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UNI-T®

UT513B/UT513C
Insulation Resistance Tester
User Manual

Preface

Thank you for purchasing this brand new product. In order to use this product safely and correctly, please read this manual thoroughly, especially the safety notes.

After reading this manual, it is recommended to keep the manual at an easily accessible place, preferably close to the device, for future reference.

Limited Warranty and Liability

Uni-Trend guarantees that the product is free from any defect in material and workmanship within one year from the purchase date. This warranty does not apply to damages caused by accident, negligence, misuse, modification, contamination or improper handling. The dealer shall not be entitled to give any other warranty on behalf of Uni-Trend. If you need warranty service within the warranty period, please contact your seller directly.

Uni-Trend will not be responsible for any special, indirect, incidental or subsequent damage or loss caused by using this device.

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I. Overview

UT513B/UT513C is digital high-voltage insulation resistance tester, designed with multiple ranges including 250V, 500V, 1000V, 2500V and 5000V, each with voltage fine-adjusted at a step of 10%. The tester can store 999 groups of data, which can be transferred to personal computer via USB cable or in real time. UT513C has Bluetooth communication and capacitance measurement functions.

UT513B/UT513C is mainly used to measure insulation resistance of cable, motor, power generator, transformer, mutual inductor, high-voltage switch, lightning arrester, and more, it is an ideal measurement meter for electric power, telecommunication, meteorology, machine room, oil field, electromechanical installation and maintenance, and power supply department of Industry and mining enterprise.

The user manual includes related safety information, warning, etc. Please read the related contents and follow all warnings and precautions.

1.1 Models

Models	Rated voltage	Insulation resistance range	Short-circuit current
UT513B	250V, 500V, 1000V, 2500V, 5000V	0.25MΩ~2TΩ	About 3.5mA
UT513C	250V, 500V, 1000V, 2500V, 5000V	0.25MΩ~5TΩ	About 5.0mA

1.2 Features

1. Insulation resistance range up to 2TΩ (UT513B) and 5TΩ (UT513C)
2. Output rated voltage ranges including 250V, 500V, 1000V, 2500V, 5000V
3. Short-circuit current: About 3.5mA (UT513B) and 5mA (UT513C)
4. Insulation resistance testing (IR)
5. AC/DC voltage testing (V)
6. Capacitance testing (CAP) (UT513C)
7. With stepping set at 10% of rated voltage for each range.
8. Polarization Index (PI) and Dielectric Absorption Ratio (DAR)
9. Resistance comparison function (COMP) with upper and lower resistance limit setting and over-range indication.
10. Timer testing mode
11. Automatic current display
12. External voltage detection function to monitor live voltage of measured object.
13. Timer function to record testing time automatically.
14. Automatic discharge and high voltage alarming functions.
15. Analog bar graph to display tested insulation resistance
16. Manual and automatic power off functions
17. The ability to delete and store 999 groups of data.
18. Data upload function to enable uploading data to computer via USB cable for data analysis.
19. Bluetooth to control the tester (UT513C)
20. LCD-backlit function
21. 5.1-inch LCD display
22. Rechargeable lithium battery pack (14.8V, 5200mAh)

1.3 Technical Specifications

Error limit: ± (a% of reading + b digits), one-year warranty

Environment temperature: 23±5℃

Environment humidity: 45~75%RH, In the table below: The humidity must be less than 50%RH when testing insulation objects with a resistance greater than 50GΩ in the parameters.

Temperature coefficient: Add an error of ±0.25% per degree (°C) when testing at temperature of >28°C or <18°C.

1.3.1 Insulation Resistance Specifications

Rated voltage	UT513B measurement range	UT513C measurement range	Accuracy	Over-range indication	Short-circuit current
250V	<0.25MΩ	<0.25MΩ	For reference only	>	UT513B: About 3.5mA UT513C: About 5.0mA current with load: 1mA~1.2mA (250V, 0.25MΩ; 500V, 0.5MΩ; 1000V, 1.0MΩ; 2500V, 2.5MΩ; 5000V, 5.0MΩ)
	0.25MΩ 2.49GΩ	0.25MΩ 4.99GΩ	± (5%+5)		
	2.50GΩ 24.9GΩ	5.00GΩ 49.9GΩ	± (10%+10)		
	25.0GΩ 100GΩ	50.0GΩ 250GΩ	For reference only		
500V	<0.50MΩ	<0.50MΩ	For reference only		
	0.50MΩ 4.99GΩ	0.50MΩ 4.99GΩ	± (5%+5)		
	5.00GΩ 49.9GΩ	5.00GΩ 99.9GΩ	± (10%+10)		
	50.0GΩ 200GΩ	100GΩ 500GΩ	For reference only		
1000V	<1.00MΩ	<1.00MΩ	For reference only		
	1.00MΩ 9.99GΩ	1.00MΩ 9.99GΩ	± (5%+5)		
	10.0GΩ 99.9GΩ	10.0GΩ 199GΩ	± (10%+10)		
	100GΩ 400GΩ	200GΩ 1.00TΩ	For reference only		
2500V	<2.50MΩ	<2.50MΩ	For reference only		
	2.50MΩ 24.9GΩ	2.50MΩ 24.9GΩ	± (5%+5)		
	25.0GΩ 249GΩ	25.0GΩ 499GΩ	± (15%+10)		
	250GΩ 1.00TΩ	500GΩ 2.50TΩ	For reference only		
5000V	<5.00MΩ	<5.00MΩ	For reference only		
	5.00MΩ 49.9GΩ	5.00MΩ 49.9GΩ	± (5%+5)		
	50.0GΩ 499GΩ	50.0GΩ 999GΩ	± (15%+20)		
	500GΩ 2.00TΩ	1.00TΩ 5.00TΩ	For reference only		

1 TΩ (Tera ohm) =1000GΩ=10^{12}Ω

1 GΩ (Giga ohm) =1000MΩ=10^{9}Ω

1 MΩ (Mega ohm) =1000KΩ=10^{6}Ω

Note: For insulation resistance measurement, if the measured capacitive reactance is greater than about 100nF, it may cause reading to fluctuate significantly.

Over-range warning: For example, in the 1000V voltage output range of UT513B, if the range is exceeded, it will display >400GΩ.".

1.3.2 Current Specifications

Model	Measurement accuracy	Display accuracy	Range	Remark
UT513B	±(10%+5)	0.01nA 0.01μA 0.01mA	0.01nA 3.50mA	Test stops automatically if current remains at ≥1.00mA for 10s
UT513C			0.01nA 5.00mA	

1.3.3 Output Voltage Specifications

Rated voltage	Output accuracy	Display accuracy	Output voltage	Remark
250V	+(0%~20%)	1V	250V 300V	Voltage adjustment range with step set at 10%: (50% 120%) 250V cannot step down and 5000V cannot step up.
500V			500V 600V	
1000V			1000V 1200V	
2500V			2500V 3000V	
5000V			5000V 6000V	

1.3.4 Voltage Testing Specifications

Voltage measurement	Measurement range	Accuracy	Resolution	Over-range indication	Remark
DC voltage	30 1000VDC	±(3%+5	1V	OL	1. Input impedance: 200MΩ 2. Frequency: 50Hz/60Hz
AC voltage	30 750VAC	±(3%+5	1V	OL	

Note: LO is displayed if the input voltage is less than about 25V; the reading flashes if the input voltage is between about 750VAC~824VAC or 1000VDC~1099VDC; "OL" is displayed with buzzer making sound and LCD flashing if the input voltage is greater than about 1100VDC or about 825VAC.

1.3.5 Capacitance Testing Specifications (UT513C)

Capacitance measurement	Measurement range	Accuracy	Over-range indication	Remark
250V	0.01uF 1.00uF	± 15%+3	>1.00uF	Note the withstand voltage of capacitance shall not be less than the rated voltage.
500V	1.00uF 15.0uF		>15.0uF	
1000V	1.00uF 15.0uF		>15.0uF	

Note: Rated voltages for capacitance measurement include 250V, 500V, and 1000V. LO is displayed if measured capacitance is 0.01uF; if object with large capacitive reactance is measured when the battery power indicator indicates the battery power is less than "2 segments", the tester may powers off for protection, in such situation, please restart the tester or connect with charger to activate the battery for powering on the tester.

1.3.6 Common Specifications

Power supply	Rechargeable lithium battery (14.8V, 5200mAh)
Rated voltage	250V, 500V, 1000V, 2500V, 5000V
Output voltage accuracy	+ (0% 20%)
Insulation resistance range	UT513B: 0.25MΩ 2.00TΩ; UT513C: 0.25MΩ 5.00TΩ
Output short-circuit current	UT513B: About 3.5mA (10s); UT513C: About 5.0mA (10s)
Continuous insulation resistance measurement	√ (default mode)
Polarization index testing	√ (automatic display)
Absorption ratio testing	√ (automatic display)
Timing measurement	√
Resistance comparison measurement	√
Voltage testing	√ UT513C can automatically identify AC/DC voltage
Capacitance testing	UT513C only
Current display	Current is displayed when measuring insulation resistance.
Voltage stepping	√
Monitoring live voltage of external measured object	Monitor the voltage of measured object and the discharge state after testing. If voltage is higher than 36V, it is forbidden to test for protecting the tester and the operator
High voltage warning	The warning symbol flashes if detected voltage exceeds the safety voltage.
Timer testing	Record testing time automatically. Timing range: 0s 99m and 59s
Storage function	Store 999 groups of data
Communication function	Upload testing data to computer via USB cable.
	Upload data and operate tester through Bluetooth (UT513C)
Battery power indication	Battery power indication to indicate charging when low battery occurs.
Auto power off	Power off automatically in 15 minutes of inactivity and without occurrence of high voltage.

Dimensions	238mm(L)x166mm(W)x90.5mm(D)
Weight	About 1800g (including battery)
Test leads	Red high-voltage test lead: 1 pc Green test lead: 1 pc Black test lead: 1 pc
Operating environment	0℃ 35℃; <75%RH
Storage environment	-20℃ 60℃; <80%RH
Altitude	<2000m
Pollution degree	2
CAT rating	CAT IV 600V
Safety standards	CE,UKCA EN 61010-1; EN IEC 61010-2-034; BS EN 61010-1; BS EN IEC 61010-2-034

II. Accessories

Please check if any accessory in the package is missing or damaged:

1. User manual: 1 pc
2. Test lead (red, black, green: 1 for each): 3 pcs
3. USB cable: 1 pc
4. Lithium battery charger (model: CS36M168200M1; specification: Input:100-240Vac (Fluctuations+10%), 50/60Hz, 0.8A,Output: 16.8Vdc, 2A: 1 pc
5. Lithium battery pack (installed inside the tester, model: UT-M18, specification: 14.8V, 5200mAh): 1 pc
6. Adapting charging stand (optional accessory, model: UT-W12)
7. Carrying strap:1pc

If any missing or damaged accessory occurs, please contact with the supplier immediately.

III. Safety Information

Thank you for purchasing the High-Voltage Insulation Resistance Tester. The product is designed, manufactured and tested in accordance with IEC61010 Safety Standard (safety requirements of electric measurement products), Double Insulation, and Overvoltage CAT IV 600V Standard. Before first use, please read and follow the safety information and the precautions in the user manual, so as to avoid electric shock or personal injury.

⚠ Warning

- Please read the user manual thoroughly and follow the “Safety Information” strictly.
- Keep the user manual with you for use at any time.
- Use the tester according to the operating instructions.
- Follow the operating instructions strictly failure to follow can cause personal injury and product damage.
- Please wear insulation gloves before use.
- Do not measure circuit with voltage over 750VAC or 1000VDC.
- It is forbidden to test near inflammable environment, spark cause explosion.
- Do not perform operation with tester surface or user’s hands wet.
- Please avoid short circuit occurs between metal part and test lead when measuring voltage, otherwise it may cause personal injury.
- Do not exceed the upper range when performing measurement.
- Do not start testing when the test leads are not connected properly.
- Do not open the battery cover during measurement.
- Do not touch the measured circuit during or right after insulation resistance measurement, otherwise it may cause electric shock.
- Please stop testing if dirt or carbide susceptible to damaging insulation characteristic is found with test lead or port.
- Please do not short-circuit or connect test lead when measuring insulation resistance, misoperation may accidentally cause test to be stopped or LED to be lit off. Top end of test lead will discharge when test lead is short-circuited or connected, please note that certain discharge can deteriorate the product performance.
- Please check the tester and the test lead before use for any damage or defect. Please stop using the tester if test lead or casing insulation is damaged, LCD shows nothing, or the tester cannot work normally.
- It is forbidden to use the tester without battery cover set in place, otherwise it may pose a risk of electric shock.
- Keep fingers behind the finger guard when perform measurement, do not touch exposed wire, connector, alligator clip, etc. to avoid electric shock.
- The output voltage at right position before measurement, it is forbidden to switch over the output voltage during measurement to avoid product damage.
- If the battery power indicator shows less than one “segment” of power left, please charge or replace the battery immediately to ensure measurement accuracy. Remove the battery if the product is not used for a long time. Power off the tester before opening the battery cover.
- Do not alter the internal wiring without authorization to avoid product damage and safety hazard.
- Do not store or use the tester in flammable and explosive environments, or environments with high temperature, high humidity, and strong electromagnetic field.
- Please clean the casing using soft cloth and mild detergent, do not use abrasive or solvent to avoid casing corrosion and product damage.
- If insulation on probe is damaged, replace a new one which should meet EN 61010-031 standard, rated follow parameters of the product or better.
- Before each use verify tester operation by measuring a known voltage.
- Indoor use only

IV. Electrical Symbols

⚠	Risk of electric shock
⧈	Double-insulated or insulation-enhanced
DC	Direct Current
AC	Alternating Current
⏚	Grounding
⚠	Warning
▮▮▮▮	Battery voltage
CAT IV	It is applicable to test and measuring circuits connected at the source of the building's low-voltage MAINS installation

V. External Structure

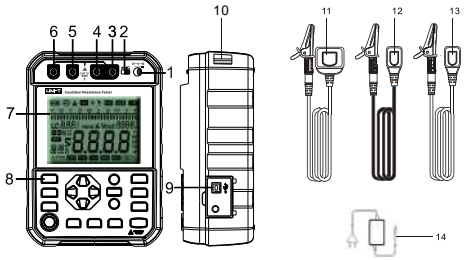

Fig. 5.1 External structure

1	Battery charging port
2	Selection switch for charging and testing modes
3	LINE: High-voltage output outlet (dual-plug red lead)
4	LINE: Outlet for shielding high-voltage lead (dual-plug red lead)
5	GUARD: Grounding protection outlet (single-plug green lead)
6	EARTH: High resistance measurement outlet (single-plug black lead)

7	LCD segmented display screen
8	Functional buttons
9	USB port
10	Carrying strap location
11	Dual-plug high-voltage test lead (red)
12	High resistance sampling test lead (black)
13	Protective test lead (green)
14	Lithium battery charger

VI. Button Description

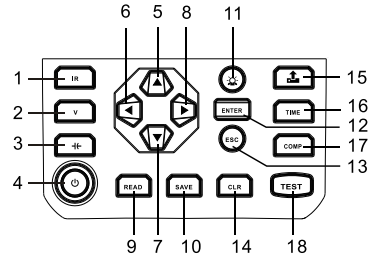

Fig. 6.1 Functional buttons

1	Insulation resistance measurement mode
2	AC/DC voltage measurement mode (UT513C) DCV measurement mode (UT513B)
3	Capacitance measurement mode (UT513C) ACV measurement mode (UT513B)
4	Power on/off
5	Increase; select high range or previous group of data
6	Decrease; adjust time and resistance; cyclically display
7	Decrease, select low range or next group of data

8	Increase; adjust time and resistance; cyclically display
9	Read data
10	Save data
11	Backlight
12	Confirm parameter setting
13	Return
14	Delete saved data
15	Upload data
16	Timer resistance test
17	Compare resistance test
18	Conduct testing

VII. LCD Display

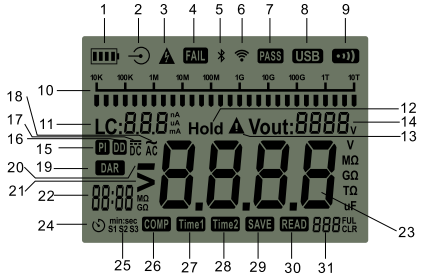

Fig. 7.1 Symbols on LCD

1	Battery power
2	Battery charging
3	Live measured object or risk of high voltage
4	Failed resistance comparison testing
5	Bluetooth

6	Wi-Fi communication (Reserved symbol. Not applicable to UT513B and UT513C)
7	Pass resistance comparison testing
8	USB communication
9	Buzzer
10	Analog bar graph of insulation resistance testing
11	Current display
12	Data hold
13	Indication of dangerous operation
14	Monitoring display of voltage output
15	Polarization index testing mode
16	Dielectric constant testing mode
17	DC voltage testing mode
18	AC voltage testing mode
19	Dielectric absorption ratio testing mode
20	Inverted input of DC voltage testing
21	Over-range test result
22	Comparison resistance setting or timer setting
23	Display area of measured insulation resistance, AC/DC voltage, capacitance, etc.
24	Timer
25	Stepping indication
26	Resistance comparison mode
27	Time1 of the timer
28	Time2 of the timer
29	Save data
30	Read data
31	Data storage capacity

VIII. Button Operation

- Power button

Long press power button for more than 2 seconds to turn on the tester (full symbols are displayed on LCD for 1 second), long press again to turn it off. The tester is designed with auto power off function.

- IR

Insulation resistance testing button: The default mode is continuous insulation resistance testing mode when powering on the tester. Short press this button to switch to insulation resistance testing function.

- V

AC/DC voltage testing button: Without high voltage output, short press “V” button to switch to AC/DC voltage testing mode. The tester can identify AC/DC voltage automatically (UT513C).
For UT513B, please select DCV or ACV button manually to enter corresponding DC or AC voltage measurement mode.

- ⊣⊢ (UT513C)

Capacitance measurement button: Without high voltage output, short press “⊣⊢” to switch to capacitance measurement mode.

- ▲

A. Under insulation resistance measurement or capacitance measurement condition and without testing voltage output, short press ▲ to select high-range voltage output.
B. For data reading, press ▲ to select last group of data.
C. For time or resistance setting, press ▲ to increase time or resistance.

- ▼

A. Under insulation resistance measurement or capacitance measurement condition and without testing voltage output, short press ▼ to select low-range voltage output.
B. For data reading, press ▼ to select next group of data.
C. For time or resistance setting, press ▼ to decrease time or resistance.

- ◀

A. Under insulation resistance measurement condition and without testing voltage output, press ◀ to progressively decrease at the step of corresponding range (decrease by 50% at a step of 10% each).
B. When setting time or resistance, ◀ button is used as a cursor button to adjust time and resistance.
C. After polarization index or absorption ratio measurement is completed, press ◀ to cyclically display polarization index or absorption ratio, insulation resistance in Time2 and Time1.

- ▶

A. Under insulation resistance measurement condition and without testing voltage output, press ▶ to progressively increase at the step of corresponding range (increase by 120% at a step of 10% each).
B. For time or resistance setting, ▶ button is used as a cursor button to adjust time and resistance.
C. After polarization index or absorption ratio measurement is completed, press ▶ to cyclically display polarization index or absorption ratio, insulation resistance in Time2 and Time1.

- READ

Without high voltage output, short press “READ” to read latest group of saved data, and press ▲ and ▼ to select different data.

- SAVE

Short press “SAVE” to save current displayed data. The LCD shows the symbol “FUL” and the number of group “999” to indicate full storage. To save next group of data, please clear the saved data.

- Backlight button

Short press this button to turn on/off the backlight.

- Setting confirmation button

For setting parameter in non-testing state, short press “ENTER” to confirm the setting and exit the current setting.

● Setting cancellation/exit button
For setting parameter without high voltage output, short press “ESC” to cancel current setting and exit. Under “TIME” and “COMP” modes, short press “ESC” consecutively for twice to return to the interface of continuous insulation resistance measurement.

● Data deletion button
In “READ” state, short press “CLR” and then press “ENTER” to delete current data, press “ESC” to exit data deletion function. In “READ” state, the symbol “CLR” and the storage capacity symbol “2Hz” flash when “CLR” is long pressed for 2 to 3 seconds, press “ENTER” to confirm clearing all saved data, press “ESC” to exit data deletion function. Note: To delete all saved data after short pressing “CLR”, please long press “CLR” directly to enter after pressing exit button.

● Data upload button
Short press data upload button to cyclically select Bluetooth (UT513C), WIFI (not used temporarily) and USB data transfer modes, current transfer mode can be displayed on the LCD synchronously, select current mode to transfer data through confirmation button.
When connected to the computer software, press and hold this button to upload all stored data to the PC.
Bluetooth: Active checking; passive uploading for the tester.
USB: Active loading for the tester.

● Timer setting button
The default mode of the tester is continuous insulation resistance measurement mode. Under insulation resistance measurement condition and without testing voltage output, perform time setting for insulation resistance measurement mode. Short press “TIME” to cyclically select “Continuous Measurement”, “Timer Measurement”, “Polarization Index Measurement” and “Absorption Ratio Measurement”, press “ENTER” to confirm the selection, press “ESC” to unselect and return to default measurement mode.

● Comparison measurement button
Under insulation resistance measurement condition and without testing voltage output, short press “COMP” to select resistance comparison measurement as insulation resistance measurement mode, the default comparison value is 10MΩ.

● Measurement button
This button is used to turn on/off insulation resistance measurement or capacitance measurement. Long press “TEST” for more than 2 seconds to start measurement. If current measurement function is enabled, the red warning light illuminates the background of “TEST” button. Short press “TEST” to exit measurement.

IX. Testing Instructions

9.1 Testing Preparation

(1) Press power button for more than 2 seconds to turn on the tester. The tester enters default state after full symbols are displayed on LCD for about 1 second.

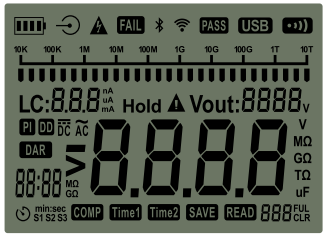

Fig. 9.1.1 Full symbols shown on LCD

(2) When the battery power indicator shows only one “segment” of power left, the indicator flashes to indicate that the battery power is almost used up, which means battery charging or replacement is needed. If the battery power indicator shows no “segment”, it means the batter power cannot meet power demand, the tester must be charged or the battery must be replaced. The relation between “segment” left and “battery voltage” is shown in the table below:

Battery power indicator	Battery voltage
No segment	<13.5V (“2Hz” flashes Power off after 10s)
1 segment	13.6~14.3V (“1Hz” flashes)
2 segments	14.4~15.1V
3 segments	15.2~15.9V
4 segments	>16.0V

Note: Do not perform measurement during charging, interlock is designed between testing and charging ports in structure.

9.2 Battery Charging

The tester is built with rechargeable lithium battery pack (14.8V, 5200mAh). Please charge with the supplied dedicated lithium battery charger (16.8V , 2A) (Fig. 9.2.1), or remove the lithium battery pack and then charge it with the supplied adapting charging stand (9.2.2).

When charging with battery charger in power on state, the battery power indicator and the charging symbol are displayed (not displayed when charging in power off state). When charging with the charging stand, the charging symbol lights up (lighting up red for “under charging”; green for fully charged; flashes in red and green alternately to indicate threshold state).

Note: The red indicator light at the battery charger only indicates energizing when connecting with power grid, it does not indicate if the battery is fully charged. Please observe the battery charging symbol on the LCD when powering on the tester, to judge if the battery is charged fully.

Note: To prevent high-voltage electric shock caused by mistaken testing during charging, the tester is designed with poka-yoke mechanism to meet the safety standards, that is, the tester cannot be charged with the charger during test, and the test lead cannot be connected during charging.

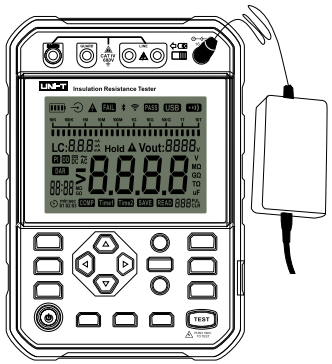

Fig. 9.2.1 Tester charging

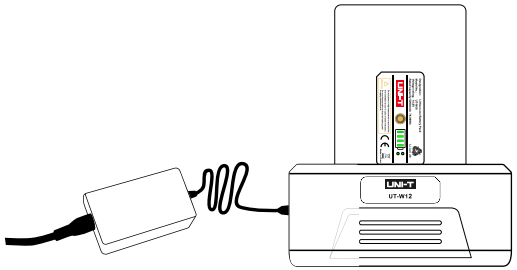

Fig. 9.2.2 Charged with charging stand (optional: UT-W12)

Note: Before removing the lithium battery pack, please power off the tester and remove all test leads to prevent electric shock!

9.3 Basic Measurement Operations

9.3.1 Insulation Resistance Measurement

Note:

⚠ To perform wiring and measurement operations, please wear high-voltage insulation gloves and protective gear before testing.

⚠ Before testing, please make sure that the measured object is de-energized, and do not measure the insulation of live equipment or circuit.

⚠ Please operate the tester with care as high-voltage output exists. Please ensure good contact between measured object and test lead. Keep your hands away from the test clips before pressing “TEST” button to perform test.

⚠ Do not short-circuit the two test leads during testing (high-voltage output state) or measure insulation resistance after high-voltage output, otherwise it may cause personal injury, fire or product damage.

⚠ For resistance below 1MΩ at the 250V range, the measurement duration cannot exceed 10 seconds and multiple consecutive measurements cannot be performed. For resistance below 2MΩ at the 500V range, below 5MΩ at the 1000V range, below 10MΩ at the 2500V range, and below 20MΩ at the 5000V range, the same limitations apply.

Calculation formula: $R = \frac{U}{I}$ (Ohm’s law)

Where R is the measured insulation, U is the tester output voltage and I is the current of measured circuit.

9.3.1.1 Continuous Insulation Resistance Measurement

When the tester is powered on, it enters the default mode of continuous insulation resistance measurement (500V output voltage). Connect test leads with measured object, press ▲ and ▼ to select high-voltage range, press ◄ and ► to select fine-tuned step voltage, then press “TEST” to perform test, the LCD shows basic elements including battery power, high-voltage warning symbol (“2Hz” flashes), leakage current, real-time output voltage, measured insulation resistance, testing value of analog bar graph, continuous measurement duration, storage capacity, etc. Press “TEST” to end the testing, turn off the testing voltage of insulation resistance, turn off the testing indicator light, and automatically discharge fast (discharge course is displayed), the LCD maintains current measured element on it.

9.3.1.2 Timer Measurement

Under insulation resistance testing condition without high voltage output, press “TIME” to enter timer measurement mode.

When cycling through in insulation resistance measurement mode, the display of timer measurement mode differs from that of other measurement modes.
There is no time setting interface in the default continuous mode interface, there is PI symbol for polarization index measurement, and there is DAR symbol for absorption ratio measurement.

When entering timer measurement mode, Time1 and timer symbol are displayed on LCD, the default countdown of 05:00 flashes (mantissa) to indicate user can set the time. Press ◄ and ► to select the digit (similar with cursor) of the time to be changed, press ▲ and ▼ to change the value of the selected digit of the time, then press “ENTER” to confirm and save the change or press “ESC” to cancel the change.

Press “TEST” to perform test, the LCD shows basic elements including battery power, high-voltage warning symbol, leakage current, real-time output voltage, measured insulation resistance, testing value of analog bar graph, Time1, set countdown time, storage capacity, etc.

When the set time is up, the test ends automatically, the testing indicator light turns off, and the tester automatically discharge fast (discharge course is displayed), the LCD maintains current measured element on it.

9.3.1.3 Polarization Index Measurement

Polarization Index (PI) refers to the value of measured resistance in 10 minutes to that in 1 minute. It takes 10 minutes to perform polarization index testing. If the time of insulation testing is 10 minutes or more, polarization index testing is completed and saved.

$$PI = \frac{R_{10min}}{R_{1min}}$$

Polarization Index (PI)	4	4 2	2.0 1.0	1.0
Insulation condition	Very good	Good	Poor	Dangerous

Press “TIME” button under insulation resistance testing condition without high voltage output. When the LCD shows PI, it indicates the tester enters polarization index measurement mode.

Then, the LCD shows PI, Time1, Time2, timer symbol, etc. In initial interface, the default time of Times is 1 minute, that is 01:00 (the mantissa flashes to indicate user can set the parameter). The default time of Time2 is 10 minutes, that is 10:00. After completing setting Time1, the tester by default switches to setting state of Time2. Press “ENTER” to confirm and save the change, or press “ESC” to cancel the change.

Press “TEST” to perform test, the LCD shows basic elements including battery power, high-voltage warning symbol, leakage current, real-time output voltage, measured insulation resistance (Time1 or Time2), testing value of analog bar graph, Time1 or Time2, set countdown time, PI, storage capacity, etc.

When the set time is up, the test ends automatically, the testing indicator light turns off, the tester discharges fast, and the LCD shows the testing value. Press ◄ and ► to cyclically display PI, insulation resistance in Time2, and insulation resistance in Time1.

9.3.1.4 Dielectric Absorption Ratio Measurement

Dielectric Absorption Ratio (DAR) refers to the value of insulation resistance in 1 minute to that in 15 seconds. It takes 1 minute to perform absorption ratio testing. The measurement data of all insulation testing in less than 1 minute are deemed invalid. If the time of insulation testing is 1 minute or more, the absorption ratio testing is included in the result.

$$DAR = \frac{R_{1min}}{R_{15s}}$$

Dielectric Absorption Ratio (DAR)	1.4	1.25 1.0	1.0
Insulation condition	Very good	Good	Dangerous

Press “TIME” button under insulation resistance testing condition without high voltage output. When the LCD shows DAR, it indicates the tester absorption ratio measurement mode.

Then, the LCD shows DAR, Time1, Time2, timer symbol, etc. In initial interface, the default time of Time1 is 15 seconds that is 00:15 (the mantissa flashes to indicate user can set the parameter). The default time of Time2 is 1 minute that is 01:00. After completing setting Time1, the tester by default switches to the setting state of Time2. Press “ENTER” to confirm and save the change, or press “ESC” to cancel the change.

Press “TEST” to perform test, the LCD shows basic elements including battery power, high-voltage warning symbol, leakage current, real-time output voltage, measured insulation resistance (Time1 or Time2), testing value of analog bar graph, Time1 or Time2, set countdown time, DAR, storage capacity, etc.

When the set time is up, the test ends automatically, the testing indicator light turns off, the tester discharges fast, and the LCD shows the testing value.
Press ◀ and ▶ to cyclically display DAR, insulation resistance in Time2, and insulation resistance in Time1.

9.3.1.5 Comparison Measurement

Press “COMP” button under insulation resistance testing condition without high voltage output. When the LCD shows “COMP”, it indicates the tester enters comparison measurement mode. The default comparison resistance is 10MΩ, the initial interface flashes at the unit of 10MΩ at a frequency of 1HZ, to indicate the tester is in comparison resistance setting state. Press ◀ and ▶ to select the digit and unit of comparison resistance to be changed, press ▲ and ▼ to adjust comparison resistance and unit, then press “ENTER” to save the parameter setting or press “ESC” to cancel the parameter setting. After that, hold down “TEST” for 2 seconds, if insulation resistance is less than comparison resistance, the symbol “FAIL” will appear on the LCD, otherwise “PASS” appears.

To return to the continuous measurement interface, please press “COMP” in “COMP” mode or press “ESC” twice consecutively.

9.3.2 Voltage Measurement

1) Connect red test lead with “LINE” input terminal, and black with “EARTH”.
2) Connect red and black alligator clips with measured circuit. For DC voltage measurement, if the voltage of red test lead is negative, the negative symbol “-” appears on the LCD.

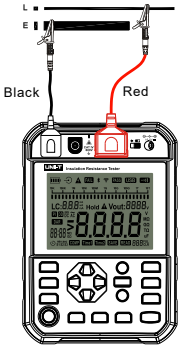

Fig. 9.3.2.1 Wire connection of voltage measurement

Note:

⚠ Do not measure AC power supply over 750Vac or DC power supply over 1000Vdc. It is possible to display higher voltage (10%), but it may damage the tester.

⚠ Avoid electric shock when working with high voltage.

⚠ After completing all measurement operations, please disconnect the test lead with the measured circuit, and remove the test lead from the input terminal.

9.3.3 Capacitance Measurement

As a part of insulation measurement, the tester has circuit capacitance measurement function. Without high voltage output, press capacitance measurement button, the default range is 500V. Under capacitance measurement function, there are only three rated voltage ranges including 250V , 500V and 1000V, press ▲ and ▼ to switch the ranges. For capacitance measurement, the tester calculate the circuit capacitance by measuring the charge and voltage of circuit.

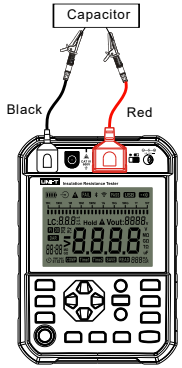

Fig. 9.3.3.1 Wire connection of capacitance measurement

Calculation formula: $C=\frac{Q}{U}$

Where C is measured capacitance, Q is the accumulated charge in the measured object and U is the voltage of both ends of measured object.

Note: If the withstand voltage of the capacitor is less than the output voltage of the capacitor, please do not perform measurement to avoid capacitor damage. When measuring capacitor with polarity, please note that red test lead is the negative of power output and black is positive, to avoid breaking down the capacitor with polarity.

X. Wire Connection Modes

10.1 . Cable Insulation Resistance Testing

A. Insulation resistance measurement with two-wire connection

There is leakage current at the surface of inner insulation layer near the end of cable, the leakage current is included in the measured current of "-" terminal, causing the measured resistance to be lower than actual insulation resistance. This mode can be used for non-ultrahigh resistance measurement, as shown in the figure below:

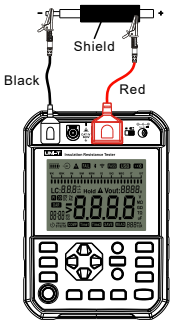

Fig. 10.1.1 Two-wire connection

B. High insulation resistance measurement with three-wire connection

Wind the well-conducted bare wire around the exterior of inner insulation layer, connect the safety terminal with the exterior conductor of inner insulation layer in order to prevent current leakage at the surface of measured object. Surface leakage current is conducted to the safety terminal, so as to eliminate the surface leakage current at the measurement path between “+” and “-” poles, thus improving the measurement accuracy, as shown in the figure below:

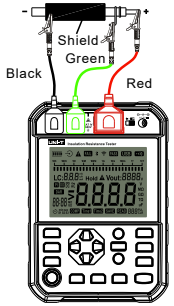

Fig. 10.1.2 Three-wire connection

C. Ultra-high insulation resistance measurement with three-wire connection

Wind the well-conducted bare wire around the exterior of inner insulation layer, connect the safety terminal with the exterior conductor of inner insulation layer and the unused cable. Surface leakage current is conducted to the safety terminal, so as to eliminate the surface leakage current at the measurement path between “+” and “-” poles, thus ensuring the measured insulation resistance is the insulation resistance between the selected cable and exterior insulator, and eliminating the leakage path between cables, as shown in the figure below:

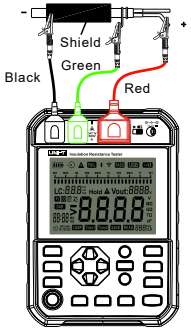

Fig. 10.1.3 Three-wire connection

10.2 . Transformer Insulation Resistance Testing

A. Testing of insulation resistance between primary winding and grounding of secondary winding

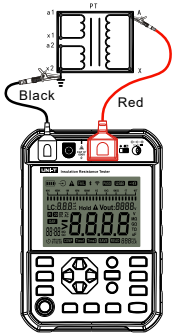

Fig. 10.2.1 Connection of testing

B. Testing of insulation resistance between grounding of primary winding and secondary winding

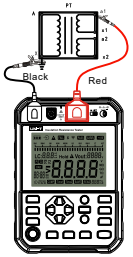

Fig. 10.2.2 Connection of testing

C. Testing of insulation resistance between secondary windings

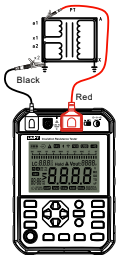

Fig. 10.2.3 Connection of testing

XI. Maintenance

Clean the casing:

1. Wipe the surface using soft cloth or sponge dipped with water
2. Do not immerse the tester in water to avoid tester damage.
3. Do not store the tester if it is wet.
4. The calibration and maintenance must be performed by qualified professional repair personnel or specified repair department.

XII. UNI-T Smart Measure Download Instructions

1. Introduction

UNI-T Smart Measure is a mobile APP, supporting mobile phones running IOS 10.0 or newer and Android 5.0 or newer. Mobile phones running other operating system depends on the actual issued application software.

2. Installation

For IOS: Search “UNI-T Smart Measure” in “App Store” or scan the QR code below
For Android: Search “UNI-T Smart Measure” on “Google play” or scan the QR code below.

(QR code for IOS) (QR code for Android)

3. Usage

3.1 Please turn on the Bluetooth function on both the instrument and your phone. On your phone's home screen, find the installed "UNI-T Smart Measure" APP icon and tap to open it. After the "UNI-T Smart Measure" software starts and enters the navigation interface, it will automatically search for nearby Bluetooth instrument devices. Select the corresponding instrument device model name and click to connect, or you can scan the QR code on the device body to connect directly. Once connected, the "UNI-T Smart Measure" APP and the instrument can communicate data and display measurement values, as well as perform button control operations.

3.2 The "UNI-T Smart Measure" APP has functional modules such as Bluetooth wireless communication, data recording, equipment management, report creation, data sharing, and data synchronization. For information on the various functional modules and usage of "UNI-T Smart Measure", please refer to the "UNI-T Smart Measure" user manual. To open the user manual, follow these steps: click on the main menu button “ ≡ “ in the top right corner of the App → Setting → Help Guide.

4. Uninstallation

To uninstall the APP, please use the uninstaller of mobile phone.

The contents of the User Manual are subject to change without further notice.