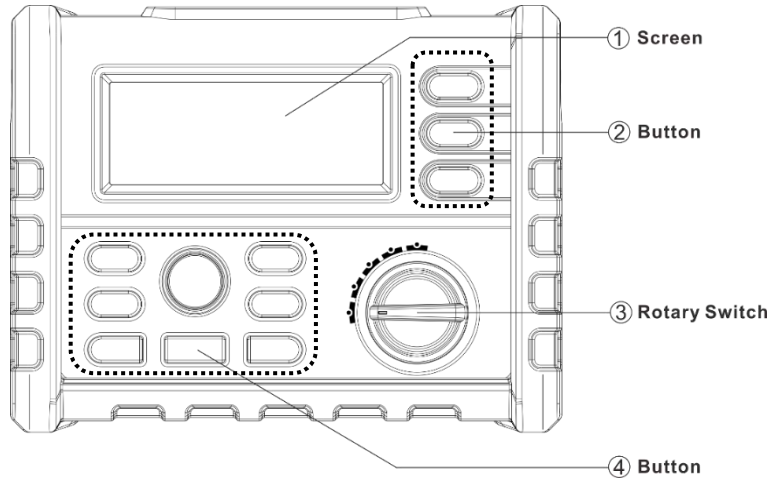
1.3 Accessories

Please check the actual configuration subject to the packing list.

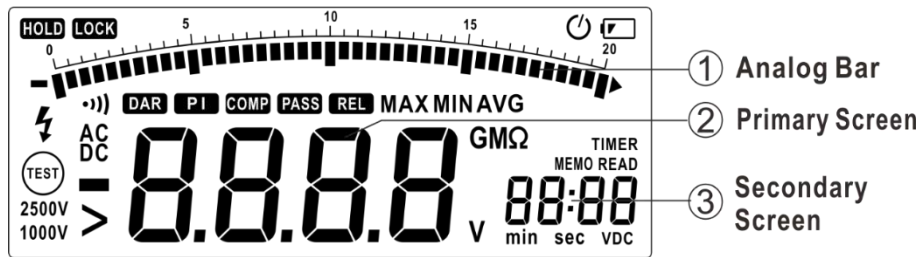
Item	Test Leads	Clips	Battery AA LR6	Manual
Quantity	2	2	6	1

2. Device Description




2.1 Front Panel



2.2 Display Screen



Display	Description
HOLD	Hold function; In DCV, ACV, and Continuity tests, the display screen will stop updating data when the “HOLD” appears; In the insulation test, the “HOLD” appears after completing the test, and holds the last test values.
LOCK	It appears after pressing the TEST button and starting the insulation test; It disappears when you press the TEST button again to stop the test.
	Auto power off function.
	Low battery indicates when it is time to replace the battery; To avoid false readings, which could lead to possible electric shock or personal injury, replace the battery as soon as the low battery indicator appears.
DAR	Display the DAR value of the tested object in insulation test mode.
PI	Display the PI value of the tested object in insulation test mode.

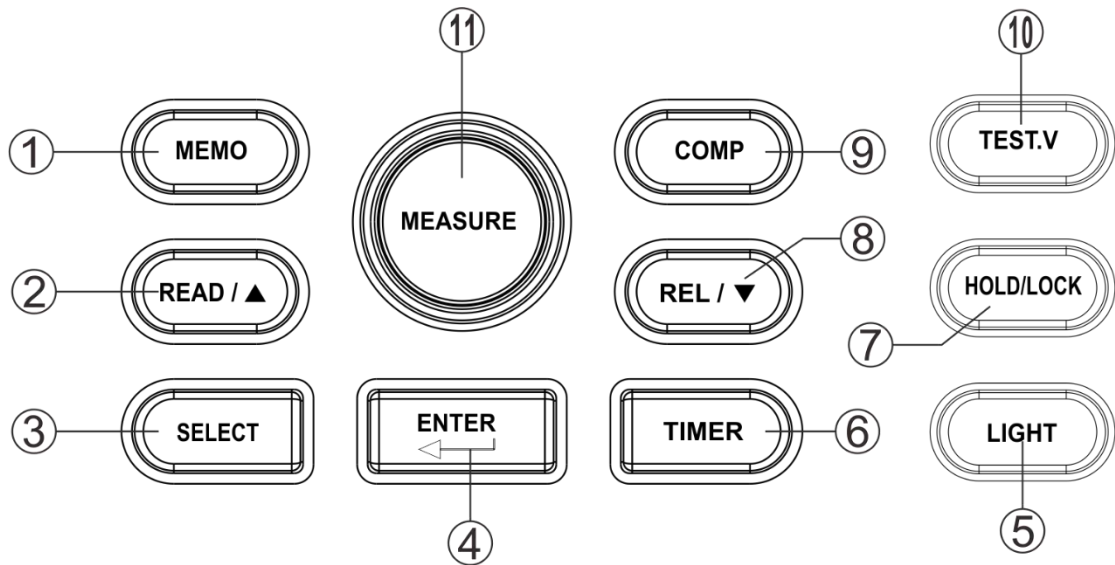
COMP	Compare function; the “COMP” appears when the compare function is enabled.
PASS	When the compare function is enabled, the “PASS” appears when the measuring value is between the upper limit and lower limit value range.
REL	Relative measurement is enabled.
MAX MIN AVG	Show the maximum, minimum, and average value of test data.
	Unsafe voltage warning; an unsafe voltage exists on the measuring terminals of the tester. Do not touch terminals to avoid electric shock.
	Continuity test sign; it appears during the continuity test.
AC DC	AC: Measure AC Voltage; DC: Measure DC Voltage.
	The “Test” indicator shines during the insulation test.
-	Minus sign; it displays when the measured value is negative.
>	It appears when the current measurement value exceeds the measure upper limit in the insulation test.
2500V 1000V	The output measuring voltage displays during the insulation test.
GMΩ	Resistance measurement unit.
V	Voltage measurement unit.
TIMER	Timely measurement function is enabled.
MEMO	The data storage function is enabled.
READ	For reading and viewing saved data; when the saved data is invalid, there displays “----”.
min sec	Time unit for timer measurement.
VDC	Output DC voltage unit; it displays in insulation test.

2.3 Screen Symbol

Screen Symbol	Description
batt	Shows on the primary screen mean that the battery voltage is too low to continue operation, so please replace the battery in time.
bat	Shows on the secondary screen mean that the battery is too low to perform an insulation test.
PrES	Preset value.
POFF	Automatically power-off function is canceled.
LIVE	Shows when the tester has detected voltage on the input terminals in insulation test mode.
DISC	In insulation test, the tester is performing discharge for capacitance load. Do not touch any input terminals to avoid electric shock.

SAVE	Save measured data.
dEL n:	Delete the selected data.
dEL ALL	Delete all saved data.
COMP Hi	Alarm upper limit value.
COMP Lo	Alarm lower limit value.
----COMP	The preset alarm upper limit or lower limit value is invalid, please reset.
OFF	The buzzer beep function is disabled.

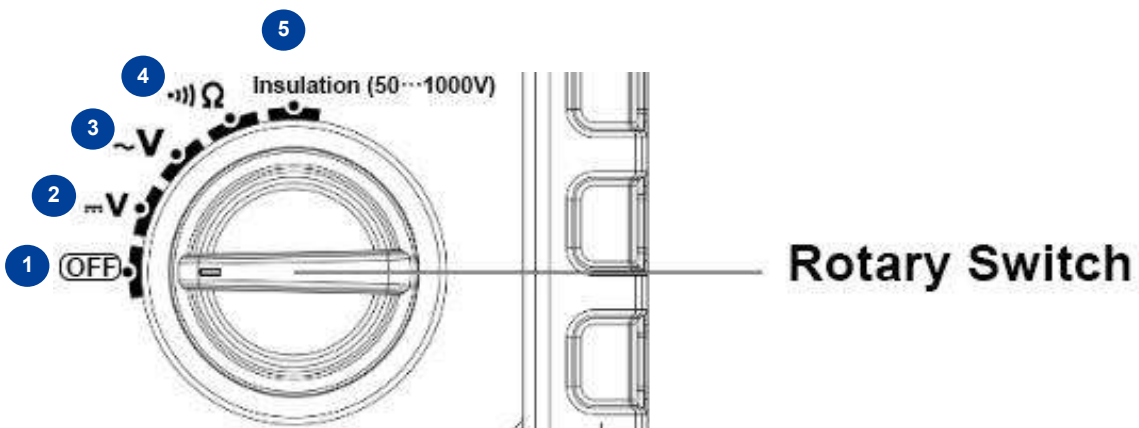
2.4 Operating Button



No.	Button	Description
①	MEMO	Enable the data storage function to store the measuring data in the internal memory of the tester
②	READ / ▲	For reading data saved in the internal memory of the tester; For changing the cursor position when modifying setting values
③	SELECT	Switch screen display; ● DCV/ACV/Continuity test: display max, min, avg, upper limit, lower limit, and relative values; ● Insulation test: display max, min, avg, upper limit, lower limit, preset timer, DAR, and PI values
④	ENTER	To confirm the preset values
⑤	LIGHT	On/Off control of the backlight; the backlight turns on when pressing the LIGHT button, and automatically turns off after 10 seconds

⑥	TIMER	Enable the timing measurement function
⑦	HOLD/LOCK	Hold in DVC, ACV, and Continuity tests; Lock in Insulation test
⑧	REL / ▼	Enable the relative function in DVC, ACV, and Continuity tests; modify data in the cursor position
⑨	COMP	Enable the compare function
⑩	TEST.V	Select the test voltage for the insulation test
⑪	MEASURE	Press to start the insulation test

2.5 Rotary Switch



No.	Position	Description
①	OFF	Turn off the tester power
②	mV	DC voltage measurement function; voltage measuring range: 0.1~1000V
③	~V	AC voltage measurement function; voltage measuring range: 0.1~750V
④	Ω	Continuity function (resistance measurement); resistance measuring range: 0.01~200Ω
⑤	Insulation	Insulation test function; test range:0.01MΩ~10.00GΩ. Test output voltage 50V (default), 100V, 250V, 500V, 1000V selectable, and the set voltage output value will be automatically saved.

2.6 Input Terminal

No.	Position	Description
①	V(HI)	Positive input terminal for measuring voltage and resistance; In insulation test, it is for output of test voltage.

②	COM	Negative input terminal for measuring voltage and resistance.
③	LO	Low input terminal for insulation test.

3. Function Instructions

3.1 Power On Function

When turning the rotary switch from the **OFF** to other positions, pressing and holding the following buttons will enable additional functions of the tester.

- **SELECT**: Press and hold the **SELECT** button, and the tester powers on. The tester displays POFF until the **SELECT** button is released, and the tester will cancel the automatic power-off function;
- **ENTER**: Press and hold the **ENTER** function, and the tester powers on. The tester will disable the resistance beeping prompt function.

3.2 Automatic Power Off

The tester has an automatic power-off function to conserve battery power if there is no function change or button press for 10 minutes. The beep will beep 3 times to prompt before automatically shutting down and users can press any buttons to release sleep mode and wake the tester up.

- Press and hold the **SELECT** button and power on the tester, the automatic power-off function will be canceled.
- The system will disable the automatic power-off function during the insulation test.

3.3 Hold Function

It is used for DCV, ACV, and Continuity tests, not insulation tests.

Press the **HOLD/LOCK** button to freeze the displayed value, and the “**HOLD**” character will be shown on the screen. Press the **HOLD/LOCK** button again to exit the hold function, and the display screen will be released.

3.4 Relative Measurement

It is used for DCV, ACV, and Continuity tests, not insulation tests.

Press the **REL** button to record the current measuring value (initial value), and the “REL” character will be shown on the screen (displayed value = real measured value – initial value).

Press the **REL** button again to exit the relative measurement mode.



In relative measurement mode, users can press the **SELECT** button to view the initial value; when the initial value is invalid, the display shows “----”.

3.5 Insulation Test Lock

In insulation test mode, press the **TEST** button to perform the insulation test. Stop the insulation test by releasing the **TEST** button, and the display will show a “HOLD” character.

Before testing, press the **HOLD/LOCK** button and the screen displays “LOCK”. Then press the **TEST** button, and the tester will perform an insulation test until users press the **TEST** button again. After completing an insulation test, the lock function will be automatically canceled.

Note: The test lock function is invalid when the timer function is selected.

3.6 Data Storage

Press the **MEMO** button (in DCV, ACV, and Continuity tests, the tester will switch to HOLD status automatically), the screen displays the “MEMO” character, and the secondary screen displays the data number to be saved. Press the “ Δ/∇ ” button to modify the data number and press **ENTER**, then the screen will display “SAVE” which indicates the system is saving data.

The data is stored successfully when the buzzer beeps one time. The tester supports storing 20 sets of data and the storage number from 00 to 19.



3.7 Data Reading

Press the **READ** button to read the saved data. The screen displays “**READ**”, the secondary screen displays the data number, and the primary screen shows the value.

Press the “ Δ/∇ ” button to switch the data number and read the corresponding data.



3.8 Data Delete

In READ mode, press **ENTER**, and the screen will display the “**dEL n**” to prompt whether to delete the data. Press the **ENTER** button again to delete selected data.



Press the **READ** button, and then the screen will display the “**dEL ALL**” to prompt whether to delete all data. Press **ENTER** to delete all data at once time.

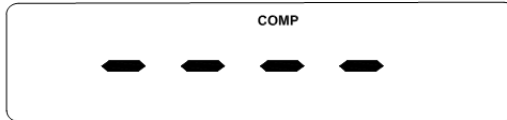
Once the data is successfully deleted, the system goes back to the READ mode.

Note: users can press any other button to back to the READ mode during the operating process.

3.9 Data Compare

The COMP function is used for monitoring whether the measured data exceeds the preset alarm upper limit or lower limit. The tester beeps and the screen will not display “**PASS**” when the measured data is higher than the upper limit or lower than the lower limit.

Press the **COMP** button to enable the data compare function and the screen displays the “**COMP**” character. It is unable to activate the COMP function when the preset upper limit value is lower than the lower limit value, and the screen will display “----” as shown below. The system will prompt to reset the alarm upper limit and lower limit.



When the measured data is lower than the upper limit and higher than the lower limit, the screen display “**PASS**”.

Press the **SELECT** button to view preset alarm upper limit and lower limit values:

- When the primary screen displays “**COMP**” and the secondary screen displays “**HI**”, the value displayed on the primary screen is the preset alarm upper limit.
- When the primary screen displays “**COMP**” and the secondary screen displays “**LO**”, the value displayed on the primary screen is the preset alarm lower limit.



When the alarm limit value is displayed on the primary screen, press **ENTER** to modify the preset value.

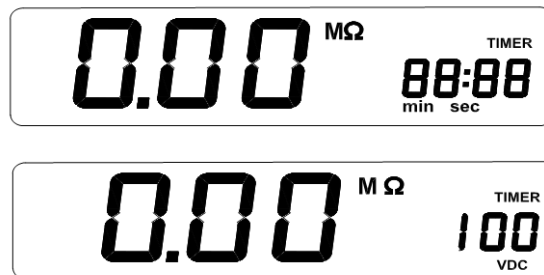
- 1) Press the **SELECT** button to switch the preset data range and input signal polar.
- 2) Press “ Δ/∇ ” to modify the value, and press **ENTER** to save the settings.



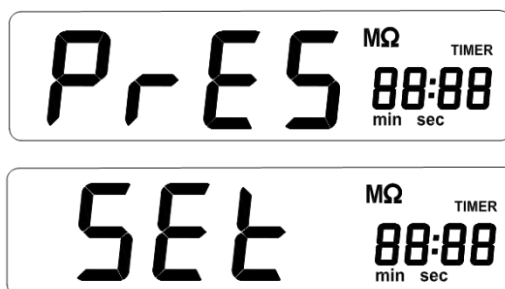
3.10 Timer Function

The TIMER function can only be activated in the insulation test mode. Enable the timer function by pressing the **TIMER** button, and the screen displays the “TIMER” character. (The lock function will be invalid when the timer function is enabled.) The tester starts the insulation test after pressing the **MEASURE** button, and the test will be stopped when the preset time is reached.

After starting the TIMER function, the secondary screen displays the real-time voltage and test time. During measurement, the tester only displays voltage by default, and it can be switched to display the test time by pressing “△”.



Press **SELECT** to check the preset time. The screen displays “TIMER”, the “PRES” is shown on the primary screen and the preset time is shown on the secondary screen. Press **ENTER**, and the screen displays “SEt”, then users can press “△/▽” to modify time and press **ENTER** again to save. (*Note: It is unable to activate the TIMER function when the time is set to 0.*)



3.11 MAX/MIN/AVG

While testing, the tester will automatically record the maximum, minimum, and average

values. Press the **SELECT** button to switch different parameters to view.

3.12 DAR & PI

The DAR and PI are used to check whether the leaking current is reduced after a voltage is applied to the tested object (when the PI or DAR value is close to 1, it means that the insulation of the tested object is destroyed). The tester automatically calculates the PI and DAR values as a reference for judging insulation performance. Both DAR and PI represent the change in insulation resistance over some time after the tested object is subjected to the measurement voltage.

$$\text{DAR (absorption Ratio)} = \frac{R_{60 \text{ Sec}}}{R_{15 \text{ Sec}}}$$

$$\text{PI (Polarization Index)} = \frac{R_{10 \text{ Min}}}{R_{1 \text{ Min}}}$$

Note:

R10Min=Resistance value measured after applying voltage for 10 minutes;

R1Min=R60Sec=Resistance value measured after applying voltage for 1 minute;

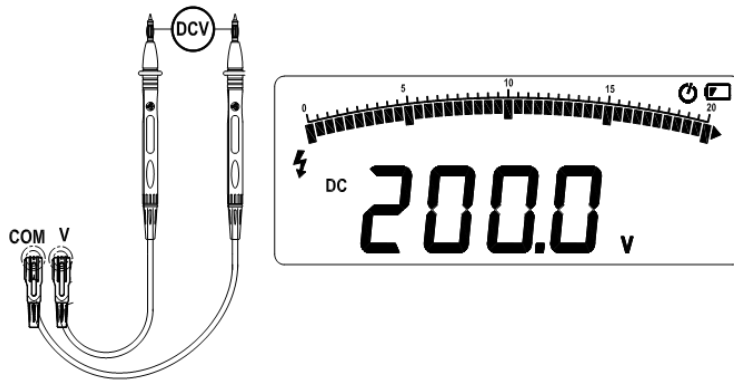
R15Sec=Resistance value measured after applying voltage for 15 seconds.

After starting the insulation test, press the **SELECT** button to view the current DAR and PI values. When the measurement time is less than 1 minute, the DAR and PI will be invalid and the screen will display "----".

4. Test Mode Instructions

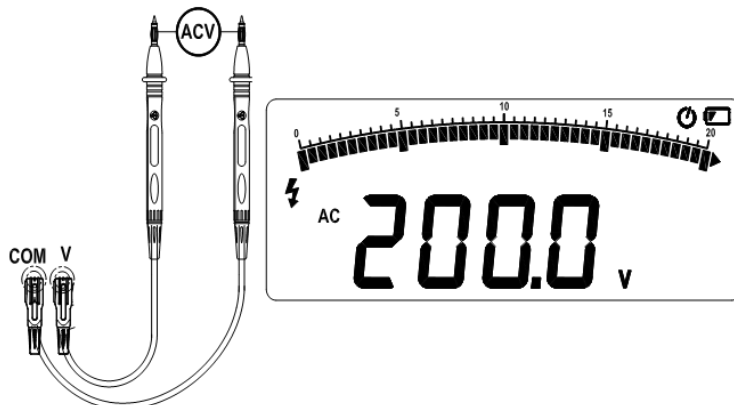
4.1 DC Voltage Measurement (DCV)

Turn the rotary switch to mV position, and connect the red probe with the V terminal, and connect the black probe with the COM terminal as shown below.



4.2 AC Voltage Measurement (ACV)

Turn the rotary switch to $\sim\text{V}$ position, and connect the red probe with the V terminal, and connect the black probe with the COM terminal as shown below.



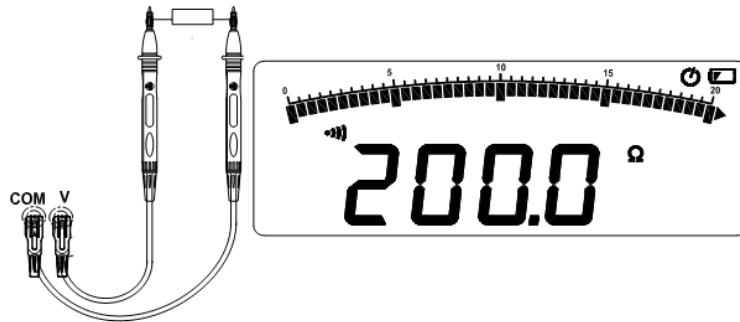
4.3 Continuity Test

⚠ ATTENTION! Do not measure the voltage when switching to Ω position to avoid damage to the tester.

Turn the rotary switch to Ω position, and connect the red probe with the V terminal,


and connect the black probe with the COM terminal. The buzzer beeps when the resistance is less than 3Ω .

Note: When measuring small resistance, since the inherent error of the test leads resistance affects the measurement accuracy, it is recommended to use the relative measurement function to eliminate the error caused by the test leads resistance.




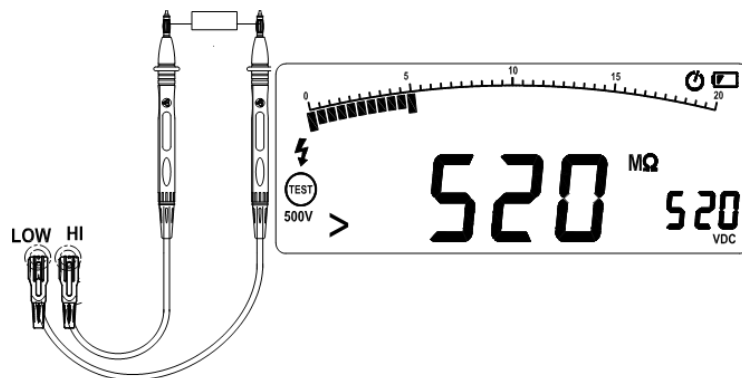
4.4 Insulation Test

⚠ WARNING! Do not perform the insulation test on the live circuit! Check and confirm the test leads are free from any damage!

Turn the rotary switch to the insulation position first. (If  displayed, please replace the battery in time.)

- 1) Insert the test probes into the High and Low terminals (When measuring high resistance, do not twist the test leads around each other to avoid affecting the measurement results). If the tester displays the “**Live**” character, it means that the circuit is live. Please remove the test leads from the tested object, and discharge the circuit before the next measuring.
- 2) Press the **TEST.V** button to select the correct output voltage.
- 3) There are two operating methods to start and stop the insulation test:
 - a) Press and hold the **MEASURE** button for more than 1 second to start the test, and release the **MEASURE** button to stop the test;

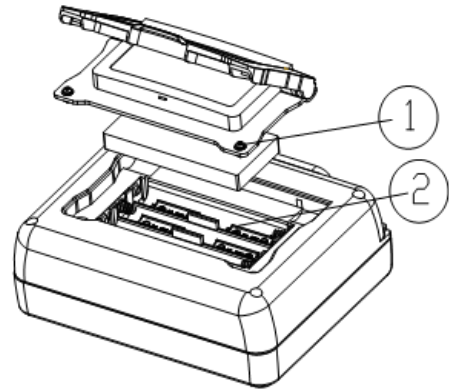
- b) Press the **LOCK** button to enable the lock mode and the screen displays a “**LOCK**” character, then press **MEASURE** to start the test and release the **MEASURE** button. Press **MEASURE** again to stop the test.
- 4) After starting the test, the high voltage symbol ⚡ is displayed on the tester’s screen. The  symbol and the indicator of the **MEASURE** button flash during the insulation test. The primary screen shows the measured resistance value and the second screen displays the actual output voltage.
- 5) Stop the test according to the operating method in step 3). Then the tester automatically discharges the measurement load, and the tester displays a “**DISC**” character.
- 6) When the output voltage displayed on the secondary screen is 0V, the discharge is finished and stopped.
- 7) Disconnect the test leads from the tested circuit.



5. Tester Battery Replacement

⚠ WARNING! *To avoid electric shock and personal injury, please replace the battery in time when the battery voltage is low. Before replacing, please turn the rotary switch to the power off position, and disconnect the tester test wire from the tested circuit, and remove it from the tester!*

- 1) Unscrew the fastening screw of the battery cover and remove the battery;
- 2) Replace the old battery and pay attention to the direction of the battery electrodes marked on the bottom of the battery case;
- 3) Cover the battery and tighten the screws.



Note: ① screw ② battery

6. Specifications

Index	Description
Safety Standards	Comply with IEC/EN 61010-1 1000V CAT III, 600V CAT IV measurement standards
Voltage Measurement	1000Vdc voltage; 750Vac voltage (true valid value)
Overload Protection	<p>When performing voltage measurement, if the input terminals are V and COM, the max overload protect voltage is 1200V; if the input terminals are Hi and Lo, the overload protect voltage is 600V;</p> <p>In other test modes, the overload protect voltage is 250V (valid value)</p>
Tester Battery	A total of six 1.5V AA alkaline batteries; It supports completing at least 1000 insulation tests (standard test with conditions of 1000V, 1M Ω , and duty cycle of 5 seconds power on and 25 seconds power off)
Insulation Measurement Range	0.01M Ω ~10.00G Ω
Insulation Test Voltage	50V, 100V, 250V, 500V, 1000V
Insulation Output Voltage Accuracy	+20%, -0%
Insulation Short Circuit Test Current	1.8mA nominal value
Insulation Auto-Discharge Time	When capacitance (C)=1 μ F or less, the discharge time < 1 second
Insulation Live Circuit Detection	Before test initialization, if the terminal voltage > 20V, the alarm will occur and the test will be prohibited
Insulation Max Capacitive Load	Operable with up to 1 μ F load
Storage Temperature	-20 $^{\circ}$ C~60 $^{\circ}$ C
Operating Temperature	0 $^{\circ}$ C~40 $^{\circ}$ C

Storage Altitude	12000m
Operating Altitude	2000m 1000V CAT III; 3000m 1000V II
Temperature Coefficient	Per (°C) × 0.05 × (specified accuracy) for temperature < 18°C or temperature > 28°C
Relative Humidity	40%~75% (40%~60% when insulation test resistance > 1GΩ)
Dimension (mm)	194(L)*150(W)*72(H)
Weight (g)	950g

7. Technical Index

7.1 DC Voltage Accuracy

Voltage Range	Resolution	Accuracy
200V	0.1V	$\pm(0.5\% +5)$
1000V	1V	$\pm(0.5\% +5)$

7.2 AC Voltage Accuracy

Voltage Range	Resolution	Accuracy (50~60Hz)
200V	0.1V	$\pm(1.5\% +5)$
750V	1V	$\pm(1.5\% +5)$

7.3 Resistance Accuracy

Resistance Range	Resolution	Accuracy (50~60Hz)
20 Ω	0.01 Ω	$\pm(1\% +5)$
200 Ω	0.1 Ω	$\pm(1\% +5)$

7.4 Insulation Test Accuracy

Output Voltage	Display Range	Resolution	Test Current	Accuracy
50V (0~20%)	0~20M Ω	0.01M Ω	1mA@50K	$\pm(3\%+5)$
	20~200M Ω	0.1M Ω		
	200~500M Ω	10M Ω		$\pm(5\%+5)$
100V (0~20%)	0~20M Ω	0.01M Ω	1mA@100K	$\pm(3\%+5)$
	20~200M Ω	0.1M Ω		
	200M Ω ~1.00G Ω	10M Ω		$\pm(5\%+5)$
250V (0~20%)	0~20M Ω	0.01M Ω	1mA@250K	$\pm(3\%+5)$
	20~200M Ω	0.1M Ω		
	200~250M Ω	1M Ω		

	250MΩ~2.50GΩ	10MΩ		±(5%+5)
500V (0~20%)	0~20MΩ	0.01MΩ	1mA@500K	±(3%+5)
	20~200MΩ	0.1MΩ		
	200~500MΩ	1MΩ		
	500MΩ~5.00GΩ	10MΩ		±(5%+5)
1000V (0~20%)	0~200MΩ	0.1MΩ	1mA@1000K	±(3%+5)
	200~1000MΩ	1MΩ		
	1.00~5.00GΩ	0.01GΩ		±(5%+0.1GΩ)
	5.00~10.00GΩ	0.01GΩ		±(10%+0.2GΩ)
	10.00~30.00GΩ	0.01GΩ		±(20%+0.2GΩ)
	30.00~100.00GΩ	0.01GΩ		±(30%+0.3GΩ)