Io/Ior CLAMP LEAKER

MCL-500IRV

INSTRUCTION MANUAL

Thank you very much for selecting our Io/Ior clamp leaker model MCL-500IRV.

This model is complex instrument and employs a very reliable mechanical/electronic design.

Before you use your new instrument, read this instruction manual completely and familiarize yourself thoroughly with all functions and keep this instruction manual carefully to take out whenever you need.

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SAFETY SUMMARY observe by all means

- To use this instrument safely, read this “SAFETY SUMMARY” carefully and apply the instrument correctly.
- The CAUTIONs and WARNINGs which appear on the following pages are stated to prevent the operator & other people from the dangers and their properties from the damages beforehand.

⚠ WARNING : This symbol indicates the contents "Possibilities of the death or the serious wound can be supposed" caused from mis-operations.

⚠ CAUTION : This symbol indicates the contents "Possibilities of the injury or only the material damage can be supposed" caused from mis-operations.

⚠ WARNING

POSSIBLE ELECTRICAL SHOCK

- This instrument is for the use of low voltage circuit.
- Do not make measurements in the circuit more than AC 600V.
  Before use, check and confirm the voltage of circuit to be measured.
- Apply only the coated cables and do not clamp the 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 the battery cover is off, do not operate this instrument.
- Do not give a shock to the tip of CT.
- Do not disassemble this instrument.
- Replace the batteries after took off test probe, etc. from the circuit.

SPECIFICATIONS

1. CURRENT DETECTION ZCT

Inside diameter	: Φ40mm
Method	: Split core type ZCT
Withstanding voltage	: AC 2200V/1 minute between CT core and grip

2. MEASURING PART

Measuring function	: Leakage current (Io), Line current (I), Resistive leakage current (Ior), AC Voltage (V)
Measuring method	: Clamp CT (in case of Ior, based on voltage standard to be inputted directly or by non-contact voltage sensor)
Measuring range	: Io, Ior: 40mA/400mA/4A I: 40mA/400mA/4A/40A/500A V: 500V
Input frequency range	: 50Hz/60Hz (auto)
AC current detection	: I,Io,V: True RMS by analog operation Ior: RMS by synchronous dual integration mode
AD conversion	: Successive approximation method
Display change	: By rotary switch
Display	: LCD, max.9999 reading with annunciator
Data hold indication	: "DH" mark on LCD
Sampling rate	: 2 times/sec.
Overrange indication	: "OL" mark on LCD
Low battery indication	: "B" mark on LCD
Auto power off	:Approx. 10 minutes after power on
Filter/V Input Switch	:When pressing this switch once at I, Io current measurement, "FL" mark on LCD and high frequencies are cut off. By pressing once again, this function will be released. In case of Ior measurement, this switch is ineffective. By pressing this switch at Ior measurement, "Direct Voltage Input" or "Non-contact Voltage Input" can be selected. [Ld] mark on the right upper side of display means direct voltage input and [no] display shows non-contact voltage input.
Ior Switch	: In case of measuring Ior current, press this switch and then, set the circuit condition to be measured by Ior SELECT switch.
Circuit voltage	: less than 600V (isolated wire)
Operating temperature	: 0~40°C < 85%RH (without condensation)
Storage temperature	: −10～60 °C < 70%RH (without condensation)
Consumption current	: 13mA (approx. 48h for continuous use)
Power supply	: AAA alkali battery LR03 × 3
Dimension/Weight	: 70(W) × 223(H) × 34(D)mm, approx. 440g
Accessories	: Battery LR-03 (installed into the instrument)/3pcs. Carrying Case/1pce., Instruction Manual/1pce. Test Lead for direct voltage input/1set Non-contact voltage input sensor/1pce.

Accuracy (23 °C±5 °C, less than 85%RH)

Leakage current (Io), Line current (I), Resistive leakage current (Ior), Voltage (V)

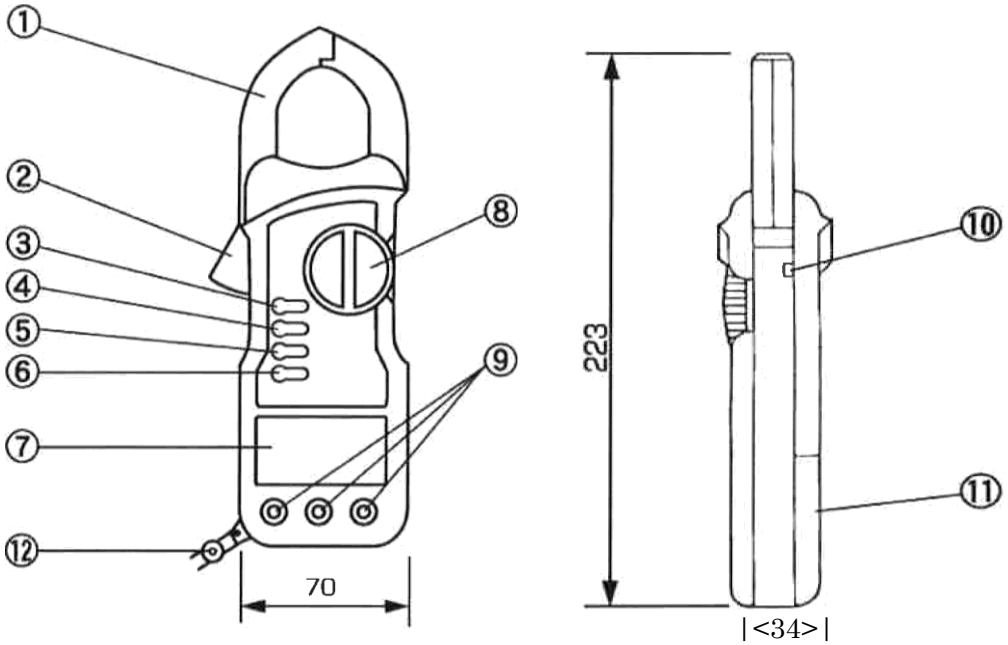
Range		Resolution	Display	Accuracy
I, Io	40mA	0.01mA	0.40mA~39.99mA	±1.0%rdg±10dgt
	400mA	0.1mA	40.0mA~399.9mA	±1.0%rdg±10dgt
	4A	0.001A	0.4A~3.999A	±1.0%rdg±10dgt
	40A	0.01A	4.0A~39.99A	±1.0%rdg±10dgt
	500A	0.1A	40.0A~499.9A	±1.0%rdg±3.0%FS
Ior (direct)	40mA	0.01mA	0.40mA~39.99mA	±1.5%rdg±15dgt
	400mA	0.1mA	4.0mA~399.9mA	±1.2%rdg±15dgt
	4A	0.001A	0.04A~3.999A	±1.2%rdg±15dgt
Ior (non-contact)	40mA	0.01mA	0.40mA~3.99mA	±3.0%rdg±20dgt
			4.00mA~39.99mA	±1.5%rdg±15dgt
	400mA	0.1mA	4.0mA~39.9mA	±3.0%rdg±20dgt
			40.0mA~399.9mA	±1.5%rdg±15dgt
	4A	0.001A	0.040A~0.399A	±3.0%rdg±20dgt
			0.400A~3.999A	±1.5%rdg±15dgt
V	500V	0.1V	10.0V~499.9V	±1.0%rdg±8dgt

※ The conductor must be located at the center of CT.
※ Input voltage for Ior measurement.

※ The accuracy of Ior is based on the phase angle with 0° between the voltage and current at the standard voltage of AC100V in case of single phase. In case of 3P/3W, it is based on the phase angle with 300° between the voltage and current at △wiring and the standard voltage of AC200V.
※ The accuracy of non-contact Ior is based on the inputted voltage by standard non-contact voltage sensor.

※ At each range, the value less than 9 count becomes "0" display compulsively (zero suppression).
※ The specifications, dimensions, etc. subject to change due to product improvement, etc.

NAME OF EACH PART AND EXPLANATION



① Clamp Type ZCT : Sensor for detecting current and clamp method.

② Open/Close Lever : CT will open by pushing this lever to inside.

③ Power Switch (POWER) : By pressing this switch, the power becomes on and pressing once again, power off.

④ Ior SELECT Switch : Setting for single phase or 3 phase/3 wires (200V). By pressing this switch, [1 ϕ] lightens on LCD in case of single phase and [Δ] on display in case of 3 phase/3 wires.

⑤ FILTER/V Input Switch : By pressing this switch at I. Io current measurement, [FL] mark on the display and high frequencies will be cut off. By pressing once more, this function will be released. In case of Ior measurement, this function is ineffective.

By pressing this switch at Ior measurement, direct voltage input or non-contact voltage input can be selected.
In case of [Ld] mark on the right upper side on display, direct input is selected and in case of [no] mark on display, non-

⑥ Ior Switch : For Ior current measurement, press this switch once and set the circuit condition to be measured by pressing Ior SELECT Switch.

⑦ LCD Display : Display of measured values, measuring conditions, battery situation, etc.

⑧ Range Switch : Switch for current & voltage range (40mA, 400mA, 4A, 40A, 500A, 500V).

⑨ Voltage Input Terminal (Red, Black, Green) : Red & Black terminals for voltage measurement and direct voltage input for measurement of resistive leakage current (Ior).
For the measurement of line voltage, set the range switch to 500V. (voltage measurement is unable by non-contact voltage input sensor).
For Ior current measurement, connect red terminal to V1 and black terminal to N in case of single phase.
In case of 3 phase/3 wires, connect red terminal to R phase and black to T phase.
In details of wiring on Ior leakage current measurement, refer to each [Wiring Method].

⑩ Data Hold (D-HOLD) : By pressing one time, DH (Data Hold) on LCD and it will be released by pressing one more time.

⑪ Battery Cover (the reverse side) : Remove this cover to replace the batteries.

⑫ Hand Strap : During measurement, avoid to fall down the instrument by using this strap.

REPLACEMENT OF BATTERIES

⚠ WARNING

POSSIBLE ELECTRICAL SHOCK OR ACCIDENT

- Do not replace the batteries under the conditions of clamping CT to the conductor and inputting voltage to the terminals.
- Do not operate the instrument with battery cover off.

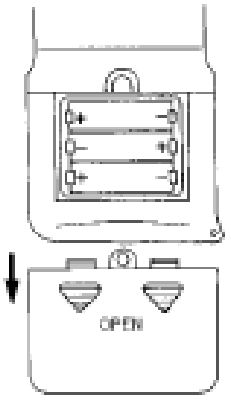
⚠ CAUTION

When not using the instrument for a long period, remove the batteries and keep separately. The batteries may leak and may cause damage to the instrument.

- 「B」sign will appear on the display when batteries are exhausted and get less than operation voltage. Replace to new batteries immediately.
- Do not use the batteries mixed new one and once used and or different kind ones.

〔How to replace the batteries〕

- Remove the screw fixing battery cover at the bottom of rear case by + driver and slide & remove the battery cover to the direction of arrow mark.
- Pick up the exhausted batteries.
- Confirm the polarities and put the new batteries.
- Replace the battery cover to the original position and fix screw by driver.



MEASUREMENT

For the safety operation, keep and pay attention to the cautions and warnings stated in this manual.

⚠ WARNING

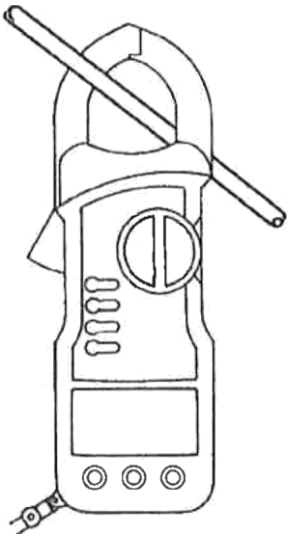
POSSIBLE ELECTRICAL SHOCK

- This instrument is for the use of low voltage circuit.
  Do not make measurements in the circuit more than AC 600V.
  Before use, check and confirm the voltage of circuit to be measured.

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.
- Do not use the instrument, leaving the battery cover off.
- If excessive current is applied to the CT, the instrument will be heated and damaged. Do not apply more than 50Arms to the CT part.
- Do not apply more than AC500V to the voltage input terminals.

(1) Line Current Measurement



1) Press POWER ③ switch once.
2) Set the measuring range by Range Switch ⑧.
   (In case of current ranges, choose larger range than expected).
3) Open clamp jaw and clamp ZCT to the conductor to be measured and close CT completely.
4) Read the displayed value (in case of over range, 「ＯＬ」 mark on display).
   In the place where hardly can read the display, use data hold function.
5) In order to cut high frequencies, press FILTER Switch ⑤.

NOTE:

- For line current measurement, clamp CT to one conductor. In case of clamping CT to cabtyre cable, parallel line, etc. in a lump, line current cannot be measured.
- The power will become automatically off approx. 10 minutes after the switch operation due to auto power off function.
- Measurement of line current cannot be done on Ior current mode.

(2) Leakage Current Measurement

1) Measurement at grounding line
   Do the same method as for line current measurement.

2) Measurement for other circuit except for grounding line
   The operations are the same as for line current but clamp CT to 2 wires en bloc in case of single phase and 3 wires en bloc in case of 3 phase.

(3) Voltage Measurement (500V Range)

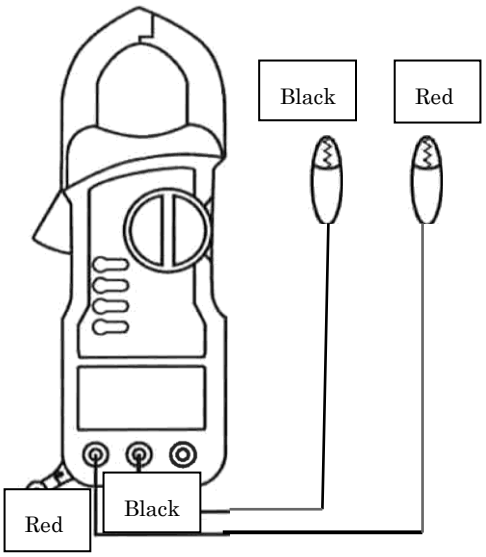
1) Press POWER switch ③ once.

2) Set the range switch to 500V.

3) Insert the test leads into the voltage input terminals ⑨ (Red & Black).

4) Connect the test lead clips to the circuit to be measured.

5) Read the displayed value.



⚠ WARNING

- Do not apply the voltage more than 500V AC to the voltage input terminals (~VINPUT). It may cause breakage

POSSIBLE ELECTRICAL SHOCK

- Measuring test leads are consumable articles. Confirm there is no damage at insulation coating of the wire before use. When having found unusual point, stop the use and repair or replace to the new one.

POSSIBLE BURNING & WOUND

- Connect the lead wires correctly & firmly.
  It may cause spark by mis-connection.

(4) Resistive Leakage Current (Ior) Measurement

ATTENTION FOR MEASUREMENT

* The range of Ior is connected with ~A range. Firstly, measure Io current at ~A range and then, measure Ior current at the same range. (In case of Io value at 40mA range, measure Ior at 40mA range. In case of Io value at 400mA range, measure Ior at 400mA range).
  Max. measurable Ior current is 4A. In case of Ior current value more than 4A, it is not reliable even getting some measured value.

* For direct voltage input, connect R phase to Red terminal and T phase to Black terminal in case of 3 phase/3 wires (Δ wiring method). Set measuring mode to 3φ and Δ mark will be on the display. In case of single phase/3 wires, connect V1 to Red terminal and N to Black terminal. In case of single phase, input AC 100V.

* For voltage input by non-contact voltage input sensor, connect cord plugs of sensor to the same color voltage input terminals ⑨ of the instrument body.
  In case of 3 phase/3 wires (Δ wiring method), connect Red clip to R phase and White clip to T phase (Δ mark will be on the display by measuring mode 3φ).
  In case of single phase/3 wires, connect V1 to Red terminal and N to Black terminal. In case of single phase, input AC 100V.

* When inputting voltage by non-contact sensor, the phase angle is taken via electrostatic capacity of the coated wires to be measured. In case of not putting the clip part of sensor to the wires firmly, the measured values may get unstable and may indicate unusual. Also, in case of bending coated wires, the clip sensors cannot touch them completely. Apply the clip sensor to the straight part of wires as much as possible.

* In case of Ior measurement, the instrument is looking for phase angles of current and voltage. Set the CT direction correctly and make measurement accurately.

*This instrument is making measurement on live line condition and the measured value may differ from the result measured by ordinary insulation resistance testers.

WARNING

- Do not apply the voltage more than 500V AC to the voltage input terminals (~VINPUT). It may cause breakage

POSSIBLE ELECTRICAL SHOCK

- Measuring test leads are consumable articles. Confirm there is no damage at insulation coating of the wire before use. When having found unusual point, stop the use and repair or replace to the new one.

POSSIBLE BURNING & WOUND

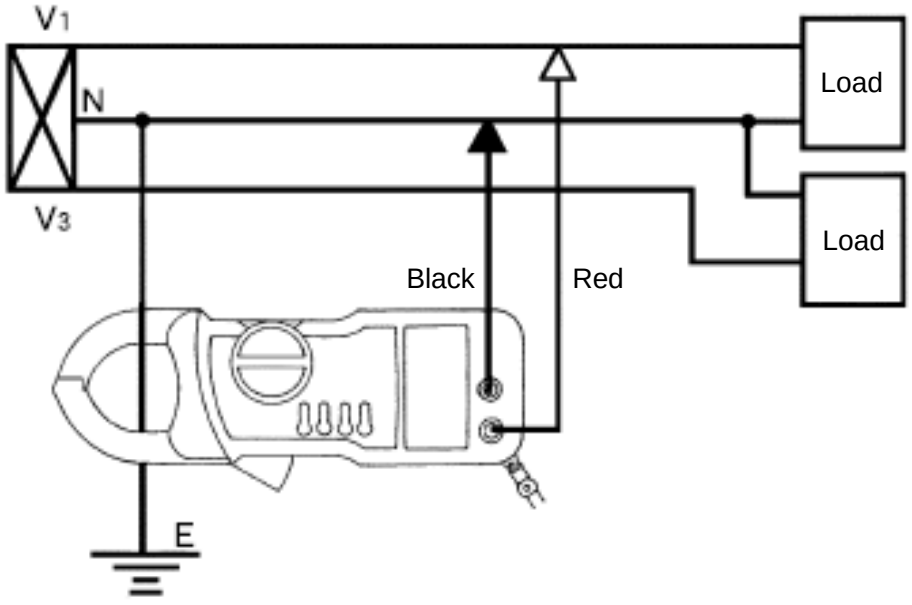
- Connect the lead wires correctly & firmly.
  It may cause spark by mis-connection.

1) Press POWER switch ③ once.
2) Insert the equipped test leads for direct input or non-contact voltage input sensor to the voltage input terminals ⑨ (Red, Black, Green) according to the colors of each lead.
3) Input the voltage and current according to the circuit to be measured. As to details, refer to wiring method as under.
4) Select the appropriate current range by Range Switch and press Ior Switch ⑥ once. (Measure Io & Ior current at the same range. In case of 40mA range of Io current, measure Ior at 40mA range. Max. measurable Ior value is 4A).
5) Select single phase or 3 phase/3 wires circuit by Ior SELECT Switch ④. By pressing this switch one time, the condition will be changed. In case of single phase, [1 ϕ] will be displayed on LCD and [Δ] will be on LCD in case of 3 phase/3 wires.
6) Read the displayed value.

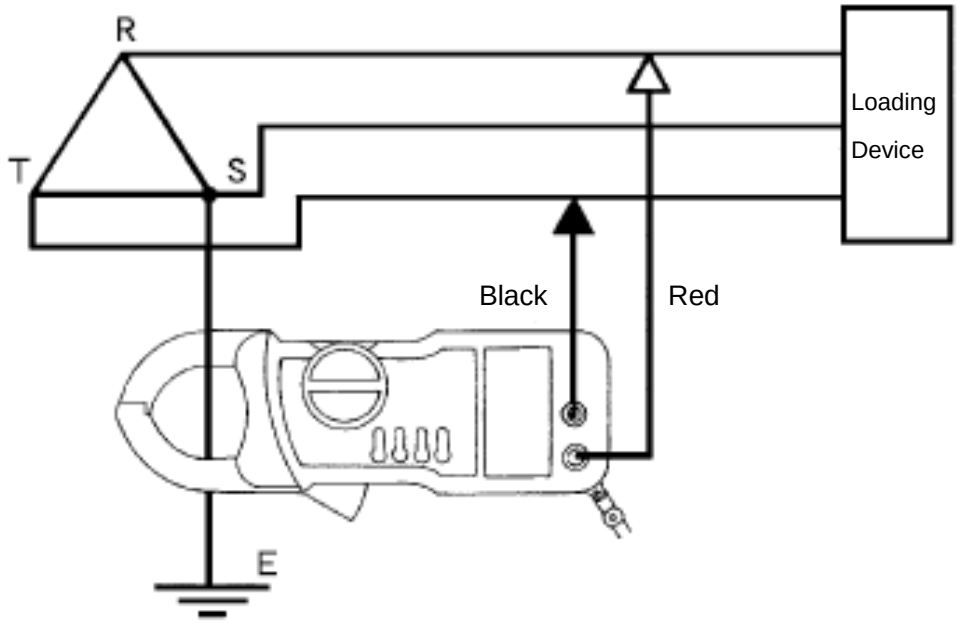
- Use Data Hold function ⑩ when the displayed value can be hardly read.

(Wiring Method of Direct Voltage Input Leads)

In case of Single Phase/3 Wires (Measuring Mode 1 ϕ) [Ld] on display

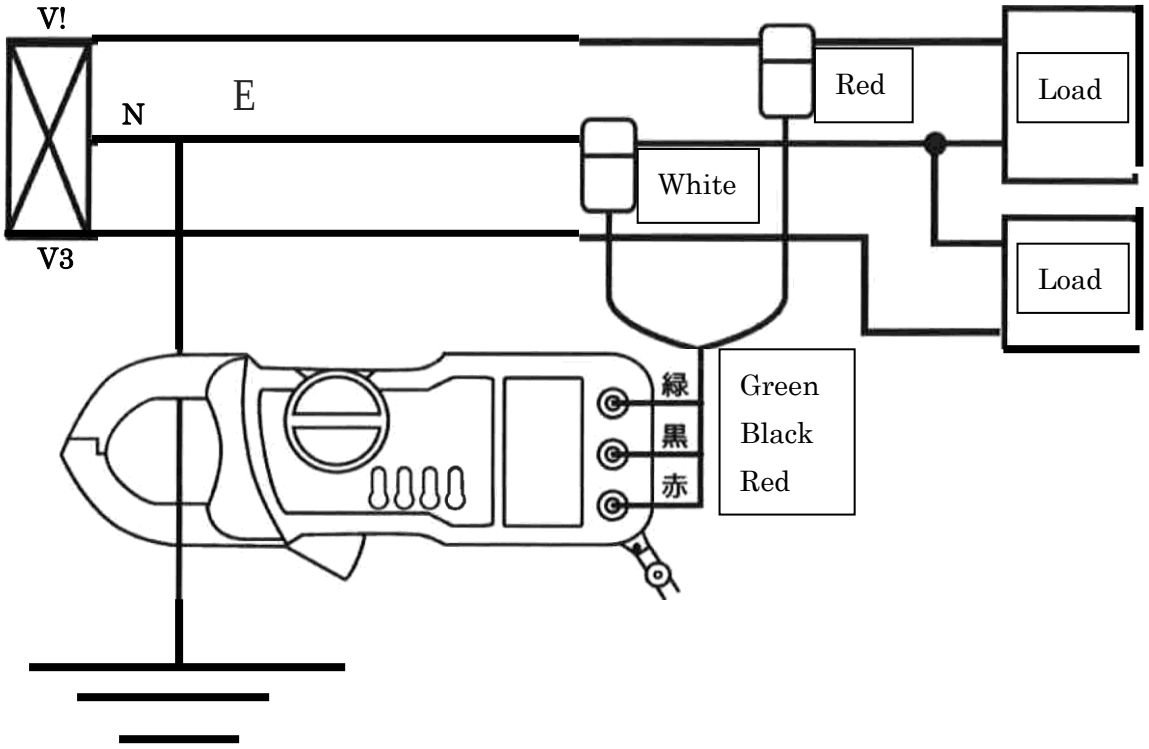


In case of 3 Phase/3 Wires　(Measuring Mode: Δ)　[Ld] on display

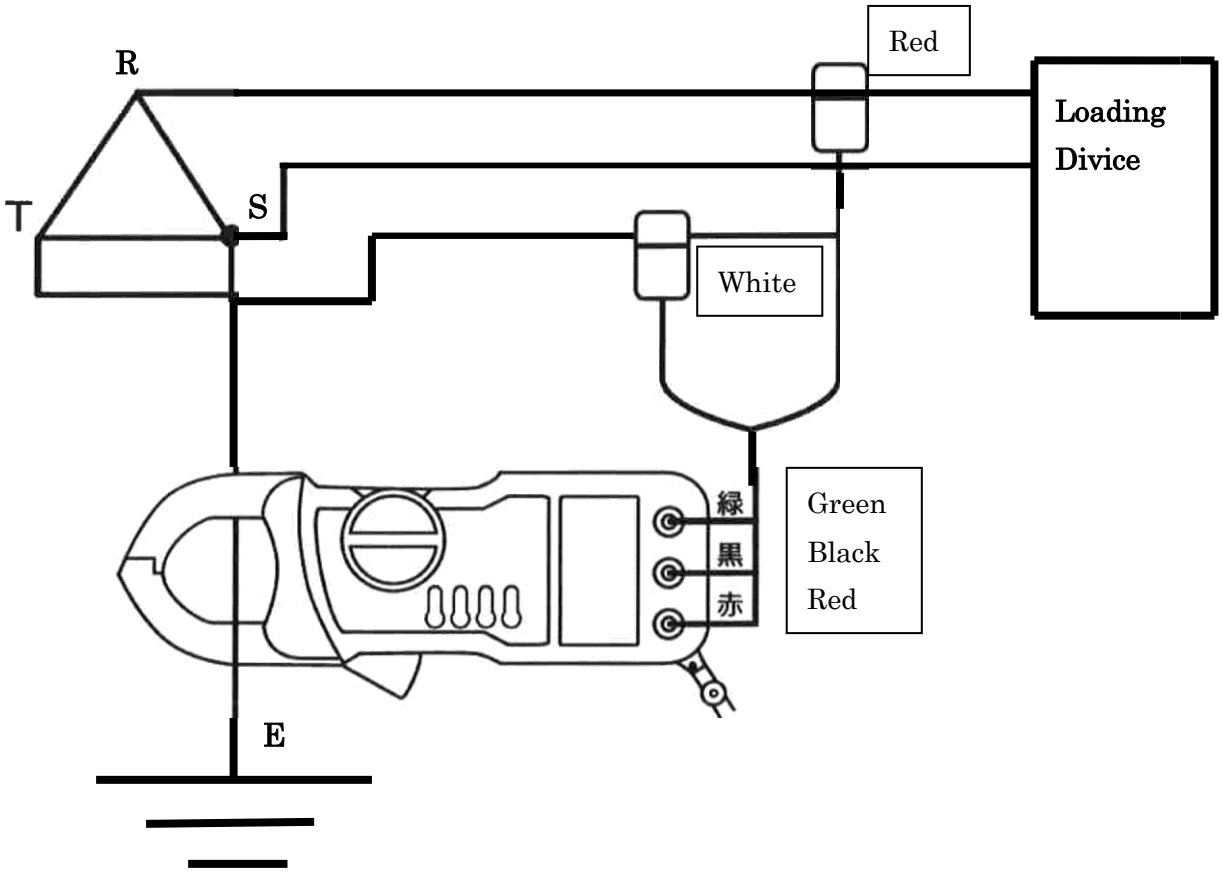


(Wiring Method of Non-contact Voltage Input Sensor)

In case of Single Phase/3 Wires　(Measuring Mode 1 ϕ)　[no] on display



In case of 3 Phase/3 Wires　(Measuring Mode: Δ)　[no] on display



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.

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.

The warranty period is 12 months from the date of purchase and the instrument shall be repaired at free of charge, provided that we judge the cause of defect is obviously resulted from our responsibility.

GURANTEE REGULATIONS

1.This instrument is warranted for the operation under normal use for 12 months from the date of purchase.
2.This warranty does not cover the following defects:
  a. Defect caused from the improper use and operation.
  b. Defect caused from the use, operation and storage beyond the original specifications, designs and conditions.
  c. Defect caused from the renovations or repairs done by someone else than us or our representatives.
  d. Defect not caused from our responsibility.