

# ROGOWSKI LEAK METER

## MODEL RLM-10+

CE compliant version

### INSTRUCTION MANUAL

Thank you very much for selecting our model RLM-10+ Flexible Leakage Current Meter.

This model is complex instrument and employ 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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- 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.
- Do not use this CT if the double insulation of the blue anti-friction protective layer and the black insulation part are worn away and a different color excluding blue and black colors on the CT sensor flexible part surface is found (Even if wear indicators become visible, at least basic insulation has been provided).

△ 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.

⊗ IEC directive: Do not install or remove around uninsulated, hazardous live conductors that may cause electric shock, electrical burns, or arc flash.

### △ 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 600V. Before use, check and confirm the voltage of circuit to be measured.
- Apply only the covered cables and do not clamp the bare cables. When measuring bare wires, use insulating gloves and be careful to avoid electric shock. To prevent electric shock accidents, users should ensure a safe work area and avoid contact with live parts when opening and closing the CT before using it.

#### **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 flexible CT is damaged and if the battery cover is off, do not operate this instrument.
- Replace the batteries after took off CT, etc. from the circuit.

#### **POSSIBLE INSTRUMENT DAMAGE**

- Do not disassemble this instrument.
- Do not twist, bend and or pull the flexible CT unnecessarily. It may cause quality deterioration and or breakage.
- Do not use it on electrical circuits with frequency bands other than 50~60Hz, it may be damaged.

## 1. GENERAL

- This instrument is the world first superior AC leakage current clamp tester using Rogowski method flexible sensor which can be bent freely.
- Even coreless coil sensor but least influence from the external magnetic fields and residual current with wide ranges (1.0mA ~ 999.9A).

## 2. CAUTION BEFORE USE

After open the box, check the appearance of instrument and confirm whether standard accessories are contained. Once if you found an damage or shortage, contact the sales agent or directly to us.

## 3. SPECIFICATIONS

### 1) CURRENT DETECTION SENSOR (FLEXIBLE CT)

Model No.	: FZCT-220SP
Method	: Rogowski Split-core type
Inside Diameter	: $\Phi$ 210mm (total length 650mm)
Influence of Residual Current	: less than 250mA (at the most sensitive place by AC50A)
Withstanding voltage	: AC2200V/1 minute
Length of Lead Wire	: Approx. 2m between CT and Display Unit

### 2) MEASURING PART

Measuring function	: AC Line current and Leakage Current
Measuring method	: Clamp CT
Measuring range	: AC 1000mA/10A/100A/1000A
Applicable frequency	: 50~60Hz
Change of range	: 4 range manual by rotary switch
A/D conversion	: Dual integration mode with RMS current detection
Sampling rate	: 2 times/sec.
Display	: LCD, 9999 count with annunciator
Data hold indication	: "DH" mark on LCD
Over range indication	: "OL" mark on LCD
Low battery indication	: "⊕⊖" mark on LCD
Signal output for recorder	: DC 100mV to full scale of each range (output impedance : less than 10K $\Omega$ )
Auto power off	: Approx. 10 minutes after power on and can power on again by once setting range switch to off. In case of using recorder cable, this function is cancelled.
Back light function	: By pressing 「LIGHT」switch, back light lightens on the display. The light will be off by pressing the switch once again.
Data hold function	: By pressing 「D·HOLD」switch, hold measuring data. To release the hold, press the switch again.

### 3) GENERAL SPECIFICATIONS

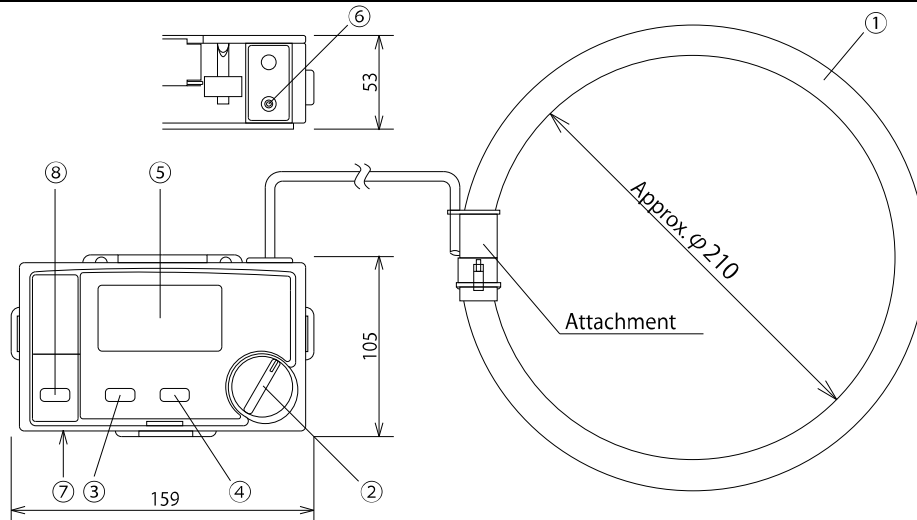
Circuit voltage	: less than AC 600V
Overvoltage Category	: CAT-IV 600V or CAT-III 1000V
Applicable Standards	: (EMC) IEC 61326-1 (Safety) IEC 61010-1, EN 61010, IEC61010-2-32 RoHS Directive
Operating temperature	: 0~40°C, < 80%RH (without condensation)
Storage temperature	: -10~60°C, < 70%RH (without condensation)
Withstanding voltage	: AC 2200V/1 minute
Power supply	: LR-6 × 6
Dimension/Weight	: Display part : 159(W) × 105(H) × 53(D)mm, approx. 350g w/o batteries CT part : inside diameter 210mm, approx. 250g
Accessories	: Soft Case, Test Lead, Batteries, Instruction Manual
Option	: Output Cable for Recorder(MR-003)

### 4) ACCURACY (23°C ± 5°C, less than 80%RH, 50/60Hz)

Range	Resolution	Accuracy
1000mA	0.1mA	± 3%rdg ± 5dgt
10A	0.001A	± 2.5%rdg ± 5dgt
100A	0.01A	
1000A	0.1A	
Signal Output		± 2% F.S.

- \* Provided that the conductor to be measured should be located at the center of CT.
- \* For each measurement range, "0" is displayed for 10 counts or less.
- \* The range of guarantee of accuracy is 10% or more of each range.
- \* If the value exceeded the measurement range, "OL" will be displayed.

### 4. NAME OF PART & EXPLANATION



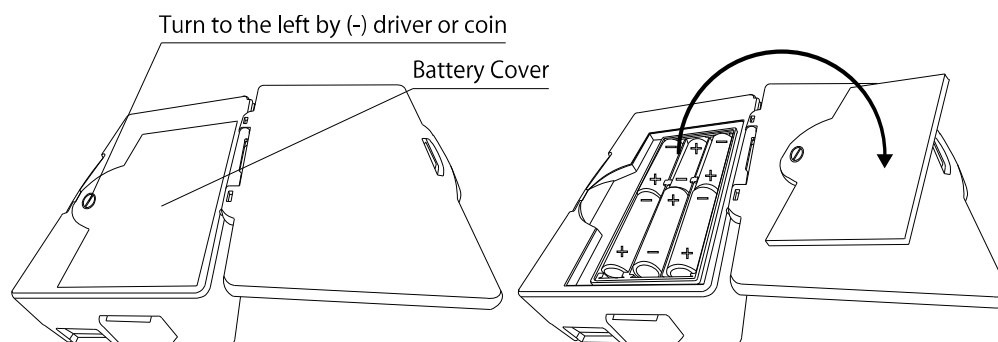
- ① Current Sensor : For current detection, flexible type
- ② Range Switch : Power on/off(including Auto power off) and range selection.

- ③ Filter Switch : By pressing this switch, “FL” mark on LCD and Filter function starts which will cut high frequency component. By pressing switch once again, this function will be released(Filter characteristics:  $f_c$ =Secondary LPF of 150Hz).
- ④ 「D-HOLD」 Switch: By pressing this switch, “DH” mark on LCD and the displayed value will be hold. By pressing switch once again, this function will be released.
- ⑤ LCD Display : Showing measured value, unit and battery condition.
- ⑥ 「REC」 Recorder Output : Connect with recorder for long period measurement.  
Output is DC 100mV to the full scale of each range.
- ⑦ Battery cover (Back side) : By removing this cover, batteries can be replaced.
- ⑧ 「LIGHT」 Switch : Pressing this switch turns on the backlight of the display.  
Press again to turn off the backlight. (Pull up the LIGHT switch to turn on the backlight of the display and lock it in the pulled up state. To turn off the backlight, return the LIGHT switch to its original position and pull it up again.)

## 5. OPERATION

### 5-1) REPLACEMENT OF BATTERIES

- 1) Remove the screw fixing battery cover at the rear case by (–) driver or coin (turn to left) and open off battery cover.
- 2) Replace the batteries in the correct direction of (+)(–) polarity according to the indication graved in battery compartment.
- 3) In case of not using instrument for a long time, remove all the batteries to avoid exhaustion and leakage of batteries.



#### ⚠ WARNING

- ① It may cause leakage of batteries and or defect of electric circuit, if the batteries are placed at wrong polarity position.
- ② Do not dissolve the batteries and or throw them into the fire.

#### ⚠ WARNING

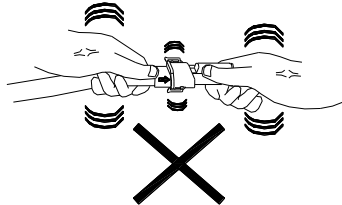
#### POSSIBLE ELECTRICAL SHOCK OR ACCIDENT

- Do not replace the batteries under the conditions of measuring current.
- Do not operate the instrument with battery cover off.

## 5-2) CT handling

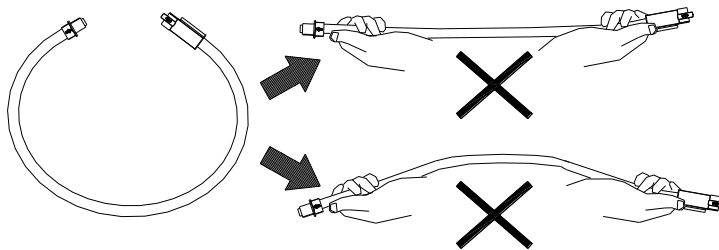
This clamp-type CT has very sensitive construction, in order to achieve better reading with high accuracy. Therefore, damage or twisting power to CT may cause breakage or accuracy disturbance. In order to use this instrument longer, when applying CT, pay extra attention to following points.

1. Do not twist CT too much, when opening/ closing



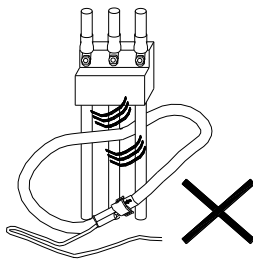
It may cause damages to CT, and it may disturb measurements.

2. Do not strengthen CT too much
3. Do not twist CT to the opposite direction



It may cause serious disturbance to CT. Consequently, it causes breakage and it becomes un-workable.

4. Do not twist CT to intolerable direction



It may deteriorate CT and it causes higher probability of breakage.

\*In addition, it is not the drop-proof. Drop from certain height may cause breakage. Take care when you are handling the instrument.

### 5-3) MEASUREMENT

To use the instrument safely, strictly observe WARNING and CAUTION stated on this manual.

#### ⚠ WARNING

##### **POSSIBLE ELECTRICAL SHOCK**

- For the safety, use this instrument in the circuit less than AC 600V. Before use, confirm circuit voltage to be measured.
- Apply only the covered cables and do not clamp the bare cables. When measuring bare wires, use insulating gloves and be careful to avoid electric shock. To prevent electric shock accidents, users should ensure a safe work area and avoid contact with live parts when opening and closing the CT before using it.

##### **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 this instrument if flexible CT and or case of display part are damaged.
- Do not operate this instrument if battery cover is off.

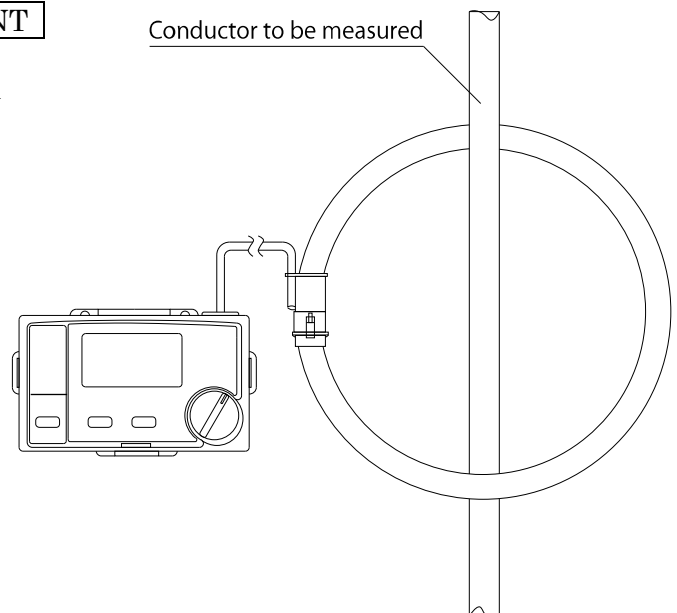
#### ⚠ CAUTION

- At 1000mA range, the display hardly becomes “000” mA at “0” input but it is not wrong.
- It takes some while to get “0” display at the time of changing rotary switch from off to on but it is not wrong.

### (1) MEASUREMENT OF LINE CURRENT

- ① Set the range switch from off to 1000A (Display will appear).
- ② Open the attachment part of flexible CT and clamp the conductor to be Measured and close the attachment.
- ③ Select the appropriate range by range switch and read the displayed value. (In case of over range, “OL” mark will be displayed).

- ※ Use Data Hold function at the place Where display can hardly read.
- ※ Use Filter function at the place where high Frequency contains.



### (2) MEASUREMENT OF LEAKAGE CURRENT

#### ① Measurement of Grounding Line

The operation is same manner as for line current.

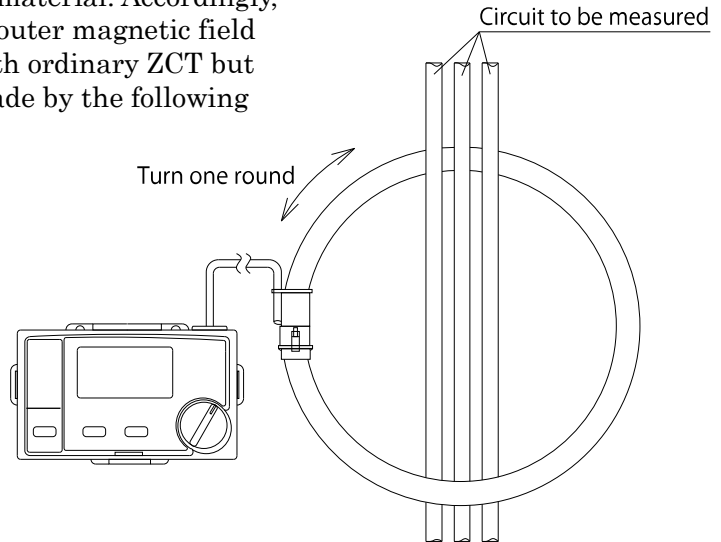
#### ② Measurement, except for Grounding Line

Clamp flexible CT to the conductor, 2 wires in case of single phase and 3 wires or 4 wires in case of three phase en bloc.

**TECHNICAL POINT FOR LEAKAGE CURRENT MEASUREMENT**

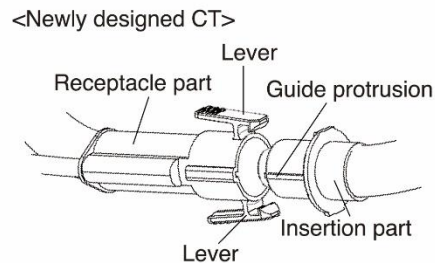
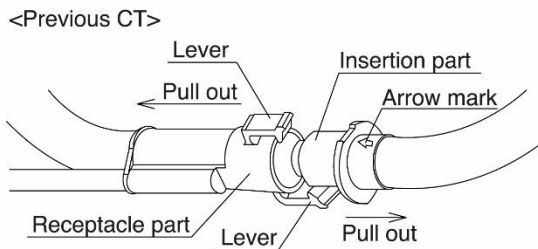
Current detection sensor (Flexible CT) for this instruments is core-less coil type without magnetic material. Accordingly, it is more affected by the influences of outer magnetic field and residual current in comparison with ordinary ZCT but more accurate measurement can be made by the following method:

Set the CT as the right drawing and turn it round one time, watching the displayed value. The least value is most accurate leakage current of the circuit to be measured.



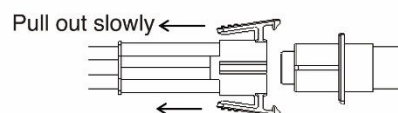
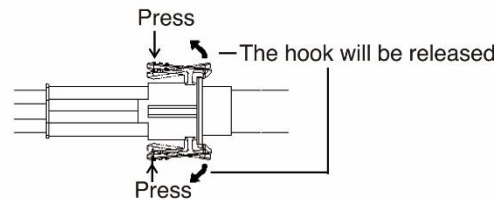
**OPEN/CLOSE METHOD OF CURRENT DETECTION SENSOR (FZCT-220SP)**

Including explanation of parts that can be safely held by hand during opening and closing operations when clamping on the covered cables(When clamp on the bare cables, use the insulating gloves and other safety tools).



The opening and closing method of the CT sensor has changed. To open and close the CT sensor referring to the figure below.

Please note that it cannot be inserted unless it is aligned with the guides on the protrusions on both sides.



Note: This CT has no exposed metal parts, so there is no direct contact with the metal/internal mechanisms of the CT in the general conditions.



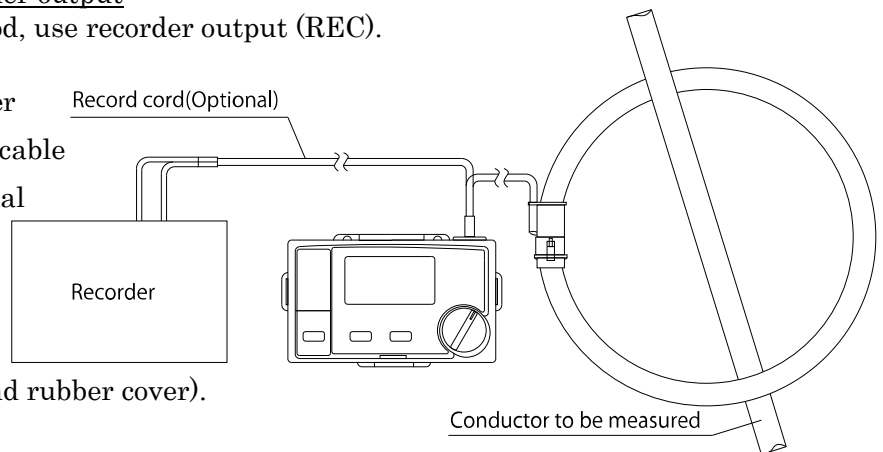
### (3) OTHER MEASUREMENTS

#### ① Measurement by using recorder output

To monitor current for a long period, use recorder output (REC).

Remove the screw and rubber cover of "REC" part. Insert the recorder cable ( $\phi$  2.5mm plug) into "REC" terminal and connect with recorder. After insertion of cable, auto power off function is cancelled.

(Pay attention not to lose screw and rubber cover).



#### ② Measurement for bigger diameter circuit by using 2 units

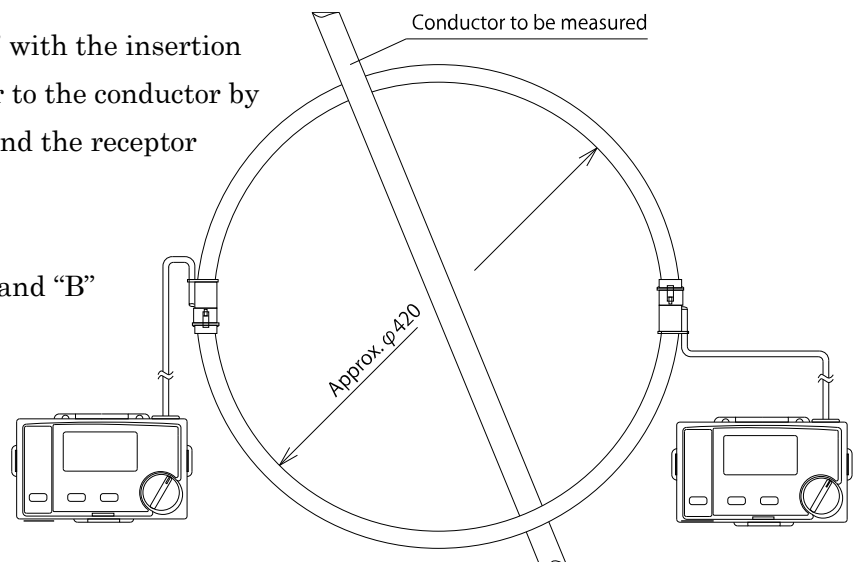
a) Connect the receptor part of "A" with the insertion part of "B" and clamp CT sensor to the conductor by using the insertion part of "A" and the receptor part of "B".

b) Set the measuring range of "A" and "B" to the same.

c) Read the displayed value of "A" & "B" and the total

value ("A" + "B") is flowing current in the circuit to be measured.

Note: Previous CT and newly designed CT cannot be connected. Please connect only with the newly designed CT or only with the previous CT.



### 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 15 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 15 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.