sanwa

DMM

CD5001

デジタルマルチメータ

DIGITAL MULTIMETER

取扱説明書

INSTRUCTION MANUAL

CE

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【1】 SAFETY PRECAUTIONS: Before use, read the following safety precautions

This instruction manual explains how to use your CD5001 digital multimeter safely. Before use, please read this manual thoroughly to ensure correct and safe use. After reading it, keep it together with the product for reference to it when necessary.
Using this product in ways not specified in this manual may damage its protection function.
The instructions given under the headings of "⚠ WARNING" and "⚠ CAUTION" must be followed to prevent accidental burn and electrical shock.

1-1 Explanation of Warning Symbols

The meaning of the symbols used in this manual and attached to the product is as follows.

⚠ : Very important instruction 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.

Symbols attached to the product

⚠ : Refer to the instruction manual before use.
⚠ : High voltage. Do not touch.
⧈ : Double insulation or reinforced insulation
⏚ : Ground Ω : Resistance •)) : Continuity buzzer
⊣⊢ : Capacitance ☼ : Backlight ◄ : EF antenna

1-2 Warning Messages for Safe Use

⚠ WARNING

The following instructions are intended to prevent personal injury such as burn and electric shock. Be sure to follow them when using the instrument.

1. This instrument is a digital multimeter for metering low voltages. Never use it on electric circuits that exceed 1000 V.
2. Never apply an input signal exceeding the maximum rating input value (see section 1-3).
3. Never use the instrument for measuring the line connected with equipment (i.e., motors) that generates induced or surge voltage since it may exceed the maximum allowable voltage.

4. Never use the instrument if it is damaged or broken; the same applies to the test leads.
5. Never use the instrument with the case or battery lid removed.
6. During measurement, do not hold the test pin side of the flange of the test leads.
7. Do not turn the rotary switch to change the function during measurement.
8. Be sure to check the rotary switch position, measurement range, and measurement terminals for each measurement.
9. Never use the instrument when it is wet or with wet hands.
10. Never attempt to repair or modify the product, except for battery and fuse replacement.
11. Be sure to perform start-up inspection and annual inspection.
12. This instrument is for indoor use only.
13. When measuring equipment containing a hazardous charged part, follow your local and national safety standards.
14. Do not use the instrument in a method other than specified. Otherwise, the protection function may be spoiled.

⚠ CAUTION

1. Correct measurement may not be performed when using the instrument near transformers, high current paths, or other sources of strong magnetic fields, near radio transmitters or other sources of electromagnetic radiation, or near charged objects.
2. The instrument may malfunction or correct measurement may not be performed when measuring special waveform such as that of the inverter circuit.

1-3 Maximum Overload Protection Input

Rotary switch position	Input terminal	Max. rated input value	Max. overload protection input value
AUTOV · ACV · DCV · Hz	**V Hz •))) Ω ⊣⊢ (+)** and **COM**	DC/AC 999.9 V	DC/AC 1000 V
•))) · Ω · ⊣⊢		Voltage input prohibited	DC/AC 1000 V

【2】 APPLICATIONS AND FEATURES

2-1 Applications

This instrument is a true RMS (root mean square) digital multimeter designed for measurements within the range of CAT. IV 600 V and CAT. III 1000 V. It is suitable for measurements in electrical work sites of low-voltage circuits.

2-2 Features

- Safety design in compliance with the IEC61010-1.
- Full 4-digit 9999 count.
- True RMS conversion method for AC measurement.
- Electric Field (EF) detection function incorporated.
- AUTO V function automatically distinguishes between DC and AC voltage.
- Auto Hold function automatically holds the measurement value once it stabilizes (only during voltage measurement).
- Large, easy-to-see display.
- Compact, lightweight, easy-to-hold design.
- Test probes can be secured to the body.
- Auto power off after approx. 30 minutes of inactivity (can be cancelled).
- Bright backlight.

Measurement Category (Overvoltage Category)

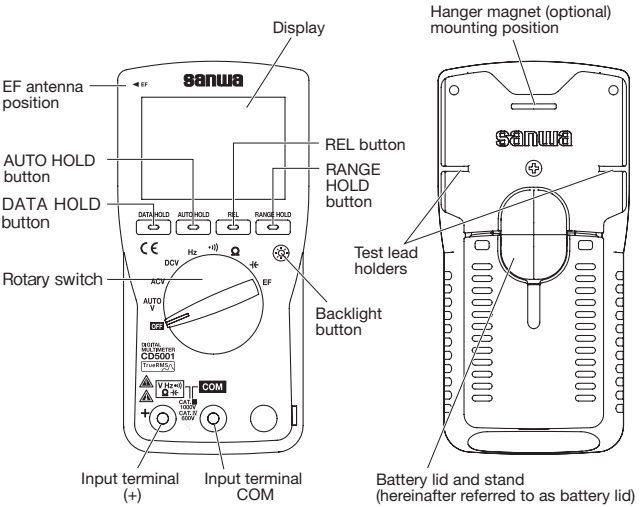
CAT II : Line on the primary side of equipment with the power cord to be connected to the receptacle.

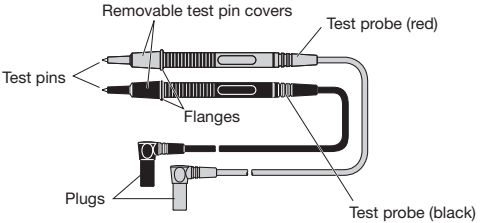
CAT III : Line from the primary side or branch of equipment which directly takes in electricity from a distribution board to the receptacle.

CAT IV : Line from the service conductor to the distribution board.

【3】NAMES OF COMPONENT UNITS

3-1 Main Unit and Test Leads

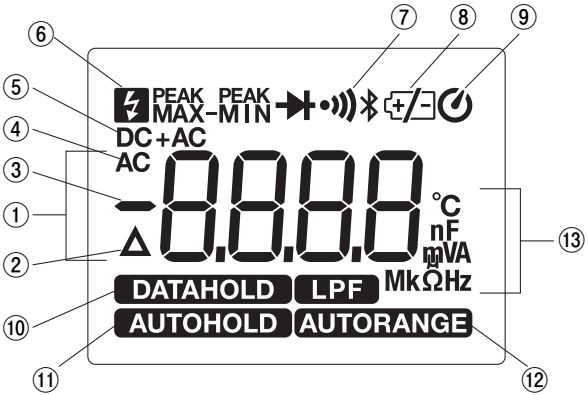




ATL101

・When the removable test pin covers are mounted: CAT.IV 600 V, CAT.III 1000 V
・When the removable test pin covers are not mounted: CAT.II 1000 V

3-2 Display



①	Numeral display part
②	Relative mode
③	Polarity (-)
④	AC measurement function
⑤	DC measurement function
⑥	Voltage warning indicator
⑦	Continuity check
⑧	Low battery warning
⑨	Auto Power OFF
⑩	Data Hold mode
⑪	Auto Hold mode
⑫	Auto Range mode
⑬	Measurement units

PEAK PEAK MAX-MIN , , , +AC , LPF : Not used with this instrument

【4】DESCRIPTION OF FUNCTIONS

4-1 Rotary Switch

Use this switch to turn the power on and off and to select various functions.

4-2 Data Hold Function: DATA HOLD Button

When the DATA HOLD button is pressed, DATAHOLD lights up on the display, and the current display value is held (retained). The display will not change even if the measurement input fluctuates. Pressing the button again will turn off DATAHOLD , release the hold mode, and restore the measurement mode.

4-3 Auto Hold Function: AUTO HOLD Button

When the AUTO HOLD button is pressed during voltage measurement, AUTO HOLD lights up on the display, and the device enters the Auto Hold mode, holding the current display value.

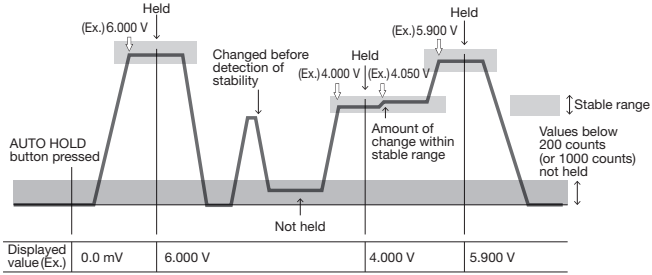
When a new stable measurement value is detected in the Auto Hold mode, the buzzer sounds, and the new measurement value is automatically held. If the test leads are removed, the last detected measurement value is held. Pressing the button again cancels the Auto Hold mode.

This function is only available in the AUTO V, ACV, and DCV settings.

Note:

- The measurement value will be held if there is a change greater than 4% from the measurement value held the last time and if the fluctuation of the measurement value is within 4% for 3 consecutive times.
- Values below 200 counts for each range will not be held (with the exception of 1000 counts for the 999.9 mV AC range).
- During ACV measurement where the test leads are open, the Auto Hold mode may be activated due to noise or induced voltage in the 999.9 mV AC range. Should this be the case, select a range above 9.999 V AC using the Range Hold function.
- In the Auto Hold mode, the REL button and RANGE HOLD button are disabled.
- Pressing AUTO HOLD button in the Data Hold mode switches the mode to the Auto Hold mode.

・Auto Hold Operation Example



4-4 Relative Measurement Function: REL Button

When the REL button is pressed, Δ lights up on the display, showing the value based on the input value which is set to 0 (reference) at the time the button is pressed. Pressing the button again will cancel the display.
This function is only available in the **AUTOV**, **ACV**, **DCV**, **Ω** , and ⊣⊢ settings.

4-5 Range Hold Function: RANGE HOLD Button

Pressing the **RANGE HOLD** button switches the device to the Manual mode, and the range is fixed (the AUTORANGE indicator on the display will turn off). In the Manual mode, each press of this button will shift the range, so select the appropriate range while checking the unit and the position of the decimal point on the display.
To return to the Auto Range mode, press and hold this button for more than 1 second (the AUTORANGE indicator on the display will light up).
This function is only available in the ACV, DCV, and **Ω** settings.

4-6 Backlight Function: ☼ Button

Pressing the ☼ button turns on the backlight of the display. Pressing the button again turns it off. To conserve battery power, turn off the backlight after use.

Note:

・The backlight does not turn off automatically.

4-7 Auto Power OFF Function

This instrument incorporates the Auto Power OFF function that turns off the display automatically about 30 minutes after the last operation, conserving battery power. To reactivate the instrument, press the DATA HOLD or RANGE HOLD button, or turn the rotary switch to the OFF position and then turn it back again.

To disable the Auto Power OFF function, turn the rotary switch from the OFF position to any other position while pressing and holding the RANGE HOLD button. Release the RANGE HOLD button once the display shown on the right appears.

Then, if the instrument starts up with the indicator turned off, it means that the Auto Power OFF function is disabled.

Note:

- Approximately 1 minute before the display turns off, the buzzer will sound 5 times.
- Disabling the Auto Power OFF function and the buzzer cannot be done simultaneously. (see section 4-10).
- Even when the Auto Power OFF function is activated, a small amount of current still flows. So be sure to turn the rotary switch to the OFF position once the measurement is completed.

4-8 Low Battery Indication

The indicator lights up on the display when the batteries have discharged down to a supply voltage of about 2.5 V or less. Replace the batteries when this indicator lights up (see section 6-4).

4-9 Voltage Warning Indicator and Buzzer

The indicator is displayed when AC or DC voltage exceeding 30 V may be applied to the input terminal. Also the buzzer sounds twice when the input voltage exceeds 30 V from below 30 V.

This warning function operates even when the measured value display is fixed by the Data Hold mode (see section 4-2). (The measured value does not change.)

4-10 Buzzer Deactivation Function

While pressing and holding the REL button, turn the rotary switch from the OFF position to any desired position. When the display shown on the right appears, release the REL button. The instrument will start up with the buzzer deactivated.

To reactivate the buzzer, turn the rotary switch to the OFF position and then turn it back to any desired position.

Note:

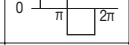
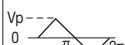
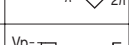
- The buzzer cannot be deactivated simultaneously with the deactivation of the Auto Power OFF function (see section 4-7).

4-11 AC Detection Method

This instrument uses the true RMS (root mean square) method, representing the magnitude of AC as the same work amount as DC. With the true RMS circuit, it is capable of measuring the RMS value of non-sinusoidal waves such as sine waves, square waves, and triangle waves.

4-12 Crest Factor

The Crest Factor (CF) is represented by the ratio of the peak value of a signal to its RMS value. For the most common waveforms such as sine waves and triangle waves, the CF is relatively low.
On the other hand, waveforms similar to pulse trains with low duty cycles will have a high CF. Refer to the table below for the voltage and crest factor of typical waveforms.

	Input Waveform	0 to Peak Vp	RMS value Vrms	Average Value Vavg	Crest Factor Vp / Vrms	Form Factor Vrms / Vavg
Sine Wave		Vp	$\frac{Vp}{\sqrt{2}}$ =0.707 Vp	$\frac{2\,Vp}{\pi}$ =0.637 Vp	$\sqrt{2}$ =1.414	$\frac{\pi}{2\sqrt{2}}$ =1.111
Square Wave		Vp	Vp	Vp	1	1
Triangle Wave		Vp	$\frac{Vp}{\sqrt{3}}$ =0.577 Vp	$\frac{Vp}{2}$ =0.5 Vp	$\sqrt{3}$ =1.732	$\frac{2}{\sqrt{3}}$ =1.155
Pulse		Vp	$\sqrt{\frac{\tau}{2\pi}}\cdot Vp$	$\frac{\tau}{2\pi}\cdot Vp$	$\sqrt{\frac{2\pi}{\tau}}$	$\sqrt{\frac{2\pi}{\tau}}$

Voltages of Various Forms

Note:

- The AC voltage measurement of this instrument is AC-coupled. The DC component of the input signal is cut off.

【5】 MEASUREMENT PROCEDURE

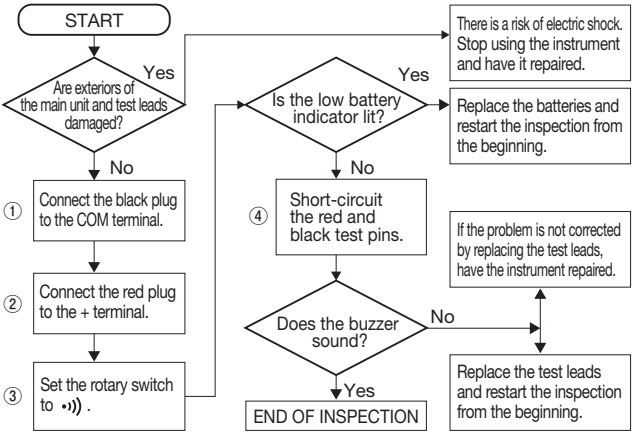
⚠ WARNING

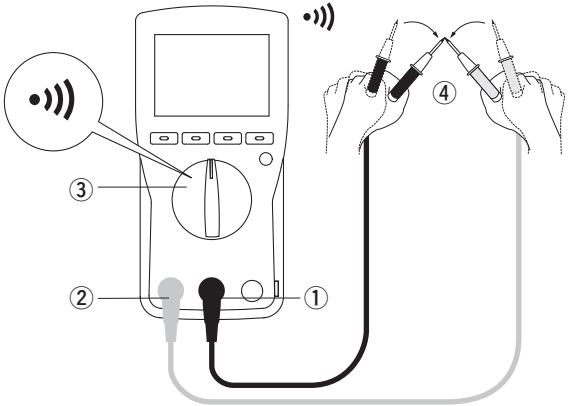
1. Do not apply an input signal exceeding the maximum rated input of each function.
2. During measurement, do not turn the rotary switch.
3. During measurement, do not touch the test pin side of the flange of the test lead.
4. When measurement has been finished, remove the test pins from the measured object and return the rotary switch to the OFF position.
5. Use test leads that are compatible with the measurement category of the measured object. When combining main units and test leads with different measurement categories, the combination will be limited by the lower measurement category.

5-1 Start-up Inspection

Perform the following pre-operational check for safety.

- External appearance: Check that the main unit is free of abnormality or damage due to dropping, etc.
- Accessories: Check that there are no abnormalities such as disconnections or cracks in the test leads.
- Check that the +/- indicator is not lit. If it is lit, replace the batteries with new ones. If nothing is displayed on the display, the batteries might have been totally discharged. (See section 6-4.)
- Check that there is no disconnection in the test leads by setting the rotary switch to the •)) position and short-circuiting the test pins.
- Make sure your hands and the main unit are not wet.

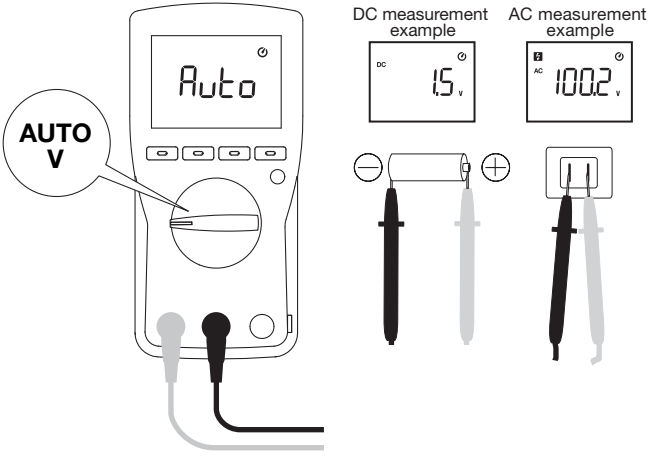

START
Are exteriors of the main unit and test leads damaged?
Yes
There is a risk of electric shock. Stop using the instrument and have it repaired.
No
① Connect the black plug to the COM terminal.
② Connect the red plug to the + terminal.
③ Set the rotary switch to •)) .
Is the low battery indicator lit?
Yes
Replace the batteries and restart the inspection from the beginning.
No
④ Short-circuit the red and black test pins.
Does the buzzer sound?
No
If the problem is not corrected by replacing the test leads, have the instrument repaired.
Replace the test leads and restart the inspection from the beginning.
Yes
END OF INSPECTION


•))
•))
④
③
②
①

5-2 Automatic Voltage Detection Measurement (AUTO V)

This function automatically detects whether the input voltage is alternating current (AC) or direct current (DC).

Rotary switch position	Max. rated input value	Range
AUTO V	AC/DC 999.9 V	999.9 V

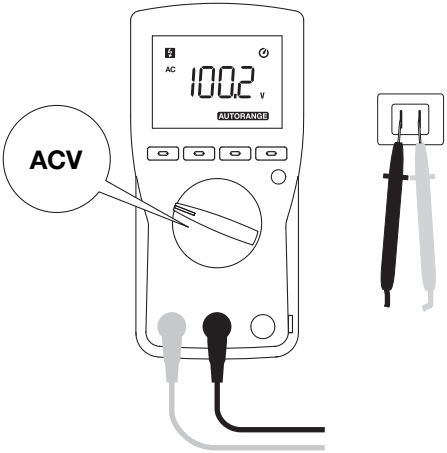


Note:

- When there is no input, the numeric section of the display will show [**Auto**].
- If both AC and DC are present, the display will show the one with a higher RMS value.
- Since the AUTO V function distinguishes between AC and DC, it may take longer than measuring AC voltage (**ACV**) or DC voltage (**DCV**) alone. When using the Auto Hold function in conjunction, the time until the measurement stabilizes will also be added, which may result in a delay before the measurement value is displayed.

5-3 AC Voltage Measurement (ACV)

Rotary switch position	Max. rated input value	Range
ACV	AC 999.9 V	999.9 mV/9.999 V/99.99 V/999.9 V

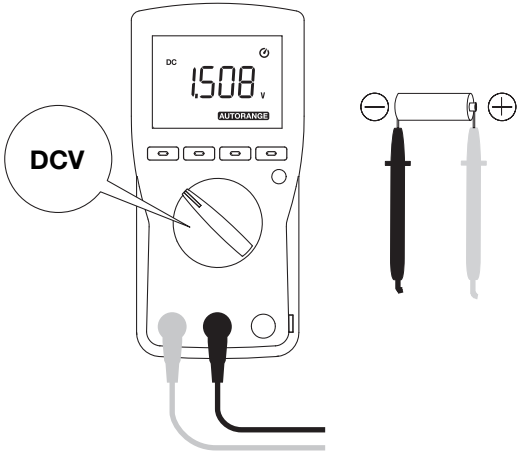


Note:

- The displayed value may fluctuate when the test leads are open, but this is not a malfunction.
- Measurement of an inverter power supply circuit may cause a malfunction.

5-4 DC Voltage Measurement (DCV)

Rotary switch position	Max. rated input value	Range
DCV	DC 999.9 V	999.9 mV/9.999 V/99.99 V/999.9 V



Note:

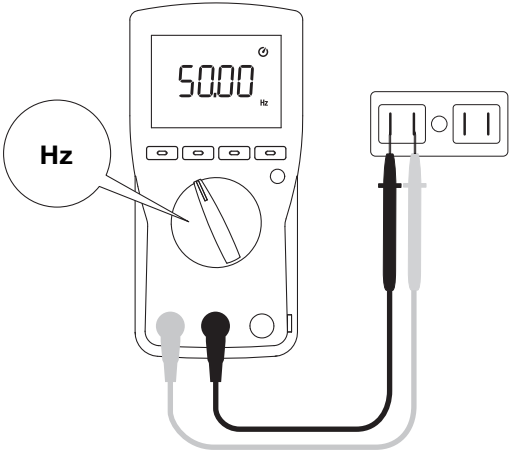
- The displayed value may fluctuate when the test leads are open, but this is not a malfunction.

5-5 Frequency Measurement (Hz)

⚠ CAUTION

Never use the instrument for measuring frequencies to ground as the earth leakage breaker may trip.

Rotary switch position	Max. rated input value	Range
Hz	99.99 kHz (≦1000 Vrms)	9.999 Hz/99.99 Hz/999.9 Hz/ 9.999 kHz/99.99 kHz (Auto range only)



Note:

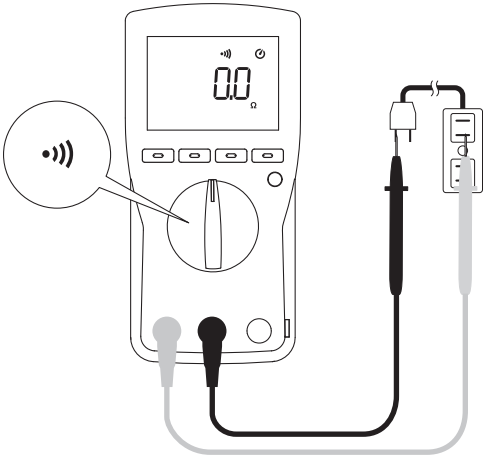
- Due to the low input resistance, a large amount of current will flow during measurement. Never use the instrument for measuring circuits or devices having a small current capacity.
- The displayed value may fluctuate when the test leads are open, but this is not a malfunction.
- Zero cross (+ potential → - potential → + potential) frequencies can be measured. Frequencies of + potential only or – potential only such as logic pulses cannot be measured.
- When this function is used, the data hold and relative function cannot be used.

5-6 Continuity Check (•)))

⚠ WARNING

Never apply an external voltage to the measurement terminals.

Rotary switch position	Max. rated input value	Range
•)))	999.9 Ω	999.9 Ω



Note:

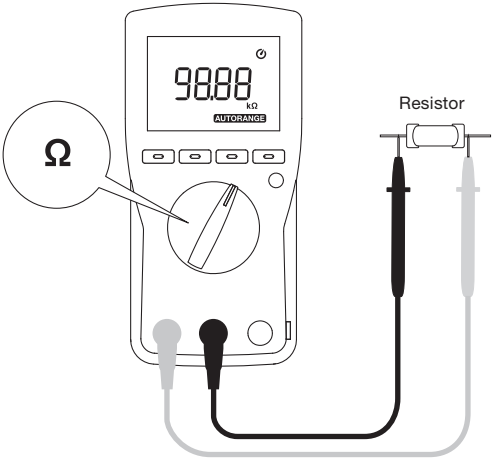
- Open circuit voltage: Approx. 0.6 V DC.
- Continuity buzzer sound range: Approx. 30 to 70 Ω or less.

5-7 Resistance Measurement (Ω)

⚠ WARNING

Never apply an external voltage to the measurement terminals.

Rotary switch position	Max. rated input value	Range
Ω	99.99 MΩ	999.9 Ω/9.999 kΩ/99.99 kΩ/999.9 kΩ/ 9.999 MΩ/99.99 MΩ



Note:

- The open voltage across the measurement terminals is about 1.0 V DC or less.
- If the measurement is affected by noise, shield the measured object with the potential of COM (-).
- If a test pin or the measured object is touched by a finger during measurement, a measurement error will result due to the resistance of the human body.

5-8 Capacitance Measurement (⊣⊢)

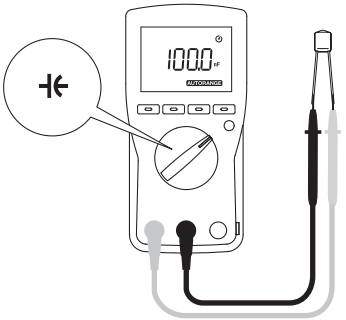
⚠ WARNING

Never apply an external voltage to the measurement terminals.

⚠ CAUTION

1. Remove electric charge in the capacitor prior to measurement.
2. Because this instrument applies a current to the capacitor to measure, it is not suitable for measurement of electrolytic capacitors having a large leak current as a large error will occur.
3. For capacitors having large capacitance, measurement takes a longer time (approx. 10 sec. in the 99.99 mF range)

Rotary switch position	Max. rated input value	Range
⊣⊢	99.99 mF	999.9 nF/9.999 µF/99.99 µF/999.9 µF/ 9.999 mF/99.99 mF



Note:

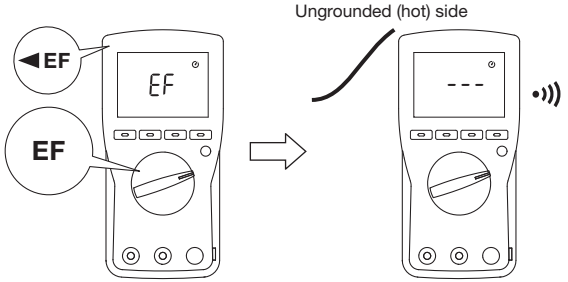
- The display may become unstable due to the flowing capacitance of ambient noise or the test leads. To minimize the effects of the floating capacitance, connect the measured object (capacitor) directly to the + measurement terminal and COM (-) terminal whenever possible.
- The capacitance measurement is available in the auto range only.

5-9 Voltage Detection (EF: Electric Field Detection)

⚠ WARNING

1. Before performing voltage detection, confirm the operation of this instrument with a known power source.
2. Be aware that the presence of voltage below the detection voltage does not necessarily mean there is no voltage.
3. Do not use the instrument with the test leads fixed in the test lead holder.

This function detects the electric field generated by AC voltage and allows a simple determination of the presence or absence of voltage. Bring the upper left part of the main body, where the ◀**EF** mark is located, close to or in contact with the part under test. On the ungrounded (hot) side, the "-" indicator will appear on the display, the buzzer will sound, and the backlight will flash.



If detection is not possible on the grounded side, "EF" will remain displayed on the display and the buzzer will not sound.
As the detected voltage increases, the number of "-" on the display will increase, and the intermittence of the buzzer and backlight will become faster.

Note:

- If the wiring is long, detection may occur even on the grounded side.
- Touching the marked part to an ungrounded case of the equipment or touching it with your hand may cause "-" to be displayed and the buzzer to sound.
- Depending on the surrounding conditions, the "-" display and buzzer may momentarily activate even if the marked part is not brought close to the part under test.
- In the vicinity of inverters or other sources of high frequency, this function may operate even at a distance of a few dozen centimeters.

【6】 MAINTENANCE

⚠ WARNING

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

6-1 Maintenance and Inspection

1) Appearance:
   Is the instrument not damaged due to falling or other cause?
2) Test leads:
   Are the test leads not damaged or the core wires not exposed from the test leads?

If any of the above problems exists, stop using the instrument and request for repair.

6-2 Calibration

For more information, please contact Sanwa's authorized agent / distribution service provider, listed on our website. (See section 7-3.)

6-3 Cleaning and Storage

⚠ CAUTION

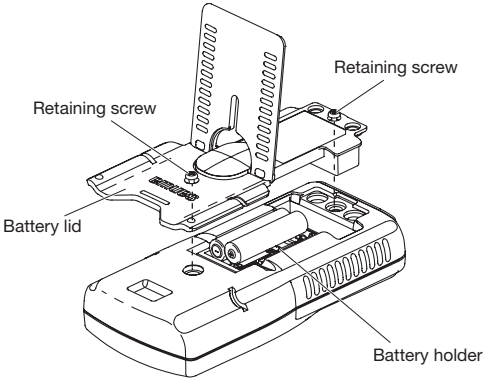
1. The main unit is not resistant to volatile solvent and must not be cleaned with thinner or alcohol. For cleaning, use dry, soft cloth and wipe it lightly.
2. The main unit is not resistant to heat. Do not place it near heat-generating devices.
3. Do not store the instrument in a place where it may be subjected to vibration or where it may fall.
4. Do not store the instrument in places under direct sunlight, or hot, cold or humid places or places where condensation is anticipated.
5. If the instrument will not be used for a long time, be sure to remove the batteries.

6-4 Battery Replacement

⚠ WARNING

1. To avoid electric shock, do not remove the battery lid while an input is applied to the measured terminal or during measurement.
2. Make sure that the rotary switch is set to OFF before replacing the batteries.

① Set up the stand and loosen the battery lid retaining screws (x 2) with a Phillips screwdriver.
② When the battery lid lifts up, remove it from the unit.
③ Replace both of the two batteries in the battery holder with new ones while paying attention the polarity.
④ Attach the battery lid and retaining screws in the original positions.



【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 a 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. This warranty shall not apply to disposable batteries, or any product or parts, which have been subject to one of the following causes:

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

Note:

1) Prior to requesting repair, please check the following:
   Capacity of the batteries, polarity of installation, and discontinuity of the test leads.
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 a Sanwa authorized agent / service provider in advance. The minimum retention period of service functional parts is six (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

【8】 SPECIFICATIONS

8-1 General Specifications

Operation method	⊿−Σ method
AC detection method	True RMS (AC coupling)
Display	Max. 9999 counts
Sampling rate	Approx. 5 times/sec. (DCV)
Over-range display	“OL” shown in numeric section
Range selection	Auto and Manual
Polarity switching	Automatic selection (Only “-” is displayed.)
Battery low warning	⊕/⊟ lights up on display when supply voltage from internal batteries drops below about 2.5 V.
Operating environmental conditions	Altitude no more than 2000 m, indoor use, environmental pollution degree II
Operating temperature / humidity	Temperature: 5 to 40 °C Humidity is as follows (without condensation). 5 to 31 °C: Max. 80 % RH 31 to 40 °C: Linearly decreases from 80 % RH to 50 % RH.
Storage temperature / humidity	Temperature -10 to +40 °C: No more than 80 % RH, without condensation Temperature +40 to +50 °C: No more than 70 % RH, without condensation (Remove batteries when instrument is not to be used for long time.)
Power supply	LR03 / AAA alkaline battery, 1.5 V x 2
Auto power off	Instrument power is turned OFF in about 30 min. after last operation. Standby current: Approx. 2 μA
Power consumption	Approx. 2 mA (during DCV measurement, with backlight off)
Battery life	Approx. 550 hours (during DCV measurement, with backlight off)

Dimensions / mass	149 (*H*) x 72 (*W*) x 37 (*D*) mm, approx. 232 g (excluding protrusions, including batteries)
Safety standards	IEC61010-1, IEC61010-2-030, IEC61010-2-033 CAT. IV 600 V, CAT. III 1000 V IEC61010-031
EMC Directive	IEC61326
Accessories	Instruction manual, test leads (ATL101), LR03 / AAA alkaline battery x 2

8-2 Optional Accessories

Hanger magnet: HM-1
Clamp sensor: ACS101

8-3 Measuring Range and Accuracy

Temperature: 23±5 °C, humidity: 80 % RH max. (no condensation)
rdg (reading): Read value
dgt (digit): Number of counts of last digit

AUTO V : AC/DC Voltage

Range	Accuracy	Input Resistance	Remarks
999.9 V	DC: ±(0.7 %rdg + 6dgt) AC: ±(1.7 %rdg + 6dgt)	Approx. 10 MΩ	• Measurement range DC: ≥1.0 V or ≤-1.0 V AC: ≥1.0 V (in AC measurement) • Accuracy guarantee frequency range: 40 to 400 Hz (sine wave) Measurement not possible when frequency exceeds 1 kHz. • Accuracy guarantee range ≥5% of range • Crest factor At half scale: ≤3 At full scale: ≤1.5

ACV : **AC Voltage**

Range	Accuracy	Input Resistance	Remarks
999.9 mV	±(1.0 %rdg + 5dgt)	Approx. 11 MΩ	• Accuracy guarantee frequency range: 40 to 400 Hz (sine wave) Measurement not possible when frequency exceeds 1 kHz. • Accuracy guarantee range ≥5% of each range • Crest factor At half scale: ≤3 At full scale: ≤1.5
9.999 V			
99.99 V		Approx. 10 MΩ	
999.9 V			

DCV : **DC Voltage**

Range	Accuracy	Input Resistance	Remarks
999.9 mV	±(0.5 %rdg + 2dgt)	Approx. 11 MΩ	
9.999 V			
99.99 V		Approx. 10 MΩ	
999.9 V			

Hz : **Frequency**

Range	Accuracy	Remarks
9.999 Hz	±(0.1 %rdg + 5dgt)	• Auto range only • Sensitivity: Approx. ≥3 Vrms • Measurement not possible when frequency is less than 1 Hz. • Input resistance: Approx. 900 kΩ
99.99 Hz		
999.9 Hz		
9.999 kHz		
99.99 kHz		

•)) : **Continuity Check**

Continuity buzzer activation range: Sounds at approx. 30 to 70 Ω or less.
Open circuit voltage: Approx. 0.6 V DC.

Ω : Resistance

Range	Accuracy	Remarks
999.9 Ω	±(0.5 %rdg + 5dgt)	Open circuit voltage: Approx. ≤1.0 V
9.999 kΩ		
99.99 kΩ		
999.9 kΩ		
9.999 MΩ	±(1.5 %rdg + 5dgt)	
99.99 MΩ	±(5.0 %rdg + 5dgt)	

⊣⊢ : Capacitance

Range	Accuracy	Remarks
999.9 nF	±(5 %rdg + 5dgt)	・Auto range only ・Accuracy for film capacitors or equivalent or better with lower leakage current ・Accuracy guarantee range: ≥5 nF
9.999 µF		
99.99 µF		
999.9 µF		
9.999 mF		
99.99 mF		

EF (Electric Field) detection function :
Detects AC voltages or electric fields of approx. 80 V or higher.

Note:
・Detection frequency: 50 Hz / 60 Hz
・Detection antenna: Top left of the main unit, section marked with ◄ EF

Accuracy calculation method

Example: AC voltage measurement (AC)

Indicated value: 200.0 V

Range accuracy: 999.9 V range ... ±(1.0 %rdg+5dgt)

Error: ± (200.0 V x 1.0 % + 5dgt) = ±2.5 V

True value: 200.0 V ± 2.5 V (in a range of 197.5 V and 202.5 V)

* In the 999.9 V range, 5 dgt corresponds to 0.5 V.

The product specifications described in this manual and its appearance are subject to change without notice for improvement or other reasons.

MEMO

sanwa®

三和電気計器株式会社
本社=東京都千代田区外神田 2-4-4・電波ビル
郵便番号=101-0021・電話=東京(03)3253−4871(代)
大阪営業所=大阪市浪速区恵美須西2−7−2
郵便番号=556-0003・電話=大阪(06)6631−7361(代)
SANWA ELECTRIC INSTRUMENT CO., LTD.
Dempa Bldg, 4-4 Sotokanda 2-Chome Chiyoda-Ku, Tokyo, Japan

01-2402 2040 6027