LIST OF PRODUCTS

* Digital Multimeter
* AC Clamp Adaptor
* Thermo Anemometer
* Distance Meter
* Network Cable Tester
* Earth Resistance Tester
* DC Power Supplies
* Calibrators
* Frequency Counter
* Phasing Sticks
* Waterproof Pen Testers
* EMF Detector
* Digital AC & AC/DC Clampmeter
* AC/DC Current Adaptor
* Thermo Hygrometer
* Digital Lux Meter
* Power Factor Regulator
* Digital Panel Meters
* High Voltage Detectors
* Gas Detectors
* Function Generator
* Battery Tester
* Solar Power Meter
* Discharge Rods(400 KV)
* Wood, Paper & Grain Moisture Meter
* Transistorised Electronic Analog & Digital Insulation Resistance Testers(upto 15 KV)
* Digital Sound Level Meter & Sound Level Calibrator
* Digital contact & Non-contact Type Tachometer
* Digital Non-contact (infrared) Thermometer/ Thermal Imaging Camera
* Maximum Demand Controller/Digital Power Meter
* Digital Hand Held Temperature Indicators

KUSAM-MECO®

OFFICE ADDRESS / SERVICE CENTER

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Rajiv Gandhi Marg, Sanpada, Navi Mumbai-400705.
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E-mail : sales@kusam-meco.co.in ; **Website :** www.kusamelectrical.com

KUSAM-MECO®

AN ISO 9001:2015 COMPANY

CLAMP-ON TYPE DIGITAL EARTH RESISTANCE CURRENT LEAKAGE TESTER MODEL KM 1720



OPERATION MANUAL

KUSAM-MECO

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KUSAM-MECO

WARRANTY

Each “KUSAM-MECO” product is warranted to be free from defects in material and workmanship under normal use & service. The warranty period is one year (12 months) and begins from the date of despatch of goods. In case any defect occurs in functioning of the instrument, under proper use, within the warranty period, the same will be rectified by us free of charges, provided the to and fro freight charges are borne by you. This warranty extends only to the original buyer or end-user customer of a “KUSAM-MECO” authorized dealer.

This warranty does not apply for damaged Ic’s, fuses, disposable batteries, carrying case, test leads, or to any product which in “KUSAM-MECO’s” opinion, has been misused, altered, neglected, contaminated or damaged by accident or abnormal conditions of operation or handling. “KUSAM-MECO” authorized dealer shall extend this warranty on new and unused products to end-user customers only but have no authority to extend a greater or different warranty on behalf of “KUSAM-MECO”. “KUSAM-MECO’s” warranty obligation is limited, at option, free of charge repair, or replacement of a defective product which is returned to a “KUSAM-MECO” authorized service center within the warranty period. THIS WARRANTY IS BUYER’S SOLE AND EXCLUSIVE REMEDY AND IS IN LIEU OF ALL OTHER WARRANTIES, EXPRESS OR IMPLIED, INCLUDING BUT NOT LIMITED TO ANY IMPLIED WARRANTY OF MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE. “KUSAM-MECO” SHALL NOT BE LIABLE FOR ANY SPECIAL, INDIRECT, INCIDENTAL OR CONSEQUENTIAL DAMAGES OR LOSSES, INCLUDING LOSS OF DATA, ARISING FROM ANY CAUSE WHATSOEVER.

All transaction are subject to Mumbai Jurisdiction.

KUSAM-MECO

MUMBAI

TEST CERTIFICATE

CLAMP-ON TYPE DIGITAL EARTH RESISTANCE CURRENT LEAKAGE TESTER

This Test Certificate warranties that the product has been inspected and tested in accordance with the published specifications.

The instrument has been calibrated by using equipment which has already been calibrated to standards traceable to national standards.

MODEL NO. **KM 1720**

SERIAL NO. _____

DATE: _____

ISO 9001:2015
REGISTERED

QC
KUSAM-MECO
PASS

KUSAM-MECO

Precaution For Use

Thank you for purchasing this Clamp earth resistance tester from our company. In order to better use for the product, please be certain:

----Read this user manual carefully.

----Comply with the operating cautions presented in this manual.

- At any circumstances, user should pay special attention to safety.
- Pay attention to the measuring range and operating environment specified in this tester. Do not clamp and test power line.
- Pay attention to the text labeled on the panel and backplane of the meter.
- Before boot up, withhold the trigger once or twice to ensure the jaws are closed well.
- In booting up, do not withhold the trigger, nor clamp any wires.
- In normal boot up and display "OL Ω" symbol, and then clamp and test the measured object.
- The clamp contact surfaces must be kept clean, cannot rubbed with caustics and coarse material.
- Avoid any impact onto this meter, especially the Jaw contact surface.
- In dangerous site, it is strongly recommended to use our explosion-proof type clamp grounding resistance meter.
- It is strictly forbidden to disassembled and replaced battery in hazardous locations for the explosion-proof type product.
- It is normal that the meter clamp will have some buzzing sound in measuring resistance, pay attention to the difference from alarm "beep, beep, beep -" sound.
- Measuring wire current should not exceed the meter range upper limit.
- Please take out the batteries if the meter will not use in a long time.
- Disassembly, calibration, and repair of this tester must be performed by authorized personnel.
- Due to the reason of this instrument, if it is dangerous to continue using, should stopped and sealed immediately ,and handled by an authorized institution.

Introduction

Clamp Type Earth Resistance Tester is our company's technology research and development team on technical quality of the pursuit of excellence, through continuous innovation to improve, upgrade with the old product. Its performance is mainly reflected in: Breakthrough in self-test the boot a long time to waiting, start immediately into the test. Breakthrough relay self-test mode, using the most advanced processing algorithms and digital integration technology.

Breakthrough the old product to heavy issues, more in line with characteristics of hand-held devices.

New design, panel operation with 6 buttons, better performance.

Increase sound and light alarm function, with "beep-beep-beep" alarm sound.
Increase the interference signal recognition indicator function, with "beep-beep-beep" indicator.

Measurement range : 0.01Ω-1500Ω

Clamp Grounding Resistance Tester is widely used in the grounding resistance measurement of the power, telecommunications, meteorology, oilfield, construction and the industrial and electrical equipment. In the measurement of a grounding system with loop, does not require breaking down the grounding down lead, and no need the auxiliary electrode. It is safe, fast and simple in use.

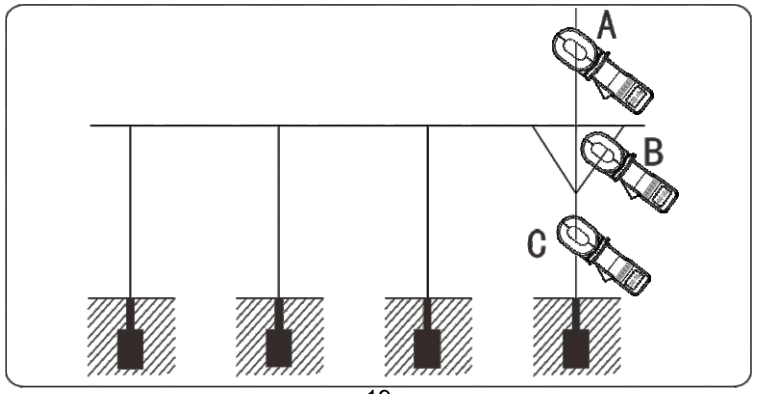
The tester can measure ground faults which cannot be measured by traditional methods. It can be used in applications where traditional methods cannot be measured, because the Clamp Grounding Resistance Meter measures the combined value of grounding body resistance and grounding lead resistance.

Clamp Grounding Resistance Meter have long jaw and round jaw style. Long jaw style is suitable for the occasion of flat steel grounding.

resistance of each branch, which is the grounding resistance of a single grounding body when the grounding wire is in good contact.
Obviously, in this case, test with the traditional voltage-current method and KM clamp meter. Their measurement results are not comparable at all, since the subjects are not the same, it is quite normal for the results to be significantly different.
9.1.2. The grounding resistance measured by the clamp meter is the composite resistance of the grounding branch. It includes the contact resistance, the lead resistance and the grounding body resistance of the branch to the common ground wire. However, the measured value is only the grounding body resistance under the condition of trip coil by traditional voltage and current method. Obviously, the measurement value of the former is larger than that of the latter. The value size of the difference reflects the value size of the contact resistance between the branch and the common ground wire.
It should be noted that the grounding resistance specified in the national standard includes grounding lead resistance. The terms in DL/ t621-1997 "grounding of AC electrical device" include the following stipulation: "the sum of the ground resistance and the ground wire resistance of the ground electrode or natural ground electrode is called the grounding resistance of the grounding device."
This kind of stipulations same clear. This is because the lead resistance and the grounding resistance of ground body are equivalent with lightning protection safety.

9.2. Measuring Point Selection

In some grounding system, like the picture show below, should chose a correct point for measurement, or will get different result.
In measuring atApoint, the measured branch not form circuit, the tester will display "**OL Ω**", should change the measuring point.
In measuring at B point, the measured branch form circuit of metallic conductor, the meter display "**L 0.01Ω**" or a very small resistance value of metallic circuit, should change the measuring point.
In measuring at C point, the measurement value is the earth resistance value under the branch.



8.2.2. **The earth resistance measurement of the machine room and the launch tower**

It normally form two point grounding system when machine room and launch tower connect to ground, shown as figure 24:

If the value of meter is lower than the allowable value of grounding resistance, then the grounding resistance of machine room and the launch tower is valid. If the value is greater than allowable value, please measure by single point grounding method.

8.3. Building Lightning Protection System

If the grounding pole of the buildings is independent with each other, the earth resistance measurement of each grounding pole shown as figure 25:

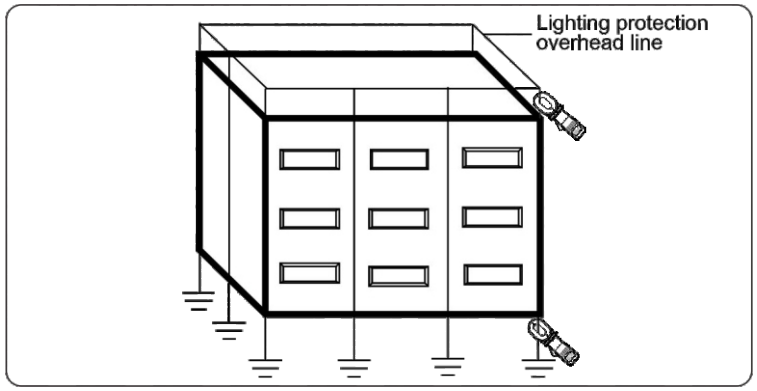


Figure 25

9. Earth Resistance Measurement Attention

9.1. Users sometimes may measurement compare KM meter with traditional voltage-current method , and with a big difference; to solve this situation, users should pay attention to the problems mention below:

9.1.1. Whether trip coil or not when tested by the traditional voltage-current method. (Whether the tested grounding body separated from the grounding system or not).if not, then the measured grounding resistance is the parallel value of all grounding resistances

It is useless to measure the parallel value of all grounding body resistances, because the purpose of measuring ground resistance is to compare it with an allowable value specified in the relevant standards to determine whether the ground resistance is qualified or not.

For example: The allowable value of grounding resistance stipulated in GB50061-97 "design code for overhead power lines 66KV and below" is for the so-called "each tower". It is clearly stated in the standard interpretation: "the grounding resistance of each tower refers to the resistance value measured by interrupt electrical continuity between the grounding body and ground wire.

This standard is very specific.

As mentioned above, the result measured by clamp meter is the grounding

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2. General Specifications:

- **Resistance Measurement Range :** 0.001Ω - 1500 Ω
- **Maximum Resistance Measurement Resolution :** 0.001Ω
- **Measurement Resistance Frequency :** > 1 KHz
- **Current Measurement Range :** 0.00mA - 35A
- **Current Frequency :** 50 / 60Hz
- **Display screen :** 4 digit LCD Backlight, 47 x 28.5 mm in length
- **Jaw Opening Size :** 32 mm
- **Max. Bus Bar Dimension :** 32 mm × 65 mm.
- **Structure :** Clamp CT
- **Single Measurement Time :** 0.5 second
- **Protection grade :** Double insulation
- **External Magnetic Field :** < 40A / m
- **External Electric Field :** < 1V/m
- **Operating Temperature :** -20°C ~ 55°C10; RH-90%RH
- **Operating Humidity:** 10% ~ 90%RH
- **Data Storage :** 500 groups
- **Setting Range of Resistance Alarm Critical Value :** 1 ~ 199Ω
- **Setting Range of Current Alarm Critical Value :** 1 ~ 499mA
- **Audible & Visual alarm :** "beep--beep--beep --" alarm sound.

  Press “AL” key to turn on and off
- **Power supply :** 4 X AAA alkaline dry battery (6VDC)
- **Weight :** Approx. 1160gm
- **Dimension :** Approx. 285(L) x 85(W) x 56(D) mm
- **Accessories :** Standard Testing Coil (5.1Ω), User manual,

  Batteries & Strong Carrying Case.

Electrical Specifications:

RESISTANCE MEASUREMENT

Measurement Range (Ω)	Resolution (Ω)	Accuracy (Ω)
0.010~ 0.099Ω	0.001 Ω	±(1% + 0.01Ω)
0.10~ 0.99 Ω	0.01 Ω	±(1% + 0.01Ω)
1.0 ~ 49.9 Ω	0.1 Ω	±(1% + 0.1Ω)
50.0 ~ 99.5 Ω	0.5 Ω	±(1.5% + 0.5Ω)
100 ~ 199 Ω	1 Ω	±(2% + 1Ω)
200 ~ 395 Ω	5 Ω	±(5% + 5Ω)
400 ~ 590 Ω	10 Ω	±(10% + 10Ω)
600 ~ 880 Ω	20 Ω	±(20% + 20Ω)
900 ~ 1500 Ω	30 Ω	±(25% + 30Ω)

CURRENT MEASUREMENT

Measurement Range	Resolution	Accuracy
0.00mA - 9.99mA	0.01mA	±(2.5% + 1mA)
10.0mA - 99.0mA	0.1mA	±(2.5% + 5mA)
100mA - 299mA	1mA	±(2.5% + 10mA)
0.30A - 2.99A	0.01A	±(2.5% + 0.1A)
3.0A - 9.9A	0.1A	±(2.5% + 0.3A)
10.0A - 19.9A	0.1A	±(2.5% + 0.5A)
20.0A - 35.0A	0.1A	±(3% + 1A)

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8. Field Application

8.1. Power System Application

8.1.1. **Transmission line tower grounding resistance measurement**

Normally, the tower of transmission line connect to the earth to form multi point grounding system, using clamp meter to clamp the grounding line. The tester can measure the grounding resistance of the branch circuit.

8.1.2. **Transformer neutral point grounding resistance measurement**

There are two situations for transformer to connect the grounding line: iterative earth to form multi point grounding resistance; single point grounding measurement for single point grounding.

When measuring, if the meter shows "**L 0.01Ω**" may because there are two or more grounding line of tower or transformer connected underground. At this time, user should release the redundant grounding line and just remain one.

8.1.3. **The application in power station, power substation**

clamp meter can use to test the situation of contact and connect of circuit. With the help of one test line, it can be used to test the connect situation of equipment in station and the grounding system. Single point grounding measurement is allowed for the measurement of grounding resistance.

8.2. Telecommunications System Application

8.2.1. The earth rsistance measurement of the machine room in the building

The machine room of telecommunication system normally in the upper deck of the building. It is hard to use the meg-ohm meter to measure. However, Clamp meters are very convenient to test. Connect the fire hydrant and the pole being measured by one testing line, then using the meter test the testing line. The value of meter=resistance of machine room + the resistance of testing line + the grounding resistance of fire hydrant.

If the grounding resistance of fire hydrant is very small, then:

The grounding resistance of machine room ≈ value of meter - resistance of testing line.

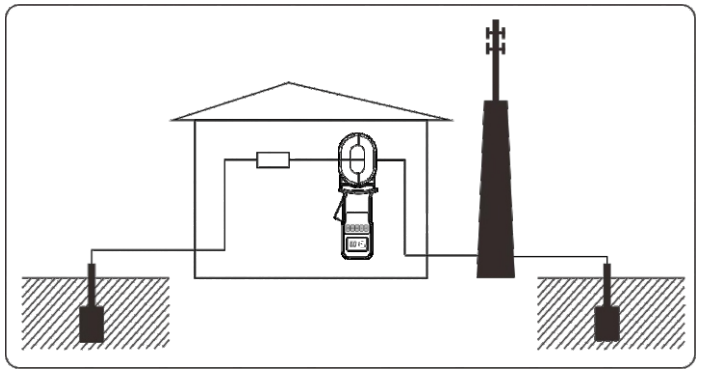


Figure 24

The 1st step, conntect with R_A and R_B with a test line, shown as figure 21, the teser can measure the 1st data R_1

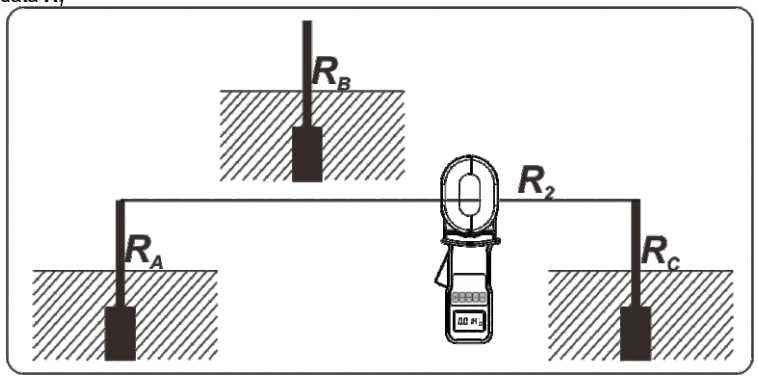


Figure 22

The 2nd step, conntect with R_A and R_c with a test line, shown as figure 22, the teser can measure the 2nd data R_2.

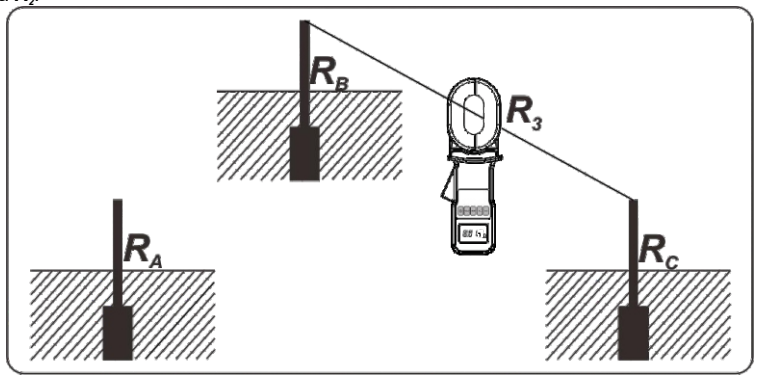


Figure 23

The 3rd step, conntect with R_B and R_c with a test line, shown as figure 23, the teser can measure the 3rd data R_3.

Above three steps, the reading measured in each step is the value of the two series grounding resistance. In this way, we can easily calculate the value of each grounding resistance:

From: $R_1=R_A+R_B$; $R_2=R_B+R_C$; $R_3=R_C+R_A$

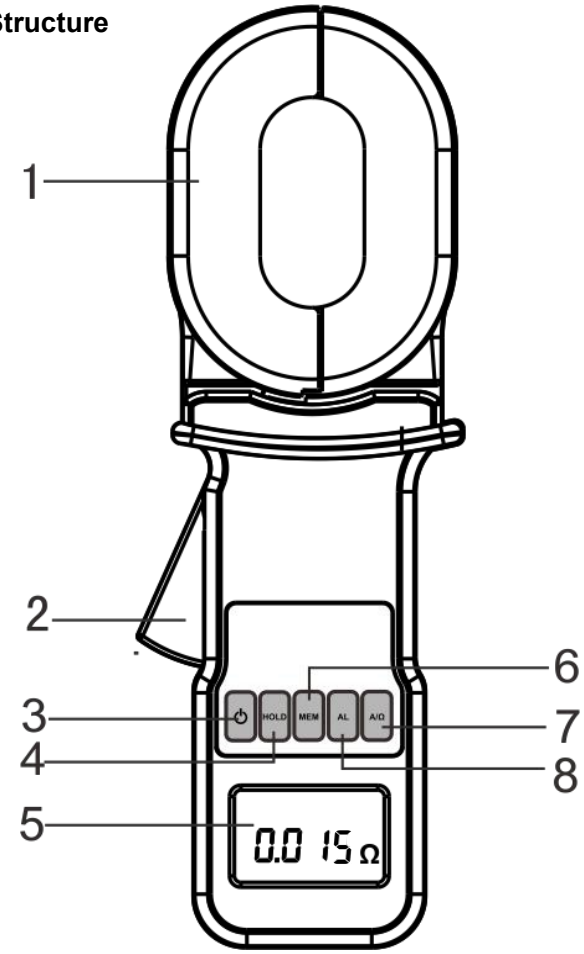
Get: $R_A=(R_1+R_3-R_2)\div 2$

This is the grounding resistance value of the grounding body R_A. To facilitate the memory of the above formula, these three grounding bodies scan be viewed as a triangle; The measured resistance is equivalent to the value of the resistance values of the adjacent edges plus or minus resistance value of the opposite sides, and divided by 2.

As the reference points, the grounding resistance values of the other two grounding bodies are:

$$R_B=R_1-R_A \qquad R_C=R_3-R_A$$

3. Tester Structure



1. Clamp Jaw: 65mmx32mm

2. Trigger: Control the clamp jaw open and close

3. ⏻ Key: Power On /Off /Quit /Clear Data

4. **HOLD** Key: Lock / Release display / Storage

5. LCD screen

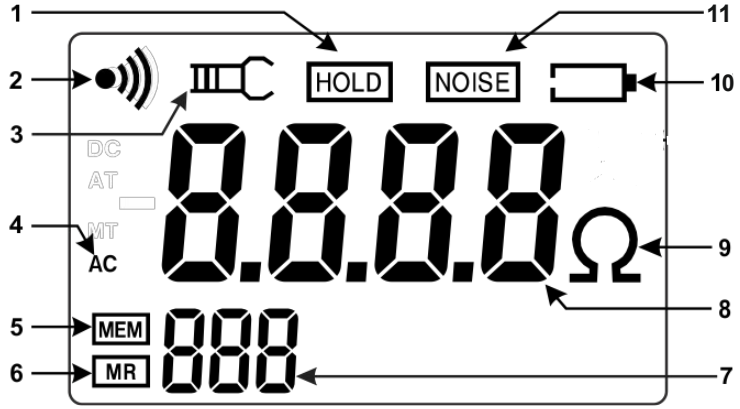
6. **MEM** Key: Data Access / Clear Data

7. **A/Ω** Key: Resistance & Current function switch / right arrow function key

8. **AL** Alarm Function Key: Alarm Open / Turn Off / Alarm Critical Value Setting

4. Liquid Crystal Display

4.1 LCD Screen



1. Data hold and lock symbol	2. Alarm symbol
3. Clamp jaw opening symbol	4. AC current symbol
5. Data memory full symbol	6. Memory data access symbol
7. Data memory record groups	8. Resistance measurement value
9. Resistance unit symbol	10. Current unit symbol
11. Low battery power symbol	12. Interference symbol

4.2. Special Symbols Description

4.2.1. Clamp Jaw opening symbol---The symbol will be displayed when the clamp jaw is opening, which may the trigger is artificially withheld, or the clmap jaw with polluted and can not close fully, and can not measurement. After clearning the clamp jaw metal interface and then starting up the tester to operate again.

4.2.2.“Er” Power on self-checking error symbol---The symbol will be displayed when power on self-checking, which may the trigger is artificially withheld, or the clmap jaw with polluted can not close fully, and can not measurement. After clearning the clamp jaw metal interface and then starting up the tester to operate again.

4.2.3.“ ” Battery power symbol---when the battery symbol with 4 grid indicate the battery power is enough; when the battery voltage is lower than 4.8V, “ ” symbol will be displayed. When the battery volate low, cannot guarantee accuracy of the measurement and may influence the tester normal measurement, should replace the battery when the battery voltage low.

4.2.4. "**OL Ω**” Symbol indicate that the measured resistance has exceeded upper limit range of the tester.

4.2.5."L0.01Ω" Symbol indicates that the measured resistance has exceeded lower limit range of the tester.

to the earth electrode of the grounding system to artificially create a loop for testing. The following presented is two kinds of methods for the single-point grounding measurement by use of the Meter. These two methods can be applied to the occasions beyond the reach of the traditional voltage-current testing methods.

7.3.1. Two-Point Method

As shown in the figure below, in the vicinity of the measured grounding body R_A, find an independent grounding body of better grounding state R_B (for example, near a water pipe or a building). R_A and R_B line will connect to each other using a single testing line.

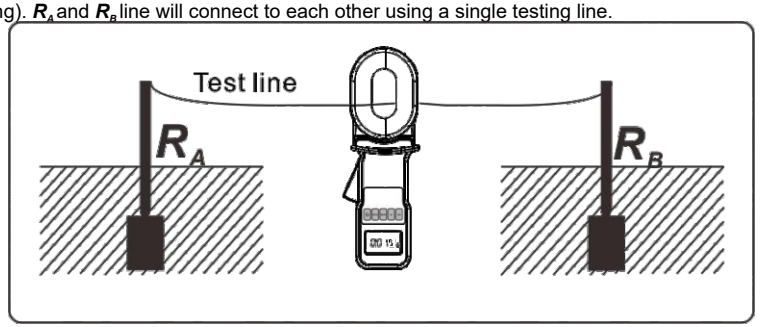


Figure 20

As the resistance value measured by the tester is the value of the series resistance from the testing line and two grounding resistances.

$R_T = R_A + R_B + R_L$ Where:

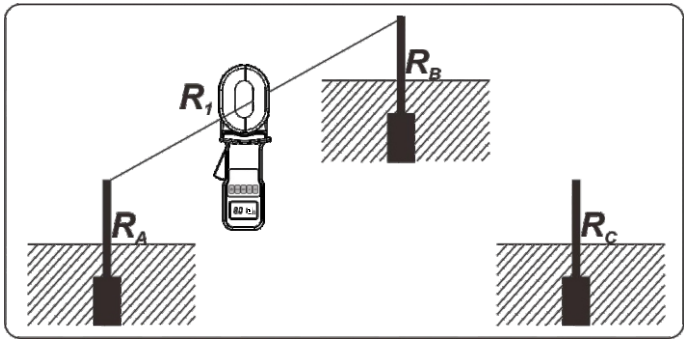
R_T is the resistance value measured with the tester.

R_L is the resistance value of the testing line.

Tester can measure out the resistance value R_L by connecting the test lines with both ends. So, if the measurement value of the Meter is smaller than the allowable value of the grounding resistance, then the two grounding bodies are qualified for grounding resistance.

7.3.2. Three-Point Method

As shown in the figure below, in the vicinity of the measured grounding body R_A, find two independent grounding body R_B and R_C.



7.2. Limited Point Grounding System

This is quite common situation. For example, in some towers, five towers are connected with each other through overhead grounding wire; besides, the grounding of some of the buildings is not an independent grounding grid. But several grounding bodies connected with each other through the wire.

Under such circumstances, the above R_0 regarded as 0, will yield more error on the results of the measurement.

Due to the same reasons mentioned above, we may ignore the impact of the mutual resistance; the equivalent resistance of the grounding resistance paralleled is calculated by the usual sense. Thus, for the grounding system of N (N is smaller, but larger than 2) grounding bodies, it can offer N equations:

$$R_1 + \frac{1}{\frac{1}{R_2}\ \frac{1}{R_3}\ \cdots\cdots\ \frac{1}{R_N}} = R_{1T}$$

$$R_2 + \frac{1}{\frac{1}{R_2}\ \frac{1}{R_3}\ \cdots\cdots\ \frac{1}{R_N}} = R_{2T}$$

$$\vdots$$

$$R_N + \frac{1}{\frac{1}{R_2}\ \frac{1}{R_3}\ \cdots\cdots\ \frac{1}{R_N}} = R_{NT}$$

Where:

R1, R2, ……R_N are grounding resistances of N grounding bodies.

R_{1T}, R_{2T}, ……R_{NT} are the resistances measured with the Meter in the different grounding branches.

It is nonlinear equations with N unknown numbers and N equations. It indeed has a definite solution, but it is very difficult to solve the issue artificially, even impossible when N is larger.

Therefore, you're expected to buy the Limited-Point Grounding System Solution software produced by this Company. Users can use the office computer or notebook computer to carry out solutions.

In principle, in addition to ignore the mutual resistance, this method does not have the measurement error caused by neglecting R0.

However, users need to pay attention to that: In response to the number of the grounding bodies mutually linked in your grounding system, it is necessary to measure the same number of the testing values for calculating of the program, not more or less. And the program would output the same number of grounding resistance values.

7.3. Single-Point Grounding System

From the measuring principle, **KM 1720** tester can only measure the loop resistance,

the single-point grounding is not measured. However, users are able to use a testing line very near

4.2.6. "OL A" Symbol indicates that the measured current has exceeded upper limit range of the tester.

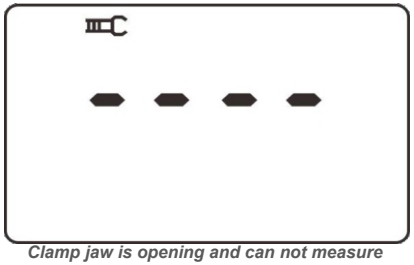
4.2.7. Alarm symbol---The symbol will flash display when the measured value is larger than the setting alarm critical value, and the tester will make intermittent alarm sound "Du--du--du" .

4.2.8. MEM Data memory full symbol---Storaged data is full of 500 groups, cannot continue to store data, and the MEM symbol will flash.

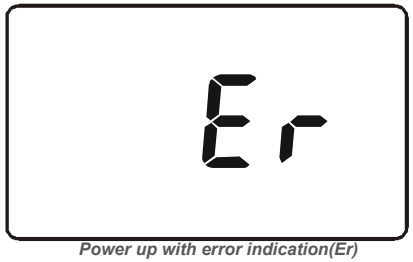
4.2.9. MR Data access symbol---When accessing the data will display, at the same time display the group number of the stored data.

4.2.10. NOISE Symbol---This symbol flashes when the tested grounding loop system with a large interference current.And the tester will make prompt sound "Du--du--du", the accuracy of the testing cannot be guaranteed at this time.

4.3. LCD Display Example



Clamp jaw is opening and can not measure



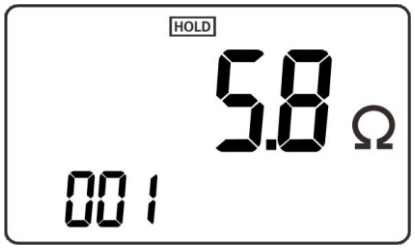
Power up with error indication(Er)



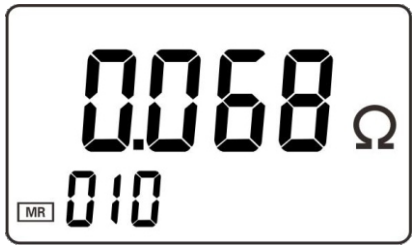
Measured loop resistance less than 0.01Ω



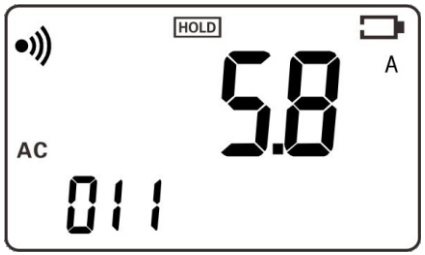
Measured loop resistance is 480Ω



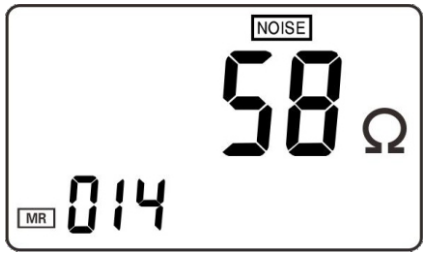
Measured loop resistance is 5.8Ω, hold present data as 001 group



Accessing stored data of the 10th groups, and measure loop resistance is 0.068Ω



Alarm function actived, the measured current exceeded the critical value of alarm setting
Low battery voltage symbol display
Measured current is 5.8A
Hold the measured current and numberning as the 11th group store data



Accessing the 14th group stored data
Measured resistance value is 58Ω
The data was measured in a large interference signal

5. Operating Method

5.1. Power Up

⚠	*When powering up, can not press the trigger and make the clamp jaw opening, and cannotclampandtestanyconductor*
	After the tester powering up and display "OLΩ", then can press the trigger and open jawstoclamp andtestthemeasuredconductor
	Beforepoweringup,pressthetrigger1~2timestoensuretheclampjaw isclosed well
	When powering up the tester, must be sure to keep the natural static state, do not overturn,nor impose any external force on the clamp jaw,otherwise, the accuracy of measurementcannotbeguaranteed

Press ⏻ button to power up the tester, auto-checking the LCD at first and display all symbols shown as figure 1. The tester also automatic calibration at the same time, after powering up will display "**OL Ω**" and automatically enter in resistance measurement mode shown as figure 2. If not automatic calibration in normal power up, the tester will display **Er** symbol and indicate error in power up shown as figure3:

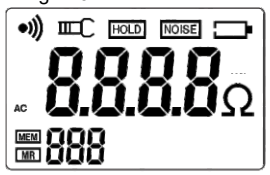


Figure 1



Figure 2

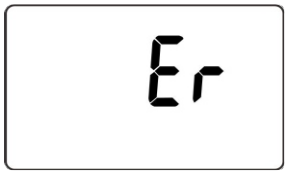


Figure 3

Power up with error need to check the problem and restart.

If haven`t display **OLΩ** after powering up and self-checking, but display a larger resistance value , shown as figure 4. But detect with test ring still can get correct result. This indicate that the



Figure 4

6.2. Current Measurement Principle

The basic principle of **KM1720** in the current measurement is same as the earth resistance measurement, shown as the figure 17. The AC current ***I*** of the measured wire, through the current magnetic loop and coil, can generate an induction current I_1. The teter will measure I_1. The measured current ***I*** can be obtained by the following formula.

$$I = n * I_1$$

Where: ***n*** is the turn ratio of the secondary side and primary side.

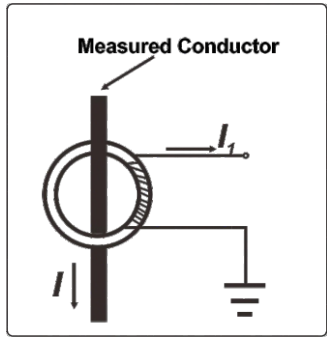


Figure 17

7. Earth Resistance Measurement Methods

7.1. Multi- point Grounding System

for the multi-point grounding system (such as electricity transmission tower grounding system, grounding cable communications systems, certain buildings, etc.), usually form a grounding system connect with the overhead grounding wire(communication cable shielding layer). Shown as follow figure, when the tester measuring, the equivalent electric circuit as follow:

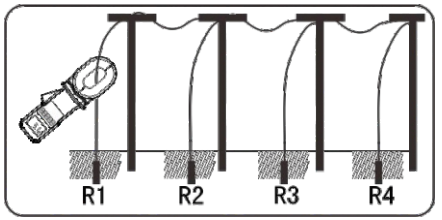


Figure 18

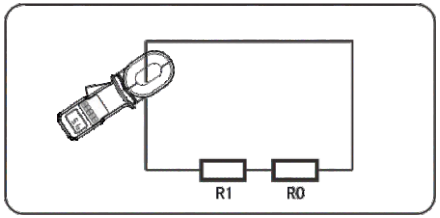


Figure 19

Where:

R_1 is the predicted earth resistance.

R_0 is the the equivalent resistance of the ground resistance which all towers in parallel.

Although strictly on the theoretical grounding, because of the existence of so-called "mutual resistance", R_1 is not usually of electrotechnics in the sense of value in parallel (it will be slightly bigger than a parallel connection of electrotechnics sense value) But because a tower grounding hemisphere was much smaller than the distance between the towers, and with a great number of locations after all, R_0 is much smaller than R_1. Therefore, it can be justified to assume $R_0=0$ from an engineering perspective. In this way, the resistance we measured should be ***R1***.

Many times of comparing tests in different environments and different occasions with the traditional method proved that the above assumption is entirely reasonable.

automatically return to the measurement mode. If the load is larger than the alarm critical value, the tester will flashes and display alarm symbol, and make intermittent sound “Du--du--du--". In setting process, press ⏻ button to exit from alarm critical value setting mode, and return to measurement mode, and will not change the previous setting value. In data access mode, press **MEM** button to exit from data access mode, then can set alarm critical value operation.

5.8. Alarm Critical Value Checking

In testing mode, press **AL** button for 3 seconds enter into the alarm critical value interface, which will flash the highest-digit, the value checking each time is that setting in last time. Press **AL** button 3 seconds or ⏻ button again to exit from the checking mode and return to the measurement mode. Shown as figure 15, the last resistance alarm critical value was 20Ω.

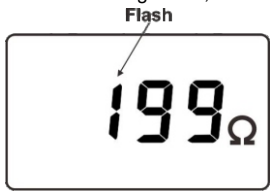


Figure 13

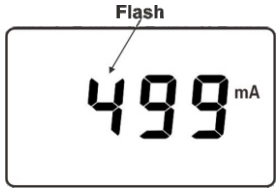


Figure 14

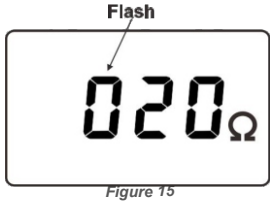


Figure 15

5.9. Clear Data

In data access mode, press **MEM**+⏻combination button automatically clear all the stored data. After clearing will display as Figure 12. The data can’t be restored after clearing.

5.10.Operation of Bluetooth software

This software is a mobile APP that only supports Android system 4.0 and above phones. Used to connect the Bluetooth APP of the multi-functional clamp-on ground resistance meter and does not support other devices with Bluetooth function.
Scan the QR code with mobile phone to get the download link of the APP software. When installing, user need to obtain the corresponding permission. Please click "Agree" or "Allow".

6. Measurement Principle

6.1. Resistance Measurement Principle

The basic principle of **KM 1720** in the measurement of resistance is to measure the loop resistance, shown as figure 16. The clamp jaw part of the tester is comprised of voltage coil and current coil. The voltage coil provides excitation signal and induce a potential ***E*** on the measured loop. Under the action of electric potential ***E*** will generate a current ***I*** in the tested circuit loop, The tester will measure ***E*** & ***I***. The measured resistance ***R*** can be obtained by the following formula :

$$R=\frac{E}{I}$$

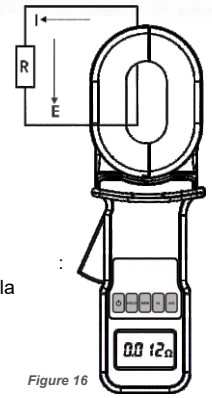


Figure 16

tester will has a larger error only in measuring the large resistance (e.g. more than 100Ω), whereas in measuring the small resistance, can still keep the original accuracy, Users can still use it with confidence.

5.2 Shutdown

The tester in powering up state, press ⏻ button again to shutdown.
After the tester powering up with 5 minutes and without any operation, the LCD screen will enter in flashing state, and will automatic shutdown after the flashing state is continue for 30 seconds to reduce battery consumption. Press ⏻ button in flashing state could delay the shutdown and keep to working.
In HOLD mode, press **HOLD** button to exit from the HOLD mode, press ⏻ button again to shutdown.
In setting alarm critical value mode, press ⏻ or **AL** button for 3 seconds first to exit from the mode, then press ⏻ button again to shutdown.

5.3. Resistance Measurement

After powering up and self-checking, display "**OL Ω**" and then can make the resistance measurement. Press the trigger and open the clamp jaws to clamp the measured loop, reading the resistance value.
If user necessary, Self-calibration can be proformed with the certified resistor attach with the standard accessories shown as figure 5. the reading value should be consistent with the nominal value on the test ring (1.0 Ω).
The nominal value of the test ring is the value testing at temperature of 20°C. It is normal for the displayed value to differ by one digital from the nominal value.
E.g.: If the nominal value of test ring is 1.0 Ω, it`s normal that display as 0.9 Ω or 1.1 Ω. Display "**OL Ω**", indicate that the measured resistance value exceed the upper limit range of the tester. Display "**L0.01Ω**", indicate that the measured resistance value exceed the lower limit range of tester shown as figure 6.

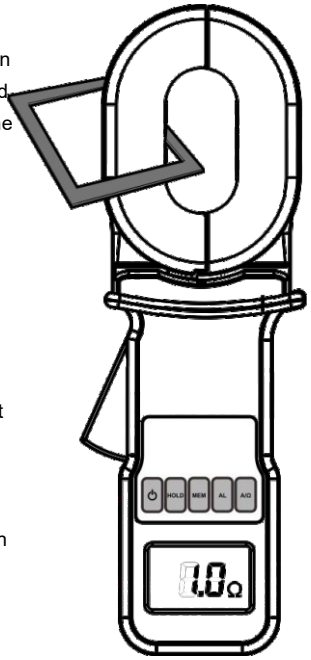


Figure 5

Figure 6

Flashing display symbol, and with intermittent "Du--du--du--" sound, indicate that the measured resistance exceed the resistance alarm critical value.

In HOLD mode, press **HOLD** button to exit the HOLD mode then can continue measuring.

In MR mode, press **MEM** button to exit the MR mode, then can continue measuring.

In setting alarm critical value mode, press the button or **AL** button for 3 seconds to exit from alarm critical value mode, then can continue measuring.

*5.4. Current Measurement

After powering up and self-checking, the tester will automatically enter into the resistance measurement mode and display "**OL Ω**", press **A/Ω** button, and the tester will enter into the current measurement mode and display "**AC 0.00mA**", shown as figure 7. At this time, press the trigger and open the clamp jaws to clamp on the measured conductor, reading the current value.

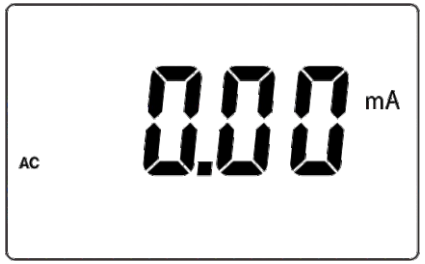


Figure 7

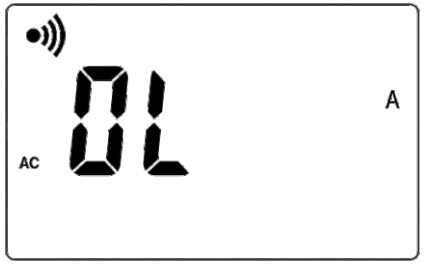


Figure 8

If the tester display "**OL A**", indicate that the measured current exceed the upper limit range of tester, shown as Figure 8.

Flashing display symbol , and issue intermittent sound of "Du --du--du--" , indicate that the measured current exceed the seeting alarm critical value of the current.

In HOLD mode, press **HOLD** button to exit from the HOLD mode, then can continue measuring.

In MR morde, press **MEM** button to exit from the MR mode, then can continue measuring.

In setting alarm critical value mode, press the button or the **AL** button for 3 seconds and exit from alarm critical value mode, then can continue measuring.

In the resistance test mode, press **A/Ω** button switch to current test mode.

5.5. Data Lock/Release/Storage

In testing mode, press **HOLD** button to hold the present display value and display HOLD symbol. This hold value will automatically numbering and store as one group of data, press **HOLD** button to cancel holding function, and HOLD symbol disappear and then continue measuring. Repeat the above operations, which can store full memory as 500 groups. If the memory is full, the MEM symbol will flash display.

Shown as figure 9, hold the measured resistance 5.8Ω, and store as the 1st group data.

Shown as figure 10, hold the measured current 1.8A, and store as the 500th groups data. If the

memory are full, the MEM symbol will flash.

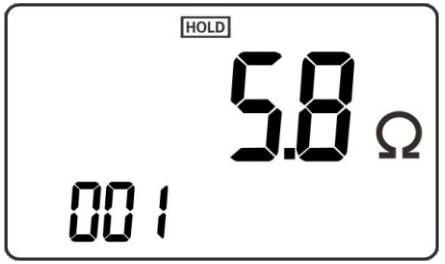


Figure 9

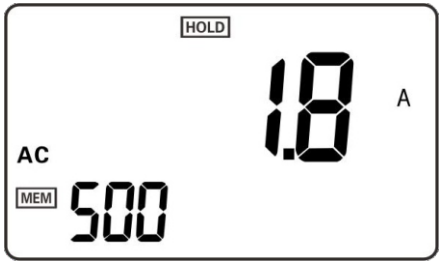


Figure 10

In the data accessing mode, press **MEM** button to exit from data accessing mode, and then can operate to hold and store the data.

In setting Alarm Critical Value mode, press the button or the **AL** button for 3 seconds and exit from alarm critical value mode, and then can operate to hold and store the data.

Shutdown and power up again will not lose the stored data.

5.6. Data Access

Press **MEM** button to enter into data store and access mode and the tester will display the 1st group store data default, shown as figure 11. Then press the **Ω** (**A/Ω**) button to scroll up the all store data. If not store data, will display shown as Figure 12.

In setting alarm critical value mode, press button or the **AL** button for 3 seconds to exit from alarm critical value mode, then press **MEM** button to enter into data store mode.



Figure 11

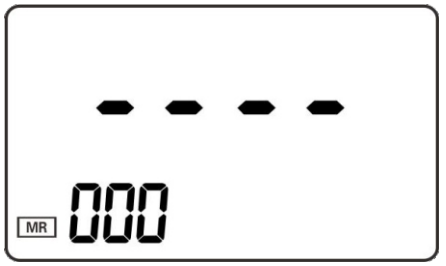


Figure 12

5.7. Alarm Setting

In the testing mode, press **AL** button to turn on/off the alarm function.

In testing mode, long press **AL** button for 3 seconds and enter into the setting alarm critical value interface. At this time, the highest-digit flash, seting the highest-digit first shown as figure 13 and figure 14. Press **AL** button to switch from the highest to lowest digits. Press **Ω** (**A/Ω**) button to change as "0, 1…9 " at present flash digit; After setting all the digits, press **AL** button for 3 seconds to confirm the alarm critical value setting. Successful setting will active the alarm function, and then