

Io/Ior CLAMP LEAKER

MCL-800IRV

INSTRUCTION MANUAL

Thank you very much for selecting our Io/Ior clamp leaker model MCL-800IRV.

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.

MULTI MEASURING INSTRUMENTS CO.,LTD.
Akihabara Murai Bldg., 7F, 1-26 Kanda Sakuma-cho,
Chiyoda-ku, Tokyo, 101-0025 Japan
TEL : 81-3-3251-7013 FAX : 81-3-3253-4278
Home Page : <http://www.multimic.com/>
E-mail : multi@multimic.com

- 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 | : Φ 80mm |
| 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), Insulation resistance (M Ω) [calculated value] |
| Measuring method | : Current: by clamp CT (in case of Ior, based on voltage standard to be inputted directly or by non- contact voltage sensor) Voltage: by direct voltage input probe |
| Measuring range | : Io, I: 0~10A 4 range auto with min. resolution 0.001mA Ior: 0~10A 4 range auto with min. resolution 0.001mA V: 10V~500V 1 range with min. resolution 0.1V M Ω : calculated by voltage and current values |
| Input frequency range | : 50Hz/60Hz (manual change) |
| AC current detection | : Dual integration method |
| AD conversion | : Successive approximation method |
| Display change | : By tact switch |
| Display | : LCD, max.9999 reading with annunciator |
| Data hold indication | : "DH" mark on LCD |
| Sampling rate | : 2 times/sec. |
| Over range indication | : "OL" mark on LCD |
| Low battery indication | : "B" mark on LCD |
| Auto power off | : Approx. 10 minutes after power on |
| Circuit voltage | : less than 600V (isolated wire) |
| Operating temperature | : 0~50°C < 85%RH (without condensation) |
| Storage temperature | : -10~60 °C < 80%RH (without condensation) |
| Withstanding Voltage | : AC2000V/1minute between CT and grip part |
| Consumption current | : 14mA (approx. 48h for continuous use) |
| Power supply | : AAA alkali battery LR03 \times 3 |
| Dimension/Weight | : 71(W) \times 315.3(H) \times 37(D)mm, approx. 750g |
| 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. |

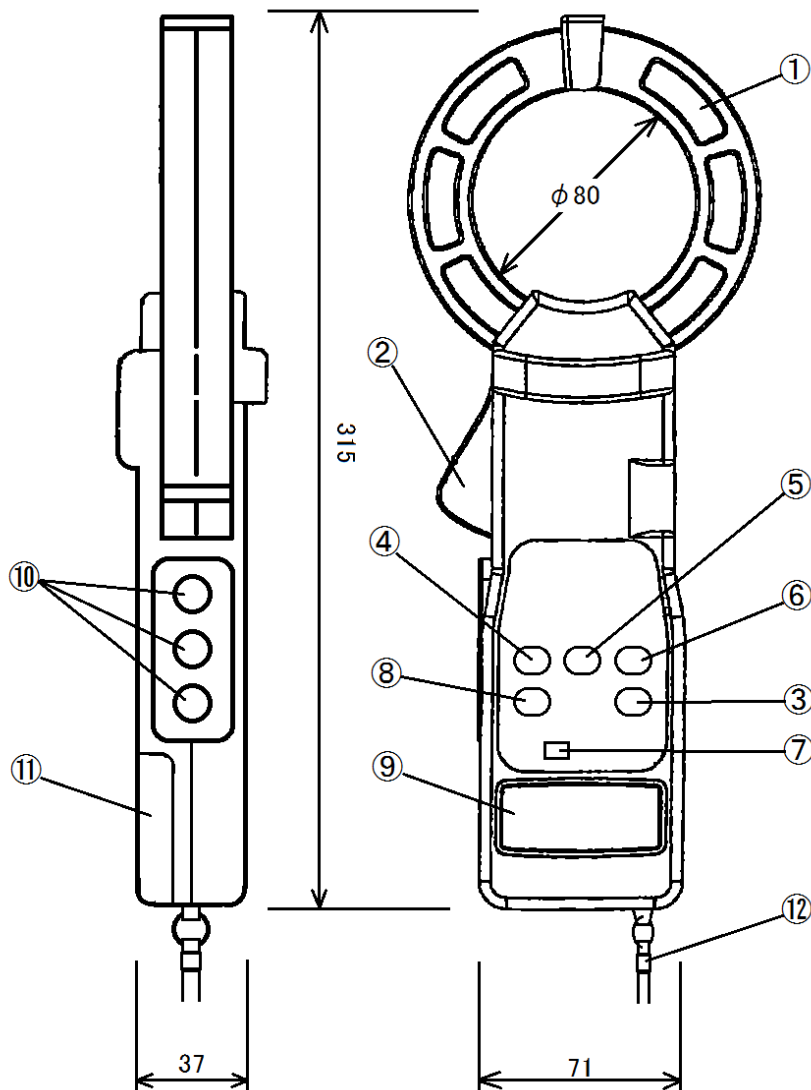
Accuracy (23°C±5°C, less than 85%RH)

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

| | Range | Resolution | Display | Accuracy |
|---|--------|---------------|-----------------|----------------|
| I, Io | 10mA | 0.001mA | 0.010mA~9.999mA | ±1.0%rdg±10dgt |
| | 100mA | 0.01mA | 10.00mA~99.99mA | |
| | 1000mA | 0.1mA | 100.0mA~999.9mA | |
| | 10A | 0.001A | 1.000A~9.999A | |
| Ior (direct) | 10mA | 0.001mA | 0.010mA~9.999mA | ±1.5%rdg±20dgt |
| | 100mA | 0.01mA | 10.00mA~99.99mA | ±1.5%rdg±15dgt |
| | 1000mA | 0.1mA | 100.0mA~999.9mA | |
| | 10A | 0.001A | 1.000A~9.999A | |
| Ior (non contact) Single Phase | 10mA | 0.001mA | 0.010mA~9.999mA | ±2.0%rdg±20dgt |
| | 100mA | 0.01mA | 10.00mA~99.99mA | ±2.0%rdg±15dgt |
| | 1000mA | 0.1mA | 100.0mA~999.9mA | |
| | 10A | 0.001A | 1.000A~9.999A | |
| Ior (non contact) Three Phase | 10mA | 0.001mA | 0.500mA~4.999mA | ±3.0%rdg±40dgt |
| | | | 5.000mA~9.999mA | ±2.0%rdg±15dgt |
| | 100mA | 0.01mA | 10.00mA~99.99mA | ±2.0%rdg±15dgt |
| | 1000mA | 0.1mA | 100.0mA~999.9mA | |
| 10A | 0.001A | 1.000A~9.999A | | |
| V | 500V | 0.1V | 10.0V~499.9V | ±1.0%rdg±8dgt |

- ※ The conductor must be located at the center of CT.
- ※ Set the frequency of power to be measured by frequency range switch ⑦.
- ※ 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 Δwiring and the standard voltage of AC200V.
- ※ The accuracy of non-contact Ior is based on the inputted voltage by standard non-contact voltage sensor.
- ※ During the measurement of Ior by non-contact sensor, the phase is taken via electrostatic capacity and the plugs (Red, Green, Black) of voltage input terminal ⑩ are tending to receive induction. Keep handing the instrument away from the voltage input terminal as much as possible.
- ※ The insulation resistance values are calculated by the formula of voltage and current (Ior).
- ※ Io and Ior ranges are auto but they can be changed to manual, in case of hardly reading the displayed values due to sharply fluctuating current to be measured. Refer to “5. Change of Current & Voltage Ranges” in this manual.

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 Voltage Select Switch (\sim V) : When the voltage input mode is direct input, the voltage value will be displayed by pressing this switch (in case of non-contact voltage input, the measured value will become [----] and the voltage measurement is not available).

When measuring Ior, the voltage input mode can be changed (direct input or non-contact input) by operation in the combination with ⑧ Data Hold Switch.

As to the operation method, refer to “5. Change of Current & Voltage Ranges” in this manual.

- ⑤ **Current Range Select Switch:** When power switch on, the display is for Ior current measurement. By pressing this switch once, the display becomes Ior of single phase (1ϕ /Ior). By pressing once again, the display becomes Ior of Δ three phase (Δ /Ior) and by pressing further once, the display becomes Ior of Y three phase (Y/Ior). Set this switch correctly according to the circuit to be measured.
- When measuring Ior, the current range can be changed by operation in the combination with ⑧ Data Hold Switch. As to the operation method, refer to “5. Change of Current & Voltage Ranges” in this manual.
- ⑥ **Insulation Resistance Select Switch ($M\Omega$)** : By pressing this switch, the insulation resistance value will be displayed by the calculation of voltage & Ior values. For this measurement, the direct voltage input mode is used. In case of non-contact voltage input, the display become [---] and the insulation measurement cannot be done in this method. Make circuit setting correctly (Press once is for $\phi 1$, twice is for Δ and three times is for Y).
- ⑦ **Frequency Select Switch** : Set the frequency of power supply to be measured.
- ⑧ **Data Hold (D-HOLD)** : By pressing one time, DH (Data Hold) on LCD and it will be released by pressing one more time.
- ⑨ **Liquid Crystal Display (LCD):** Showing measured value, measuring mode and battery condition on the display.
- ⑩ **Voltage Input Terminal (Red, White, Black)** : Voltage input terminals for line voltage measurement (500V range) and for resistive leakage current (Ior) measurement. For the measurement of line voltage, set the voltage input mode to direct and use the direct voltage input probe (voltage measurement is unable by non-contact voltage input sensor). For Ior current measurement, change the voltage input mode by operation in the combination with ⑧ Data Hold Switch. As to the operation method, refer to “5. Change of Current & Voltage Ranges” in this manual. In details of wiring on Ior leakage current measurement, refer to each [Wiring Method].
- 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.

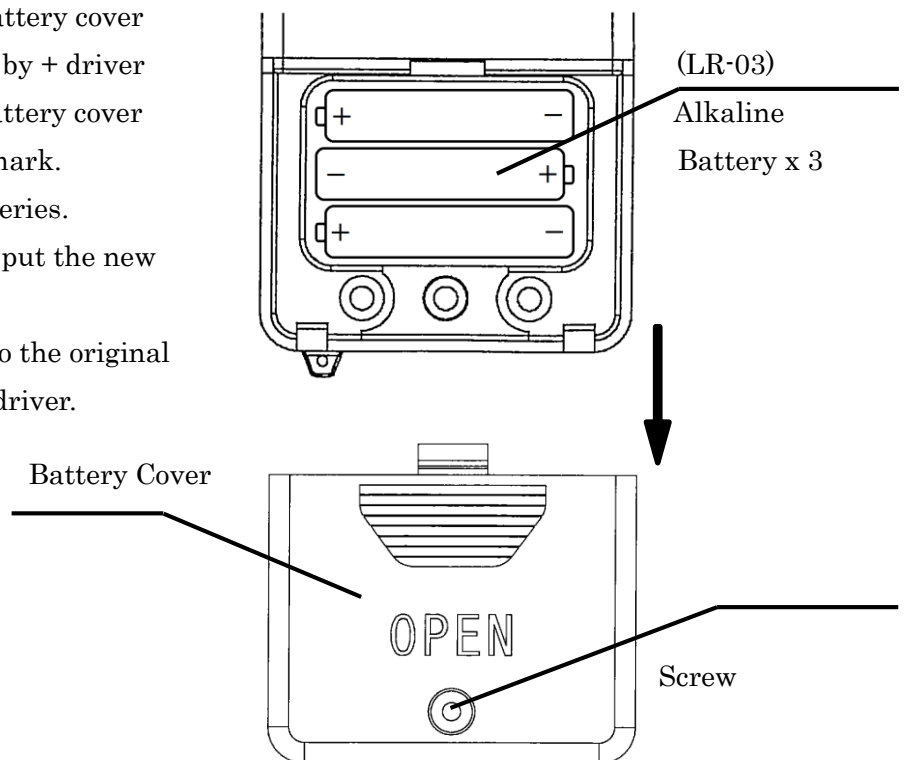
⚠ CAUTION

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

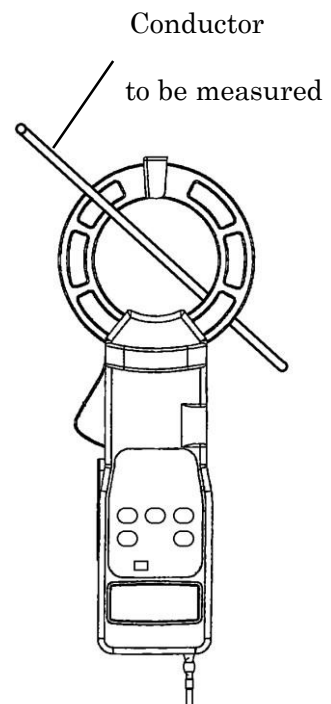
- Do not handle the instrument in the rain, at humid place, with a drop of water and or with wet hands.
- Do not use the instrument if the CT or CT case are damaged and if something is wrong with the CT cables.
- Do not use the instrument, leaving the battery cover off.
- If excessive current is applied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

(NOTE: At Ior range, the display value will not become 0 even in case of zero input but it is not malfunction).

(1) Line Current Measurement

- 1) Press POWER ③ switch once. All displays appear and then, range becomes I_o current measurement.(auto range).
- 2) Set the frequency by ⑦ Frequency Select Switch to be measured.
- 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, 「O L」 mark on display).

In the place where hardly can read the display, use data hold function.



NOTE:

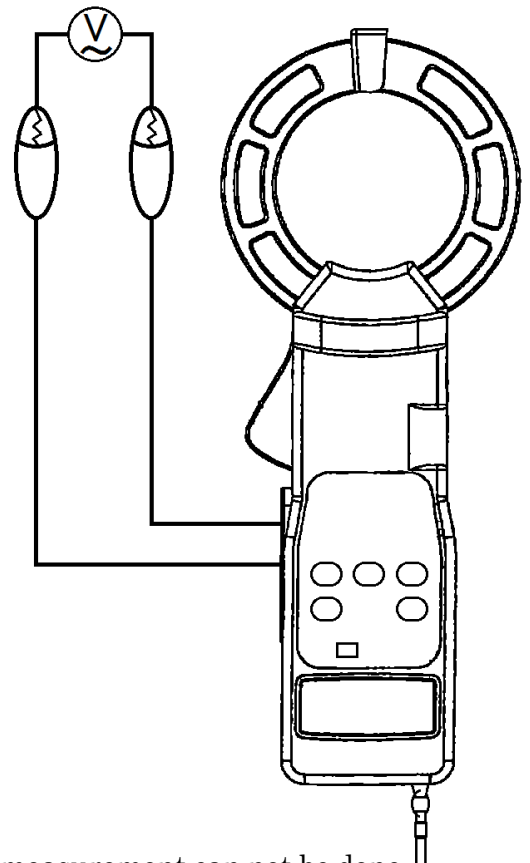
- The power will become automatically off approx. 10 minutes after the switch operation due to auto power off function.
- Measurement of line current cannot be done on I_{or} current mode.
- The current range of this instrument is auto but it can be changed to manual when the appropriate range cannot be fixed. As to the operation, refer to “5. Current Range Change” in this manual.

(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. All displays appear and then, range becomes I_o current measurement.
- 2) Press ④ Voltage Select Switch once.
Display becomes voltage (measuring mode 1 ϕ /I_{or}).
- 3) Set the frequency to the power supply voltage to be measured by ⑦ Frequency Select Switch.
- 4) Make voltage input mode to [L] direct voltage input.
- 5) Insert the test leads into the voltage input terminals ⑩ (Red & White).
- 6) Connect the test lead clips to the circuit to be measured.
- 3) Read the displayed value.



*When voltage input mode is non-contact, the voltage measurement can not be done.
As to the operation of voltage input mode, refer to “5. Voltage Input Change” in this manual.

⚠ 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 direct voltage input lead wires correctly & firmly. It may cause spark by mis-connection.

(4) Resistive Leakage Current (I_{or}) & Insulation Resistance (M Ω) Measurements

ATTENTION FOR MEASUREMENT

- * This instrument is making measurement on live line condition and the measured value may differ from the result measured by ordinary insulation resistance testers.
- * For insulation resistance measurement, the voltage input method is different in case of single phase, 3 phase/3 wires & 3 phase/4 wires. Refer to wiring methods and use the instrument correctly.
- * In case of I_{or} (M Ω) measurement, the instrument is looking for phase angles of current and voltage. Pay full attention to the wiring method. Also, in case of wrong setting of frequency, the phase angle will be changed and accurate measurement cannot be done. Make frequency setting correctly.
- * 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.

WARNING

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

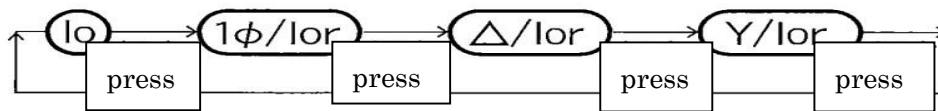
POSSIBLE ELECTRICAL SHOCK

- 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.

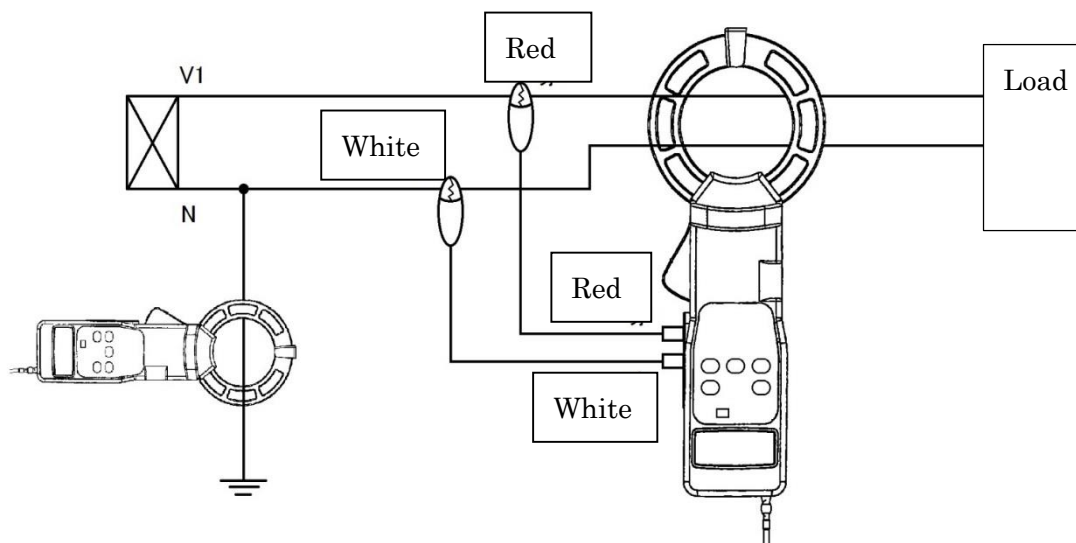
- 1) Press POWER switch ③ once. Display becomes I_o current.
- 2) Set the power supply frequency to be measured by ⑦ Frequency Select Switch.
- 3) Insert the equipped test leads for direct input or non-contact voltage input sensor to the voltage input terminals ⑩ according to the colors of each lead. As to the operation of voltage input mode (direct input or non-contact input), Refer to “5. Voltage Input Change” in this manual.
- 4) Input the voltage and current according to the circuit to be measured. As to details, refer to wiring method as under.
- 5) Check the I_o current display and press Voltage Select Switch ④ once to confirm if the voltage is inputted correctly. Press Current Select Switch ⑤ and set I_{or} circuit mode. Read the displayed value.
The circuit mode will be changed by pressing Current Select Switch ⑤ in the following manner:



- 6) To measure insulation resistance (MΩ), press Insulation Resistance Select Switch ⑥. The display becomes [OL] in case of no voltage input. In case of non-contact voltage input mode, the display becomes [----] and the measurement cannot be done.
 - Use Data Hold function ⑩ when the displayed value can be hardly read.

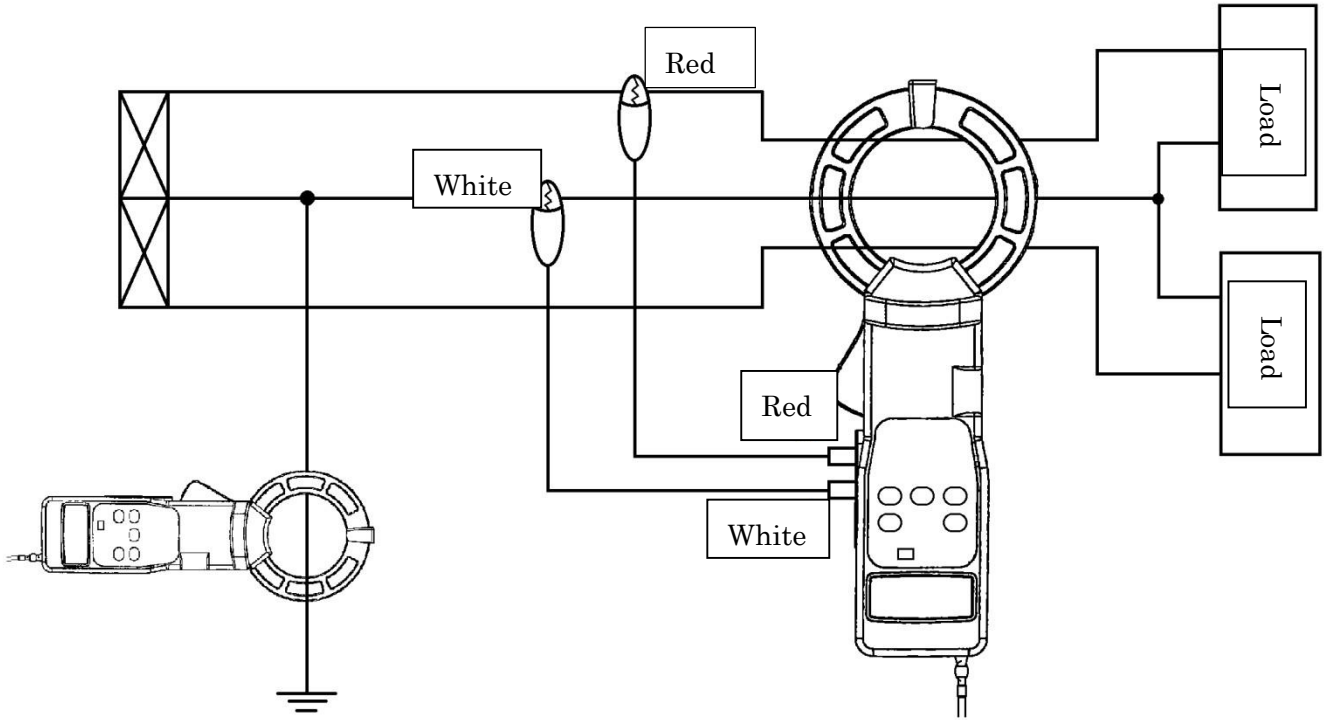
Wiring Method of Direct Voltage Input Leads

a. In case of Single Phase/2 Wires Measuring Mode 1 φ /I_{or} [L] on display



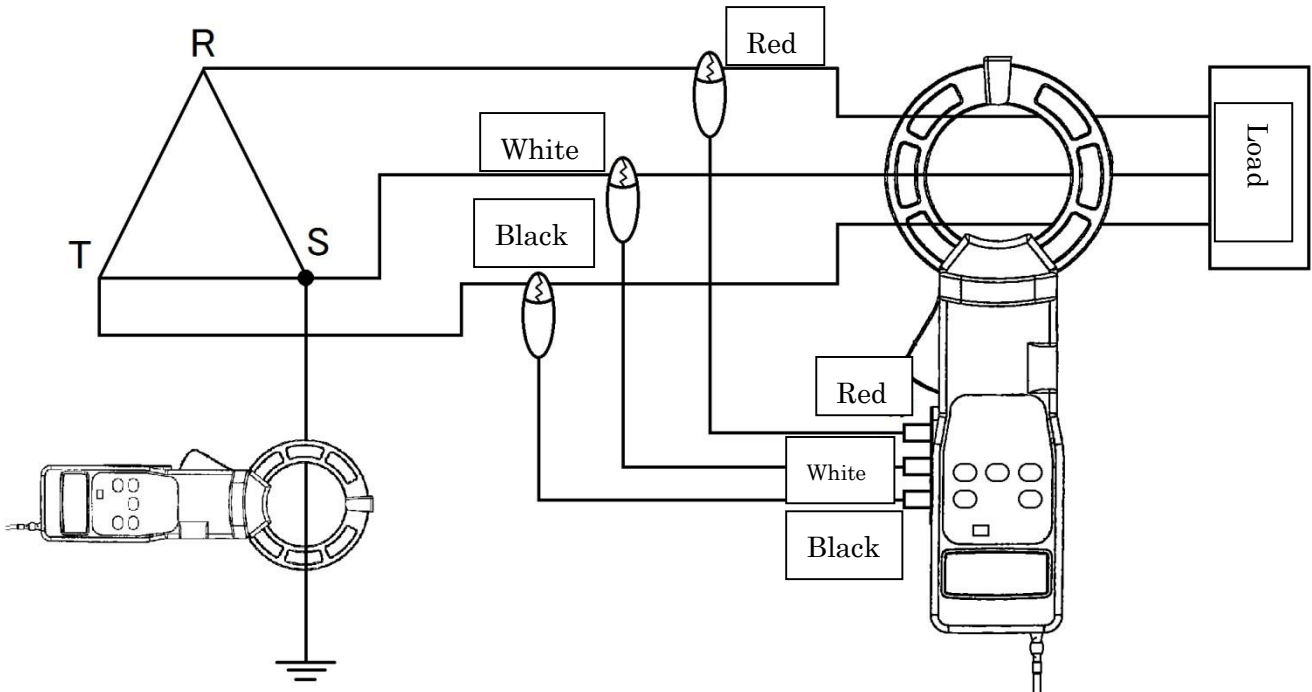
*CT can be applied to the grounding line also.

b. In case of Single Phase/3 Wires Measuring Mode 1 ϕ /Ior [L] on display



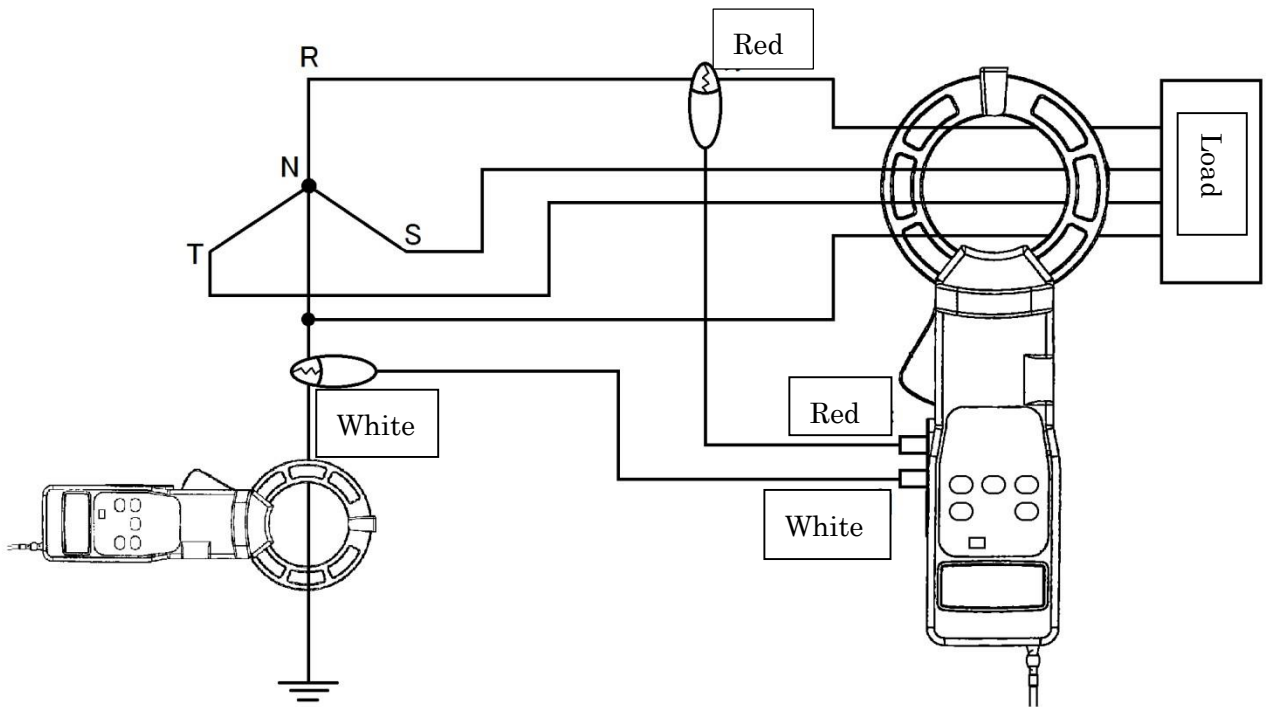
*CT can be applied to the grounding line

c. In case of Three Phase/3 Wires Measuring Mode Δ /Ior [L] on display



*CT can be applied to the grounding line

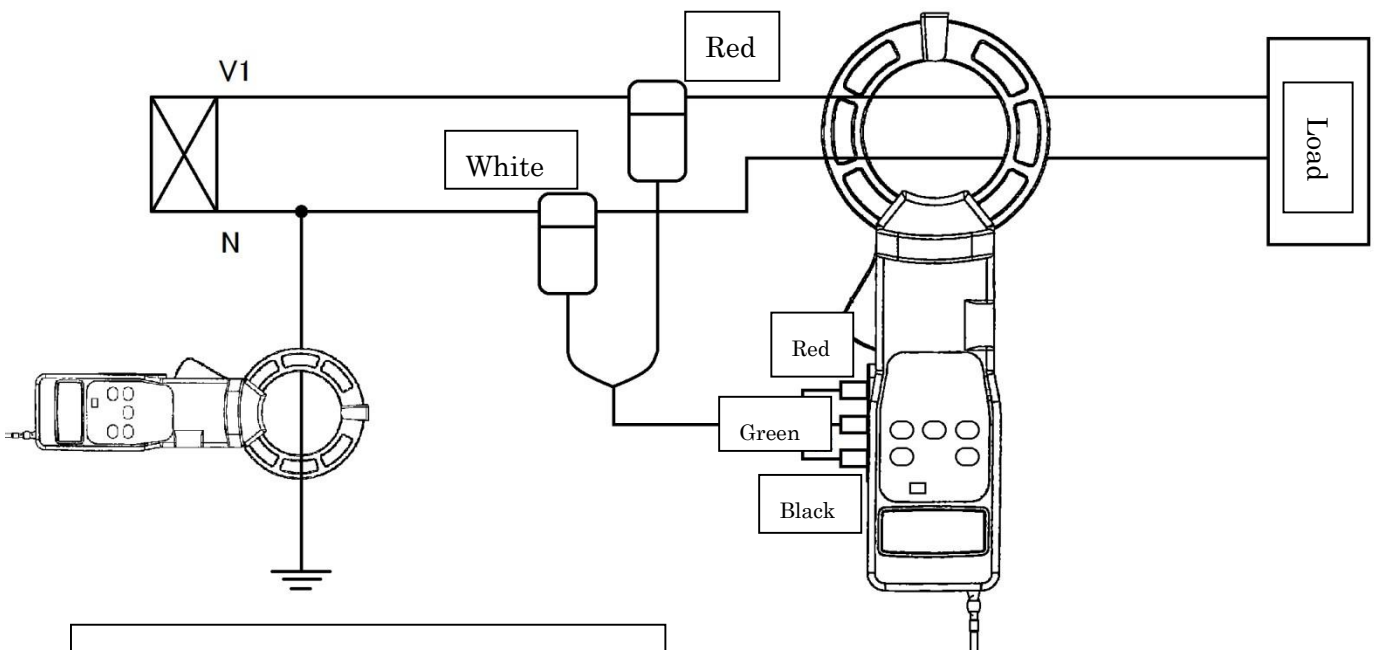
d. In case of Three Phase/4 Wires (Neutral Grounding) Measuring Mode Y/Ior [L] on display



*CT can be applied to the grounding line

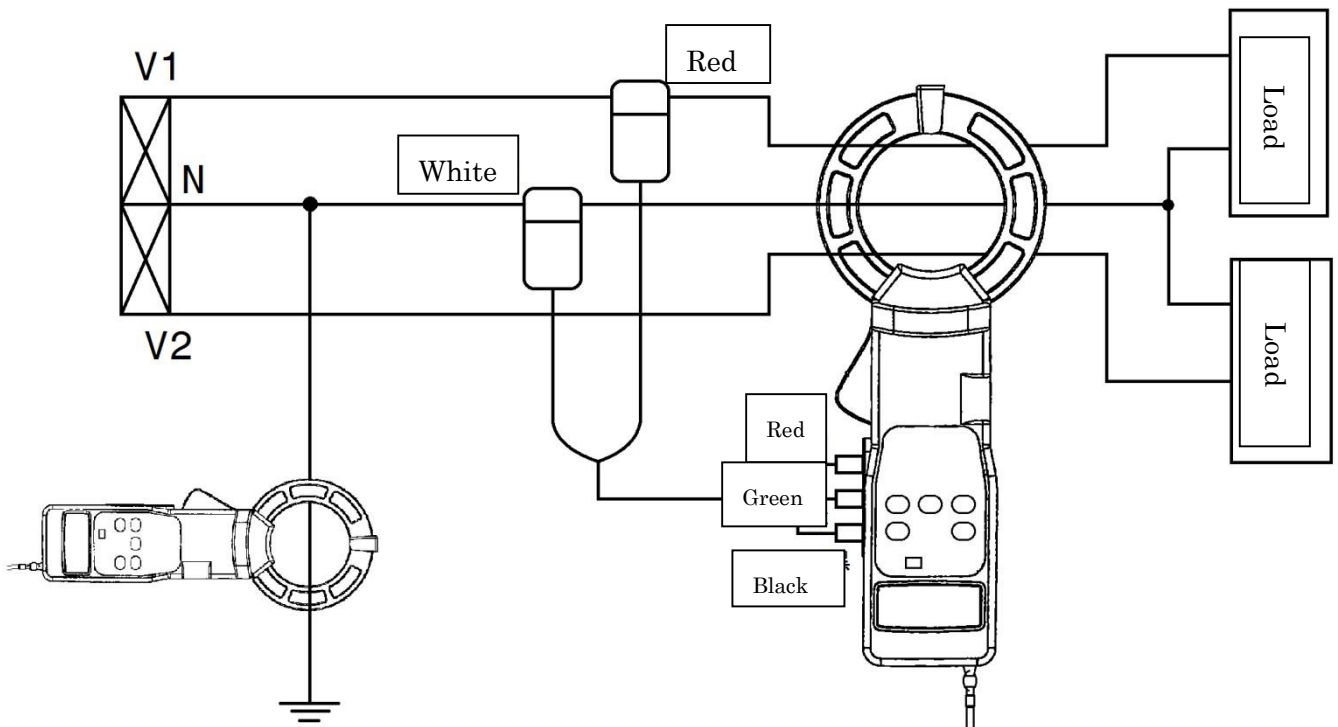
Wiring Method of Non-contact Voltage Input Leads

e. In case of Single Phase/2 Wires Measuring Mode 1 ϕ /Ior [n] on display



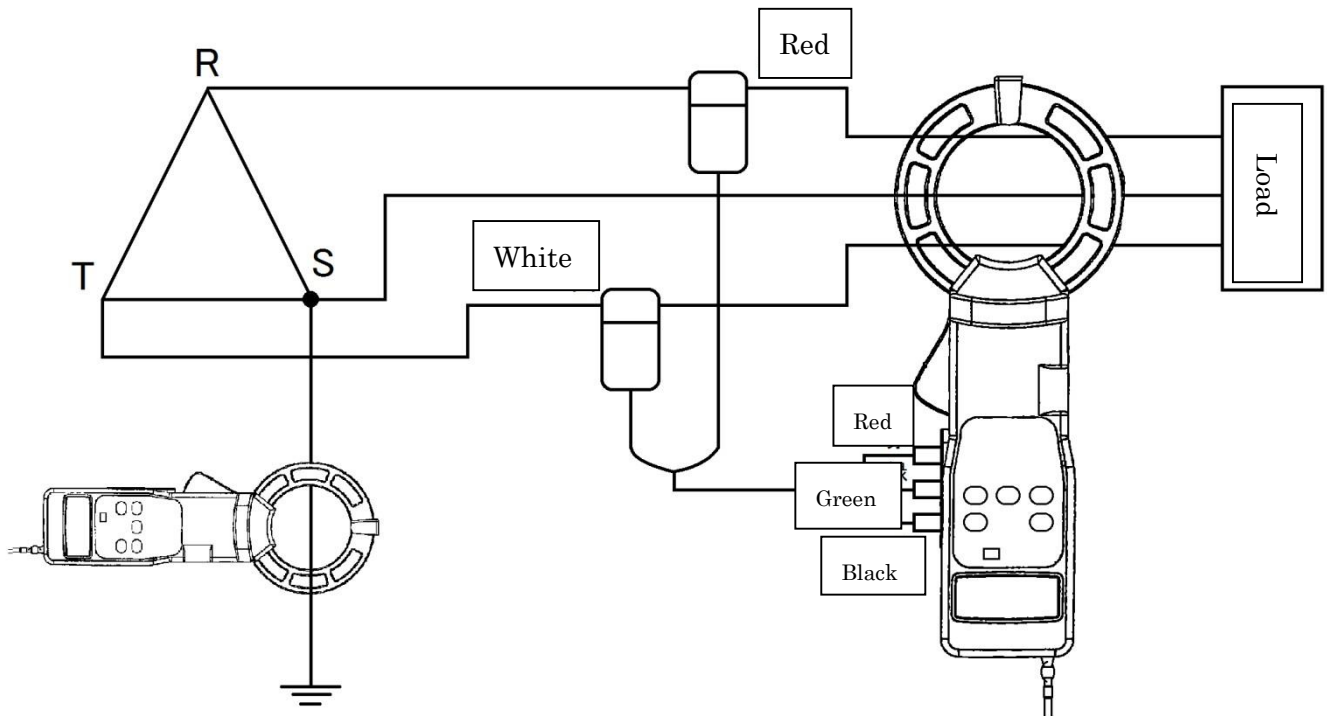
*CT can be applied to the grounding line

f. In case of Single Phase/3 Wires Measuring Mode 1 ϕ /Ior [n] on display



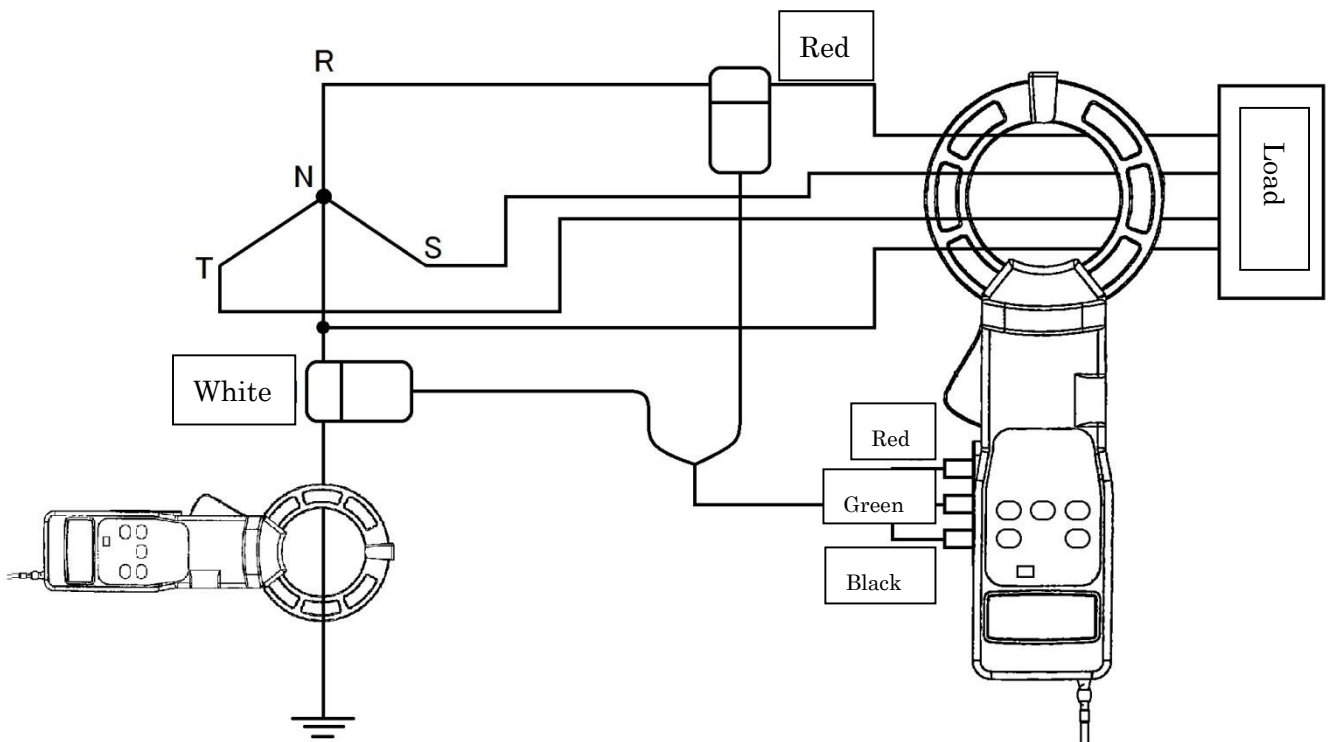
*CT can be applied to the grounding line

g. In case of Three Phase/3 Wires Measuring Mode Δ /Ior [n] on display



*CT can be applied to the grounding line

h. In case of Three Phase/4 Wires (Neutral Grounding) Measuring Mode Y/Ior [n] on display



*CT can be applied to the grounding line.

(5) Change of Current and Voltage Ranges

The current ranges of this instrument becomes “auto” automatically after power switch on but when the range cannot be fixed due to large fluctuated current to be measured, it is impossible to measure it.

In this case, fix the range manually and measure the current under manual range condition.

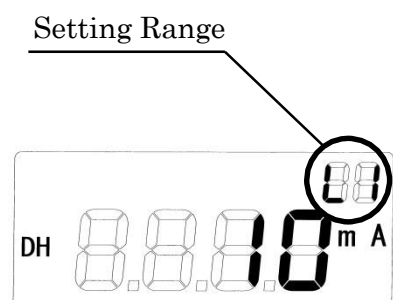
*How to operate the manual ranges (Change of Current Ranges)

(1) Press Power Switch ③ once. All display lights and then, the range becomes I_o current measurement mode (auto range).

(2) Press Data Hold Switch ⑧ once. (“DH” mark on display).

(3) Press Current Range Select Switch ⑤ once.

On the display, “10mA” and “L1” (indicating setting range) appear at right side.



- (4) Press Data Hold Switch ⑧ once again. “DH” mark will be released and the range becomes 10mA.
- (5) To change the range continuously, press Data Hold Switch ⑧ and get “DH” mark on display. By pressing Current Range Select Switch ⑤, the range will be changed [AUTO] – [10mA] – [100mA] – [1000mA] – [10A] sequentially. After get proposed measuring range on display, press Data Hold Switch ⑧ once. “DH” mark disappears and the range becomes accordingly.
- *After once power off this instrument and power on again, the current range becomes [AUTO] automatically.

*How to operate the voltage input mode (Change of Voltage Input)

- (1) Press Power Switch ③ once. All display lights and then, the range becomes Io current measurement mode (auto range).
- (2) Press Data Hold Switch ⑧ once. (“DH” mark on display).
- (3) By pressing Voltage Select Switch ④, the voltage input range changes to [Direct Input] or [Non-contact Input]. At setting range sign on LCD ⑨, “L” appears in case of direct voltage input and “n” appears in case of non-contact voltage input.

*Table for Setting Ranges

| Change of Current Ranges | Voltage Input Mode (Change of Voltage Input) | |
|--------------------------|--|-------------------|
| | Direct Voltage Input | Non-contact Input |
| Auto | L0 | n0 |
| 10mA | L1 | n1 |
| 100mA | L2 | n2 |
| 1000mA | L3 | n3 |
| 10A | L4 | n4 |

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.