

3CT METHOD LEAKAGE CURRENT METER

MCL-4000F

INSTRUCTION MANUAL

Thank you very much for selecting our model MCL-4000F
Leakage Current Meter.

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

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.

○ 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 electric field, 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 the 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.
- If excessive current is applied to the CT, the instrument will be heated and damaged. Use the CT according to the rating current.

1. GENERAL

3CT/4CT Method Leakage Current Meter (Model MCL-4000F) measures the leakage current and or the line current in low voltage circuit. The ordinary clamp can measure the leakage current by clamping CT to the conductors en bloc but the actual measuring fields where CT can be clamped en bloc are very limited. This model MCL-4000F can measure the leakage current by clamping CTs respectively to each phase of conductors.

2. SPECIFICATIONS

2-1 Current Detection CT

Inside Diameter of CT : ϕ 36mm
Remanence Current : less than 10mA at 100A of 3P/3W in balance
Withstanding Voltage : AC2000V, 1 minute between CT core and outer case
Dimension & Weight : 96(W)x120(H)x42(D)mm, 430g

2-2 Measuring Part

Measuring Function : Leakage Current (4CT/3CT/2CT & grounding line) and Line Current
Measuring Method : Clamp CT Method
Measuring Range : 0~20mA/2000mA (Leakage)
0~800A (Line Current)
Range Switch : 3 range manual
AC Conversion : Average Rectification
AD Conversion : Double Integration Method
Sampling Rate : 2 times/second
Display : LCD, max. reading 1999 with annunciator
Over Range Indication : Blanking of all digit except MSD 1 (except 800A range)
Data Hold Function : "DH" sign on the display
Low Battery Indication : "B" sign on the display
Output Signal for Recorder: DC100mV full scale to each range except 800A
(DC40mV to 800A range)
Output Impedance : Less than 10K Ω
High Frequency Cut : Low Pass Filter (130Hz)

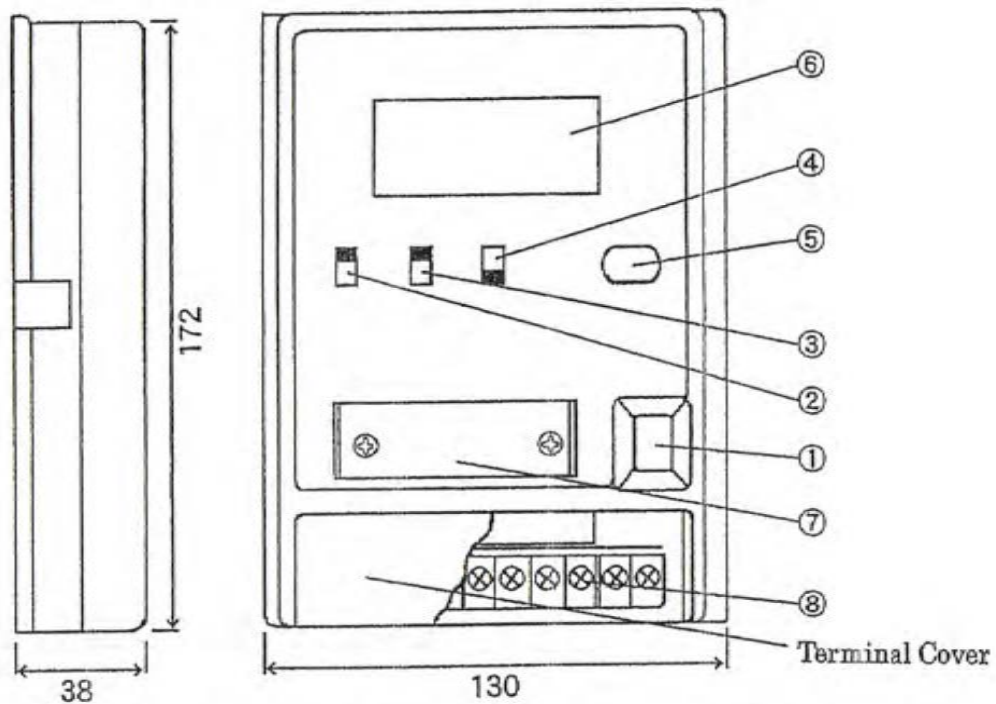
2-3 General Specification

Limitation of Circuit Voltage	: Low Voltage Circuit less than AC500V
Withstanding Voltage	: AC2000V, 1 minute
Operating Temperature	: 0~40°C, less than 80%RH (non-condensing)
Storage Temperature	: -10~60°C, less than 80%RH (non-condensing)
Power Supply	: UM-4 (1.5V) x2
Consumption Current	: 2mA (approx. 200h continuous)
Dimension & Weight	: 130(W)x172(H)x38(D)mm, 380g
Standard Accessories	: Battery/2, Carrying Case/1, Detection CT/3, Instruction Manual/1
Option	: CT for 3P/4W (Model No. MCL-4000F-NCT)

2-4 Accuracy

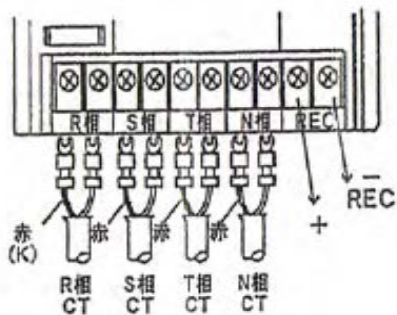
Function	Range	Resolution	Accuracy(45~65Hz)
Leakage Current	200mA	0.1mA	1.0%±5dgt
	2000mA	1mA	
Line Current	800A	1A	1.0%±5dgt
Output Signal for Recorder			±1.5% F.S.

3. NAME OF PART & EXPLANATION



- ① Power On/Off Switch : Switch to supply the power to the instrument
- ② LINE/LEAK Switch : "LINE" for line current measurement and "LEAK" for leakage current measurement
- ③ Range Switch : Manual range switch to select 200mA/2000mA
- ④ FL (Filter) Switch : Switch to cut high frequency component
- ⑤ Data Hold Switch : Switch to hold the displayed value
- ⑥ LCD Display : Display of measured value, symbol and sign
- ⑦ Battery Cover : To replace the battery, remove this part
- ⑧ Terminal Stand : For connection of CT, according to wiring method

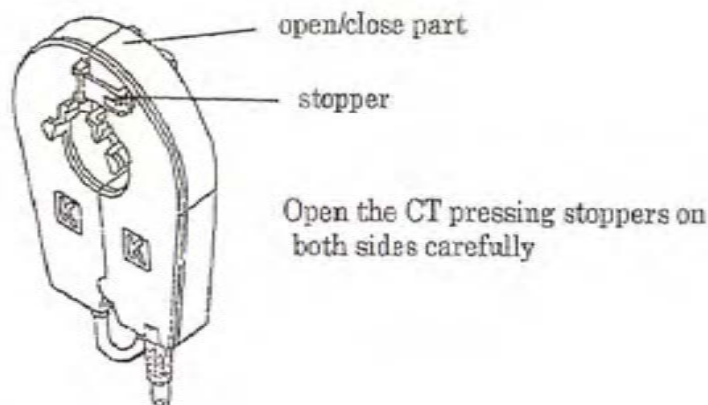
Wiring Method



- ① Leakage of Grounding Line : Connect "R" phase CT and Line Current to "N" phase terminal
- ② 3P/3W Leakage Current : Connect each "R", "S" & "T" phase CT to the respective terminals
- ③ 1P/2W Leakage Current : Connect each "R" & "S" phase CT to the respective terminals

- ④ 1P/3W Leakage Current : Connect each "R", "S" & "T" phase CT to the respective terminals
- ⑤ 3P/4W Leakage Current : Connect each "R", "S", "T" & "N" phase CT to the respective terminals

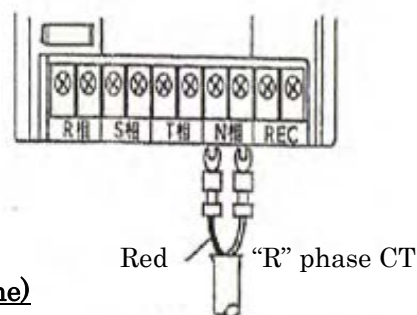
MCL-4000FCT



4. OPERATION PROCEDURE

4-1 Measurement of Line Current

- ① Set power switch "ON".
- ② Connect "R" phase CT to "N" terminal.
- ③ Set LINE/LEAK switch to "LINE".
- ④ Clamp CT to one of conductors to be measured.



4-2 Measurement of Leakage Current (Grounding Line)

- ① Set power switch "ON".
- ② Connect "R" phase CT to "N" terminal.
- ③ Set LINE/LEAK switch to "LEAK".
- ④ Clamp CT to the grounding line and measure leakage current.
- ⑤ If necessary, change the measuring range by range switch.
- ⑥ Where the circuit contains many high-frequency waves, use filter switch.

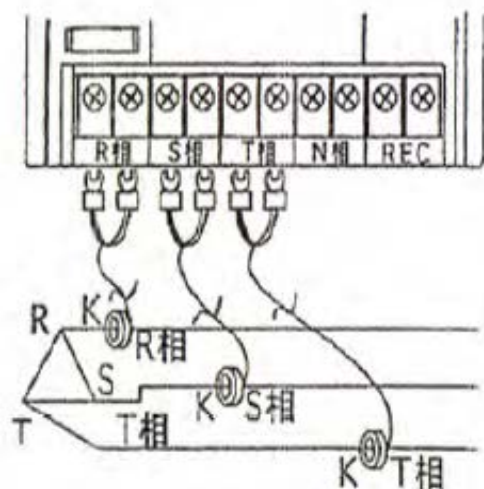
△ CAUTION

It may cause damage to the instrument.

- In case of applying the excessive current to CT at the time of line current measurement, it may cause damage to the instrument by heating. Do not apply more than AC 800A to CT.

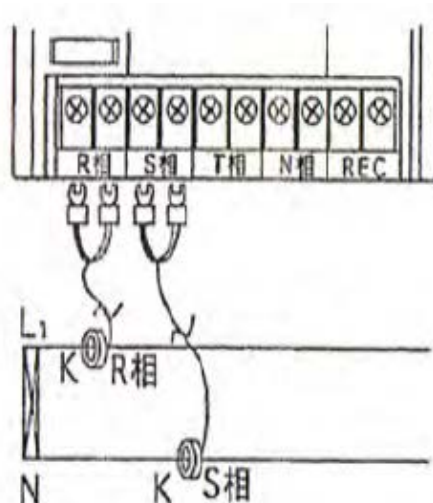
4-3 Measurement of Leakage Current (3P/3W)

- ① Connect each "R" phase, "S" phase & "T" phase CT to the respective terminals.
- ② Set LINE/LEAK switch to "LINE".
- ③ Set power switch "ON".
- ④ Clamp CTs to one of conductors respectively (make "K" side of CT toward power supply side).
- ⑤ Set LINE/LEAK switch to "LEAK" to measure the leakage current.
- ⑥ Where the circuit contains many high-frequency waves, use filter switch. In case of the field where the measured value hardly can be seen, use data hold switch.
- ⑦ After finished the measurement, set LINE/LEAK switch to "LINE" and remove CTs from the conductors.



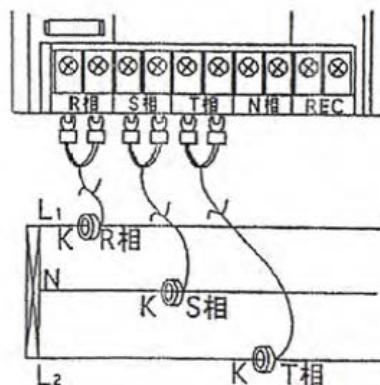
4-4 Measurement of Leakage Current (1P/2W)

- ① Connect "R" phase CT and "S" phase CT to the respective terminals.
- ② Set LINE/LEAK switch to "LINE".
- ③ Set power switch "ON" and clamp CTs to the conductors ("R" phase CT to L₁ and "S" phase CT to N).
- ④ Measure the leakage current in the same manner as ⑤~⑦ of 3P/3W.



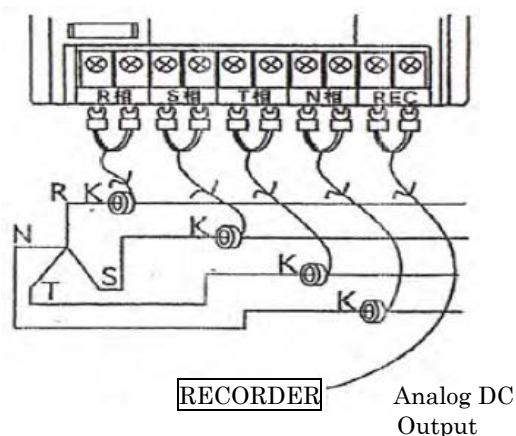
4-5 Measurement of Leakage Current (1P/3W)

- ① Connect "R" phase, "S" phase & "T" phase CT to the respective terminals.
- ② Set LINE/LEAK switch to "LINE".
- ③ Set power switch "ON" and clamp CTs to the conductors ("R" phase CT to L₁, "S" phase CT to N, "T" phase CT to L₂) and make "K" side of each CT toward power supply side.
- ④ Measure the leakage current in the same manner as ⑤~⑦ of 3P/3W.



4-6 Measurement of Leakage Current (3P/4W)

- ① Connect each "R" phase, "S" phase, "T" phase & "N" phase CT to the respective terminals.
- ② Set LINE/LEAK switch to "LINE".
- ③ Set power switch "ON" and clamp CTs to the conductors ("R" phase CT to "R" Line, "S" phase CT to "S" Line, "T" phase CT to "T" Line, "N" phase CT to "N" Line) and make "K" side of each CT toward power supply side.
- ④ Measure the leakage current in the same manner as ⑤~⑦ of 3P/3W.



△CAUTION

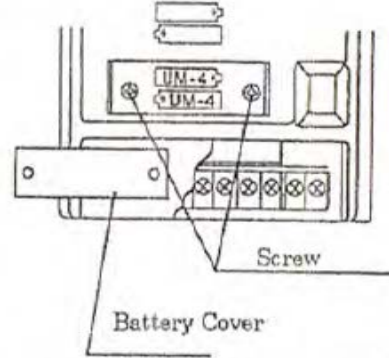
1. In case that the phase balance is wrong in 1P/3W, there may be an error in the measurement.
2. Be sure to set LINE/LEAK switch to LINE whenever clamping or removing CTs. In case of clamping or removing CTs leaving LINE/LEAK switch to LEAK at the measurement of 2CT~4CT method, it may cause the internal resistor burning.

4-7 Signal Output for Recorder

This instrument has the signal output function for recorder which enables the long period measurement. As to the recorder, use one with the input impedance more than $1M\Omega$.

4-8 Change of Batteries

- Confirm the power switch is “OFF” and remove the screws by + driver and take off the battery cover.
- Take out the exhausted batteries and install new ones, not to mistake the polarity. the battery cover and tighten the screws.



- ※ When the batteries are exhausted and the voltage gets lower than operation, “B” sign appears on LCD.
- ※ Replace the batteries to new ones immediately but do not mix the new and old one and or different kinds.

△ WARNING

POSSIBLE ELECTRICAL SHOCK OR ACCIDENT

- Do not use the instrument absolutely, keeping the battery cover off.

△ CAUTION

- In case of not using the instrument for a long period, keep it without batteries installed. It may cause liquid leakage of batteries and may cause the damage to the instrument.
- Do not lose the screw for battery cover and not mistake to put them into the instrument.

5. 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.

6. 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 responsibilities.