

9243-CA600 AC Clamp Meter Operation Manual

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VIDEO OF PRODUCTS.



Preface

Thank you for purchasing the new AC clamp meter. In order to use this product safely and correctly, please read this manual thoroughly, especially the Safety Instructions part.

After reading this manual, it is recommended to keep the manual at an easily accessible place, preferably close to the device, for future reference.

I. Overview

The 9243-CA600 are true RMS AC clamp meter. They are designed according to EN61010-1 and CAT II 600V/CAT III 300V safety standards. This meter come with full-featured protection which ensures users a safe and reliable measurement experience. Aside from all the normal features of AC clamp meter, this meter also include current frequency measurement, high voltage frequency measurement, audio visual NCV detection, plenty of additional safety features and live/neutral wire detection.

II. Features

- True RMS measurement
- Audio visual NCV detection
- Maximum measurable voltage: 600V, high voltage frequency range: 10Hz~10kHz• Current frequency response: 50Hz~100Hz, current frequency measurement function
- Very large capacitance (60mF), low voltage frequency (10MHz), and live/neutral wire measurement functions
- Large LCD and fast refresh rate (3 times/s)
- Response time for capacitance measurement: less than 3s for $\leq 1\text{mF}$; about 6s for $\leq 10\text{mF}$; about 8s for $\leq 60\text{mF}$
- Full-featured false detection protection for up to 600V (30kVA) energy surge; overvoltage and overcurrent alarm functions
- The power consumption of the meter is about 1.8 mA. The circuit has an automatic power saving function. The consumption in sleep state is $< 11\mu\text{A}$, which effectively extends the battery life to 400 hours.

Warning: Before using the meter, please read the Safety Instructions carefully.

III. Accessories

Open the package box and take out the meter. Please double check whether the following items are missing or damaged.

- User manual (Chinese & English) ----- 2 pcs
- Test leads ----- 2 pcs
- Cloth bag ----- 1 pc

If any of the above is missing or damaged, please contact your supplier immediately.

IV. Safety Instructions

The meter is designed according to EN61010-1, 61010-2-032 and electromagnetic radiation protection EN61326-1 safety standards, and conforms to CAT II 600V, CAT III 300V, double insulation and pollution grade II.

Note: In case the meter is not used in accordance with the operating instructions, the protection provided by the meter may be weakened or lost.

- Before use, please check if there is any item which is damaged or behaving abnormally. If any abnormal item (such as bare test lead, damaged meter casing, broken LCD, etc.) is found, or if the meter is considered to be malfunctioning, please do not use the meter.
- Do not use the meter if the rear cover or the battery cover is not covered up, or it will pose a shock hazard!
- When using the meter, keep fingers behind the finger guards of the test leads, and do not touch exposed wires, connectors, unused inputs, or circuits being measured to prevent electric shock.
- The function switch should be placed in the correct position before measurement. It is forbidden to change the position during measurement to avoid damage to the meter!
- Do not apply voltage over 600V between any meter terminal and earth ground to prevent electric shock or damage to the meter.
- Be cautious when the measured voltage is higher than 60V (DC) or 30Vrms (AC) to avoid electric shock!
- Never input voltage or current which exceeds the specified limit. If the range of the measured value is unknown, the maximum range should be selected.
- Before measuring the resistance, diode and continuity online, switch off the power supply of the circuit, and fully discharge all capacitors to avoid inaccurate measurement.

- When the " " symbol appears on the LCD, please replace the batteries in time to ensure measurement accuracy. If the meter is not in use for a long time, please remove the batteries.
- Do not change the internal circuit of the meter to avoid damage to the meter and user!
- Do not use or store the meter in high temperature, high humidity, flammable, explosive or strong magnetic field environments.
- Clean the meter casing with a soft cloth and mild detergent. Do not use abrasives or solvents!

V. Electrical Symbols

Symbol	Description
	Caution, possibility of electric shock
	Alternating current
	Direct current
	Equipment protected throughout by DOUBLE INSULATION or REINFORCED INSULATION
	Earth (ground) TERMINAL
	Warning or Caution

VI. General Specifications

- Max display: 6099
- Polarity display: Auto
- Overload display: "OL" or "-OL"
- Low battery indication: The " " symbol is displayed.
- Low battery shutdown prompt: The "Lo.b" interface appears on the LCD and lasts for about 10s, the buzzer beeps three times, and the meter automatically shuts down.
- Test position error: If the source under test is not placed at the center of the clamp jaws when measuring current, $\pm 1.0\%$ additional error in reading will be produced.
- Drop protection: 1m
- The maximum size of jaw opening: 28mm in diameter
- Battery: AAA battery 1.5V \times 2
- Auto power off: If there is no operation of the function switch or any button for 15 minutes, the meter will automatically power off. This function can be turned off as needed.
- Dimensions: 215mm \times 63mm \times 36mm
- Weight: About 245g (including batteries)
- Altitude: 2000m
- Operating temperature and humidity: 0 $^{\circ}$ C~30 $^{\circ}$ C ($\leq 80\%$ RH), 30 $^{\circ}$ C~40 $^{\circ}$ C ($\leq 75\%$ RH), 40 $^{\circ}$ C~50 $^{\circ}$ C ($\leq 45\%$ RH)
- Storage temperature and humidity: -20 $^{\circ}$ C~60 $^{\circ}$ C ($\leq 80\%$ RH)
- Electromagnetic compatibility: RF=1V/m, overall accuracy = specified accuracy + 5% of range RF>1V/m, no specified calculation

VII. External Structure (fig. 1)

- NCV sensing end
- Clamp jaws
- Hand guard
- LED indicator
- Jaw opening trigger
- Function switch
- LCD display
- Function buttons
- Positive (+) input jack
- COM (negative -) input jack



fig.1

VIII. Button Description

1. SELECT Button

In the composite function position, press this button to switch between the corresponding measurement functions; in the AC/DC/Hz position, short press this button to switch between the AC and DC functions, and longpress (about 2s) this button to enter/exit the Hz measurement function.

In the NCV/LIVE position, short press this button to switch between the EFH and EFL ranges, and long press (about 2s) this button to enter/exit the LIVE measurement function.

2. HOLD/BACKLIGHT Button

Short press this button to enter/exit the data hold mode, and long press (about 2s) this button to turn on/off the backlight (the backlight will automatically turn off after 60s).

3. MAX/MIN Button

Short press this button to enter the maximum/minimum measurement mode and long press this button to exit (only valid for AC/DC voltage, AC current and resistance measurement).

4. REL Button

In the capacitance and voltage positions, press this button to store the current reading as a reference for future readings. When the LCD display value is reset to zero, the stored reading will be subtracted from the future readings. Press this button again to exit the relative value mode.

IX. Operating Instructions

1. AC Current/Current Frequency Measurement (fig. 2)

- Select the AC current range (6A, 60A or 600A)
- Press the trigger to open the clamp jaws, and fully enclose one conductor.
- Only one conductor can be measured at a time, otherwise the measurement reading will be wrong.

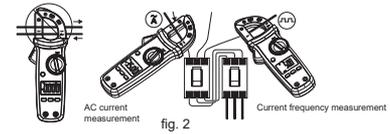


fig. 2

Note:

- The current measurement must be taken within 0 $^{\circ}$ C~40 $^{\circ}$ C. Do not suddenly release the trigger, as the impact will change the reading for a short time.
- To ensure measurement accuracy, center the conductor in the jaws. Otherwise, $\pm 1.0\%$ additional error in reading will be produced.
- When the measured current is $\geq 600\text{A}$, the meter will automatically sound an alarm and the high voltage alarm prompt " " will automatically flash.
- If the LCD displays "OL", it indicates that the current is over range and there is a danger of damage to the meter.

2. AC/DC Voltage and Voltage Frequency Measurement (fig. 3)

- Insert the red test lead into the "LIVE- \pm V Ω Hz" jack, black into the "COM" jack.
- Turn the function switch to the AC/DC voltage position, and connect the test leads with the measured load or power supply in parallel.

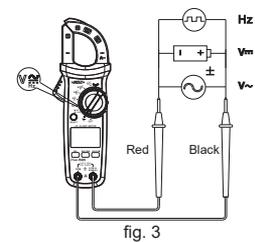


fig. 3

Note:

- Do not input voltage above 600V. Although it is possible to measure higher voltage, it may damage the meter.
- Be cautious to avoid electric shock when measuring high voltage.
- When the measured voltage is $\geq 30\text{V}$ (AC) or $\geq 60\text{V}$ (DC), the LCD will display the high voltage alarm prompt " ".

3. Resistance Measurement (fig.4)

- Insert the red test lead into the "LIVE- \pm V Ω Hz" jack, black into the "COM" jack.
- Turn the function switch to the " " position, press the SELECT button to select resistance measurement, and connect the test leads with both ends of the measured resistance in parallel.

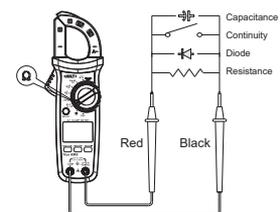


fig.4

Note:

- If the measured resistor is open or the resistance exceeds the maximum range, the LCD will display "OL".
- Before measuring the resistance online, switch off the power supply of the circuit, and fully discharge all capacitors to avoid inaccurate measurement.
- If the resistance is not less than 0.5 Ω when the test leads are short-circuited, please check the test leads for looseness or other abnormalities.
- Do not input voltage higher than 30V to avoid personal injury.

4. Continuity Test (fig.4)

- Insert the red test lead into the "LIVE- \pm V Ω Hz" jack, black into the " " jack.
- Turn the function switch to the " " position, press the SELECT button to select continuity measurement, and connect the test leads with both ends of the measured load in parallel.
- Measured resistance $< 10\Omega$: The circuit is in good conduction status; the buzzer beeps continuously. Measured resistance $> 31\Omega$: The buzzer makes no sound.

Note:

- Before measuring the continuity online, switch off the power supply of the circuit, and fully discharge all capacitors.
- Do not input voltage higher than 30V to avoid personal injury.

5. Diode Test (fig.4)

- Insert the red test lead into the "LIVE- \pm V Ω Hz" jack, black into the "COM" jack. The polarity of the red test lead is "+" and that of the black test lead is "-".
- Turn the function switch to the " " position, press the SELECT button to select diode measurement, and connect the test leads with the positive and negative poles of the measured diode.
- 0.08V \leq reading $< 1.2\text{V}$: The buzzer makes one beep indicating the normality of the diode. Reading $< 0.08\text{V}$: The buzzer beeps continuously indicating the damage of the diode. For the silicon PN junction, the normal value is generally about 500~800 mV.

Note:

- If the diode is open or its polarity is reversed, the LCD will display "OL".
- Before measuring the diode online, switch off the power supply of the circuit, and fully discharge all capacitors.
- Do not input voltage higher than 30V to avoid personal injury.

6. Capacitance Measurement

- 1) Insert the red test lead into the "LIVE \leftarrow V \rightarrow Hz" jack, black into the "COM" jack.
- 2) Turn the function switch to the " \leftarrow " position, and connect the test leads with the measured capacitance in parallel. For capacitance $\leq 100\text{nF}$, it is recommended to use "REL" measurement mode.

⚠ Note:

- If the measured capacitor is short-circuited or the capacitance exceeds the maximum range, the LCD will display "OL".
- When measuring capacitance $>600\mu\text{F}$, it may take some time to steady the readings.
- Before measuring, fully discharge all capacitors (especially for capacitors with high voltage) to avoid damage to the meter and user.

7. Non-contact AC Electric Field Sensing (NCV, fig. 5a)

The electric field sensing sensitivity is divided into two levels ("EFHI" and "EFLo"). The meter defaults to "EFHI". Select different sensitivity levels for measurement according to the intensity of the measured electric field. When the electric field is around 220V (AC) 50Hz/60Hz, select "EFHI"; when the electric field is around 110V (AC) 50Hz/60Hz, select "EFLo".

- 1) Turn the function switch to the NCV position.
- 2) Bring the NCV sensing end of the clamp jaws close to a charged electric field (socket, insulated wire, etc.). The LCD will display the segment "-", the buzzer will beep, and the red LED will flash. As the intensity of the measured electric field increases, the more the segments (---) are displayed, and the higher the frequency at which the buzzer beeps and the red LED flashes.

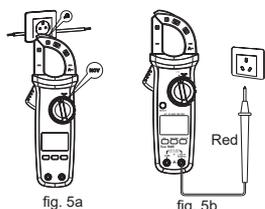


fig. 5a

fig. 5b

⚠ Note:

- Use the NCV sensing end of the clamp jaws to approach the measured electric field, otherwise the measurement sensitivity will be affected.
- When the measured electric field voltage is $\geq 100\text{V}$ (AC), observe whether the conductor of the measured electric field is insulated to avoid personal injury.

8. Live/Neutral Wire Measurement (fig. 5b)

- 1) Turn the function switch to the LIVE position.
- 2) Insert the red test lead into the "LIVE \leftarrow V \rightarrow Hz" jack, make the black test lead suspended, and use the red test lead to touch the socket or bare wire to distinguish the live or neutral wire.
- 3) When the neutral wire or uncharged object is detected, the "----" state is displayed.
- 4) When the AC "live wire" ($>60\text{V}$) is detected, the LCD will display "LIVE" accompanied by audio/visual indication.

⚠ Note:

- When using the LIVE function, in order to avoid the effect of the interference electric field of the COM input on the accuracy of distinguishing the live/neutral wire, please move the black test lead away from the COM input.
- When using the LIVE function, keep your hand away from the meter casing.
- When the LIVE function is applied to the measurement of dense high-voltage electric field, the accuracy of the meter to judge the "live wire" may be unstable. In this case, it should be judged by the LCD display and sound frequency together.

9. Others

- 1) Auto power off: During measurement, if there is no operation of the function switch or any button for 15 minutes, the meter will automatically shut down to save power. You can wake it up by pressing any button or restart it after turning the function switch to the OFF position. To disable the auto power off function, press and hold the SELECT button in the off state, and then turn on the meter. To resume the auto power off function, restart the meter after shutdown.
- 2) Buzzer: When any button is pressed or the function switch is turned, if it is valid, the buzzer will make one beep (about 0.25s). When measuring voltage or current, the buzzer will beep intermittently to indicate the over range.
- 3) Low battery detection: The battery voltage will be automatically detected as long as the meter is on. If it is lower than 2.5V, the LCD will display the "▢" symbol.
- 4) Low battery shutdown function: When the battery voltage is lower than 2.4V, the LCD displays the "▢" symbol, the "Lo.Bt" interface appears and lasts for about 10s, the buzzer makes consecutive beeps three times, and then the meter automatically shuts down (no interface is displayed).

X. Technical Specifications

Accuracy: \pm (a% of reading + b digits) Ambient temperature and humidity: $23^{\circ}\text{C}\pm 5^{\circ}\text{C}$; $\leq 80\%\text{RH}$ Temperature coefficient: temperature should be within $18^{\circ}\text{C}\sim 28^{\circ}\text{C}$ and the fluctuation range should be within $\pm 1^{\circ}\text{C}$. When the temperature is $< 18^{\circ}\text{C}$ or $> 28^{\circ}\text{C}$, add temperature coefficient error 0.1 x (specified accuracy) $^{\circ}\text{C}$.

1.AC Current

Range	Resolution	Accuracy	Overload Protection
6.000A	0.001A	$\pm(4\%+10)$	620A
60.00A	0.01A	$\pm(2\%+10)$	
600.0A	0.1A		
Current frequency monitoring: 50Hz~100Hz	0.1Hz	$\pm(1.0\%+5)$	

- Frequency response: 50Hz~100Hz
- For 6A range, open circuit allows least significant digit <3 .
- Accuracy guarantee range: 1%~100% of range
- The input current amplitude of the current frequency should be $>2\text{A}$.

2.AC Voltage

Range	Resolution	Accuracy	Overload Protection
6.000V	0.001V	$\pm(1.0\%+5)$	600Vrms
60.00V	0.01V	$\pm(0.8\%+5)$	
600.0V	0.1V		
Voltage frequency monitoring: 10Hz~10kHz	0.01Hz~0.01kHz	$\pm(1.0\%+5)$	

- Input impedance: About 10M Ω
- Frequency response: 45Hz~400Hz, true RMS display
- Accuracy guarantee range: 1%~100% of range; the input voltage amplitude of the voltage frequency should be $>5\text{V}$.
- The AC crest factor of a non-sinusoidal wave while can only reach 1.8 at 6000 counts. The additional error should be added for the corresponding crest factor as follows:
 - a) Add 3% when crest factor is 1~2
 - b) Add 5% when crest factor is 2~2.5
 - c) Add 7% when crest factor is 2.5~3

3.DC Voltage

Range	Resolution	Accuracy	Overload Protection
600.0mV	0.1mV	$\pm(0.7\%+3)$	600Vrms
6.000V	0.001V	$\pm(0.5\%+2)$	
60.00V	0.01V	$\pm(0.7\%+3)$	
600.0V	0.1V		

- Input impedance: About 10M Ω
- For mV range, short circuit allows least significant digits 5.
- Accuracy guarantee range: of range $\leq 1\%\sim 100\%$

4.Frequency/Duty Ratio

Range	Resolution	Accuracy	Overload Protection
10Hz~10MHz	0.01Hz~0.01MHz	$\pm(0.1\%+4)$	600Vrms
0.1%~99.9%	0.1%	$\pm(3.0\%+5)$	1) Measuring sensitivity: $\leq 100\text{kHz}$: 200mVrms \leq input amplitude $\leq 30\text{Vrms}$ $>100\text{kHz}\sim 1\text{MHz}$: 600mVrms \leq input amplitude $\leq 30\text{Vrms}$ $>1\text{MHz}\sim 10\text{MHz}$: 1Vrms \leq input amplitude $\leq 30\text{Vrms}$ 2) Duty ratio is only applicable to the measurement of square wave $\leq 10\text{kHz}$; amplitude: 1Vp-p Frequency $\leq 1\text{kHz}$ Duty ratio: 10.0%~95.0% Frequency $>1\text{kHz}$ Duty ratio: 30.0%~70.0%

5. Resistance

Range	Resolution	Accuracy	Overload Protection
600.0 Ω	0.1 Ω	$\pm(1.0\%+2)$	600Vrms
6.000k Ω	0.001k Ω	$\pm(0.8\%+2)$	
60.00k Ω	0.01k Ω		
600.0k Ω	0.1k Ω		
6.000 M Ω	0.001M Ω		
60.00 M Ω	0.01M Ω		

6. Continuity

Range	Resolution	Accuracy	Overload Protection
600.0 Ω	0.1 Ω	$<30\Omega$: Consecutive beeps $>31\Omega$: No beep Open circuit voltage: About 2.0V	600Vrms

7. Diode

Range	Resolution	Accuracy	Overload Protection
6.000V	0.001V	Open circuit voltage: About 3.9V Measurable PN junction: Forward voltage drop $\leq 2\text{V}$. For the silicon PN junction, the normal value is generally about 0.5~0.8V.	600Vrms

8.Capacitance

Range	Resolution	Accuracy	Overload Protection
6.000nF	0.001nF	$\pm(4.0\%+10)$	600Vrms
60.00nF	0.01nF		
600.0nF	0.1nF		
6.000uF	0.001uF	$\pm(4.0\%+5)$	
60.00uF	0.01uF		
600.0uF	0.1uF	$\pm 10\%$	
6.000mF	0.001mF		
60.00mF	0.01mF		

- Measured value = displayed value - open circuit value of the test leads (For capacitance 100nF , it is recommended to use "REL" \leq measurement mode.)
- For capacitance range, open circuit allows least significant digit ≤ 20 .

9. NCV

Range	Electric field sensing sensitivity level	Accuracy
NCV	EFLo	To sense the wire above 24 $\pm 6\text{V}$ and identify whether the mains socket is charged
	EFHI	To sense the wire above 74V $\pm 12\text{V}$, to identify whether the mains socket is charged, or to judge the live/neutral wire of the socket according to the intensity of the sensing

- Test results may be affected by different socket designs or wire insulation thickness.

10. LIVE

Range	Electric field sensing sensitivity level	Accuracy
LIVE	trigger voltage $\geq 60\text{V}$ (50Hz/60Hz)	When no test is being performed, display the "----" and symbol "AC". When testing the neutral wire, display the "----". When the probe of the meter touches the "hot wire" of the mains power supply, display the characters "LIVE" and "⚡" and changes the frequency of the sound and LED flashing according to the intensity of the induction, indicating the strength of the voltage of the hot wire.

XI. Maintenance

- ⚠ Warning: Before opening the rear cover of the meter, remove the test leads to avoid electric shock.

1.General Maintenance

- 1) When the meter is not in use, place the function switch in the OFF position to avoid continuous consumption of battery energy.
- 2) Clean the meter casing with a soft cloth and mild detergent. Do not use abrasives or solvents!
- 3) The maintenance and service must be implemented by qualified professionals or designated departments.

2.Battery Replacement (fig. 6)

- 1) Turn off the meter and remove the test leads from the input terminals.
- 2) Unscrew the screw of the battery compartment, remove the battery cover, and replace the 2 standard AAA batteries according to the polarity indication.
- 3) Secure the battery cover and tighten the screw.

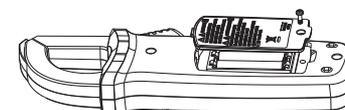


fig. 6

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