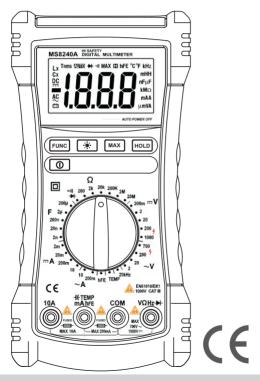
MASTECH® M58240A

Digital Multimeters



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1. Preface

This digital multimeter (hereinafter referred to as the "meter") is a pocket-sized multifunction instrument that uses $4 \times 1.5 \text{V}$ SIZE AA batteries.

This series of products is designed with beautiful appearance, firm structure and excellent durability. It uses elastic ABS material and double-injection molding design, and has good shock-resistant performance.

The meter meets GB/T 13978-92 digital multimeter general technology standards and GB4793.1-1995 (IEC-61010-1: 2001) electronic measurement instrument safety requirements, with class-II pollution and over-voltage standard CAT III 600V. Its full function protection ensures the safe and proper use of the meter.

As a general electrical measuring and testing device, this meter can be widely used in the social electronic fields such as schools, research institutes and factories.

2. Safety Information

The user should observe to the following safety tips in

⚠ Warning

Please particularly note that inappropriate use may cause shock or damage to the meter. The user should comply with common safety procedures and completely follow the safety measures stated in this operation manual.

In order to make full use of the meter's functions and ensure safe operation, please carefully follow the procedures described in this section.

order to avoid personal injury and meter malfunction that may be caused by electric shock.

- Do not measure any voltage outside the measurement range specified by this meter.
- Although there is an internal protection circuit in the resistance measurement position, do not apply any high voltage (above 100V) in the resistance measurement position.
- Check the test wire for any damage or bare metal.
- The meter should not be used in direct sunlight or high temperature.
- Please note that possible electric shock may be caused if input voltage exceeds 36V AC or 48C DC.
- Before measuring current, please first switch off the equipment to be measured, and disconnect the measured circuit. Then, connect the test probe securely, switch on the power, and then start measuring.
- Pay attention to correct battery polarity when replacing batteries.
- Be sure to use a fuse with the same specification and model when replacing it.

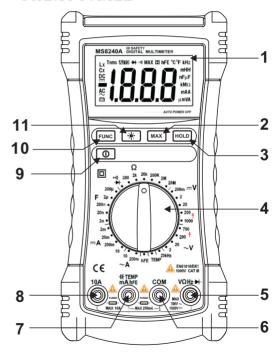
Electric symbols:

4	Dangerous voltage	÷	Grounding
AC	AC (Alternating Current)	DC	DC (Direct Current)
	Double insulation	#	Fuse
\triangle	Warning, please see the related instructions in the manual		

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- 3. Product Overview
- 3.1 Product Outline

FRONT PANEL



Appearance description

- 1. Liquid crystal display (LCD)
- 2. Maximum key
- 3. Data hold key
- 4. Knob
- 5. Inputs of voltage, resistance, frequency and diode
- 6. Common end
- 7. Inputs of current, capacitance and temperature
- 8. Input of large current
- 9. Power switch key
- 10. Function choice
- 11. Backlight control key

3.2 Function Keys

FUNC	Function switch key: used for temperature measuring range switch (°C and °F), and diode measuring range switch between diode mode and continuity mode.
HOLD	Hold key: During measuring, press this key. The current displayed readout of the meter is locked on the display and it will be unlocked after you press the key again.
MAX	Maximum key: During measuring, press this key to display the currently measured maximum of the meter. Press again to exit the maximum display mode.
*	Backlight function key: The backlight will light on if you press and hold this key for 2 seconds. It will turn off automatically after 15 seconds. Press again to exit the backlight function.
0	Press to switch the meter on or off.

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4. Technical Indicators

4.1 General Characteristics

Manual measuring range DMM, with 1999 in count under full range.

Display: 3 1/2-bit LCD display

Overload protection: Full-function and full-range protection.

Data holding function Maximum measurement Backlight

Low-voltage display

Automatic power-off

Operating temperature and humidity:

0~40°C (32~104°F);

relative humidity <80%RH Storage temperature and humidity:

-10~50°C (14~122°F);

relative humidity < 70%RH

Power supply: 1.5V battery (AA type)×4 Safety level: IEC61010-1 and CAT III 600V Dimension (L×W×H): 205×102×58mm,

Weight: About 390g

4.2 Electrical Technical Indicators

(Environment temperature: 23±5°C, relative humidity: <75%)

4.2.1 DC voltage

Measuring range	Resolution	Accuracy
200mV	0.1mV	
2V	1mV	±(0.7% reading + 3digits)
20V	10mV	±(0.7% reading + 3digits)
200V	100mV	
1000V	1V	±(0.8% reading + 5digits)

Input impedance: $10M\Omega$; maximum input voltage: 1000V DC

Overload protection: 200mV measuring range:

250V DC or AC (RMS)

4.2.2 AC voltage

Measuring range	Resolution	Accuracy
2V	1mV	±(0.8% reading + 3digits)
20V	10mV	±(0.0 % reading + Suigits)
200V	100mV	
750V	1V	±(1.0% reading + 5digits)

Input impedance: $10M\Omega$; maximum input voltage: 750V DC

Overload protection: 250V DC or AC (RMS)

Frequency range: 40 ~400Hz

Response: Average response (sine wave RMS)

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4.2.3 Diode

Measuring range	Resolution	Function
→	0.001V	Display forward voltage drop of diode

Backward DC voltage: About 1.5V Forward DC current: About 1mA

Overload protection: 250V DC or AC (RMS)

4.2.4 Resistance

Measuring range	Resolution	Accuracy
200Ω	0.1Ω	
2kΩ	1Ω	
20kΩ	10Ω	±(1.0% reading + 3digits)
200kΩ	100Ω	
2ΜΩ	1kΩ	
20ΜΩ	10kΩ	±(1.2% reading + 5digits)

Open circuit voltage: About 0.45V Overload protection: 250V DC or AC (RMS)

4.2.5 Circuit continuity

Measuring range	Function
01))	The buzzer will sound when the resistance is less than (50±20) Ω

Open circuit voltage: About 0.5V

Overload protection: 250V DC or AC (RMS)

4.2.6 DC current

Measuring range	Resolution	Accuracy
2mA	1μA	
20mA	10µA	±(1.0% reading + 5digits)
200mA	100μΑ	
10A	10mA	±(1.5% reading + 8digits)

Maximum current: 200mA for mA jack and 10A for A jack Overload protection: mA measuring range:

F250mA/1KV fuse

10A measuring range: F10A/1KV fuse

4.2.7 AC current

Measuring range	Resolution	Accuracy
200mA	10µA	±(1.5% reading + 5digits)
10A	1mA	±(2.0% reading + 8digits)

Maximum current: 200mA for mA jack and 10A for A jack Overload protection: mA measuring range:

F250mA/1KV fuse

10A measuring range: F10A/1KV fuse

Frequency range: 40 - 400HZ

Response: Average (sine wave RMS)

4.2.8 Transistor hFE

Measuring range	Function
hFE	Display approximation: 1 ~1000 times

Base current: About 1mA, Vce: About 2.5V Protection: 250mA/1KV fast melting fuse

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4.2.9 Temperature

Measuring range	Resolution	Accuracy
-20°C~0°C		±(5.0% reading + 4digits)
0°C~400°C	1°C	±(2.0% reading + 3digits)
400°C~1000°C		±(3.0% reading + 3digits)
-0°F~32°F		±(5.0% reading + 4digits)
32°F~752°F	1°F	±(2.0% reading + 3digits)
752°F~1832°F		±(3.0% reading + 3digits)

Overload protection: F250mA/1KV fast melting fuse 250V DC or AC RMS

4.2.10 Capacitance

Measuring range	Resoluti	Accuracy
2nF	0.001nF	
20nF	0.01nF	
200nF	0.1nF	±(4.0% reading + 15digits)
2µF	1nF	
200µF	100nF	

Overload protection: F250mA/1KV fast melting fuse 36V DC or AC RMS

4.2.11 Frequency

Measuring range	Resolution	Accuracy
20kHZ	100HZ	±(1.5% reading + 15digits)

Overload protection: 250V DC or AC (RMS)

Measuring range: 1V~10V RMS

5. Measurement Operation

5.1 DC Voltage and AC Voltage Measurement

⚠ Warning

- 1. Do not measure any RMS voltage higher than 1000V DC or 750V AC. This prevents electrical shock and/or meter damage.
- Do not measure any RMS voltage higher than 1000V DC or 750V AC between the common end and ground. This prevents electrical shock and/or meter damage.

The voltage measuring range of this meter: DC voltage: 200.0mV, 2.000V, 20.00V, 200.0V and 1000V:

AC voltage: 2.000V, 20.00V, 200.0V and 750.0V

Method of measuring voltage:

- 1. Rotate switch to the appropriate position.
- 2. Connect black and red test probe to COM input socket and V input socket, respectively.
- 3. Measure the voltage of circuit to be tested with other two ends of test probes. (Connected with the circuit to be tested in parallel).
- 4. Read the measured voltage value from LCD display. When measuring DC voltage, the display will simultaneously show the voltage polarity which is connected with red test probe.

Note:

In the DC 200Mv and AC 2V measuring ranges, the meter will have various readouts due to interference from the extrernal sources, but this does not affect the normal use and measurement accuracy of the meter.

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5.2 Resistance Measurement

⚠ Warning

To avoid damaging meter or device to be measured, before measuring resistance, turn off all circuits to be tested and discharge all high voltage capacitors. The resistance measuring range of this meter: $200.0\Omega,\,2.000K\Omega,\,20.00K\Omega,\,200.0K\Omega,\,200.0K\Omega,\,2000M\Omega,\,20.00M\Omega$

Method of measuring resistance:

- 1. Rotate switch to the appropriate position.
- 2. Connect black and red test probe to COM input socket and V input socket, respectively.
- 3. Measure the resistance value of circuit to be tested with other two ends of test probes.
- 4. Read the measured value from LCD display.

Note:

- 1. A circuit's measured resistance value is usually different from the rated value of resistance. This is because the connection between the other elements on the circuit and tested resistance can be equal to the parallel connection of two or more resistances.
- To accurately measure low resistance, make a short circuit between the two test probes and read the resistance value of the short circuit. Subtract this value from the measured value of the resistance in the circuit tested.
- 3. When measuring in the high-resistance range, the reading will be stablize after several seconds.
- In the open circuit state, the meter will display "OL", indicating that the measured value exceeds the measuring range.

5.3 Diode Measurement

⚠ Warning

To avoid damaging the meter or device to be measured, before measuring diodes, turn off all circuits to be tested discharge all high voltage capacitors.

Method of measuring diodes:

- 1. Rotate the switch to → ○1) position.
- 2. Connect black and red test probe to COM input socket and V input socket, respectively.
- 3. Connect black and red test probe to negative pole and positive pole of the diode to be tested, respectively.
- 4. The meter will display the forward bias voltage value of diode tested. If the test probe polarity is reversed, the meter will display "OL".

Note:

When measuring a diode on a circuit, the meter will display the forward voltage drop for forward measuring; when connected in reverse, readings will depend on the values of other elements connected in parallel on two ends on the diode

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5.4 Continuity Measurement of Buzzer

⚠ Warning

To avoid damaging meter or device to be measured, before continuity tests, turn off all circuits to be tested and discharge all high voltage capacitors.

Method of continuity test:

- 1. Rotate the switch to → ○1) position, and press the FUNC key once.
- 2. Connect black and red test probe to COM input socket and V input socket, respectively.
- 3. Connect the test probes to the two ends of the tested appliance and circuit respectively.
- 4. The meter will display the approximate resistance value between two tested points. If the resistance value between the two tested points is less than $(50\pm20)\Omega$, the buzzer will sound.

5.5 Capacitance Measurement

⚠ Warning

To avoid damaging meter or device to be measured, before continuity tests, turn off all circuits to be tested and discharge all capacitors.

The capacitance measuring range of this meter: 2.000nF, 20.00nF, 20.00nF, 2.000uF and 200.0uF.

Method of measuring capacitance:

- 1. Rotate switch to the appropriate position.
- Connect black and red test probe to COM input socket and V input socket, respectively. (You can also use the dedicated multifunction test holder to measure capacitance).
- Measure the two leads of the capacitor to be tested with other two ends of test probes and read the measured value from LCD display.

Note:

When measuring bulk capacitors with this meter, readings will be stablizee after a few seconds. When measuring the small capacitor with less than 20nF, the distributed capacitance (displayed base number) of the meter and wire should be subtracted.

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5.6 Transistor Measurement

⚠ Warning

Do not apply any RMS voltage higher than 250V DC or AC between common end and hFE end.

This prevents electrical shock and/or meter damage.

Method of measuring transistor:

- 1. Rotate the switch to hFE position.
- 2. Plug multi-function socket with correct polarity (the "+" end of multi-function socket is connected with hFE end, "COM" end is connected with common end).
- 3. Determine that the transistor is NPN or PNP type, then insert three pins of transistor, e.b.c, to the corresponding holes of dedicated multi-functional socket.
- 4. Read hFE approximation of transistor to be measured from LCD display.

5.7 Frequency Measurement

⚠ Warning

Do not measure the frequency of RMS voltage higher than 250V DC or AC. This prevents electrical shock and/or meter damage.

Method of measuring frequency:

- 1. Rotate switch to 20KHZ position.
- 2. Connect black and red test probe to COM input socket and HZ input socket, respectively.
- 3. Measure the frequency value of circuit to be tested with other two ends of test probes.
- 4. Read the measured frequency value from LCD display.

Note:

Do not input the voltage over 10V RMS, as accuracy of readings cannot be guaranteed.

5.8 Current Measurement

⚠ Warning

To avoid damage to meter or device, before measuring current, please check the meter's fuse. When measuring, use correct input socket, function selection and measuring range.

When the circuit voltage is over 250V, do not attempt to measure current on the circuit.

When the test probe is inserted to the current input socket, don't connect the other end of the test probe with any circuit in parallel.

DC measuring range of meter:

2.000mA. 20.00mA. 200.0mA and 10.00A:

AC measuring range: 200.00mA and 10A.

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Method of measuring current:

- 1. Turn off the power supply and discharge all high voltage capacitors on the circuit to be tested.
- 2. Rotate switch to the appropriate position.
- 3. Connect the black test probe to the COM input socket. If the current to be tested is lower than 200mA, connect the red test probe to the mA input socket. If the measured current is between the range of 200mA~10A, the red test probe should be connected to 10A input socket.
- 4. Turn off the circuit to be tested. Connect the black test probe to the low voltage end of disconnected circuit to be tested and the red test probe is connected to the other end (high voltage) of disconnected circuit.
- 5. Connect the power supply to the circuit, then read the LCD display. If the display shows only "OL", it means that the input is out of the selected input range. Please rotate the switch to a higher measuring range.
- Turn off the power to the circuit tested. Discharge all the capacitors, remove the test probes from the meter and restore the circuit to the original state.

Note:

- When measuring current, the meter should be connected in series, instead of in parallel, to avoid the meter damage and risking personal safety.
- Lengthy measurements of large currents (>10A) will affect the display accuracy of the meter. Standard test time cannot be over 10 seconds in any 3 minute period.
- During DC measurement, if the test probes are connected in reversal order to the circuit, the display will become negative, but the measurement accuracy of the meter will not be affected.

5.9 Temperature Measurement

⚠ Warning

Do not input any voltage higher than 12V DC or AC RMS within the temperature measuring range, to avoid damage to the meter.

Method of measuring temperature:

The MS3203 multifunction socket with K-type temperature probe is required for measuring temperature.

- 1. Rotate the knob to the TEMP position. The LCD will display "OL" and temperature unit "C.
- When inserting the multifunction socket, insert "COM" and "V" leads of the socket in the comm end and current MA jacket respectively.
- Then insert the temperature probe into the side temperature jacket of the multifunction socket.
 Note the polarity of the attachment. The LCD will display the temperature of the current environment.
- 4. The other end of the temperature probe (the temperature sensor) is put into the object to be tested. The LCD will display the temperature at the location of the current sensor.
- Press the "FUNC" key to convert the measured value to "F, or set the temperature unit to "F first before measuring.

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6. Maintenance

6.1 Battery Replacement

When the 🔁 symbol shows on the display during use of the meter, you must replace the batteries, to avoid affecting the normal use of the meter.

Method of replacing batteries:

- 1. Disconnect the test wire. Switch off the power.
- 2. Open the battery cover on the rear of the case with the screwdriver, and remove the batteries.
- 3. Install batteries with same specification, and secure the cover.

6.2 Fuse Replacement

Steps for replacing fuse:

- 1. First remove the test wire, and switch off the meter.
- 2. Open the battery cover on the rear cover with the screwdriver, and remove the damaged fuse.
- 3. Install a fuse with same specification, put the battery cover in place again, and tighten the screws.

6.3 Cleaning

Please wipe the surface of the meter with the soft cloth and mild detergent, if necessary. Do not use organic solvents as they will corrosion the meter's case.

