Clamp Earth Tester

MET-10X

Instruction Manual

Thank you very much for selecting our model Met-10X Clamp Earth Tester.

Before use the instrument, read this instruction manual completely and familiarize yourself throughly with all functions.

Keep this instruction manual carefully to take out whenever you need.

MULTI
Let's Create
New Concepts of
Instruments

MULTI MEASURING INSTRUMENTS CO.,LTD

Akihabara Murai Bldg. 7F, 1-26 Kanda Sakuma-cho,
Chiyoda-ku, Tokyo, Japan, 101-0025
TEL:+81-3-3251-7016 FAX:+81-3-3253-4278
Home Page:http://www.multimic.com/
E-mail: multi@multimic.com

Ver 1.00

• • • CAUTION FOR INSTRUCTION MANUAL • • •

- Read this instruction manual throughly and comprehend the contents completely and then, use the instrument.
- Keep this instruction manual carefully, as it would not be reissued.
- Can not guarantee the safety for the use other than the original applications of this instrument and provided in this instruction manual.
- Obey to the instructions about the safety in this manual by all means.
- The contents of this manual subject to change without notice due to the development of specifications & functions of the instrument in future.
- There may be the differences between the display of the instrument mentioned in this instruction and the actual instrument.
- The drawings in this manual may have been omitted partially and or been abstracted.
- Although trying to make assurance doubly sure, please inform us through the dealers if you find any suspicious point, error and or omission in this i nstruction manual.
- It is prohibited to reprint and or to copy this instruction manual in all or partially without permission.

CONTENTS

Safety Summary ・・・・・・・・・・・・・・・・・・・・・・・・ 1
1 . General ・・・・・・・・・・・・・・・・・・・・・・・・・・・・ 3
1.1 Product Summary
1.2 Measurement Principle
2 . Suggestions Before Use ・・・・・・・・・・・・・・・・・・・・ 4
3 . Explanation for the name of each part and function ・・・・・・・ 5
4 . Handling Method ・・・・・・・・・・・・・・・・・・・・・・ 7
4.1 Preparation for use
4.2 Operation procedure
1) Use as earth resistance meter ・・・・・・・・・・・・・・ 8
(1) How to measure
2) Use as the surge impedance meter ・・・・・・・・・・ 18
(1) How to measure
3) Use as clamp current meter ・・・・・・・・・・・・ 19
4) How to use memory function ・・・・・・・・・・・・ 21
(1) Input the values into memory
(2) Check memories on display
(3) Delete the memory
4.3 Bluetooth function ・・・・・・・・・・・・・・・・・・・・ 23
4.4 Other function ・・・・・・・・・・・・・・・・・・・・・・ 24
5 . Specifications ・・・・・・・・・・・・・・・・・・・・・・・・ 25
5.1 Measuring CT (Φ 34)
5.2 Measuring CT (Φ 80) option
5.3 Injection CT (Φ 34)
5.4 Injection CT (Φ 80) option
5.5 Specification of Measuring Part
5.6 General Specification
6 . Q & A ・・・・・・・・・・・・・・・・・・・・・・・・・・・ 28
7 . Repair Service ・・・・・・・・・・・・・・・・・・・・・・・ 28
8 . Warranty ・・・・・・・・・・・・・・・・・・・・・・・・・・ 28

SAFETY SUMMARY

observe by all means

● Read these "SAFETY SUMMARY" carefully to use the instrument properly.

● The following warning and caution are intended to prevent danger and damage to the user and those around the user.

⚠ **WARNING** identifies that incorrect handling may cause danger to the life and body of the user.

⚠ **Caution** identifies that incorrect handling may cause damage of the instrument or insufficient performance.

● The following symbol indicates the standard applied.

: The symbol indicates that the Bluetooth wireless technologies are employed.

Trademarks(TM, (R) mark, are not specified in this manual.)

- Bluetooth is a trademark of Bluetooth SIG,Inc. Multi Measuring Instruments Co.,Ltd. uses it under a license agreement with the company.
- Android and Google Play are trademarks of Google LLC
- The iOS trademark is used under a license agreement with Cisco Systems, Inc. USA.
- iPhone, iPad, iPad mini and iPod Touch are trademarks of Apple Inc.,registered in the US and other countries.
- App Store is a service mark of Apple Inc.

○OPERATION ENVIRONMENT

⚠ **Caution**

●Do not, use or storage this instrument under the condition of direct rays of the sun, high temperature & humidity and or condensation, as it may cause the deformation and or the isolation defect of the instrument.

●Do not use this instrument in the environment influenced by acids, alkalis, organic solutions, corrosive gas, etc.

●Do not use or storage this instrument where the mechanical vibration can be directly transmitted, as it may cause defect of the instrument.

●Do not use this instrument nearby the appliances which generate strong magnetic field and or are electrified, as it may cause mis-movement, of the instrument.

●This instrument does not have the water/dust-proof structure. Do not use this instrument in the environment with a lot of dust and drops of water, as it may cause defect of the instrument.

○ OPERATION CONDITION & CONNECTION

Warning

POSSIBLE ELECTRICAL SHOCK

- This instrument is for use of low voltage circuit. Do not make measurements of power lines carrying more than AC 500V
  Before use, check and confirm the voltage of circuit to be measured.
- Apply only the coated cables and do not clamp bare cables.

POSSIBLE ELECTRICAL SHOCK or ACCIDENT

- Do not handle the instrument in the rain, at humid place, with a drop of water and or with wet hands.
- Do not use the instrument if the CT or CT case are damaged and If something is wrong with the CT cables.

POSSIBLE ELECTRICAL SHOCK OR FIRE HAZARD

- If excessive current is applied to the CT, the instrument will be heasted and damaged. Use the CT according to the rating current.
- The power supply voltage of battery charger is AC 220-240V.
  Do not apply the voltage except the indicated, as it may cause the damage to the instrument and or the electrical accident.
- Do not apply the voltage exceeding AC 10V to the input & output terminal of instrument body.

Caution

◇ **FOR SAFETY USE**

- Do not drop the instrument & CTs and or do not give the strong shock.
- Do not put heavy goods on the cables of instruments, CTs & Accessories and do not modify those cables.
- If dropping CTs and or giving strong shock, the joint surface of CTs are damaged and it may cause wrong influences to the measurement.。
- To avoid defect of CTs due to the break of cables, do not bend and or Pull the cables at the base of CTs. Handle them very carefully.

1. GENERAL

1 . 1 Product Summary

The construction for grounding is obligated to ensure the safety for operations of electric appliance and the measurement for earth resistance musct be done at regular intervals to maintain the safety for a long period.

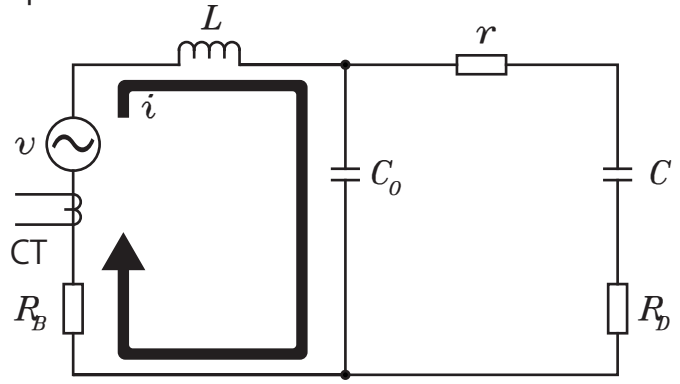
For the measurement of earth resistance by the ordinary earth testers, it is necessary to drive the auxiliary rods and or to disconnect the grounding lines after the operation of power-off but these operations are not applicable so easily at the present measuring fields and the measurement of earth resistance is getting difficult more and more.

This instrument can measure earth resistance everywhere just by clamping CTs to the grounding lines and the measurement is not restricted by time, as it is not necessary to put off the electric power of the circuit. The measured data can be saved in internal memory of the instrument. Meanwhile, this instrument also has another function to measure the leakage current of the circuit.

This instrument has a Bluetooth communication function. It communicates with a smartphone/tablet with the dedicated application "Multi-Tracer" installed, and can display measured values or save them on a

1 . 2 Measurment principle

Equivalent circuit



υ	: Injection Voltage by Injection CT
i	: Resonance current
CT	: Measuring CT
L	: Inductance of circuit
r	: DC resistance of the circuit
C_0	: Electrostatic capacity of the circuit
C	: Electrostatic capacity of the electric appliance
R_B	: Earth resistance ($R_B \gg r$)
R_D	: Earth resistance

When the auto sweep signal(4kHz to 200kHz, 160mV p-p) is injected into the circuit, the resonance phenomenon is caused at the certain frequency by inductance(L) and electrostatic capacity(C_0) and the current flow(i) is caused. When the resonance phenomenon is caused, the current flow(i) become maximum. The injected current(i) into the circuit is proportional to the earth resistance(R_B) and this current(i) is measured by the measuring CT and used for the computation of the earth resistance value(R_B) with other calculation factors. The resonance phenomenon is caused almost at 4kHz to 200kHz frequency in our field test.

2. SUGGESTIONS BEFORE USE

After opening the package, inspect the apprearance of the instrument and check the accessories. If you find any damage of appearance and or the lack of accessories, inform to the distributor you bought the instrument.

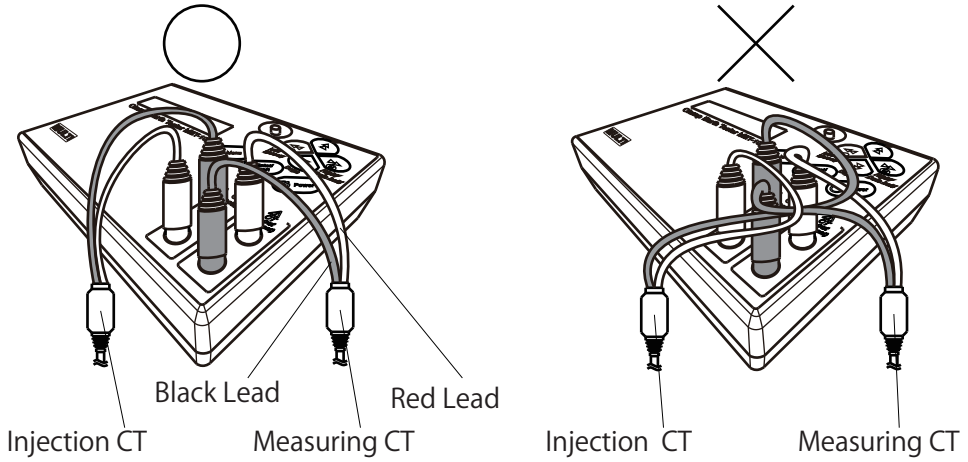
《 ACCESSORIES 》

Carrying Case	1
Measuring CT (CT SENSOR)	1
Injection CT (INJECTION CT)	1
Auxiliary Lead Wire	1
AA Alkaline batteries LR6	4
Manual	1

Precautions for use

1. The instrument measures the earth resistance as it injects the frequency by the Injection CT and detects the current by the Measuring CT.
   If the red lead wire inserted to the input terminal for the Injection CT on this instrument and the red lead wire inserted to the input terminal for the Measuring CT are twisted and overlapped, the influence of electric induction occurs on over 200Ω.

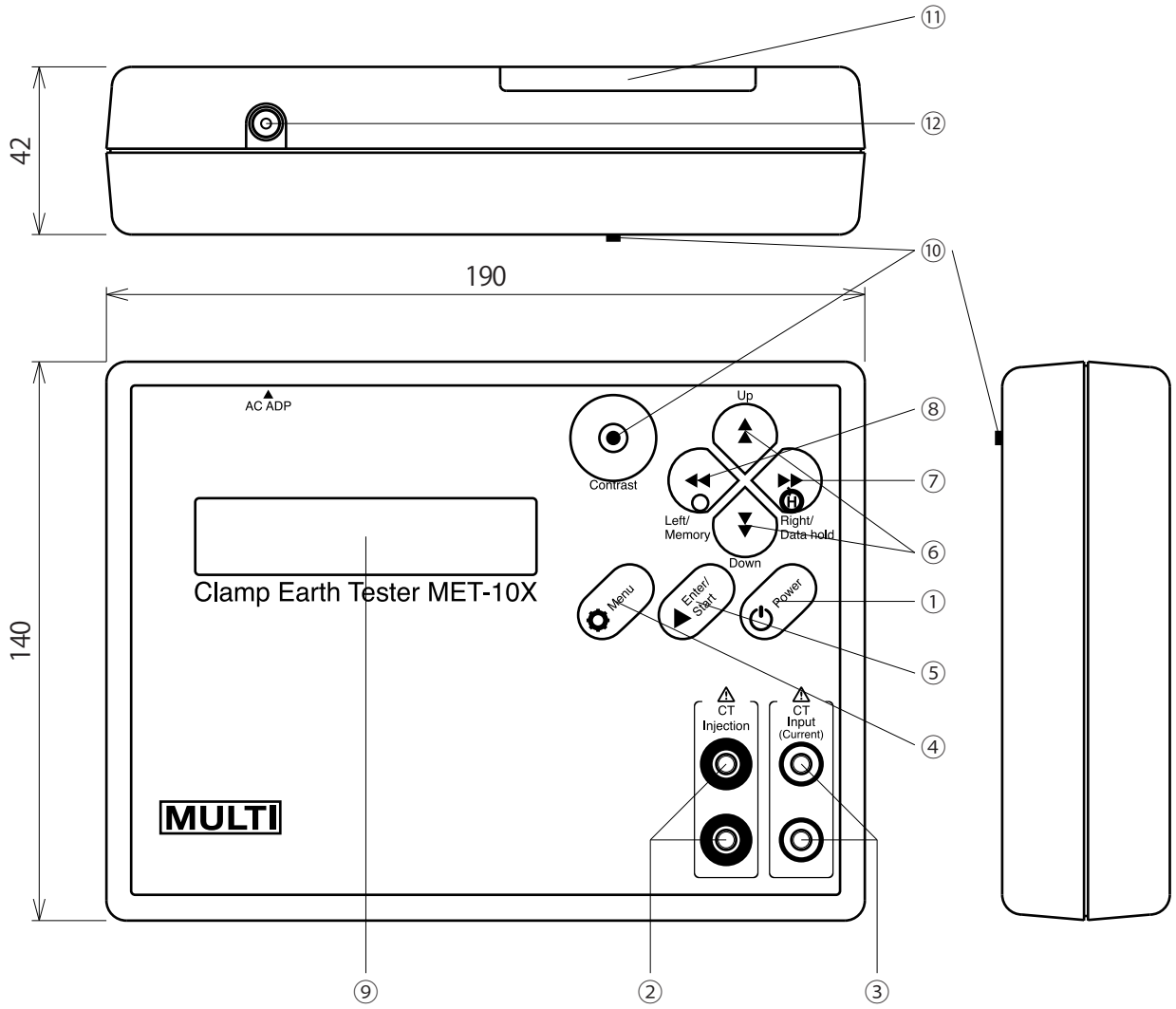
   Please note that the terminal lead wire of the Injection CT and the terminal lead wire of the Measuring CT do not overlap.



※ As shown in × figure, the red lead crossed on the read lead, it leads to the cause of error.
As shown in ○ figure,, Please note that Lead wires do not overlap and tangle up.

2. The instrument injects the current to the electric circuit sweeping the frequency (4 kHz to 200 kHz)
   When harmonic currents is on ground wire to measure, it may be influenced by harmonic current depending on the timing.
   If it is influenced by harmonic currents, the measured value is lowered more than the ground resistance you expect.

3. Explanation for the name of each part and function



(Explanation for each part and function)

① Power switch (Power) : Power ON and Off switch.The power will be turned off automatically 10min after the final key operation(Auto power off function)

② Injection CT input terminal (CT Injection) : The insertion terminal for the Injection CT. Connect red plug to the red terminal, black plug to the black terminal.

③ CT Sensor input terminal (CT Input (Current)) : The Insertion terminal for the measuring CT. Connect red Plug to the red terminal, black plug to the black terminal.

④ Menu switch (Menu): Press this switch to return to the initial screen

⑤ Input switch (Enter / Start): Input measurment condition setelected by UP , DOWN . It is used to measure the ground resistance when starting

⑥ Up 、Down switch: Up and Down key switch for the cursor of the display

⑦ Right / Data hold Switch(Right / Data hold): Move the cursor on the display. Press this switch, "DH" mark is displayed and the value is held in the display. To release, press this switch again on measurement of current, ground resistance and surge impedance.

⑧ Left /Memory switch (Left / Memory): Move the cursor on the display
Press this switch to store the Data Hold value into the memory.

⑨ Display (LCD): Display measurment condition and measured data on LCD of 2 × 20

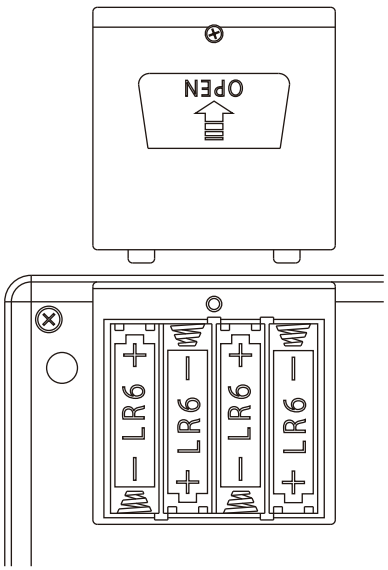
⑩ Contrast knob (Contrast): Contrast adjustment of the display.

⑪ Strorage for battery: Insert AA alkaline battery, LR6 x 4

⑫ Jack for AC adaptor: Connect the exclusive AC adaptor

4. Handling method

4 . 1 Preparation before use



1) Power supply storage

① Unscrew battery cover and slide it to detach (See the right figure)

② Store battery in the case . Be careful not to make mistake on plus or minus polarity (AA alkaline batteries LR6 × 4)

③ Set back battery cover and screw it to fix

⚠ Warning

Being in danger of electric shock and electric shock accident

●Do not exchange battery while measuring

●Please set back battery cover after you detached it. Do not measure while keeping the battery cover detached because it is danger

⚠ Caution

It may cause a malfunction

●Please store batteries detached to main body when you do not use it for a long time. It may casue liquid spill for batteries.

●Please do exchange 4 batteries at same time whenever exchanging batteries with the new ones

●Do not use batteries except the specified batteries

2) Setting the date/ time for CT

① Press “Power” once

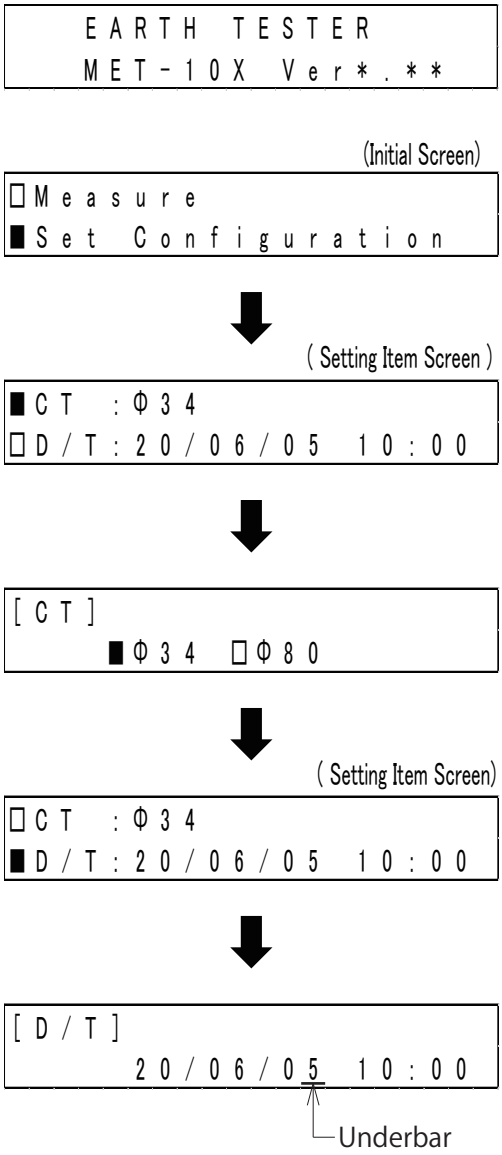
② Press “Down” on the initial screen once, plase the cursol to Set Configuration and Press “Enter”

③ Place the cursol to CT and press “Enter”
※Displaying the current settings

④ Place the cursol to the CT diameter to use and plase the cursol by using “ Left” ,” Right” , press “ Enter” to fix. The setting items screen shows up after fixing (the attached CT is φ34 and φ 80CT is optional .

⑤ Press “Down” on the setting items screen and place the cursol to D/T and press “Enter”

⑥ This is the setting screen on the date/time. Press “Right” and place underscore to the item you like to set and fix the date/time by pressing “UP” and “Down” Press “Enter” along to time signal to fix
※「Year」 means last 2 digits of year



4 . 2 Operating procedure

1) Use as earth-resistance meter

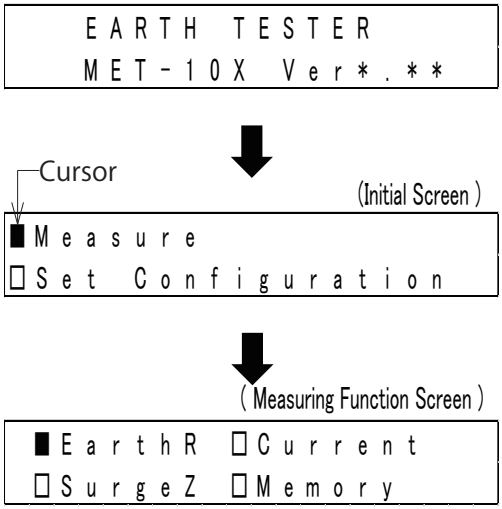
(1) How to measure

① Press” Power” once

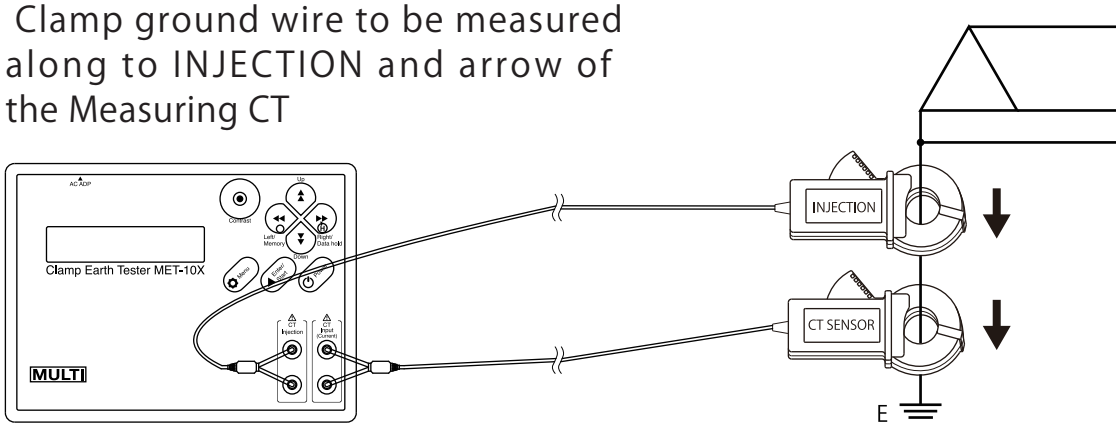
② Place the cursol to “Measure” and press” Enter” once

③ It shows as in the right figure

④ Connect the Injection CT to CT injection terminal and the Measuring CT to CT input terminal of this main body. Please connect red lead wire to red terminal and black lead wire to black terminal



⑤ Clamp ground wire to be measured along to INJECTION and arrow of the Measuring CT



⑥ Press “Down” two times and place cursol on Current and press “Enter”

```
□EarthR ■Current
□SurgeZ □Memory
```

⑦ Confirm the current value flowing in ground wire(Can not measure of ground resistance whenever current value is 1A and more)

```
[Current]     50.2Hz
              15.3mA
```

(Measuring Function Screen)

⑧ Press “Menu” once and go back to selection screen of measuring function

```
□EarthR ■Current
□SurgeZ □Memory
```

⑨ Place cursol to EarthR and press “Enter”

```
■EarthR □Current
□SurgeZ □Memory
```

⑩ Plase cursol to High and press Enter

```
■High
□Low
```

⑪ EarthR Measuring starts to blink and measure ※ To stop measuring press” Menu” once

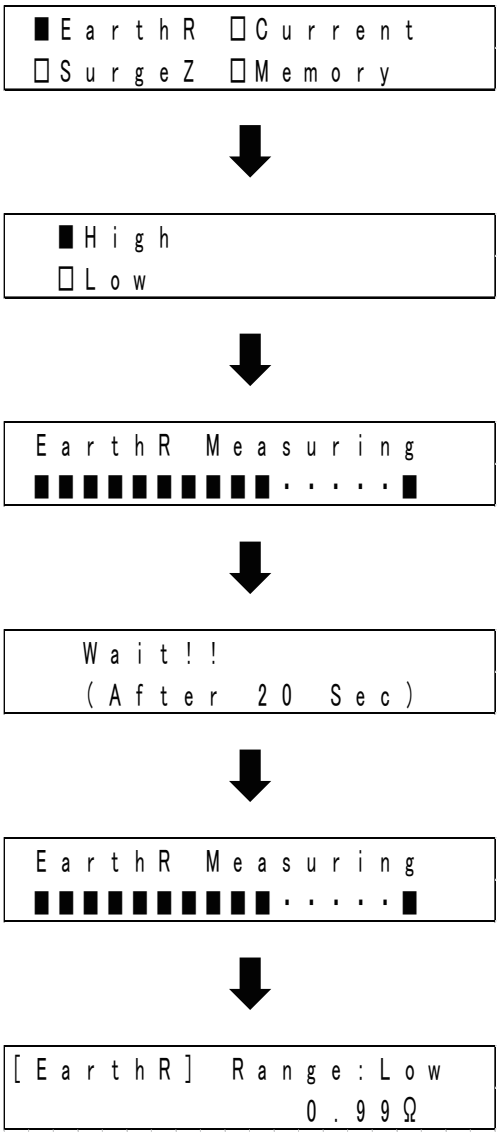
```
EarthR Measuring
■■■■■■■■■■·····■
```

⑫ About 30sec later, it displays measured value

※To masure in a row, there is alloted waiting time t in consideration of stability of electrical circuit but it is not abnormal

```
[EarthR] Range:High
              12.0Ω
```

⑬ Measure on High range and whenever measured value is low, it changed to Low range automatically and starts to measure after waiting time



Caution

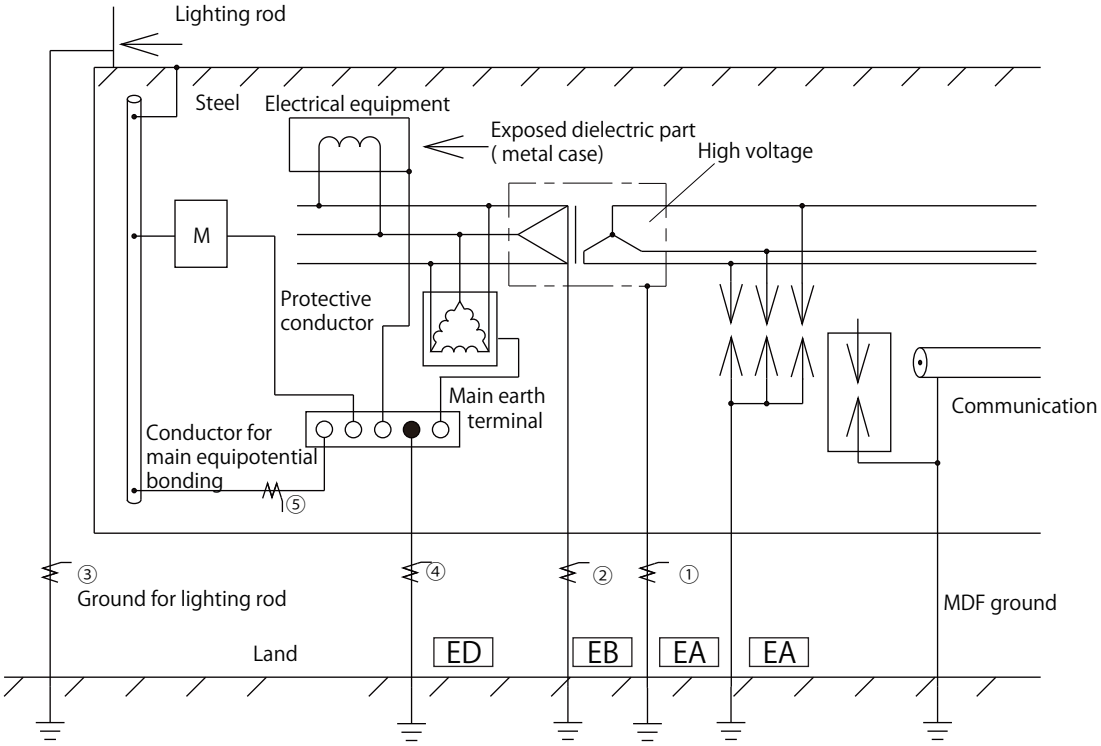
●Please make CT for injection and CT for measuring in the same direction. If you made in wrong direction,「OVER」and the abnormal value are displayed.

● It can not measure the ground wire over 1A

●This product measures grounding resistance by L, C of electrical circuit. If the meaured grounding resistance is higer than expected, the electrical circuit is not resonated. In that case, please measure with auxiliary lead under the example of use here

●Usage example as earth resistance meter

Usage example 1 (3phase 3lines) live lines



means the part to clamp(CT for detection ,CT for injection)

① is box for High voltage equipment. in this case, erelcrican circuit is short and LC is small amount . please clamp using auxiliary lead wire

② is ground wire. In this case, just clamp to measure

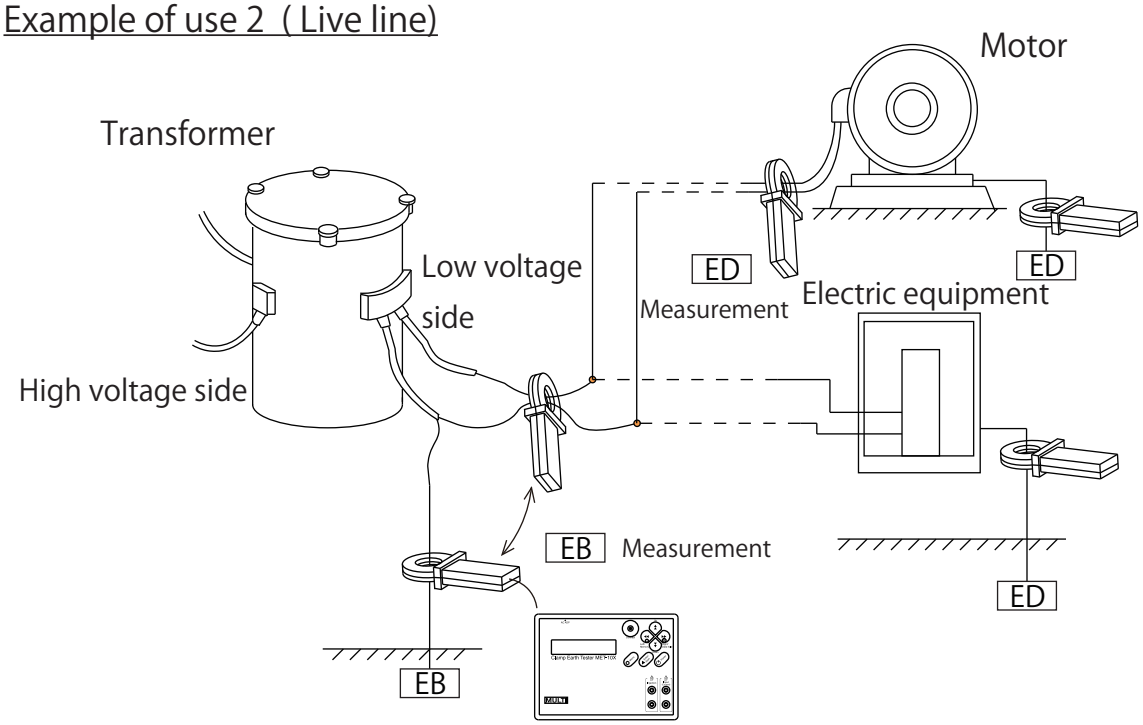
③ is ground wire for lighting rod. In this case, electrical circuit is short and LC value is small amount . please clamp using auxiliary lead wire

④ is ground wire. In this case, just clamp to measure

⑤ is equippotential bonding conductor. In this case, just clamp to measure

※ Ground wire to use auxiliary lead wire is that cable run is short , LC is small amount and there is the electrical circuit not connecting to electrically powered equipment In this case, please connect ground phase with grounded outlet to ground wires and the ground wire you measure with the auxiliary lead wire

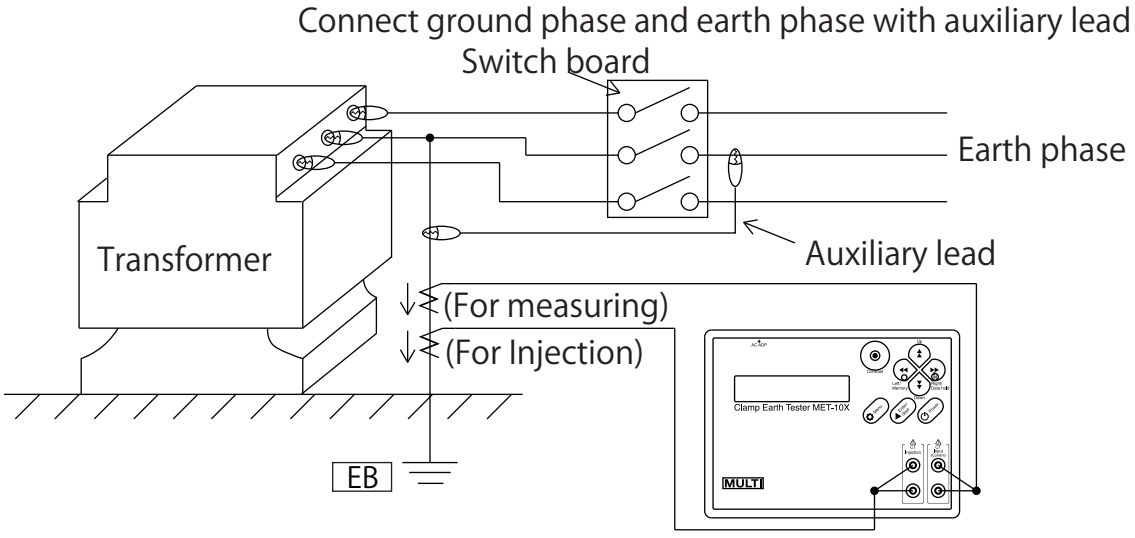
Example of use 2 (Live line)



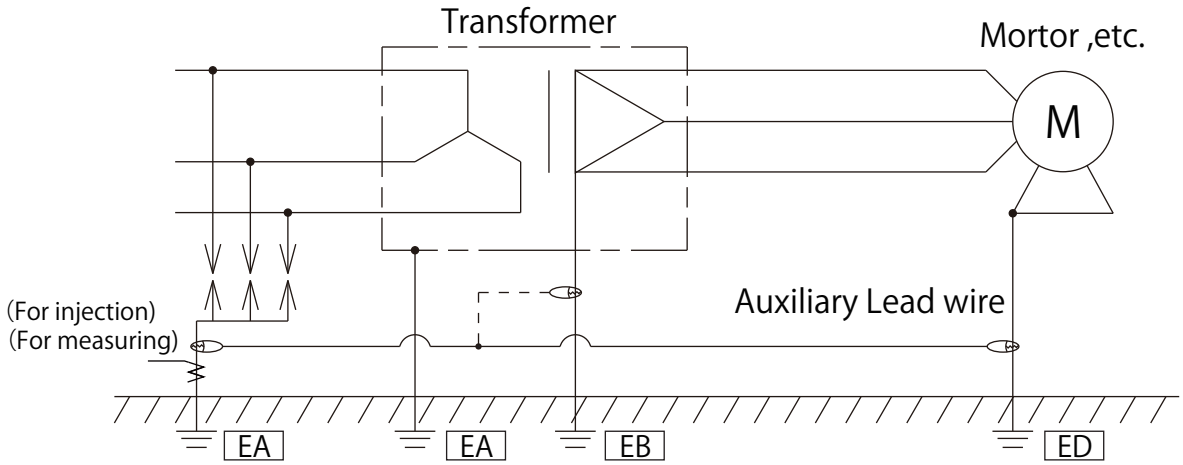
※Clamp the Injection CT and the Measuring CT at same position

- In the case of clamping 3phase at once or Single phase at once near transformer, EB 's ground resistance can be measured.
- In the case of clamping clamping 3phase at or 1phase at once near load, ED ' s ground resistance can be measured.

Example of use 3 (power outage)



Example of use 4 (Short cable way and no resonance)



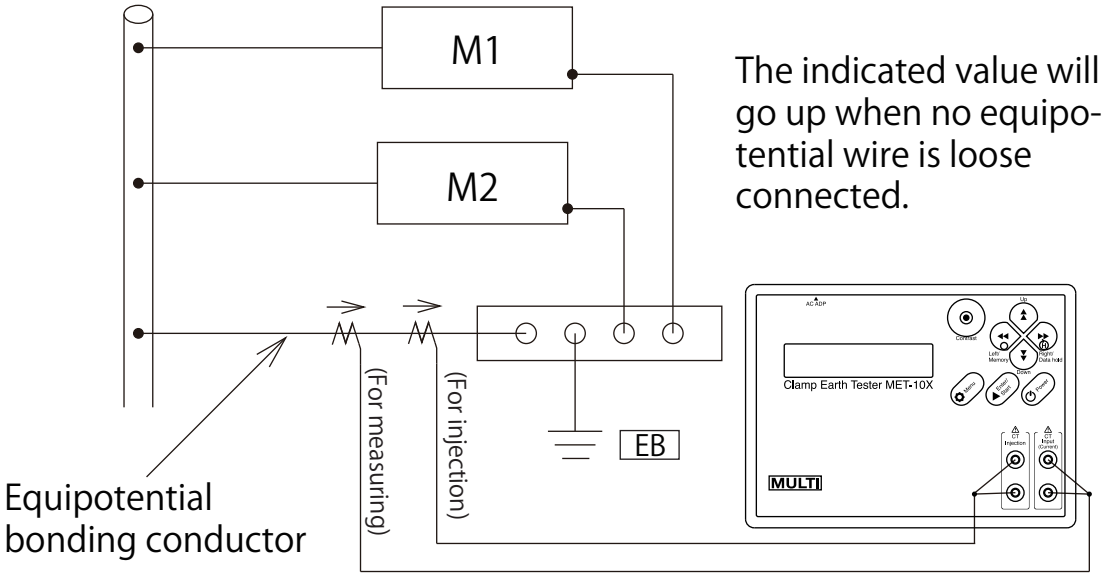
There are many cases that EA and ED are common electrical ground in the current field and EB electrical ground is single one.

For example, when measuring the ground resistace of arrester in this situation and「OVER」was displayed. In this case, connect the ausiliary lead to ED because of short distance of electrical circuit and lacking LC component.

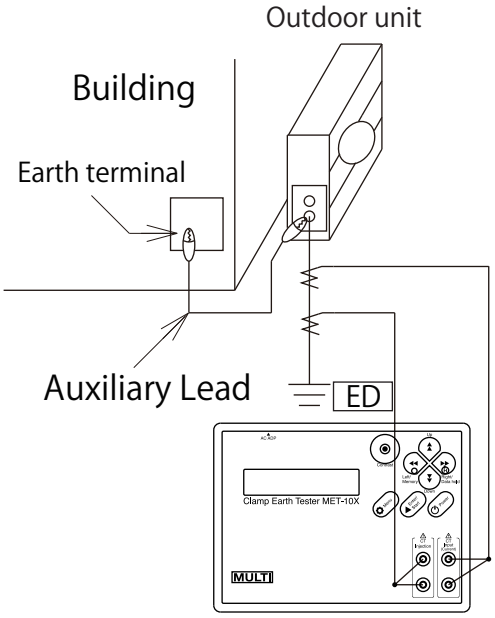
※ It can be connected to EB but investigate the situation on the site with ground relay and other , there is possibility that it will start operation

When the resonance doesn't happen connected to the auxiliary lead, you can measure as multiple ground resistance and EA + ED are displayed.

Example of use 5 (Measuring the equipotential bonding)



Example of use 6 (Autodoor unit of air conditioner , etc)



Measuring the ground resistance

In this case, measure ED without auxiliary lead connected firstly

When the value is 「 OVER 」 and very high in this state, the cable way is short and LC is small and the resonance is not happening

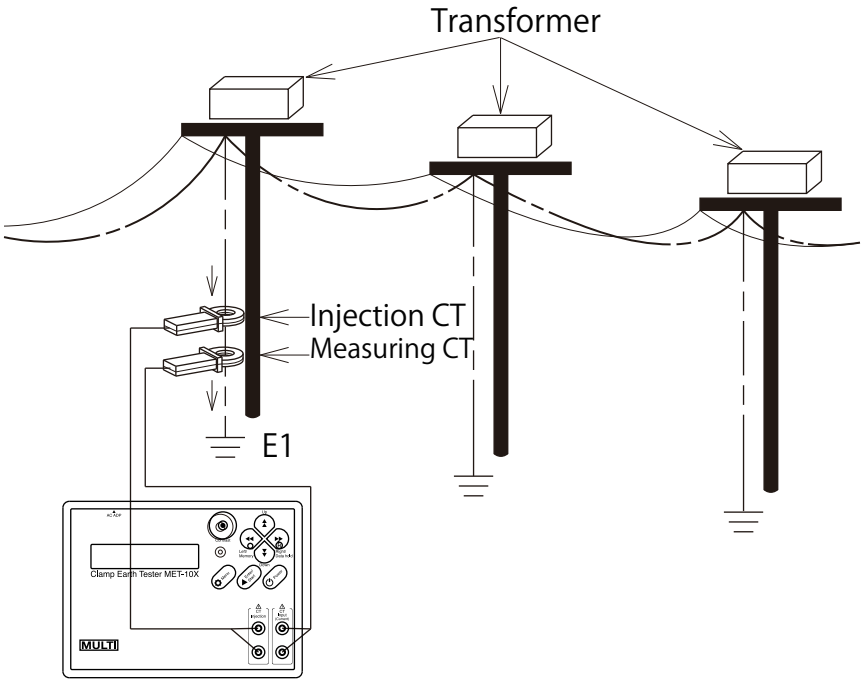
Use the auxiliary lead.

Connect the earth terminal of the building to ED with the auxiliary lead.

Please measure it again.

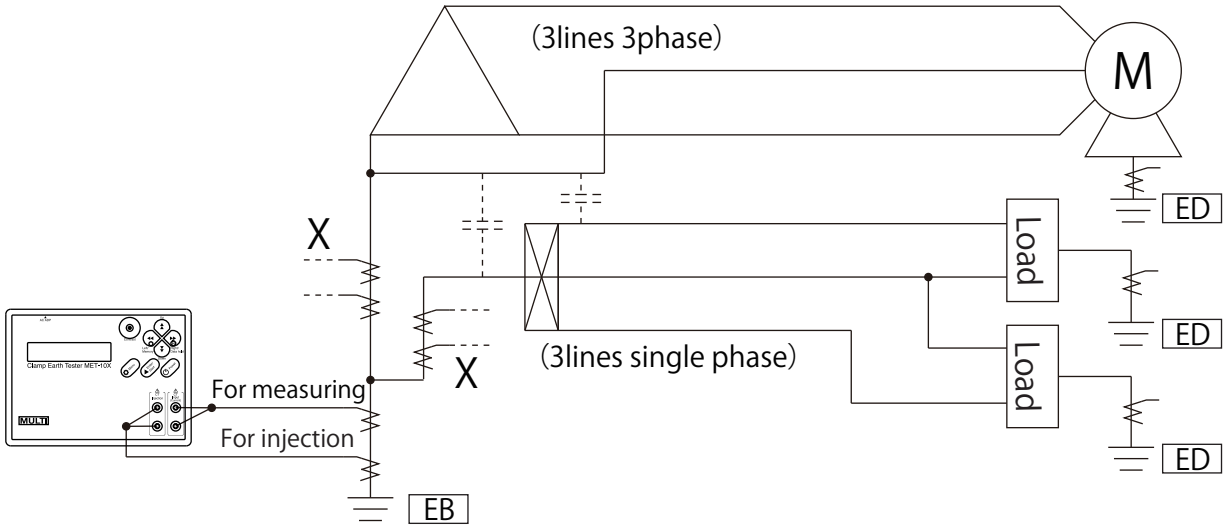
※The load equipment is being halted, keep the power on (Capacitance of the equipment will increase)

Example of use 7 (Measurment of multiple grounding)



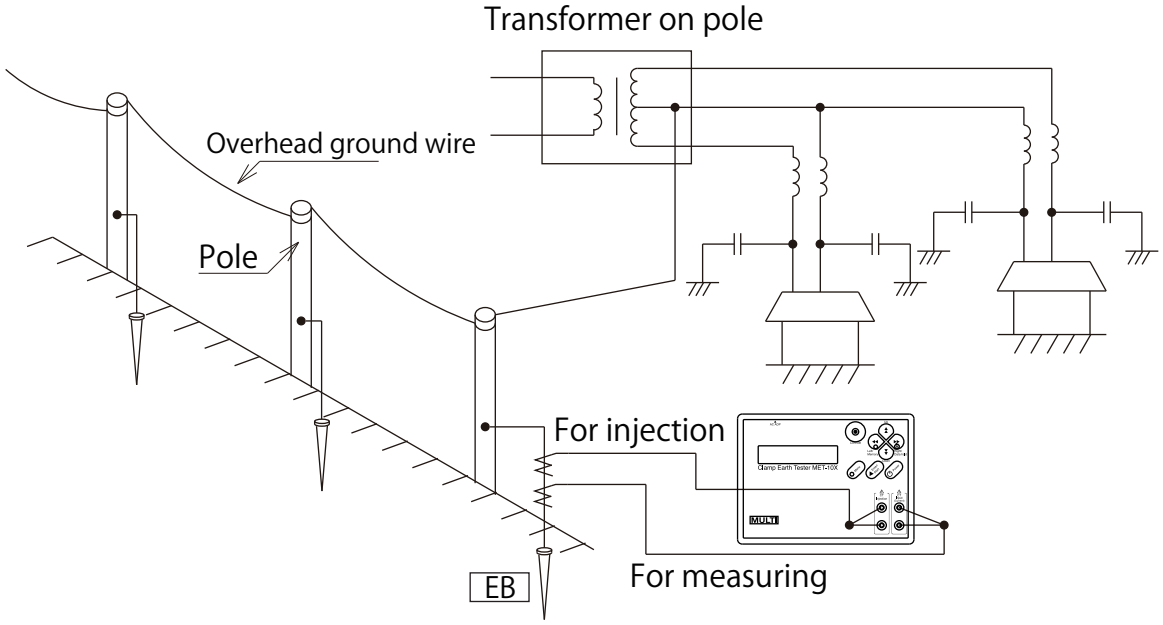
As in the figure, Clamping the Injection CT and the Measuring CT , you can measure the resistance of only E1

Example of use 8 (Multiple grounding)



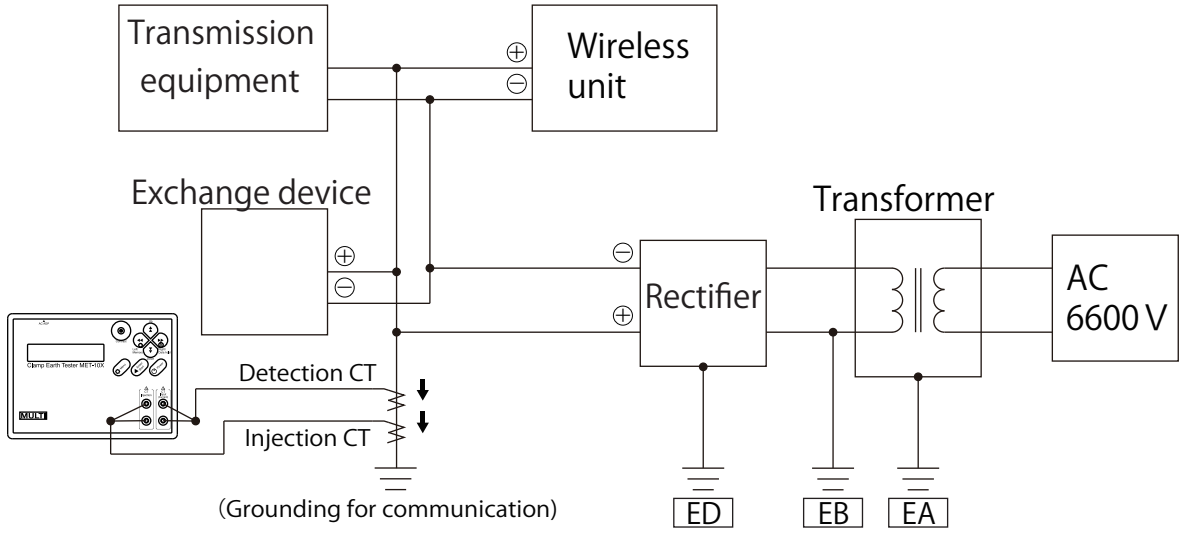
※In the case that single phase 3lines,3phase 3lines and wire are in same duct, when measuring X mark, the loop may happen in stray capacity Please measure it with EB in that case

Example of use 9 (Common grounding)



In the field as the above figure, it can measure solo grounding resistance and joint value of every electric pole

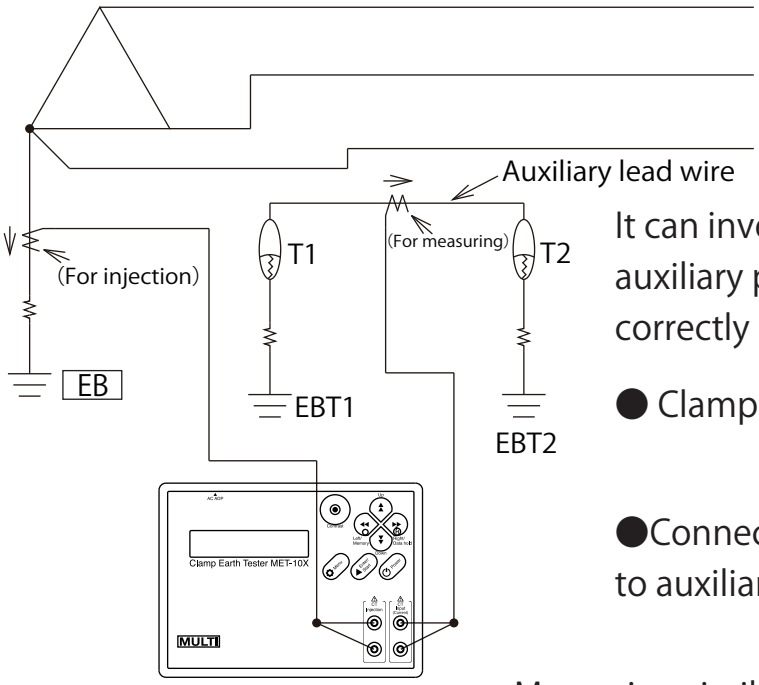
Example of use 10 (Measuring of grouding communication)



●Measure signal ground only with clamping

●No malfuction and damage on communication equipment happen, please use with piece of mind

Example of use 11 (Investigation of auxiliary pole)



It can investigate whether or not auxiliary pole is hammered down correctly

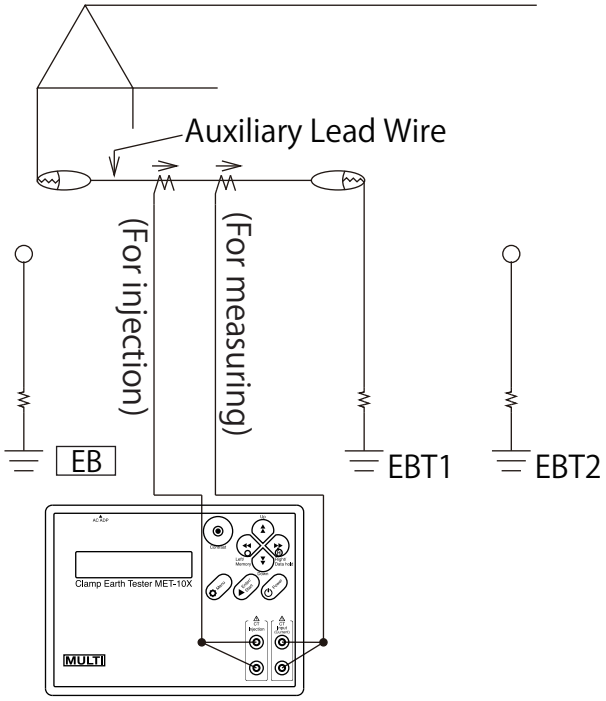
● Clamp EB with CT for injection

●Connect auxiliary pole T1 and T2 to auxiliary lead

※ Please pay attention to the orientation of CT

Measuring similar to this, if 「 OVER 」is displayed
Auxiliary poles are in right position

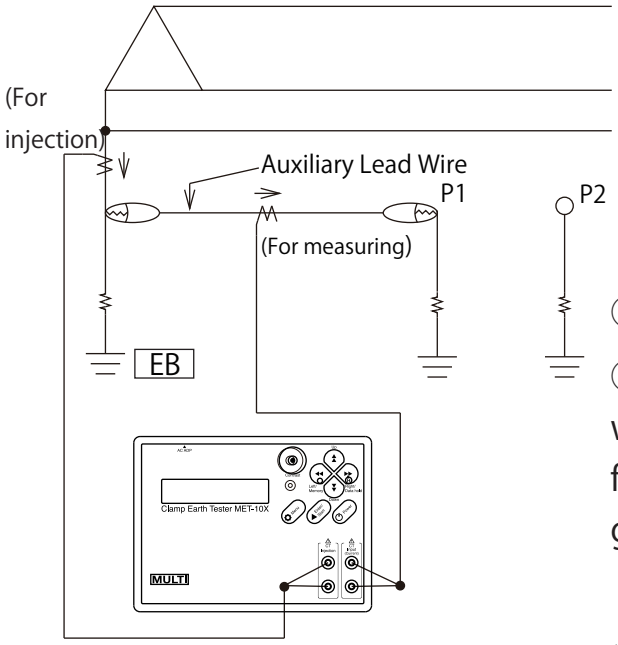
Example of use 12 (Measuring the ground resistance of Auxiliary pole)



Detach EB and connect the auxiliary lead to EBT1

Clamp the auxiliary lead with CT for injection and CT for detection to measure

EBT2 is the same as the above explanation



① Connect P1 to EB with auxiliary lead

② Including P1 and EB, superimpose with CTs for injection and measuring from P1 side, it can measure the ground resistance of P1 auxiliary pole

※Please pay attention to the orientation of CT

2) Use as the surge impedance meter

Summary

As for the surge impedance measurement of grounding system, the electric potential will go up with inductive lightning flowing in grounding wire. The lightning surge is 1 μs to 40 μs. This impedance is said as 10times the value measured by grounding resistance tester(1kHz).But this impedance is not recognized. That is unknown cause, if the damage on equipment happens when inductive lightning happens. Recogninzing the surge impedance and lowering it, it leads to lowering the risk for the protected equipment. MET-10X measures the resistance value injecting the frequency25kHz(40μs). This surge impedance is just guide but please use it to lower the risk of lightning damage.

(1) How to measure

① Press Power switch once

②Place cursor on Measure and press Enter switch once

③It turns to the right figure, measuring function screen

④Connect the Injection CT to CT input terminal for the Injection and Measuring CT to CT input terminal for detection and Red lead to Red terminal and Black lead to Black terminal

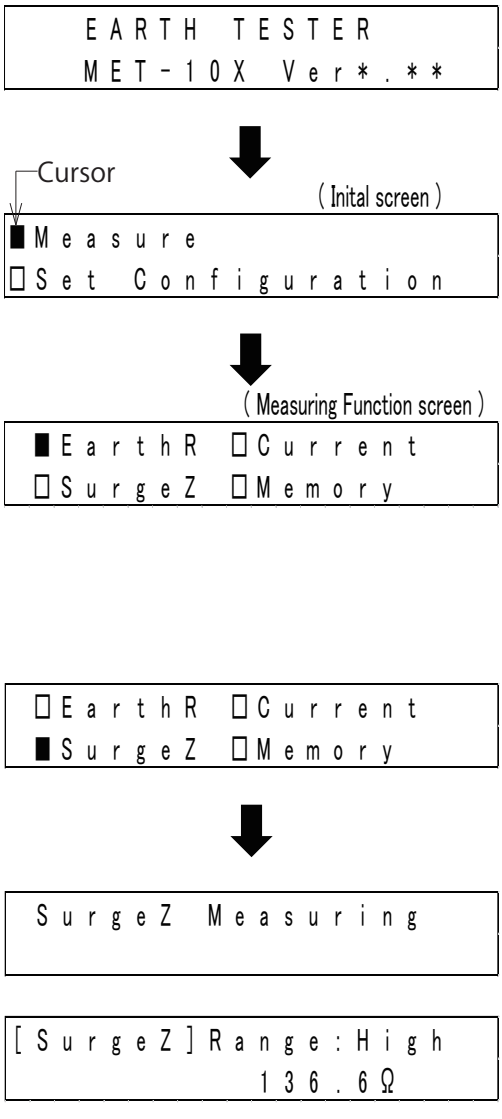
⑤Clamp the grounding wire aligning with the same direction of allows of the Injection CT and the Measuring CT

⑥Press Down switch once and place the cursor over SurgeZ and press Enter switch once

⑦Turns to SurgeZ Measuring Screen and measuring starts

※To stop measuring , press Menu once

⑧It displays the value in 3seconds

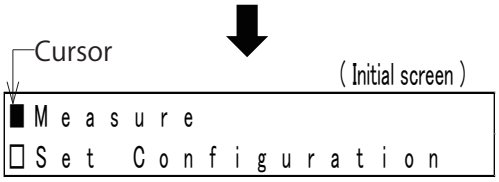


3) Use as clamp ammeter

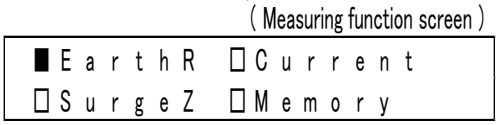
(1) How to measure

① Press Power switch once

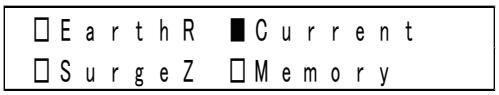
②Place cursor on Measure and press Enter switch once



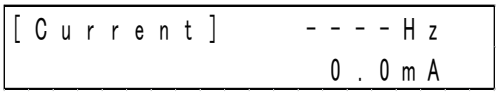
③The function screen as right figure



④Press Down switch 2times and place cursor on Current and press Enter switch once



⑤It will be ready to measure as the right figure



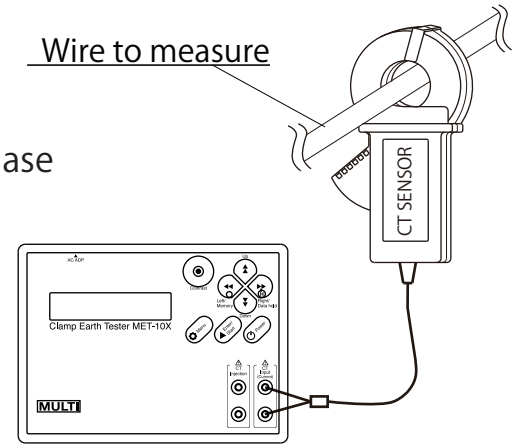
⑥Connect CT SENSOR for the Mesuring CT to CT input terminal , open clamp part, clamp an electrical wire to measure and close clamp part

※Range will be changed manually（Auto range）

⑦Read the displayed value (「OVER」displays, when the input current is over mesuring range) Press Data hold switch to keep it. When「DH」appear on diplay, please press Data hold switch

(Measure the leakage current)

① Clamp the grounding line and read the displayed value



② To measure a leakage current in a single-phase or 3phase circuit, clamp the all active conductors(e.g. L1, N or L1, L2, L3, N). Read the displayed value.

* Go back to initial screen from measuring
  Press Menu switch once
* Measuring freaqency is 45Hz to 65Hz
  ※Current/Freaquency being over measuring range,
  「- - - - Hz」is displayed

Warning

POSSIBLE ELECTRICAL SHOCK OR FIRE HAZARD:

- The applicable circuit voltage is limited to AC 500V rms. Before measurements, check the circuit voltage to be measured.
- Never make measurements for uninsulated conductors.
- Never fail to keep the maximum tolerable input. Do not apply more than AC 20A rms to the CT.

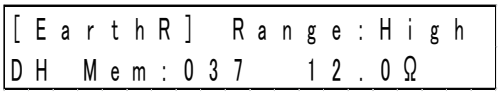
4) How to use memory function

(1) Input the values into memory

① Measuring current,ground resistance and surge impedance, press Data hold switch after measurment to hold the measured value with DH displayed

② Pressing Memory switch, it records the time of when pressed and records the measured value、displays memory number (1to200) .it can not record over memory number 200.

※ 2seconds after Memory switch pressed, 「Mem : * * * 」is disappeared



(2) Check memories on diaplay

① Press Menu switch to initial screen

②Place cursor on Measure and press Enter switch

③ Press Down switch 3times and place cursor on Memory and press Enter switch

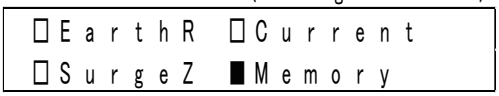
④Place cursor on Display and press Enter switch

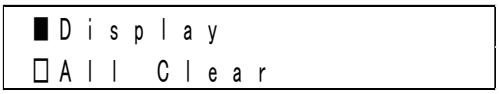
⑤The memory content screen

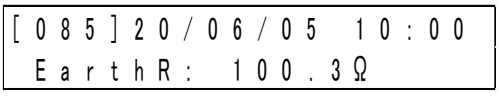
Press Down switch or Up switch to display contents of memory. As an example, the right figure is the recording date and the measured value. To back to initial screen, press Menu switch 3times

(Initial screen)

(Measuring function screen)







※No memory as right figure. It will back to measuring function screen in 2seconds

(3) Delet the memory

Memory data is recorded within 200 and over 200, it can not store. Inputting new data , please delete all memories.

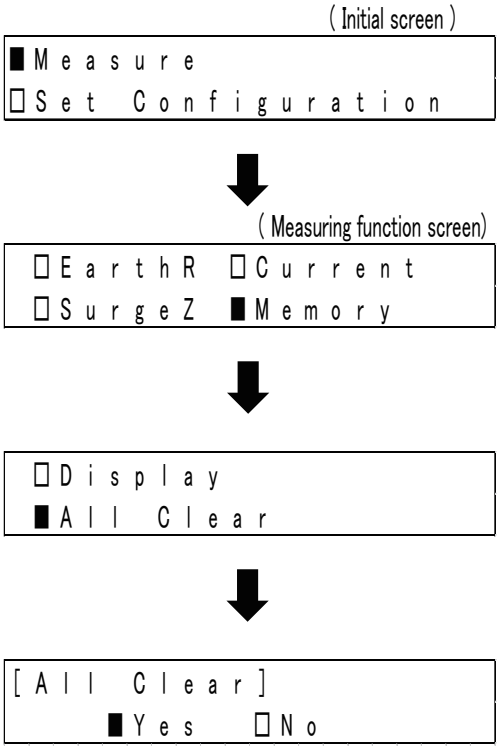
①Press Menu switch to initial screen

②Place cursor on Measure and press Enter switch

③Press Down switch 3times and place cursor on Memory and press Enter switch

④Press Down switch once and place cursor on All Clear and press Enter switch

⑤ Place cursor on YES by Left , Right switch and press Enter switch.
Deleting all memory and back to measuring function screen. If you do not delete , place cursor on No and press Enter switch.



4 . 3 BLUETOOTH FUNCTION

MET-10X has Bluetooth communication function (Bluetooth 4.2 Class2)

With the dedicated application" Multi-Tracer" on the smartphone side, it is able to check measuring data and save the measurement results.

If your mobile device is an iPhone, iPad, etc., download" Multi-Tracer" from the APP Store, and install. For Androide devices, download" Multi-Tracer from Google Play and install.App-Store requires Apple ID. Google-Play Google account.

For information of each account, communicate with a dedicated supplier of each mobile devise.

Caution

- This product has a low power data communication system based on the Radio Law. EYSHCN:001-A10745
- The communication range depends on the surrounding environment , such as other radio waves and devices.
- This product uses communication frequencies of the 2.4 GHz band. If another wireless devices are using similar communication frequencies near this product, it may disturb wireless communication of both devices. Radio-wave interference may occur. In this case, stop other wireless devices or change the place where this product is used to avoid radio-wave interference.
- The Bluetooth communication function may not works on all mobile terminals.
- " Multi-Tracer" is free of charge. However, the internet connection fee is different for downloading or using the apps.
- "Multi-Tracer" may not work on all mobile devices.

1) Use of Bluetooth function

①Turn on the instrument

②Start up "Multi-Tracer" on the terminal you installed and connect to MET-10X

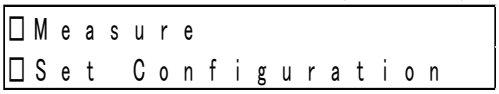
③Bluetooth mark shows up on the display of MET-10X, connecting the communication terminal.

※ The measured value you can get from the terminal(Multi-Tracer)
※ Connecting to the terminal (Multi-Tracer), the initial screen changes to the measuring function screen.
※ It changes to the screen of measuring item , required by the terminal (Multi-Tracer)
※ Connecting to the terminal (Multi-Tracer), other switches except power switch are invalid.

4 . 4 Other function

1) Information display

(Initial screen)

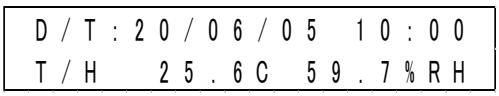


① Press Down switch twice on initial screen. Place cursor over Information and press Enter switch

② Display Mac Address of BLE module described on main body

③ Press Down switch once to display the date , temp and humidity

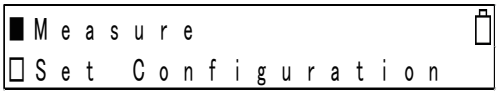
※ Temp and humidity is measured by sensor in mainbody which are reference values



2) Display of battery voltage state

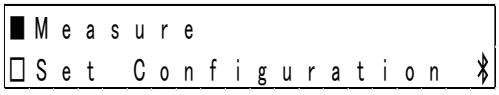
Battery voltage is lowered , the battery mark displays on upper right of screen

※ It displays on all screen



3) Display of Bluetooth connection

Connecting to communication terminal, it displays lower right the mark of Bluetooth



4) Auto power off function

It will be turned off around 10min after pressing the final switch operation.

※ Conditions of Auto power off function invalid

- Operated by AC adaptor
- Connecting Bluetooth to the communication terminal

5. SPECIFICATIONS

5 . 1 DETECTION CT (φ 34)

CT Inner diameter：φ 34 mm (Clamp type)
Withstanding Voltage ：AC 3700V、1 minute (betwen CT Core & CT Handle)
Length of Cable：2.5 m
Size & Weight：90.5 (W) × 165 (H) × 38 (D) mm、approx.460g

5 . 2 DETECTION CT (φ 80) Option

CT Inner diameter：φ 80 mm (Clamp type)
Withstanding Voltage：AC 2200V、1 minute (between CT Core & CT Handle)
Length of Cable：2.5 m
Size & Weight：125 (W) × 240 (H) × 40 (D) mm、approx.570g

5 . 3 INJECTION CT (φ 34)

CT Inner diameter：φ 34 mm (Clamp type)
Withstanding Voltage：AC 3700V ,1 minute(between CT Core & CT Handle)
Injection Method：CT Clamping Method
Injection Frequency：4 kHz ～ 200 kHz (auto-sweep method) , 25 kHz (fix method)
Injection Waveform：Sine Wave
Injection Level：Approx. 160 mVp
Cable Length：2.5 m
Size & Weight：90.5 (W) × 165 (H) × 38 (D) mm、Approx. 440g

5 . 4 INJECTION CT (φ 80) Option

CT Inner diameter：φ 80 mm (Clamp type)
Withstanding Voltage：AC 2200V、1 minute (between CT Core & CT Handle)
Injection Method：CT Clamping Method
Injection Frequency：4 kHz ～ 200 kHz (auto-sweep method) , 25 kHz (fix method)
Injection Wafeform：Sine Wave
Injection Level：Approx. 160 mVp
Cable Length：2.5 m
Size & Weight：125 (W) × 240 (H) × 40 (D) mm, approx.670g
Shield(option)
Size & Weight：123 (W) × 120 (H) × 42 (D) mm, approx. 220g

(It needs to keep distance(80cm) between φ80mm Injection CT and Detection CT, if it can not on the site, the shield(option) for Injection CT is needed.

5 . 5 MEASURING PART

Mearsuring Function ： Earth Resistance, Surge Impedance, AC Current (Load/Leakage)

Measuring Method ： CT Clamping Method

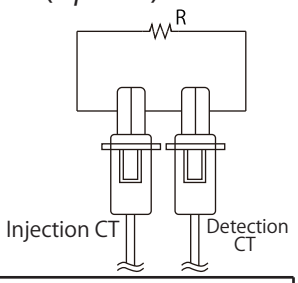
Measuring Range ： Earth Resistance ： 0.1 Ω ～ 10 Ω / 500 Ω (φ 34)
0.1 Ω ～ 10 Ω / 300 Ω (φ 80)
Surge Impedance ： 0.1 Ω ～ 10 Ω / 500 Ω (φ 34)
0.1 Ω ～ 10 Ω / 300 Ω (φ 80)
AC Current(50 / 60 Hz) ： 0 ～ 200 mA / 2 A / 20 A (φ 34)
1 ～ 200 mA / 2 A / 5 A (φ 80)

Accuracy ： 23 ℃ ± 2 ℃ , less than 80 %RH

※The accracy of ground resistance and surge impedance is the accuracy of pure resistance.

※The accuracy of ground resistance and surge impedance is exercised as Measuring CT and Injection CT is posisioned as the right figure.

※Earth current is within 1A



・Earth Resistance

C T	Range	Measuring range	Resolution	Accuracy
φ 34	Low	0.10 Ω ～ 10.00 Ω	0.01 Ω	0.10 Ω ～ 1.00 Ω ： ± 0.1 Ω 1.00 Ω ～ 10.00 Ω： ± 0.5 Ω
	High	10.0 Ω ～ 500.0 Ω	0.1 Ω	10.0 Ω ～ 50.0 Ω ： ± 2.0 Ω 50.0 Ω ～ 200.0 Ω： ± 5.0 Ω 200.0 Ω ～ 300.0 Ω： ± 20.0 Ω 300.0 Ω ～ 500.0 Ω： ± 30.0 Ω
φ 80	Low	0.10 Ω ～ 10.00 Ω	0.01 Ω	0.10 Ω ～ 1.00 Ω ： ± 0.1 Ω 1.00 Ω ～ 10.00 Ω： ± 0.5 Ω
	High	10.0 Ω ～ 300.0 Ω	0.1 Ω	10.0 Ω ～ 50.0 Ω ： ± 2.0 Ω 50.0 Ω ～ 200.0 Ω： ± 5.0 Ω 200.0 Ω ～ 300.0 Ω： ± 20.0 Ω ※Condition: With the shield for Injection CT

・Surge Impedance

C T	Range	Measuring range	Resolution	Accuracy
φ 34	Low	0.10 Ω ～ 10.00 Ω	0.01 Ω	0.10 Ω ～ 1.00 Ω ： ± 0.1 Ω 1.00 Ω ～ 10.00 Ω： ± 0.5 Ω
	High	10.0 Ω ～ 500.0 Ω	0.1 Ω	10.0 Ω ～ 50.0 Ω ： ± 2.0 Ω 50.0 Ω ～ 200.0 Ω： ± 5.0 Ω 200.0 Ω ～ 300.0 Ω： ± 20.0 Ω 300.0 Ω ～ 500.0 Ω： ± 30.0 Ω
φ 80	Low	0.10 Ω ～ 10.00 Ω	0.01 Ω	0.10 Ω ～ 1.00 Ω ： ± 0.1 Ω 1.00 Ω ～ 10.00 Ω： ± 0.5 Ω
	High	10.0 Ω ～ 300.0 Ω	0.1 Ω	10.0 Ω ～ 50.0 Ω ： ± 2.0 Ω 50.0 Ω ～ 200.0 Ω： ± 5.0 Ω 200.0 Ω ～ 300.0 Ω： ± 20.0 Ω ※Condition: With the shield for Injection CT

・AC Current(50Hz / 60Hz)

C T	Range	Measuring range	Resolution	Accuracy
φ 34	200 mA	0.0 mA ～ 200.0 mA	0.1 mA	± 3 % rdg ± 8 dgt
	2 A	0.200 A ～ 2.000 A	0.001 A	± 2 % rdg ± 8 dgt
	20 A	2.00 A ～ 20.00 A	0.01 A	± 2 % rdg ± 8 dgt
φ 80	200 mA	1.0 mA ～ 200.0 mA	0.1 mA	± 3 % rdg ± 8 dgt
	2 A	0.200 A ～ 2.000 A	0.001 A	± 2 % rdg ± 8 dgt
	5 A	2.00 A ～ 5.50 A	0.01 A	± 2 % rdg ± 8 dgt

AC Conversion : Average sensing rms reading
A / D Conversion : Dual integrated method
Display : 2lines x 20 character/letter w/contrast adjustment
Sampling Rate : 2 times/second(AC current)
Measuring Time : Approx.30 sec(Earth Resistance), once a second(Surge impedance)
Over Range Display : "Over" on the display
Low Battery Indicate : 「 ⊓ 」on the display
Data Hold Function : Data hold for measurement
Memory Function : Max. Memory Data 200
Auto Power Off : Automatically power off in 10min after the final key operation
Bluetooth Connection : Bluetooth4.2 Class2

5 . 6 GENERAL SPECIFICATION

Power Supply : AA alkaline batteries LR6 × 4
AC adaptor UNI315-0916 (option)
Limitation of Circuit Voltage : less than AC 500V
Operation Temperature : 0 ℃～ 40 ℃ , less than 85%RH (non-condensing)
Storage Temperature : -10 ℃～ 60 ℃ , less than 80%RH(non-condensing)
Withstanding Voltage (50Hz / 60Hz 、1 mintute) : AC 3700V, between CT core & handle (φ34)
AC 2200V, between CT core & handle(φ80 : option)
AC 2300V, between Power supply & case
Insulation Resistance : DC 500V-100 MΩ between CT core & handle
φ 34 , φ 80
DC 500V - 50 MΩ between Power supply & case
Power Consumption : Approx.160 mA When battery voltage 6V(Earth resistance measurement)

Size & Weight : 190 (W) × 140 (H) × 42 (D) mm, approx. 450g (only main body, not including battery)

Accessories : Carring Case ・・・・・・・・・・・・・・・・・・・1
Detection CT (φ 34) ・・・・・・・・・・・・・・・・・1
Injection CT (φ 34) ・・・・・・・・・・・・・・・・・1
Subsidiary Lead wire ・・・・・・・・・・・・・・・・・1
AA alkaline batteries LR6 ・・・・・・・・・・・・・・4
Manual ・・・・・・・・・・・・・・・・・・・・・・・・1
Option : Detection CT (φ 80), Injection CT (φ 80), Shield for Injection CT, AC adaptor(UNI315-0916)

6. Q & A

Q：「Pressing Power switch , it does not display the screen 」
A：「 Do you still have battery, battery voltage? Please check the battery. The Contrast on LCD is fading ? If so, please adjust Contrast. 」

Q：「 Measuring at high range,OVER is appeared after measuring at low range automatically. 」
A：「The instrument measures the ground resistance ,injecting to electrical circuit ,sweeping freaquency 4kHz to 200kHz. It is the state it can not measure because of a lot of the frequency injected and the same noise .」

Q：「 The value of ground resistance is too low (reached to 0 Ω) 」
A：「 When metal loop by steel frame and the loop happens between line and line, the low value is displayed(0Ω). Please change where to clamp and clamp the part close to the earth electrode. 」

Q：「 The value of ground resistance is too high (OVER displayed) 」
A：「 Over is displayed because the electric circuit is short and it does not resonate due to small amount of LC. Please connect the ground phase of the near outlet with the ground , ground wire of T/T system to the ground wire to measure with the auxiliary wire.」

Q：「 Is it ok to line up 2 clamps ? 」
A：「 It is ok to line up CTs(φ 34). Using the option CT (φ 80) , please keep the distance(80 cm). If you can not keep that distance on site, you needs the option, the sheild for Injection CT」

7. REPAIR SERVICE

When requesting for repair service, please bring the instrument directly to the dealer where you bought. When mailing the instrument, always pack it in its original or equivalent packing materials to avoid any damage during the transportation and also put together with documents showing your name, address, phone number and defect point.

8. WARRANTY

This instrument is sent out from our factory after the sufficient internal inspections but if you find any defect due to the fault in our workmanship or the original parts, please contact the dealer where you bought the instrument.