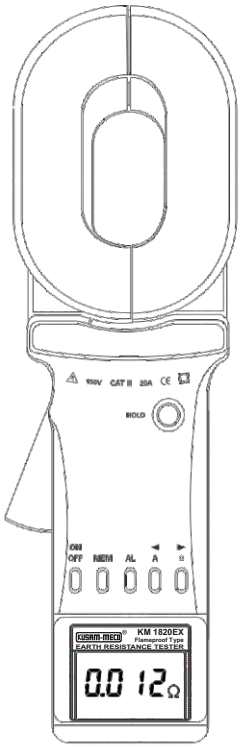
KUSAM-MECO®

An ISO 9001:2015 Company

# Flameproof Type Earth Resistance Tester

## KM 1820EX




# MANUAL

# CONTENT

## Precaution For Use

Thank you for purchasing Explosion Proof Type Clamp earth resistance tester.

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.**

Under any circumstances, user should pay special attention to safety.

Pay attention to measuring range and usage environment stipulated for the 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 jaw planes contact side must keep clean, and should not be polished with corrosive and rough materials.

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 earth resistance tester.

This tester use LR6 AA 1.5v battery, 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.

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.

## 1. Introduction

**KUSAM-MECO** Explosion Proof Type Clamp 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-1200Ω

Stored data 99 Units. Lower power consumption, Maximum operating current less than 50mA.

**KUSAM-MECO** Explosion Proof Type Clamp Earth 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 **KUSAM-MECO** Explosion Proof Type Clamp Earth Resistance Tester measures the combined value of grounding body resistance and grounding lead resistance.

**KUSAM-MECO+ type** clamp meter has passed the certification of explosion-proof and met GB3836-2000 explosive gas environment with electrical equipment. The explosion-proof marks is Exia Ⅱ BT3Ga. Explosion-proof qualified number: **CE18.2380**.It can be applied to the corresponding inflammable and explosive environment.

# 2. Specification

## 2.1. Range and Accuracy

| Measure Range | Resolution | Accuracy Class |
|---|---|---|
| 0.010Ω-0.099Ω | 0.001Ω | ±（1%＋0.01Ω） |
| 0.10Ω-0.99Ω | 0.01Ω | ±（1%＋0.01Ω） |
| 1.0Ω-49.9Ω | 0.1Ω | ±（1%＋0.1Ω） |
| 50.0Ω-99.5Ω | 0.5Ω | ±（1.5%＋0.5Ω） |
| 100Ω-199Ω | 1Ω | ±（2%＋1Ω） |
| 200Ω-395Ω | 5Ω | ±（5%＋5Ω） |
| 400-590Ω | 10Ω | ±（10%＋10Ω） |
| 600Ω-1200Ω | 30Ω | ±（25%＋30Ω） |

## 2.2. Specifications

| | |
|---|---|
| Resistance Range | 0.01Ω-1200Ω |
| Resistance Resolution | 0.001Ω |
| Data Storage | 99 unit |
| Audio - light alarm | "beep--beep--beep --" alarm sound.<br>Press “AL” key to turn on and off |

| | |
|---|---|
| Alarm Critical Value Setting Range | Resistance:1-199Ω ； |
| Power | 6VDC (4 PCS alkaline dry battery) |
| Working Temp | -20℃-55℃； 10%RH-90%RH |
| LCD Screen | 4-bit LCD digital display,<br>47mm(L) × 28.5mm(W) |
| Jaw size(mm) | Long-jaw 65mmX32mm |
| Open size of Jaw(mm) | Long clamp 32mm; |
| Weight | Long jaw 1160 g; |
| Meter Size | Long jaw:285mm(L)x85mm(W)x56 mm(H) |
| Protection Level | Double insulation |
| Structure | Clamp CT |
| Shift | Automatic shift |
| Explosion Mark | Exia Ⅱ BT3 Ga |
| External Magnetic Electric field | ＜40A/m；＜1V/m |
| Single Measurement Time | 0.5 s |
| Resistance Measurement Frequency | ＞1KHz |

## 3. Meter Structure

**3.1.** Long Clamp Jaw: 65mmx32mm

**3.2.** Trigger: control the draw open and close

**3.3. ON/OFF** Key: Boot Up / Shutdown /Quit /Clear Data

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

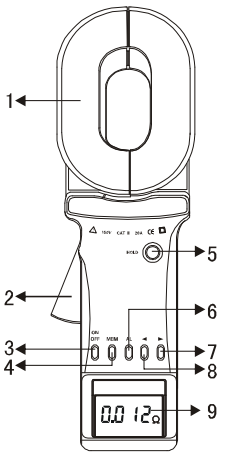
**3.5.** HOLD Key: Lock / Release display / Storage

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

**3.7.** Resistance Measure Switch Key Ω /Right Arrow Key

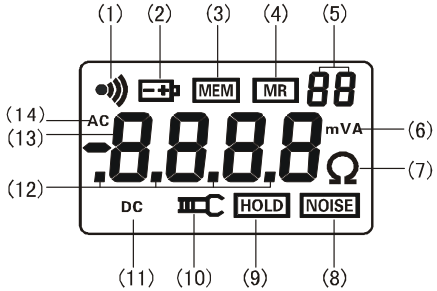
**3.8.***Current Measure Switch Key A /Left Arrow Key

**3.9.** Liquid Crystal Display (LCD)



# 4. Liquid Crystal Display

## 4.1. LCD Screen




**4.1.1.** Alarm symbol

**4.1.2.** Low battery voltage symbol

**4.1.3.** Full data storage symbol

**4.1.4.** Data access symbol

**4.1.5.** 2-Digital No. of data storage unit

**4.1.6.** Current 、voltage unit symbol

**4.1.7.** Resistance unit symbol

**4.1.8.** Noise signal symbol

**4.1.9.** Data lock symbol

**4.1.10.** Open jaw symbol

**4.1.11.** Direct current symbol

**4.1.12.** Metrication decimal point

**4.1.13.** 4-digital LCD figures display

**4.1.14.** AC Symbol

## 4.2. Description of Special Symbols

**4.2.1.** Jaw opening symbol: This symbol is displayed when the jaw is opening. At this point, trigger may be artificially withheld, or the jaw has been seriously polluted. It cannot continue to measure.

**4.2.2.** "**Er**" Boot error symbol: May be withheld the trigger when boot up or the jaw have open.

**4.2.3.** Low battery voltage symbol: when the battery voltage is lower than 5.3V, the symbol will show. At this time, it cannot guarantee accuracy of the measurement. It should be replaced the battery.

**4.2.4.** "**OL Ω**" Symbol indicates that the measured resistance has exceeded upper limit range of the meter.

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

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

**4.2.7.** Alarm symbol: When the measured value is bigger than the setting alarm critical value, the symbol will flash. The meter issue by intermittent "beep--beep –beep--" sound.

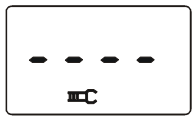
**4.2.8.** MEM Full data storage symbol: storage data is full of 99 units, it cannot continue to store data. MEM symbol will flash.

**4.2.9.** MR Data access symbol: display in accessing data, at the same time display the serial number of the stored data.

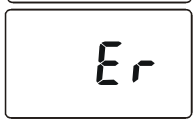
**4.2.10.** NOISE symbol: This symbol flashes when the grounded circuit with a large interference current in testing. The meter emits "beep--beep--beep--" prompt sound. The accuracy of the test cannot be guaranteed at this time.

## 4.3. Examples Illustrated

**4.3.1.** -- Jaw is in open state, and cannot measure

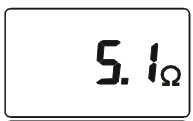


**4.3.2.** -- Boot up error indication Er (Error)




**4.3.3.** -- The measured loop resistance less than 0.01Ω

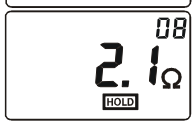

**4.3.4.** -- The measured loop resistance is 5.1Ω




**4.3.5.** -- The measured loop resistance is 2.1Ω

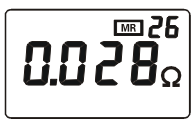
--Lock the present measurement value: 2.1Ω

--Auto storage as the 08 groups data




**4.3.6.** -- Reading the 26th groups of storage data

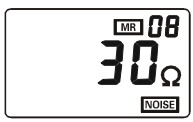
-- The measured loop resistance is 0.028Ω




**4.3.7.** -- Reading the 08 groups of storage data

--The measured resistance is 30Ω

--This data was measured with a larger signals interference



# 5. Operating Method

## 5.1.Start Up

| | |
|---|---|
|  | In booting, user cannot withhold the trigger ,cannot open jaw, and cannot clamp any wires |
| | After boot up and display “OL Ω”, then withhold the trigger, open jaws and clamp the measured wire |
| | Before booting up, the trigger should withhold one or two times to ensure the jaws are well closed. |
| | In booting, must be sure to keep the natural static state of the Meter; do not overturn the Meter, nor impose any external force on the clamp. Otherwise, the accuracy of measurement cannot be guaranteed. |

Press **ON/OFF** key, automatically test LCD at first and display all symbols as figure 1. The meter automatic calibration at the same time, after boot-up will display "**OLΩ**" and automatically enter the resistance measurement model as figure 2. If not automatic calibration in normal boot up, the meter will display Er symbol and means error in boot up as figure3:


Figure1

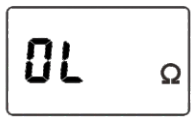



Figure2

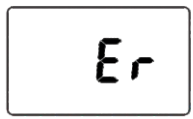



Figure3


Figure4

Start up with error need to inspect the problem and then reboot it up.

If there was not an OLΩ appearing after auto-inspection, but a larger resistance value displayed, as shown in figure 4; But the test loop detection can still get correct result. This shows that the meter has a larger error only in measuring the large resistance (e.g. more than 100Ω), whereas in measuring the small resistance, and can still keep the original accuracy, users can be rest assured in use.

## 5.2. Shutdown

After the meter is switched on, press **ON/OFF** Key to shut down.

After the meter started up 5 minutes, the LCD screen entered flashing state, and would automatically shut down after the flashing state is sustained for 30 seconds to reduce battery consumption. Press **ON/OFF** key in flashing state may delay the shutdown and keep it working.

In HOLD state, it is required to first press **HOLD** key or Power key to quit from the HOLD state, then press **ON/OFF** key to shut it down.

In state of setting alarm critical value, should first to press **ON/OFF** key or **AL** key for 3 sec to quit from the state, then press **ON/OFF** key to shut it down.

## 5.3. Resistance Measurement

After the booting and auto-inspection, display "OL Ω" and will be able to proceed with

resistance measurement. At this point, press the trigger and open the jaws, clamp the measured loop, reading and getting the resistance value.

If user thinks it necessary, the test can be done with the test ring as shown in the following figure. It shows value should be consistent with the normal value on the test ring (5.1 Ω).

(User uncertainty the meter could normal work or not, could refer and judge with this method).

The normal value on the test rings is the value at a temperature of 20 ° C.

It is normal to find the difference of 1 unit between the show value and the nominal value. E.g.: If the nominal value of test ring is 5.1 Ω, it would be normal with showing 5.0 Ω or 5.2 Ω.

Display "OL Ω", indicate that the measured resistance value exceeded the upper limit range of Meter, refer figure 3.

Display "L0.01Ω", indicate that the measured resistance value exceeded the lower limit range of Meter, refer figure 6.

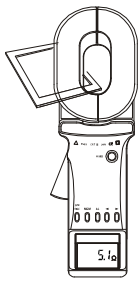


Figure5


Figure 6

Flashing display symbols •)))  , go with intermittent "beep--beep--beep--" sound, indicate that the measured resistance exceeds alarm critical value of the resistance.

In **HOLD** state, it is required to press **HOLD** key to quit the **HOLD** state before continue to measuring.

In **MR** state, it is required press **MEM** key to exit the **MR** state, then continue to measure.

In setting Alarm Critical Value state, user need to press the **ON/OFF** key or press the **AL** key for 3 seconds and exit from Alarm Critical Value state, then continue to measure.

## 5.4. Data Lock/Release/Storage

In test model, press **HOLD** key to lock the present display value and display **HOLD** symbol. This lock value is automatically numbered and stored as a set of data .Then press **HOLD** key to release locking, **HOLD** symbol would disappear and return to measurement state. By repeat the above operations, it can store 99 sets of data. If the memory is full, the **MEM** symbol will flash display.

As indicate in figure 9, lock the measured resistance 0.016Ω, and save it as data unit No.1.

As indicated in figure 10, lock the measured current 278mA, and save it as data unit No.99. If the storage is full, the **MEM** symbol flashes.


Figure 9

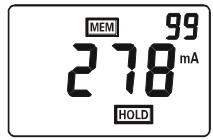



Figure 10

In the data reading mode, should press **MEM** key to quit from data reading, and then lock and save data.

In setting Alarm Critical Value state, press the **ON/OFF** key or press the **AL** key for 3 seconds, to quit from alarm critical value state, then it can lock and storage the data.

Switching on after shutdown will not lose the saved data.

## 5.5. Data Access

Press **MEM** key to enter into reading data storage mode and the default display 01 set of data, as shown in figure 11. Then press the right arrow keys to read the data stored and press the left arrow key, scrolling down to the data stored. If not store data, display shown in Figure 12.

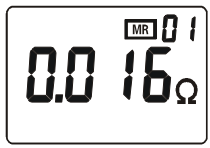



Figure 11

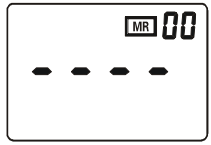



Figure 12

In setting alarm critical value state, press the **ON/OFF** key or press the **AL** key for 3 seconds, quit from alarm critical value state, then pressing **MEM** key to enter data storage model.

## 5.6. Alarm Setting

In the test model, press **AL** key to turn on or shutdown alarm function.

In test model, press **AL** key for 3 sec and enter into the setting function of alarm critical value. At this point, the highest-digit begins to flash. First set the highest digit as indicate in figure 13 and figure 14. Press **AL** key to switch from high to low digits. As the current figure flashes, press left or right arrow key to change the figures of "0, 1…9 "; After setting all the digits, press **AL** key for 3 seconds to confirm the alarm critical value currently setting. Successful setting would open alarm function, and then automatically return to the measurement mode. If the load is greater than the alarm critical value, the instrument will flashes and display alarm symbol, and emit intermittent “beep--beep--beep--"sound

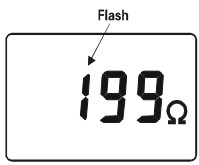



Figure 13

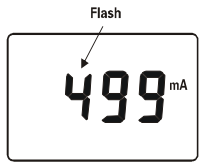



Figure 14

In setting process, press **ON/OFF** key to quit from alarm critical value setting function, returning to measurement state, and will not change the previous setting value.

In data reading model, press **MEM** key to quit from data reading state, then can set alarm critical value operation.

### 5.7. Alarm Critical Value Check

In test mode, press down **AL** key 3 seconds and enter into the alarm critical value checking, which will flash highest digit number, the value check each time is that setting in the last time. Press **AL** key 3 seconds or **ON/OFF** key to quit from the check state and return to the measurement state.

As figure 15, the alarm critical value of resistance set in the last time was 20Ω.

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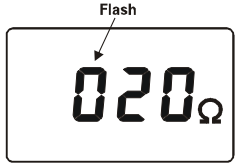
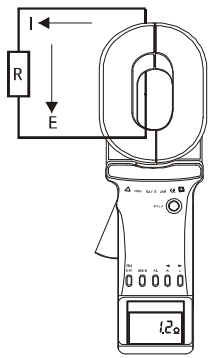



Figure 15

### 5.8. Clear Data

In data reading model, press **MEM**+**ON/OFF** combination key automatically clear all the stored data. After clearing, it shows as Figure 12. The data can't be restored after clear.

## 6. Measurement Principle




The basic principle of **KUSAM-MECO** in the measurement of resistance is to measure the loop resistance, as shown in the figure below. The jaw part of the Meter is comprised of voltage coil and current coil. The voltage coil provides excitation signal .It will induce a potential E on the measured loop.

Under the action of electric potential E will have a current in the circuit to be tested, The Meter will measure **E & I**.

The measured resistance R can be obtained by the following formula.

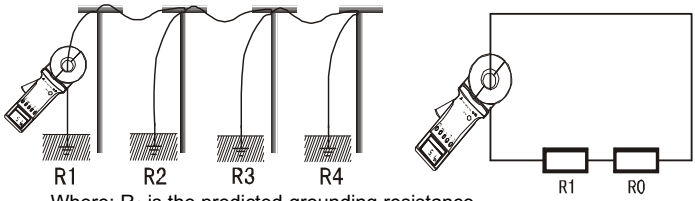
$$R = \frac{E}{I}$$

# 7. Earth Resistance Measurement Methods

## 7.1. Multi- point Grounding System

As for the multi-purpose grounding system (such as electricity transmission tower grounding system, grounding cable communications systems, certain buildings, etc.), they usually pass the overhead ground wire (cable shielding layer) connected to form a grounding system.

As the Meter is in the above measurement, its equivalent electric circuit is shown in the figure below:




Where: $R_1$ is the predicted grounding resistance.

$R_0$ for all other equivalent resistance after the tower grounding resistance in parallel.

Although strictly on the theoretical grounding, because of the existence of so-called "mutual resistance",**$R_0$** 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**.

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

## 7.2. Limited Point Grounding System

This is also quite common. For example, in some towers, five towers are linked with each other through overhead ground 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:

$$R_1 \quad \frac{1}{\frac{1}{R_2} \quad \frac{1}{R_3} \quad \cdots 13 \frac{1}{R_N}} \quad R_{1T}$$

$$R_2 \quad \frac{1}{\frac{1}{R_1} \cdot \frac{1}{R_3} \quad \cdots\cdots \quad \frac{1}{R_N}} \quad R_{2T}$$

.

$$R_N \quad \frac{1}{\frac{1}{R_1} \quad \frac{1}{R_2} \quad \cdots\cdots \quad \frac{1}{R_{(N-1)}}} \quad R_{NT}$$

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.

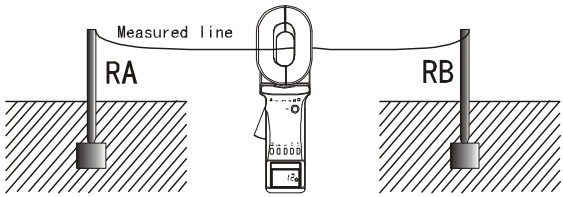
However, users need to pay attention to that: In response to the number of the grounding bodies mutually linked in your grounding system, it is necessary to measure the same number of the testing values for calculating of the program, not more or less. And the program would output the same number of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

## 7.3. Single-Point Grounding System

From the measuring principle, **KUSAM-MECO** Meter can only measure the loop resistance, the single-point grounding is not measured. However, users are able to use a testing line very near 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.




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

$R_T=R_A + R_B + R_L$

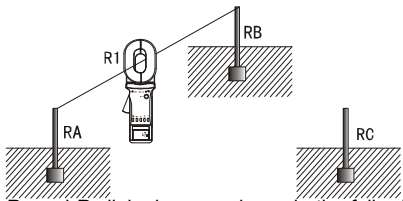
Where: $R_T$ is the resistance value measured with the Meter.

$R_L$ is the resistance value of the testing line. Meter can measure out the resistance value 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.

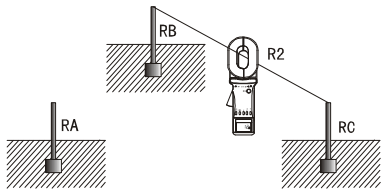
### 7.3.2. Three-Point Method

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

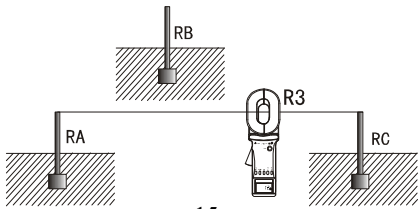
First, link $R_A$ and $R_B$ with a test line; use the Meter to get the first reading $R_1$.




Second, have $R_B$ and $R_C$ linked up, as shown in the following figure. Use the Meter to get the second reading $R_2$.




Third, have $R_C$ and $R_A$ linked up, as shown in the following. Use the Meter to get the third reading $R_3$.



In the 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: R1=RA+RB R2=RB+RC R3=RC+RA**

**We get: RA=（R1+R3-R2）÷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:

**RB=R1-RA RC=R3-RA**

# 8. Field Application

## 8.1. Application in power system

### 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 **KUSAM-MECO** clamp meter to clamp the grounding line. Meter 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

**KUSAM-MECO** 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. Application in telecommunications system

### 8.2.1. The measurement of the grounding resistance of 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,KUSAM-MECOClamp 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.

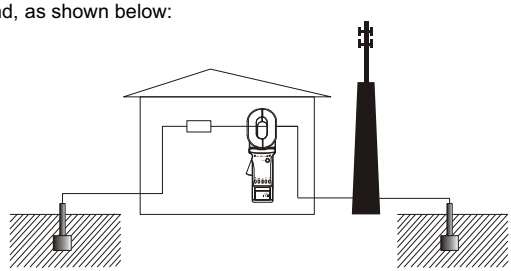
The value of meter=resistance of machine room + the resistance of testing line + the grounding resistance of fire hydrant.

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

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

### 8.2.2. The measurement of grounding resistance of machine room and the launch tower

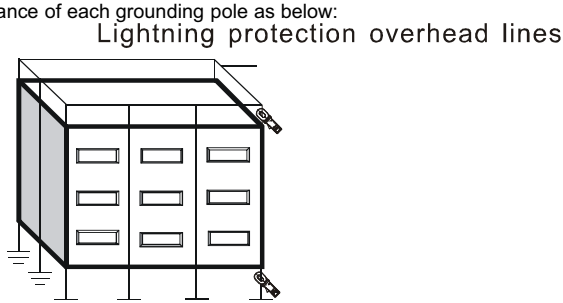
It normally form two point grounding system when machine room and launch tower connect to ground, as shown below:



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. Application in lightning protection system of building

If the grounding pole of the buildings is independent with each other, the measurement of grounding resistance of each grounding pole as below:



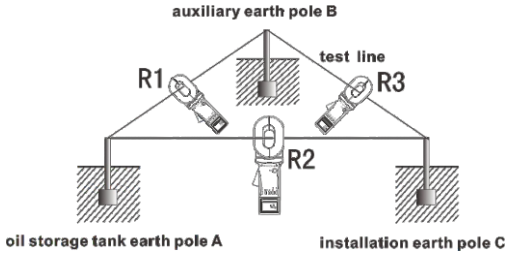

## 8.4. Application in gas station grounding system

In explosive gas environment, such as gas stations, oil fields, oil tank and other equipment must use explosion-proof products.

Base on JJF0802014 Grounding Type Anti-static Device Test Specification, gas station mainly need to test the grounding resistance and connect resistance of the facility shows below

The meter has to obey the requirement of GB3836-2010 Electrical Equipment Used in

### 8.4.1. Tanker and upload and load place grounding resistance measurement




As show above, in system of gas station, oil tank grounding pole A connect with tanker, the grounding pole C of load and upload position is a independent grounding pole. Find an independent grounding pole as an auxiliary grounding pole B (like the water piper), then base on Three point method to measurement $R_1$, $R_2$ and $R_3$.

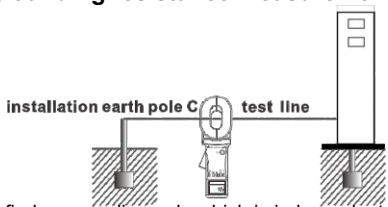
Oil tank grounding resistance: RA=(R1+R2+R3)/2

Load and upload place grounding resistance: RC=R2-RA

Auxiliary grounding pole grounding resistance: RB=R1-RA

NOTE: Cannot connect BC and AC by wires when measuring $R_1$; the same as $R_2$, $R_3$.

### 8.4.2. Tanker grounding resistance measurement

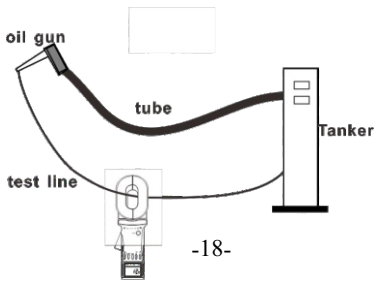



As shows above, find a grounding pole which is independent with tanker, like the grounding pole of upload and load place. Connect these two points by testing line, reading the value of $R_T$ by meter. Then can calculate the grounding resistance of tanker:

$R=R_T- R_C$

And: RT is the value of meter; RC is upload and load place grounding resistance.

### 8.4.3. The measurement of connect resistance of oil transmission piper of tanker



Connect Fuel truck nozzle and tanker by one testing line. Read $R_T$ by meter, then can figure out:

Tankers hose connection resistance is: $R = R_T - R_L$

NOTE: $R_T$ is the resistance meter measured; $R_L$ is the resistance of testing line.

# 9. Measurement Attention

## 9.1. Users sometimes may measurement compare KUSAM-MECO 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 **KUSAM-MECO** clamp meter is the 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 **KUSAM-MECO** 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 **KUSAM-MECO** 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.

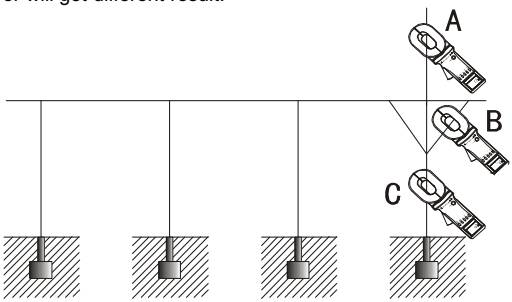
Obviously, the measurement value of the former is larger than that of the latter. The value size of the difference reflects the value size of the contact resistance between the branch and the common ground wire.

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. Selection of measurement point

In some grounding system, like the picture show below, should chose a correct point for measurement, or will get different result.




In measuring at A point, the measured branch does not form a circuit, the meter display "**OL Ω**", should change the measuring point.

In measuring at B point, the measured branch form the 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 grounding resistance value under the branch.

## 10. Battery Specification

| | |
|---|---|
| Battery Name | Alkaline zinc-manganese dry battery |
| Model | LR6 AA 1.5V |

# 10. Accessories

| | |
|---|---|
| Earth Tester | 1 PCS |
| Test Ring | 1 PCS |
| Meter Case | 1 PCS |
| User's Manual | 1 PCS |
| Product warranty manual/certificate | 1 SET |
| Conformity certificate of Explosion-Proof | 1 copy |

**The company is not responsible for other losses caused by use.**

**The contents of this user manual cannot be used as a reason to use the product for special purposes.**

**The company reserves the right to modify the contents of the user manual. If there are any changes, no further notice will be given.**

KUSAM-MECO®

An ISO 9001:2015 Company

**MUMBAI**

# TEST CERTIFICATE

## Flameproof Type Earth Resistance Tester

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

MODEL NO. **KM 1820EX**

SERIAL NO. _____

DATE: _____

ISO 9001:2015
REGISTERED

QC
KUSAM-MECO
PASS

# 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, burnt PCB's, 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.

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