

# Operating Manual



## Palm Size Digital Multimeter

### Overview

This Operating Manual covers information on safety and cautions. Please read the relevant information carefully and observe all the **Warnings** and **Notes** strictly.

#### Warning

To avoid electric shock or personal injury, read the "Safety Information" and "Rules for Safety Operation" carefully before using the Meter.

The Model \_\_\_\_\_ Multimeter (hereafter referred as "the Meter") is a 3 3/4 digits with steady operations, fashionable design and highly reliable hand-held measuring instrument. The Meter can measure AC/DC voltage, AC/DC Current, Resistance Transistor hFE, Diode and Continuity. It is an ideal tool for maintenance.

### Unpacking Inspection

Open the package case and take out the Meter. Check the following items carefully to see any missing or damaged part:

Item	Description	Qty
1	English Operating Manual	1 piece
2	Test Lead	1 pair
3	Holster	1 piece
4	1.5V Battery (AAA)(installed)	2 piece

In the event you find any missing or damage, please contact your dealer immediately.

### Safety Information

This Meter complies with the standards IEC61010: in pollution degree 2, overvoltage category (CAT I 600V, CAT II 300V) and double insulation.

CAT. I: Signal level, special equipment or parts of equipment, telecommunication, electronic, etc., with smaller transient overvoltages than overvoltages CAT. II.

CAT. II: Local level, appliance, PORTABLE EQUIPMENT etc., with smaller transient overvoltages than CAT. III

Use the Meter only as specified in this operating manual, otherwise the protection provided by the Meter may be impaired.

In this manual, a **Warning** identifies conditions and actions that pose hazards to the user, or may damage the Meter or the equipment under test. A **Note** identifies the information that user should pay attention on.

### Rules For Safe Operation

#### 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 rules:

- Before using the Meter inspect the case. Do not use the Meter if it is damaged or the case (or part of the case) is removed. Look for cracks or missing plastic.

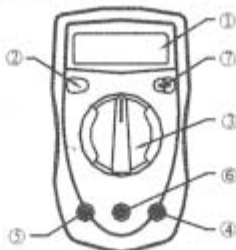
- Pay attention to the insulation around the connectors.
- Inspect the test leads for damaged insulation or exposed metal. Check the test leads for continuity. Replace damaged test leads with identical model number or electrical specifications before using the Meter.
- Do not apply more than the rated voltage, as marked on the Meter, between the terminals or between any terminal and grounding.
- The rotary switch should be placed in the right position and no any changeover of range shall be made during measurement is conducted to prevent damage of the Meter.
- When the Meter is working at an effective voltage over 60V in DC or 42V rms in AC, special care should be taken for there is danger of electric shock.
- Use the proper terminals, function, and range for your measurements.
- Do not use or store the Meter in an environment of high temperature, humidity, explosive, inflammable and strong magnetic field. The performance of the Meter may deteriorate after dampened.
- When using the test leads, keep your fingers behind the finger guards.
- Disconnect circuit power and discharge all high-voltage capacitors before testing resistance, continuity, diodes and current.
- Before measuring current, check the Meter's fuses and turn off power to the circuit before connecting the Meter to the circuit.
- Replace the battery as soon as the battery indicator "D" appears. With a low battery, the Meter might produce false readings that can lead to electric shock and personal injury.
- Remove test leads from the Meter and turn the Meter power off before opening the Meter case.
- When servicing the Meter, use only the same model number or identical electrical specifications replacement parts.
- The internal circuit of the Meter shall not be altered at will to avoid damage of the Meter and any accident.
- Soft cloth and mild detergent should be used to clean the surface of the Meter when servicing. No abrasive and solvent should be used to prevent the surface of the Meter from corrosion, damage and accident.
- The Meter is suitable for indoor use.
- Turn the Meter off when it is not in use and take out the battery when not using for a long time.
- Constantly check the battery as it may leak when it has been using for some time, replace the battery as soon as leaking appears. A leaking battery will damage the Meter.

## International Electrical Symbols

	AC or DC
	AC Current
	DC Current
	Grounding
	Double Insulated
	Deficiency of Built-In Battery
	Diode
	Fuse
	Continuity Test
	Warning Refer to the Operating Manual
	Conforms to Standards of European Union.

## The Meter Structure (figure 1)

- LCD Display
- SELECT Button
- Rotary Switch
- COM Input Terminal
- 10A Input Terminal
- Other Input Terminal
- Transistor Input Terminal



(figure 1)

### SELECT button

Selecting for DC and AC current measurement, Continuity Test and Diode Test. The buzzer sounds when switching from one function to the other Press this button to activate the Meter when it is under Sleep Mode.

## LCD Display (see figure 2)



(figure 2)

## Measurement Operation

### A. DC Voltage Measurement (see figure 3)

#### ⚠ Warning

To avoid harms to you or damages to the Meter from electric shock, please do not attempt to measure voltages higher than 500V although readings may be obtained.

The DC Voltage ranges are : 400.0mV, 4.000V, 40.00V, 400.0V and 500V

- Insert the red test lead into the **VΩmA** terminal and the black test lead into the COM terminal.
- Set the rotary switch to **V** range.
- Connect the test leads across with the object being measured.

The measured value shows on the display.



(figure 3)

#### Note:

- DCV Measurement is autoranging, the Meter has an input impedance of approx. 10MΩ. This loading effect can cause measurement errors in high impedance circuits. If the circuit impedance is less than or equal to 10kΩ, the error is negligible (0.1% or less).
- When DC voltage measurement has been completed, disconnect the connection between the testing leads and the circuit under test.

### B. AC Voltage Measurement (see figure 3)

#### ⚠ Warning

To avoid harms to you or damages to the Meter from electric shock, please do not attempt to measure voltages higher than 500V although readings may be obtained.

The AC voltage ranges are - 4.000V, 40.00V, 400.0V and 500V

- Insert the red test lead into the **VΩmA** terminal and the black test lead into the COM terminal.
  - Set the rotary switch to **V** range.
  - Connect the test leads across with the object being measured.
- The measured value shows on the display.

#### Note:

- DCV Measurement is autoranging, the Meter has an input impedance of approx. 10MΩ. This loading effect can cause measurement errors in high impedance circuits. If the circuit impedance is less than or equal to 10kΩ, the error is negligible (0.1% or less).
- When DC voltage measurement has been completed, disconnect the connection between the testing leads and the circuit under test.

### C. DC Current Measurement (see figure 4)

#### ⚠ Warning

Never attempt an in-circuit current measurement where the voltage terminals and ground is greater than 60V. If the fuse burns out during measurement, the Meter may be damaged or the operator himself may be hurt. Use proper terminals, function, and range for the measurement. When the testing leads are connected to the current terminals, do not parallel them across any circuit.

To measure current, do the following:

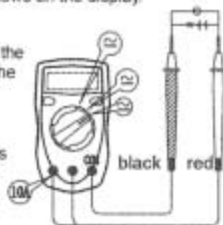
- Turn off power to the circuit. Discharge all high-voltage capacitors.
- Insert the red test lead into the **VΩmA** or **10A** terminal and the black test lead

into the **COM** terminal.

3. Set the rotary switch to an appropriate measurement position in **A $\overline{\text{---}}$**  range. DC measurement is default or press **SELECT** button to select DC measurement mode.
4. 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.
5. Turn on power to the circuit. The measured value shows on the display.

#### Note

- If the value of current to be measured is unknown, use the maximum measurement position (10A) and reduce the range step by step until a satisfactory reading is obtained.
- When current measurement has been completed, disconnect the connection between the testing leads and the circuit under test.



(figure 4)

#### D. AC Current Measurement (see figure 4)

##### ⚠ Warning

Never attempt an in-circuit current measurement where the open-circuit voltage between the circuit and ground is greater than 500V.

If the fuse burns out during measurement, the Meter may be damaged or the operator himself may be hurt. Use proper terminals function, and range for the measurement. When the testing leads are connected to the current terminals, do not parallel them across any circuit.

1. Turn off power to the circuit. Discharge all high-voltage capacitors.
2. Turn the rotary switch to suitable range, press **SELECT** to change from DC to AC measurement.
3. Insert the red test lead into the **V $\Omega$ mA** or **10A** terminal and the black test lead into the **COM** terminal.
4. Set the rotary switch to an appropriate measurement position in **A $\sim$**  range.
5. 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.
6. Turn on power to the circuit.

The measured value shows on the display.

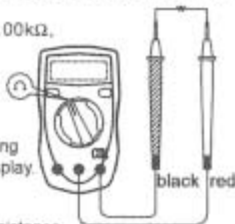
#### E. Resistance Measurement (see figure 5)

##### ⚠ Warning

To avoid damages to the Meter or to the devices under test, disconnect circuit power and discharge all the high-voltage capacitors before measuring resistance.

The  $\Omega$  ranges are : 400.0 $\Omega$ , 4.000k $\Omega$ , 40.00k $\Omega$ , 400.0k $\Omega$ , 4.000M $\Omega$ , and 40.00M $\Omega$ .

1. Insert the red test lead into the **V $\Omega$ mA** terminal and the black test lead into the **COM** terminal.
2. Set the rotary switch to the  $\Omega$  range.
3. Connect the test leads across with the object being measured. The measured value shows on the display.



(figure 5)

#### Note

- The test leads can add 0.1 $\Omega$  to 0.3 $\Omega$  of error to resistance measurement. To obtain precision readings in low-resistance measurement, that is the range of 200 $\Omega$  short-circuit the input terminals beforehand and record the reading obtained (called this reading as X). (X) is the additional resistance from the test lead. Then use the equation: measured resistance value (Y) - (X) = precision readings of resistance.
- For high-resistance measurement (>1M $\Omega$ ), it is normal taking several seconds to obtain a stable reading.
- When resistance measurement has been completed, disconnect the connection between the testing leads and the circuit under test.

#### F. Diode and Continuity Test (see figure 6)

##### Testing Diodes

##### ⚠ Warning

To avoid damages to the Meter or to the devices under test, disconnect circuit power and discharge all the high-voltage capacitors before diodes.

Use the diode test to check diodes, transistors, and other semiconductor devices.

The diode test sends a current through the semiconductor junction, and then measures the voltage drop across the junction. A good silicon junction drops between 0.5V and 0.8V.



(figure 6)

To test a diode out of a circuit, connect the Meter as follows:

1. Insert the red test lead into the **VΩmA** terminal and the black test lead into the **COM** terminal.
2. Set the rotary switch to **→|←** Diode measurement is default or press **SELECT** button to select diode measurement mode.
3. For forward voltage drop readings on any semiconductor component, place the red test lead on the component's anode and place the black test lead on the component's cathode.  
The measured value shows on the display.

#### Note

- In a circuit, a good diode should still produce a forward voltage drop reading of 0.5V to 0.8V; however, the reverse voltage drop reading can vary depending on the resistance of other pathways between the probe tips.
- Connect the test leads to the proper terminals as said above to avoid error display. The LCD will display "OL" indicating open-circuit for wrong connection. The unit of diode is Volt (V), displaying the positive-connection voltage-drop value.
- When diode testing has been completed, disconnect the connection between the testing leads and the circuit under test.

#### Testing for Continuity

To test for continuity, connect the Meter as below:

1. Insert the red test lead into the **VΩ mA** terminal and the black test lead into the **COM** terminal.
2. Set the rotary switch to **→|←**.
3. Press **SELECT** button to select continuity measurement mode.
4. Connect the test leads across with the object being measured.  
The buzzer sounds if the resistance of a circuit under test is less than 100Ω.

#### G. Transistor hFE Measurement (see figure 7)

##### Warning

To avoid damages to the Meter or to the devices under test, do not input any current over 60V DC or 30V AC.

1. Check that the transistor is PNP or NPN type.
2. Connect the transistor to be measured to the corresponding jacks.
3. LCD display hFE reference value.



(figure 7)

#### Sleep Mode

To preserve battery life, the Meter automatically turns off if you do not turn the rotary switch or press any button for around 15 minutes. The Meter can be activated by pressing the **SELECT** button or turning the rotary switch.

#### General Specifications

- Maximum Voltage between any Terminals and Grounding: 500V rms.
- Fused Protection for **VΩmA** Input Terminal: 500mA, 250V fast type, φ5x20 mm
- 10A Terminal: Un-fused.
- Range: Auto ranging
- Maximum Display: Display: 3999.
- Measurement Speed: Updates 3 times / second.

- Temperature:
  - Operating: 0°C–40°C (32°F–104 °F).
  - Storage: -10°C–50°C (14°F–122°F).
- Relative Humidity: 75% @ 0°C - 30°C, 50% @ 31 - 40°C.
- Altitude: Operating: 2000 m.  
Storage: 10000 m.
- Battery Type: Two piece of 1.5V AAA Battery.
- Battery Deficiency: Display: 2
- Negative reading: Display: "-".
- Overloading: Display: "OL".
- Dimensions (HxWxL): 130 x 73.5 x 35mm.
- Weight: Approx. 156g (battery included).
- Safety/Compliances: IEC61010 CAT I 600V, CAT II 300V overvoltage and double insulation standard.
- Certification: CE

#### Accuracy Specifications

Accuracy: (a% reading + b digits), guarantee for 1 year.  
Operating temperature: 23°C -5°C.  
Relative humidity: <75%.

##### A. DC Voltage

Range	Resolution	Accuracy	Overload Protection
400mV	100μV	±(0.8%+3)	500V DC or AC
4V	1mV	±(0.8%+1)	
40V	10mV		
400V	100mV		
500V	1V		

Remark: Input impedance: 10MΩ.

##### B. AC Voltage

Range	Resolution	Accuracy	Overload Protection
4V	1mV	±(1.2%+3)	500V DC or AC
40V	10mV		
400V	100mV		
500V	1V		

#### Remarks:

- Input impedance: approx. 10MΩ.
- Displays effective value of sine wave (mean value response).
- Frequency response 40Hz – 400Hz.

##### C. DC Current

Range	Resolution	Accuracy	Overload Protection
400μA	0.1μA	±(1%+2)	500mA/250V fast type fuse φ 5x20mm
4000μA	1μA		
40mA	10μA	±(1.2%+2)	Un-Fused
400mA	100μA		
4A	1mA	±(1.5%+5)	Un-Fused
10A	10mA		

#### Remark:

- **At 10A Range:** For continuous measurement 10 seconds and interval not less than 15 minutes
- Input impedance: approx. 10MΩ.
- Measurement voltage drop: Full range at 400mV.

##### D. AC Current

Range	Resolution	Accuracy	Overload Protection
400μA	0.1μA	±(1.5%+5)	500mA/250V fast type fuse φ 5x20mm
4000μA	1μA		
40mA	10μA	±(2%+5)	Un-Fused
400mA	100μA		
4A	1mA	±(2.5%+5)	Un-Fused
10A	10mA		

#### Remark:

- **At 10A Range:** For continuous measurement 10 seconds and interval not less than 15 minutes
- Input impedance: approx. 10M Ω
- Measurement voltage drop: Full range at 400mV.

#### E. Resistance

Range	Resolution	Accuracy	Overload Protection
400Ω	0.1Ω	±(1.2%+2)	250V DC or AC
4kΩ	1Ω	±(1%+2)	
40kΩ	10Ω		
400kΩ	100Ω		
4MΩ	1kΩ		
40MΩ	10kΩ	±(1.5%+2)	

#### F. Diodes and Continuity Measurement

Range	Resolution	Remark	Overload Protection
→ ←	1mV	Displays approximate forward voltage drop reading	250V DC or AC
→ ←	0.1Ω	Buzzer beeps at <100Ω	

#### G. Transistor hFE Test

Range	Remark	Testing Condition
hFE	Can test NPN and PNP type transistor. Displays range: 0-1000β	I <sub>bo</sub> ≈10μA V <sub>ce</sub> ≈1.5V

#### Maintenance

This section provides basic maintenance information including battery and fuse replacement instruction.

##### Warning

Do not attempt to repair or service your Meter unless you are qualified to do so and have the relevant calibration, performance test, and service information. To avoid electrical shock or damage to the Meter, do not get water inside the case.

##### A. General Service

- Periodically wipe the case with a damp cloth and mild detergent. Do not use abrasives or solvents.
- To clean the terminals with cotton bar with detergent, as dirt or moisture in the terminals can affect readings.
- Turn the Meter to OFF position when it is not in use and take out the battery when not using for a long time.
- Do not store the Meter in a place of humidity, high temperature, explosive, inflammable and strong magnetic field.

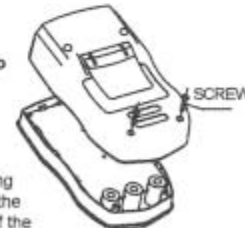
##### B. Replacing the Battery(see figure 8)

##### Warning

To avoid false readings, which could lead to possible electric shock or personal injury, replace the battery as soon as the battery indicator "J" appears.

To replace the battery:

1. Disconnect the connection between the testing leads and the circuit under test, and remove the testing leads away from the input terminals of the Meter.
2. Turn the Meter to OFF position.
3. Remove the screw from case bottom, and separate the case bottom from the case top.
4. Remove the battery from the battery compartment.
5. Replace the battery with a new 1.5V AAA battery.
6. Rejoin the case bottom and case top, and reinstall the screw.



(figure 8)

##### C. Replacing the Fuses (see figure 8)

 **Warning**

To avoid electrical shock or arc blast, or personal injury or damage to the Meter, use specified fuses **ONLY** in accordance with the following procedure.

To replace the Meter's fuse:

1. Disconnect the connection between the testing leads and the circuit under test, and remove the testing leads away from the input terminals of the Meter.
2. Turn the Meter to **OFF** position.
3. Remove the screws from case bottom, and separate the case bottom from the case top.
4. Remove the fuse by gently prying one end loose, and then take out the fuse from its bracket.
5. Install **ONLY** replacement fuses with the identical type and specification as follows and make sure the fuse is fixed firmly in the bracket.  
Fuse 1: 500mA 250 V, fast type, f 5x20mm.
6. Rejoin the case bottom and case top, and reinstall the screw.

Replacement of the fuses is seldom required. Burning of a fuse always results from improper operation.