

1. Introduction

This Meter is a handheld and battery operated Digital Multi Meter(DMM) with multi function. This Meter is designed to meet IEC1010-1 CAT III over voltage category and double insulation. The entire outer surface of the case has been formed with thermo plastic elastomer, giving the main body, though downsized, high resistance against the shock of a drop.

The MS8240C are a high performance, low power consumption and 3 5/6 digits (6000 counts) with 61 segments bar graph.

This operating instruction covers information on safety and caution. Please read relevant information carefully and observe all the warnings and notice strictly. The MS8240C as general use tester may be widely used in school, institute and factory etc.

2. Safety note



Warning

To avoid possible electric shock or personal injury and to avoid possible damage to the meter or to the equipment under test, adhere to the following rule:

- Do not apply more than the rated voltage, of marked on the meter, between the input terminal and grounding terminal..

- Do not apply voltage between 'COM' and 'V/ Ω ' terminal, in the resistance measuring state.
- When measuring the voltage over than 30V AC or 50V DC, pay the attention to electric shock.
- Do not expose the instrument to the direct sun light, extreme temperature and humidity or dew full.
- Inspect the test lead for damaged insulation or exposed metal.
- Before measuring current, check the Meter's fuses and turn off power to the circuit before connecting the meter to the circuit.
- Disconnect circuit power and discharge all high voltage capacitors before testing continuity, diode, resistance, capacitance or current.

Note international Electrical Symbol.

	Dangerous Voltage		Ground
	AC (Alternating current)		Warning see explain in manual
	DC (Direct Current)		Double insulation
	AC or DC		Fuse

Measurement category(over voltage category):

This instrument is meet the safety condition of CAT III. The equipment is used for measurement in building facilities. Examples are measurements on distribution boards, circuit breaker and industrial equipment located in fixed facilities, as a fixed motor.If the equipment (include probe assembly; type:T3009, 10A/1KV CAT III) is used in a manner not specified by the manufacture, the protection provided by the equipment/probe assembly may be impaired. If necessary, the probe assembly must be replaced with the type specified in this manual.

3. Explanation of controls and indicators

3-1. Meter illustration

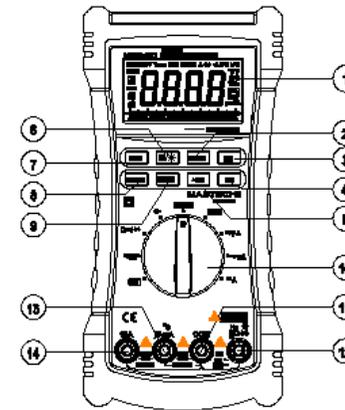


Fig.1 MS8240C Front Arrangement

- ① LCD display
- ② “RANGE” push button
- ③ “RST” push button
- ④ “LPF” push button
- ⑤ “REL” push button
- ⑥ “H/BKLIT” push button
- ⑦ “FUNC” push button

- ⑧ “MAX/MIN” push button
- ⑨ “Hz/Duty” push button
- ⑩ Rotary Switch(Knob)
- (1) “COM” terminal
- (12) “V/Ω” Input terminal
- (13) “uA/mA” input terminal
- (14) “10A” input terminal

3-2. Functional push button

Push button	Function
Func	“ FUNC ” key is the function select key that acts with trigger. Use the key as switch of DC/AC, Resistance/Continuity/Diode and °C/°F.
H/★	Press “ HOLD ” to enter and exit the hold mode in any mode. That act with trigger. When press and holding this key for more than 2secs , the meter is switched to the back light mode.
MAX/MIN	This key is act with trigger. Press this key once, the maximum value is holding (Will displays ‘MAX’ symbol in the LCD)and press once again this key, the minimum value on holding(Will displays ‘MIN’ symbol in the LCD). When press and holding this key for more than 2sec, the meter will be return to the normal mode. After pressing the key, A/D will keep working, and

	the display value are always updated and kept the maximum or minimum value.
RANGE	It is the auto/manual measurement push key that act with trigger. The default is auto measurement when power is on. To press once time, will switch to manual measurement and ‘AUTO’ sign displayed on the LCD. If continue to press the key in the top range, the meter will be jump to the lowest range, and recirculating orderly. If press and hold this key Over 2sec, the meter will switch to Auto Measurement mode and ‘AUTO’ sign will be displayed on the LCD.
REL	Press the “ REL ” key, you can measure the relative value and ‘REL’ sign will appears on the LCD display in the relative mode. What is meant by relative value? Press the “ REL ” key, the meter make the first measured value into a reference value (You must be decide a reference value as the input signal.) , and the meter store the displayed reading as a reference value. The relative measured value that displayed in LCD is achieved by subtracting a reference value from the present reading value. $V_x - V_{ref} = V_{display}$ In it, V_x —measured value, V_{ref} —reference value, V_{disp} —displayed value
Hz/Duty	This key acts with trigger.. Press “ Hz/Duty ”key when frequency mode is in operation, the meter will switch to duty cycle measurement mode. Press

	this key again to switch to frequency measurement mode also.
LPF	This key is Low Pass Filter acting key, yet act with trigger. Press this key to reduce the influence of high harmonic to measurement result in the AC voltage and current measurement mode. The frequency band wide of the Low Pass Filter is 1KHz at 3db). When press this key, 'LPF' sign is displayed on the LCD, it is means the Low Pas Filter is acted and then when press the key once again, the 'LPF' sign will is not lighted.
RST	This is used reset the Meter, without power ON/OFF.

7		Data hold
8	LPF	Low Pass Filter
9		Low battery indicator
10	MK Ω	Ω K Ω M Ω is unit of resistance
11	°C/°F	The unit of temperature (°C: Centigrade; °F: Fahrenheit)
12	umVA	uV mV V is unit of voltage uA mA A is unit of current
13	—	Indicate negative reading
14		Relative measurement
15	%	Duty cycle
16	numF	Capacitance Units.
17	APO	Auto- power OFF

3-3. Display indicators

Number	Indicator	Meaning
1	Auto	The meter is in the auto range mode.
2		DC voltage or current
3		AC voltage or current
4		Diode
5	MAX	Maximum value
6	MIN	Minimum value



Fig. 2 LCD

4. Specification

4-1. General Specification

- Auto ranging DMM , that full scale is 6000 counts
- Display : 3 5/6 digit LCD display with 61 segment bar graph.
- Surge protection: Protected by SG (1500V).
- Over load protection: Used the PTC protection circuit for Resistance, capacitance and frequency measurement.
- DATA HOLD function
- MAX/MIN value measurement function
- AUTO/MANUAL Mode selection

- Back Light
- Low battery indication
- Relative value measurement function
- Temperature measurement (°C/°F)
- Auto Power- OFF.
- Operating temperature & Humidity: 0 ~ 40°C (32 ~104 °F) & < 80% RH [indoor use]
- Storage temperature & Humidity: -10 ~ 50°C (14 ~ 122 °F) & <70%RH[indoor use]
- Power Supply: 1.5V Battery(AA Type) x 4
- Safety Class: IEC1010-1, CAT III
- Dimension (L x W x H) & Weight: 205 x 102 x 58mm, Approx. 390g

4-2. Electrical Specification

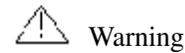
Function	Range	Best. Resolution	Accuracy
DC Voltage	600mV 6V/60/600/1000V	0.1mV	$\pm(0.5\%rdg+3dgt)$ $\pm(0.8\%rdg+3dgt)$
AC Voltage	6V/60V/700V	0.1mV (50Hz) (2KHz)	$\pm(1\%rdg+4dgt)$ $\pm(2\%rdg+3dgt)$
DC Current	600uA/6mA/60mA/ 600mA 10A	0.01uA	$\pm(1.2\%rdg+4dgt)$
AC Current	600uA/6mA/60mA/ 600mA 10A	0.01u (50Hz) (2KHz)	$\pm(1.5\%rdg+3dgt)$ $\pm(2\%rdg+3dgt)$
Resistance	600 Ω /6K/60K/ 600K Ω / 6M Ω /60M Ω	0.01 Ω	$\pm(1\%rdg+2dgt)$
Capacitance	40nF/400nF/ 4uF/40uF/400uF	1nF	$\pm(3\%rdg+2dgt)$ $\pm(3.5\%rdg+3dgt)$
Frequency & Duty	1Hz to 10MHz 1% to 99%	1Hz	$\pm(0.2\%rdg+3dgt)$
Temperature	-10°C to 700°C (14°F to 1292°F)	1°C (°F)	$\pm(3\%rdg+3dgt)$
Continuity check	Buzzer sounds at less than 20 Ω	Open circuit voltage: about 0.6V	
Diode Check		Open circuit voltage: about 2.8V	

4-3. Accessory

1. K-type temperature probe ----- 1pc
2. Multi-Function Socket (MS3202) --- 1PC

5. Measurement operation

5-1. DC & AC voltage measurement



Warning

To avoid harms to you or damage to the meter from electric shock. Please do not attempt to measure voltage higher than DC 1000V/AC 700Vrms although readings may be obtained.

The DC voltage range are 600mV/ 6.000V/ 60.00V and 1000V; and then. The AC voltage ranges are 600.0mV /6.000V/ 60.00V and 700V.

To measure DC/AC voltage:

1. Set the rotary switch to ‘  ’ position.
2. Insert the red test lead into the “**V Ω** ” input terminal and the black test lead into the COM terminal.
Default status is DC voltage measurement mode and then AC voltage measurement mode is selected by **FUNC** push key.
3. Connect the test lead across with the object being measured.
The measured value will be show on the LCD display.

Note:

- When DC or AC voltage measurement has been completed, disconnect the connection between the testing lead and the circuit under testing.

5-2. Resistance measurement

The resistance range are: 600.0 Ω / 6.000K Ω /60.00K Ω /600.0K Ω / 6.000M Ω /60.00M Ω .

To measure resistance, connect the meter as follows:

1. Set the rotary switch to ‘ Ω \rightarrow \rightarrow \rightarrow ’ position. At the start, the meter is resistance mode. In this range, you can switch to continuity and diode check mode by the “FUNC” key. Its sequence as follows:

Ω \rightarrow \rightarrow \rightarrow \rightarrow Ω

2. Insert the red test lead into the “V Ω ” terminal and the black test lead into the COM terminal. Connect the test lead across with the object being measured.

The measured value will be show on the LCD display.

Note:

- The test lead can add 0.1 Ω to 0.2 Ω of error to resistance measurement. To obtain precision reading in low-resistance measurement, that is the range of 600.0 Ω , short the input terminal before measuring. In this time, the contact resistance displayed on the LCD. You can subtract the contact resistance value from the measured value.

- For high-resistance measurement (>10M Ω), it is normal taking several second to obtain stable reading.
- The LCD display OL indicating open-circuit for the tested resistor or the resistor value is higher than the maximum range of the meter.

5-3. Diode/Continuity check

- ① Set the rotary switch to ‘ Ω \rightarrow \rightarrow \rightarrow ’ position. To select the continuity mode, press one time the “FUNC” push button.
- ② Insert the red test lead into the “V Ω ” terminal and the black test lead into the COM terminal.
- ③ The buzzer sound if the resistance of a circuit under test is less than 25 Ω .
- ④ Select the diode check mode by the “FUNC” key.
- ⑤ Use the diode test mode to check diodes, transistors and other semiconductor device. In the diode test mode sends a current through the semiconductor junction, and the measure the voltage drop across the junction. A good silicon junction drop between 0.5V and 0.8V.
- ⑥ For forward voltage drop reading on any semiconductor component, place the red test lead on the component anode and place the black test lead on the component cathode. The measured value show on the display.
- ⑦ Reverse the test lead and measure the voltage across the diode again.
 - If diode is good, the display shows “OL”.
 - If diode is shorted, the display shows 0 (zero) in both direction.
 - If display shows “OL” in both direction, the diode is open.

5-4. Capacitance measurement



Warning:

To avoid damage to the Meter or to the equipment under test, disconnect power and discharge all high-voltage capacitors before measuring capacitance.

You can use the DC voltage function to confirm that the capacitor is discharged.

The capacitance ranges are 40.00nF/ 400.0nF/ 4.000uF/ 40.00uF/ 400.0uF.

Measuring steps::

1. Set the rotary switch to ' Ω --- ' position.
2. For the convenience of user, provided the MS3202 Multi Function Socket as accessory. First time, insert the Socket to the " $\text{V } \Omega \text{ ---}$ "input terminal and "COM" terminal, and then insert the capacitor to the two holes on the Socket. The pin marked "V" is pointed to the " $\text{V } \Omega \text{ ---}$ "input terminal, and the pin marked "COM" is pointed "COM" input terminal respectively. The measured value will be displayed on the LCD display.

NOTE:

[1] You can used the MS3202 Socket according to the capacitor pin size.. The pin(marked "V") of MS3202 Socket must be pointed to the

" $\text{V } \Omega \text{ ---}$ " input terminal.

If the capacitor pin is thick (i.e, Diameter of pin >1 mm), the insert to the MS3202 socket is disabled. In this case , directly insert the capacitor under test to the "COM" and " $\text{V } \Omega \text{ ---}$ "terminals, or using the leads(probe) to measuring capacitance of capacitor.

[2] To increase the accuracy of capacitance measurement when measuring under 4nFcapacitance, you can connecting 0.15uF Capacitor in parallel with the capacitor under measuring , or use relative measurement mode to automatically subtract the capacitance build-in equalized capacitance and residual capacitance of PCB lead wire from the result.

5-5. Frequency & Duty cycle measurement

The normal measurement ranges are 9.999Hz/ 99.99Hz/9.999KHz/99.99KHz/999.9KHz/ 9.999MHz, and the duty cycle range is 1% to 99%.

1. Set the rotary switch to 'Hz/Duty' position, and the 'Hz' sign shown on the LCD display.
2. Insert the red test lead into the " $\text{V } \Omega$ "input terminal and the black test lead into the "COM" terminal.
3. Connect the test leads across with the circuit under testing. The measured value shown. on the LCD display.
4. To switch to the duty cycle mode , press "Hz/Duty" Push key.

NOTE: Input signal level must be higher than 0.5V (i.e. sensitivity).

5-6. DC uA/AC uA measurement

1. Set the rotary switch to the 'uA' position.
2. Select the DC uA or AC uA with "FUNC" push button. The meter default to DC current measurement mode.
3. Turn off power to the circuit. Break the circuit point to be measured.
4. Connect the two test lead to complete the broken circuit.
5. If the measured current is too high, the display will indicate "OL". In this case, the higher current range (mA or A) should be selected.

5-7. DC/AC mA measurement

1. Turn off power to the circuit. Set the rotary switch to the 'mA' position.
2. The meter default to DC current measurement mode. Select AC mA measurement mode by "FUNC" push button.
3. Break the current path to be tested. Connect the red test lead to the more positive side of the break and the black test lead to the more negative side of the break.
4. Turn on power to the circuit. The measured value show on the display.

5-8. DC/AC 10A measurement

1. Turn off power to the circuit. Set the rotary switch to the 'A' position. Default mode is DC A measurement mode and select AC A measurement mode by the "FUNC" key.
2. Insert the red test lead into the input terminal marked as '10A'.
3. The measuring procedure is same as that of mA or uA.

Note:

- For safety sake, the measuring time for high current should be ≤ 5 seconds for each measurement and the interval time between two measurement should be greater than 3 minutes. If the measuring time is long, the 10A current is generate the thermal, so the measured value is unstable.
- When current measurement has been completed, disconnect the connection between the testing lead and the circuit under test.

5-9. Temperature measurement

When temperature measuring, should be using the K-type temperature Probe and MS3202 multi-function socket.

The measuring steps:

1. Set the rotary switch to 'TEMP' position. The 'OL' and ' °C ' signs will be displayed on the LCD.
2. Insert the multi-function socket to 'COM' terminal and 'uA/mA' terminal. The two 'COM' and 'V' pins of multi-function socket must be point at the 'COM' terminal and 'uA/mA' terminal respectively .
3. The temperature unit may be ' °F ' by 'FUNC' key.
4. Insert the temperature probe to the multi-function socket, however you are take note of '+' and '-' polarity.
5. First time, the display is environment temperature. When insert the temperature sensor to object under testing, the measured temperature value will be displayed on the LCD.

6. Maintenance

6-1. Replacing the battery

When meter display  the battery must be replaced to maintain normal operation.

- (1) Disconnect and remove all test probes from any live source and meter.
- (2) Open the battery cover on the bottom case by screwdriver.
- (3) Remove old battery and snap new one into battery holder

6-2. Fuse replacement

Replacing the defective fuse should be done according to the following procedure.

- (1) To avoid electrical shock, remove the test lead and any input signal before opening the bottom case.
- (2) Remove the battery cover and remove the three screws from the bottom case.
- (3) Lift the button case until it gently unsnaps from the top case.
- (4) Remove the defective fuse and insert a new fuse of the same size and rating.
- (5) Replace the bottom case and reinstall all the screws.

6-3. Cleaning and Decontamination

The meter can be cleaned with soft clean cloth to remove any oil, grease or grime.

Do not use liquid solvent or detergent.