

# DIGITAL MULTIMETER OPERATION MANUAL

## 1. GENERAL

The instrument is a stable and good performance digital multimeter driven by battery. It uses the LCD with 42mm-high figure to make the reading clear, and make the operation more convenient.

The instrument has the function of measuring DCV, ACV, DCA, ACA, resistance, capacitance, frequency, inductance, diode, triode and continuity test, temperature and automatic power on and off, backlight and torch. The instrument takes dual-integral A/D converter as key point, it is an excellent tool.

## 2. OPEN PACKING 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
Battery case	1pc

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

## 3. SAFETY NOTES

This series meter meets the standard of IEC61010 (the safety standards request issued by IEC or equal GB4793.1 standards). Please read below notes carefully before operation.

- 3-1. Input of limit values beyond range is prohibited.
- 3-2. The voltage which is less than 36V is a safety voltage. When measuring voltage higher than DC 36V, AC 25V, check the connection and insulation of test leads to avoid electric shock.
- 3-3. Be sure to keep the test leads off the testing point when converting function and range.
- 3-4. Select correct function and range to avoid fault operation.
- 3-5. When the battery is not installed and the back cover is not tightened, please do not use this table for testing;
- 3-6. When you measuring resistance, capacitor, diode, temperature and on-off test, do not input voltage signal;
- 3-7. Before replacing the battery or fuse, remove the test leads from the test point and turn off the power switch;
- 3-8. 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.
- 3-9. Make measurements using only the correct measurement standard class (CAT), voltage and current rated probe, test conductor and adapter.
- 3-10. Safety symbols  
 "⚠" exists high voltage, "GND" ground, "□" dual insulation, "⚠" must refer to manual.  
 "🔋" low battery

## 4. ELECTRIC SYMBOL

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

## 5. GENERAL SPECIFICATION

- 5-1 Displaying: LCD displaying
- 5-2 Max. indication: 1999 (3 1/2), auto polarity indication
- 5-3 Measuring method: dual slope A/D transfer
- 5-4 Key calibration technology
- 5-5 Sampling rate: approx. 3 times/sec
- 5-6 Over range indication: MSD displays "OL"
- 5-7 Low battery indication: "🔋" symbol displays
- 5-8 Operation: 0~40°C, relative humidity <75%
- 5-9 Storage environment: -20°C~60°C, relative humidity <85%RH;
- 5-10 Power: Four 1.5V AAA battery LR03
- 5-11 Size: 186×92×52 mm
- 5-12 Weight: approx.395g (including 1.5V batteries)

## 6. Appearance structure (Figure 1)

- 6-1. Sound alarm indicator light
- 6-2. LCD display
- 6-3. Function/gear switch
- 6-4. measurement input terminal
- 6-5. Power button
- 6-6. Triode test terminal
- 6-7. Hold/function selection/backlight/Torch
- 6-8. Relative value measurement/maximum and minimum value measurement
- 6-9. Torch
- 6-10. Hang hole
- 6-11. Battery compartment setting screw
- 6-12. Bracket
- 6-13. Testleads holder

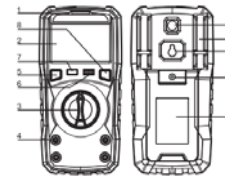
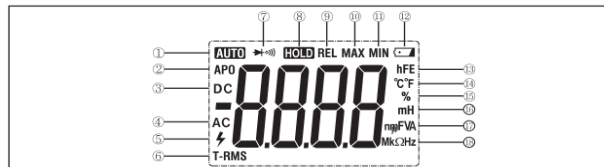


Figure 1

## 7. Display screen



(1)	Automatic 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 measurement	(10)	Maximum value measurement
(11)	Minimum value measurement	(12)	Low battery
(13)	Triode	(14)	Temperature
(15)	Duty cycle	(16)	Inductance
(17)	Current	(18)	Resistance / Frequency

## 8. Key function

- 8-1. Power on/off function  
Press/press up the "POWER APO" button to turn on/off the POWER of the product.
- 8-2. Data hold  
Short press the "HOLD B/L SELECT" button to keep the current measured value displayed on the LCD of the meter, and display "HOLD" character. Press the key again to exit the data hold function, and the "HOLD" character disappears; except frequency, diode and buzzer, and temperature measurement.
- 8-3. Function conversion  
Short press the "Hold B/L Select" key at the temperature range to convert °C to °F. Press "HOLD B/L SELECT" at the buzzer/diode range to switch continuity test and diode test. Press "HOLD B/L SELECT" key at the frequency range to achieve frequency and duty cycle test conversion.  
**⚠⚠Warning: In order to avoid possible electric shock and fire injury, do not use the HOLD function to measure unknown potential. After the HOLD function is turned on, the display screen will not change when different potential is measured.**

- 8-4. Backlight and torch function on/off  
Long press the "HOLD B/L SELECT/🔦" backlight and torch open at the same time, and long press again to turn off the backlight and torch.
- 8-5. Cancel automatic power off (APO) function:  
Press and hold the "REL/MAX/MIN" button to turn on the power switch, the "APO" symbol on the screen will disappear, and the meter will cancel the automatic power off function.
- 8-6. Relative value measurement/maximum and minimum value measurement:  
Relative value measurement: press "REL/MAX/MIN" button at ACV, DCV, ACA, DCA and capacitance range, the meter enters relative value measurement mode and "REL" character appears on the screen.  
Maximum and minimum measurement: Long press the "REL/MAX/MIN" key for 2 seconds, the meter will enter the maximum and minimum measurement mode. At this time, the character "MAX" will appear on the LCD screen, that is the maximum measurement; Short press the "REL/MAX/MIN" key again and "MIN" character will appear on the LCD screen, that is the minimum value measurement. Long press the "REL/MAX/MIN" key for 2 seconds to exit the maximum and minimum measurement mode, and at the same time, the "MAX" or "MIN" characters on the LCD screen disappear.

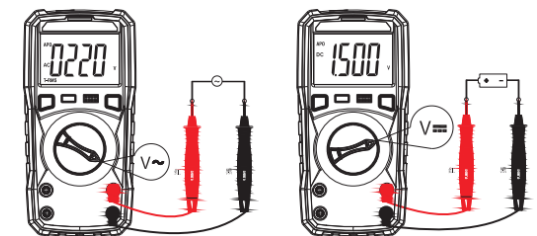
## 9. Operation instruction

First of all, please pay attention to check the battery, and place the knob in the position required to measure. If the power is low, the "🔋" symbol will appear on the LCD display. Note the symbol "⚠" next to the test leads socket, which warns you to pay attention to the test voltage and current, do not exceed the indicated value.

### (1) AC/DC voltage measurement (Figure 2)

- 1-1. Turn the knob to the corresponding ACV/DCV gear. If the measured voltage is unknown, a larger range should be selected, and then gradually reduce until the reading with the highest resolution is obtained.
- 1-2. Insert the red test lead into the "VΩHz" jack and the black test lead into the "COM" jack.

Figure 2



1-3. Connect the test leads to the testing point reliably, the screen will display the measured voltage value; when measuring DCV, the voltage and polarity of the point connected by the red test lead will show on the LCD.

**NOTE:**

- (1). If it shows "OL" on the LCD, it means the value is beyond the present range. Now you need to set the knob to a higher range.
- (2).When measuring high voltage (above 220V), it's necessary to wear the personal protective equipment (approved rubber gloves, masks and flame-retardant clothes, etc.) to prevent the electric shock and arc damaged by the dangerous electric conductor exposes.
- (3).The input voltage must not exceed DC1000V or AC750V, or it may damage the circuit of the meter.
- (4). Disconnect the test leads and the circuit under tested after all measurement operations are completed.

**(2). AC/DC current measurement (Figure 3)**

2-1. Turn the knob to the corresponding ACA/DCA gear position, and connect the test leads to the power supply or circuit under tested in series. The measured current value and the current polarity of the red test lead will be displayed on the screen at the same time.

2-2. Insert the red test lead into the "mA" or "20A" jack (Max. 200mA) or 20A jack (Max. 20A), and the black test lead into the "COM" jack.

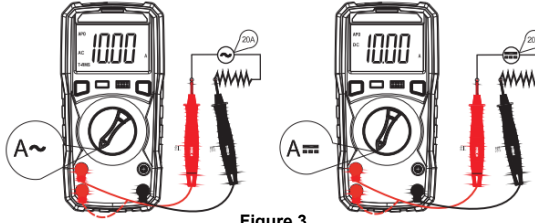


Figure 3

**NOTE:**

- (1).Before the meter connected with the tested circuit in series, you should turn off the power of the circuit.
- (2).If the range is unsure beforehand, please set it on the max range. Then choose the proper range according to the reading, if the reading is "OL", the value is beyond the present range. Now you need to set the knob to a higher range.
- (3).Max. input current is 200mA or 20A (subject to where the red test lead apply to), too large current will blow the fuses of mA or  $\mu$ A range. Be sure the test is less than 10 seconds when testing 20A current. Too large current will heat the circuit.
- (4).When measuring large current (above 10A), personal protective equipment (approved rubber gloves, masks and flame retardant clothing, etc.) should be wore to prevent electric shock and arc injury when dangerous electric conduct or is exposed.
- (5).Please keep the test leads away from the circuit after finished your test.
- (6).Do not input more than DC 36V, AC 25V to the current jack and "COM" jack.

**(3). RESISTANCE MEASUREMENT (Figure 4)**

3-1. Set the knob to a proper resistance range, and then connect the test leads across the resistance to be tested.

3-2. Input the black test lead to "COM" terminal and the red one to "VΩHz" terminal.

**NOTE:**

- (1). The LCD displays "OL" while the resistance is under an open circuit or over range. The knob should be adjusted to a proper range. When measuring value is

over 1MΩ, the reading will take a few seconds to be stable. It's normal for high resistance measuring.

- (2). When test low resistance, test leads will bring internal resistance, in order to get a accurate readings, you can mark the short circuit value of the test leads, then subtract it from the value of the low resistance.
- (3). When measuring an on line resistance, be sure that the power is off and all capacitors are released completely.
- (4). Do not input any voltage at resistance range.

**(4).CAPACITANCE MEASUREMENT (Figure 5)**

4-1. Switch to a proper capacitance range, connect the test leads to the two side of the tested capacitor. (Red test lead is "+")

4-2. Input the black test lead to "COM" terminal and the red test lead to "VΩHz" terminal.

**NOTE:**

- (1).The LCD displays "OL" while it is over range. The capacitance range is automatically converted; Maximum measurement: 2mF;
- (2). When measuring the capacitance below 20nF, there may be residual reading on the screen display value, which is the distributed capacitance of the test leads; For accurate reading, before testing you can press "REL" key for relative value measurement; (below 20nF only)
- (3), when measuring serious leakage or breakdown of capacitance at large capacitance range, some values will be displayed and unstable; For large capacitance measurements, the reading takes a few seconds to stabilize, which is normal for large capacitance measurements; .
- (4). Please discharge the capacitor sufficiently before testing the capacity of the capacitor to prevent damage to the meter.
- (5). Unit: 1mF = 1000uF 1uF = 1000nF 1nF = 1000pF

**(5). TRANSISTOR hFE**

5-1. Set the knob to "hFE" range.

5-2. Verify the transistor under tested is NPN or PNP, insert emitter, base and collector to proper jack.

**(6). DIODE AND CONTINUITY TEST (Figure 6)**

6-1. Input the black test lead to "COM" terminal and the red one to "VΩHz" terminal (the polarity of red lead is "+") .

6-2. Turn the knob to "diode" range, it is default buzzer range when you turn on the power of the meter, press SELECT key to convert to diode range, connect the test leads to the diode under tested, and the reading is the approx. value of diode forward voltage drop. For silicon PN junctions, about 500mV to 800mV is confirmed to be normal. If the tested diode is under open circuit diode or mistake the polarity, it will show "OL" on the LCD.

6-3. Press the SELECT key to convert to buzzer range, connect the test leads to two points of the tested circuit, if the buzzer sounds and the continuity alarm light on, the

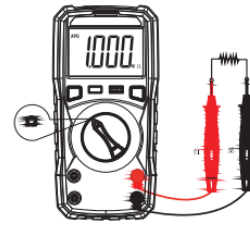


Figure 4

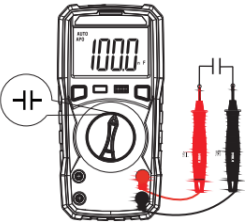


Figure 5

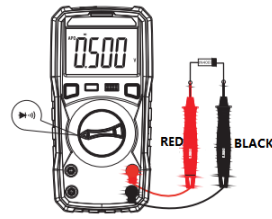


Figure 6

resistance is less than (50 ± 20) Ω.

**NOTE: Do not input voltage at this "diode/continuity" function.**

**(7).FREQUENCY MEASUREMENT (Figure 7)**

7-1.Set the knob to frequency range, connect test leads or shield cable across to the signal source or the load to be tested.

7-2.Input the test leads or shield cable to "COM" and "VΩHz" terminal.

**NOTE:**

- (1).When input over 10V RMS, reading is workable but accuracy is not guaranteed.
- (2).It is better to use shield cable to measure small signal at noisy environment.
- (3).When measuring high voltage (above 220V), personal protective equipment (approved rubber gloves, masks and flame retardant clothing, etc.) should be wore to prevent electric shock and arc injury caused by exposure of dangerous electric conductor.
- (4).Do not input more than 250V DC or AC peak voltage, to avoid the damage of the instrument.
- (5).This frequency range is an automatic range test, which can be measured from 10Hz to 20MHz.
- (6). Short press "SEL ECT" key can be converted to the duty cycle test.

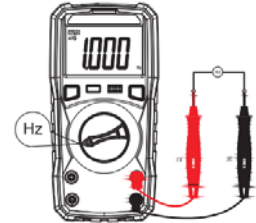


Figure 7

**(8).INDUCTANCE MEASUREMENT**

8-1. Input the black test lead to "COM" terminal and the red test lead to "mA" terminal.

8-2. Set the knob to "mH" or "H" range, then connect the test leads to the inductance which is to be tested.

8-3.If it shows "OL" on the LCD or the inductance range is unsure beforehand, you need to set the knob to a higher range

**NOTE:**

- (1).The LCD displays "OL" while no any inductance input.
- (2).Range "mH" is auto convert range of 2mH/20mH/200mH, and range "H" is the auto range of 2H/20H.
- (3).Do not input voltage at this range.
- (4).Inductance measurement below 0.2mH is for reference only.

**(9).Temperature measurement (Figure 8)**

To measure the temperature, insert the negative pole of the thermocouple sensor into the "COM" socket and the positive pole insert the "VΩHz" socket, the thermocouple working end (measuring temperature end) is placed above or inside the object to be measured, can read the temperature value directly from the screen, the reading is Celsius. Press the "Hold B/L Select" key can convert degrees Celsius or Fahrenheit.

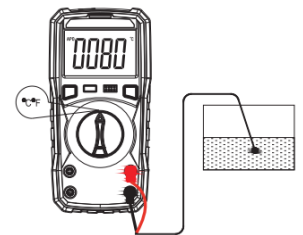


Figure 8

**(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 3sounds. If there is still no operation, the meter will automatically turn off the power after a long sound one minute later. To cancel APO function, please refer to the instructions in section 8, "key function".

### 10. Technical characteristics

Accuracy:  $\pm$  (a%  $\times$  reading + digit), at (23  $\pm$  5) °C, relative humidity < 75%. One year guarantee since production date.

Performance (Note "▲" indicates that the meter has this range; "\*" means the meter does not have this range.)

FUNCTION	INCLUDE OR NOT
DCV	▲
ACV	▲
DCA	▲
ACA	▲
Resistance $\Omega$	▲
Inductance L	▲
Diode / continuity testing	▲
Capacitance C	▲
Temperature °C / °F	▲
Triode hFE	▲
Frequency F	▲
Auto power-off APO	▲
Backlight / Torch	▲

#### (1).DC Voltage

Range	Accuracy	Resolution	Input impedance	Overload protection
200mV	$\pm$ (0.5%+5)	0.1mV	About 10M $\Omega$	250VDC/AC RMS
2V	$\pm$ (0.5%+3)	0.001V		1000V DC / 750V AC RMS
20V		0.01V		
200V		0.1V		
1000V		$\pm$ (1.0%+10)		

#### (2).AC Voltage TRUE RMS MEASUREMENT

Range	Accuracy	Resolution	Input impedance	Overload protection
200mV	$\pm$ (1.0%+5)	0.1mV	About 10M $\Omega$	250VDC/AC RMS
2V	$\pm$ (0.8%+5)	0.001V		1000V DC / 750V AC RMS
20V		0.01V		
200V		0.1V		
750V		$\pm$ (1.2%+10)		

Accurate measurement range: 10%-100% of the range;  
Frequency response: 40Hz-1KHz

Measurement mode (sine wave) : True RMS

Crest factor: CF  $\approx$  3, adding an additional error of 1% to the reading at CF  $\geq$  2.

#### (3).DCA

Range	Accuracy	Resolution	Load voltage	Overload protection
200uA	$\pm$ (1.2%+8)	0.1uA	0.1mV / mA	FUSE 200mA/250V
2mA		0.01mA	2.58mV / mA	
20mA		0.01mA	2.86mV / mA	
200mA		0.1mA	3.74mV / mA	
20A	$\pm$ (2.0%+5)	0.01A	24.8mV / A	FUSE 20A/250V

20A (test within 10 seconds); Recovery time is 15 minutes.

#### (4).ACA

Range	Accuracy	Resolution	Load voltage	Overload protection
200uA	$\pm$ (1.5%+15)	0.1uA	0.1mV / mA	FUSE 200mA/250V
2mA		0.01mA	2.58mV / mA	
20mA		0.01mA	2.86mV / mA	
200mA		0.1mA	3.74mV / mA	
20A	$\pm$ (3.0%+10)	0.01A	24.8mV / A	FUSE 20A/250V

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

Frequency response: 40Hz-1 KHz;

Measurement mode (sine wave): true RMS;

Crest factor: CF  $\approx$  3, adding an additional error of 1% to the reading at CF  $\geq$  2.

20A (test within 10 seconds); Recovery time is 15 minutes.

#### (5)Resistance ( $\Omega$ )

Range	Accuracy	Resolution	Fault current	Overload protection
200 $\Omega$	$\pm$ (0.8%+5)	0.1 $\Omega$	About 0.4mA	250VDC/ AC RMS
2k $\Omega$	$\pm$ (0.8%+3)	0.001k $\Omega$	About 100uA	
20k $\Omega$		0.01k $\Omega$	About 10uA	
200k $\Omega$		0.1k $\Omega$	About 1uA	
2M $\Omega$		0.001M $\Omega$	About 0.2uA	
20M $\Omega$	$\pm$ (1.0%+25)	0.01M $\Omega$	About 0.2uA	
200M $\Omega$	$\pm$ (5.0% + 30)	0.1M $\Omega$	About 0.2uA	

Open circuit voltage: about 1V

The measured error doesn't include lead resistance.

#### (6).Capacitance

Range	Accuracy	Resolution	Over-load protection
20nF	$\pm$ (3.5%+20)	0.01nF	250VDC/ AC RMS
200nF		0.1nF	
2uF		0.001uF	
20uF		0.01uF	
200uF		0.1uF	
2mF		$\pm$ (5.0%+10)	

Accurate measurement range: 10% - 100%.

Large capacitance response time:  $\geq$  1mF About 8s;

The measured error doesn't include lead capacitance

#### (7).Frequency

Range	Accuracy	Resolution	Over-load protection
10Hz	$\pm$ (1.0%+10)	0.01Hz	250VDC/ AC RMS
100Hz		0.1Hz	
1kHz		0.001kHz	
10kHz		0.01kHz	
100kHz		0.1kHz	
1MHz		0.001MHz	
20MHz		0.01MHz	

**NOTE:** For signals below 3Hz, the reading is zero.

Input sensitivity: 1V RMS.

#### (8). Diode and continuity testing

Range	Reading	Condition	Error	Over-load protection
→ $\infty$ )	Forward voltage drop of diode	The test current is approx 0.4mA, the open circuit voltage is approx 3.3V	5%	250VDC/ AC RMS
	Buzzer makes a long sound while resistance is less than 50 $\Omega$ ±20 $\Omega$	The test current is approx 0.4mA.		

Caution: Do not input voltage at this range!

#### (9).Temperature ( °C )

Range	Displaying range	Resolution	Over-load protection
(-20 - 1000)°C	<400°C $\pm$ (1.0%+5) $\geq$ 400°C $\pm$ (1.5%+15)	1°C	600VDC/ AC RMS
(-4 - 1832) °F	<752°F $\pm$ (1.0%+5) $\geq$ 752°F $\pm$ (1.5%+15)	1°F	

Sensor: K type thermocouple (Ni-Cr - Ni-Si) banana plug.

#### (10). Inductance (L)

Range	Accuracy	Resolution	Over-load protection
2mH	$\pm$ (2.5%+30)	0.001mH	36VDC/ AC RMS
20mH		0.01mH	
200mH		0.1mH	
2H	$\pm$ (5%+20)	0.001H	
20H		0.01H	

Do not input voltage at this range.

#### (11).Transistor hFE DATA TEST

Range	Displaying range	Test condition
hFE NPN or PNP	0 ~ 1000 $\beta$	Basic current is approx. 10uA , V <sub>ce</sub> is about 1.5V

#### 11. Replace the battery or fuse (Figure 9)

Refer to Figure 9 and follow these steps:

11-1. Take the test leads away from the circuit under tested, pull out the test leads from the input jack, and short press "POWER APO" to turn off the meter power.

11-2. Take out the screws on the battery door with a screwdriver and remove the battery door and bracket.

11-3. Take out the old battery or bad fuse and replace it with a new 1.5V alkaline battery or new fuse.


11-4. Cover the battery door and install the screws on the battery door with a screwdriver.

11-5. Battery specification: 1.5VX4 AAA LR03

11-6. Fuse Specification:

mA input fuse "FS1":  $\phi$  5x20mm 200mA 250V

20A input fuse "FS2":  $\phi$  5X20mm 20A 250V

Note: when the low-voltage "  " symbol is displayed on the LCD, the built-in battery should be replaced immediately, otherwise the measurement accuracy will be affected.

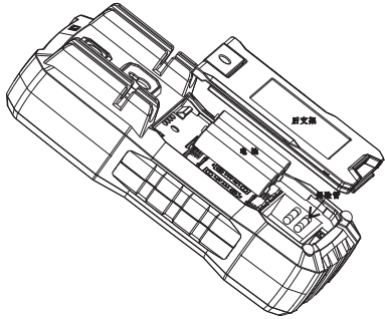


Figure 9

## 12. MAINTENANCE

**Do not try to modify the electric circuit.**

12-1. Keep the meter away from water, dust and shock.

12-2. Do not store and operate the meter under the condition of high temperature, high humidity, combustible, explosive and strong magnetic place.


12-3. Wipe the case with a damp cloth and detergent, do not use abrasives and alcohol.

12-4. If do not operate the meter for a long time, should take out the battery to avoid leakage

12-5. Replace fuse: When replacing fuse, please use another same type and specification fuse.

## 13. Trouble shooting

If your meter is not working properly, the following methods can help you quickly solve the problem. If the fault still cannot be removed, please contact the repair center or dealer.

Fault	Solution
No reading on LCD	<ul style="list-style-type: none"><li>●Power off--- Turn on the power</li><li>●Holding key---Set a correct mode</li><li>●Replace battery</li></ul>
The signal  appears	<ul style="list-style-type: none"><li>●Replace battery</li></ul>
No current input	<ul style="list-style-type: none"><li>●Replace fuse</li></ul>
Big error	<ul style="list-style-type: none"><li>●Replace battery</li></ul>
LCD is dark	<ul style="list-style-type: none"><li>●Replace battery</li></ul>

This manual is subject to change without notice;

The contents of this manual are considered to be correct. If the user finds any errors or omissions, please contact the manufacturer;

The company does not bear the accident and harm caused by the user's wrong operation;

The functions described in this manual are not used as a reason to use the product for a special purpose.