

Before using the instrument, please read this manual carefully, and save it well for future using.



# Contents

<b>Statement</b> .....	1
<b>Safety statement</b> .....	1
<b>Safety information</b> .....	2
<b>Main functions of the meter</b> .....	3
<b>Overview</b> .....	3
Meter panel description.....	5
Display description.....	7
<b>Operation instruction</b> .....	8
Earth voltage measurement.....	9
Earth resistance measurement by Bi-pole method (simple measurements).....	9
Earth resistance measurement by Tri-pole method (accurate measurements).....	11
Storage of measurement data.....	14
Reading of measurement data.....	14
Data deletion.....	14
Relative measurement.....	14

Maximum/minimum/average value measurement.....	15
Backlight.....	15
Auto shutdown.....	15
<b>General specification.....</b>	<b>16</b>
<b>Technical specifications.....</b>	<b>17</b>
<b>Battery replacement.....</b>	<b>18</b>

## ***Statement***

In accordance with international copyright law, nothing in this instruction manual may be reproduced in any form (including storage and retrieval or translation into other national or regional languages) without permission and written consent. If there are any changes in the future version of this instruction manual, no further notice will be given.

## ***Safety statement***

### **Caution**

The ' Caution' sign indicates the condition and operation that can cause damage to the meter or equipment.

It requires caution when performing this operation, which may cause damage to this instrument or equipment if not correctly performed or not followed. If these conditions are not met or are not fully understood, please do not continue to perform any actions indicated by this caution sign.

### **Warning**

The ' Warning' sign indicates the dangerous situation and operation to users.

It requires attention in the execution of this operation, which may lead to personal injury or casualties if not correctly perform this operation or do not comply with this operation steps. If these conditions are not met or fully understood, please do not continue to perform any operation indicated by the warning sign.

**Before using this meter, please read this instruction carefully and be aware of the relevant safety warning information.**

## ***Safety information***

This instrument can only be installed and operated by qualified personnel in accordance with the following safety precautions, specifications and technical data. At the same time, the use of this instrument requires compliance with all laws and safety regulations related to varieties of specific applications. An electrical device in operation means that some parts of the device can carry hazardous voltages in general. Non-compliance with warnings may result in serious personal injury and equipment damage.

A 'qualified person' means a person who is familiar with the set-up, installation, start-up and operation of the instrument and has the formal qualifications required to perform such work.

The instrument are designed and manufactured according to IEC61016 safety specifications and comply with GB4793.1-1995 (IEC-1010-1:1990) safety requirements for electronic measuring instruments.

### **Warning**

- **Make sure that the rotary switch is set to the correct position and that the test lead is fully and correctly inserted into the test port before measuring.**
- **Do not use the instrument in circuits where the voltage to earth exceeds 300 volts DC or AC.**
- **Do not use the instrument near explosive gases, vapors or dusts.**
- **Do not connect the test lead or Earth rod when the meter surface or hands are wet.**  
**Do not touch the connecting test line or grounding rod when measuring.**
- **Do not open the battery cover during measurement.**
- **Do not carry out measurements under abnormal conditions, e.g. damage to the instrument body,**

**exposed metal parts of the instrument or test leads.**

- **Do not install replacement parts on the meter or modify the meter. If the instrument is damaged, return it to your local dealer for servicing.**
- **Please turn the rotary switch to the 'shutdown' position and remove the test lead before you can open the battery cover to replace the battery.**

 **Caution**

- **When not using or saving the instrument for a long time, please remove the battery and place it well.**
- **Do not expose the instrument to sunlight, heat, humidity and dew.**
- **Do not use abrasives or organic solvents for cleaning, use a neutral detergent or a damp rag for cleaning.**
- **Do not save the instrument when it is wet. It must be kept after drying.**

### ***Main functions of the meter***

- Measurement of interference voltages
- Measurement of the earth resistance of different equipment (e.g. high-voltage towers, buildings, electrical engineering grounding systems, mobile communication base stations, high-frequency transmitters, etc.)
- Monitoring and planning of lightning protection systems
- Resistance measurement with auxiliary earth electrodes

### ***Overview***

The instrument is controlled by an intelligent microcontroller chip, with high reliability and high accuracy. It can be used

## *Users' Guide for Earth Ground Resistance Tester*

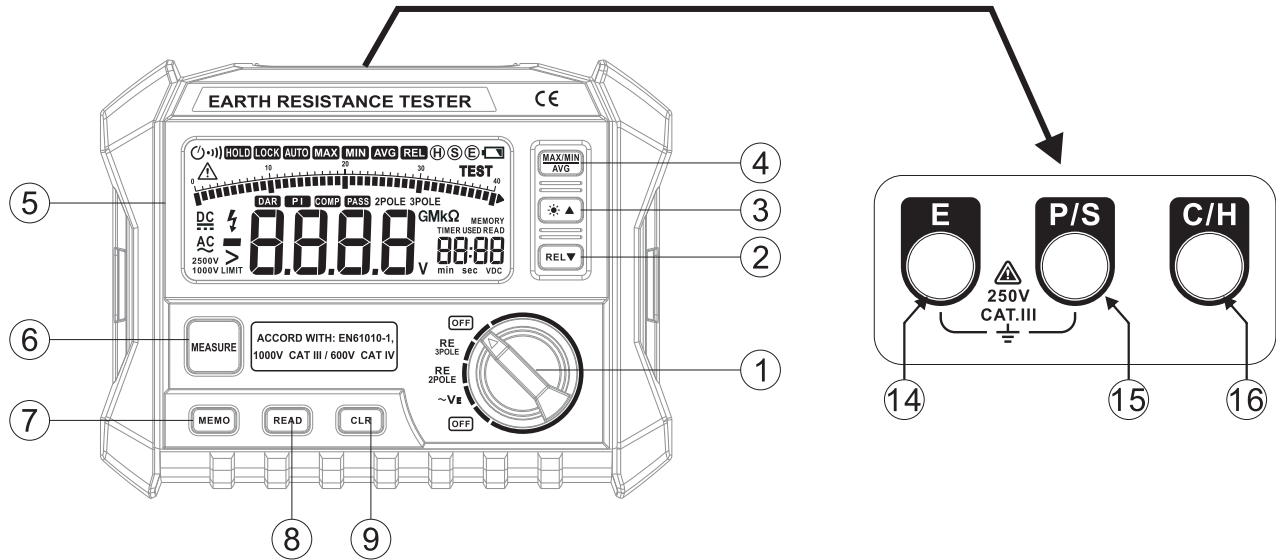
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to test the earth resistance of various power distribution lines, indoor wiring, electrical equipment, lightning protection equipment, etc. There are two measurement modes: two-pole method and three-pole method. It can also measure the earth voltage.

The instrument uses a large liquid crystal digital display with a backlight, which is easy for the user to read. It has data storage function, which can store 100 sets of measurement data, and the data will not be lost when power is lost, which can be convenient for users to make historical data inquiry. It can measure the maximum value, minimum value and average value, and has relative measurement function and automatic shutdown function.



Meter panel description



① Rotary switch

It can control power switch. It is also used to selection between the measurement of earth voltage, measurement of resistance in Bi-pole method or measurement of resistance in Tri-pole method.

② Key of REL

It is used not only for the selection of relative measurement functions, but also for the down-flip operation when

reading data.

③ Key of LIGHT

It is not only used to control the switch of backlight, but also used to flip up operation when reading data.

④ Key of MAX/MIN/AVG

It is used to switch between the measurement of maximum, minimum and average.

⑤ LCD

It is used to display measurement results, functions, units and other symbols.

⑥ Key of MEASURE

It is used for starting or ending resistance measurements.

⑦ Key of MEMO

It is used to save measurement results in the instrument.

⑧ Key of READ

It is used to read measurement data in the instrument.

⑨ Key of CLR

It is used to clear away data in the meter.

⑭ **E** socket

It is used to connect with the grounding pole.

⑮ **P/S** socket

## Users' Guide for Earth Ground Resistance Tester

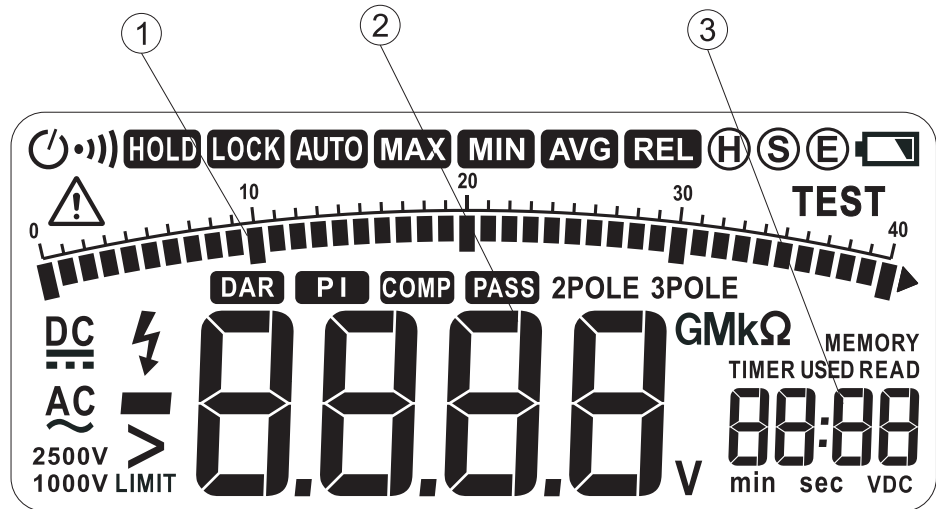
It is used to connect with the auxiliary grounding pole.

### ⑩ C/H socket

It is used to connect with the auxiliary grounding pole.

### Display description

- ① Simulation bar
- ② Display of data obtained
- ③ Display of memory used for data storage.







### Display symbol

#### description:

TEST:	Measurement markers	>LIMIT:	Limit has been exceeded
MAX:	Maximum	MIN:	Minimum

## *Users' Guide for Earth Ground Resistance Tester*

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AVG:	Average	REL:	Relative measurement
READ:	Data Reading	MEMO:	Data Storage
USED:	There are data in memories.		
2POLE:	Bi-pole method is being used for measurement of resistance		
3POLE:	Ti-pole method is being used for measurement of resistance		
V:	Volts (voltage)	KΩ:	Kilohm (unit of resistance)
~:	AC symbols	 :	Battery is low with the symbol on
 :	For warnings and cautions	 :	Socket identification symbol
 :	Auto power-off has been started with the symbol on		

### ***Operation instruction***

#### **Warning**

**When measuring earth voltage, do not apply more than 300 V to the measurement port.**

**When measuring earth resistance, high voltage will be output between E, P/S or E, C/H ports, and electric shock will be avoided.**

Before using the meter for measurement, first check the battery voltage, turn on the meter switch, and see if the under-voltage indicator "  " appears, if it does, replace the battery according to the operation in the battery replacement chapter.

### ***Earth voltage measurement***

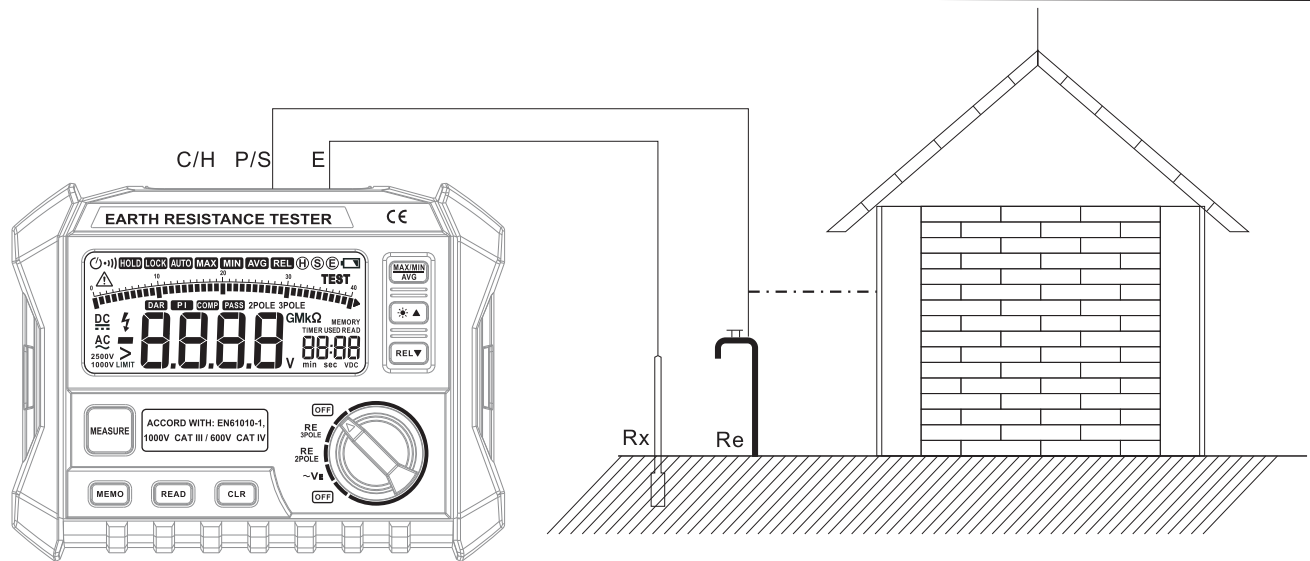
Turn the rotary switch to the " $\sim V_E$ " position and insert the test lead into the E and P/S jacks. The other end of the test lead is connected in parallel to the voltage source or load terminals for measurement and the voltage value is displayed on the LCD screen.

### ***Earth resistance measurement by Bi-pole method (simple measurements)***

This method does not use the measurement method of auxiliary grounding rod. The existing grounding electrode with known minimum grounding resistance is used as auxiliary grounding electrode, such as metal buried pipes, common grounding of commercial power supply or building lightning rod as auxiliary grounding electrode. The measurement steps are as follows:

- (1) First measure the earth voltage

The earth voltage is measured before the earth resistance is measured, and whether the measured device has earth voltage is detected according to the "earth voltage measurement" method. If the earth voltage exists and exceeds 10 V, the measurement of the earth resistance will produce relatively large error. Please cut off the power supply of the measured object and measure it after the earth voltage drops.



(2) Measurement of the earth resistance

Turn the rotary switch to the "Bi-pole method" position, connect the meter to the measured device as shown above, press the "Measure" key to start measurement, the "Measure" key light will light up and flash, the buzzer will sound after the measurement stops automatically, and the "Measure" key light will go out, the measured value **Re** will be automatically kept on the display to be obtained by users.

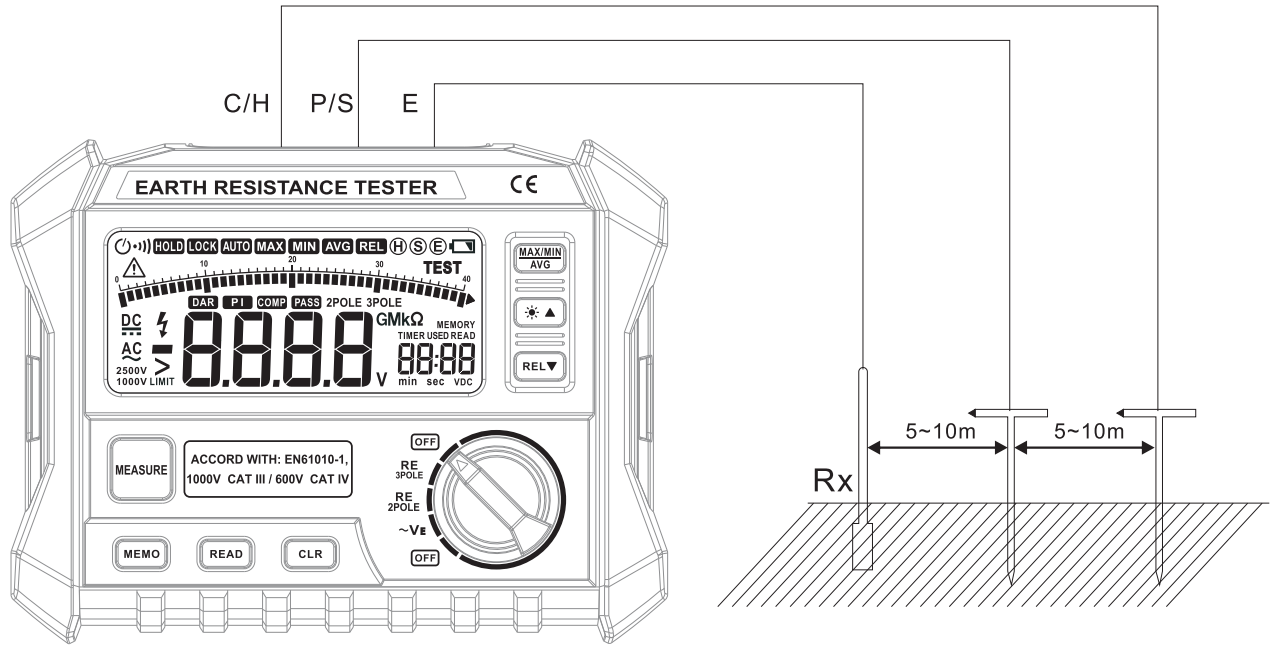
Note: If the measured value is out of range, the display will show >LIMIT 4000Ω, indicating that the auxiliary grounding resistance of the auxiliary ground rod is too large and the current cannot flow through the instrument.

(3) Calculating earth resistance values

The measured value **Re** is the sum of the earth resistance value **re** of the auxiliary grounding electrode and the true earth resistance value **Rx**, so the measured value **Re** minus the value **re** is the true earth resistance value **Rx**:  
**Rx (earth resistance value) = Re (measured value) - re (earth resistance value of the auxiliary grounding electrode).**

*Earth resistance measurement by the Tri-pole method (accurate measurements)*

This meter uses the potential difference method to measure the earth resistance. The potential difference method refers to the method of calculating the earth resistance value **Rx** by flowing AC rated current **I** between the measured object **E** ( grounding electrode ) and **C/H** ( current electrode ), and the potential difference **V** between the measured object **E** and **P/S** ( voltage electrode ).



(1) First check the earth voltage

The earth voltage is measured before measuring the earth resistance, and whether the measured device has the earth voltage is detected according to the “earth voltage measurement” method. If the earth voltage exists and



exceeds 10 V, the measurement of the earth resistance will produce relatively large error. Please cut off the power supply of the measured object and measure it after the earth voltage drops.

(2) Measurement of the earth resistance

As shown in the above figure, starting from the measured device, P auxiliary grounding rod and C auxiliary grounding rod are arranged in a straight line every 5 to 10 meters, and then they are deeply penetrated into the earth. The test leads ( black, red, green ) are connected from the E, P / S, C / H ports of the meter in the order of the device, P auxiliary grounding rod and C auxiliary grounding rod.

The rotary switch is rotated to the 'Tri-pole method' position, and the measurement is started by pressing the 'Measure' key. The 'Measure' key light is lit and flickered. After the measurement is automatically stopped, the buzzer rings and the 'Measure' key light is extinguished. The measurement value is automatically maintained on the display screen and the measurement results are read.

**Note:** Please insert the auxiliary grounding rod into the moist soil as far as possible. If you have to insert dry soil, stone or sand, please wet the part inserted by the auxiliary grounding rod with water to keep the soil moist. When measuring on concrete, please level the auxiliary grounding rod, shower water or put wet towels on the auxiliary grounding rod.

**Note:** If the measured value is out of range, the '>LIMIT4000Ω' symbol will be displayed, indicating that the auxiliary earth resistance of the auxiliary earth bar C is too large for current to flow through the meter. Please confirm whether the leads is loose and the earth resistance of the auxiliary grounding rod. The mixing or contact of the test leads may also lead to the error of the measured value. Therefore, before measuring, please ensure that the test lead is separated. When the auxiliary grounding resistance is too large, the indication value will produce large error.

Please bury the auxiliary grounding rods P and C respectively in the place with more moisture and ensure the connection safety of each connection part.

### ***Storage of measurement data***

The meter can store up to 100 sets of measurement data without loss of data when power is lost.

(1) Press the 'Record' key on standby mode and the data is stored in the memory. When the data are stored to 100, the oldest data will be deleted before storing the data.

### ***Reading of measurement data***

The meter's data reading function allows you to view stored historical measurement data.

(1) Press the 'READ' key on standby mode, the instrument enters the data reading interface, the 'READ' symbol is displayed, if there is data in the current position the 'USED' symbol will be displayed. Press the 'READ' key again to exit the data storage interface.

(2) Briefly press the "▼" or "▲" key to flip up or down the data.

(3) In the read mode, press the 'READ' key to exit the read mode.

### ***Data deletion***

The meter can delete the data in the read mode. Briefly press the 'Delete' key to delete the data at the current position.

### ***Relative measurement***

(1) In the relative measurement mode, the 'REL' symbol is displayed. The current displayed value is stored in the memory as a reference value, and for future measurements, the displayed value is the difference between the

input value and the reference value, i.e. **current reading = input value - reference value.**

(2) In the earth resistance measurement mode, the relative measurement mode cannot be entered during the measurement.

(3) In the data reading and storage mode, the relative measurement mode cannot be entered.

(4) When the current display value exceeds the limit value, the relative measurement mode cannot be entered.

### ***Maximum/minimum/average value measurement***

Press the 'Select' key to switch the measurement mode among the maximum, minimum, average and normal measurement modes, and the corresponding signs are displayed on the screen.

(1) **In the MAX measurement mode**, the largest value of the measurement data is displayed on the screen.

(2) **In the MIN measurement mode**, the smallest value of the measurement data is displayed on the screen.

(3) **In the AVG measurement mode**, the average value of the measurement results is displayed during the measurement process.

### ***Backlight***

Press the backlight button to turn the backlight on or off.

### ***Auto shutdown***

The meter defaults to turn on the automatic shutdown function. Press and hold the 'Auto Power Off ' key and turn the rotary switch to turn on the power to turn off the automatic sleep mode. When the automatic shutdown function is turned on, if the meter is not operated within 10 minutes, the meter will turn off the display and enter the

sleep mode, and there will be a buzzer reminder before shutdown. It can be woken up by triggering any key. If you do not use it for a long time, please turn the rotary switch to the 'Off ' position.

### ***General specification***

- Measurement methods:
  - ① The earth resistance is measured by the constant current conversion method. This method uses the test current with a frequency of about 800 Hz and a size of about 3MA.
  - ② The measurement of the earth voltage adopts average numerical rectification method.
- The instrument works between 0 °C and 40 °C, relative humidity below 85 %
- The storage temperature is -10°C to 50°C, the relative humidity is below 85%.
- Power supply: eight 1.5V AA batteries
- Volume: 330 X 125 X 265
- Weight: about 3.5kg
- **Accessories:** 3 test leads (one 20-meter-long red lead, one 10-meter-long green lead and one 2-meter-long black lead ), 2 auxiliary earth bars

### Technical specifications

**Accuracy:**  $\pm$  (% rdg + dgts). 'rdg': display value. 'dgt': the magnitude of the smallest change.

The guarantee period is one year.

**Baseline conditions:** The ambient temperature is between 18°C and 28°C, and the relative humidity is below 80%.

	Range	Accuracy	Resolution
Earth resistance	0 ~ 29.99Ω	$\pm(2\%rdg + 6d)$	0.01Ω
	30.0 ~ 99.9Ω	$\pm(3\%rdg + 3d)$	0.1Ω
	100 ~ 999Ω	$\pm(3\%rdg + 3d)$	1Ω
	1.00k~4.00kΩ	$\pm(3\%rdg + 3d)$	10Ω
Earth voltage	0V~200V (50/60HZ)	$\pm(1\%rdg + 5d)$	0.1V

## ***Battery replacement***

### **⚠ Warning**

**Never replace the batteries while the meter is damp.**

**Never replace the batteries while the meter is being used. Switch off the meter and disconnect the test leads and earth rods before replacements to avoid electrical shock.**

### **⚠ Caution**

**Never mingle new batteries with old ones.**

**Pay attention to the polarity of the batteries in replacements.**

- (1) Unscrew the battery cover and remove it.
- (2) Replace the old batteries with new one and pay attention to their polarities.
- (3) Put back the battery cover and screw it.

