

— 4 —



## [1] SAFETY PRECAUTIONS

**Before use, read the following safety precautions.**

This instruction manual explains how to use your CL3000. This digital clamp sensor is designed for use with low-voltage circuitry. Before use, please read this manual thoroughly. After reading it, keep it together with the product for reference to it when necessary.

If this product is not used as specified in this manual, its protection function may be compromised.

The instructions given under the headings of WARNING and CAUTION must be followed to prevent accidental burn and electric shock.

### 1-1 Explanation of Warning Symbols

The meanings of the symbols used in this manual and attached to the product are as follows:


 : **Very important instructions for safe use.**

The warning messages are intended to prevent accidents to operating personnel such as burn and electric shock.

The caution messages are intended to prevent incorrect handling which may damage the product.

 : Symbol requesting warning or reference to the instruction manual.

 : Symbol requesting caution or risk of electric shock.

 : Double insulation or reinforced insulation

 : Symbol inhibiting clamping or unclamping around/from a conductor in the live state without wearing insulation protective gear such as rubber-insulated gloves.

### 1-2 Warning Messages for Safe Use

#### WARNING

To avoid physical injury such as burns or electric shock, be sure to observe the following instructions when using this instrument.

1. Pay special attention when measuring voltages of AC 33 Vrms (46.7 V peak) or DC 60 V or more to avoid injury.
2. This clamp sensor is designed for use with low-voltage circuitry. Never use it on lines that exceed 600 V.
3. Do not apply a signal exceeding the maximum rated input (see 1-3 below).
4. Do not use the instrument if the main unit or cable is damaged or broken.
5. Do not use the instrument with the case or battery compartment cover removed.
6. Always wear insulation protective gear such as rubber-insulated gloves before clamping or unclamping the instrument around/from a live-state conductor.
7. Be sure to check the range before each measurement.
8. Do not use the instrument if it or your hand is wet.
9. Do not attempt to repair or modify the instrument except to replace the battery.
10. Be sure to check the instrument before each use and inspect it at least once a year.
11. Always use this instrument exclusively indoors.
12. When measuring equipment containing a hazardous charged part, it is required to wear protective gear for prevention of accidents. For details, please follow your local and national safety standards.
13. To avoid compromising the protection function of this instrument, do not use it in any way other than instructed in this manual.

### 1-3 Overload Protection Input

Input	Maximum rated input	Maximum overload protection input
Flexible CT	AC 3000 A	AC 5000 A

## [2] APPLICATION AND FEATURES

### 2-1 Applications

This instrument is an AC clamp sensor designed in compliance with IEC61010-1 CAT III 600 V. It is capable of measuring AC current up to 3000 A.

It is suitable for measuring the current of electrical lines, appliances power supply facilities operating on low voltages of no more than 600 V.

### 2-2 Features

- Safety design in compliance with the IEC61010-1.
- Flexibility facilitating conductor clamping even in narrow spaces.
- Air-core coil for weight reduction.
- Wide measuring range: 30 A / 300 A / 3000 A
- Output voltage of AC 3 V at full scale.
- The measured value can be re-read with a multimeter capable of up to AC 3,000 V display.
- The waveform can be observed on an oscilloscope or similar instrument using a banana plug-BNC conversion connector.

### Measurement categories (overvoltage categories)

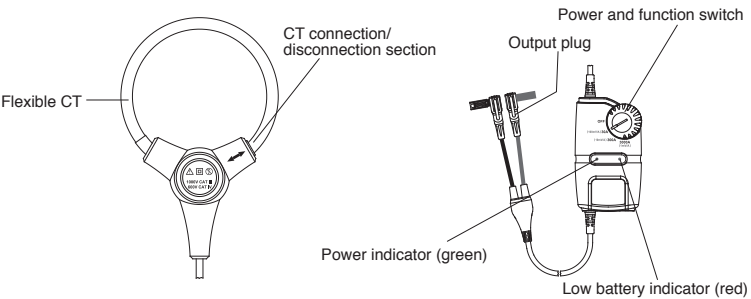
**CAT I** :Secondary cable runs from a power supply transformer connected to a wall socket.

**CAT II** :Primary cable runs of power-consuming equipments from a wall socket.

**CAT III**:Primary cable runs of equipments directly connected to a distribution board and cable runs from a distribution board to wall sockets.

**CAT IV**:Cable runs from an incoming line to a distribution board.

## [3] NAMES OF PARTS



## [4] DESCRIPTION OF FUNCTIONS

### 4-1 Power and function switch

Rotate this switch to turn the instrument power ON/OFF and to select a measuring range.

### 4-2 Power indication (POW)

The green lamp lights when the power of the instrument is ON.

\* The Auto Power OFF function is not provided. To prevent unnecessary battery exhaustion, be sure to set the power and function switch to OFF after finishing measurement.

### 4-3 Low battery indication (BATT)

This indicator lights on the display when the supply voltage from the internal batteries drops below about 2.4 V. If this indicator lights, replace the batteries (both) with new ones.

## [5] MEASUREMENT PROCEDURE

#### WARNING

1. It is hazardous to use the flexible CT with a conductor in the live state. Be sure to wear insulation protective gear such as rubber-insulated gloves before clamping or unclamping the flexible CT.
2. Do not use the instrument if the coating of the flexible CT is damaged and the internal white part is exposed.
3. Do not use the instrument with a line with voltage to ground over 600 V.

#### CAUTION

1. To reduce the measurement errors, position the measured conductor (wire) as close as possible to the center of the flexible CT.
2. Always clamp around a single wire at a time. Correct current measurement is impossible if multiple wires, for example two single-phase and three 3-phase lines, a cable with multiple conductors or parallel cords are clamped.
3. Correct measurement may sometimes be impossible near a source of strong magnetic field, such as a transformer or high-current path, a source of electromagnetic wave or a charged object.

### 5-1 Start-up inspection

Check the following items before starting measurement.

- Appearance: Check that the exterior of the instrument is not damaged by dropping it.
- Check that the cable between the flexible CT and the cabinet and the cable between the cabinet and the output terminal are normal without wire disconnection or cracking of the cable coating.
- Check that the low battery indicator does not light up. If it lights up, replace the batteries with new ones.
- Check that the instrument and your hand are not wet.

\* If the power indicator or low battery indicator does not light up after turning the instrument ON, the batteries may be exhausted.

### 5-2 AC amperage (ACA) measurement

Always wear insulation protective gear such as rubber-insulated gloves.

- 1.Connect the output plugs of this instrument to the measuring instrument. Set the measuring instrument to the function capable of displaying AC 3,000 V.
  - \* The reading of the measurement instrument may be inaccurate when the AC+DC function is selected. Be sure to select an AC function.
- 2.Set the power and function switch to the desired range. If the measured current value is unknown, begin with the 3000 A range and decrease it sequentially as required.
- 3.Clamp the flexible CT around the conductor so that this is positioned vertically on the center of the flexible probe.
- 4.To adjust the current phase, set the current direction marking on the load side.
- 5.Convert the voltage value displayed on the measuring instrument into the current value or observe the waveform.

### 5-3 Examples of current calculations by connecting multimeter

When the instrument is used in combination with a digital multimeter, the accrual current should be calculated based on the AC voltage value displayed on the multimeter.

\* It is recommended to use a DMM capable of AC mV display of 4000 counts or more.

**Example 1:**  
The range of this instrument is set to 3000 A (1 mV/A), and the multimeter reads AC 2.000 V:

Actual current =	$\frac{\text{Reading}}{\text{Sensitivity}} = \frac{2.000 \text{ V}}{1 \text{ mV/A}}$	
	$= \frac{2000 \text{ mV}}{1 \text{ mV/A}}$	= 2000 A

**Example 2:**  
The range of this instrument is set to 300 A (10 mV/A), and the multimeter reads AC 2.000 V:

Actual current =	$\frac{\text{Reading}}{\text{Sensitivity}} = \frac{2.000 \text{ V}}{10 \text{ mV/A}}$	
	$= \frac{2000 \text{ mV}}{10 \text{ mV/A}}$	= 200 A

**Example 3:**  
The range of this instrument is set to 30 A (100 mV/A), and the mutimeter reads AC 2.000 V:

Actual current =	$\frac{\text{Reading}}{\text{Sensitivity}} = \frac{2.000 \text{ V}}{100 \text{ mV/A}}$	
	$= \frac{2000 \text{ mV}}{100 \text{ mV/A}}$	= 20 A

## [6] MAINTENANCE

#### WARNING

1. The section is very important for safety. Read and understand the following instructions fully and maintain your instrument properly.
2. For securing safety and accuracy, inspect and calibrate the instrument at least every year.

### 6-1 Maintenance and inspection

1) Appearance:

- Check that the exterior of the instrument is not damaged by dropping it.

2) Cable between flexible CT and cabinet and cable between cabinet and output terminal:

- Check that the cable is normal without damage or exposed conductor.

3) Flexible CT:

- Check that the white part inside the flexible CT is not exposed due to coating damage.

If any of the troubles above is found, do not use the instrument and call for service.

### 6-2 Calibration and Inspection

For more information, please contact Sanwa's authorized agent/distributor service provider, listed in our website. See section 7-3.

### 6-3 Storage

#### CAUTION

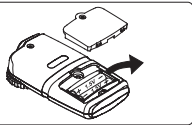
1. The panel and case are not resistant to volatile solvent and must not be cleaned with thinner or alcohol.
2. The panel and case are not resistant to heat. Do not place the instrument near heat-generating devices (such as a soldering iron).
3. Do not store the instrument anywhere it may be subject to vibrations or could fall.
4. When storing the instrument, avoid hot, cold or humid locations, locations exposed to direct sunlight, or locations where condensation is anticipated.
5. When the instrument is not going to be used for an extended time, be sure to remove the batteries.

### 6-4 Battery Replacement

• The battery loaded at the factory is a monitor battery, so their service life may be shorter than that of a brand-new battery. A monitor battery is a type of battery used to check the functions and performance of a product.

#### WARNING

- To prevent the risk of electric shock, do not remove the battery compartment cover while the flexible CT is clamped around the measured conductor.



1. Using a Phillips screwdriver, remove the fixing screw (x 1) from the battery compartment cover.
2. Replace both of the two batteries in the battery holder with new ones by taking care of the polarity.
3. Place the battery compartment cover and tighten the fixing screw.

## [7] AFTER-SALE SERVICE

### 7-1 Warranty and Provision

Sanwa offers comprehensive warranty services to its end-users and to its product resellers. Under Sanwa's general warranty policy, each instrument is warranted to be free from defects in workmanship or material under normal use for the period of one (1) year from the date of purchase.

This warranty policy is valid within the country of purchase only, and applied only to the product purchased from Sanwa authorized agent or distributor.

Sanwa reserves the right to inspect all warranty claims to determine the extent to which the warranty policy shall apply.

Note that the accuracy of the instrument is warranted for one (1) year while the provided articles other than the instrument itself are not covered by the warranty.

1. A failure due to improper handling or use that deviates from the instruction manual.
2. A failure due to inadequate repair or modification by people other than Sanwa service personnel.
3. A failure due to causes not attributable to this product such as fire, flood and other natural disaster.
4. Non-operation due to a discharged battery.
5. A failure or damage due to transportation, relocation or dropping after the purchase.

### 7-2 Repair

Customers are asked to provide the following information when requesting services:

1. Customer name, address, and contact information
2. Description of problem
3. Description of product configuration
4. Model Number
5. Product Serial Number
6. Proof of Date-of-Purchase
7. Where you purchased the product

Please contact Sanwa authorized agent / distributor / service provider, listed in our website, in your country with above information. An instrument sent to Sanwa / agent / distributor without those information will be returned to the customer.

Note:

- 1) Check the following items again before calling for service.

- Remaining power of the internal batteries and the polarity of inserted batteries.

- 2) Repair during the warranty period:

The failed instrument will be repaired in accordance with the conditions stipulated in "7-1 Warranty and Provision".

- 3) Repair after the warranty period has expired:

In some cases, repair and transportation cost may become higher than the price of the product. Please contact Sanwa authorized agent / service provider in advance. The minimum retention period of service functional parts is 6 years after the discontinuation of manufacture. This retention period is the repair warranty period. Please note, however, if such functional parts become unavailable for reasons of discontinuation of manufacture, etc., the retention period may become shorter accordingly.

- 4) Precautions when sending the product to be repaired

To ensure the safety of the product during transportation, place the product in a box that is larger than the product 5 times or more in volume and fill cushion materials fully and then clearly mark "Repair Product Enclosed" on the box surface. The cost of sending and returning the product shall be borne by the customer.

### 7-3 SANWA Website

<http://www.sanwa-meter.co.jp>

E-mail: [exp\\_sales@sanwa-meter.co.jp](mailto:exp_sales@sanwa-meter.co.jp)

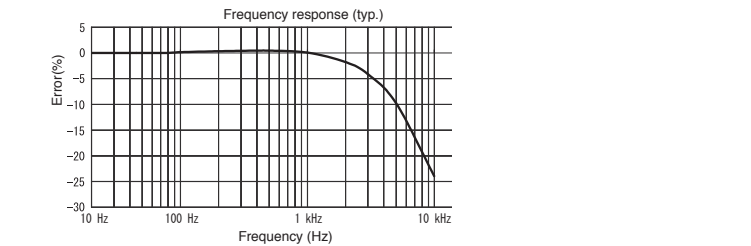
## [8] SPECIFICATIONS

### 8-1 General specifications

Range switching	AC 30 / 300 / 3000 A (100 mV/1 A) / (10 mV/1 A) / (1 mV/1 A)
Internal resistance of connectable measuring instrument	10 kΩ or more
Output impedance	No more than 250 Ω
Low battery indication	The BATT indicator lights on the display when the supply voltage from the internal batteries drops below about 2.4 V.
Flexible CT length	Approx. 485 mm
Flexible CT diameter	Approx. ø8.5 mm
Clamped conductor diameter	Max. approx. ø150 mm
Cable length	Between flexible CT and cabinet: Approx. 1.8 m Between cabinet and output terminal: Approx. 0.5 m
Operating environmental conditions	Altitude no more than 2000 m, indoor use, environmental pollution degree II
Accuracy-guaranteed temperature/humidity ranges	23±5 °C, no more than 80 %RH (without condensation)
Operating temperature/humidity ranges	5 to 40 °C, no more than 80 %RH (without condensation)
Storage temperature/humidity ranges	-10 to +50 °C, no more than 80 %RH (without condensation)
Power supply	"AAA"-size alkaline battery 1.5 V (LR03) x 2
Power consumption	Approx. 25 mW TYP.
Continuous operation duration	Approx. 110 hours
Dimensions and mass	120(H) × 70(W) × 26(D) mm, approx 300 grams (including batteries)
Safety standards	IEC61010-1 CAT III, 600 V, IEC61010-2-030, IEC61010-2-032
EMC Directive	IEC61326-1
Accessories	Instruction manual, carrying pouch (C-CL3000)

### 8-2 Measuring ranges and accuracies

- Accuracy-guaranteed temperature/humidity ranges: 23 ± 5 °C, no more than 80 %RH (without condensation)
- Accuracy-guaranteed frequency range: 45 to 500 Hz, AC sine wave
- Accuracy (45 to 65 Hz): ±(2.0 % of rdg + 0.3 % of FS) + Error of connected measuring instrument  
rdg: reading. FS: Full Scale (0.3 % FS means 0.009 V.)  
Assuming that the measured conductor is located on the center of the circle formed by the flexible CT.
- Phase error: Less than ±1 °C
- Bandwidth: 10 Hz to 10 kHz (within ±3 dB)



- Temperature coefficient: At temperatures below 18 °C and above 28 °C, add Accuracy x 0.1 per degree.
- Addition of errors due to conductor location

Distance from center	Addition to accuracy
Radius 25 mm (ø50)	± 1.0 %
Radius 50 mm (ø100)	± 2.0 %
Radius 75 mm (ø150)	± 3.0 %

Specifications and external appearance of the product described above may be revised or modified without prior notice.