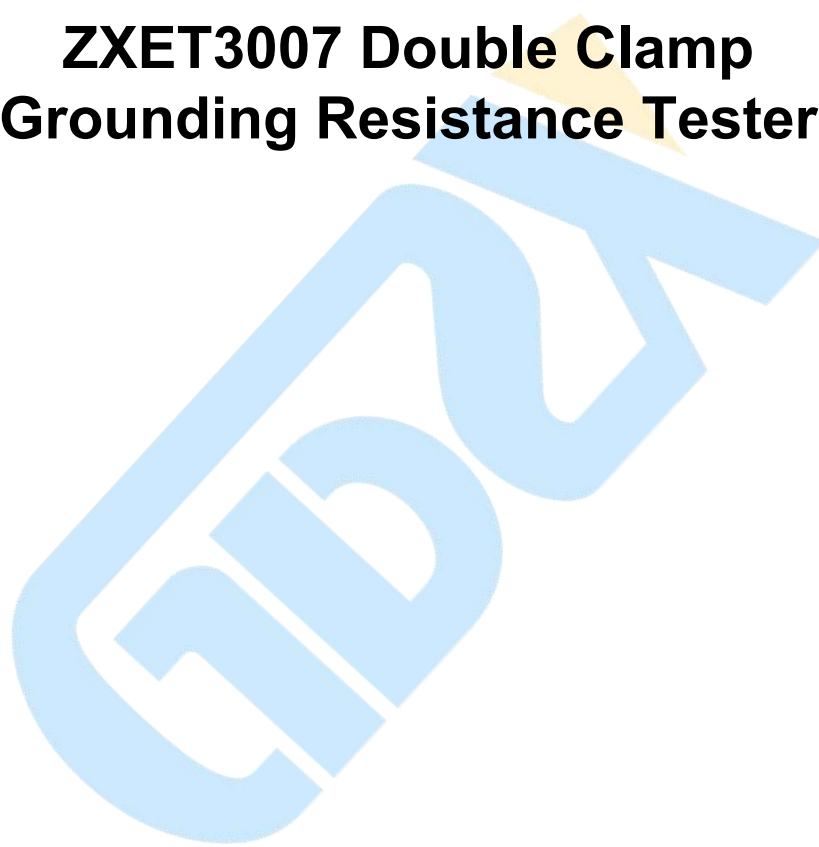


**ZXET3007 Double Clamp  
Grounding Resistance Tester**



## CONTENTS

Safety Instructions.....	1
I. Intruduction.....	2
II. Technology Specification.....	3
III. Product Photograph.....	6
IV. Display.....	7
V. Working Principle.....	8
VI. Operation.....	9
1. Basic Operation.....	9
2. Test.....	10
3. Three wire test grounding resistance.....	12
4. Soil resistivity test.....	13
5. AC voltage test.....	15
6. Grounding voltage test.....	15
VII. Battery management.....	16
VIII. Packing.....	16



## Safety Instructions

- The instrument is designed, manufactured and inspected according to IEC61010 safety standard.
- ***The RS232 interface and internal circuit of the instrument is non-isolated . It is forbidden to connect the computer when testing voltage, otherwise the instrument will be burned or electric shock accident will occur. The voltage test line must first be pulled out of the meter before connecting to the RS232 data port to read data from the computer. Online monitoring in manuals is not applicable to monitoring voltage.***
- In any case, the use of this instrument should pay special attention to safety, pay attention to the body of the instrument labels and symbols.
- It shall make sure that tester and accessories are in good condition before use; it can be used only when there is no damaged, naked or broken part in testing wires or insulation layer. During the measurement, it is forbidden to contact exposed conductors and the circuit being measured.
- Please confirm the location of **FUNCTION** knob before measuring.
- Confirm that the connecting plug of the wire has been tightly inserted into the instrument interface.
- Do not apply more than 100 V AC or DC voltage between the test end and the interface, otherwise the instrument may be damaged.
- Do not measure in flammable places, sparks may cause explosions.
- Do not place in high temperature and humidity, condensation places and direct sunlight for long time to store and store instruments.
- If the instrument is damp, first dry it and store.
- When charging the battery, please confirm that the test line has been removed from the meter and the **FUNCTION** knob is in the "**OFF**" position.
- The meter shows a low battery voltage symbol and should be charged to the battery in time.
- If you don't use this meter for a long time, please charge the battery every 3 months.
- Pay attention to the measuring range and use environment specified in this instrument.
- This measuring device is only to be used, disassembled, adjusted and repaired by qualified personnel with authorization.
- For the reason of this instrument, if it is dangerous to continue to use it, it should be stopped immediately and sealed up immediately, which should be handled by authorized authority.
- Safety warning signs in meters and manuals shall be operated in strict accordance with the contents of this manual.

## I. Introduction

**ZXET3007 earth resistance and soil resistivity tester** is specially designed and manufactured for ground resistance, soil resistivity, ground voltage, AC and AC voltage in combination with the new lightning-proof ground resistance testing standard. The testing current reaches 20mA. The digital and micro-processing technology, precision 4-wire method, 3-wire method and simple 2-wire method are used to measure ground resistance, importing FFT (Fast Fourier Transform) technology, AFC (Automatic Frequency Control) technology, with a unique function of anti-interference capability and the ability to adapt to the environment, consistency of repeat testing, to ensure high precision, high stability and reliability for prolonged measure, which is widely used in electric power, telecommunications, meteorology, oil field, construction, lightning protection, industrial electrical equipment and other earth resistance, soil resistivity, earth voltage, AC voltage measurement

**ZXET3007 also named as Precise Earth Resistance Tester, 4-pole Earth Resistance Tester, 2/3/4-pole Earth Resistance Tester, Soil Resistivity Tester**, The tester is composed of host machine, data software, test line, auxiliary grounding rod, communication line and so on. The special toolbox design of the main engine uses polypropylene plastics as raw materials and adds a new type of composite filler for one-time injection molding. It has the advantages of low density, strength, stiffness, hardness, abrasion resistance, heat resistance and insulation. The box can withstand about 200 kg of pressure to ensure high precision, high stability and high practicability of various environmental tests. The host of large LCD display with backlight, bar graph indicating that can be seen clearly, it can store 2000 sets of data. Through data software, it can realize the functions of reading, consulting, saving, reporting and printing historical data.

## II. Technology Specification

Function	Grounding resistance, loop resistance, conduction resistance and equipotential connection resistance test; soil resistivity and AC voltage test.
Power	DC 9V(Zi-Mn dry battery R14S 1.5V 6 PCS, continuous standby for 300 hours )
Back light	Controllable white screen backlight, suitable for use in dark field.
Testing method	precision 4 wire 3wire testing, simple 2 wire test grounding resistance
Measuring method	Earth Resistance: rated current change-pole method, measurement current 20mA Max
	Soil Resistivity: 4-pole measurement (Wenner method)
	Earth Voltage: average rectification(between P(S)-ES)
Range	<b>234 wire method for measuring ground resistance (R) :</b> 0.000Ω ~ 30000Ω
	<b>Soil resistivity (ρ) :</b> 0.00Ωm ~ 9000kΩm
	<b>Grounding voltage :</b> AC 0.0 ~ 100.0V
Max. resolution	<b>234 wire method for measuring ground resistance (R) :</b> 0.001Ω
	<b>Soil resistivity (ρ) :</b> 0.01Ωm
	<b>Grounding voltage :</b> 0.1V
Accuracy	<b>234 wire method for measuring ground resistance (R) :</b> ±2%rdg±5dgt ( 0.000Ω ~ 29.999Ω ) ±2%rdg±3dgt ( 30.00Ω ~ 2999.9Ω ) ±4%rdg±3dgt ( 3000Ω ~ 30000Ω )
	<b>Soil resistivity (ρ) :</b> depends on R accuracy ( ρ=2πaR a:1 m ~ 100m ; π=3.14 )
	<b>Grounding voltage :</b> ±2%rdg±3dgt
	Note1. when rC max or rP max additional tolerance ≤±5%rdg ±5dgt (rC max:4kΩ+100R < 50kΩ, rP max:4kΩ+100R < 50kΩ) Additional tolerance when 5V interferes voltage ≤±5%rdg±5dgt
Testing voltage wave shape	sine wave

# ZXET3007 EARTH TESTER



Testing frequency	128Hz/111Hz/105Hz/94Hz(Automatic frequency selection)
Short circuit test current	AC 20mA max
Open circuit test voltage	AC 40V max
Electrode spacing	1m ~ 100m
Ranging	Grounding resistance : 0.000Ω ~ 30000Ω Full auto ranging
	Soil resistivity : 0.00Ωm ~ 9000kΩm Full auto ranging
LCD	6-bit LCD display, white screen backlight
LCD size	128mm×75mm
LCD display size	124mm×67mm
Testing indication	LED flashing indication in measurement.LCD count down.Progress bar chart indication
charging indication	When charging, the indicator on the charger is bright red, full of bright green.
size	Host machine : Length Width Height 320mm×275mm×145mm
	Outer size : Length Width Height 400mm×245mm×335mm
Standard test wire	Total 4pcs : red wire 20m , black wire 20m , yellow wire 10m , green wire 10m, each 1pcs
Simple test wire	Total 2pcs : red wire 1.6m , black wire 1.6m each 1pcs
auxiliary grounding rod	4 pcs : φ10mm×150mm
Test time	Ground voltage : approx 2times/sec ; ground resistance : approx 7times/sec ; soil resistivity : approx 7times/sec
Test times	5000times above ( short circuit test, test 1 time,Stop for 30 seconds and retest. )
Circuit voltage	AC 600V below test
communication port	With RS232 interface, storage data can be uploaded to the computer and saved to print.
communication wire	RS232 communication wire 1pcs, length 1.5m

## ZXET3007 EARTH TESTER



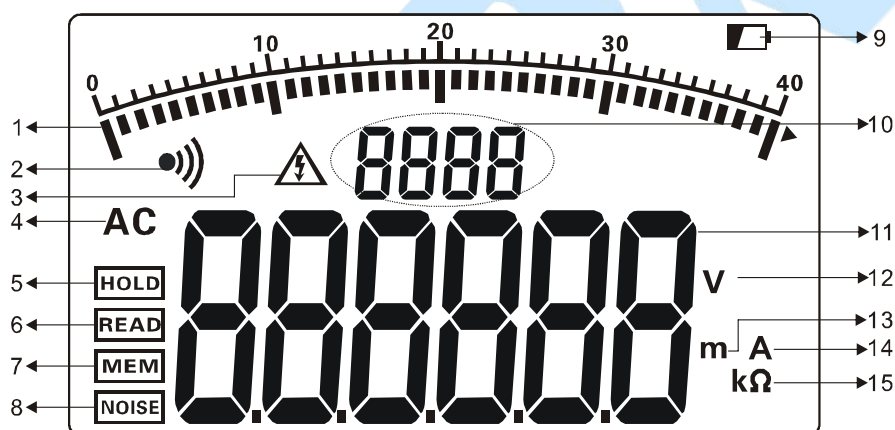
Data HOLD	The "HOLD" symbol indicates data is kept.
data save	2000 SET , " <b>MEM</b> "Storage instructions , display " <b>FULL</b> "Indicates that the storage is full.
data read	the "READ" symbol indicates look up data
overflow display	Exceeding measuring range overflow function: " <b>OL</b> " icon display
Interface test	Recognize interference signal automatically, " <b>NOISE</b> " icon display when interference voltage exceed 5V
auxiliary grounding test	Can measure auxiliary earth resistance, 0.00KΩ-30000Ω(100R+rC<50kΩ, 100R+rP<50kΩ)
Alarm function	When measuring value exceeds alarm setting value, there is "Toot-toot-toot" alarm hint
battery voltage	When low battery , battery voltage low icon will display, reminding to charging battery.
Automatically power off	Turn off automatically after standby 15 minutes.
working current	Standby: about 25mA (Backlight shut off) ; backlight : 25mA Max(only backlight consumption) ; Measurement: about 150mA (Backlight shut off)
weight	Host machine : 2.66kg(with battery)
	Total weight : 6.88kg(with package)
Tool box	The military toolbox is designed to support 200kg.
Work condition	-10℃ ~ 40℃ ; 80%rh below
Store condition	-20℃ ~ 60℃ ; 70%rh below
Overload protection	Measurement ground resistance : <b>C(H)-E、 P(S)-ES between each</b>
Insulation resistance	20MΩ above(between circuit and shell 500V)
Withstand voltage	AC 3700V/rms(between circuit and shell)
Electromagnetic features	IEC61326(EMC)
Protection type	IEC61010-1(CAT III 300V、 CAT IV 150V、 pollution class2) ; IEC61010-031 ; IEC61557-1(ground resistance)\ IEC61557-5(soil resistivity) ; JJG 366-2004(ground resistance meter)



### III. Product photograph



### IV. Display

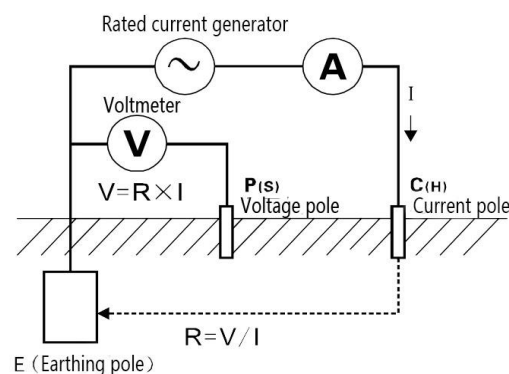


1. Test progress bar chart (showing progress of the test, dynamic display).
2. Alarm indicator (when the critical threshold is over).
3. Over voltage indication (when test voltage exceeding 30V, caution safety)
4. Exchange instructions.
5. Data holding ( **MEM** key to display data while maintaining data).
6. Data access (long press **MEM** key for 3 seconds to enter data access).
7. Data storage (press **MEM** to hold data while displaying while storing data).
8. Interference signal indication (interference voltage exceeds 5V display).
9. Battery low indication.
10. Storage data group number indication.
11. Test data.
12. Voltage unit symbol.
13. Length unit symbol.
14. Current unit symbol.
15. Resistance unit symbol.

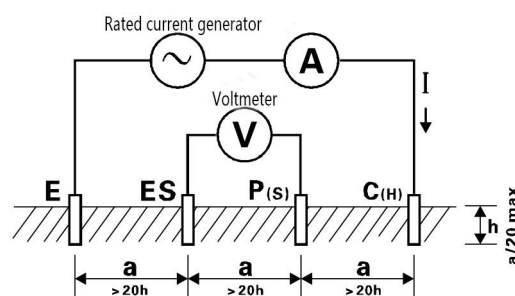


## V. Working principle

1. The earth voltage is measured by the average rectification method.
2. The grounding resistance is measured by the method of rated electrorheological pole, i.e. the flow AC rated current  $I$  between the **E** grounding electrode and the **C(H)** current electrode. The potential difference  $V$  between the **E** grounding electrode and the **P(S)** voltage electrode is obtained, and the grounding resistance value  $R$  is calculated according to the formula  $R=V/I$ . In order to ensure the accuracy of the test, a four-wire method is designed to increase the **ES** auxiliary earth pole. In the actual test, **ES** and **E** are clamped at the same point of the earth body. The four-wire method can eliminate the influence of the contact resistance (usually dirt or rust) between the grounding body, auxiliary grounding rod, test clamp and the input interface surface of the instrument on the measurement, and can eliminate the influence of the line resistance on the measurement.



3. Soil resistivity ( $\rho$ ) was measured by four-pole method (Winner method): alternating current  $I$  flowing between **E** grounding electrode and **C(H)** current electrode, the potential difference  $V$  between **P(S)** voltage electrode and **ES** auxiliary ground electrode, the potential difference  $V$  divided by alternating current  $I$ , the resistance value  $R$  of the middle two points, the distance between the electrodes is  $a$ (m), and the soil resistivity value was obtained by formula  $\rho = 2 \pi a R$  ( $\Omega \cdot m$ ). The distance between **C(H)** -**P(S)** and **P(S)** -**ES** is equal to  $a$  (i.e.,  $a$ ). For calculation convenience, please let the electrode spacing  $a$  be much larger than the buried depth  $h$ , generally should meet  $a > 20h$ , see below.



4. The working errors (**B**) of the above methods are calculated from the inherent errors (**A**) and the variation errors (**E<sub>i</sub>**) of the instruments used.

$$B = \pm (|A| + 1.15 \times \sqrt{E_2^2 + E_3^2 + E_4^2 + E_5^2})$$

A: inherent error

E2: changes in power supply voltage variations

E3: variation of temperature variation


E4: changes caused by disturbance voltage changes


E5: changes in resistance of contact electrodes




## VI. Operation

### 1. Basic Operation





Turn **FUNCTION** knob to realize the switch machine, and the knob indicates the "OFF" position is turned off. This instrument shuts down automatically 15 minutes after the start-up. After the automatic shut-down, the function knob will be transferred to the "OFF" position and restart.

After power on, if the LCD display battery voltage low sign "  ", indicating that the battery is insufficient, please charge the battery according to the instructions. Battery power is sufficient to ensure measurement accuracy.

After starting, press the  key to turn on or turn off the backlight. The backlight function is suitable for dim places. The default backlight is turned off every time.

After power on, the **FUNCTION** function selection knob is turned to the corresponding position, short press "AL" key can turn on or off the alarm function, long press "AL" key (about 3 seconds) to enter the alarm threshold setting, press "   " key to change the current number size, short press "AL" key to move the cursor, and long press "AL" key to save and exit. When the measurement value is greater than the critical set value while the alarm function is turned on, the instrument will flicker and display the sign of "  " **Dou-Dou-Dou-Dou** and send out the alarm sound.

In test mode, press "MEM" key to lock the current display data, display "HOLD" and "MEM" symbols, and automatically number storage, if the storage is full, the instrument shows "FULL" symbols. Then press the "MEM" button to unlock.

In test mode, press "MEM" (more than 3 seconds) for data access, press "  " or "  " key to look up data with step value of 1, hold "  " or "  " key to lookup data with step value of 10, and press "SET" key Check the values of **rC**, **rP** and **a**, then press "MEM" to exit when the currently data group is grounding

resistance data or soil resistivity data.

If there is no stored data during the visit, LCD will display "-----" and see the top right picture.


In the data access state, press the "**CLR**" key to enter the data deletion, press the "**CLR**" key to select "**NO**" or "**YES**", select "**NO**" and then press the "**MEM**" key not to delete and return to the data access state, select "**YES**" and then press the "**MEM**" key to delete the stored data, after deletion LCD display "----". Data deletion function is to delete all stored data at one time, after deletion can not be restored, please operate with caution.

The data stored in the instrument can be uploaded to the computer. Connect the RS232 communication line between the computer and the instrument, the instrument boots up, running data software, if the software shows that the serial port is opened and connected successfully, you can read the stored historical data, upload the computer and save.

Data software has the functions of reading, accessing, saving and printing historical data.

## 2. Test

Four wire precision test grounding resistance

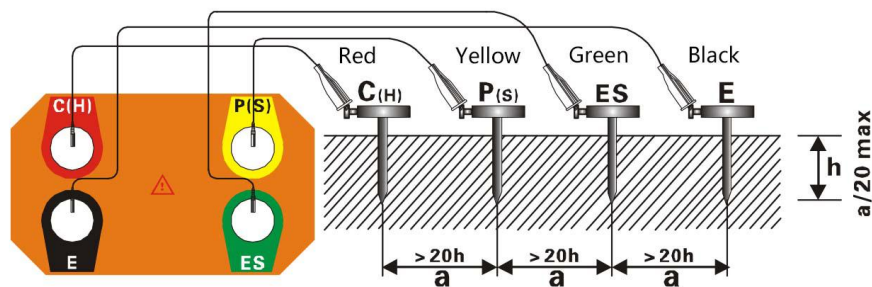
	When testing the grounding resistance, first confirm the grounding line to the ground voltage value, that is, the <b>C (H)</b> and <b>E</b> or <b>P (S)</b> and <b>ES</b> voltage value must be below 20V, if the grounding voltage is above 5V, the instrument shows <b>NOISE</b> symbols, at this time the grounding resistance measurement may produce errors, at this time will be measured grounding body equipment power off, so that the grounding voltage drops after Then the grounding resistance test is carried out.
---	--

**Four-wire test:** Four-wire test can eliminate the influence of contact resistance between grounding body, auxiliary grounding rod, test clamp, instrument input interface (usually dirty or rusty) surface on the measurement. It can eliminate the influence of line resistance change on the measurement. It is better than three-wire test.

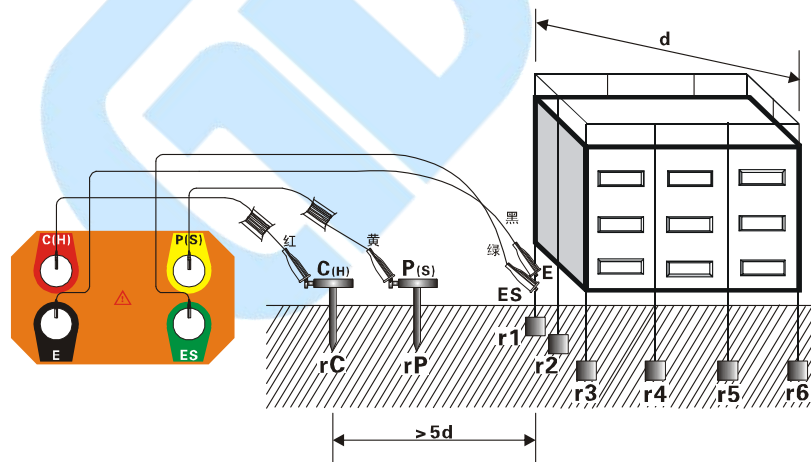
The following illustration: from the object under test, generally 5 m to 20 m interval, **P (H)**, **C(H)** auxiliary grounding rods are buried in a straight line deep into the earth, the grounding test line (black, green, yellow, red) from the instrument **E**, **ES**, **P(S)**, **C(H)** interface corresponding to the grounding

electrode E, auxiliary voltage electrode P (S), auxiliary current electrode C (H).

	<p>The distance between the grounding body E and the current electrode C (H) should be at least five times the depth (h) of the grounding body under test or five times the length (d) of the electrode under test.</p>
	<p>The total grounding resistance of a complex grounding system is measured. The distance D is the distance of the maximum diagonal line of the grounding system.</p>
	<p>When testing, the test lines can not be intertwined, otherwise it may affect the accuracy of the test.</p>



For multi-point independent grounding system or grounding system of the earth grid, users can choose longer test lines by themselves, and the electrode spacing is 5 times longer than the maximum diagonal length of the ground grid under test. As follows:



$$R=r1 // r2 // r3 // r4 // r5 // r6 // \dots // rn \text{ (} r1\dots rn \text{ are independent grounding points)}$$

R—meter reading number, the total earth resistance value of the whole grounding system.

R1...Rn—they are all independent grounding points, and each grounding wire

is separately placed.

$r_C$ —auxiliary earth electrode resistance (H) of current pole C.

$r_P$ —earth resistance (S) with auxiliary voltage P.

$n$ —the number of independent grounding points, the more points, the smaller the  $R$  value.

After connecting the test line, turn the **Function** selection knob to the "rearth" position to enter the grounding resistance test mode and "test", press the key to start the test. During the test process, there are countdown instructions and test progress bar chart instructions. After the test, stable data will be displayed, that is, the grounding resistance value of the tested grounding body  $R$ .

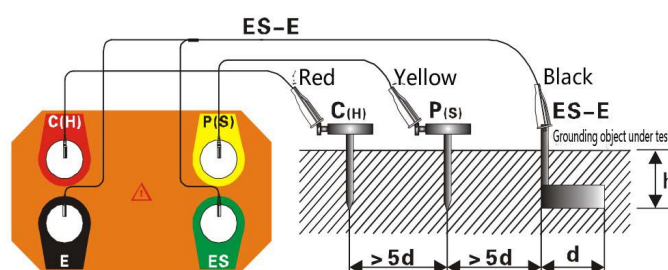
After the test, press the "set" key to see the auxiliary current pole **C (H)** and auxiliary voltage pole **P (S)** grounding resistance value  $R_c$ ,  $R_p$ ,  $R_c$ ,  $R_p$  value display after the automatic return to show the measured grounding resistance value  $R (S)$ .

The following figure shows that the grounding resistance tested is 2.205 $\Omega$ , and the instrument has 8 sets of data; the grounding resistance  $R_C$  of auxiliary current electrode **c(H)** is 0.36 k $\Omega$ , and the grounding resistance  $R_P$  is 0.27 K. The auxiliary voltage electrode **p(S)**.



### 3. Three wire test grounding resistance

Three-line test: as shown below, the **ES**, **E** interface of the short-circuit instrument, namely, three-line test, instrument operation and four-line test the same. Three-wire test can not eliminate the influence of wire resistance change on measurement, nor can it eliminate the influence of contact resistance change between instrument and test wire, between test wire and auxiliary grounding rod, and the oxide layer on the surface of grounding object should be removed in measurement.

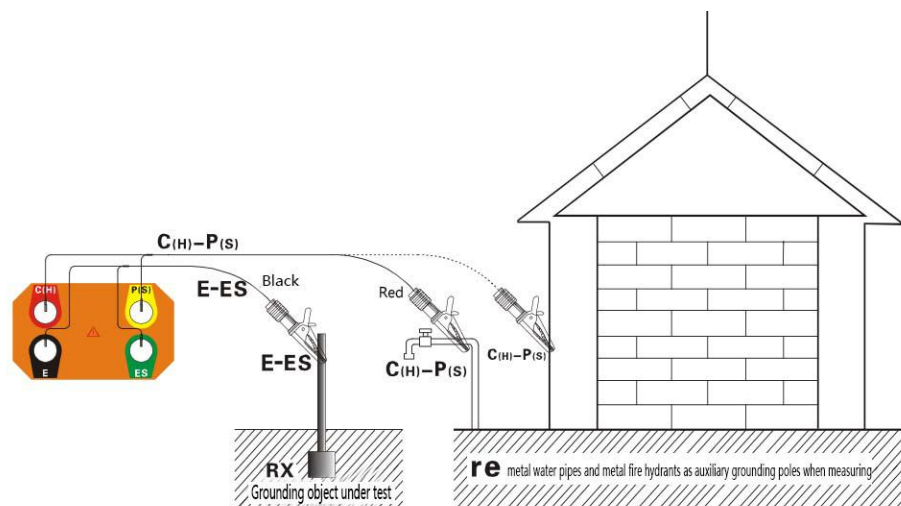
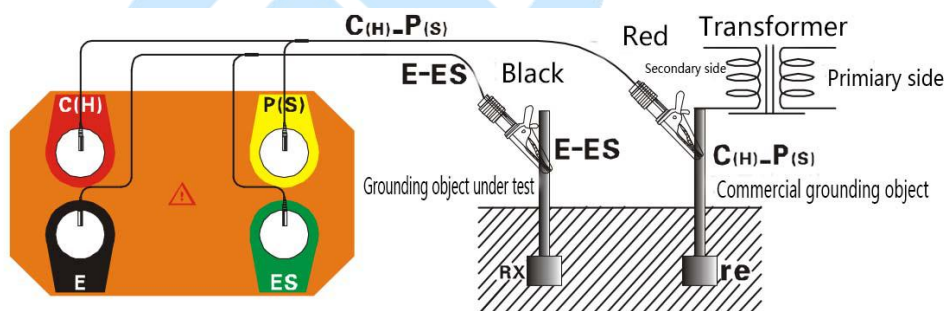




Two wire simple test grounding resistance

Two-wire test: This method is a simple measurement method without auxiliary grounding rod, using the existing grounding electrode with the smallest grounding resistance as auxiliary grounding electrode, using two simple test lines to connect (that is, **C (H) - P (S)** interface short connection, **E - ES** interface short connection). It can replace auxiliary grounding rod **C (H)** and **P (S)** by metal pipe, fire hydrant, common grounding of commercial power system, lightning protection grounding electrode of building and so on, and pay attention to removing the oxide layer of the connection point of the selected metal auxiliary grounding body when measuring. The wiring is shown below, and the instrument operates with the four line test.

	<p><b>When choosing commercial power system grounding as auxiliary grounding electrode, it is necessary to confirm that it is the grounding electrode of commercial power system first, otherwise the circuit breaker may start, which is dangerous.</b></p>
	<p><b>The simple two-wire method is used to measure the grounding resistance, and the grounding object with small re value is selected as the auxiliary grounding electrode as far as possible, so that the meter reading is closer to the true value. Priority should be given to metal water pipes and metal fire hydrants as auxiliary grounding poles when measuring.</b></p>



The instrument reading is the sum of the grounding resistance value of the grounding body under test and the grounding resistance value of the commercial grounding body, that is,  $R = R_X + R_e$ .

Among them:  $R$  -- for meter reading value;

$R_X$  - the grounding resistance value of the grounded body.

$R_e$  -- earthing resistance values for common grounding bodies such as commercial power systems.

Then the grounding resistance of the tested grounding body is:  $R_x = R - R_e$ .

#### 4. Soil resistivity test

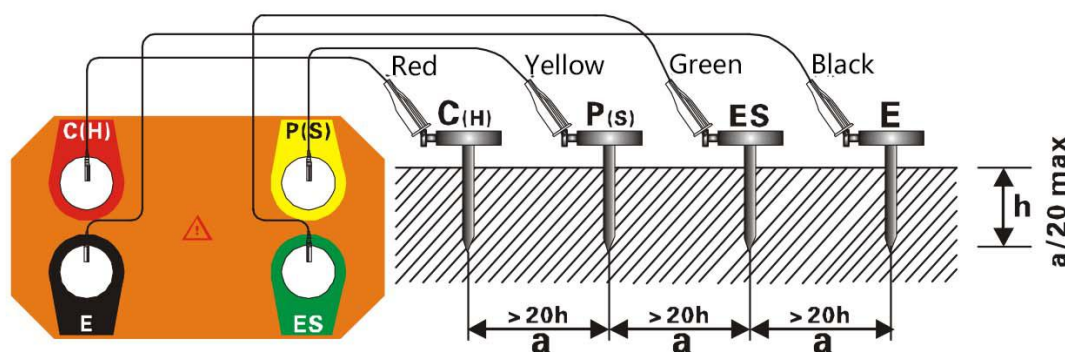
Soil resistivity  $\rho$  is an important factor determining the grounding resistance of grounding object. Different properties of soil, of course, have different soil resistivity, that is, the same soil, because of temperature and water content and other differences, soil resistivity will also change significantly. Therefore, in order to have a correct basis for the design of grounding device, so that the designed grounding device can better meet the needs of practical work, it is necessary to measure the soil resistivity.

Soil resistivity was measured by the quadrupole method (**Wen Nafa**).

According to formula  $\rho = 2\pi a R$  ( $\Omega m$ ), the soil resistivity  $\rho$  unit is  $\Omega m$ .

$a$  --- electrode spacing;  $R$  ---  $P(S)$  -  $ES$  electrode.

Four-pole method (Winner method): Connect the test line according to the following figure, pay attention to the distance between the auxiliary grounding rods and the depth of embedding. Bury the auxiliary grounding rods **C (H)**, **P (S)**, **ES**, **E** in a straight line into the ground, and connect the grounding test line (red, yellow, green, black) from the **C (H)**, **P (S)**, **ES**, **E** interface of the instrument to the **C (H)**, **P (S)**, **E**. **S**, **E** auxiliary grounding bar.



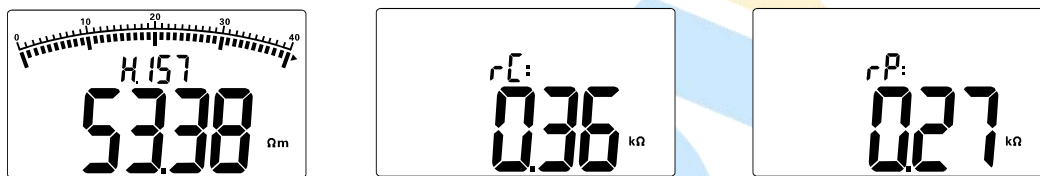
Assisted Grounding Bar Spacing Settings: After connecting the test line, first turn the **FUNCTION** function selection knob to the position of "**p EARTH**", enter the soil resistivity test mode, press the "**SET**" key (about 3 seconds) to



enter the auxiliary grounding bar spacing settings, press the "SET" key to move the cursor, press the "▲ ▼" key to change the currently number(a value range: 1m ~ 100m), then press SET key to save the set a value, and return to the soil resistivity test mode.

After setting a value, in the soil resistivity test mode, press the "TEST" key to start the test, and the countdown shows the test progress, after the completion of the test shows a stable soil resistivity value.

In the following figure, the measured soil resistivity is 53.38<sub>m</sub>, and 157 sets of data have been saved. Press SET to display the grounding resistance value of auxiliary current electrode C (H) and auxiliary voltage electrode P (S) rP. After the display, the ground resistance value of auxiliary current electrode C (H) and auxiliary voltage electrode P (S) rP are automatically returned to display the measured soil resistivity.

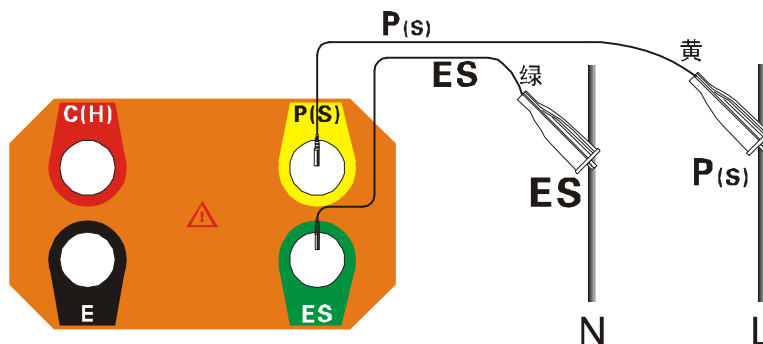


### 5. AC voltage test


	<b>AC line voltage test can not operate 100V.</b>
	<b>Connect P (S) and ES interface to test commercial AC voltage without connecting C (H) and E interface.</b>

AC voltage test, refers to the general commercial AC voltage test, pay attention to the difference between the ground voltage, this instrument can be used to test the voltage of the AC line below 100V.

See the following figure: First connect the test line with the instrument's P (s), ES interface, and then connect the test line to the line under test. After connecting, switch the FUNCTION function conversion knob to the "EARTH VOLTAGE" position to start the test. LCD displays the test results.



## 6. Grounding voltage test

	<b>Requiring 1 auxiliary grounding rods for grounding voltage test.</b>
	<b>As long as the instrument is connected to the earth through the test line and auxiliary grounding rod, the other test lines of the instrument interface can not be connected to the L, N lines of commercial power supply, otherwise causing leakage of electricity, circuit breaker, dangerous !</b>
	<b>Grounding voltage test should not exceed 100V.</b>
	<b>It can not be used for commercial voltage test, otherwise the instrument will be damaged.</b>

Grounding voltage: that is, when electrical equipment grounding fault occurs, the potential difference between the shell of grounding equipment, grounding wire, grounding body and zero potential point, grounding voltage is to take the earth as a reference point, the potential difference with the earth, the earth is zero potential point.

An auxiliary grounding bar should be used in the grounding voltage test, and the difference between commercial AC voltage test and auxiliary grounding bar should be noted. See the following figure: After the instrument, auxiliary grounding rod and test line are connected, switch the **FUNCTION** function conversion knob to the "**EARTH VOLTAGE**" position and start testing the grounding voltage. LCD displays the test results.

## VII. Battery management



- **charge the battery in time, do not use the meter for a long time, charge the battery once every 3 months.**
- **When charging, the indicator on the charger is bright red, full battery in bright green.**
- **Must use standard chargers to charge.**

1. When the battery voltage is insufficient, please charge in time, charging time is about 1 hours.
2. To replace the battery, open four screws from the bottom of the toolbox, remove the instrument panel, and replace the battery. If the user is unable to replace the battery, please contact the manufacturer.
3. Rotating **FUNCTION** function knob to see if it can start normally. If you can't turn on the machine, press the second step to re-operate.

## VIII. PACKING

Instrument	1set
Tools box	1pcs
1 auxiliary grounding rods	4pcs
Test wire	4pcs(red 20m; yellow 10m; green 10m; black20m)
Simple testing wire	2pcs(red 1.6m, black 1.6m)
Charger, Charger line	1set
Data Software(E-Edition)	1pcs
RS232 communication wire	1pcs
User manual,warranty card	1pcs