

I. INTRODUCTION :

M3800 and M3900 are the full protected, 3 1/2 handheld digital multimeter used for measuring DC voltage and current, AC voltage and current, resistance, diode and transistor hFE.

II. FEATURES :

- * DC basic accuracy $\pm 0.5\%$.
- * Full range, auto zeroing, auto indication of polarity selection, over-range and low battery.
- * Resolution up to $0.01\mu\text{A}$ for small current.
- * Large current measurement can be up to 20A.
- * Full range protection and alarm sounds when mis-connect to wrong testing position.

III. TECHNICAL SPECIFICATION :

Accuracy : $\pm a\%$ reading $\pm$ no of digits guaranteed for 1 year.

Environmental temperature: $23^\circ\text{C} \pm 5^\circ\text{C}$

Relative Humidity: $< 75\%$

1. DC Voltage :

RANGE	ACCURACY	RESOLUTION
200mV	$\pm 0.5\%$ of rdg $\pm$ 1 digit	$100\mu\text{V}$
2 V		1 mV
20V		10mV
200V		100mV
1000V		1 V

Input impedance : $10\text{M}\Omega$ on all ranges.

Overload protection : DC or AC peak value of 1000V. (except 200mV range with the maximum value being 220V rms)

2. AC Voltage :

RANGE	ACCURACY	RESOLUTION
200mV	$\pm 1.2\%$ of rdg $\pm$ 3 digits	$100\mu\text{V}$
2 V	$\pm 0.8\%$ of rdg $\pm$ 3 digits	1 mV
20V		10mV
200V		100mV
700V	$\pm 1.2\%$ of rdg $\pm$ 3 digits	1 V

Input impedance : $10\text{M}\Omega$ on all ranges.

Frequency range : 40Hz to 1000Hz.

Overload protection : AC 700V rms or 1000V peak continuous on all ranges. (except 200mV range with the maximum value being 220V rms)

Indication : Average value (rms of sine wave).

3. DC Current :

RANGE	ACCURACY	RESOLUTION
$200\mu\text{A}$	$\pm 0.5\%$ of rdg $\pm$ 1 digit	$0.1\mu\text{A}$
2 mA		$1\mu\text{A}$
20mA		$10\mu\text{A}$
200mA	$\pm 1.2\%$ of rdg $\pm$ 1 digit	$100\mu\text{A}$
2 A		1 mA
20A, $20\mu\text{A}$	$\pm 2\%$ of rdg $\pm$ 5 digits	10mA, $10\mu\text{A}$

Overload protection : 2A/250V fused (20A not fused)

Maximum input current : 20A with maximum 15 seconds.

Measuring voltage drop : 200mV

4. AC Current :

RANGE	ACCURACY	RESOLUTION
200 μ A	$\pm 1.0\%$ of rdg ± 3 digits	0.1 μ A
2 mA		1 μ A
20mA		10 μ A
200mA	$\pm 1.8\%$ of rdg ± 3 digits	100 μ A
2 A		1 mA
20A, 20 μ A	$\pm 3\%$ of rdg ± 7 digits	10mA, 10nA

Overload protection : 2A/250V fused (20A not fused)

Frequency range : 40Hz to 1000Hz

Maximum input current : 20A with maximum 15 seconds.

Indication : Average value (rms of sine wave)

Measuring voltage drop : 200mV

5. Resistance :

RANGE	ACCURACY	RESOLUTION
200 Ω	$\pm 0.8\%$ of rdg ± 3 digits	0.1 Ω
2 K Ω		1 Ω
20K Ω		10 Ω
200K Ω		100 Ω
2 M Ω		1 K Ω
20M Ω	$\pm 1\%$ of rdg ± 2 digits	10 K Ω

Overload protection : 220V DC or AC rms.

Open circuit voltage : <700mV.

Relative Humidity : 0-75%, 0°C to 35°C on 2M, 20M

0-90%, 0°C to 35°C on all other range.

6. Diode and Buzzer Test :

RANGE	ACCURACY	TESTING CONDITION
	Display the approx. reading of the forward voltage of diode	Forward DC current approx. 1mA. Reversed DC voltage approx. 2.8V
	Built-in buzzer sounds if the resistance is less than 30 Ω	

Overload protection : 250V DC or AC rms.

7. Transistor hFE Test :

RANGE	ACCURACY	TESTING CONDITION
hFE	Test both NPN or PNP type of transistor hFE value. Display range : 0-1000 β	Basic current approx. 10 μ A Vce approx. 2.8V

IV. OPERATING INSTRUCTION :

Check the 9-volt battery by setting the ON-OFF switch to ON. If the battery is weak, "LOBAT" or "BAT" sign will appear on the display. The sign  next to the test lead jacks is for warning that the input voltage or current should not exceed the indicated values. This is used to prevent the damage to the internal circuitry. The function switch should be set to the range which you want to test before operation.

1. DC and AC Voltage Measurement :

1.1 Connect RED test lead to "V/ Ω " jack, BLACK test lead to "COM" jack.

1.2 Set the FUNCTION switch to the desired DVC or ACV position and connect the test leads across the source or load under measurement. The display will show "1" when the voltage being measured exceed the selected range which should then set the RANGE switch to a higher range.

The same procedure is also applicable for measuring AC voltage.

Attention :

- a. If the voltage range is not known beforehand, set the FUNCTION switch to the highest range and work down.
- b. Do not measure more than 1000V using DCV position and 750V rms using ACV position. There is a danger of damaging the internal circuitry although measurement may be possible.
- c. When the input jack is not connected, the display may show readings especially at 200mA and 2V range. This is normal. The readings will be zero if connect the two leads and maintain a short circuit status.

2. DC and AC Current Measurement :

- 2.1 Connect the RED test lead to "A" jack (maximum for 2A) or "20A" jack (maximum for 20A and 10 seconds) and BLACK test lead to "COM" jack.
- 2.2 Set the FUNCTION switch to the highest range and gradually work down to the desired DCA or ACA position and connect the test leads in series with source or load under measurement.

Attention :

The current measurement function is protected by the fuse. The fuse will be blown to protect the internal circuitry if mis-connect to AC current. The fuse rating should be 2A/250V for replacement. Pay special attention to 20A range as it is not protected by the fuse. When using such range, maximum input current can be 10A but no measurement should take more than 15 seconds. Otherwise, the reading will fluctuate due to the heating up of shunt resistance.

3. Resistance Measurement :

- 3.1 Connect the RED test lead to "V/ Ω " jack and BLACK test lead to "COM" jack.
- 3.2 Set the FUNCTION switch to the Ω position and connect the test leads across the resistor under measurement. The display will then show the resistance value.

Attention :

- a. When the input is not connected, i.e. at open circuit, the display will show "1" for the overrange condition.

- b. If the resistance value being measured exceeds the maximum value of the range selected, an over-range indication will be shown i.e. "1". Then select a higher range. For the resistance of approximately 1 M above, the DMM may take a few seconds to stabilize. This is normal for a high resistance readings.
- c. When checking in-circuit resistance, make sure the circuit under test has all the power removed and that all capacitors are fully discharged.

4. Diode Measurement :

- 4.1 Connect RED test lead to the "V/ Ω " jack and BLACK test lead to the "COM" jack. The polarity of the RED test lead should be "+"
- 4.2 Set the FUNCTION switch to the $\rightarrow$ position and connect the leads across the diode under measurement.

Attention :

- a. When the input is not connected, i.e. at open circuit, the display will show "1" for the overrange condition.
- b. There is around 1 milliamp current flow through the device under test.
- c. The meter display the forward voltage drop in millivolts, and an overrange signal "1" appears when the diode is reversed.

5. Audible Continuity Test :

- 5.1 Connect the RED test lead to the "V/ Ω " jack and BLACK test lead to the "COM" jack.
- 5.2 Set the FUNCTION switch to the ∞ position (same as 200 Ω range of resistance position) and connect the test leads across the resistance under measurement.
- 5.3 Buzzer sounds if the resistance between two probes less than approximately 30 Ω .

Attention :

- a. When the input is not connected, i.e. at open circuit, the display will show "1" for the overrange condition.
- b. If testing is carelessly operated in power on status, the buzzer will sound to warn you. (cause no damage)

6. Transistor hFE Measurement:

Set the FUNCTION switch to the hFE position. Determine whether the transistor is NPN or PNP type and locate the Emitter, Base and Collector leads. Insert the leads into the proper holes in the socket on the front panel. The display will show the approx. hFE value at Base Current 10 μ A of about Vce 3V.

V. GENERAL OPERATING PRECAUTIONS:

1. Never connect more than 1000V DC or 700V AC rms to the DMM.
2. Never mis-connect to the improper range as this will damage the internal circuitry.
3. Never operate the DMM unless the battery cover is in place and fully closed.
4. Battery or fuse replacement should only be done after the test leads have been disconnected and power is off.

VI. GENERAL CHARACTERISTICS AND ACCESSORIES

SUPPLIED:

Size (mm): 87x172x36

Weight: 240g (include 9V battery)

Accessories supplied: Test leads, 9V battery

VII. BREIF SUMMARY OF THE FUNCTION:

M3900	M3800	
✓	✓	DC Voltage
✓	✓	DC Current
✓	✓	AC Voltage
✓	✓	AC Current
20	20	Max. Resistance (M)
✓	✓	Diode Test
✓	✓	Transistor Test
		Continuity Buzzer
		Light Emitting Indication
		Capacitor
		Frequency
		Temperature
		Conductance
		Battery Test
		Logic Test
		Square Wave Output Signal
20	20	Large Current (A)
20	20	Small Current (μ A)
L	S	Display Size (L,S)
		Others