

# UNI-T®



Certificate No. 956661

## UT593/595

### Operating Manual



**Multi-functional Electrical  
Measuring Instrument**



P/N:110401101901

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## OVERVIEW:

UT593/UT595 is a kind of comprehensive digital multifunctional electrical safety test instrument. The overall instrument adopts new design as well as large-scale integrated analogy circuits, digital circuits and microcomputer chip combination. It is mainly used to complete measurement of parameters including (RCD) electric leakage protector, loop circuit/line impedance, grounding continuity test, test insulation resistance, DC voltage, AC voltage and phase sequence judgment; it has more functions, higher accuracy and stable performance as well as it is reliable and convenient for operation. It is applicable to measuring (RCD) electric leakage protector, measuring insulation of various electrical equipment and grounding continuity test. UT593/UT595 is your ideal choice for maintenance, test and inspection on electric protector of various electrical equipment.


## I. SAFETY WARNINGS

This instrument is designed, manufactured and inspected in accordance with IEC 61010 safety standard (safety requirements of electric measurement products). This manual includes warnings and safety rules that users must follow to ensure safe operation and status of the instrument. Read the following instructions before using it.



Warning


- Carefully read and understand this Users' Manual before using this instrument.
- Always follow requirements in this manual and well keep the manual for reference at any time.
- In test by the instrument, wrong operations will lead to accidents and damages to the instrument.

 Mark on the instrument indicates that for safe operation of this instrument, users shall operate the instrument according to the relevant content in this manual.

1. Danger: To avoid possible serious or fatal damages caused under some status and operations.
2. Warning: To avoid the danger of electric shock.
3. Notice: To avoid damages to the instruments and to conduct accurate measurement.


 Danger

- Do not measure the circuits with voltage above AC 440 V/ DC 440V.
- Do not conduct test at combustible place for sparks may cause explosion.
- Do not operate this instrument if the surface of the instrument is wet or operator's hands are wet.
- In measuring, do not touch the conductive part of test pen.
- Do not open the battery cover in measurement.
- Do not touch the circuit to be tested in conducting insulation measurement and electric leakage protector measurement.






 Warning

- In case of any abnormality, stop using it. For example: The instrument is damaged or metal part is exposed.
- Be careful when working under the voltage exceeding 33Vrms, 46.7Vacrms or 70 Vdc. This kind of voltage may cause electric shock.
- After high resistance measurement, electric charges stored in the circuits to be test shall be released.
- Do not change the battery when the instrument is under wet conditions.
- Ensure all test wires are firmly connected to test ports of the instrument.
- Ensure the instrument shuts down when you open the battery cover.

 Notice

- Before resistance measurement, the circuits to be tested must be totally discharged and shall be completely isolated from the power supply circuits.
- If the test pen is damaged and is needed to be replaced, you must replace it with the one of the same model and electrical specification.
- When the battery indicator () shows that electric energy is used up, do not use the instrument. If you do not use the instrument for a long time, take the battery out for storage.
- Do not store or operate this instrument in high temperature, high humidity, inflammable and explosive conditions and strong electromagnetic field.
- Clean the shell of the instrument with wet cloth or cleaning agent rather than abrasive objects or solvent.
- When the instrument is wet, make it dry before storage.

## II. DEFINITION OF SYMBOLS

	Danger of possible electric shock
	Double insulation or reinforced insulation
	DC
	AC
	Grounding

- Design and production is made in strict accordance with IEC 61010 safety standard. It complies with and passes voltage safety standard (CAT III 300V) and pollution class II standard.
- Automatic voltage discharge function.

### III. TECHNICAL SPECIFICATION

Error limit:  $\pm$  (a% reading + digit), one year of assurance period

Ambient temperature:  $23 \pm 5^{\circ}\text{C}$

Ambient humidity: 45~75% RH

UT593/UT595<(RCD) test indices for electric protector>

Set current for RCD test	10 mA	30mA	100mA	300mA	500mA
Applied voltage	Voltage: $220 \pm 10\%$ Frequency: 45Hz~65Hz				
Precision of test current	$1 \Delta n$ , $2*I \Delta n$ and $5*I \Delta n$ : (0%+10%)				
	$1/2*I \Delta n$ :-10%~0%				
Measurement of tripping time of (RCD) electric leakage	$1/2*I \Delta n$ scope: 0mS~2000mS				
	$1*I \Delta n$ scope: 0mS~500mS (Select the function to count down)				
	$1*I \Delta n$ scope: 0mS~300mS				
	$2*I \Delta n$ scope: 0mS~200mS (Select the function to count down)				
	$2*I \Delta n$ scope: 0mS~150mS				
	$5*I \Delta n$ scope: 0mS~40mS				
	Note: $2*I \Delta n$ measurement is only applicable to UT 595				
Precision of tripping time	$\pm$ (5%+5)				
Range of tripping trigger current	$1/2*I \Delta n$ - $1.1*I \Delta n$ (total 7 test points)				
Precision of tripping trigger current	$\pm 10\%$				

● <Test indices for loop circuit impedance of UT593/UT595>

Applied voltage (live wire to earth wire)	Voltage: $220V \pm 10\%$ , Frequency: 45Hz~65Hz
Test current and test time	20A/20ms
Measuring scope	$0.05\Omega \sim 2000\Omega$
Measuring range	$0.05\Omega \sim 1.99\Omega$
	$2.0\Omega \sim 19.9\Omega$
	$20\Omega \sim 2000\Omega$
Precision scope	$\pm$ (5%+5)
Resolution	Minimum $0.01 \Omega$
Ipsc expected fault current	0KA~26KA

● <Test indices for line circuit impedance of UT593/UT595>

Applied voltage (live wire to earth wire)	Voltage: 195V~440V , Frequency: 45Hz~65Hz
Test current and test time	Line circuit impedance test current and time: 20A/20ms
Measuring scope	$0.05\Omega \sim 2000\Omega$
Measuring range	$0.05\Omega \sim 1.99\Omega$
	$2.0\Omega \sim 19.9\Omega$
	$20\Omega \sim 2000\Omega$
Precision scope	$\pm$ (5%+5)
Resolution	Minimum $0.01 \Omega$
Ipsc expected fault current	0KA~26KA

● <Test indices for non-tripping loop circuit impedance of UT593/UT595>

Applied voltage (live wire to earth wire)	Voltage: 220V±10%, Frequency: 45Hz~65Hz
Test current	non-tripping loop circuit impedance test current 20A
Display scope	0.01Ω~2000Ω
Measuring scope	1.00Ω~2000Ω
Measuring range	1.00Ω~1.99Ω
	2.0Ω~19.9Ω
	20Ω~2000Ω
Precision scope	±5%±12d+ Noise Margin(1.00~1.99)±5%±5d(2.0~19.9)
Resolution	Minimum 0.01Ω
Ipsc expected fault current	0KA~26KA

● <Test indices for grounding continuity of UT593/UT595>

Rated voltage	About 5.0V
Measuring scope	0.01Ω ~ 200Ω
Test current	At 0.00Ω~ 2.00Ω, the test current is more than 200mA
Precision scope	0.01Ω ~200Ω: ± (2%+5)

● <Test indices for insulation resistance of UT593/UT595>

Rated voltage	250V	500V	1000V
Measuring scope	250 V measuring scope: 0.05 MΩ~250MΩ 500 V measuring scope: 0.05 MΩ~500MΩ 1000 V measuring scope: 0.05 MΩ~1000MΩ		
Open circuit voltage	DC 250V ±10%	DC 500V±10%	DC 1000V ±10%
Rated test voltage	At 250 KΩ, 0.9mA~1.1mA	At 500 KΩ, 0.9mA~1.1mA	At 1 MΩ, 0.9mA~1.1mA
Short-circuit	Less than about 1.8mA		
Precision scope	0.05MΩ~1000MΩ: ± (5%+5)		

● <Test indices for voltage of UT593/UT595>

	DC voltage	AC voltage
Measuring scope	± 0V ~± 440V	0V~440V(50/60Hz) less than 10V, only for reference
Special function	Automatic identification for AC voltage and DC voltage	
Resolution	1V	
Precision	± (2%+3)	

● <Test indices for frequency of UT593/UT595>

Measuring scope	20Hz~100Hz
Resolution	1Hz
Precision	Only for reference

● <Test indices for phase sequence rotation of UT593/UT595>

Scope of applied voltage	Three-phase AC voltage 100V~440V, frequency: 45Hz~65Hz;
Measuring result	As per the sequence: L1→L2→L3 foreword rotation; L1→L3→L2 reversed rotation
Determination of phase loss	Loss of any L1, L2 or L3 will be displayed on LCD.

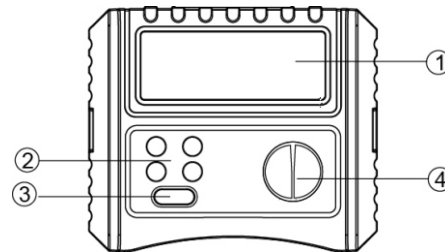
- Display: Liquid-crystal display, the maximum reading displayed of 9999
- Low battery level warning: Diagram of battery
- Overrun indication: "OL"
- Automatic range function
- Unit display: It can display function and symbol of quantity of electric charge unit
- Working conditions: 0°C~40°C/ relative humidity 85% or below
- Storage conditions: -20°C~60°C/relative humidity 90% or below
- Physical dimension: 210mm (L)X 175mm (W) X 90mm (D)
- Current consumption: About 50mA (at the maximum output of 1000V) (normally about 10 mA)
- Attachments: Test line, alkaline battery 1.5V (5#) X 8 pieces, Users' Manual, portable bag

Weight 1kg (including battery)

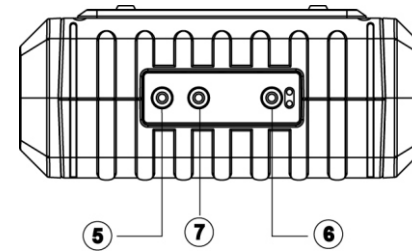
Power supply alkaline battery 1.5V (5#) X 8 pieces

## IV. FRONT VIEW AND UPPER SIDE VIEW OF THE INSTRUMENT (SEE FIG. 1 AND FIG. 2)

1. LCD display
2. Function key F1, F2, F3, F4
3. Test key
4. Rotary switch
5. Test input pen (black)
6. Test input pen (red) and special pen with TEST key
7. Test input pen (green)



(Fig. 1)



(Fig. 2)

## V. ROTARY SWITCH

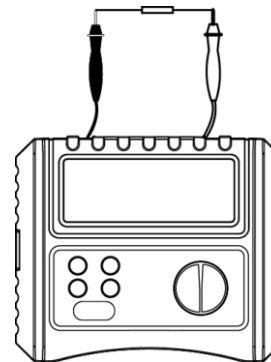
1. Phase-sequence measurement;
2. Voltage/frequency measurement;
3. 250V insulation resistance measurement;
4. 500V insulation resistance measurement;
5. 1000V insulation resistance measurement;
6. Measurement of maximum 200mA grounding continuity
7. Shutdown
8. Measurement of loop circuit/expected fault current/line circuit impedance/expected short-circuit current;
9. Automatic RCD measurement;
10. RCD tripping time 50% action current measurement;
11. RCD tripping time 100% action current measurement;
12. RCD tripping time 200% action current measurement (only for UT595);
13. RCD tripping time 500% action current measurement;
14. RCD tripping action trigger current measurement;

## VI. PREPARATION BEFORE MEASUREMENT

When you start the instrument and the battery mark on the upper-right corner of the LCD display indicates low voltage, it indicates the battery is almost used up and needed to be replaced.

Low voltage symbol	Battery voltage
	7V or below

## VII. GROUNDING CONTINUITY MEASUREMENT (SEE FIG. 3 FOR CONNECTION DIAGRAM)



Wiring method:

- (1) Before measuring insulation resistance, the circuit to be tested must be totally discharged and must be completely isolated from the power circuit.
- (2) Insert the red test line or special pen with TEST key into the “Red” input port, black test line into the “Black” input port.
- (3) Connect red and black alligator clips or pen test probe to the circuit to be tested. Correctly connect the object to be test to the instrument according to the connection diagram; then make the rotary switch point to the Ω; press the TEST key to start grounding continuity measurement.



Selection and operation of function keys F1-F4 is shown below:

F1	F2	F3	F4
Buzzer and backlight	Test lock	ZERO	Not used

Instructions on key operation:

Press and hold F1 for about 2 seconds to open and close the backlight; press and release F1 to open and close 20  $\Omega$  comparison function; at the same time, LCD shows the buzzer mark. When the measured continuity value is lower than 20  $\Omega$ , the buzzer will give an alarm.

F2 is used to open and close the measuring lock function. When long-time measurement is needed, press F2 to start Test lock measurement function; at the same time, the LCD displays the symbol of lock. In this case, you only need to press and release the Test key to start long-time measurement.

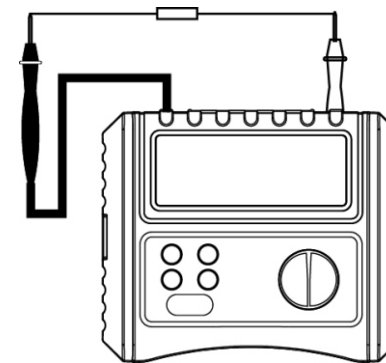
Press the test key again to stop measurement. If you want to stop the measuring lock function, press the F2 again or make the rotary switch point to other functions.

F3 is used to realize return to zero of measuring pens. After two pens are reliably short-circuited, press and hold F3 until LCD shows the reading of 0.00  $\Omega$  and the symbol of "ZERO" and then this function operation is considered to be completed.

**⚠ Notice:**

1. In order to ensure precision of measured value, you must conduct return-to-zero by short-circuit before test.
2. Do no measure live objects.
3. Before test, when voltage between two measuring terminals is more than 30V, the instrument will automatically display the voltage between two terminals. At the same time, the buzzer gives an alarm. In this case, the measuring key TEST is disabled.

## VIII. INSULATION RESISTANCE MEASUREMENT (FOR CONNECTION DIAGRAM, SEE FIG. 4)



(Fig.4)

**⚠ Wiring method:**

- (1). Before measuring insulation resistance, the circuit to be tested must be totally discharged and must be completely isolated from the power circuit.
- (2). Insert the red test line or special pen with TEST key into the "Red" input port, black test line into the "Black" input port.
- (3). Connect red and black alligator clips or pen test probe to the circuit to be tested.

**⚠ Notice:**

Prior to test, ensure that the circuit to be test is not live. Do not measure the insulation of live equipment or live circuit.

Prior to test, when voltage between two measuring terminals is more than 30V, the instrument will automatically display the voltage between two terminals. At the same time, the buzzer gives an alarm. In this case, the measuring key TEST is disabled.

- If the battery cover is opened, do not conduct measurement.

**⚠ Notice:**

Do not short-circuit two test pens under high voltage output state and do not measure the insulation resistance after high voltage output.

After ensuring that the object to be tested is not live, correctly connect the object to be tested to the instrument according to connection diagram; and then make the rotary switch point to “Insulation” and select the proper test voltage; then press the TEST key to start insulation resistance measurement.

Selection and operation of function keys F1-F4 is shown below:

F1	F2	F3	F4
Buzzer and backlight	Test lock	Not used	Not used

Instructions on key operation:

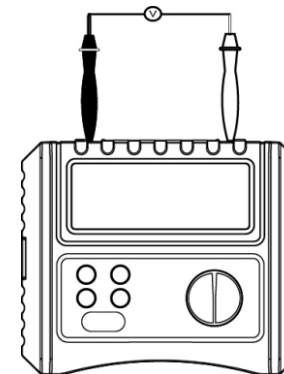
Press and hold F1 for about 2 seconds to open and close the backlight; press and release F1 to open and close 20  $\Omega$  comparison function; when the measured insulation resistance value is lower than 20  $\Omega$ , the buzzer will give an alarm.

F2 is used to open and close the measuring lock function. When long-time measurement is

needed, press F2 to start TEST lock measurement function; at the same time, the LCD displays the symbol of lock. In this case, you only need to press and release the Test key to start long-time measurement.

Press the test key again to stop measurement. If you want to close the measuring lock function, press the F2 again or make the rotary switch point to other functions.

## IX. VOLTAGE/FREQUENCY MEASUREMENT (SEE FIG. 5 FOR CONNECTION DIAGRAM)



(Fig. 5)

Make the rotary switch point to Volts: According to connection method 1/2, conduct correct wiring, i.e. voltage/frequency measurement connection method (Fig. 5) 1:

- (1). Insert the red test line into “Red” input port and black test line into “Black” input port.
- (2). After red and black alligator clips or probes are connected to the circuits to be tested, automatically identify AC and DC voltages and display the measured voltage and frequency on the LCD.

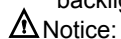
Connection method (Fig. 7) 2:

- (1). Insert special red, green and black test lines with power plugs into the red, green and black input ends on the side of the instrument
- (2). Insert the plugs of three lines into the socket of the circuit to be tested. Automatically identify AC and DC voltages and display the measured voltage and frequency on the LCD.

Selection and operation of function keys F1-F4 is shown below:

F1	F2	F3	F4
Buzzer and backlight	Not used	Not used	Not used

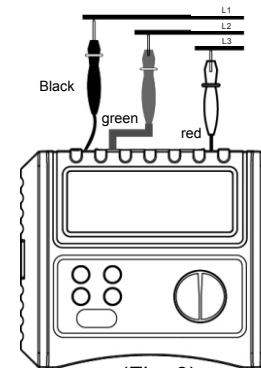
Instructions on key operation: Press and hold F1 for about 2 seconds to open and close the backlight; no function is available for other F2, F3, F4 and TEST.



Notice:

- Do not input voltage higher than 440V or 44Vrms. It is possible to display higher voltage, but it has the risk to damage the instrument.
- In measuring of higher voltage, special attention shall be given to avoiding electric shock.
- After all measuring operations are completed, disconnect the test line from the tested circuit and remove the test line from the instrument input end.
- If the battery cover is opened, do not conduct measurement.

## X. PHASE SEQUENCE AND PHASE LOSS MEASUREMENT (SEE FIG. 6 FOR CONNECTION DIAGRAM)



(Fig. 6)

Make the rotary switch to Phase Rotary; correctly connect wires as per the Fig. 6 to make phase sequence and phase loss measurement.

Instructions on correct wiring operation: Connect red, green and black pens into the instrument according to the corresponding color; then connect them to the corresponding phase:

In three-phase AC, black pen is connected to L1, green pen to L2 and red pen to L3; after connection, the LCD immediately displays the phase sequence.

Results of rotation and phase loss

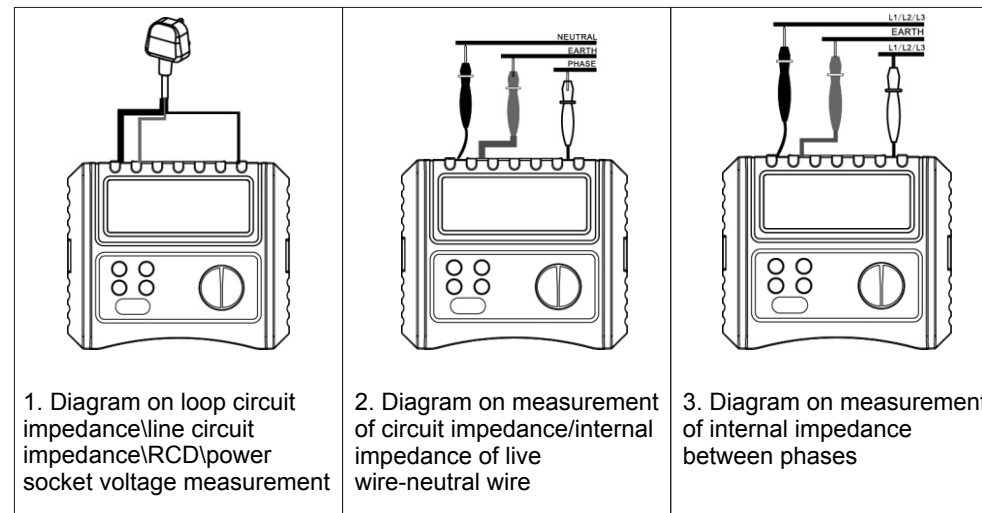
Selection and operation of function keys F1-F4 is shown below:

F1	F2	F3	F4
Buzzer and backlight	Not used	Not used	Not used

Instructions on key operation: Press and hold F1 for about 2 seconds to open and close the backlight; no function is available for other F2, F3, F4 and TEST.

- Do not input voltage higher than 440V or 44Vrms. It is possible to display higher voltage, but it has the risk to damage the instrument.
- In measuring of higher voltage, special attention shall be given to avoiding electric shock.
- After all measuring operations are completed, disconnect the test line from the tested circuit and remove the test line from the instrument input end.
- If the battery cover is opened, do not conduct measurement.

## XI. MEASUREMENT OF FAULT LOOP CIRCUIT IMPEDANCE/ FAULT EXPECTED SHORT-CIRCUIT CURRENT (SEE FIG. 7 AND 8 FOR CONNECTION DIAGRAM)



Make the rotary switch point to LOOP. According to Fig. 7 and 8, insert special red, green and black lines with power plugs and test probes into the red, green and black input ends on the side of the instrument; connect plugs or test probes into power frequency civil 220V socket or circuit; press TEST key to start measurement of loop circuit impedance/fault expected short-circuit current.

Selection and operation of function keys F1-F4 is shown below:

F1	F2	F3	F4
Buzzer and backlight	Not used	Not used	Not used

Instructions on key operation: Press and hold F1 for about 2 seconds to open and close the backlight; no function is available for other F2, F3, F4 and TEST.

**⚠ Notice:**

1. You must ensure normal supply of power frequency civil 220V in the power socket; in case of abnormal power supply or no power, L-PE and L-N symbols at the lower-left corner of LCD blink at the same time.
2. You must ensure that earth end of the power socket is soundly earthed; in case of poor grounding or no grounding of the power socket, L-PE and N-PE symbols at the lower-left corner of LCD blink at the same time.
3. You must ensure that neutral wire end of the power socket is reliably connected; in case poor connection or no connection of the neutral wire end of the power socket, L-N and N-PE symbols at the lower-left corner of LCD blink at the same time.
4. In measuring loop circuit impedance/fault expected short-circuit current, ensure that live wire phase and neutral wire phase are not reversed for the power socket; otherwise, L-PE, L-N and N-PE symbols at the lower-left corner of LCD blinks at the same time.
5. This kind of measurement is conducted under high-voltage state; much attention shall be given to personal safety.

## XII. MEASUREMENT OF LINE CIRCUIT IMPEDANCE/EXPECTED SHORT-CIRCUIT CURRENT (SEE FIG. 7, FIG. 8 AND FIG. G FOR CONNECTION DIAGRAMS)

Make the rotary switch point to NO TRIP item in LOOP, according to Fig. 7, 8 and 9, insert special red, green and black lines with power plugs and test probes into the red, green and black input ends on the side of the instrument; connect plugs or test probes into power frequency civil 220V socket or circuit; press TEST key to start measurement of line circuit impedance\expected short-circuit current.

Selection and operation of function keys F1-F4 is shown below:

F1	F2	F3	F4
Backlight/L-N/L-PE	Not used	Not used	Not used

Instructions on key operation:

Press and hold F1 for about 2 seconds to open and close the backlight;  
Press and release F1 for switching between L-N\L-PE measuring functions;  
No function is available for other F2, F3, F4 and TEST.

**⚠ Notice:**

1. You must ensure normal supply of power frequency civil 220V in the power socket; in case of abnormal power supply or no power, L-PE and L-N symbols at the lower-left corner of LCD blink at the same time.
2. You must ensure that earth end of the power socket is soundly earthed; in case of poor grounding or no grounding of the power socket, L-PE and N-PE symbols at the lower-left corner of LCD blink at the same time.

3. You must ensure that neutral wire end of the power socket is reliably connected; in case poor connection or no connection of the neutral wire end of the power socket, L-N and N-PE symbols at the lower-left corner of LCD blink at the same time.
4. In measuring loop circuit impedance\fault expected short-circuit current, ensure that live wire phase and neutral wire phase are not reversed for the power socket; otherwise, L-PE, L-N and N-PE symbols at the lower-left corner of LCD blinks at the same time.
5. This kind of measurement is conducted under high-voltage state; much attention shall be given to personal safety.

### XIII. AUTOMATIC RCD SEQUENCE TEST (SEE FIG. 7)

Make the rotary switch point to AUTO item in RCD, according to Fig. 7, insert special red, green and black lines with power plugs into the red, green and black input ends on the side of the instrument; connect plugs into power frequency civil 220V socket; press TEST key to start Automatic RCD sequence test.

Instructions: Automatic RCD testing is to complete measurement of 6 items of RCD tripping time in turn by pressing the key for one time. For one time of test, 6 items of RCD measurement must be completed at a time and the next test can be conducted. After test, the data are stored in the instrument; you can press F3 to read the data of the whole test process. The sequence for 6 items of RCD tests is as below:

1.  $1/2 * I \Delta n / 0^\circ$
2.  $1/2 * I \Delta n / 180^\circ$
3.  $1 * I \Delta n / 0^\circ$
4.  $1 * I \Delta n / 180^\circ$
5.  $5 * I \Delta n / 0^\circ$
6.  $5 * I \Delta n / 180^\circ$

Selection and operation of function keys F1-F4 is shown below:

F1	F2	F3	F4
Backlight	AC/DC/time	RCL	I $\Delta$ n

Instructions on key operation:

1. Press and hold F1 for about 2 seconds to open and close the backlight;
2. Press F2 for switching between RCD test type and count-down measuring mode; RCD test type: optional full-wave and half-wave measuring modes; count-down measuring mode: in this mode, press TEST key; in default, count-down from 30s to 0s to start RCD test.
3. Press F3 to show data stored after completion of test.
4. Press F4 to start RCD test current selection function.

#### Notice:

1. You must ensure normal supply of power frequency civil 220V in the power socket; in case of abnormal power supply or no power, L-PE and L-N symbols at the lower-left corner of LCD blink at the same time.
2. You must ensure that earth end of the power socket is soundly earthed; in case of poor grounding or no grounding of the power socket, L-PE and N-PE symbols at the lower-left corner of LCD blink at the same time.
3. You must ensure that neutral wire end of the power socket is reliably connected; in case poor connection or no connection of the neutral wire end of the power socket, L-N and N-PE symbols at the lower-left corner of LCD blink at the same time.
4. In measuring loop circuit impedance\fault expected short-circuit current, ensure that live wire phase and neutral wire phase are not reversed for the power socket; otherwise, L-PE, L-N and N-PE symbols at the lower-left corner of LCD blinks at the same time.

5. This kind of measurement is conducted under high-voltage state; much attention shall be given to personal safety.

## XIV. GENERAL RCD TEST (SEE FIG. 7)

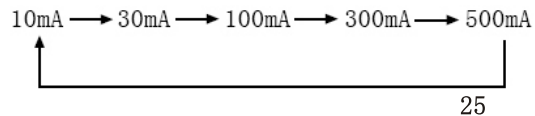
Make the rotary switch point to  $1/2 \cdot I_{\Delta n}$ ,  $1 \cdot I_{\Delta n}$ ,  $2 \cdot I_{\Delta n}$  (only for UT595),  $5 \cdot I_{\Delta n}$  test items in RCD. According to Fig. 7, insert special red, green and black lines with power plugs into the red, green and black input ends on the side of the instrument; connect plugs into power frequency civil 220V socket; press TEST key to start RCD test.

Selection and operation of function keys F1-F4 is shown below:

F1	F2	F3	F4
Backlight/0°/180°	AC/DC/time	Not used	$I_{\Delta n}$

Instruments on key operation:

Press and hold F1 for about 2 seconds to open and close the backlight;  
 Press and release F1 for switching between 0° and 180° phase angles for RCD testing;  
 Press F2 for switching between RCD test type and count-down measuring mode; RCD test type: optional full-wave and half-wave measuring modes; count-down measuring mode: in this mode, press TEST key; in default, count-down from 30s to 0s to start RCD test.  
 Press F4 to start RCD rated leakage testing current selection function; rated set items and selection sequence are as below:



Note: The set leakage current value varies with the multiple. The specific multiple is corresponding with leakage current, as shown in the following table:

	10mA	30mA	100 mA	300 mA	500Ma
$1/2 \cdot I_{\Delta n}$	■	■	■	■	■
$1 \cdot I_{\Delta n}$	■	■	■	■	■
$2 \cdot I_{\Delta n}$ (only for UT595)	■	■	■		
$5 \cdot I_{\Delta n}$	■	■	■		

### ⚠ Notice:

1. You must ensure normal supply of power frequency civil 220V in the power socket; in case of abnormal power supply or no power, L-PE and L-N symbols at the lower-left corner of LCD blink at the same time.
2. You must ensure that earth end of the power socket is soundly earthed; in case of poor grounding or no grounding of the power socket, L-PE and N-PE symbols at the lower-left corner of LCD blink at the same time.
3. You must ensure that neutral wire end of the power socket is reliably connected; in case poor connection or no connection of the neutral wire end of the power socket, L-N and N-PE symbols at the lower-left corner of LCD blink at the same time.
4. In measuring loop circuit impedance/fault expected short-circuit current, ensure that live wire phase and neutral wire phase are not reversed for the power socket; otherwise, L-PE, L-N and N-PE symbols at the lower-left corner of LCD blinks at the same time.
5. This kind of measurement is conducted under high-voltage state; much attention shall be given to personal safety.

## XV. TEST OF RCD TRIPPING ACTION TRIGGER CURRENT (SEE FIG. 7)

Make the rotary switch point to ▲ Ramp test item in RCD. According to Fig. 7, insert special red, green and black lines with power plugs into the red, green and black input ends on the side of the instrument; connect plugs into power frequency civil 220V socket; press TEST key to start RCD test.

Selection and operation of function keys F1-F4 is shown below:

F1	F2	F3	F4
Backlight/0°/180°	AC/DC/time	Not used	I Δn

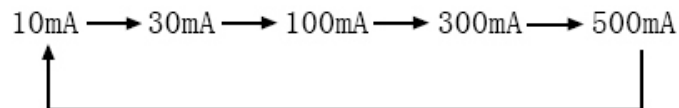
Instruments on key operation:

Press and hold F1 for about 2 seconds to open and close the backlight;

Press and release F1 for switching between 0° and 180° phase angles for RCD testing;

Press F2 for switching between RCD test type and count-down measuring mode; RCD test type: optional full-wave and half-wave measuring modes; count-down measuring mode: in this mode, press TEST key; in default, count-down from 30s to 0s to start RCD test.

Press F4 to start RCD rated leakage testing current selection function; rated set items and selection sequence are as below:



Note: The set leakage current value varies with the waveform. The specific waveform is corresponding with leakage current, as shown in the following table:

	10mA	30mA	100 mA	300 mA	500Ma
Full wave	■	■	■	■	■
Half wave	■	■	■	■	

⚠ Notice:

1. You must ensure normal supply of power frequency civil 220V in the power socket; in case of abnormal power supply or no power, L-PE and L-N symbols at the lower-left corner of LCD blink at the same time.
2. You must ensure that earth end of the power socket is soundly earthed; in case of poor grounding or no grounding of the power socket, L-PE and N-PE symbols at the lower-left corner of LCD blink at the same time.
3. You must ensure that neutral wire end of the power socket is reliably connected; in case poor connection or no connection of the neutral wire end of the power socket, L-N and N-PE symbols at the lower-left corner of LCD blink at the same time.
4. In measuring loop circuit impedance\fault expected short-circuit current, ensure that live wire phase and neutral wire phase are not reversed for the power socket; otherwise, L-PE, L-N and N-PE symbols at the lower-left corner of LCD blinks at the same time.
5. This kind of measurement is conducted under high-voltage state; much attention shall be given to personal safety.



## XVI. REPLACE BATTERY



Danger

In order to avoid the possible electric shock, remove the lead from the instrument in replacing the battery.




Notice

- Don't use the old and new batteries together.
- Note the polarity of the battery in installation of it.



Danger

- Don't conduct the measurement when the battery is opened.
- If LCD displays “”, it means that the battery is needed to be replaced. Follow the steps below for replacement:
  - (1). Turn off the power (rotary switch pointing to OFF) and remove the test lead.
  - (2). Unscrew screws on cover of the battery box and remove the cover to replace 6 pieces of batteries.
  - (3). After replacing the battery, tighten the screws.

## XVII. MAINTENANCE

Clean shell:

Wet the soft cloth and sponge with clean water to wipe the surface.

In order to avoid damages to the instrument, don't immerse the instrument into water.

When the instrument is wet, make it dry before storage.

When calibration, inspection or maintenance is needed for the instrument, hand it over to the competent professional maintenance personnel or the specified maintenance department.

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