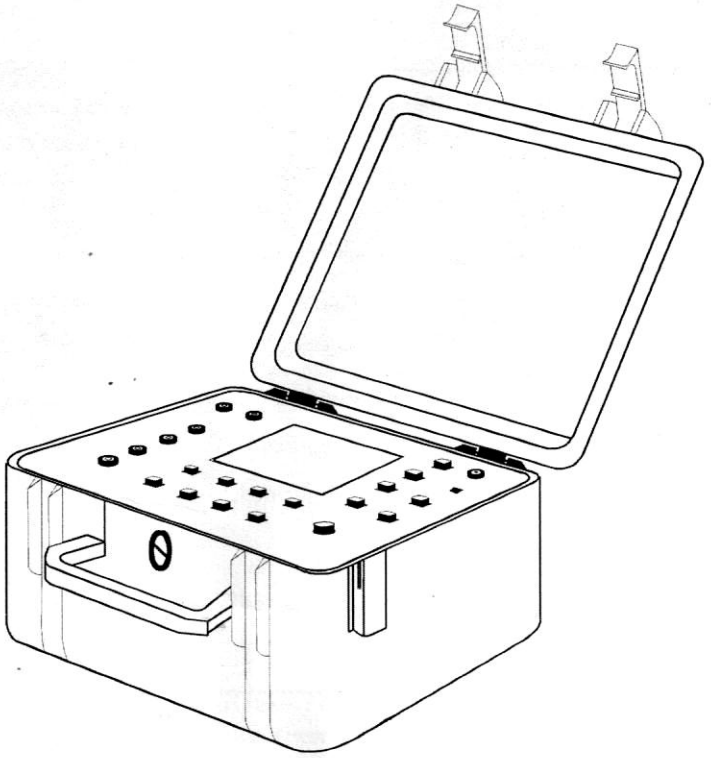
Multifunctional Earth Tester



KM 4237ER
USER MANUAL

KUSAM-MECO

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I. Safety Precautions and Procedures

Thank you for purchasing our company's **Dual-clamp Multi-function Grounding Resistance Tester**. Before using the instrument for the first time, in order to avoid possible electric shock or personal injury, please be sure to **read and strictly observe the safety rules and precautions listed in this manual.**

In any case, the use of this instrument should pay special attention to safety.

- The instrument is designed, produced and inspected according to IEC61010 safety specifications.
- In any case, the use of this instrument should pay special attention to safety.
- When measuring, high-frequency signal generators such as mobile phones should not be used next to the meter to avoid errors.
- Pay attention to the text and symbols on the body of the instrument.
- Before use, make sure that the instrument and accessories are in good condition. The insulation layer of the instrument and test wire is not damaged, exposed or broken.
- During the measurement, it is forbidden to touch exposed conductors and the circuit being measured.
- Make sure the connection plug of the wire is tightly inserted in the meter connector.
- Do not apply more than 100V AC voltage or DC voltage between the test terminal and the interface, doing so may damage the meter.
- Do not measure in flammable places, sparks may cause explosion.
- When the instrument is in use and the enclosure or test wire is broken and the metal is exposed, please stop using it.
- Do not place and store the instrument for a long period of time under conditions of high temperature, humidity, condensation, and direct sunlight.
- When charging the battery, make sure the test line has been removed from the meter and the meter is off.
- The meter displays the battery voltage low symbol "▭" and should be charged in time.
- Pay attention to the measuring range and use environment specified by this instrument.
- The use, disassembly, calibration and maintenance of this instrument must

be performed by authorized personnel.

- Because of the reason of this instrument, if it is dangerous to continue using it, it should be immediately stopped and sealed immediately, and it should be handled by a qualified organization.
- The "⚠" safety warning sign in the instrument and manual must be operated strictly in accordance with the contents of this manual.

II. Introduction

Double clamp multi-function grounding resistance tester is also called **double clamp grounding resistance tester**. The advanced grounding resistance tester integrates a variety of measurement methods. In addition to the traditional function of ancillary grounding resistance, it also has the unique function of measuring without auxiliary ground. It uses a large LCD gray screen backlight display and microprocessor technology, through the microprocessor control precision 4-wire method, 3-wire method and simple 2-wire method, selection method, double clamp method to measure grounding resistance test. Large-diameter current clamp design, using double jaw measurement technology, without the need to hit the auxiliary ground, without the need to isolate the grounding body and equipment to achieve on-line measurement. Suitable for telecommunications, electricity, meteorology, computer rooms, oil fields, power distribution lines, iron tower transmission lines, gas stations, factory grounding networks, lightning rods and so on. Instrument testing is precise, fast, simple, stable and reliable.

The **double clamp multi-function grounding resistance tester** is controlled by the microprocessor and can accurately detect the grounding resistance, soil resistivity, grounding voltage, DC resistance and AC current. It uses a fast filtering technique to minimize interference. The resistance value of the auxiliary electrode is displayed on the same screen to facilitate the determination of the measurement error due to environmental factors, and it is convenient to measure the true grounding resistance more accurately. At the same time store 500 sets of data, online monitoring data through monitoring software, USB data uploaded to PC and unique features such as **intelligent alarm alert**

Double clamp multi-function grounding resistance tester consists of host, monitoring software, test line, USB cable, and grounding rod. It has the functions of reading, checking, saving, reporting and printing of historical data.

III. Rang and Accuracy

Test Function	Range	Accuracy	Resolution
2、3、4 wire method for measuring ground resistance (Re)	0.00Ω～29.99Ω	±2%rdg±5dgt(remark 1)	0.01Ω
	30.0Ω～299.9Ω	±2%rdg±3dgt	0.1Ω
	300Ω～2999Ω		1Ω
	3.00kΩ～30.00kΩ		10Ω
DC resistance(Re)	0.0Ω～299.9Ω	±2%rdg±3dgt	0.1Ω
	300Ω～2999Ω		1Ω
	3.00kΩ～30.00kΩ		10Ω
Selection method for measuring ground resistance(Re)	0.00Ω～29.99Ω	±2%rdg±5dgt(remark 1)	0.01Ω
	30.0Ω～299.9Ω	±2%rdg±3dgt	0.1Ω
	300Ω～3000Ω		1Ω
Double clamp method for measuring ground resistance (Re)	0.01Ω～0.99Ω	±10%rdg±10dgt	0.01Ω
	1.0Ω～9.9Ω		0.1Ω
	10Ω～100Ω		1Ω
Soil resistivity(ρ)	0.00Ωm～99.99Ωm	ρ=2πaR（a≤2）	0.01Ωm
	100.0Ωm～999.9Ωm		0.1Ωm
	1000Ωm～9999Ωm		1Ωm
	10.00kΩm～99.99kΩm		10Ωm
	100.0kΩm～999.9kΩm		100Ωm
	1000kΩm～9999kΩm		1kΩm
Ground voltage	AC 0.00～100.0V	±2%rdg±3dgt	0.01V
AC current	AC 0.0mA～1000A	±2%rdg±3dgt	0.1mA

Remark:

1. Reference conditions: accuracy with Rh Rs < 100Ω。
   Working conditions:Rh max=3kΩ+100R<50kΩ; Rs max=3kΩ+100R<50kΩ
2. Depends on the measurement accuracy of R, π=3.14, a:1 m～100m;

2. General specification

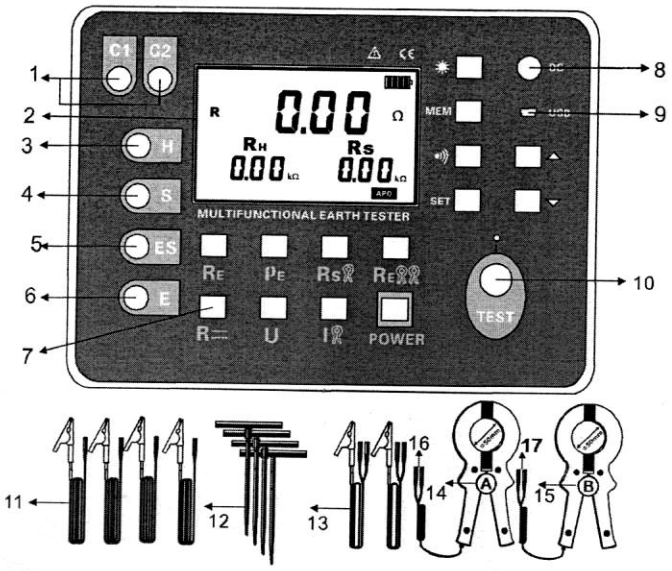
Function	Ground resistance、Soil resistivity、DC resistance、Ground voltage、AC current
Ambient temperature and humidity	23℃±5℃, below 75%rh
Interference voltage	<20V (should be avoided)
Interference	<2A (should be avoided)

current	
Measure R electrode spacing	a>5d
Measured ρ electrode spacing	a>20h
Power	8.4V lithium battery (built-in)
Backlight	Controllable backlight, suitable for use in dim places
measurement mode	Precise four-wire、 three-wire measurement, simple two-wire measurement、Selection method, double clamp method for measuring grounding resistance
Measurement methods	2.3.4-wire method measurement: Polarization method, measuring current 20mA Max Soil resistivity: four-pole method Selectivity Measurement: Polarization Method, Measuring Current 20mA Max Double clamp method: non-contact mutual inductance measurement method, test current 1mA Max DC resistance: polarization method AC current: average rectification (clamp) Ground Voltage: Average Rectification(between S-ES interface)
Test voltage waveform	Sine wave
Test frequency	128Hz
Short circuit test current	AC 20mA max
Open circuit test voltage	AC 28V max
Electrode spacing range	1m～100m
Display mode	4-bit large LCD display, with backlight
Measurement instructions	LED flashing indicator during measurement
LCD size	111mm×68mm
LCD display field	108mm×65mm
Instrument size	L/W/H: 277.2mm×227.5mm×153mm

Clamp size	L/T/H: 101mm×27mm×214mm
Test line	4 strips: red 15m, black 15m, yellow 10m, green 10m each one
Simple test line	2strips: yellow 1.5m, green 1.5m each one
Auxiliary Grounding rod	4PCS: Φ10mm×200mm
Current clamp	2PCS: Banana plug
Current clamp diameter	Φ50mm
Current clamp lead	Length 2m
Measure time	AC current: about 2 times/sec; Ground voltage: about 2 times/sec; grounding resistance、soil resistivity: about 7 seconds/time
Line voltage	Measurement below AC100V (ground voltage measurement function cannot be used to measure commercial power)
USB interface	With USB interface, storage data can be uploaded to the computer, save and print
Communication Line	One USB communication line, 1.5m long
Data storage	500 groups, "MEM" storage indicates, flashing "FULL" symbol indicates that the memory is full
Data review	Data review function: "MR" symbol display
Overflow display	Over-range overflow function: "OL" symbol display
Current clamp low current indication	When measuring by the selection method or the double-clamp method, when the current signal received by the current clamp A is lower than 0.5 mA, the symbol "" is displayed, and at this time, the clamping direction of the current clamp A should be checked.
Interference test	Automatic identification of interference signals, "NOISE" symbol indication when the interference voltage is higher than 5V
Auxiliary grounding test	With auxiliary ground resistance test function, 0.00KΩ ~ 30kΩ (Rh max = 3kΩ +100R <50kΩ; Rs max = 3kΩ +100R <50kΩ)
Alarm function	Alarm when the measured value exceeds the alarm setting value

Battery voltage	Real-time display of battery power, reminding timely charging when battery voltage is low
Automatic Shutdown	"APO" Indicates, automatic Shutdown After 15 Minutes
Power consumption	Standby: 40mA Max(Backlight off)
	Turn on backlight: 43mA Max
	measuring: 120mA Max(Backlight off)
Weight	Instrument: 2430g(with battery)
	Current clamp: 940g(2PCS)
	Test lines: 1300g(including simple test line)
	Auxiliary grounding rod: 850g(4PCS)
Working temperature and humidity	-10℃～40℃; below 80%rh
Storage temperature and humidity	-20℃～60℃; below 70%rh
Overload protection	Grounding resistance: AC 280V/3 seconds between H-E and S-ES ports
Insulation resistance	20MΩ (500V between circuit and housing)
Pressure resistance	AC 3700V/rms(between circuit and housing)
Electromagnetic properties	IEC61326(EMC)
Suitable for safety regulations	IEC61010-1(CAT Ⅲ 300V、CAT Ⅳ 150V、pollution level 2); IEC61010-031; IEC61557-1(grounding resistance); IEC61557-5(soil resistivity); JJG 366-2004. JJG 366-2004(ground resistance meter); JJG 1054-2009(Clamp grounding resistance meter).

IV. Structure

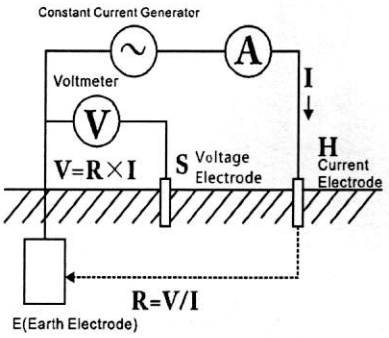


1. Receiving current clamp A interface
2. LCD
3. H interface(current pole)
4. S interface(voltage pole)
5. ES interface(auxiliary grounding pole)
6. E interface(grounding electrode)
7. Function button area
8. DC charging
9. USB interface
10. Test button
11. Test line
12. Auxiliary grounding rob
13. Easy test line
14. Receiving current clamp A
15. Excitation current clamp B
16. Receive current clamp A connection port, blue banana head is the same, black is for public port.
17. Excitation current clamp B connection port, red banana head is the same, black is for public port.

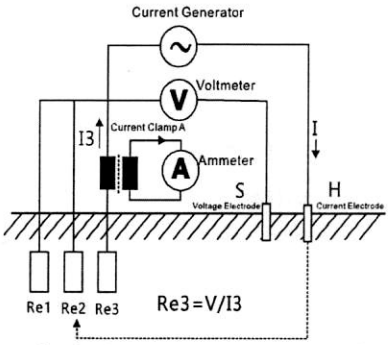
V. Measuring Principle

1. Three-wire four-wire method for measuring ground resistance are using the rated current change method(Suitable for accurate measurement of single point grounding system), that is, the AC rated current I flows between the ground electrode of the measuring object E and the H current electrode to obtain the potential difference V between the E ground electrode and the S voltage electrode, and calculate the grounding

resistance R according to the formula R=V/I. In order to ensure the accuracy of the test, a four-wire method was used to increase the ES auxiliary ground. During the actual test, ES and E were clamped at the same point of the grounding body.

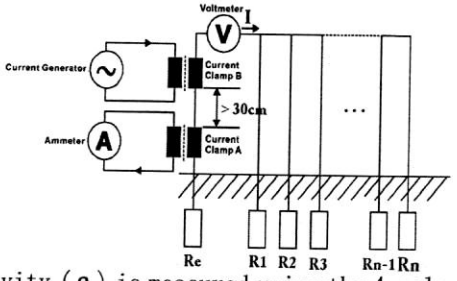


2. Selection method for measuring ground resistance value using current polar change method(applicable to one of the earth grounding resistances of the system without tripping measurement and connection), apply AC current I between the Re1 Re2 Re3 ground electrode and the H current electrode, current I3 flowing through Re3 is measured by current clamp A, at the same time, the potential difference V between the Re3 ground electrode and the S voltage electrode is measured, and calculate the grounding resistance value Re3 according to the formula Re3=V/I3. In order to ensure the accuracy of the test, the 4-wire method is used to increase the ES auxiliary ground. During the actual test, ES and E are clamped at the same point of the grounding body.

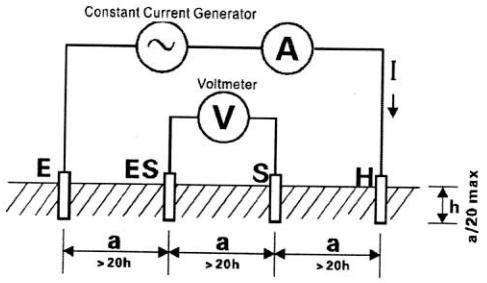


3. Double clamp method for measuring ground resistance(applicable to multiple independent points and connected systems do not support auxiliary ground measurement), generate an AC electromotive force V by

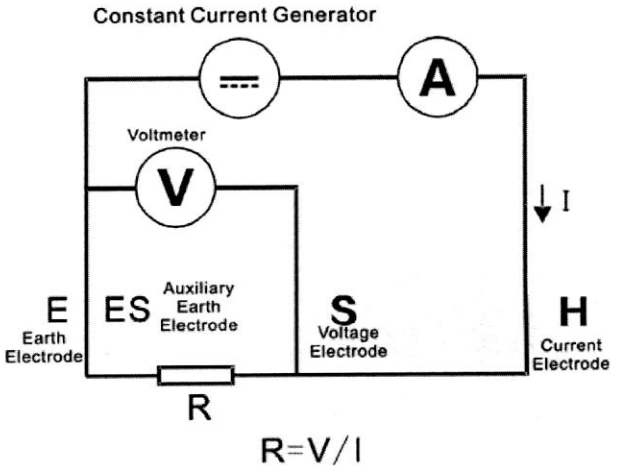
excitation clamp B, the current I is generated in the loop by the AC electromotive force V, then the feedback current I is detected by the current clamp A, and calculate the resistance value according to the formula R=V/I, in the figure, R=Re+R1//R2//R3//...Rn-1//Rn, when R1//R2//R3//...Rn-1//Rn (resistance value of multiple grounding points connected in parallel) is much smaller than Re, have R≈Re.



4. Soil resistivity (ρ) is measured using the 4-pole method (Winner method): AC current I between ground electrode E and **current electrode H**, calculate the potential difference **V** between the **voltage pole S** and the **auxiliary ground pole ES**, the potential difference **V** is divided by the alternating current **I** to obtain the middle two resistance value **R**, , the electrode spacing distance is **a(m)** , according to the formula **ρ =2 π aR(Ω m)**, the soil resistivity value is obtained, when the distance between **H-S** and **S-ES** is equal (both **a**), it is the Wenner method. For ease of calculation, please make the electrode spacing **a** much larger than the buried depth **h**, generally should meet **a**> 20**h**, see the figure below.



5. The two-three-four-wire DC resistance test adopts the rated current polar change method(suitable for measuring equipotential bonding resistance test), that is, the DC rated current I flows between the measuring objects R, find the potential difference V across R, and calculate the grounding resistance R according to the formula R=V/I. In order to ensure the accuracy of the test, the 4-wire method is used to increase the ES auxiliary ground. During the actual test, ES and E are clamped at the same point of the grounding body. 。



$$R=V/I$$

6. In the above methods, the working error (B) is the error within the rated operating conditions, which is calculated from the inherent error (A) and variation error (Ei) of the existing instrument.。

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

A: inherent error
E2: Changes due to power supply voltage changes
E3: Changes due to temperature changes
E4: Changes due to disturbance voltage variations
E5: Changes due to contact electrode resistance

7. AC current leakage measurement using average rectification。
8. Ground voltage measurement using average rectification。

VI. Operation

1. Switch on/off

Press the POWER button to switch on and off, it will automatically shut down after 15 minutes when it is not operating.

2. Battery Voltage Check

After powering on, battery voltage will real-time displayed , if the LCD shows a low battery voltage symbol "▭", it indicates that the battery is running low. Please charge it in time. The battery power is sufficient to ensure the accuracy of the measurement.

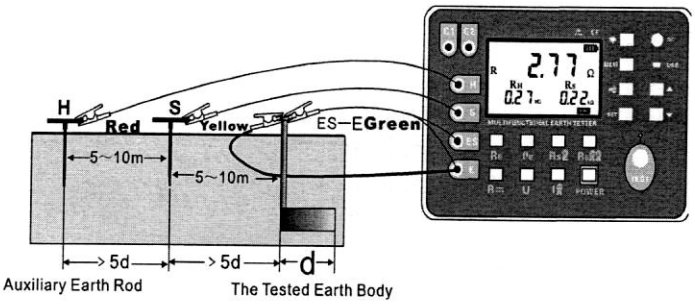
3. Four-wire precision test grounding resistance

⚠	**When testing the grounding resistance, first confirm the grounding voltage of the grounding wire, that is, the voltages of H and E or S and ES must be less than 20V. If the grounding voltage is above 5V, the meter displays the NOISE symbol, then, the measurement value of the grounding resistance may be inaccurate. At this time, the measured grounding device is first de-energized so that the grounding voltage is lowered and then the grounding resistance test is performed.**

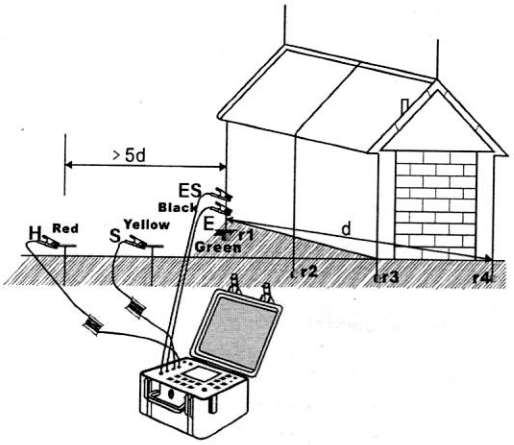
Four-wire test: The four-wire test eliminates the influence of the contact resistance between the measured grounding body, the auxiliary grounding rod, the test clip, and the input interface of the instrument (usually dirt or rust) on the measurement, and eliminates the wire resistance change. The effect of the measurement is better than the three-wire test.

See the following figure: Beginning with the measured object, respectively, the S, H auxiliary grounding rod is buried deep into the ground in a straight line, connect the grounding test lines (black, green, yellow, and red) from the E, ES, S, and H interfaces of the meter to the ground electrode E under test, the auxiliary voltage electrode S, and the auxiliary current electrode H.

⚠	**The distance between the measured grounding body E and the current pole H should be at least 5 times the buried ground depth (h) of the measured grounding body, or 5 times the buried ground electrode length (d).**
	Measure the total grounding resistance of a complex grounding system. The distance d is the distance of the largest diagonal of the grounding system.
	During the test, the test leads cannot be intertwined with each other. Otherwise, the test accuracy may be affected.



For multi-point independent grounding systems or larger ground networks, 50m or longer test leads can be optionally tested, as shown below:



R=r1 // r2 // r3 // r4 // r5 // r6 // ··· // rn(r1···rnall independent grounding points)

R——meter readings

r1···rn——are all independent grounding points

rH——ground resistance of auxiliary current pole H

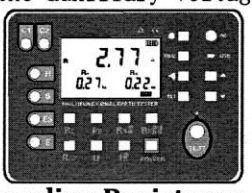
rS——ground resistance of auxiliary voltage pole S

After connecting the test line, press the function button R to enter the ground resistance test mode, and press the "TEST" key to start the test. There is a countdown indication during the test and stable data is displayed after the test is completed. That is, the grounding resistance value RH of the

grounding resistance value and the auxiliary current pole H, the grounding resistance value RS of grounding resistance value R and auxiliary voltage pole S.

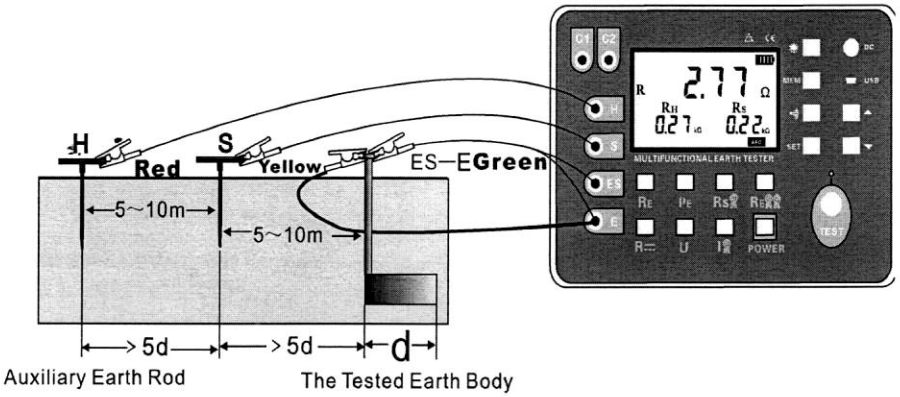
As shown in the following figure, the tested grounding resistance is 2.77 Ω, the grounding resistance of the auxiliary current RH is 0.27KΩ, and the grounding resistance of the auxiliary voltage electrode RS is 0.22KΩ.

。



4. Three-wire Test Grounding Resistance

Three-wire test: As shown below, short-circuit the ES, E interface of the instrument, which is a three-wire test, instrument operation is the same as four-wire test. The three-wire test cannot eliminate the influence of the wire resistance on the measurement, nor can it eliminate the influence of the change of the contact resistance between the instrument and the test wire and the influence of the change between the test wire and the auxiliary grounding rod. When measuring, the oxide layer on the surface of the ground body to be measured must also be removed.

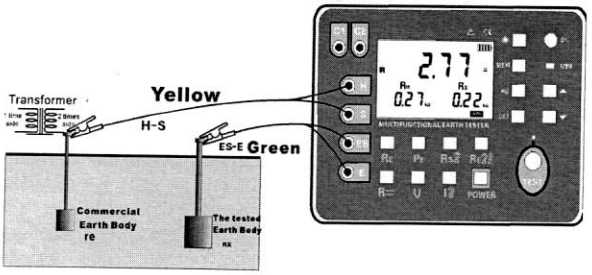


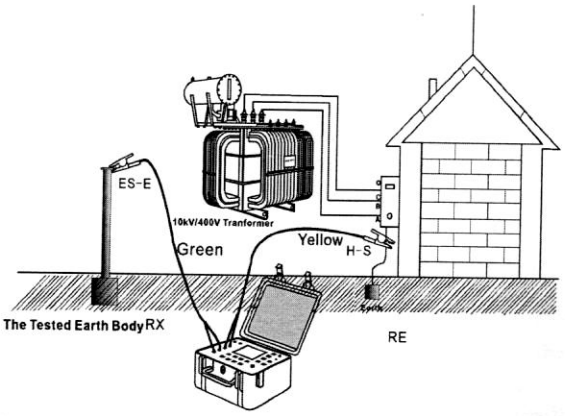
5. Two-wire Easy Test Grounding Resistance

Two-wire test:: This method is a simple measurement method that does not use the auxiliary grounding rod. It uses the grounding electrode with the smallest value of the grounding resistance as the auxiliary grounding electrode, and uses two simple test lines to connect the HS interface and the E-ES interface.). The auxiliary ground rods H and S may be replaced with metallic ground pipes such as metal water pipes and fire hydrants, common

grounding of commercial power systems, or lightning protection grounds of buildings, etc., take care to remove the oxide layer at the connection point of the selected metal auxiliary grounding body during measurement. Wiring as shown below, the instrument operation same as the four-wire test.

⚠	**When using the commercial power system grounding as an auxiliary grounding pole measurement, it must be confirmed that it is the grounding pole of a commercial power system. Otherwise, the circuit breaker may start up and be in danger.**
	Use a simple two-wire method to measure the grounding resistance, and try to select the grounding body with a small re value as the auxiliary grounding electrode so that the meter reading is closer to the true value. When measuring, Please take precedence to choose the metal water pipe and metal fire hydrant as the auxiliary grounding electrode.





The simple method measures the grounding resistance. The instrument reading value is the sum of the grounding resistance of the measured grounding

body and the grounding resistance of the commercial grounding body. That is:

RE=RX+re

And: **RE** is the meter reading value;

RX is the grounding resistance value of the grounding body under test;

re is the grounding resistance value of a common grounding body such as a commercial power system.

Then, the grounding resistance of the measured grounding body is:

RX=RE−re

6. Four-wire Selection Test Grounding Resistance

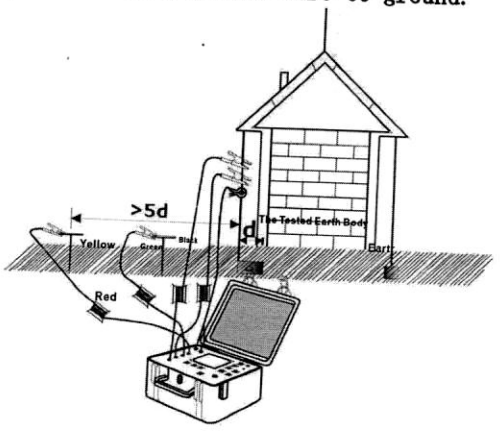
⚠	**When testing the grounding resistance, first confirm the grounding voltage of the grounding wire, that is, the voltages of H and E or S and ES must be less than 20V. If the grounding voltage is above 5V, the meter displays the NOISE symbol, then the grounding resistance is measured. There may be errors in the value. At this time, the measured grounding device is powered off first, and then the grounding voltage is lowered before the grounding resistance test is performed.**

The four-line selection method can accurately measure the grounding resistance of one of the grounding bodies without releasing the buckle. The four-wire test eliminates the influence of the contact resistance between the measured grounding body, the auxiliary grounding rod, the test clamp, and the input interface of the instrument (usually dirt or rust) on the measurement, and can eliminate the influence of the wire resistance change on the measurement. Better than three-wire test.

See the following figure: Beginning with the measured object, respectively, the S, H auxiliary grounding rod is buried deep into the ground in a straight line, connect the grounding test lines (black, green, yellow, and red) from the E, ES, S, and H interfaces of the meter to the ground electrode E under test, the auxiliary voltage electrode S, and the auxiliary current electrode H, plug the blue plug of the current clamp A into the C1 connector of the instrument, plug the black plug into instrument C2 interface, the current clamp clamps the deflector of the grounding body under test, pay attention to the direction of the current clamp, current must flow from the front of the clamp to ensure measurement accuracy.

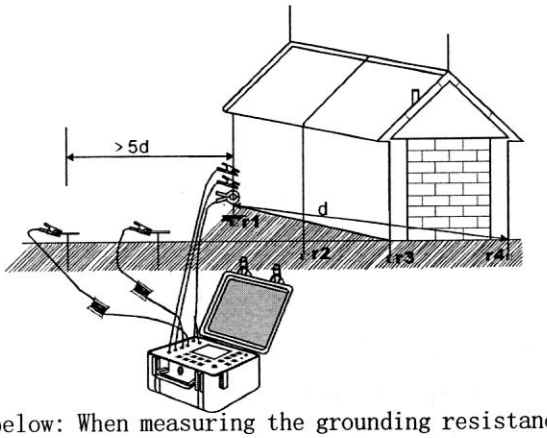
⚠	**When testing the grounding resistance, first confirm the leakage current of the grounding wire, the grounding wire current is less than 2A, and the grounding wire current is more than 100mA, then**

	the measured value of the grounding resistance may produce errors, at this time, the grounded device is first powered off, so that the leakage current of the grounding line is reduced and then the grounding resistance test is performed. At the same time, ensure that the current must flow from current clamp front to current clamp, otherwise, the ground resistance value cannot be tested normally. When the meter shows the " ⊂⊃ " symbol, it means that the current signal received by the A current clamp is too small, it should be checked whether the current clamp A is clamped well or reversed, the direction of the current clamp A is correct, the auxiliary pile has no poor contact, etc.
	The direction of the current signal received by the current clamp B is from the underground to the ground, the front of current clamp B is the current inflow direction, that is the side of the clamp with B mark clamp ground wire to ground.

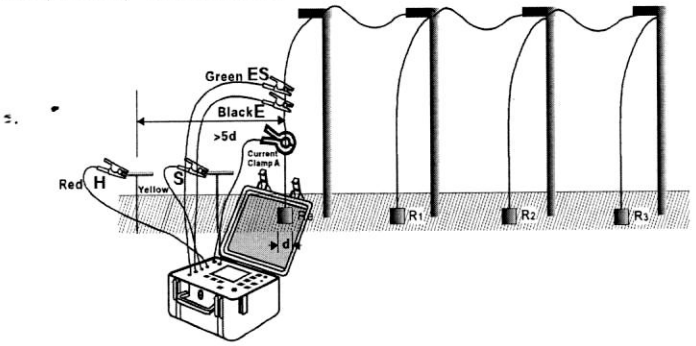


After the test line is connected, press the function key "RS" to enter the ground resistance test mode. Press the "TEST" key to start the test. During the test, there is a countdown indication. After the test is completed, the stable data is displayed, that is, the grounding resistance R of the measured grounding body on the left in the above figure.

For multi-point independent grounding systems or larger ground networks, 50m or longer test leads can be optionally tested, as shown in the following figure:The measurement result is the grounding resistance value of r1, which is not affected by the grounding resistance value of r2, r3, r4, r5....



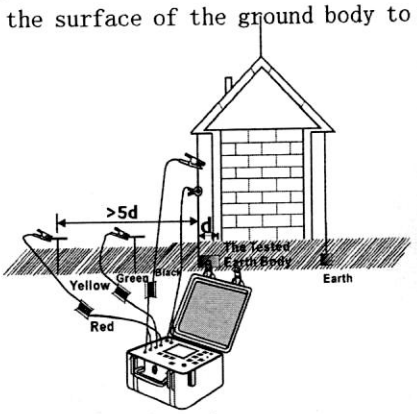
As shown below: When measuring the grounding resistance of the tower, the four-line selection method can accurately measure the grounding resistance value Re of the tower under measurement without tripping, the traditional three-wire and four-wire method is used to measure the resistance value when Re is connected in parallel with R1, R2, and R3. If Re is faulty and R1, R2, and R3 are connected in parallel, the traditional three-wire and four-wire method is difficult to find out where the Re fault is located, easily overlooked.



7. Three-wire Selection Test Grounding Resistance

Three-line selection test: as shown below, short-circuit the ES, E interface of the instrument, which is a three-line selection test, the instrument operation is the same as the four-wire selection test. The three-wire selection test cannot eliminate the influence of the wire resistance change on the measurement, nor can it eliminate the influence

of the change of the contact resistance between the instrument and the test wire and between the test wire and the auxiliary grounding rod. When measuring, the oxide layer on the surface of the ground body to be measured must also be removed.

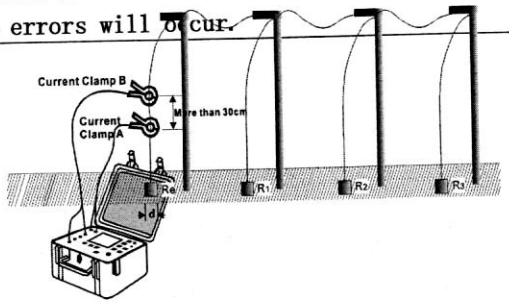


8. Double Clamp Test Ground Resistance

The double-clamp method is suitable for measuring the conditions of an independent multi-point grounding system, as shown below, In a multi-point grounding system, it is not necessary to measure the grounding resistance value by using a pile, insert the red plug of the current clamp B into the H interface of the instrument and the black plug into the E interface of the instrument. Plug the blue plug of the current clamp A into the C1 port of the meter and the black plug into the C2 port of the meter, the two current clamps are clamped into the circuit under test. Note that the directions of the two current clamps must be the same and the distance between the two current clamps must be greater than 30 cm. The two current clamps must not be interchanged. Otherwise, errors may occur.

⚠	**When testing the grounding resistance, first confirm the leakage current of the grounding wire, if the grounding wire current is more than 100mA, the measured value of the grounding resistance may cause an error. At this time, the measured grounding equipment is first powered off to make the grounding wire leak. The ground resistance is tested after the current drops. At the same time, the current must be flowed into the current clamp from the front of the current clamp when testing the double clamp method, otherwise the ground resistance value cannot be tested normally. When the meter shows the "⊂⊃" symbol, it means that the current signal received by the current clamp B is too small. It should be checked whether the current clamp is clamped**

	properly, the direction of the current clamp B is correct, the resistance of the measuring loop is too large or no circuit is formed. Ensure that the current clamp spacing is greater than 30cm, otherwise errors will occur.



After the test line is connected, turn the function selection knob to the "RE" position to enter the ground resistance test mode. Press the "TEST" key to start the test. During the test, there is a countdown indication and a test progress bar graph indicator. After the test is completed, stable data is displayed, That is, the measured grounding resistance of the grounding body R=Re+R1//R2//R3. When R1//R2//R3<<Re, it can be approximated as R≈Re.

9. Soil Resistivity Test

The soil resistivity ρ is an important factor that determines the grounding resistance of the grounding body. The soil resistivity ρ is an important factor determining the grounding resistance of the grounding body. Different types of soil, of course, have different soil resistivities, even the same kind of soil, because of different temperature and moisture content, the soil resistivity will also have a significant change. Therefore, in order to have a correct basis for the design of the grounding device, the designed grounding device can better meet the needs of the actual work, and the soil resistivity must be measured.

The soil resistivity was measured by the four-pole method (Winner method).

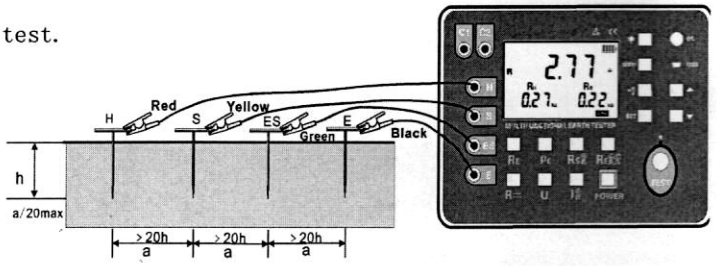
The soil resistivity ρ is calculated according to the formula $\rho = 2\pi aR$ (Ωm), and the unit is Ωm, and:

a——Electrode spacing

R——**S-ES** Resistance of soil between electrodes

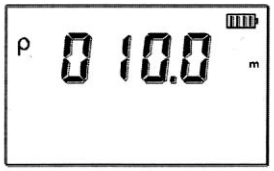
Four-pole method (Winner method): Connect the test leads as shown below. Note the spacing between the auxiliary grounding bars and the depth of burial, bury

H, S, ES, and **E** auxiliary ground rods in the ground in a straight line, connect the grounding test leads (red, yellow, green, and black) from the **H, S, ES,** and **E** connectors of the instrument to the **H, S, ES,** and **E** auxiliary grounding rods under test.



According to the Wenner method, the value of the soil resistivity measured is approximately the soil resistivity at the depth a between the two grounding rods. The soil homogeneity can be checked by changing the a value to design a suitable grounding electrode.

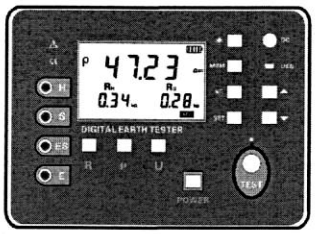
Auxiliary ground rod spacing setting:After connecting the test line, press the function button " ρ_E " to enter the soil resistivity test mode, press and hold the "SET" key (more than 3 seconds) to enter the spacing setting of the auxiliary grounding rod, short press "•))" to move the cursor, press "▲" or "▼" key to change the current value (value **a** range: 1m ~ 100m), long press "SET" key (more than 3 seconds) to save the set value **a** and return to soil resistivity test mode.



After setting value **a**, in soil resistivity test mode, press "TEST" key to start the test, and count down to display the test progress. After the test is completed, a stable soil resistivity value is displayed.

As shown in the following figure, the measured soil resistivity is **47.23 Ωm**, the grounding resistance value **RH** of the auxiliary current electrode is 0.34KΩ, and the grounding resistance value **RS** of the auxiliary voltage

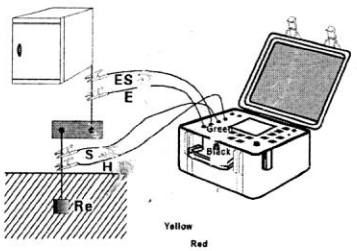
electrode is 0.28KΩ. After this display is completed, it will automatically return back to display the tested soil resistivity ρ.



10. DC Resistance Test

DC resistance test is used for equipotential bonding resistance, resistance between metal components, etc. The four-wire test can eliminate the influence of the contact resistance between the test clamp and the input interface of the instrument (usually dirt or rust) on the measurement, it can eliminate the impact of line resistance change on the measurement, better than the two-wire test.

As shown below: The connect resistance value between the measuring equipment and the grounding body. Insert one end of the test line (black, green, yellow, and red) into the E, ES, S, and H interfaces of the meter respectively. The test lines E and ES clamp the equipment grounding cable. Lead ends, S, H clamp the end of the ground lead down to ground.



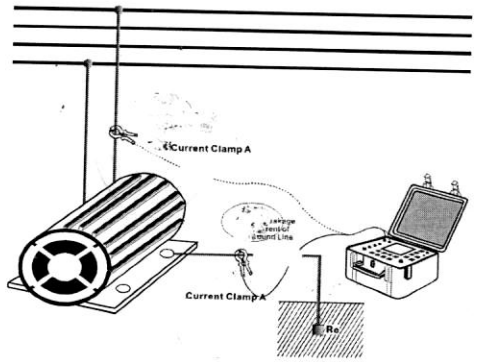
After the test line is connected, press the function key "R⎓" to enter the DC resistance test mode. Press the "TEST" key to start the test. During the test, there is a countdown indication. After the test is completed, the stable data is displayed, that is, the resistance value R of the connected potential of the device under test and the grounding body.

11. AC Current Test

As shown in the figure, the blue plug of the current clamp A is inserted into the C1 connector of the meter, the black plug is inserted into the C2

connector of the meter, and the current clamp is clamped into the measured wire.

⚠	**The line current under test should not exceed 600A. Only the current clamp can be used for testing. Do not connect the current signal directly to the instrument jack. Otherwise, the meter may be damaged.**
	When measuring the current, use current clamp A, and the switching current clamp will occur an error.
	When measuring the load current, the current clamp clamps the live wire (single), and when measuring the leakage current, clamp the live wire and neutral wire (two wires) together or clamp the ground wire.
	When measuring leakage currents, interference from surrounding electromagnetic fields should be avoided.



After connecting the current clamp, press the function key "IR" to enter the current test mode. The LCD directly displays the current effective value.

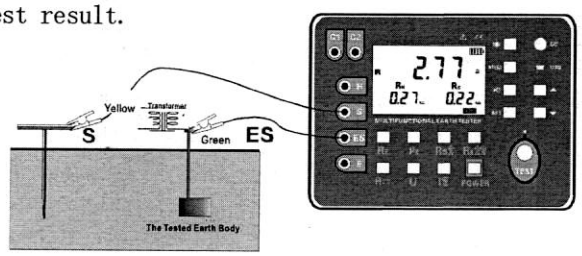
12. Ground Voltage Measurement

⚠	One auxiliary grounding rod is required for the ground voltage test.
	As long as the instrument is connected to the ground through the test wire and the auxiliary grounding rod, the other test wires of the instrument interface cannot be connected to the L and N wires of the commercial power supply. Otherwise, the leakage may occur, and the circuit breaker may start up and be dangerous.

	Ground voltage test cannot exceed 100V。
	Cannot be used for commercial voltage test, otherwise it will damage the instrument

Grounding voltage: when the ground fault of the electrical equipment occurs, the potential difference between the grounding device casing, the grounding wire, the grounding body and the zero potential point, the grounding voltage is the earth's reference point, potential difference with the earth, the earth is zero potential point.

An auxiliary grounding rod is required for the ground voltage test. Note the difference from the commercial AC voltage test. See the following figure: After the meter, auxiliary grounding rod and test line are all connected, press function button "U", start to test the ground voltage, and the LCD shows the test result.



13. Backlight Control

After power on, press "☀" key to turn the backlight on or off, and the backlight function is suitable for dim places. The default backlight turns off every time you turn it on.

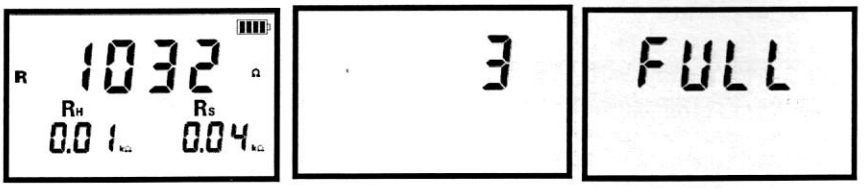
14. Alarm Setting

After power on, short press "•))) " to turn on and off the alarm function. Short press "SET" key to set the resistance alarm value, press "•))) " key to move the cursor, press "▲" or "▼" key to change the current size, and then press "SET" key to save and exit. When the measured value is greater than the alarm critical setting value and the alarm function is turned on, the meter displays the "•))) " symbol and issues a "beep-beep-beep--" alarm sound. The maximum value of the ground voltage alarm setting is 100V, the maximum value of the ground resistance alarm setting is 3000Ω, and the maximum value of the soil resistivity alarm setting is 9999Ωm. As shown below:



15. Data Lock/Storage

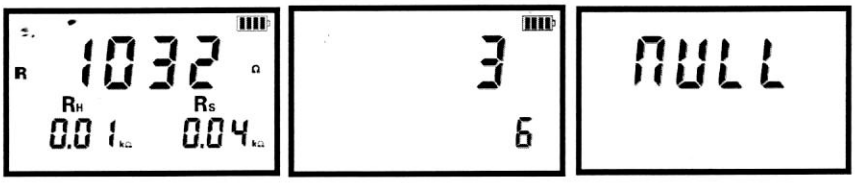
After the power-on or measurement is completed, short press "MEM" key to lock the current display data, and automatically numbered and storage. If the memory is full, the meter displays the "FULL" symbol. As shown below: The measurement data is 1032 Ω. Short press "MEM" to display the data showed that it is stored as the third group.



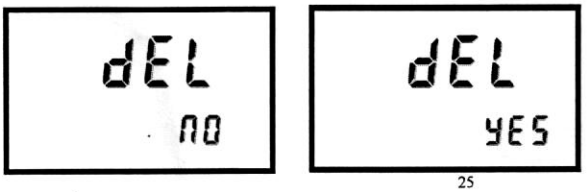
16. Data Review/Deletion

After the power on or measurement is completed, press and hold the "MEM" button (more than 3 seconds) to enter the data review mode. The interface corresponding to the stored data interface and the stored data group number flash alternately. Press "▲" or "▼" key to select the corresponding data of the array number with a step by 1, hold down the "▼" or "▲" key to select the array number with a step by 5, then press "MEM" to exit. See below

In the figure below, the number 3 is the current group number, and 6 is the total group number. If no data is stored, the LCD displays "NULL". See the figure below.



Under data review status, press "SET" key to enter data deletion, press "▲" or "▼" key to select "NO" or "YES", select "NO" and then press "SET" key to not return data review status, select "YES". Press the "SET" key again to delete the stored data. After the deletion, the following figure is displayed.



17. Data Upload

⚠	**Do not connect the computer to read data while various tests are in progress, otherwise the ground voltage may damage the computer or the instrument.**

Connect the USB communication cable of the computer and the instrument, turn on the instrument and run the monitoring software. If the USB connection is successful, the stored historical data can be read, uploaded to the computer and saved.

The monitoring software has on-line real-time monitoring and historical query functions, dynamic display, alarm value setting and alarm indication function, and functions such as reading, viewing, saving and printing of historical data.

VII. Battery Replacement

The instrument is powered by a 8.4V lithium battery. When the battery power is reduced, the power indicator bar is reduced. When the voltage drops to 5V, the battery symbol "▭" is displayed. Please charge in time. Low voltage affects the measurement accuracy.

VIII. Accessories

Instrument	1PC
Instrument bag	1PC
Auxiliary grounding rod	4PCS
Current clamp	2PCS
Monitoring software CD	1PC
USB communication line	1PC
Test line	4PCS
Simple test line	2PCS
8.4V lithium battery (built-in)	1PC
Charger	1PC
Manual, certificate	1SET