

# Digital Multimeter

## Users Manual



**Read this users manual thoroughly before use**



# WARRANTY

This instrument is warranted to be free from defects in material and workmanship for a period of one year. Any instrument found defective within one year from the delivery date and returned to the factory with transportation charges prepaid, will be repaired, adjusted, or replaced at no charge to the original purchaser. This warranty does not cover expandable items such as battery or fuse. If the defect has been caused by a misuse or abnormal operating conditions, the repair will be billed at a nominal cost.

# INTRODUCTION

This multimeter is a 4000 count, 3 3/4-digit digital multimeter. It can be used to measure DC and AC voltage, DC and AC current, resistance, capacitance, frequency, diode, temperature, continuity, and duty cycle. It can be operated easily and is an ideal measurement tool.

## **It can be used to measure :**

1. DC and AC voltage
2. DC and AC current
3. Resistance
4. Diode
5. Continuity
6. Duty cycle
7. Frequency
8. Temperature
9. Capacitance

# SAFETY INFORMATION

This meter has been designed according to IEC-61010 concerning electronic measuring instruments with a measurement category ( CAT II 600V ) and pollution degree 2.

## **Warning**

To avoid possible electric shock or personal injury, follow these guidelines:

- a. Do not use the meter if it is damaged. Before you use the meter, inspect the case. Pay particular attention to the insulation surrounding the connectors.
- b. Inspect the test leads for damaged insulation or exposed metal. Check the test leads for continuity. Replace damaged test leads before you use the meter.
- c. Do not use the meter if it operates abnormally. Protection may be impaired. When in doubt, have the meter serviced.
- d. Do not operate the meter around explosive gas, vapor, or dust.
- e. Do not apply more than the rated voltage, as marked on the meter, between terminals or between any terminal and earth ground.
- f. Before use, verify the meter's operation by measuring a known voltage.

- g. When measuring current, turn off circuit power before connecting the meter in the circuit. Remember to place the meter in series with the circuit.
- h. When servicing the meter, use only specified replacement parts.
- i. Use caution when working above 30V ac rms, 42V peak, or 60V dc. Such voltages pose a shock hazard.
- j. When using the probes, keep your fingers behind the finger guards on the probes.
- k. When making connections, connect the common test lead before you connect the live test lead. When you disconnect test leads, disconnect the live test lead first.
- l. Remove the test leads from the meter before you open the battery cover or the case.
- m. Do not operate the meter with the battery cover or portions of the case removed or loosened.
- n. To avoid false readings, which could lead to possible electric shock or personal injury, replace the battery as soon as the low battery indicator ( "  " ) appears.
- o. To avoid electric shock, do not touch any naked conductor with your hand or skin, do not ground yourself while using the meter.
- p. When in Relative mode ( the symbol " REL " appears ) or in Data Hold mode ( the symbol "  " appears ), caution must be used because hazardous voltage may be present.
- q. Remaining endangerment:  
When an input terminal is connected to dangerous live potential it is to be noted that this potential at all other terminals can occur!

- r. CATII - Measurement Category II is for measurements performed on circuits directly connected to low voltage installation. ( Examples are measurements on household appliances, portable tools and similar equipments. ) Do not use the meter for measurements within Measurement Categories III and IV.

## **Caution**

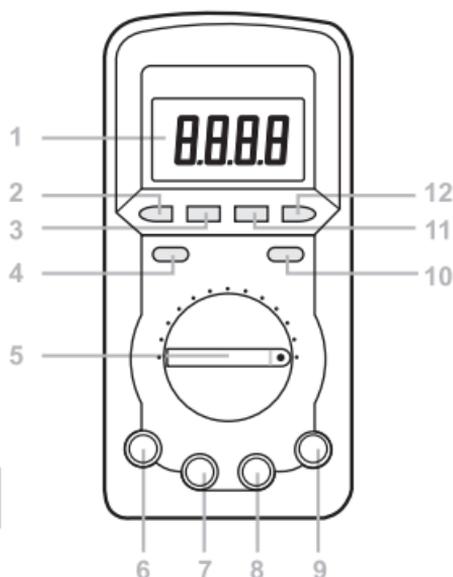
To avoid possible damage to the meter or to the equipment under test, follow these guidelines:

- a. Disconnect circuit power and discharge all capacitors before testing resistance, diode, continuity, capacitance or temperature.
- b. Use the proper terminals, function and range for your measurements.
- c. Before measuring current, check the meter's fuse and turn off the power to the circuit before connecting the meter to the circuit.
- d. Before rotating the range switch to change functions, disconnect test leads from the circuit under test.
- e. Remove test leads from the meter before opening the meter case or the battery cover.

## Symbols

- ~ AC (Alternating Current)
- ≡ DC (Direct Current)
- ≈ DC or AC
- ⚠ Important safety information. Refer to the manual.
- ⚡ Dangerous voltage may be present. Be cautious.
- ⏏ Earth ground
- ⚡ Fuse
- CE Conforms to European Union directives
- Double insulated
- 🔋 Low battery

# INSTRUCTION



**Figure 1**

## 1. Display

3 3/4-digit LCD, with a max. reading of 3999

## 2. " FUNC " Button

In current measurements, this button can be used to select ac or dc function.

When the Function/Range switch is in  $\rightarrow+$  or  $\bullet|||$  position, pressing this button switches the meter between diode and continuity measurements.

## 3. " RANGE " Button

It can be used to switch the Meter between autorange mode and manual range mode.

It can also be used to select desired manual range.

## 4. " HOLD " Button

It can be used for Data Hold mode.

## 5. Function / Range Switch

It can be used to select the desired function and range as well as to turn on or off the meter.

**6. " 10A " Jack**

Plug-in connector for the red test lead for current ( 400mA~10A ) measurements.

**7. " mA°C/°F " Jack**

Plug-in connector for the red test lead for temperature and current ( < 400mA ) measurements.

**8. " COM " Jack**

Plug-in connector for the black test lead.

**9. " VΩHz $\frac{1}{f}$  " Jack**

Plug-in connector for the red test lead for all measurements except current and temperature measurements.

**10. "  " Button**

Press and hold down this button for about 2 seconds to turn on the backlight.

Press the button again to turn off the backlight.

**11. " Hz % " Button**

When the Function/Range switch is in Hz % position, pressing this button switches the meter between frequency and duty cycle measurements

**12. " REL " Button**

It is used for relative measurement.

## Built- in Buzzer

1. When you press a button, the built-in buzzer will give a beep if this press is effective.
2. In continuity test, when the resistance is less than about  $50\Omega$ , the buzzer will sound.

## LCD EXPLANATION

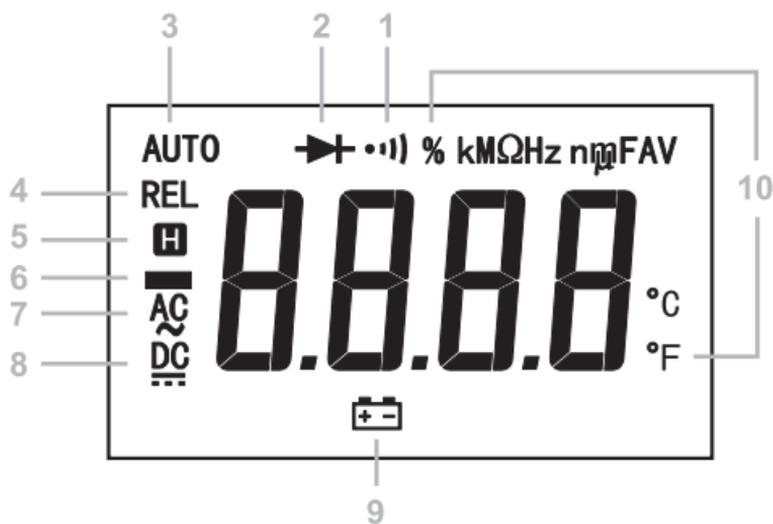


Figure 2

	SYMBOL	MEANING
1		Continuity test is selected.
2		Diode test is selected.
3	<b>AUTO</b>	Autorange mode is selected.
4	<b>REL</b>	Relative mode is active.
5		Data Hold is enabled.
6		Negative sign
7	<b>AC</b> 	AC
8	<b>DC</b> 	DC
9		<p>The battery is low and should be replaced immediately.</p> <p><b>Warning</b> To avoid false readings, which could lead to possible electric shock or personal injury, replace the battery as soon as this low battery indicator appears.</p>

## 10. Units on the LCD

mV、V	Voltage unit mV: Millivolt ; V: Volt; $1V=10^3mV$
$\mu A$ 、mA、 A	Current unit $\mu A$ : Microamp; mA: Milliamp; A: Ampere; $1A=10^3mA=10^6\mu A$
$\Omega$ 、k $\Omega$ 、 M $\Omega$	Resistance unit $\Omega$ : Ohm; k $\Omega$ : Kiloohm; M $\Omega$ : Megohm; $1M\Omega=10^3k\Omega=10^6\Omega$
Hz、kHz、 MHz	Frequency unit Hz: Hertz; kHz: Kiloherzt; MHz: Megahertz; $1MHz=10^3kHz=10^6Hz$
$^{\circ}C$ 、 $^{\circ}F$	Temperature unit $^{\circ}C$ : Celsius degree; $^{\circ}F$ : Fahrenheit degree; $a(^{\circ}F)=32+1.8 \times b(^{\circ}C)$
%	Unit of duty cycle %: Percent
nF、 $\mu F$ 、	Capacitance unit nF: Nanofarad; $\mu F$ : Microfarad; $1\mu F=10^3nF$

# GENGRAL SPECIFICATION

**Display:** 3 3/4-digit LCD, with a max. reading of 3999

**Overrange Indication:** " OL " shown on the LCD.

**Negative Polarity Indication:** " – " displayed automatically

**Sampling Rate:** About 2~3 times/sec

**Operating Temperature:** 0°C~40°C, <75%RH

**Storage Temperature:** -20°C~60°C, <85%RH

**Operating Altitude:** 0 to 2000 meters

**Battery:** 9V, 6F22 or equivalent

**Low Battery Indication:** "  " shown on the display

**Dimensions:** 165X83X47mm

**Weight:** about 351g ( including battery and holster )

# SPECIFICATIONS

Accuracy is specified for a period of one year after calibration and at 18°C to 28°C, with relative humidity < 75%. Accuracy specifications take the form of:  
 $\pm$  ([% of Reading]+[number of Least Significant Digits])

## DC Voltage

Range	Resolution	Accuracy
400mV	0.1mV	$\pm$ (1.0% + 5)
4V	0.001V	$\pm$ (0.8% + 3)
40V	0.01V	
400V	0.1V	
600V	1V	$\pm$ (1.0% + 5)

**Input Impedance:** range 400mV : >1000M $\Omega$   
the other ranges: 10M $\Omega$

**Max. Permitted Input Voltage:**  
range 400mV: 250V DC/AC  
the other ranges: 600V DC/AC

## AC Voltage

Range	Resolution	Accuracy
4V	0.001V	$\pm$ (1.0% + 5)
40V	0.01V	
400V	0.1V	
600V	1V	$\pm$ (1.2% + 5)

**Input Impedance:** 10M $\Omega$

**Max. Permitted Input Voltage:** 600V DC/AC

**Frequency Range:** 40Hz ~ 400Hz

**Response:** Average, calibrated in rms of sine wave.

## DC Current

Range	Resolution	Accuracy
400 $\mu$ A	0.1 $\mu$ A	$\pm (1.2\%+3)$
4000 $\mu$ A	1 $\mu$ A	
40mA	0.01mA	
400mA	0.1mA	
4A	0.001A	$\pm (1.8\%+3)$
10A	0.01A	$\pm (2.0\%+5)$

### Overload Protection:

For "mA°C/°F" jack inputs: Fuse, 500mA/250V, Fast

For "10A" jack inputs: no fuse protection

( For inputs > 5A : measurement duration <10 secs,  
interval >15 minutes )

**Maximum Voltage Drop:** 800mV

## AC Current

Range	Resolution	Accuracy
400 $\mu$ A	0.1 $\mu$ A	$\pm (1.5\%+5)$
4000 $\mu$ A	1 $\mu$ A	
40mA	0.01mA	
400mA	0.1mA	
4A	0.001A	$\pm (2.0\%+5)$
10A	0.01A	$\pm (3.0\%+10)$

### Overload Protection:

For "mA°C/°F" jack inputs: Fuse, 500mA/250V, Fast

For "10A" jack inputs: no fuse protection

( For inputs > 5A : measurement duration <10 secs,  
interval >15 minutes )

**Maximum Voltage Drop:** 800mV

**Frequency Range:** 40Hz ~ 400Hz

**Response:** Average, calibrated in rms of sine wave.

## Resistance

Range	Resolution	Accuracy
400Ω	0.1Ω	± (1.0%+5)
4kΩ	0.001kΩ	± (1.0%+3)
40kΩ	0.01kΩ	
400kΩ	0.1kΩ	
4MΩ	0.001MΩ	
40MΩ	0.01MΩ	± (2.0%+5)

Open Circuit Voltage: about 0.45Vdc

Overload Protection: 250V DC/AC

## Frequency

Range	Resolution	Accuracy
9.999Hz	0.001Hz	± (1.0%+3)
99.99Hz	0.01Hz	± (0.8%+3)
999.9Hz	0.1Hz	
9.999kHz	0.001kHz	
99.99kHz	0.01kHz	± (1.0%+3)
200kHz	0.1kHz	
>200kHz		Not Specified

Measurement Range: 1Vrms ~ 20Vrms

Overload Protection: 250V DC/AC

## Diode and Continuity

Range	Introduction	Test Condition
	The approx. forward voltage drop of diode will be displayed.	Open Circuit Voltage: about 1.5V
	The built-in buzzer will sound if the resistance is less than about 50Ω. The buzzer will not sound if the resistance is more than 120Ω.	Open Circuit Voltage: about 0.45V

Overload Protection: 250V DC/AC

## Capacitance ( use Relative mode )

Range	Resolution	Accuracy
40nF	0.01nF	± (4.0%+5)
400nF	0.1nF	
4μF	0.001μF	
40μF	0.01μF	
100μF	0.1μF	± (8.0%+5)

Overload Protection: 250V DC/AC

## Duty Cycle

Range	Resolution	Accuracy
5% ~ 95%	0.1%	1Hz ~ 10kHz: ± (2%+5)
		>10kHz: not specified

Measurement Range: 3Vp-p ~ 10Vp-p

Overload Protection: 250V DC/AC

## Temperature

Range	Resolution	Accuracy
-20°C~1000°C	1°C	-20°C~0°C: $\pm (6.0\%+5)$
		0°C~400°C: $\pm (1.5\%+5)$
		>400°C: $\pm (1.8\%+5)$
-4°F~1832°F	1°F	-4°F~32°F: $\pm (6.0\%+9)$
		32°F~752°F: $\pm (1.5\%+9)$
		>752°F: $\pm (1.8\%+9)$

Overload Protection: Fuse, 500mA/250V, fast action.

### Note:

1. Accuracy does not include error of the thermocouple probe.
2. Accuracy specification assumes ambient temperature is stable to  $\pm 1^\circ\text{C}$ . For ambient temperature changes of  $\pm 5^\circ\text{C}$ , rated accuracy applies after 1 hour.

## OPERATION INTRODUCTION

### Using Relative Mode

Relative mode is available in all measurements except frequency and duty cycle measurements.

Selecting relative mode causes the meter to store the present reading as a reference for subsequent measurements.

1. Press the "**REL**" button, the meter enters the Relative mode and store the present reading as a reference for subsequent measurements, and "**REL**" appears on the display as an indicator. The display reads zero.
2. When you perform a new measurement, the display shows the difference between the reference and the new measurement.
3. Press the "**REL**" button again, the meter exits the Relative mode.

## **Manual Ranging and Autoranging**

The meter defaults to autorange mode in functions which have both autorange mode and manual range mode.

When the meter is in autorange mode, "AUTO" is displayed.

1. Press the "**RANGE**" button to enter the manual range mode, the symbol "AUTO" disappears. Each press of the "**RANGE**" button increases the range. When the highest range is reached, the meter wraps to the lowest range.
2. To exit the manual range mode, press and hold down the "**RANGE**" button for more than 2 seconds, the meter returns to the autorange mode and the symbol "AUTO" appears.

## Data Hold Mode

Press the " **HOLD** " button to hold the present reading on the display, " **H** " appears on the display as an indicator. To exit the Data Hold mode, press the button again, " **H** " disappears.

## Measuring Voltage

1. Connect the black test lead to the " **COM** " jack, and the red test lead to the " **VΩHz** " jack.
2. Set the range switch to  $V_{\text{---}}$  or  $V_{\sim}$  range.  
( The  $V_{\text{---}}$  range is for dc voltage measurements, the  $V_{\sim}$  range is for ac voltage measurements. )
3. Select autorange mode or manual range mode with the " **RANGE** " button.

If you use manual range mode and don't know the magnitude of the voltage to be measured beforehand, select the highest range and then reduce it range by range until satisfactory resolution is obtained.

4. Connect the test leads across the source or load to be measured.
5. Read LCD display. For dc voltage measurement, the polarity of red lead connection will be indicated as well.

### Note

To avoid electric shock to you or damages to the meter, do not attempt to measure dc voltage higher than 600V or ac voltage higher than 600V rms although readings may be obtained.

## Measuring Current

1. Connect the black test lead to the " **COM** " jack. If the current to be measured is less than 400mA, connect the red test lead to the " **mA°C** " jack. If the current is between 400mA and 10A, connect the red test lead to the " **10A** " jack instead.
2. Set the range switch to desired "  **$\mu\text{A}\approx$**  ", "  **$\text{mA}\approx$**  " or "  **$10\text{A}\approx$**  " range.
3. Select ac or dc current measurement with the " **FUNC** " button, the display shows the relevant symbol ( " **AC** " or " **DC** " ).
4. Turn off power to the circuit which you want to measured.  
Discharge all capacitors.
5. Break the circuit path to be measured, connect the test leads in series with the circuit.
6. Turn on power to the circuit, then read the display.  
For dc current measurement, the polarity of the red test lead connection will be indicated as well.

### Note :

If you don't know the magnitude of the current to be measured beforehand, select the highest range and then reduce it range by range until satisfactory resolution is obtained.

## Measuring Resistance

1. Connect the black test lead to the " **COM** " jack, and the red test lead to the " **VΩHz** " jack. ( Note : The polarity of the red lead is positive " + ". )
2. Set the range switch to  $\Omega$  range.
3. Connect the test leads across the load to be measured.
4. Read the reading on the display.

### Note :

1. For resistance above  $1M\Omega$  , the meter may take a few seconds to stabilize reading. This is normal for high resistance measurements.
2. When the input is not connected, i.e. at open circuit, " OL " will be displayed as overrange indication.
3. Before measuring in-circuit resistance, make sure that the circuit under test has all power removed and all capacitors are fully discharged.

## Continuity Test

1. Connect the black test lead to the " **COM** " jack, and the red test lead to the " **VΩHz** " jack. ( Note: The polarity of the red lead is positive " + ". )
2. Set the range switch to **•))** position, press the " **FUNC** " button until the symbol " **•))** " appears on the display.
3. Connect the test leads across the circuit to be measured.
4. If the circuit resistance is less than about 50Ω, the built-in buzzer will sound.

### Note:

Before performing in-circuit continuity test, make sure that the circuit under test has all power removed and all capacitors are fully discharged.

## Diode

1. Connect the black test lead to the " **COM** " jack, and the red test lead to the " **VΩHz** " jack. ( Note: The polarity of the red lead is positive " + ". )
2. Set the range switch to **➔** position, press the " **FUNC** " button until the symbol " **➔** " appears on the display.
3. Connect the red test lead to the anode of the diode to be tested, and the black test lead to the cathode.
4. The display will show the approximate forward voltage drop of the diode.

If the connection is reversed, "OL" will be shown on the display.

## Measuring Frequency

1. Connect the black test lead to the " **COM** " jack, and the red test lead to the " **VΩHz** " jack.
2. Set the range switch to **Hz%** position.
3. Press the " **Hz%** " button until the display shows " **Hz** ".
4. Connect the test leads across the source or load to be measured.
5. Read the reading.

### Note:

The voltage of the input signal should be between 1V rms and 20V rms. If the voltage exceeds 20V rms, the accuracy of reading may be out of the specified accuracy range.

## Measuring Duty Cycle

1. Connect the black test lead to the " **COM** " jack, and the red test lead to the " **VΩHz** " jack.
2. Set the range switch to **Hz%** position.
3. Press the " **Hz%** " button until the display shows " **%** ".
4. Connect the test leads across the signal source be measured.
5. Read the reading.

### Note:

1. The voltage of input signal must be between 3Vp-p and 10Vp-p, and the frequency of the input signal must

be less than 10kHz. If the voltage exceeds 10Vp-p or the frequency exceeds 10kHz, the accuracy of the reading may be out of the specified accuracy range.

## Measuring Temperature

### NOTE

To avoid possible damage to the meter or other equipment, remember that while the meter is rated for  $-20^{\circ}\text{C}$  to  $+1000^{\circ}\text{C}$  and  $-4^{\circ}\text{F}$  to  $1832^{\circ}\text{F}$ , the K Type Thermocouple provided with the meter is rated to  $250^{\circ}\text{C}$ . For temperatures out of that range, use a higher rated thermocouple.

The K Type Thermocouple provided with the meter is a present, it is not professional and can only be used for non-critical reference measurements. For accurate measurements, use a professional thermocouple.

1. Connect the negative " - " plug of the K type thermocouple to the " **COM** " jack, and the positive " + " plug to the " **mA°C/°F** " jack.
2. Set the range switch to " **°C** " or " **°F** " position.
3. Connect the end of the thermocouple to the object to be measured.
4. Wait until the reading is stable, read the reading on the display.

## Measuring Capacitance

1. Connect the black test lead to the " **COM** " jack, the red test lead to the " **VΩHz** " jack. ( Note: The polarity of the red lead is positive " + ". )
2. Set the range switch to **⇄** position.
3. Connect the test leads across the capacitor to be measured.
4. Wait until the reading is stable, then read the reading. ( For high-capacitance measurements, it may take about 30 seconds for the reading to be stable. )

### Note:

1. Before measurement, make sure that the capacitor to be measured has been discharged thoroughly.
2. To improve the accuracy of low capacitance measurement, subtract the residual capacitance of the meter and test leads by using relative measurement.
3. For the measurements  $\geq 100\mu\text{F}$ , the display will show "OL" as overrange indication.

## **Auto Power Off**

The display will blank and the meter will go into "Sleep" mode if you do not operate the meter for about 30 minutes.

To arouse the meter from Sleep, rotate the range switch.

To disable the automatic power-off feature, turn on or arouse the meter while pressing and holding down the "**FUNC**" button.

## **MAINTENANCE**

### **Warning**

Except replacing battery and fuse, never attempt to repair or service the meter unless you are qualified to do so and have the relevant calibration, performance test, and service instructions.

Store the meter in dry place if you don't use it.

### **General Maintenance**

Periodically wipe the case with a damp cloth and mild detergent. Do not use abrasives or solvents.

Dirt or moisture in the terminals can affect readings.

Clean the terminals as follows:

1. Set the range switch to OFF position and remove the test leads from the meter.
2. Shake out any dirt which may exist in the terminals.
3. Soak a new swab with alcohol.
4. Work the swab around in every terminal.

## Replacing the Battery and Fuse

### Warning

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

To prevent damage or injury, install only replacement fuse of the same ratings.

Disconnect the test leads before opening the back cover or the battery cover.

To replace the battery, remove the screws on the battery cover and remove the battery cover, replace the exhausted battery with a new battery of the same type ( 9V, 6F22 or equivalent ). Reinstall the battery cover and the screws.

This meter uses one fuse: 500mA, 250V,  $\phi$  5X20mm, Fast action

To replace the fuse, open the battery cover, take the meter out of the holster, open the back cover, replace the fuse with a new one of the same ratings. Reinstall the back cover and its screws. Then reinstall the holster, the battery cover and the battery cover's screws sequentially.

# ACCESSORIES

**Users Manual:** 1 piece

**Test Lead:** 1 pair

# PRESENT

K Type Thermocouple: 1 piece

# NOTE

1. This manual is subject to change without notice.
2. Our company will not take the other responsibilities.
3. The content of this manual can not be used as the reason to use the meter for any other special applications.

## DISPOSAL OF THIS ARTICLE

Dear Customer,

If you at some point intend to dispose of this article, then please keep in mind that many of its components consist of valuable materials, which can be recycled.

Please do not discharge it in the garbage bin, but check with your local council for recycling facilities in your area.



