

DIGITAL MULTIMETER

OPERATION MANUAL

I. INTRODUCTION

The instrument is a stable and high performance digital multimeter driven by battery. It uses the LCD with 42mm high to make the readings clearly.

The instrument has the function of measuring DCV, ACV, DCA, ACA, Resistance and Capacitance, Frequency, Diode, Triode, Continuity test, Temperature, Auto power off (can be canceled) and backlight function. The instrument takes dual-integral A/D converter as key point, is an excellent tools. It's an ideal tool for lab, factory and family.

The new generation series of productions add NCV (non-contact ACV induction measurement) and torch function on the basis of the original function.

II. OPEN THE PACKAGE FOR CHECKING

Open the box, take out the meter, checking the items below if they are missing or damaging:

K type probe (-20°C~250°C)	1pc
1.5V AAA LR03 Battery	4pcs

Instruction	1pc
Test leads	1pair
Multi-function socket	1pc






Please contact with your supplier, if you find out any problems.

III. SAFETY NOTES











This series meter meets the standard of IEC61010 (the safety standards request issued by IEC or equal GB4793.1 standards). Read it before operation.

1. Input over range is prohibited in each range during the test.
2. Voltage less than 36V is safety voltage. When measuring voltage higher than 36V DC, 25V AC, check the connection, insulation of test leads to avoid electric shock.
3. When changing function and range, test leads should be removed from testing point.
4. Select correct function and range.
5. Don't operate the meter when the battery case and back cover are not fixed

6. Don't input voltage during the resistance measurement.
7. Test lead should be removed from testing point before changing the batteries or fuses, and turn off the power.
8. Comply with local and national safety regulations, wear personal protective equipment (approved rubber gloves, masks and flame retardant clothing, etc.), to prevent electric shock and arc injury caused by exposure of dangerous electric conductor.
9. Make measurements using only the correct measurement standard class (CAT), voltage and current rated probe, test conductor and adapter.
10. Safety symbols


“” exists high voltage, “”GND, “” dual insulation
 “” must refer to manual, “”low battery

IV. SAFETY SYMBOLS

	Warning		DC
	High Voltage danger		AC
	Ground		AC and DC
	Dual insulation		Accord with order of the European Union
	Low battery Voltage		Fuse

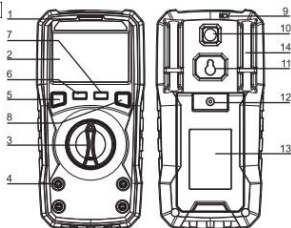
V. SPECIFICATIONS

GENERAL SPECIFICATIONS

- 1) Display mode: LCD displaying.
- 2) Max. indication: 3999 (3 3/4) , auto polarity indication
- 3) Measuring method: Dual integral A/D conversion
- 4) Sampling rate: Approx. 3times/second
- 5) Over range indication: “OL” displays
- 6) Low battery: The “” displays.
- 7) Operating environment: (0 ~ 40) °C, humidity<75%RH.
- 8) Storage environment:-20°C~60°C, humidity<85%RH
- 9) Power: Four 1.5V AAA batteries, LR03
- 10) Dimension: 186mm×92mm ×52mm.
- 11) Weight: approx 395g (include four 1.5V batteries).

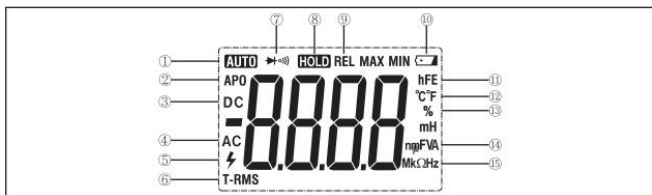
VI. EXTERNAL STRUCTURE

1. Sound alarm indicator light
2. LCD display
3. Function / range knob
4. Measuring input terminal



5. Function selection button
6. Auto / manual range conversion
7. Relative value measurement/ torch control
8. Data hold / backlight control
9. NCV induction position
10. Torch window
11. Hang hole
12. Screws for fixing the battery box
13. Bracket
14. Test leads holder

VII. LCD DISPLAY



1	Auto range	2	Auto power off
3	DC measurement	4	AC measurement
5	High voltage	6	True RMS
7	Diode/continuity test	8	Data hold
9	Relative value	10	Low battery
11	Triode	12	Temperature
13	Duty cycle	14	Current measurement
15	Resistance/ Frequency		

VIII. KEY DESCRIPTION

1.Data hold:

Short press the "HOLD B/L" button to hold the measuring data on the LCD, and the symbol "HOLD" appears. If you press the key again, the data hold function will be closed and the symbol will disappear.



Warning: to prevent possible electric shock, fire or personal injury, do not use the data hold function to measure the unknown voltage. When open the HOLD function, the LCD will keep original data when measuring a different voltage.

2.Backlight function:

Long press the "HOLD B/L" button to turn on the back light of the LCD, and long press this key again to turn off the back light.

3. Function select key (Hz/DUTY SELECT key)

At the DC/AC mV、 μ A、mA、A range, short press the "Hz/DUTY SELECT" key to convert among DCV, ACV, and DCA, ACA for testing; At the diode/continuity test range, short press the "Hz/DUTY SELECT" key to convert the diode and continuity test, the diode range is already set by default. At the ACV range, short press the "Hz/DUTY SELECT" key to cycle switch among the voltage, accompanying frequency, duty cycle. At the temperature range, short press the "Hz/DUTY SELECT" key to convert the Celsius and Fahrenheit; At the Frequency range, short press the "Hz/DUTY SELECT" key to convert the Frequency and duty cycle test.

4. Auto / manual range conversion


The auto range is already set by default after the meter is turned on, short press the "RANGE" key, the meter convert to

manual range, the “AUTO” symbol on the LCD will disappear. At the manual range mode, the meter starts from the low range, when you press the "RANGE" key, the range change to a higher one, the procedure repeats like this in sequence; long press "RANGE" key to exit the manual range mode, and the LCD displays "AUTO" symbol.

5. Relative measurement

At the DC/AC mV、V、uA、mA、A range, capacitance, temperature range, short press the "REL" key to enter the relative measurement mode, and the “REL” symbol appears on the LCD. Short press the “REL” key again, the meter exit the relative measurement mode, and the “REL” symbol disappears.



6. Torch

Long press "REL/  " to turn on/off the torch.


7. Cancel the auto power off function

Press the “Hz/DUTY SELECT” key to turn on the meter, the “APO” symbol disappears, and then the auto power off function closed.

IX. MEASUREMENT INSTRUCTIONS

First of all, please check the battery, and turn the knob to the proper range that you need. If the battery is out of power, the "  " symbol will appear on the LCD. Pay attention to the  symbol next to the jack for test leads. This is a warning that the voltage and current should not exceed the indicated value.

1. DCV and ACV measurement

- 1-1. Set the knob to the mV/ACV/DCV range, and connect the test leads across to the circuit under test. The voltage and polarity of the point which the red test lead is connected are display on the LCD.
- 1-2. Insert the black test lead to "COM" jack, the red one to  jack.
- 1-3. The auto range is already set by default after the meter is turned on, LCD displays "AUTO" symbol, press the "RANGE" key to convert to manual range, the range 40mV,400mV (only for DC mV/AC mV range), 4V, 40V, 400V, 1000V/750V (DCV/ACV) are optional.

1-4. You can get the result from LCD.

1-5. At the DC mV/AC mV range, short press the “Hz/DUTY SELECT” key to convert DC/AC mV measurement. The DC mV range is already set by default after the meter is turn on.

Note:

- (1) Do not input a voltage over DC 1000V or AC 750V , otherwise the circuit might be damaged. At the DC/AC mV range, the input voltage should not exceed 250VDC/ AC RMS.
- (2) Please keep the test leads away from the circuit after finished your testing.
- (3) When measured voltage is higher than 220V, it's necessary to wear personal protective equipment (such as approved rubber gloves, face masks, and flame-retardant clothing etc.) to prevent the injury from electric shock and arc.

2. DCA and ACA measurement

2-1. Set the knob to a proper DCA/ACA range, and then

connect the test leads to the power or circuit under test in series. The polarity and the current value of this point which connects to the red test lead will display on the LCD.

2-2. Insert the black test lead to “COM” jack, the red one to $\frac{\text{mA}}{\mu\text{A}}$ ” (max. 400mA) or “10A” (max. 10A) jack.

2-3. You can get the result from display.


2-4. Short press the “Hz/DUTY SELECT” key to convert DCA or ACA, the DCA range is already set by default after the meter is turned on. Short press “RANGE” key to convert to manual range, you can choose 400uA, 4000uA at the uA range, and 40mA, 400mA are optional at the mA range, 4A, 10A are optional at the A range. The auto range is already set by default after the meter is turned on.

Note:

(1) If the tested current range is unsure beforehand, please start from the highest range then find the proper range according to the reading. Do not measure the voltage in the current jack.

- (2) If the reading displays “OL”, the value is beyond the present range. Now you need to set the knob to the higher range.
- (3) Be careful when measuring 10A range. Continuous measurement of high current will heat the circuit, even affect the accuracy and damage the meter.
- (4) When measuring the large current above 10A, it's necessary to wear personal protective equipment (such as approved rubber gloves, face masks, and flame-retardant clothing etc.) to prevent the injury from electric shock and arc.

3. Resistance measurement

- 3-1. Set the knob to resistance range, then connecting the test leads to the tested resistance.
- 3-2. Insert the black test lead to “COM” jack, the red one to “” jack.
- 3-3. You can read the measurement results from the display.
- 3-4. Auto range method is already set by default after the meter turned on, short press “RANGE” key to convert to

the manual range, The range 400Ω , $4K\Omega$, $40K\Omega$, $400K\Omega$, $4M\Omega$, $40M\Omega$ are optional.

Note:

- (1) If "OL" displays on LCD, it means over range, now you need to set the range knob to the higher range. When measuring resistance is more than $1M\Omega$, the reading may take a few seconds to stabilize. This is normal for high resistance measurement.
- (2) When the input terminal is under open circuit, the figure "OL" will be displayed for the overload condition.
- (3) When checking in-circuit resistance, be sure the power has been switched off and all capacitors are fully discharged.

4. Capacitance measurement

4-1. Set the range knob to a proper capacitance range, connect the test leads to the capacitor under tested (the polarity of red test lead is "+").

4-2. Insert the red test lead to "VΩHz" jack and the black one to "COM" jack.

4-3. You can get the result from LCD.

Note:

- (1) If the LCD displays "OL", it indicates the value is over range. The maximal range is 100mF.
- (2) When measuring capacitance, due to the effect of lead wire and the distributed capacitance, there may be some residual reading without connection to capacitance under measured. It will be clearer when measuring small capacitance range. Measuring result is to subtract the residual reading for getting accurate reading. This will not affect the measuring accuracy. You can short press the "REL" key to clear the residual reading of open-circuit, then measuring the relative value.
- (3) When under a large capacitance range, if capacitor is broken or leakage, the LCD will display some value and it's unstable.
- (4) Discharge all the capacitance completely before measuring to avoid the damage of the meter.
- (5) UNIT: $1\text{mF}=1000\text{uF}$ $1\text{uF}=1000\text{nF}$ $1\text{nF}=1000\text{pF}$

5. TRANSISTOR hFE

5-1. Set the knob to “hFE” range.

5-2. Insert the adapter to “ $\frac{V\Omega Hz}{\text{°C/°F-IT}}$ ” and “COM” jack, then according to the NPN or PNP, insert emitter, base and collector to proper jack.

5-3. You can get the result from LCD.

6. Diode and continuity test

6-1. Set the range knob to the “ $\rightarrow \text{D}$ ” range. The diode range is already set by default after the meter is turned on, short press the “Hz/DUTY SELECT” key to convert the diode and continuity test. Set the black test lead to “COM” jack, and the red one to “ $\frac{V\Omega Hz}{\text{°C/°F-IT}}$ ” jack (the polarity of red test lead is “+”), meanwhile connect the red test lead to the positive of the diode and the black one to the negative. The reading is the approx value of the diode positive volt drop. If the test leads connect to the reverse polarity of diode, the LCD will display “OL”.

6-2. Connect the test leads to two ends of the circuit under tested, if the resistance is lower than approx. $(50 \pm 20) \Omega$, the LCD displays “ $\rightarrow \text{D}$ ” symbol, and the buzzer sounds.

7. Frequency measurement

7-1. Turn the knob to frequency range, and connect the test leads or shielded cable across the signal source or the load under tested.

7-2. Insert the black test lead to the "COM" jack and the red one to the " $\frac{V}{\Omega}$ Hz
C/F-IT
hFE" jack.

7-3. You can get the result from the LCD.

7-4. Short press the "Hz/DHTY SELECT" key to convert to duty cycle.

Note:

- (1) When it is over 10V RMS, you can get the result, but we cannot promise the accuracy.
- (2) It is preferable to use shielded cable for measuring small signal in noisy environment.
- (3) Be careful when measuring high voltage
- (4) Do not input a voltage over DC 250V or AC peak value to avoid damage to the meter.
- (5) It is auto range at the frequency range, you can test 10Hz

~20MHz.

8. Temperature measurement

When measuring temperature, insert the negative of the thermocouple sensor into the "COM" jack, and insert the positive into the "VΩHz
C/F-H
hFE" jack; put the sensing part of the temperature probe on or inside the tested object. Read the value from the LCD which shows as Celsius. Short press the "Hz/DHTY SELECT" key can convert the Celsius or Fahrenheit unit.

9. Non-contact voltage induction measurement NCV

9-1. Turn the knob to "NCV" range.

9-2. NCV induction voltage range is 48V~220V, let the upper position of the meter close to the measured electric AC power line, when the ACV is sensed, the upper red indicator lights of the meter flashing and at the same time a buzzer alarm on, the more close to the AC power line, the more stronger the ACV sensed, the corresponding flashing lights, and the buzzer alarm sounds faster.

10. Automatic power on/off

In order to save power consumption and prolong battery life, the APO automatic shutdown function will be turned on by default after the meter is turned on. If the user does not operate the meter within 14 minutes, the meter will be prompted with 3 sounds. If there is still no operation, the meter will automatically turn off the power after a long sound one minute later. Short press “SELLECT” can turn on the multimeter. To cancel APO function, please refer to the instructions in section 8, "key function".

X. Technical characteristics

Accuracy: $\pm (a\% \times \text{reading} + \text{digit})$

Environment temperature: $(23 \pm 5) ^\circ\text{C}$

Relative humidity: $<75\% \text{RH}$.

One year guarantee since production date.

10-1. DC Voltage

Range	Accuracy	Resolution	Input impedance	Overload protection
4V	$\pm (0.5\% + 4)$	1mV	About 10M Ω	1000V DC / AC RMS
40V		10mV		
400V		100mV		

1000V	$\pm(1.0\%+6)$	1V		
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10-2. DC mV

Range	Accuracy	Resolution	Input impedance	Overload protection
40mV	$\pm(0.5\%+5)$	0.01mV	>40M Ω	250VDC / AC RMS
400mV		0.1mV		

10-3. AC mV (True RMS)

Range	Accuracy	Resolution	Input impedance	Overload protection
40mV	$\pm(1.0\%+6)$	0.01mV	About 10M Ω	250V DC / AC RMS
400mV		0.1mV		

10-4. ACV (True RMS)

Range	Accuracy	Resolution	Input impedance	Overload protection
4V	$\pm(0.8\%+10)$	1mV	About 10M Ω	1000V DC / 750AC RMS
40V		10mV		
400V		100mV		
750V	$\pm(1.2\%+10)$	1V		

Accuracy measurement range: 10%-100% of the range;

Frequency response: 40Hz-1 kHz;

Measurement mode (sine wave): true RMS;

Crest factor: $CF \leq 3$, adding an additional error of 1% to the

reading at $CF \geq 2$.

AC frequency measurement error: $0.2\%+0.02\text{Hz}$;

AC frequency measurement range: $40\text{Hz}\sim 1\text{k Hz}$;

AC frequency input sensitivity: $80\text{V}\sim 600\text{V}$

10-5. DCA

Range	Accuracy	Resolution	Load voltage	Overload protection
400uA	$\pm(1.0\%+10)$	0.1uA	0.1mV/ mA	FUSE 400mA/250V
4000uA		1uA	0.1mV/ mA	
40mA	$\pm(1.2\%+8)$	10uA	1.552mV/ mA	
400mA		100uA	1.637mV / mA	
4A	$\pm(1.2\%+10)$	1mA	31.789mV/ A	FUSE 10A/250V
10A		10mA	31.789mV/ A	

10A (test within 10 seconds); Recovery time is 15 minutes.

10-6. ACA (True RMS)

Range	Accuracy	Resolution	Load voltage	Overload protection
400uA	$\pm(1.5\%+10)$	0.1uA	0.1mV/ mA	FUSE 400mA/250V
4000uA		1uA	0.1mV/ mA	
40mA		10uA	1.552mV/ mA	
400mA		100uA	1.637mV / mA	
4A	$\pm(2.0\%+5)$	1mA	31.789mV/ A	FUSE 10A/250V
10A		10mA	31.789mV/ A	

Δ Measuring range of accuracy value: 10% - 100% of the range;

Frequency response: 40Hz - 1k Hz

Measuring way (sine wave): True RMS

Crest factor: $CF \leq 3$, when $CF \geq 2$, add an additional error of 1% of the reading

10A (The measurement should not be more than 10 seconds);

Recovery time is 15 minutes.

10-7. Resistance

Range	Accuracy	Resolution	Short-circuit current	Open-circuit voltage
400 Ω	$\pm(0.8\%+5)$	0.1 Ω	About 0.4mA	About 1V
4k Ω	$\pm(0.8\%+4)$	1 Ω	About 100uA	
40k Ω		10 Ω	About 10uA	
400k Ω		100 Ω	About 1uA	
4M Ω		1k Ω	About 0.2uA	
40M Ω	$\pm(1.2\%+10)$	10k Ω	About 0.2uA	About 0.5V

Measuring error does not include lead resistance

Overload protection: 250VDC/AC RMS

10-8. Capacitance

Range	Accuracy	Resolution	Overload protection
6nF	$\pm(5.0\%+40)$	0.001nF	250VDC/AC RMS

60nF	$\pm(3.5\%+20)$	0.01nF	
600nF		0.1nF	
6uF		0.001uF	
60uF		0.01uF	
600uF		0.1uF	
6mF	$\pm(5.0\%+10)$	0.001mF	
60mF	$\pm 10\%$	0.01mF	
100mF		0.1mF	

⚠ Measuring range of accuracy: 10% - 100% of the range

Large capacitance response time: $\geq 1\mu\text{F}$ about 8s

Measurement error does not include lead distribution capacitance


10-9. Frequency

Range	Accuracy	Resolution	Overload protection
10Hz	$\pm(0.5\%+10)$	0.01Hz	250VDC/AC RMS
100Hz		0.1Hz	
1kHz		1Hz	
10kHz		10Hz	
100kHz		100Hz	
1MHz		1kHz	
20MHz		10kHz	

⚠ Note: The reading will be zero if the signal is below 3Hz.

Input sensitivity: 1V

10-10. Diode and continuity Test


Range	Displaying value	Test Condition	Error
	Positive voltage drop of diode	The positive DC Current is approx 0.4mA. Negative voltage is approx 1.5V.	5%
	Buzzer sounds , the resistance is less than $50\pm 20\Omega$	Open circuit voltage: 0.4V	

Warning: Do not input voltage at this range.

Overload protection: 250V DC/AC RMS

10-11. Temperature

Range	Accuracy	Resolution	Overload protection
$(-20-1000)^{\circ}\text{C}$	$<400^{\circ}\text{C} \pm(1.0\%+5)$ $<400^{\circ}\text{C} \pm(1.5\%+15)$	1°C	250V DC/AC RMS
$(-4\sim 1832)^{\circ}\text{F}$	$<752^{\circ}\text{F} \pm(1.0\%+5)$ $\geq 752^{\circ}\text{F} \pm(1.5\%+15)$	1°F	

 Sensor: Type-K thermocouple (Ni-Cr – Ni-Si) banana probe

10-12. Transistor hFE DATA TEST


Range	Displaying range	Test condition
hFE NPN or PNP	0 ~ 1000	Basic current is approx. $10\mu\text{A}$, V_{ce} is about 1.5V

XI. Replace the battery or fuse

1. Move away the test leads from the circuit under test, pull out the test lead from the input jack, turn the range knob to the "OFF" range to turn off the power.
2. Use a screwdriver to twist off the screws on the battery cover, and remove the battery cover and bracket.
3. Take out the old battery or the broken fuse, then replace with a new alkaline battery 9V or a new fuse.
4. Close the battery cover and use a screwdriver to tighten the screws on the battery cover.
5. Battery specifications: 4 * 1.5V AAA alkaline batteries
6. Fuse specifications:

mA input fuse "FS1": $\varnothing 5 * 20\text{mm}$ 400mA 250V

10A input fuse "FS2": $\varnothing 5 * 20\text{mm}$ 10A 250V

Note: When the low voltage "" symbol displays on the LCD, the battery should be replaced immediately, otherwise the measuring accuracy will be affected.


XII. MAINTENANCE AND CARE

It is an accurate meter. Do not try to modify the electric circuit.

1. Pay attention to the waterproof, dustproof and break proof of the meter;
2. Please do not store or use it in environment of high temperature, high humidity, high flammability or strong magnetic.
3. Please wipe the meter with a damp cloth and soft detergent, and abrasive and drastic solvent such as alcohol are forbidden.
4. If do not operate for a long time, should take out the battery to avoid leakage.
5. When replacing fuse, please use another same type and specification fuse.

13. Trouble Shooting

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

Fault	Solution
No reading on LCD	●Power off--- Pls turn on the power
	●Holding key-- Pls set a correct mode
	●Replace battery
The signal  appears	●Replace battery
No current or temperature input	●Replace fuse
Error Value	●Replace battery

This user's manual is subject to any change without further notice.

The content in this user's manual is deemed correct; if you find any mistake, omission, etc, please contact the manufacturer.

We will not be held liable for any accidents or harms caused due to your wrong operations.

The functions set forth in this user's manual shall not be regarded as reasons for applying this product for special purposes.