

CM-2016 Digital Clamp Meter Operation Manual

The meter is a precision instrument. To avoid damage injury caused by wrong operation, please read this manual carefully before operation.

1. SUMMARY


This is a 3 5/6 digit digital AC/DC clamp meter with good stability and reliability. It has a LCD with 14mm digit display, which gives clear readings.

It can test DCV, ACV, DCA, ACA, resistance, capacitance, frequency, temperature, diode, continuity, as well as non-contact AC voltage test. It is equipped with clamp jaw lighting, unit symbol display, data hold function, auto power off and warning functions. It works in both auto range and manual range. To assure high accuracy and resolution, it adopts a micro-processor which drives the LCD directly and a dual integral A/D converter IC. It is an ideal tool for labs, factories radio-technology and household.

2. SAFETY NOTICE

The meter is designed to be in compliance with IEC1010-1 (EN61010-1), pollution2, CAT.III600V and UL3111-1. Please read this manual carefully before operation.

2-1.SAFETY SYMBOLS

 CAUTION: Refer to manual before operation.

 Low battery indication.

 WARNING: High voltage!

 Double insulation.

2-2.SAFETY INSTRUCTIONS

2-2-1. To avoid damage to the meter or personal injury, please read this manual carefully before operation, and follow instructions in this manual during operation.

2-2-2. Disconnect all signals and plug off test leads before opening the case cover. To avoid electric shock or damage to the meter, water should not be leaked inside.

2-2-3. DO NOT use the meter to do any test before the case cover or screws is fully assembled.

2-2-4. DO NOT input any value higher than the rated limit.

2-2-5. DO NOT input voltage to terminals in resistance range.

2-2-6. Turn the power switch to OFF position after use.

2-2-7. To avoid damage by battery leakage, remove batteries before long-term storage.

2-2-8. Voltage above 60Vdc or 30Vac RMS will cause severe electric shock.

2-2-9. To avoid electric shock, be careful when nipping naked testing objects.

3. FEATURES

3-1. GENERAL FEATURES

3-1-1. Display: LCD.

3-1-2. Max. display: 5999 digits (3 5/6), and auto polarity display.


3-1-3. Clamp open max.28mm.

3-1-4. Over-range display: "OL".

3-1-5. Data hold.

3-1-6. Relative Value measurement.

3-1-7. Sampling rate: 3 times/sec.

3-1-8. The symbol  appears when battery is low.

3-1-9. Continuity test: buzzer alarms when < (50±10) Ω.

3-1-10. Auto range or Manual range.

3-1-11. Auto power off.

3-1-12. Power consumption: approx.3mA.

3-1-13. Power source: 2 × 1.5V batteries (AAA).

3.1.14 Operating environment: (0~40)°C, relative humidity: <70%.

3.1.15 Dimension: 123W×270D×35H mm.

3.1.16 Weight: approx. 280g (including batteries).

3.1.17 Accessories: operation manual×1pc, test leads×1 pair, temperature probe TP01×1 pair, 1.5V AAA batteries×2pcs. carrying bag×1pc (optional).

3-2.SPECIFICATIONS

3-2-1. Accuracy: ±(a% of reading + digits). To ensure accuracy, the ambient temperature should be (23±5)°C and the relative humidity shall be less than 70%. The accuracy is guaranteed for one year since production date.

3-2-2. Temperature co-efficiency: 0.1 of specified accuracy/1°C (<18°C or >28°C).

3-2-3. DC Voltage (DCV)

Range	Accuracy	Resolution
600mV	±(1.0% of reading+5)	0.1mV
6V	±(0.5% of reading +5)	0.001V
60V		0.01V
600V		0.1V

Input impedance: 10MΩ. Overload production: 1000Vrms.

3-2-4. AC Voltage (ACVrms)

Range	Accuracy	Resolution
600mV	±(1.5% of reading+5)	0.1mV
6V	±(1.0% of reading+5)	0.001V
60V		0.01V
600V		0.1V

Input impedance: 10MΩ. Overload production: 1000Vrms

Frequency response: 750V at 40Hz~1kHz, other ranges 40Hz~400Hz.

3-2-5.DC Current (DCA)

Range	Accuracy	Resolution
600A	±(2.0%+30)	0.1A

NOTE: Clear to zero before measurement. The testing object shall be placed in the middle of the clamp jaw.

3-2-6. AC Current (TRMS)

Range	Accuracy	Resolution
600A	±(2.0%+30)	0.1A

Frequency response: Sine wave and triangle wave 40Hz- kHz; other waveforms 40Hz-200Hz.

NOTE: The testing object shall be placed in the middle of the clamp jaw.

3-2-7. Resistance (Ω)

Range	Accuracy	Resolution
600Ω	±(0.8%+5)	0.1Ω
6kΩ	±(0.8%+3)	1Ω
60kΩ		10Ω
600kΩ		100Ω
6MΩ	±(1.0%+2.5)	1kΩ
60MΩ		10kΩ

Open circuit voltage: <3V. Over load protection: 250Vrms.

NOTE:

a) In 600Ωrange, short the test leads to measure the wire resistance, and then subtract it from the real measurement value.

b) When measure resistance over 1MΩ, it is normal that the reading reacts slowly. Please wait until the reading is stable.

WARNING: DO NOT input voltage in this range.

3-2-8. Capacitance (C)

Range	Accuracy	Resolution
60nF	±(3.5%+20)	10pF
600nF		100pF
6uF		1nF
60uF	±(5.0%+10)	10nF
600uF		100nF
6000uF		1uF

Over load protection: 250Vrms.

WARNING: DO NOT input voltage in this range.

3-2-9. Frequency (f)

Range	Accuracy	Resolution
10Hz	±(0.1%+3)	0.01Hz
100Hz		0.1Hz
1kHz		1Hz
10kHz		10Hz
100kHz		100Hz
1MHz		1kHz
20MHz		10kHz

Input sensitivity:>0.7V. Over load protection: 250Vrms.

3-2-10. Temperature

Range	Accuracy	Resolution
(-40~1000)°C	±(1.0%+5) < 400°C (1.5%+15) ≥ 400°C	1°C
(0~1832)°F	±(0.75%+5) < 750°F ±(1.5%+15) ≥ 750°F	1°F

Sensor: K type banana plug (Nickel-Chromium Nickel-Silicon)

WARNING: DO NOT input voltage in this range.

3-2-11. Diode and Continuity test

Range	Display value	Testing condition
	Diode forward voltage drop	Forward DC current 1mA. Open circuit voltage 3V.
	When the testing resistance is less than (50 ± 2 0)Ω, the buzzer alarms continuously.	Open circuit voltage 3V. Press SELECT key to switch between two ranges.

Over load protection: 250Vrms.

WARNING: DO NOT input voltage in this range.

4. OPERATION INSTRUCTIONS

4-1. PANEL ILLUSTRATION (Fig.1)

- 1) Clamp jaw: 0-600A DC current, AC current and NCV detecting device.
- 2) Clamp gunlock: Press the gunlock to open clamp jaw.
- 3) Hand protection: A safe design to protect users from touching the dangerous area.
- 4) Clamp light: Turn on the clamp light to light up the tested area in the dark to prevent danger.
- 5) NCV indicator: Detect the existence of high voltage nearby to prevent electric shock.
- 6) Function rotary switch: Select functions and ranges; Turn on or turn off the clamp meter.

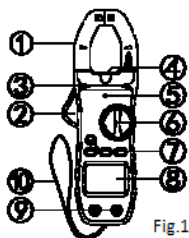


Fig.1

Function	Description
NCV	Non-Contact Voltage detection.
	DCA and ACA measurement. Press SELECT key to switch measurements.
	ACV measurement. Press Hz/DUTY key to switch measurement between frequency and duty ratio in high voltage amplitude
	DCV measurement
	Press SELECT key to switch measurement between resistance, diode, continuity and capacitance.
Hz	Frequency measurement. Press Hz/DUTY key to switch measurement between frequency and duty ratio in low voltage amplitude.
°C/°F	Temperature measurement. Press SELECT key to switch between °C and °F.

7) FUNCTION KEYS

SELECT key: This is a key to select functions, working in response to trigger. Switch between AC or DC measurement in . Or select Ω function

from . Or switch between and measurements. Or switch between °C/°F measurements.

REL/ RANGE key:

1. In and measurements, it is REL function. Press this key to clear “of readying” and enter relative value measurement. REL symbol will appear on the LCD. Press this key again to exit REL measurement. In and measurements, if the display dose not return to zero before measurement, press this key to return to zero before measurement.

2. In voltage and resistance measurements, it is RANGE function, to choose from auto range or manual range. The meter is default in auto range. The symbol “AUTO” appears on LCD. Press this key for one time to switch to manual range. Press it again for one time to increase on step from low to high. Press it for more than two seconds to return to AUTO range.

HOLD/☀ key: The HOLD key is to hold “of readying”, working in response to trigger. Press this key for one time to lock the reading. Press any other keys to exit HOLD function. Press this key for more than two seconds to turn on the LCD backlight and clamp light at the same time. The LCD backlight and clamp jaw light will be turned off automatically after five seconds, or turned off by press this key again for more than two seconds.

Hz/DUTY key: In ACA/ACV measurements, press this key to switch measurement between frequency, duty ratio, voltage and current. In frequency measurement, press this key to switch between measurement of frequency and duty ratio (1-99%).

8) LCD panel: display the measurement values and units.



No.	Function	Description
1	MAX-MIN	Invalid
2	APO	A symbol of auto power off.
3	△	Clear to zero or in REL measurement mode.
4	HOLD	Data hold function is activated.
5	-	A symbol for negative measurement value.
6	AC	In AC voltage or AC current measurement.
7	DC	In DC voltage or DC current measurement.
8	AUTO	In auto range mode.
9		Invalid
10	hFE nF, μF mV, V uA, mA, A % °C, °F NCV MΩ, kΩ, Ω Hz, kHz, MHz	In diode measurement or continuity buzzer alarm is activated. In transistor measurement (to measure the magnification times of transistor). NanaFarad, MicroFarad NanaVolt, MicroVolt MicroAmp, MilliAmp, Amp Percentage (for duty ratio measurement), centigrade degree, Fahrenheit degree Non-Contact Voltage symbol MegaOhm, Killohm, Ohm Hz, KilloHz, MegaHz
11		Low battery indication. WARNING: To avoid electric shock or personal injury, please replace batteries in time when the low battery indication appears on LCD.

9) V/Ω input terminal: The red one positive input terminal for voltage, resistance, diode, capacitance, frequency and temperature measurements. It is also COM terminal for GND input. The black one is negative input terminal.

10) Carrying belt.

4-2. DCV MEASUREMENT

(1) Turn the rotary function switch to position. Plug the red test lead into “VΩ” terminal and the black test lead into COM terminal.

(2) Touch the test leads to the test points. The LCD will display the testing voltage and its polarity on the LCD (fig.3).

NOTE:

- (1) The input voltage CAN NOT exceed the rated input. Otherwise, the meter may be damaged.
- (2) When testing high voltage circuit, to avoid electric shock, DO NOT touch the circuit by hands or bodies.
- (3) Disconnect test leads from the testing circuit when all tests are finished.

4-3. ACV MEASUREMENT

(1) Turn the rotary function switch to position. Plug the red test lead into “VΩ” terminal and the black test lead into COM terminal

(2) Touch the test leads to the test points. Read measurement values from the LCD.

(3) Press Hz/DUTY key to display frequency and duty ratio value. (fig.4)

NOTE:

- (1) Before measurement, there are some remaining digits in each range. It will not affect measurement accuracy.
- (2) The input voltage CAN NOT exceed the rated input. Otherwise, the meter may be damaged.
- (3) When testing high voltage circuit, to avoid electric shock, DO NOT touch the circuit by hands or bodies.
- (4) Disconnect test leads from the testing circuit when all tests are finished.

4-4. DCA MEASUREMENT

(1) Turn the rotary function switch to position. The meter is default at DCA measurement after power on. Press SELECT to switch between AC or DC measurement.

(2) When the meter is used in a strong magnetic field, the readings could be unstable or inaccurate. Press REL to clear to zero before measurement.

(3) Press the clamp gunlock to open the clamp jaw to get testing wire inserted in the middle and clipped completely. To ensure measurement accuracy, please check to ensure that the testing wire is placed in the middle of clamp jaw (fig.5). Measure one wire in one time. If measure more than one wires in one time, the reading will be inaccurate.

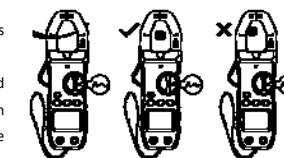


Fig.5



Fig.3



Fig.4

NOTE:

- 1) The meter uses Hall component to detect current. Hall component is a sensitive component. It is magnetic sensitive. It is also sensitive to temperature and mechanical stress. Any impact on it would cause the changes on reading in a short time. This causes some remaining values on the DC ampere reading when there is no current. To get accurate reading, press REL key to clear reading before measurement, and the testing wire must be placed in the middle of the clamp jaw.
- 2) Press the clamp gunlock to open the clamp jaw to get testing wire inserted in the middle and clipped completely. Ensure that the testing wire is placed in the middle of clamp jaw. Otherwise there will be additional accuracy $\pm 1.0\%$ of reading. Read the measurement current value of the testing wire on the LCD.
- 3) In the measurement of the DC current, if the reading is positive value, the current is top to down (broad is top, bottom cover is down).
- 4) The max. testing current is 600A. Exceeding the rated current for long time will damage the meter.

Follow below instructions to get more accurate DC current measurement:

- ① Switch off the testing wire.
- ② Press the clamp gunlock to open the clamp jaw to get testing wire inserted in the middle and clipped completely. Ensure that the testing wire is placed in the middle of clamp jaw.
- ③ When the meter reading is stabilized in the minimum value, press the REL key to clear it.
- ④ Switch on the testing wire. Read after clamp meter remains stable.
- ⑤ When measuring current, to get more accurate readings, the ambient temperature must be 0 to 40°C.

4-5 . ACA MEASUREMENT

- (1) Turn the rotary function switch to \overline{A} position. The meter is default at DCA measurement after power on. Press SELECT to switch between AC or DC measurement.
- (2) When the meter is used in a strong magnetic field, the readings could be unstable or inaccurate. Press REL to clear to zero before measurement.
- (3) Press the clamp gunlock to open the clamp jaw to get testing wire inserted in the middle and clipped completely. To ensure measurement accuracy, please check to ensure that the testing wire is placed in the middle of clamp jaw (fig.6).

NOTE:

- (1) Ensure that the testing wire is placed in the middle of clamp jaw. Otherwise there will be additional accuracy on the reading.
- (2) The max. testing current is 600A. Exceeding the rated current for long time will damage the meter.



Fig.6

4-6. RESISTANCE MEASUREMENT

- (1) Turn the rotary function switch to Ω position. Press SELECT to choose Ω measurement.
- (2) Plug the red test lead into "V Ω " terminal and the black test lead into COM terminal.
- (3) Touch the test leads to the test points. Read measurement values from the LCD (fig.7).

NOTE:

- (1) When measurement is to be done in manual range, if user has no idea about the resistance range of testing object, switch to the highest range.
- (2) If "OL" appears on LCD, it means the testing value is over range. Switch to a higher range. If the testing resistance is above 1M Ω , the readings take a few seconds to get stable.
- (3) If the input is in open circuit, "OL" appears on LCD.
- (4) When measure a live resistor, make sure that all power sources of the testing circuit are switched off and all capacitors are fully discharged before measurement.
- (5) If there are large errors during measurement, it is possible that the measurement values are affected by other live components or by electric potentials on the two sides of the testing resistor.
- (6) DO NOT input voltage in the resistance range.



Fig.7

4-7. DIODE AND CONTINUITY MEASUREMENTS

- (1) Turn the rotary function switch to \rightarrow position. Press SELECT to choose diode measurement (The symbol \rightarrow appears on LCD.) Plug the red test lead into "V Ω " terminal and the black test lead into COM terminal (fig.8). Please note that the red test lead is positive.
- (2) Forward measurement: Connect red test lead to diode's positive polarity and the black test lead to its negative polarity. The LCD will display the approximate value of forward voltage drop. The value 500~800 is normal measurement value for the silicone PN junction. If the LCD displays "OL", it means the diode is in open circuit or it is connected in reverse polarity.
- (3) Backward measurement: Connect red test lead to diode's positive polarity and the black test lead to its negative polarity. The LCD will display "OL". If there is breakdown of creepage on the diode, the LCD display a certain value.
- (4) A complete diode testing includes forward and backward measurements. If the result doesn't meet the descriptions above, it means the diode is broken.
- (5) Press SELECT to choose continuity test measurement. The symbol \rightarrow) appears on the LCD.
- (6) Touch the test leads to the test points. If the resistance between the test points is less than (50 \pm 20) Ω , the buzzer alarms.



Fig.8

NOTE:

- (1) To avoid damage to the meter, DO NOT input voltage in this range.
- (2) When measure a live circuit, make sure that all power sources of the testing circuit are switched off and all capacitors are fully discharged before measurement. The buzzer alarms in response to any negative electric potential or AC signal

4-8. CAPACITANCE MEASUREMENT

- (1) Turn the rotary function switch to \overline{C} position. Press SELECT to choose \overline{C} measurement.
- (2) Plug the red test lead into "V Ω " terminal and the black test lead into COM terminal (fig.9).
- (3) If there is remaining values on LCD before measurement, press REL key to clear it.
- (4) Plug the red test lead into "V Ω " terminal and the black test lead into COM terminal. Please note that the red test lead is for positive polarity.



Fig.9

NOTE:

- (1) DO NOT input voltage or signal in the capacitance range.
- (2) If there is remaining values on LCD before measurement, to ensure measurement accuracy, press REL key to clear it.
- (3) The meter works only in auto range during capacitance measurement.
- (4) To avoid damage to the meter, fully discharge capacitors before measurement.

4-9. FREQUENCY AND DUTY RATIO MEASUREMENT

- (1) Turn the rotary function switch to Hz position. Plug the red test lead into "V Ω " terminal and the black test lead into COM terminal.
- (2) Touch the test leads to the test points. Read measurement values from the LCD (fig.10).
- (3) Press Hz/DUTY key to switch between frequency and duty ratio measurements.

NOTE:

- (1) When the input exceeds 10Vrms, change to ACV range, and then press Hz/DUTY key to switch between frequency and duty ratio measurements.
- (2) When measure small signals in the environment with noise, it's better to use a shielded cable.
- (3) When testing high voltage circuit, to avoid electric shock, DO NOT touch the circuit by hands or bodies.
- (4) DO NOT input voltage above 250Vrms in this range.



Fig.10

4-10. TEMPERATURE MEASUREMENT

- (1) Turn the rotary function switch to the $^{\circ}\text{C}$ position. Plug the black test lead (negative) of thermocouple into "COM" terminal and the red test lead (positive) of thermocouple into "V Ω " terminal (fig.11)

NOTE:

- (1) Keep the meter away from high temperature. Use the thermocouple within the rated temperature range.
- (2) To ensure measurement accuracy, DO NOT change temperature probe at random need.
- (3) DO NOT input voltage in this range.



Fig.11

4-11. Non-Contact Voltage (NCV) Detect

WARNING: This function could be affected by different external interference sources, and then the alarm is activated by wrong signal. The

Measurement result is for reference only.

- (1) Turn the rotary function switch to "NCV" position. When the testing circuit is placed above the meter. When the meter sensor detects voltage, the indicator lights on and the buzzer alarms (fig.12).
- (2) There are 5 ranges for measuring of NCV: 0~50mV, 50~100mV, 100~150mV, 150~200mV, 250mV. For measuring results of each ranges, "LO", "L", "M", "H", "OH" appears on LCD respectively.

NOTE:

- (1) Even if there is no voltage indication, there may be voltage on the circuit. NCV detector is not the only way to detect if there is voltage.
- (2) Voltage detecting may be affected by power socket design, type of insulation and its thickness and other factors.
- (3) When there is voltage input in the meter's terminals, the voltage indicator may light on because of voltage sensor installed in the meter.
- (4) Interference sources in the external environment, such as flashing light, motor, would cause wrong signal to activate alarm function.




Fig.12

4-12. AUTO POWER OFF FUNCTION

When there is no any operation within 15 minutes, the meter will be automatically powered off and standby mode. To start the meter again, turn the rotary function switch to OFF position and then turn it to any other ranges. To cancel auto power off function, press SELECT key and turn on the power switch at the same time. The "APO" symbol disappears from the LCD.

4-13. TROUBLE SHOOTING

If the meter does not work properly, please check the meter as following steps. If the problems remain, please contact repairing center or local dealers.

Fault	Solution
No reading on LCD	Turn on the power Release the HOLD key Replace battery
 signal appears	Replace battery
Big error Value	Replace battery

4-14. MAINTENANCE

The meter is a precision instrument. Any changes on the circuit by the users are not allowed.


- (1) Keep away from water, dust. DO NOT drop the meter.
- (2) Keep away from environment of high temperature, high humidity, inflammables and explosives, and strong magnetic field.
- (3) Clean the case of the meter regularly with web cloth and soft cleaner. DO NOT use corrosive solvents or alcohol such strong solvents.
- (4) Take out batteries if the meter is meant to be not used for a long time.


NOTE:

When the LCD displays "", please replace the battery in time as per below steps.

- (1) Screw off the fixing screws. Remove the battery cover.
- (2) Take off the two 1.5V batteries and replace with new ones. Although any type of 1.5V batteries fit the use, it's better to use alkaline batteries for longer time operation.
- (3) Screw back the fixing screws and put back the battery cover.

 The specifications are subject to changes without prior notice.

 The content of this manual is regarded as correct. If users find out any mistakes or omissions, please kindly contact the manufacturer.

 The manufacturer will not be responsible for accidents or damages caused by improper operations.

 The functions described in this User Manual shall not be considered as the reason for any special usages.