Digital True RMS Multimeter Instruction Manual

1. GENERAL DESCRIPTION

This multimeter with highly stable performance is a reliable 3 6/7 digit digital multimeter. It uses the LCD with 23mm-high figure to make the reading clear and make operation more convenient.

This multimeter can test DCV, ACV, VSD, DCA, ACA, resistance, capacitance, frequency, temperature, duty cycle, transistor, diode, and continuity. This meter holds functions including true RMS, analog bar and unit symbol display, data holding, relative value measuring, maximal/minimal value measuring, auto/manual range switching (RANGE), 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 conversion IC as its core which can drive LCD directly. 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 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 When measuring voltage higher than DC 60V or AC 40V, please be careful.

2.4 Select correct function and range to avoid fault operation.

2.5 Please move the test leads away from test points when switching the function.

2.6 Please don't input voltage in current terminal.

2.7 Please don't modify the circuit arbitrarily, it may cause safety problem

2.8 Introduction of safety symbol:

"⚠" 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: 6000 (3 6/7) digits, automatic polarity, unit symbol and 61 section analog display；

3.1.3 Measurement method: double integral A/D conversion;；

3.1.4 Sampling rate: approx.3 times/sec.

3.1.5 Over-range display: "OL" displayed in the highest digit.

3.1.6 Low battery display："🔋"

3.1.7 Working environment: (0～40) ℃, relative humidity: <80%

3.1.8 Store condition: (-10～40) ℃, relative humidity: <80%

3.1.9 Battery：1 piece 9V battery（6F22）;

3.1.10 Dimension: 185×93×35mm (length*width*height);

3.1.11 Weight: approx..290g（(including battery);

3.1.12 Accessories: test leads, user manual, temperature probe, crocodile clip, gift box, and 1*9V battery.

3.2 Technical Features

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

3.2.2 DC voltage (DCV)

Range	Accuracy	Resolution
600mV	±(1.0%+5)	0.1mV
6V	±(0.5%+3)	1mV
60V		10mV
600V		100mV
1000V	±(1.0%+3)	1V

Input impedance: approx. 10MΩ

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

3.2.3 AC voltage (ACV True RMS)

Range	Resolution	Frequency response/ Accuracy	
6V	1mV	50Hz~5kHz：±(1.0%+10)	5kHz~20kHz：±(1.5%+10)
60V	10mV		
600V	100mV	＜200V 50Hz~5kHz & ≥200V 50Hz~1kHz：±(1.0%+10)	
750V	1V	50Hz~1kHz：±(1.0%+10)	

Input impedance: approx. 10MΩ

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

Display: True RMS

3.2.4 Variable Frequency Voltage True RMS（VSD-V True RMS）

Range	Resolution	Frequency response/ Accuracy	
		30Hz~60Hz	60Hz~200Hz
6V	1mV	±(2.0%+10)	±(5.0%+10)
60V	10mV		
600V	100mV	±(3.0%+10)	*
750V	1V		

Input impedance: approx. 10MΩ

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

Display: True RMS

3.2.5 DC Current（DCA）

Range	Accuracy	Resolution
600uA	±(1.0%+3)	0.1μA
6000uA		1μA
60mA		10μA
600mA		100μA
6A	±(2.0%+5)	1mA
20A		10mA

Maximum voltage drop: 300mV for mA and A range.

Maximum input current: 20A for 15 seconds.

Overload protection：0.5A/250V fast action fuse for mA fuse；13A/250V fast action fuse for A input.

3.2.6 AC Current（True RMS）

Range	Accuracy/Frequency response	Resolution
600uA	±(1.2%+20) / (40Hz-5KHz)	0.1μA
6000uA		1μA
40mA		10μA
600mA		100μA
6A	±(1.5%+20) / (40Hz-400Hz)	1mA
20A	±(2.5%+20) / (40Hz-400Hz)	10mA

Maximum voltage drop: 300mV for uA, mA and A range.

Maximum input current: 20A for 15 seconds.

Overload protection: 0.5A/250V fast action fuse, 13A/250V fast action fuse.

Display: True RMS

3.2.7 Resistance (Ω)

Range	Accuracy	Resolution
600Ω	±(0.8%+5)	0.1Ω
6kΩ	±(0.8%+3)	1Ω
60kΩ		10Ω
600kΩ		100Ω
6MΩ		1kΩ
30MΩ	±(1.2%+5)	10kΩ

Open circuit voltage: 600mV

Overload protection: 250V DC/ AC peak

NOTE: At 600 Ω range, connect the test leads to measure the wire resistance, then subtracts it from the real measurement, or press "REL" to clear the wire resistance and read the value directly.

3.2.8 Diode and Continuity Test

Range	Description	Test Condition
→+·)))	Diode forward voltage drop	Forward DC current is approximate 0.5mA, reverse voltage is approximate 1.5V.
	When the resistance under test is less than 30±10Ω, buzzer sounds continuously.	Open circuit voltage is approximate 0.5V

Overload protection: 250V DC or AC peak value

NOTE: Do not input voltage at this range.

3.2.9 Capacitance（C）

Range	Accuracy	Resolution
40nF	±(2.5%+10)	10pF
400nF	±(2.5%+5)	100pF
4μF		1nF
40μF		10nF
400μF	±(5.0%+10)	100nF
2000μF		100nF

Overload protection: 250V DC/ AC peak

3.2.10 Frequency（Hz）

Range	Accuracy	Resolution
10Hz	±(0.5%+4)	0.01Hz
100Hz		0.1Hz
1000Hz		1Hz
10kHz		10Hz
100kHz		100Hz
1MHz		1kHz
30MHz		10kHz

Input sensitivity: 0.7V RMS.

Overload protection: 250V DC/ AC peak

3.2.11 Temperature（℃/℉ ）

Range	Display	Resolution
-40 ~1000 ℃	＜400 ℃ ±(0.8% +4) ≥400℃ ±(1.5% +15)	1 ℃
0F-1832 ℉	＜750 ℉ ±(0.8% +5) ≥750℉ ±(1.5% +15)	℉

Sensor: TP01 (K-type thermocouple)

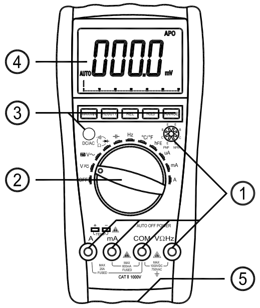
NOTE: Do not input voltage at this range, it may cause damage to the meter.

3.2.12 Transistor triode (hFE)

Measurement	Range	Test Conditions
NPN or PNP	0 ~ 1000	Base current is approximate 15uA, Vce is about 4.5V

4. OPERATION

4.1 Panel Description:



①.Input terminal:

Terminal	Description
A	Input terminal for AC and DC current measurements to Max 20.00 A（15 seconds）, frequency and duty cycle coefficient.
uA/mA	Input terminal for AC and DC microamp and milliamp measurements to 600mA (600mA can last 18 hours), frequency and duty cycle coefficient.
COM	Common terminal for all measurements
VΩHz	Input terminal for voltage, continuity, resistance, diode, capacitance, frequency, and duty cycle coefficient measurements.
hFE	Input terminal for triode measurement.
TEMP	Input terminal for temperature measurement.

②. Rotary switch: used to change the range and choose functions.

Symbol	
V≂	DC voltage measurement. Press DC/AC to shift between DC/AC voltage measurements. Press Hz/DUTY to shift between frequency and duty cycle measurements.
LO V～	Variable frequency voltage measurement. Press Hz/DUTY to shift between frequency and duty cycle measurements.
Ω→+·)))	Ω resistance measurement. Press DC/AC to choose diode test. Press DC/AC again to choose continuity test.
⊣⊢	Capacitance measurement
Hz	Frequency measurement. Press DC/AC to choose diode test. Press DC/AC again to choose continuity test.
℃/℉	Temperature measurement. Press DC/AC to shift between ℃ and ℉.
hFE	Triode magnification measurement
uA≂	DC current measurement (from 0 μA to 6000 μA). Press DC/AC for AC current measurement (from 0 μA to 6000 μA).
mA≂	DC current measurement (from 0 mA to 600 mA). Press DC/AC for AC current measurement (from 0 mA to 600 mA).
A≂	DC current measurement (from 0 A to 20A). Press DC/AC for AC current measurement (from 0 A to 20A).

③Function Button

③-1. 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 RELΔ, 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, analog bar display and auto power off can't be used.

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

③-2. Hz/DUTY

When measuring the Frequency, press Hz/DUTY will shift between frequency and duty cycle (1~99%） measurement. When measuring DC/AC voltage / current，press Hz/DUTY can choose voltage/frequency/duty cycle mode or current /frequency/duty cycle mode.

③-3. RELΔ

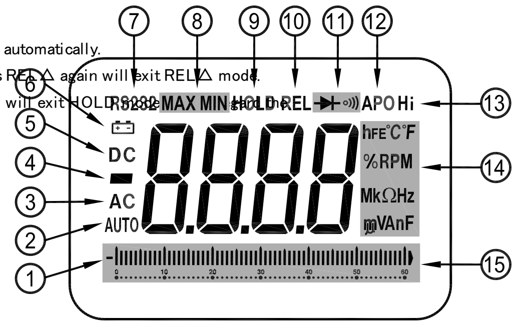
1）Stores the present reading as a reference for subsequent readings. The display is zeroed, and the stored reading is subtracted from all subsequent readings. REL △(readings)-Input value

2) RELΔ function is only available under manual range mode.

3) Press REL △ will enter manual range automatically.

4) Under REL △ mode, press REL △ again will exit REL△ mode.

5) Under HOLD mode, press REL △ will exit HOLD mode and the current measuring value as reference value, and the reference value will be subtracted by subsequent readings automatically.



6) Press RANGE, DC/AC, or switch the rotary will exit the RELΔ mode. (RELΔ symbol will disappear from LCD)

7)OL display：Under RELΔ mode, when input value over limit value, OL will be displayed. Press RELΔ to exit the RELΔ mode. When OL is displayed, meter can't enter the RELΔ mode.

8) Under RELΔ mode，analog bar display is not available.

③-4. HOLD/☀ LIGHT: Data Hold and Backlight

A.HOLD: data hold

1) Press HOLD will enter HOLD mode, the current value will be hold, and symbol HOLD will be displayed. Press HOLD again can exit the HOLD mode.

2) Press RANGE, DC/AC, or switch the rotary will exit the HOLD mode.

B.LIGHT: backlight control

3) Press HOLD more than 2 seconds will turn on the backlight. Press it for another 2 seconds will turn off the backlight. When backlight is on, it will auto off in 10 seconds, unless you press HOLD for more than 2 seconds.

⑧-5.RANGE: Auto or manual ranging.

Auto range is the default when you turn on the meter. Press RANGE it will enter manual range mode. Press RANGE can switch between the ranges available for the selected function. To return to auto ranging, hold the button down for more than 2 seconds.

⑧-6.“DC/AC”:

1) DC/AC function button can choose DC or AC measurement under ≂ mode. Under Ω (Ohm/Diode/Beeper) mode, press DC/AC can choose Ω, or . Under temperature measurement, press DC/AC can choose ℃ or ℉.

2）Keep this button down when turn on the meter, auto power off function will be canceled, the symbol APO will disappear. Under the dormancy mode, press DC/AC will turn on the meter and will activate auto power off function.

3）When there is no measurement in 15 minutes, the meter will auto power off and enter dormancy mode. In one minute before dormancy mode, the buzzer will beep 5 times to remind user. Press any button will exit the dormancy mode.

④. LCD: Display the data and unit symbol.

Number	Feature	Indication
1	-	Negative polarity indicator for the analog bar graph.
2	AUTO	Auto range mode.
3	AC	AC voltage or current measurement.
4	-	Indicates negative readings.
5	DC	DC voltage or current measurement.
6		Low battery indication. Warning: To avoid false readings, which could lead to possible electric shock or personal injury, please replace the battery as soon as the battery indicator appears.
7	RS232	Invalid.
8	MAX/MIN	Indicators for minimum-maximum recording mode.
9	HOLD	Display Hold is active.
10	REL	Relative (REL) mode is active.
11		Diode test mode and the continuity beeper is on.
12	APO	Auto power off mode is on.
13	Hi	Indicator for Hi measurement mode. At Ω range, press DC/AC can choose Max 6000MΩ high resistance measurement. Accuracy is not referable. At Hz range, press DC/AC can choose Max 1000MHz high frequency measurement. Accuracy is not referable. High frequency measurement needs special accessories: a device can divide frequency to 128, or keep the impulse amplitude above 200mV RMS. We don’t provide those special accessories.
14	hFE, ℃, ℉ % RPM MΩ, kΩ, Ω Hz, kHz, MHz mV, V A, μA, mA μF, nF	hFE (Triode magnification measurement) Degrees Celsius, Degrees Fahrenheit Percent (used in duty cycle coefficient measurement) Rotational speed (test RPM needs special accessories: a device which can convert rotate speed to electrical pulse, and the electrical pulse should be above 200mV RMS. We don’t provide these accessories.) Megohm, Kilohm, Ohm Hertz, Kilohertz, Megahertz Millivolts, Volts Amperes (amps), Microamp, Milliamp Microfarad, Nanofarad

⑤. Holster and Battery door.

4.2 DCV measurement

1. Switch the knob to "V≂" range. The default is DCV measurement, press "DC/AC" can choose DC or AC measurement.
2. Insert the black test lead in “COM” terminal and the red one in “V/Ω/Hz” terminal.
3.Auto range is the original states, it will display “AUTO” symbol，press “RANGE” key change to manual range mode，and 600mV, 6V, 60V, 600V, 1000V range is available;
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 built –in buzzer will beep to remind user, when the measuring voltage over DC1000V.

4.3 ACV measurement

1. Switch the knob to “V≂” range, and then press “DC/AC” to choose AC measurement.
2. Insert the black test lead in “COM” terminal and the red one in “V/Ω/Hz” terminal.
3. Auto range is the original states, it will display “AUTO” symbol，press “RANGE” key change to manual range mode，and 6V，60V，600V，750V range is available.
4. Connect the leads to the electric circuit. LCD will display voltage of the two test points.

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 AC 750V. 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 built –in buzzer will beep to remind user, when the measuring voltage over AC750V.

4.4 VSD True RMS voltage measurement

1. Switch the knob to “NCV ～” range.
2. Insert the black test lead in “COM” terminal and the red one in “V/Ω/Hz” terminal.
3. Auto range is the original states, it will display “AUTO” symbol，press “RANGE” key change to manual range mode，and 6V，60V，600V，750V range is available. All the signal will be converted by a wave filter, and voltage with frequency higher than 1kHz will be prevented, and voltage with lower frequency can pass. By this way, it can improve the measurement results of composite wave produced by inverter and variable-frequency motor.
4. Connect the leads to the electric circuit; LCD will display voltage of the two test points.

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 AC 750V. 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 built –in buzzer will beep to remind user, when the measuring voltage over AC750V.

4.5 DCA measurement

1. Switch the knob to “uA≂/mA≂/A≂” range. The default is DCA measurement, press "DC/AC" can choose DC or AC measurement.
2. Insert the black test lead in “COM” terminal and the red one in “uAmA” terminal (Max. 600mA) or to “A” terminal (Max.20A);
3. Connect the leads to the electric 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 600mA or 20A（subject to where the red test lead insert in）, current higher than that will damage the fuse, and may cause damage to the circuit of meter.

4.6 ACA measurement

1. Switch the knob to “uA≂/mA≂/A≂” range. Press "DC/AC" to choose AC measurement.
2. Insert the black test lead in “COM” terminal and the red one in “uAmA” terminal (Max. 600mA) or to “A” terminal (Max. 20A);
3. Connect the leads to the electric 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 600mA or 20A（subject to where the red test lead insert in）, current higher than that will damage the fuse, and may cause damage to the circuit of meter.

4.7 Resistance measurement

1. Switch the knob to “Ω” range, and connect the leads with the resistor under test.
2. Insert the black test lead in “COM” terminal and the red one in “V/Ω/Hz” terminal.;
3. Auto range is the original states, press “RANGE” key change to manual range mode.

4. Before measuring low resistance, you should make the test leads short-circuit at first, and then press “REL”. By this way, you can get the actual value of the resistance.

Note:

1 Firstly users should select the highest range, if the value of resistance is unknown beforehand, and then select the proper range based on displaying value.

2. The LCD displays “OL” when the resistance is over the selected range. The knob should be adjusted to a higher range. When measuring value is over 1MΩ, the reading will take a few seconds to be stable. It’s 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. Do not input any voltage at resistance range.

4.8 Diode and Continuity test:

1. Switch the knob to “Ω” range, and press “DC/AC” key to select diode measurement mode.

2. Insert the black test lead in “COM” terminal and the red one in “V/Ω/Hz” terminal (the polarity of red lead is “+”)

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. 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”.

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.

6. Press “DC/AC” key to select the Continuity measurement mode.

7. Connect test leads to two points of tested circuit, if the resistance is less than (30±10) Ω, the buzzer sounds.

Note:

1. Don’t input voltage at “” range.

2. Make sure the power is off and all capacitors are discharged. Any AC signal will make the buzzer sounds.

4.9 Capacitance measurement

1.Switch the knob to “⊣⊢”range；

2. Insert the black lest lead in “COM” terminal and the red one in “V/Ω/Hz” terminal.；

3. If the LCD doesn’t display “0”, press “REL” to clear the reading;

4. Connect the capacitor to “COM” and “VΩHz” terminal. (Note: the red test leads is for positive pole＋).LCD displays capacitance value.

Note:

1. Don’t input voltage or current to the “VΩHz” terminal when measuring the capacitance or the capacitor still in the “Cx” terminal.

2. In order to assure the accuracy, please press “REL” to clear the reading before testing.

3. There is only the auto range mode under the capacitance range.

4. The capacitor must be completely discharged before testing.

5. The reading of 400uF range will take more than 15 seconds to be stable.

4.10 Frequency measurement

1. Insert the black lest lead in “COM” terminal and the red one in “V/Ω/Hz” terminal.；

2. Switch the knob to “Hz” range，connect the test leads or shielded cable to the signal source or the load which is tested.

3.Press “Hz/DUTY” key to choose frequency/duty cycle measurement，LCD will display the frequency or duty cycle of the tested signal source.

Note：

1. There is only the auto range mode under the frequency range;

2. The meter can still work if the input current is higher than 10V rms, but the accuracy is not guaranteed;

3. In noisy environment, it's better to use shield cable to measure a low signal;

4. When measuring high voltage circuit, do not touch the high voltage circuit;

5. Don’t input voltage higher than 250V DC or AC peak value, or it may damage the meter.

4.11 Temperature measurement

1. Switch the knob to “℃ / ℉” range, and press “DC/AC” key to choose ℃ or ℉ measurement.

2. Insert the cold terminal (free end) of thermocouple in “TEMP”socket，and put the working terminal (temperature measuring end) of thermocouple on the surface or inside the object to be tested. Then you can read temperature from the screen, and the data is in Centigrade.

Note:

1. If insert the thermocouple oppositely, it will display the wrong value. When the temperature is rising, the value will be down.

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

3. Don’t change the temperature probe randomly, or the accuracy will not be guaranteed.

4. Don’t input voltage at temperature range.

4.12 Transistor Test (hFE)

1. Switch the knob to hFE range.

2. Define the transistor is NPN or PNP type, then insert the emitter, base and collector separately in the relative hole.

5. METER MAINTENANCE

The meter is a precise instrument. Random changes to the circuit are not allowed.

Note:

1. Don’t input the voltage value higher than DC 1000V or AC 750V rms.

2. Don’t input voltage at 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 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. Don't expose the meter under high temperature, high humidity, combustible, explosive and strong magnetic place.

7. Wipe the case with a damp cloth and detergent. Do not use abrasives and alcohol to clean the meter.

8. If do not operate for a long time, you should take out the battery to avoid leakage damage.

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

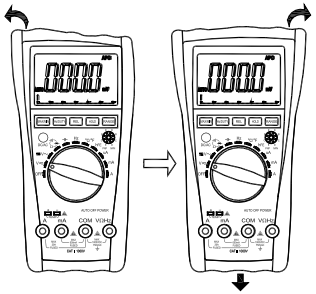
9-1. Follow picture 2, and remove the holster at first.

9-2.Unlock the battery door and remove the cover;

9-3. Replace the old battery with the new one. For longer using life, it's better to use alkaline battery.

9-4. Fix the battery door.

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, then unlock the battery door and remove the cover;

10-2. Take out the fuse and put on a new one.

10-3. Fix the battery door, and put on the holster.

6. TROUBLE SHOOTING

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

(If the problems still cannot be solved, please refer to repairing center or contact the local dealers.)

Fault	Solution
No reading on LCD	■ Turn on the power ■ Replace battery
signal appears	■ Replace battery
No current or temperature input	■ Replace fuse
Error Value	■ 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.

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