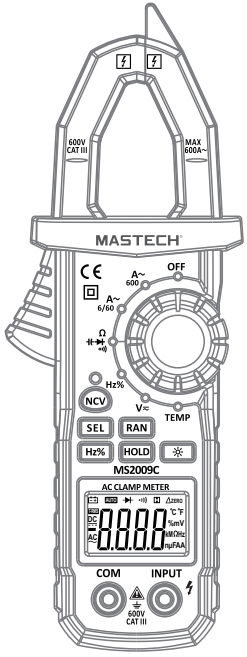
MASTECH® MS2009C

DIGITAL AC CLAMP METER
User Manual



CAT III
600V

CE

MASTECH®

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Safety Requirements

The digital AC/DC clamp meter has been designed according to Safety Standard IEC61010-1 IEC61010-2-032 for electronic measuring instruments and hand-held current clamps. It conforms to safety standards for double insulation CAT III 600 V and grade 2 for pollution.

Safety Signs

⚠ Important safety sign. Refer to the operation manual.

⚠ Danger high voltage.

Allow to be used around conductors without danger to life.

Double insulation (Safety equipment with class II).

Ground (earth).

Notes

- Before using this meter, please read carefully this user manual and pay special attention to “warning” content. Please follow the “warning” instructions.
- To meet the safety requirements, only use probe supplied with the meter. If the probe is replaced, a new one with the same model or same electric specification should be used.
- Before using it, please check the meter and probe for any damage or abnormal condition. If an abnormal situation appears (for example: bare probe, enclosure damage, no liquid crystal display, etc), don't use the meter.

- When the meter is measuring, don't touch the unused input terminal.
- Be careful when measuring voltage greater than 60V DC and 30V AC. Don't allow fingers to touch or block part of the probe.
- When you can't determine the size range of signal to be tested, please switch the function measuring range to the maximum position, then gradually select lower ranges until the correct range is found. Do not exceed the input limit specified in each measuring range.
- Don't measure voltage greater than the upper limit for each range.
- Before changing the function measuring range switch to a different position, set the probe and the circuit being tested to an open state.
- Before online resistance measurement, turn off all power supplies in circuit and release all charges on both ends of capacitor.
- Don't expose the meter exposure to strong light, high temperature or moisture (humidity).
- Don't touch bare wires, connectors or circuits being measured.

Maintenance

- Before opening the meter back cover, make sure that the probe is removed from the circuit to be measured.
- Only wet cloth and a small amount of detergent can be used for cleaning the meter. Don't use chemical solvents to wipe the meter case.
- If you find any abnormal conditionon the meter, stoop using the meter immediately and have it repaired.
- Repair the meter with the help of a trained technician.

Overview

The meter is a safe and reliable digital clamp meter with stable performance. It's design is based on a large scale integrated circuit double integral A/D converter, with full measuring range of overload protection circuit. With a unique appearance, it is a special electrical meter with superior performance. The meter can be used for measuring AC current, AC/DC voltage, resistance, diode, circuit continuity test, and non-contact voltage detection.

Meter Indications

1. AC current clamp head
Pick AC current
2. NCV indicator light
When the voltage of conductor under test is more than AC 90V, the indicator will flash constantly.
3. SEL function exchange key
When it is in **V≂** position, it is used to switch between DCV and ACV .
When it is in ⏚Ω position, it is used to switch between diode measurement and continuity measurement.
4. Display
LCD display (4 significant digits).
5. COM input end
In addition to AC current, negative input end of black probe.
6. INPUT end
Red probe positive input end when measuring voltage, resistance, diode forward voltage drop and circuit continuity.
7. Function measuring switch
Used to select each function and measuring range grade.

8. Clamp head center position
To improve current measurement accuracy, place the conductor to be measured in the center position.
9. NCV sense position
When detecting non-contact voltage, position close to the conductor to be tested

Other Keys

☀ Backlight
The meter display is set with backlight. Press the key for 2 seconds to light. Press the key for 2 seconds again to turn off the backlight.

HOLD data hold key
Press "HOLD" key. The meter display will keep the last test reading; and show "**H**"symbol. Press "HOLD" key again and the meter will restore to normal measuring state.

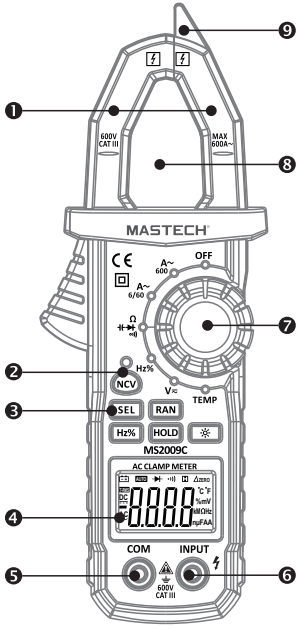
RAN Manual/Automatic Switch Key

In voltage and resistance measurement position, clamp meter is set to automatic measuring range by default. Press this key to switch to manual measuring range. In the manual measuring range mode, click the key once to jump to upper grade. If it is at the top grade, then it will jump to the bottom grade. Hold this key for 2 seconds to switch back to automatic measuring range.

Hz% duty cycle measurement key

In AC voltage mode, press "Hz%" key to show the measured frequency. Press "Hz%" again to show the measured duty cycle. Press "Hz%" again to return to AC voltage.
NCV on-contact voltage detection switch
Used for non-contact voltage detection.

Schematic Drawing For Panel



Instructions

DC Voltage Measurement

1. Insert red probe to “INPUT” jack and insert black probe to “COM” jack.
2. Place function measuring range switch to DC voltage measuring range. Press “SEL” key, and connect the probe to the power source or load to be tested. The polarity of the end connected with red probe will be shown in the display at the same time.
3. Read the measuring result from display.

Notes!

∆ If the range of voltage to be tested is not known in advance, place function measuring switch to the maximum range, then gradually reduce to obtain the correct range.

∆ Pay special attention to avoid shock when measuring high voltage.

AC Voltage Measurement

1. Insert red probe to “INPUT” jack and insert black probe to “COM” jack.
2. Place function measuring range switch to AC voltage measuring range, and connect the probe to the power source or load to be tested. The polarity of the end connected with red probe will be shown in the display at the same time.
3. Read the measuring result from display.

Notes!

∆ Pay special attention to avoid shock when measuring high voltage.

AC Current Measurement

1. Place function measuring range switch to AC current measuring range.
2. Press the trigger, open clamp head, clip the lead in the clamp to measure the lead current. Note: Clamping two or more leads at the same time will give invalid reading.
3. Read the measuring result from display.

Note:

Δ If the range of current to be tested is not known in advance, please place function measuring switch to the maximum current range, then gradually reduce to obtain the correct range.

Resistance Measurement

1. Insert red probe and black probe to “INPUT” and “COM” jack.
2. Place function measuring range switch to required Ω position, and connect the probe to resistor to be tested.
3. Read the measuring result from display.

Note:

Δ If measured resistance value is more than the maximum value of chosen measuring range, it will show will “OL`”. At this time, select a higher range.

Δ When checking online resistance, first turn off all power supplies in the circuit to be measured and discharge all capacitors fully.

Δ When measuring the resistance more than 1MΩ, the reading will be stable after several seconds. This is normal for high resistance measuring.

Diode Test

Insert red probe to “INPUT” and insert black probe to “COM” jack. At this time, red probe polarity is “+”. Place function measuring switch to ⊣▶⊢ position. Red probe is connected to the anode of diode under measurement, and black probe is connected to the cathode of diode under measurement. Read approximate forward voltage drop value from the display.

Circuit Continuity Test

Insert red probe to “INPUT” jack, and insert black probe to “COM” jack. Place function measuring switch to •ı)) position and press SEL key to enter circuit continuity test. Probe is connected to two points of circuit under measurement. In continuity test, when test resistance is less than 50Ω, buzzer will sound. When it is from 50Ω to 90Ω, buzzer may or may not sound. When it is more than 90Ω, buzzer won't sound.

Capacitance test

Insert red probe to “INPUT” jack, and insert black probe to “COM” jack. Place function measuring switch to position and press **SEL** key to enter capacitance test. Probe is connected to two points of circuit under measurement. Read the measured capacitance on the display. If overload occurs, ‘OL’ will be shown on the display.

Note:

1: When measuring large capacitance, the display may take a few seconds for the reading to stabilize.

2: To improve accuracy of measurement of capacitance under 20nF, subtract the distributed capacitance of the test leads.

CAUTION

△ When checking capacitance in circuit, make sure to turn off power and discharge capacitors fully before making measurement.

Temperature test

Place function measuring switch to the TEMP position. The display will show the current ambient temperature. Using the included type k thermocouple, connect it using the INPUT end in the red jack and the COM end into the black jack. Touch the object under test with the tip of the thermocouple and the measured temperature will be displayed.

Frequency and duty cycle test

Insert red probe to “INPUT” jack, and insert black probe to “COM” jack. Place function measuring switch to the “Hz%” position or press the “Hz%” key in AC voltage mode. Connect the probes across the load for measurement. Read the frequency or duty cycle measurement on the display. Press “Hz%” to switch between frequency and duty cycle.

Non-Contact Voltage Detection

Press NCV key. Place non-contact sensor close to the conductor. When test voltage is greater than 90V AC (RMS) and when the meter is close to the conductor, the meter induction voltage indicator will flash and buzzer will sound.

Note:

1: Even there is no indication, voltage may exist. Don't use non-contact voltage detector to judge whether there is voltage in the wire. Detection operation could be affected by socket design, insulation thickness, type and other factors.

2: When inputting voltage on the meter input terminal, due to the existence of the induced voltage, voltage induction indicator also may light.

3: Interference sources of external environment (such as flashlight, motor, etc.) may trigger non-contact voltage detection by mistake.

General Specifications

General characteristics: the maximum voltage of voltage input end and ground CAT III 600V ⎓ and 600V~

Display : LCD display with maximum of 4000 counts

Measuring principle: double integral A/D convertion

Measuring range choice: Automatic

Measurement speed: 3 times/sec

Unit display: has function and power unit symbol display

Polarity indication: display “-” symbol for negative polarity input

Overrange display: “OL”

Data hold function: display “H” on the top of LCD

Low battery display: display “▭” on the top of LCD

Power battery: DC1.5V X3 SIZE AAA.

Outside measurement: 220mm×81mm×41mm

Weight: about 286g (include battery)

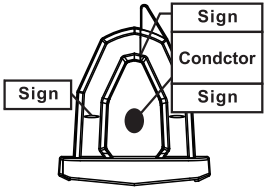
The largest size of open clamp jaw: 26mm

Operating environment: 5°C~35°C

Storage temperature: -10°C~50°C

Technical Specifications

Accuracy: ±(% of reading + digits) with one year of warranty
Environment temperature: 18°C~28°C
Environment humidity: not more than 75%
Temperature coefficient: 0.1 × Accuracy/ 1°C



* When measuring AC current, place the conductor to be measured be in the center position of clamp head. If it is not in the center position, it can increase error by 1.5%

DC Voltage

Measuring range	Resolution	Accuracy
600mV	0.1mV	±(0.8% of reading + 2 digits)
6.0V	1mV	
60V	10mV	
600V	1V	±(1.0% of reading + 2 digits)

Input impedance: 10MΩ.
Maximum allowable input voltage: 600V DC or 600V AC (RMS)

AC Voltage

Measuring range	Resolution	Accuracy
600mV	0.1mV	±(1.0% of reading + 10 digits)
6.0V	1mV	
60V	10mV	
600V	1V	±(1.2% of reading + 10 digits)

Input impedance: 10MΩ.
Measuring frequency range: 40Hz~400Hz.
Maximum allowable input voltage: 600V DC or 600V AC (RMS)

AC Current

Measuring range	Resolution	Accuracy
6.0A	0.001A	±(2.5% of reading + 10 digits)
60A	0.01A	
600A	1A	

Measuring frequency range: 50Hz~60Hz.
Maximum allowable input current: 120% for not more than 60 seconds.

Resistance

Measuring range	Resolution	Accuracy
600Ω	0.1Ω	±(1.2% of rdg +2digits)
6.0kΩ	0.001kΩ	
60kΩ	0.01kΩ	
600kΩ	0.1kΩ	
6.0MΩ	0.001MΩ	
60MΩ	0.01MΩ	±(2.0% of rdg +2digits)

Overload protection: 250V DC or 250V AC (RMS)

Diode Test

Measuring range	Resolution	Accuracy
⊣▶⊢	1mV	Display approximate value of forward voltage drop (Open circuit voltage is about 3.2V)

Overload protection: 250V DC or 250V AC (RMS)

Continuity Test

Measuring range	Resolution	Accuracy
)))	100mΩ	The buzzer will sound when it is ≤50Ω (Open circuit voltage is about 1V)

Note: When resistance is equal to 50Ω,
or more than 50Ω, the buzzer won't sound.
Overload protection: 250V DC or 250V AC (RMS)

Capacitance

Measuring range	Resolution	Accuracy
9.999nF	0.001nF	±(3.0% of reading + 10 digits)
99.99nF	0.01nF	
999.9nF	0.1nF	
9.999μF	1nF	
99.99μF	10nF	
999.9μF	100nF	
10mF	1μF	±(4.0% of reading + 10 digits)
60mF	10μF	

Overload protection: 250V DC or 250V AC (RMS)

Frequency

1. Clamp head measuring frequency (through grade A):

Measuring range	Resolution	Accuracy
99.99Hz	0.01KHz	± (1.5% of reading + 5 digits)
999.9Hz	0.1KHz	

- Measuring scope: 40Hz ~ 1kHz
- The input signal range: ⩾ 6A AC (RMS) (input current will increase when the frequency to be measured increases)
- Maximum input current: AC 600A (RMS)

2. Through grade V:

Measuring range	Resolution	Accuracy
99.99Hz	0.01Hz	± (1.5% of reading + 5 digits)
999.9Hz	0.1Hz	
9.999kHz	0.001KHz	

- Measuring scope: 40Hz ~ 10kHz
- The input voltage range: ⩾ 600mV AC (RMS) (input voltage will increase when the frequency to be measured increases)
- Input impedance: 10MΩ
- Maximum input voltage: 600V AC (RMS)

3. Through grade HZ/DUTY:

Measuring range	Resolution	Accuracy
9.999Hz	0.001Hz	±(0.5% of reading + 5 digits)
99.99Hz	0.01Hz	
999.9Hz	0.1Hz	
9.999KHz	0.001KHz	
99.99KHz	0.01KHz	
999.9KHz	0.1KHz	
9.999MHz	0.001MHz	

- Overload protection: 250V DC or AC (RMS)
- The input voltage range: ⩾ 2V (input voltage will increase when the frequency to be measured increases)

Duty Cycle

Measuring range	Resolution	Accuracy
0.5~99%	0.10%	(1.5% of reading +15 digits)

Overload protection: 250V DC or 250V AC (RMS)

Temperature

Measuring range	Resolution	Accuracy
-20~1000°C	1°C	(2.0% of reading +2 digits)
-4~1832°F	1°F	(2.0% of reading +4 digits)

Overload protection: 250V DC or 250V AC (RMS)

Automatic Power-Off

In order to extend the battery life, the meter has an automatic shutdown function. If there is no key operation or function measuring range change within 15 minutes, the meter power will disconnect automatically. Press “SEL” button to return the meter to the working state again.

Maintenance

Do not attempt to repair or perform maintenance on the instrument without being an experienced maintenance personnel in calibration, performance testing, and relevant maintenance information.

To clean input jacks:

1. Turn off power to the instrument and remove test leads from the input jacks.
2. Brush off all dirt from input jacks
3. With a clean cotton swab, use a cleaner or lubricant (ex. WD-40) to clean input jacks.
4. Use a new swab for each jack to avoid cross contamination.

Replacing The Batteries

⚠ WARNING

To avoid electric shock, make sure that the test leads have been clearly move away from the circuit under measurement before opening the battery cover of the meter.

⚠ WARNING

Do not mix old and new batteries. Do not mix alkaline, standard (carbon-zinc), or rechargeable (ni-cad, ni-mh, etc) batteries.

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If the sign " " appears, it means that the batteries should be replaced.
Loosen the fixing screw of the battery cover and remove it.
Replace the exhausted batteries with new ones.
Put the battery cover back and fix it again to its origin form.

Note:

Do not reverse the polarity of the batteries.

Replacing Test Leads

Replace test leads if leads become damaged or worn.

> ⚠ **WARNING**
>
> Use meet EN 61010-031 standard, rated CAT III 600V 10a, or better test leads.

> ⚠ **WARNING**
>
> To avoid electric shock,make sure the probes are disconnected from the measured circuit before removingthe rear cover. Make sure the rear cover is tightly screwed before using the instrument.

Accessories

User Manual	1 pcs
Probe	1 pair
Packing box	1 pcs
1.5V SIZE AAA Battery	3 pcs
Test leads	1 pair

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