

DIGITAL MULTIMETER USERS MANUAL

1. GENERAL DESCRIPTION

This 31/2 Digit Highly Stable multimeter uses two AA (1.5V) battery. It has a LCD with 22mm digit display, which makes the reading clearer and the operation more convenient. It can test DCV, ACV, DCA, ACA, resistance, NCV, temperature, transistor, diode, and continuity test. This meter also has Max Min Hold function with unit symbol display, can work in both auto and manual range, and provides auto power off, backlight and warning functions. To assure high accuracy and resolution, it adopts an 8-bit microprocessor and a dual integral A/D convertor IC. It is an ideal tool for labs, factories and radio-technology.

2. SAFETY PRECAUTIONS

The instrument is designed according to IEC1010 standard (safety standard issued by International Electro technical Committee). Please read the following carefully before operation.

- 2.1 Check the connection and insulation of test leads to avoid electric shock.
- 2.2 To avoid electric shock and damage to the meter, do not input voltage higher than DC 1000V or AC 750V during measurement.
- 2.3 Use caution when working with voltages above DC 60V or AC 40V.
- 2.4 Select correct function and range to avoid shock and fault operation.
- 2.5 Please move the test leads away from test points when switching the Range.
- 2.6 Please don't input voltage in current terminal.
- 2.7 Introduction for safety symbols:
 "△" exists high voltage, "⚡" GND, "⊞" dual insulation, "⚠" Operator must refer to manual, "⚡" Low battery indication.

3. FEATURES

3.1 General Characteristics

- 3.1.1 Display: LCD;
- 3.1.2 Max display: 2,000 (3 1/2 digits, auto polarity, and unit symbol display);
- 3.1.3 Measurement method: Analog to digital converter (in micro processor ADC+MCU);
- 3.1.4 Sampling rate: approx.3 times/sec.
- 3.1.5 Over-range display: "OL" displayed.
- 3.1.6 Low battery indicator: "⚡"
- 3.1.7 Working environment: (0~40)°C, relative humidity: <80%;
- 3.1.8 Store condition: (-10~50)°C, relative humidity: <80%
- 3.1.9 Battery: 2 X 1.5V battery (AAA);
- 3.1.10 Dimension: 170×86×35mm (length*width*height);
- 3.1.11 Weight: approx. 290g (including battery);
- 3.1.12 Accessories: test leads, user manual, temperature probe, gift box and batteries.

3.2 Technical Features

- 3.2.1 Accuracy: ±(a% × reading data + digits). To assure accuracy, the environment temperature should be (23±5) °C, relative humidity should <75%. One year accuracy guarantee since production date.
- 3.2.2 DC Voltage (DCV)

Range	Accuracy	Resolution
200mV	±(0.5%+4)	0.1mV
2V		1mV
20V		10mV
200V		100mV
1000V	±(1.0%+4)	1V

Input impedance: at 200mv range >40MΩ, at other ranges is 10MΩ.

Overload protection: 1000V DC or 750V AC peak value

3.2.3 AC Voltage (ACV)

Range	Accuracy	Resolution
2V	±(0.8%+6)	1mV
20V		10mV
200V		100mV
750V	±(1.0%+6)	1V

Input impedance: 10MΩ.

Overload protection: 1000V DC or 750V AC rms

Frequency response: at 750V range: 40~1000Hz, at other ranges: 40~2000Hz

Displaying: True RMS response (calibration based on sine wave RMS)

3.2.4 DC Current (DCA)

Range	Accuracy	Resolution
200uA	±(1.0%+5)	0.1μA
2000uA		1μA
20mA		10μA
200mA		100μA
2A		1mA
20A	±(2.0%+5)	10mA

Maximum voltage drop: 200mV for all ranges.

Maximum input current: 20A (for 15 seconds).

Over load protection: 0.2A/250V fuse and 13A/250V fuse.

3.2.5 AC Current (ACA)

Range	Accuracy	Resolution
200uA	±(1.5%+5)	0.1μA
2000uA		1μA
20mA		10μA
200mA		100μA
2A		1mA
20A	±(2.0%+10)	10mA

Maximum voltage drop: 200mV for all ranges.

Maximum input current: 20A (for 15 seconds).

Over load protection: 0.2A/250V fuse and 13A/250V fuse.

Frequency response: 40~100Hz under 20A range, 40~400Hz at other ranges.

3.2.6 Resistance (Ω)

Range	Accuracy	Resolution
200Ω	±(0.8%+1)	0.1Ω
2kΩ		1Ω
20kΩ		10Ω
200kΩ		100Ω
2MΩ		1kΩ
20MΩ		±(1.2%+5)

Open circuit voltage: >500mV

Overload protection: 250V DC/AC peak value.

3.2.7 Transistor triode (hFE)

Measurement	Range	Test Conditions
NPN or PNP	0~1000	Base current is approx 15uA, Vce is about 1.2V

3.2.8 Diode and Continuity Test

Range	Description	Test Conditions
▶)	Diode forward voltage drop	Forward DC current is approx 0.8mA, reverse voltage is approx 2.2V.
	When the resistance under test is less than 50Ω, buzzer sounds continuously.	Open circuit voltage: 2.2V

Overload protection: 250V DC/AC peak value

WARNING: Do not apply any voltage in this range.

3.2.9 Temperature (°C/°F)

Range	Accuracy	Resolution
-40°C~1000°C	<400°C ±(1.0%+5) ≥400°C ±(1.5%+15)	1°C
0F~1832°F	<750°F ±(1.0%+5) ≥750°F ±(1.5%+15)	°F

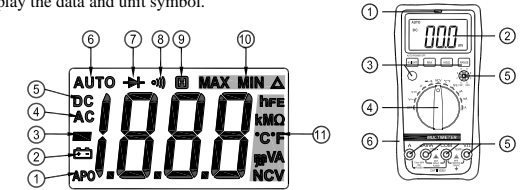
Thermocouple: K type

WARNING: do not input voltage at this range!

OPERATION INSTRUCTION

4.1 Panel Description (See picture)

- ①. NCV detector area and indicator light.
- ②. LCD: Display the data and unit symbol.



Number	Feature	Indication
1	APO	Auto power off symbol.
2	⚡	Low battery indication. Warning: To avoid error readings, which could lead to possible electric shock or personal injury, please replace the battery in time.
3	-	Indicates negative readings.
4	AC	AC voltage or current measurement.
5	DC	DC voltage or current measurement.
6	AUTO	Auto range mode.
7	▶)	Diode test mode
8	·)	Continuity beeper is on.
9	HOLD	Display Hold is active.
10	MAX MIN △	Max&Minimum value recording mode. Null
11	hFE °C/°F MΩ, kΩ, Ω mV, V uA, mA, A NCV	hFE (Triode magnification measurement) Degrees Celsius, Degrees Fahrenheit Megohm, Kilohm, Ohm Millivolts, Volts Microamp, Milliamp, Amperes (A) Non-contact voltage detector.

③Function Button

③-1 * LIGHT key: press "*" light key to turn on the backlight, the backlight can last 15 seconds. During 15 seconds, press "*" light key again will turn off the backlight.

③-2 MAX / MIN: Recording of minimum and maximum values

1) Press MAX/MIN into MAX mode, which will store the maximum value of measurements; Press it again to start MIN mode, which will store the minimum value of measurements.

2) Under MAX/MIN mode, it will start manual range automatically. Under this mode, functions like HOLD, RANGE, and DC/AC will not be available.

3) Under MAX/MIN mode, it will store maximum or minimum values automatically.

4) Under MAX/MIN mode, auto power off can't be used.

5) Press MAX/MIN for 2 seconds it will exit MAX/MIN mode.

③-3 HOLD key: press HOLD key to enter HOLD mode, the current value will be hold, and symbol HOLD will be displayed. Press HOLD again can exit the HOLD mode.

③-4 RANGE key: for choosing auto or manual range. The meter defaults to auto range in measurement function and "AUTO" symbol is displayed. To Enter Manual Range mode Press RANGE key. Each Press of RANGE key Increments the range, when the highest range is reached ,the meter wraps to the lowest range .To exit the manual range mode press and hold the Range key for more than 2 seconds.

③-5 SELECT key (yellow):

③-5-1 At range, press yellow key can choose DC or AC measurement. At range, press yellow key can choose diode or continuity test. At temperature range, press yellow key can choose °C/°F.

③-5-2 When there is no measurement for 15 minutes, the meter will auto power off and enter sleep mode. In one minute before Sleep mode, the buzzer will beep 5 times to remind user. Press any button or turn the rotary switch will exit the Sleep mode. Press yellow key to Power on the meter from the Sleep mode or Press and hold the yellow button when the meter is ON , it will cancel auto power off function.

④. Rotary switch: used to change the range and choose functions.

Switch position	Function
V~	AC voltage measurement
V=	DC voltage measurement
Ω	Resistance measurement
$\rightarrow \ominus \rightarrow$)	Diode/continuity measurement. Press SELECT key (yellow) to choose diode or continuity range.
hFE	Triode magnification measurement
$^{\circ}\text{C}/^{\circ}\text{F}$	Temperature measurement, press SELECT key (yellow) to choose $^{\circ}\text{C}$ or $^{\circ}\text{F}$.
NCV	Non-contact voltage detect
μA ~	DC current measurement (from 0uA to 2000uA). Press SELECT key (yellow) to switch to AC current measurement (from 0uA to 2000uA).
mA ~	DC current measurement (from 0mA to 200mA). Press SELECT key (yellow) to switch to AC current measurement (from 0mA to 200mA).
A ~	DC current measurement (from 0A to 20A). Press SELECT key (yellow) to switch to AC current measurement (from 0A to 20A).

⑤. Input terminal:

Terminal	Description
A	Input terminal for AC and DC current from 0 to 20A (max for10 seconds)
$\mu\text{A}/\text{mA}$	Input terminal for AC and DC current from 0uA to 200mA (less than 200mA can last 18 hours)
COM	Common terminal for all measurements, and temperature negative (-) terminal
V Ω	Input terminal for voltage, resistance, diode, and continuity, and temperature positive (+) terminal
hFE	Input terminal for triode measurement.

⑥. Holster and battery door.

4.2 DCV measurement

4.2.1 Insert the black test lead into “COM” terminal, and the red one into “V/Ω” terminal.

4.2.2 Set the rotary switch to “V=” range.

4.2.3 Auto range is the original states, it will display “AUTO” symbol. Press “RANGE” key to change to manual range mode, and 200mV, 2V, 20V, 200V, 1000V ranges are selectable;

4.2.4 Connect test leads to the test point; LCD will display polarity and voltage of the test point connected by the red test lead.

Note:

1. Under manual range mode, if LCD displays “OL”, it means over range, you should select the higher range.

2. Do not input a voltage over DC 1000V. It may cause damage to the circuit of meter.

3. Be careful while measuring a high voltage circuit. DO NOT touch the high voltage circuit.

4. The buzzer will beep to Alert user, when the measuring voltage is over DC1000V.

4.3 ACV measurement

4.3.1 Insert the black test lead into “COM” terminal, and the red one into “V/Ω” terminal.

4.3.2 Set the rotary switch to “V~” range.

4.3.3 Auto range is the original states, it will display “AUTO” symbol. Press “RANGE” key to change to manual range mode, and 2V, 20V, 200V, 750V ranges are selectable;

4.3.4 Connect test leads to the test point; LCD will display voltage of the two test points.

Note:

1. Under manual range mode, if LCD displays “OL”, it means over range, user should select the higher range.

2. Do not input a voltage over AC 750V. It may cause damage to the circuit of the meter.

3. Be careful while measuring a high voltage circuit. DO NOT touch the high voltage circuit.

4. The buzzer will beep to Alert the user, when the measuring voltage is over AC750V.

4.4 DCA measurement

4.4.1 Insert the black test lead into “COM” terminal and the red one into “uAmA” terminal (Max. 200mA) or into “20A” terminal (Max.20A);

4.4.2 Set the rotary switch to a proper current range, and then connect the test leads to the circuit. LCD will display polarity and current of the test point connected by the red test lead.

Note:

1. Firstly users should select the highest range, if users not sure about the range of current under test, and then select the proper range based on displaying value.

2. If the LCD displays “OL”, it means the current is over range. Now you need to select a higher range.

3. Maximum input current is 200mA or 20A (subject to where the red test lead is insert). Current higher than that will damage the fuse, and may cause damage to the circuit of meter.

4. If input current over 10A, and the built-in buzzer will alarm.

4.5 ACA measurement

4.5.1 Insert the black test lead into “COM” terminal and the red one into “uA.mA” terminal (Max. 200mA) or into “A” terminal (Max.20A);

4.5.2 Set the rotary switch to a proper current range, press SELECT (yellow) key to select the AC mode, and then connect the test leads to the circuit. LCD will display current value.

Note:

1. Firstly users should select the highest range, if users not sure about the range of current under test, and then select the proper range based on displaying value.

2. If the LCD displays “OL”, it means the current is over range. Now you need to select a higher range.

3. Maximum input current is 200mA or 20A (subject to where the red test lead insert into). Current higher than that will damage the fuse, and may cause damage to the circuit of meter.

4. If input current over 10A, and the built-in buzzer will alarm.

4.6 Resistance measurement

4.6.1 Insert the black test lead into “COM” terminal and the red one into “V/Ω” terminal.

4.6.2 Set the rotary switch to Ω range.

4.6.3 Auto range is the original states. Press “RANGE” key can choose manual range.

Note:

1. Please select the highest range, if the value of resistance is unknown, and then select the proper range based on displayed value.

2. The LCD displays “OL” when the resistance is over the selected range. The knob should be adjusted to a highest range. When measuring value is over 1M Ω , the reading will take a few seconds to be stable. This is normal for high resistance measurement.

3. When input terminal is in open circuit, LCD will display “OL”.

4. Before measuring in line resistor, make sure that the power is off and all capacitors are discharged completely.

5. When there is big error, it may be affected by other online component or there is voltage on the resistor.

6. Do not apply any voltage at resistance range.

4.7 Non-contact voltage detector

This function could be affected by different external interference sources, and then the alarm is activated by wrong signal. The measurement result is for reference only.

Turn the rotary function switch to “NCV” position. When the testing circuit is placed above the meter, the meter displays the strength of signal, and the buzzer alarms with “beep beep”.

Note:

1) Even if there is no voltage indication, there may be voltage on the circuit. Do not rely on NCV detector as the only way to detect voltage.

2) Voltage detecting may be affected by power socket design, type of insulation and its thickness and other factors.

3) Interference sources in the external environment, such as flashing light, motor, would cause wrong signal to activate alarm function.

4.8 Transistor hFE measurement

4.8.1 Set the rotary switch to hFE range;

4.8.2 Define the transistor is NPN or PNP type, then insert the emitter, base and collector separately into the relative hole, the value will be displayed on LCD.

4.9 Diode and Continuity test:

4.9.1 Insert the black test lead into “COM” terminal and the red one into “V/Ω” terminal (the polarity of red lead is “+”)

4.9.2 Set the rotary switch to $\rightarrow \ominus \rightarrow$) range, the original state is diode measurement mode;

4.9.3 Forward measurement: connect red test lead to the positive polarity and the black test lead to the cathode polarity of the diode. LCD will display the approx. value of forward voltage drop.

4.9.4 Backward measurement: connect red test lead to the cathode polarity and the black test lead to positive polarity of the diode. LCD will display “OL”.

4.9.5 The complete diode testing includes forward and backward measurement, if the result doesn't meet the descriptions above; it means the diode is broken.

4.9.6 Press SELECT (yellow) key to select the continuity measurement mode.

4.9.7 Connect test leads to two points of tested circuit, if the resistance is less than (50 \pm 10) Ω , the buzzer sounds.

Note:

1. Don't input voltage at “ $\rightarrow \ominus \rightarrow$)” range.

2. When test circuits, make sure the power is off and all capacitors are discharged. Any negative potential or AC signal will make the buzzer sounds.

4.10 Temperature measurement

4.10.1 Set the rotary switch to “C/F” range.

4.10.2 Press SELECT (yellow) key to select “C” or “F” mode. Insert the cold end (free end) of thermocouple in “V Ω ” and “COM” terminal, and put the working end (temperature measuring end) of thermocouple on the surface or inside the tested object. Then LCD will display the temperature of tested object, and the reading is in $^{\circ}\text{C}/^{\circ}\text{F}$ (when the polarity is contrary. The reading will decrease when the temperature of the tested object increase).

NOTE:

1) When the input terminal is open circuit, it will display the environment temperature.

2) To ensure measure accuracy, do not replace the temperature probe unless it is necessary.

3) Do not input voltage at temperature range.

MAINTENANCE

The meter is a precise instrument. Random changes to the circuit Should be avoided.

Note:

1. DO not input voltage higher than DC 1000V or AC 750V rms.

2. DO Not apply voltage in current, resistance, diode and continuity range.

3. Don't make any measurements when the battery isn't installed or the back cover isn't fixed.

4. Before replacing battery or fuse, please remove the test leads from the measuring point and Turn off the power.

5. Keep the meter away from water, dust and shock.

6. Do not use the meter under high temperature, high humidity, combustible, explosive and strong magnetic environments.

7. Clean the Case with a damp cloth and mild detergent only. Do not use abrasives and alcohol to clean the meter.

8. To avoid leakage damage, please take out the battery, if the meter will not be used for a long time.

9. When “ E ” symbol is displayed, you should replace the battery according to the following steps:

9-1. Follow picture 2, and remove the holster at first.

9-2. Unscrew the screw on the battery door and remove the cover;

9-3. Replace the old battery with a new one. (For long life, it's better to use alkaline battery.)

9-4. Replace the battery door and tighten the screw.

9-5 Follow the picture to put on the holster.

10. Fuse change: When replacing fuse, please use fuse with same type and specification.

10-1. Follow picture 2, and remove the holster at first ; Unscrew the screw on the battery door and remove the cover;

10-2. Replace the Fuse with a new one.

10-3. Replace the battery door and tighten the screw, fix the Holster.

TROUBLE SHOOTING

If the meter does not work properly, please check the meter as following steps:

(If the problems still Persists, please contact the repairing center or the local dealer.)

Fault	Solution
No reading on LCD	<ul style="list-style-type: none"> ■ Turn on the power ■ Replace battery ■ Release the HOLD key
E signal appears	<ul style="list-style-type: none"> ■ Replace battery
No current or temperature input	<ul style="list-style-type: none"> ■ Replace fuse
Big error Value	<ul style="list-style-type: none"> ■ Replace battery

■ The specifications are subject to changes without prior notice.

■ The content of this manual is regarded as correct. If users find out any mistakes or omissions, please kindly contact the manufacturer.

■ The manufacturer will not be responsible for accidents and damage caused by improper operations.

■ The functions described in this User Manual shall not be considered as the reason for any special usages.