sanwa

CAM600S

ANALOG CLAMP METER

INSTRUCTION MANUAL

CE

sanwa

SANWA ELECTRIC
INSTRUMENT CO.,LTD.
Dempa Bldg.,Sotokanda2-Chome
Chiyoda-Ku,Tokyo,Japan

Printed in Japa

[1] SAFETY INFORMATION

> The following are precautions to prevent accidents such as electrical shocks.
> Be sure to read them before using the CLAMP METER.

1-1 Symbols

The following cautionary signs appear on the clamp meter and in this manual.

⚠ Disobediance to instructions with this sign may lead to troubles of the clamp meter and accidents such as electrical shock.

1-2 Maximum Overload Protection Input (within 5 sec.)

Range	Maximum overload protection input
ACA 6–15	AC 60A
ACA 60–150	AC 600A
ACA 600	AC 750A
ACV 150,DCV 60	AC,DC 600V
ACV 300–600	AC 750V
Ω X1–X100	230V(fuse blown)

[2] APPLICATION AND FEATURES

2-1 Application

This is an AC clamp meter designed for measuring small to medium capacity cable runs of low voltage. It is suitable for measurement of alternating current in electric equipment and power supplies.

2-2 Features

- Safety design based on IEC1010-2 CAT. Ⅲ-2.
- Capable of measuring alternating current up to 600A.
- An easy-to-use pointer lock mechanism operable from the side.
- DC voltage range (60V) provided. Temperature can also be measured (optionally).

1-3 Precautions for Safety Measurement

⚠ WARNING

To ensure that the meter is used safely, follow all safety and operating instructions.

1. This meter is a clamp meter exclusive for low voltage. Use it only for circuits of 600V or below. If it is used for measuring the circuit exceeding 600V, it may cause electrical shock or damage to the meter.
2. Pay special attention when measuring the voltage of AC 30 Vrms (42.4V peak) or DC 60V or more to avoid injury.
3. Never apply an input signal exceeding the maximum input value.
4. Never use meter if it is damaged or broken.
5. During testing, never hold the iron core side of the meter ahead of its barrier.
6. Test leads:
   - Be sure to use the specified model of test leads.
   - Never use the test bar or cord that is damaged.
   - During testing, never hold the test pin side of the test bar ahead of its finger guard.
7. In case of the models using fuses, be sure to use a fuse of the specified rating and type.
   Never use a substitute of the fuse or never make a short, circuit with a lead wire.
8. Never use meter in the state that its case or battery cover is taken off.
9. Be sure to disconnect the test pins from the circuit when changing the function or range.
10. Before starting measurement, make sure that the function and range are properly set in accordance with the measurement.
11. Never use meter with wet hands or in a damp environment.
12. Never open meter case except when replacing batteries or fuses.
13. Do not attempt any alterations of original specifications.
14. To ensure safety and maintain accuracy, calibrate and check the meter at least once a year.
15. When making an measurement of distorted AC wave shape other than AC sinusoidal wave.
    Pay attention not to become the state of overload, since the value may be indicated (displayed) less than an actual value.

[3] MAINTENANCE

⚠ WARNING

1. This section is very important for safety. Read and understand the following instruction fully and maintain your instrument properly.
2. The instrument must be calibrated and inspected at least once a year to maintain the safety and accuracy.

3-1 Maintenance and Inspection

- Is the appearance not damaged by falling?
- Is the test leads not damaged?

If your instrument fails in any of the above items, do not use it and have it repaired or replace it with a new one.

3-2 Storage

⚠ CAUTION

1. The panel and the case are not resistant to volatile solvent and must not be cleaned with thinner or alcohol. For cleaning, use dry soft cloth and wipe it lightly.
2. The panel and the 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 in a place where it may be subjected to vibration or from where it may fall.
4. For storing the instrument, avoid hot, cold or humid places or places under direct sunlight or where condensation is anticipated.

Following the above instructions, store the instrument in good environment. (See 5-2)

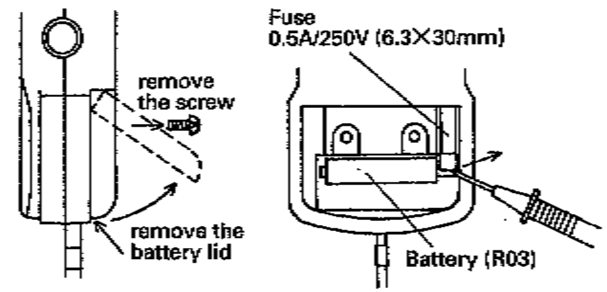
3-3 Battery and Fuse Replacement

⚠ WARNING

1. If the rear case or the battery lid is removed with input applied to the input terminals, you may get electrical shock. Before starting the work, always make sure that no input is applied.
2. Before starting the work, be sure to release the test leads from the circuit.

〈How to Replace〉

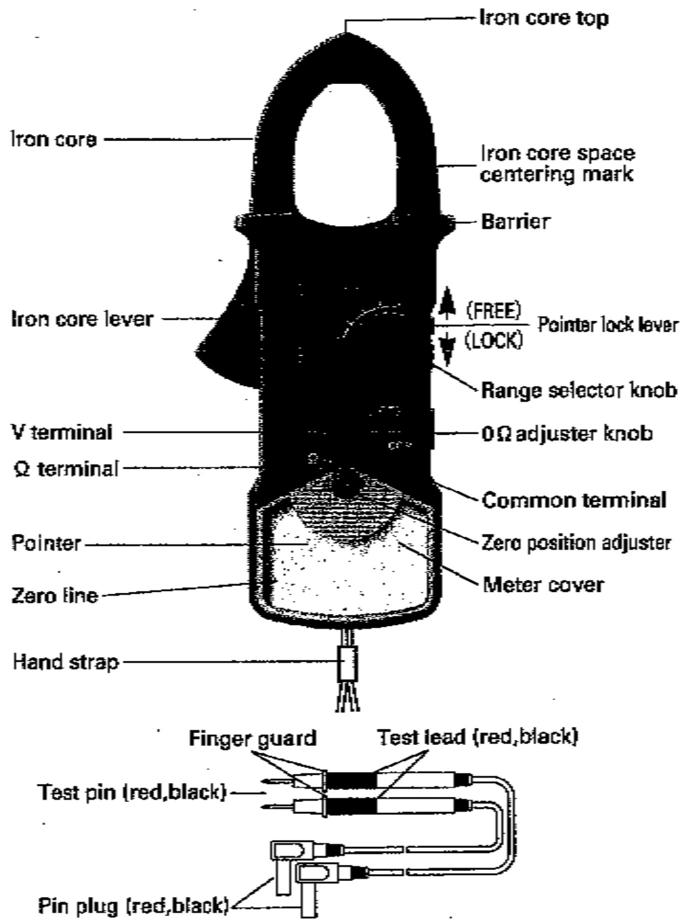
①Remove the battery lid screw with a screwdriver.
②Remove the battery lid.
③Take out the battery or fuse and replace it with a new one.
④Attach the battery lid and fix it with the screw.



Note

- Fuse replacement
  Pry up the metal part of the fuse using the pin of a test lead or other tool to remove the fuse.
- A spare fuse is attached to the inside of the battery lid.

[4] NAME OF COMPONENT UNITS



[5] SPECIFICATIONS

5-1 Measurement Range and Accuracy (23℃±5℃, 80%RH max. No condensation)

Function	Range	Tolerance	Remarks
ACA~	6-15-60-150-600	±3% against f.s. (300A or more ±4% against f.s.)	sine wave 50,60Hz
ACV~	150-300-600	±3% against f.s.	
DCV~	60	±3% against f.s.	
Ω	1k - 100k (×1) (×100)	±3% scale length	center 30Ω-3kΩ battery 1.5V×1
℃ (Temp.)	(−10~200℃)	±3.5% scale length	with optional probe (model THP)

5-2 Others

- Max. clamp size : φ36mm or 10×50mm
- Meter : Moving coil type. 183 μA
- AC rectification : Half-wave rectification
- Circuit protection : The circuit is proected by fuse even when voltage of up to AC 230V is impressed on each range for 5 seconds.
- Internal battery : R6 (IEC) or UM-3 1.5V×1
- Internal fuse : 0.5A/250V, φ6.3×30mm
- Applicable circuit voltage : AC 600V or less
- Applicable standard : IEC 1010-2 CAT.Ⅲ-2
- Withstand voltage : AC 5550V between iron core and rear case (1min.)
- Applicable hight : Up to 2000m(above sea level)
- Operating temperature/humidity range : 0~40℃, 80% RH max. no condensation
- Storage temperature/humidity range : −10~+50℃, 70% RH max. no condensation
- Dimensions and weight : 221 (H) ×97 (W) ×43 (D) mm · 420g
- Accessories : Test lead (TL21) 1. Carrying case (C-CAM6) 1. Instruction manual 1. Spare fuse (0.5A/250V, φ6.3×30mm) 1.
- Optional accessories : Temperature probe (model THP)

[6] MEASUREMENT PROCEDURE

6-1 Startup inspection

⚠ WARNING

1. Be sure to make startup inspection prior to use.
2. Do not use the meter if the body or test leads are damaged or broken.
3. Make sure the test leads are not cut or the fuse is not blown.*

*The meter is OK if the meter pointer moves when the red and black test pins are brought into contact in the resistance range. Refer to 6-6 Measuring Resistance (Ω).
Note, however, the pointer may not move if the incorporated battery have been consumed.

6-2 Preparation for Measurement

①Unlock the meter pointer. (Set the lock lever to FREE.)
②Check to see if the meter pointer is positioned on the 0 graduation line (heavy line on the left end). If not, adjust it with a screwdriver.
③Make measurement following the explanation of measurement (ACA,ACV,DCV,Ω,℃).

6-3 Ending Measurement

①If the test leads are connected to the measuring terminals, disconnect them.
②Set the range select switch to ACA600.
③Lock the meter pointer. (Set the lock lever to LOCK.)

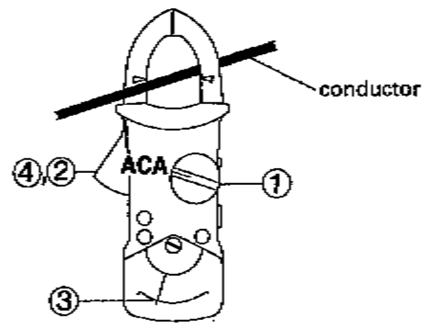
6-4 Measuring ACA~ (max. AC 600A)

1) Applications
It is suitable for measurement of alternating current in electric equipment and power supplies.

⚠ WARNING

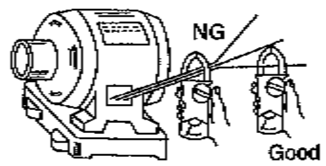
- Be sure to disconnect the test lead from the measuring terminals for preventing electric shock.
- If a current to measure can not be estimated, first measure it with the meter in the 300A or 600A range, then change it to a suitable range.

2) Measurement Procedure
①Set the range select knob to the proper ACA range according to the magnitude of the current to be measured.
②Press the iron core lever to open the iron core. Then, place the conductor to be measured at the center of the iron core. Let go of the iron core lever to fully close the iron core.
③Read the indication on the scale ("A" scale).
6A range — scale 0~60 multiplier X0.1
60A range — scale 0~60 multiplier X1
600A range — scale 0~60 multiplier X10
15A range — scale 0~15 multiplier X1
150A range — scale 0~15 multiplier X10
④After measurement, remove the iron core from the conductor.



⚠ General Cautions on Measuring Current

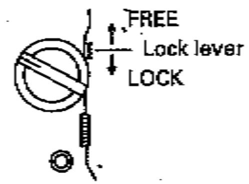
- Close the ends of the iron core (CT) completely. Otherwise, an error may occur.
- AC current measurement does not apply to the frequencies other than sinusoidal 50Hz~60Hz.
- Clamp only one conductor for measurement. Clamping 2 or more conductors leads to erroneous measurement.



- If placed close to a conductor carrying a large current or in a strong magnetic field, the meter may indicate a current value with no conductor clamped (an error is produced).
- Treat with good care the tops of the core. Open and close them gently by means of the core lever. Do not snap it open or shut. The core tops can get damaged to cause erroneous reading.
- Place a conductor to measure in the center of the CT (near the calibration point reference marks). If it is clamped in a position far from the center, a maximum of ±3% error may occur.
- If a large current is applied, vibration noise may be heard from the CT. It is not a problem.

How to Use Lock Lever

- Locking the pointer
  When taking measurement in places where indicated values are hard to read, the pointer lock lever may be used to lock the pointer for easy reading.
- When the lock lever is pushed up, the pointer is released. When the lever is pulled down, the pointer is locked at the indicating position.



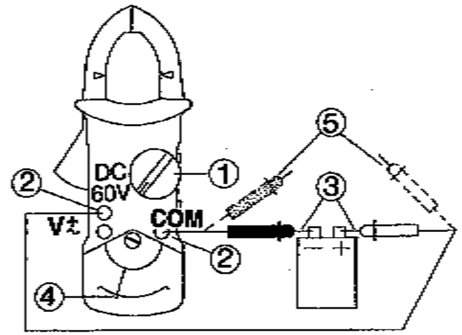
6-5 Measuring Voltage

⚠ WARNING

- Never apply an input signals exceeding the maximum rating input value.
- Be sure to disconnect the test pins from the circuit when changing the range.
- Always keep your fingers behind the finger guards on the test leads when making measurements.
- Never use meter in the state that its case or battery cover is taken off.

6-5-1 Measuring DCV ⎓ (max. DC 60V)

1) Applications
   Measures batteries and DC circuits.
2) Measurement Procedure
   ①Set the range select knob to "DC 60V"
   ②Put in the black pin plug to the "COM" terminal and red pin plug to the "V" terminal.
   ③Apply the black test pin to the minus potential side of the circuit to be measured and the red test pin to the plus potential side.
   ④Read the indication on the scale ("V" scale 0~600). multiplier ×0.1
   ⑤After measurement, remove the red and black test pins from the circuit measured.



6-5-2 Measuring ACV ~ (max. AC 600V)

1) Application

Measures sine-wave a.c. voltages such as commercial power line.

2) Measurement Procedure

①Set the range select knob to the proper ACV range according to the magnitude of the voltage to be measured.

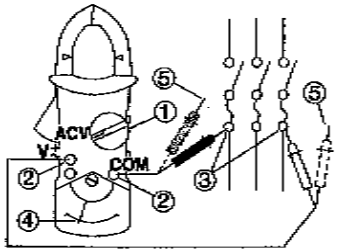
②Put in the black pin plug to the 'COM' terminal and red pin plug to the 'V' terminal.

③Apply the red and black test pins to the circuit to measure.

④Read the indication on the scale ('V' scale)

150V range — scale 0~150
300V range — scale 0~300
600V range — scale 0~600

⑤After measurement, remove the red and black test pins from the circuit measured.



⚠ CAUTION

- If a voltage to measure can not be estimated, first measure it with the meter in the 600V range, then change it to a suitable range.
- This instrument employs the average measurement system and some error is made to the indication of wavefoms other than sine waves.
- The accuracy guaranteed frequency range is 50~60Hz.
- When measuring a voltage, be sure to connect the test leads in parallel to a load.

6-6 Measuring Ω (max. 100kΩ)

⚠ WARNING

Never apply voltage to the "Ω" terminal.

1) Application

Resistance of resistors and circuits are measured.

2) Measurement Procedure

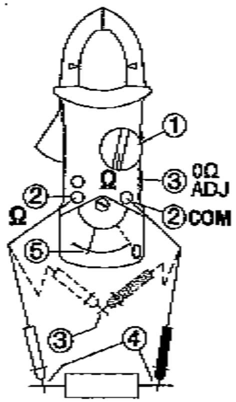
①Set the range select knob to the proper Ω range according to the magnitude of the current to be measured.

②Put in the black pin plug to the 'COM' terminal and red pin plug to the "Ω" terminal.

③Short the red and black test pins and turn the 0Ω adjuster knob so that the pointer may align exactly to 0Ω. (If the pointer fails to swing up to 0Ω even when the 0Ω adjuster is turned clockwise fully, replace the internal battery with a fresh one.)

④Apply the red and black test pins to an object to measure.

⑤Read the indication on the scale ("Ω" scale)



×1 range — scale 1k~0 multiplier ×1
×100 range — scale 1k~0 multiplier ×100

⚠ General Caution on Measuring Resistance

- The Ω range terminals release voltage is about 1.5V.
- The polarity of + and − turns reverse to that of the test leads when measurement is done in Ω range.
- Be sure to use the same rated fuse.
  In case a fuse other than the same rated one is used, error in indication occurs and/or circuit protection is made unable.
- If a test pin is touched by a finger during measurement, measurement will be influenced by the resistance in the human body to result in measurement error.

6-7 Measuring Temperature ℃ (−10～200℃) : (with the optional probe "model THP")

1) Measuring method

①Set the meter in the resistance (Ω) X100 range and connect the black test pin of the temperature probe to the common measuring terminal (COM).

②Insert the tip metal part of the temperature probe in the resistance measuring terminal (Ω) and adjust the meter indication to the 0Ω point with the 0Ω adjuster.

③Change the connection to the resistance measuring terminal (Ω) to the red test pin of the temperature probe.

④Apply the tip metal part of the temperature probe to an area to measure for temperature. When the indication has become stable, read an indicated value on the temperature scale.("℃" scale)