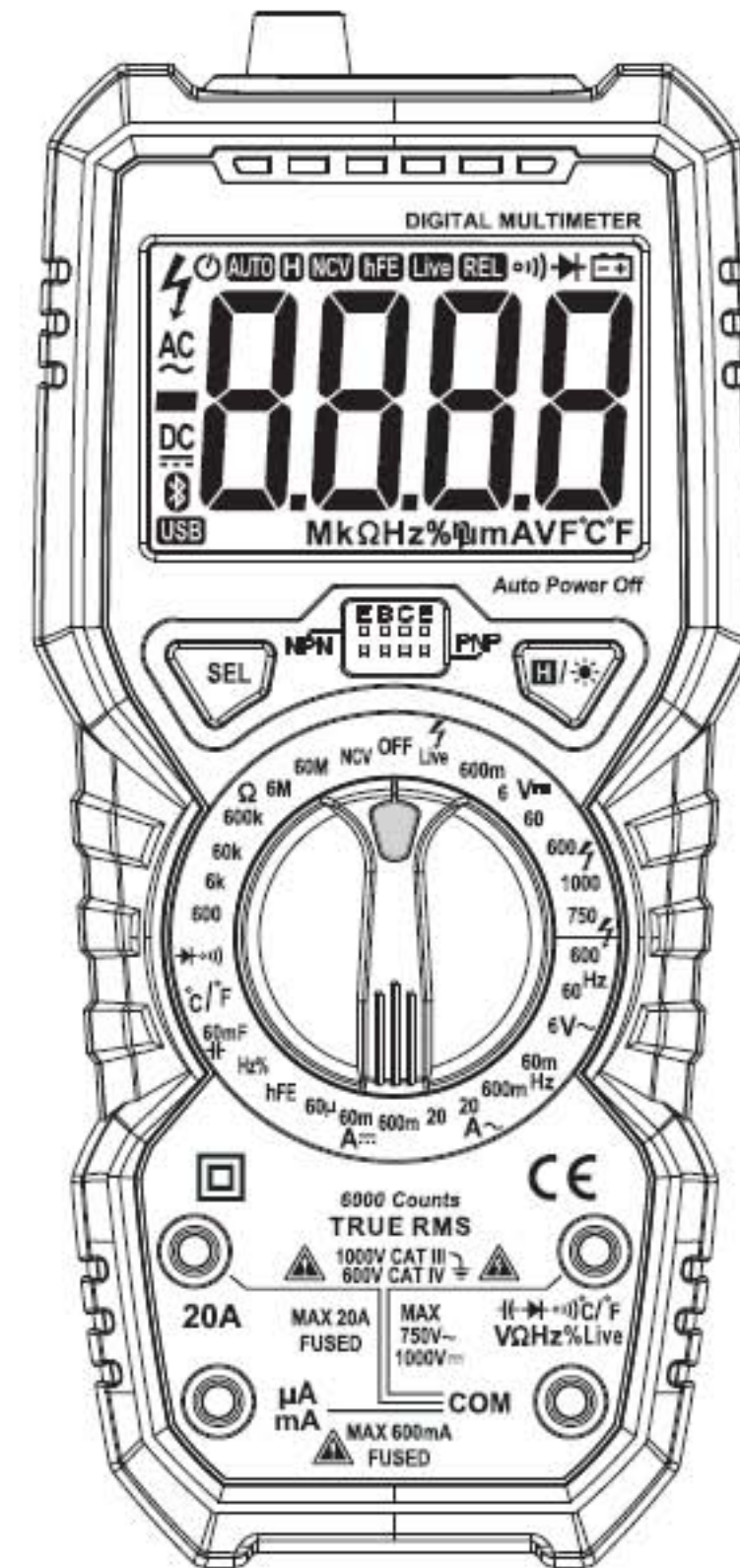


TRUE RMS MULTIMETER



EMC&LVD

Designed and Conforms to
IEC61010-1
CAT.III 1000V



Designed and Conforms to
IEC61010-1
CAT.III 1000V

Y01-04-0131 A0



Before using the instrument, please read this manual carefully, and save it well for future using.

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1. General Information

This digital multimeter is designed and manufactured in accordance with IEC-61010 safety requirements on electronic measuring meters and hand-held digital multimeters.

It is compliant with the requirements on 600V CAT IV 1000V CAT. III and pollution degree 2 as contained in IEC61010. Before using this meter, please read this manual carefully and note the relevant safety guidelines.

1.1 Safety information

1.1.1 Safety instructions

- * When using this meter, operators must comply with all standard safety procedures against the two aspects below:

- A. Electrical shock
- B. Unintended use


- * In order to ensure your personal safety, please use the test lead accompanying this meter. Prior to its use, check and make sure they are in good condition.

1.1.2 Safety considerations

- * If the meter is operated in the vicinity of large-scale equipment, the readings on the meter will grow unstable and more serious errors may arise.
- * Don't attempt to use the meter or pen-shaped meter whose appearance is damaged.
- * If the meter is incorrectly used, the safety function of the meter may fail.
- * Much care should be taken when you operate the meter around the exposed conductor or bus line.
- * This meter must be prohibited from use in the vicinity of any










explosive gas, vapor or dust.

- * The correct input terminal, function and measuring range must be used in measurement process.
- * To prevent meter from damage, the input value shall not exceed the limit for input value within each measuring range.
- * When the meter is connected to the circuit to be measured, do not touch any unused input terminal.
- * When the voltage measured exceeds 60Vdc or 30Vac RMS, do operate carefully to prevent electric shock
- * When making measurement with a test lead, keep fingers behind the protective ring of the test lead.
- * Before switching to another measuring range, ensure the test lead has been taken off the circuit measured.
- * To avoid the potential electric shock from DC due to incorrect readings, please first use AC function to check the presence of any AC voltage. Then, select a DC voltage measuring range that is equal to or greater than the AC voltage.
- * Before the measurement of resistors, diodes, capacitors or switching on/off test, cut off the power supply to the circuit to be measured, and discharge all high voltage capacitors in the circuit to be measured.
- * Resistance measurement or switching on/off test cannot be conducted on the live circuit.
- * Before the measurement of current, first examine the protective tube of the meter. Before connecting the meter to the circuit to be measured, first cut off the power supply to the circuit.
- * Before repairing TV sets or measuring the power switching circuit, pay attention to the high amplitude voltage pulse in the circuit that may bring damage to the meter.

- * This meter relies on the power supply from 4 x 1.5V AA batteries. These batteries must be correctly installed in the battery compartment of the meter.
- * When the symbol  "Battery Low" shows up, replace batteries promptly. Low battery will result in the meter displaying erroneous readings, which may cause electric shock or personal injury.
- * In category III measurement, the voltage measured should not exceed 1000V; in category IV measurement, the voltage measured should not exceed 600V.
- * The meter cannot be used when its case (or part of the case) is dismantled.

1.1.3 Safety symbols

Safety symbols can be found on the body of the meter and its operation manual.

	Warning, an important safety symbol. Refer to Operation Manual before operating the meter. Unintended use may bring damage to the meter or its components.
	AC (alternating current)
	DC (direct current)
	AC or DC power
	Ground
	Double insulation protection
	Fuse
	compliant with European Union (European Union) directive
	High voltage warning
CAT. III 1000V	overvoltage protectio
CAT. IV 600 V	overvoltage protection

1.1.4 Safety-oriented maintenance practices

- * Pull out the test lead before opening the meter's case or dismantling the battery cover.
- * Use the designated spare parts to replace the old components when repairing the meter.
- * Before opening the meter, disconnect all the power supply. To avoid any damage to the meter's elements or components, make sure you do not carry any static electricity.
- * The meter is calibrated and maintained by professionals only.
- * When opening the meter's case, pay attention to the remaining capacitance within the meter, because hazardous voltage still remains even the meter is powered off.
- * If found abnormal, the meter must be stopped immediately and sent for repair and maintenance. And the meter will not be resumed unless it has been examined and proven qualified.
- * If the meter is kept idle for a long period, please remove the battery and put it in a place free from high temperature and humidity.

1.2 Input protection measures

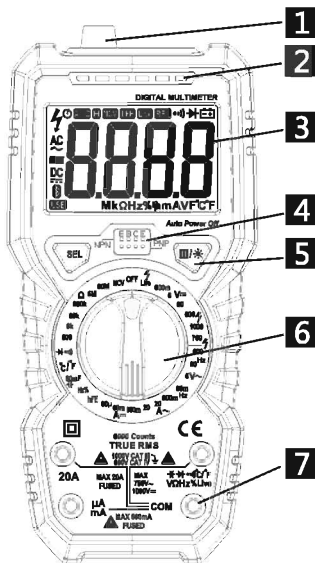
- * The tolerable maximum input voltage is 1000V for DC or 750V for AC when voltage is measured.
- * The tolerable maximum input voltage is 600V for AC voltage or equivalent valid voltage when frequency, resistance, switching on/off and diode are measured.
- * Protective tube (F630mA/250V) is used for protection when A current and mA current are measured.μ

2. Schematic diagrams for the meter

This meter is a hand-held digital multimeter with RMS. It is equipped with a large screen LCD with backlight that facilitates users

in recognizing readings. Moreover, it provides overload protection and Low Battery indications. Anyhow, it is an ideal multi-functional meter suitable for professionals, factories, schools, enthusiasts, or homes.

2.1. Schematic diagrams for the meter



Meter's physical appearance

- ①. Non-contact voltage detection area ②. Non-contact voltage indicator ③. LCD screen
 ④. HFE test jack ⑤. Keys ⑥. Rotary switch ⑦. Input socket

2.2 Monitor symbols

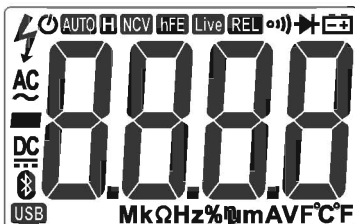


Figure 1 Monitor

Table 1 Symbols displayed


Symbol	Description
	Battery low indicator. ⚠ To avoid any electric shock or personal injury due to incorrect readings, replace battery immediately after "Battery Low" symbol appears.
	Automatic power off indicator.
	High voltage warning indicator
	Negative input polarity indicator
	AC input indicator.
	DC input indicator.
	beep on/off mode.
	diode test mode.
	automatic range mode.
	data hold mode.
	Temperature unit (°C: Celsius degree; °F: Fahrenheit)
	Duty ratio
	non-contact AC voltage detection mode.
	earth/live line judgment mode.

Table 1 Display symbols (continued)



hFE	Measurement of transistor amplification	
V, mV	V:	Volt: the unit of voltage.
	mV:	millivolt , 1×10^{-3} or 0.001 volt
A, mA, μA	A:	Ampere, unit of electric current.
	mA:	milliamperere , 1×10^{-3} or 0.001 ampere
	μA:	Microampere, 1×10^{-6} or 0.000001 ampere
Ω, kΩ, MΩ	Ω:	Ohm, the unit of resistance
	kΩ:	Kilohm, 1000 ohms.
	MΩ:	Megaohm, 1,000,000 ohms.
MkHz	HZ	Hertz, unit of frequency.
	KHZ:	KHz, 1×10^3 Hz.
	MHz	MHz, 1×10^6 or 1000 KHz
mF, μF, nF	F:	Farad, the unit of capacitance.
	mF	mF , 1×10^{-3} or 0.001 farad
	μF:	μ F , 1×10^{-6} or 0.000001 farad
	nF:	nF , 1×10^{-9} or 0.000000001 farad

2.3 Function keys

Key	Function description
SEL	<p>Function keys, such as</p> <p>Temperature measurement: $^{\circ}$C or $^{\circ}$F mode can be selected.</p> <p>Frequency measurement: HZ or duty ratio (%) mode can be selected.</p> <p>AC voltage and AC current: the key can afford voltage/frequency or current/frequency measurement modes in the AC voltage or AC current measurement status.</p>

HOLD	Press this key to hold a measured value Press the key again to disenable the hold function
	Press the key for more than 5 seconds to enable the backlight and press the key for another 5 seconds or above to disenable the backlight The hold will be automatically disenabled if the key is not pressed.

2.4 Input socket

Input socket	Description
COM	All common input terminals for measurement are connected to the common output plugs of black test leads or exclusive multi-function test sockets.
  °C/°F VΩ Hz% lives	+ input terminals for capacitor and diode tests, beep on/off test, temperature measurement, measurement on voltage, resistance, frequency, duty ratio and earth/live line judgment (in connection with red test lead)
μA mA	current μA and mA + input terminal (connected with red test lead)
20A	Current 20A + input terminal (connected with red test lead)

2.5. Accessories

- | | |
|--|--------|
| ① Operation Manual | one |
| ② Test lead | A pair |
| ③ K-Type thermocouple (depends on different model, only for the meter with it) | A pair |

3. Operating instructions

3.1 Normal operation

3.1.1 Reading hold mode



The hold mode can keep the current readings on the monitor. To exit from the hold mode, change the measurement function or press HOLD again

The steps for entry into or exit from hold mode:

1. Press the key "H", the readings will be kept and the symbol "H" will be displayed on LCD screen.
2. Press the key "H" again to restore the meter to the normal measurement status.

3.1.2 Backlight

The meter is equipped with the backlight function, so operators may access measurement results even in a poorly-lit place. The steps to enable or disable backlight:

1. Press the key  and keep the status for more than 5 seconds to enable backlight function.
2. Press the key  again and keep the status for more than 5 seconds to disable the backlight manually; or backlight will be automatically disabled approximately 15 seconds later.

3.1.3 Auto power off

When no operation is executed for approximately 15 minutes after the initialization, the meter will give off beeping sounds to remind you that the power supply to the meter will be automatically cut off and the meter will be in the state of dormancy. In the auto

power off mode, press any key to reboot.

3.2 Measurement guide

3.2.1 AC and DC voltage measurement



To prevent electric shock and/or damage to the meter, do not measure any voltage whose RMS exceeds 1000V for DC or 750V for AC.

To prevent electric shock and/or damage to the meter, do not enable any voltage between common terminals and the ground and whose RMS exceeds 1000V for DC or 750V for AC.

The meter provides the measuring ranges for DC voltage: 600.0mV, 6.000V, 60.00V, 600.0V and 1000V, and for AC voltage: 6.000V, 60.00V, 600.0V and 750V.

AC and DC voltage measurement:

1. Turn rotary switch to the tap position -- V or ~ V .
2. Connect black test led and red test led to COM input socket and V output socket.
3. Use another two ends of the test lead to measure the voltage of the circuit to be measured. (In parallel connection with the circuit to be measured)
4. LCD screen reads the measured voltage value. In measuring DC voltage, the monitor will display the polarity of the voltage connecting to red pen-shaped meter.

Notes:

- ① Within DC 600mV and AC 6V measuring ranges, even if there is no input or connection to test lead, the meter will still display some values. In this circumstance, reset the meter's

readings by pressing short circuit "V - Ω " and "COM" terminal.

- ② In AC voltage function, press the key SEL to measure the frequency of AC voltage source. Refer to frequency measurement.
- ③ The AC voltage value measured with this meter is true RMS (root mean square). These measurements are accurate for sine wave and other wave forms (without DC offset), including square wave, triangular wave and step wave.

3.2.2 Resistance measurement



To avoid damage to the meter or device under test, cut off all power supply to the circuit to be measured and fully discharge all high voltage capacitors before resistance measurement.

The unit of resistance is Ohm Ω .

The meter provides the resistance measuring ranges as follows: 600.0 Ω , 6.000k Ω , 60.00k Ω , 600.0k Ω , 6.000M Ω and 60.00M Ω .

Resistance measurement:

1. Turn rotary switch to the appropriate tap position.
2. Connect black test led and red test led to COM input socket and V Ω output socket.
3. Use another two ends of the test lead to measure the resistance of the circuit to be measured.
4. LCD screen reads the measured resistance value.

Note:

- ① The measured resistance value generally differs from the rated

resistance value.


- ② To ensure correct measurement in measuring low resistance, first use the pen-shaped meter for short circuit to read the resistance values of the circuit measured and subtract this resistance value after the measurement
- ③ At the 60M Ω position, it will take a couple of seconds to obtain stable readings. This is normal for the measurement of high resistance value.
- ④ When the meter is in open circuit, monitor will display "OL", which indicates the excess of measured value over the measuring range.

3.2.3 Diode testing



To avoid damage to the meter or device under test, cut off all power supply to the circuit to be measured and fully discharge all high voltage capacitors before the measurement of diode.

A diode is tested outside the circuit:

1. Turn the rotary switch to the position  .
2. Connect black test led and red test led to COM input socket and V/ Ω output socket.
3. Connect black test led and red test led to the negative pole and positive pole of the diode to be measured.
4. The meter will display the forward bias value of the diode to be measured. If the test lead is connected to the reverse pole, the meter will display "OL".

A normal diode will produce a forward voltage drop of 0.5V to 0.8V; the readings of reverse bias voltage will depend on the variations in

resistance values in other channels between two pen-shaped meters.

3.2.4 Beep on/off test

⚠ *To avoid damage to the meter or device under test, cut off all power supply to the circuit to be measured and fully discharge all high voltage capacitors before the beep on/off test.*

Steps for switching on/off test:


1. Turn the rotary switch to the position **•||**.
2. Connect black test led and red test led to COM input socket and V/ Ω output socket.
3. Use another two ends of the test lead to measure the resistance of the circuit to be measured. If the measured resistance is no more than 40 Ω , the sensor led (green) will be on and the beeper will sound continuously. If the measured resistance falls between 40 Ω and 60 Ω , the sensor led (red) will be on.

3.2.5 Capacitance measurement

⚠ *To avoid damage to the meter or device under test, cut off all power supply to the circuit to be measured and fully discharge all high voltage capacitors before capacitance measurement. Check whether the capacitor has been discharged.*

The meter provides the capacitance measuring ranges as follows: 6.000nF, 60.00nF, 600.0nF, 6.000 μ F, 60.00 μ F and 600.0 μ F, 6mF, 60mF.


Steps for capacitance measurement:

1. Turn the rotary switch to the position 60mF.
2. Connect black test lead and red test lead to COM input socket and  output socket.
3. Use another two ends of the test lead to measure the capacitance of the capacitor to be measured and read the measured values from LCD screen.

Notes:


- ① It will take some time to stabilize readings when a large capacitor is measured.
- ② To avoid any damage to the meter, ensure the right polarity when a capacitor with two poles is measured.

3.2.6 Transistor measurement

 ***To prevent electric shock and/or damage to the meter, do not impose any voltage of more than 36V DC or AC RMS between common terminals and hFE.***

1. Turn the rotary switch to the position hFE.
2. Judge whether the transistor is NPN or PNP type and then insert e, b and c pins of the triode into the appropriate holes of hFE test socket.
3. Read from LCD screen hFE approximate value of the transistor measured.

3.2.7 Frequency measurement

 ***To prevent electric shock and/or damage to the meter, do not measure the frequency of any voltage whose RMS is more than 250V DC or AC.***

Steps for frequency measurement:

1. Turn the rotary switch to the position HZ%
2. Connect black test lead and red test lead to COM input socket and Hz input socket.
3. Use another two ends of the test lead to measure the frequency of the circuit to be measured.
4. Read the measured frequency value from LCD screen.

3.2.8 Current measurement

⚠ Don't attempt to measure the current when open circuit voltage exceeds 250V. If fuse is blown out at the time of measurement, it may lead to meter damage or personal injury.

To avoid damage to the meter or device under test, first examine the fuse carefully before the measurement of current. Use correct input sockets, tap position functions and measuring ranges when you carry out measurement. When the test lead is inserted into the current input socket, don't put the other end of the test lead in parallel connection to any circuit.

The meter provides the measuring ranges for AC current: 60 μ A, 60.00mA, 600.0mA and for DC current: 60.00mA, 600.0mA and 20.00A;

Steps for current measurement:

1. Turn rotary switch to the appropriate tap position.
2. Connect the black test lead to COM Input socket. If the measured current is less than 600mA, connect the red test lead to mA input socket; if the measured current is from 600mA~20A, connect the red test lead to 20A input socket.
3. Disconnect the circuit to be measured Connect the black test lead

to one end of the disconnected circuit (whose voltage is relatively small); connect the red test led to the other end of the disconnected circuit (whose voltage is relatively high).

4. Power on the circuit and read displayed values. If the monitor only displays "OL", it means that the input current exceeds the selected measuring range. The rotary switch must be placed in a higher measuring range.

3.2.9 NCV test (non-contact voltage detection)

Turn the rotary switch to NCV position, and place the top of the meter closer to the conductor. If the meter detects the presence of AC voltage, the indicators for different signal strengths (upper, medium and lower) will be on and the beeper will sound alarms of different frequencies.

Notes:

- 1: Voltage may still remain even if there is no indication of such voltage. Operator shall not rely on non-contact voltage detector to check the presence of voltage. Detection operation may be affected by factors including socket design, insulation thickness and type.
- 2: When voltage is input into meter's input terminal, the voltage sensor led may be on as a result of the presence of induced voltage.
- 3: The external sources of interference (including flashlight and motor) may trigger non-contact voltage detection.

3.2.10 Live line measurement

1. Turn the rotary switch to the position Live.
2. Connect the red test lead to V Input socket.
3. Separately insert it into L hole of power socket or place it close to the live conductor. If the meter detects the presence of AC

voltage, the meter's induced voltage strength indicators (high, medium and low) will be on and the beeper sounds alarms of different strengths.

3.2.11 Measuring temperature(depends on different model,only for the meter with it)

Put the range switch at the gear of °C/°F. Insert the red plug of the thermocouple into the end of °C, and insert the black plug of the thermocouple into COM socket. Directly read the temperature value from the display screen after the reading is stable.

Notes: The maximum measuring temperature for the K-type thermocouple dispatched at random is 250 °C, and its instant measuring value can reach 300°C.

4 .Technical parameters

4.1 Overall parameters

- Operating environment:

600V CAT IV and 1000V CAT. III pollution degree: 2


Altitude < 2000 m.

Ambient temperature: 0~40°C (ambient environment will not be taken into account when relative humidity (RH) <80% and temperature <10°C).

Storage environment temperature: -10~60°C(when relative humidity <70%, remove battery).

- Temperature coefficient: $0.1 \times \text{accuracy} / ^\circ\text{C}$ (<18 °C or >28 °C)
- Allowable max voltage between terminal to be measured and ground: 1000V DC or 750V AC RMS
- Protective tube-based protection: mA position: protective tube FF 630mA/250V; A position: protective tube FF 20A/250V
- Conversion rate: approximately 3 times per second
- Monitor: 6000 counts LCD display. Automatically display unit

symbols according to different function positions.

- Over-range indication: LCD screen displays "OL"
- Battery Low indication: when the battery voltage is lower than the normal working voltage,  will show up.
- Input polarity indication: "- will automatically appear.
- Power supply: 4 x 1.5V AA battery
- Dimensions: 190 mm (L) x 89 mm (W) x 50mm (H).
- Weight: approximately 380g (including battery).

4.2 Precision

Accuracy: \pm (%readings + digits) The warranty period will run in ONE year upon the ex-factory date.

Reference conditions: ambient temperature: 18°C to 28°C; relative humidity: no more than 80%.

4.2.1 DC voltage

Measuring range	Resolution	Accuracy
600mV	0.1mV	\pm (0.5% readings + 3 digits)
6V	1mV	
60V	10mV	
600V	100mV	
1000V	1V	\pm (0.5% readings + 3 digits)

Input impedance: 10M Ω

Maximum input voltage: 1000Vdc or 750Vac RMS.

4.2.2 AC voltage

Measuring range	Resolution	Accuracy
6V	1mV	\pm (0.8% readings +3 digits)
60V	10mV	
600V	100mV	\pm (1% readings +10 digits)
750V	1V	

Input impedance: 10M Ω

Maximum input voltage: 1000Vdc or 750Vac RMS.

Frequency response: 40Hz-1KHz True RMS

4.2.3 Frequency

Measuring range	Resolution	Accuracy
9.999Hz	0.001Hz	± (1% Reading + 3 digits)
99.99Hz	0.01Hz	
999.9Hz	0.1Hz	
9.999KHz	0.001 KHz	
99.99KHz	0.01 KHz	
999.9KHz	0.1 KHz	
9.999MHz	0.001MHz	

Input voltage range: 200mV-10V AC RMS

Overload protection: 600V DC/AC


4.2.4 Electric resistance

Measuring range	Resolution	Accuracy
600Ω	0.1Ω	(0.8% Reading + +3 digits)
6kΩ	1Ω	
60kΩ	10Ω	
600kΩ	100Ω	
6MΩ	1kΩ	
60MΩ	10kΩ	± (1.2% Reading + 3 digits)

Overload protection: 600V DC/AC


Open-circuit voltage: 1V

4.2.5 Diode

Function	Measuring range	Resolution	Testing conditions
Diode test 	0-3V	0.001V	Positive DC current: approximately 1mA; Open-circuit voltage: approximately 3.2V. Monitor displays the approximate value of forward voltage drop of the diode.

Overload protection: 600V DC/AC

4.2.6 Beep on/off

Function	Measuring range	Resolution	Description	Testing conditions
	600 Ω	0.1 Ω	When the built-in beeper sounds and the green indicator is on, the resistance measured is no greater than 30 Ω . In approximately 40 Ω -60 Ω , the red indicator will be on.	Open-circuit voltage: approximately 1V

Overload protection: 600V DC/AC

4.2.7 Transistor

Measuring range	Description	Testing conditions
hFE	Monitor shows the approximate value of hFE (0 -2000).	Base current is approximately 10 μ A. Vce approximately 2.8V

4.2.8 Capacitance

Measuring range	Resolution	Accuracy
6nF	0.001nF	± (4.0% Reading + +3 digits)
60nF	0.01nF	
600nF	0.1nF	
6 μ F	1nF	
60 μ F	10nF	
600 μ F	100nF	
6mF	0.1 μ F	± (5.0% Reading + +3 digits)
60mF	0.001mF	

Overload protection: 600V DC/AC

4.2.9 DC voltage

Measuring range	Resolution	Accuracy
60 μ A	0.01 μ A	± (0.8% Reading + +3 digits)
60mA	0.01mA	
600mA	0.1mA	
20.00A	10mA	± (1.2% Reading + 3 digits)

Overload protection: mA protective tube (FF630mA/250V); 20A protective tube (FF20A/250V).

Maximum input current: mA position: 600mA DC or AC RMS;

20A position: 20A DC or AC RMS

When the measured current is greater than 5A, the continuous measurement shall not last more than 10 seconds. Another measurement cannot be conducted within 1 minute after each measurement.

4.2.10 AC voltage

Measuring range	Resolution	Accuracy
60mA	0.01mA	± (1% Reading + +3 digits)
600mA	0.1mA	
20A	10mA	± (1.5% Reading + 3 digits)

Overload protection: mA protective tube (FF630mA/250V); 20A protective tube (FF20A/250V).

Maximum input current: mA position: 600mA DC or AC RMS;

20A position: 20A DC or AC RMS

When the measured current is greater than 5A, the continuous measurement shall not last more than 15 seconds. Another measurement cannot be conducted within 1 minute after each measurement.

Frequency response: 40Hz-1KHz True RMS

4.2.11 Temperature (depends on different model , only for the instrument with it)

Measuring range	Resolution	Accuracy	
°C	1°C	-20°C~ 1000°C	± (1.0%+3) reading
°F	1°F	-4°F~ 1832°F	± (1.0%+3) reading

Overload protection: 600V DC/AC

5. Meter maintenance

This section provides the basic maintenance information, including the instructions about replacing fuse and battery.

Do not attempt to repair the meter on your own, unless you are an experienced maintenance staff and have the relevant data about calibration, performance test and maintenance,

5.1 General maintenance



To avoid electric shock or damage to the meter, do not moisten the interior of the meter. Before opening the case or battery cover, remove the line connecting the test lead and input signal.

Regularly use a damp cloth and a little detergent to clean the meter case. However, abrasive agents or chemical solvents should be prohibited.


The input socket, if dirty or humid, may affect readings.

To clean the input socket, please

- ❶ Turn off the meter and pull out all test leads from the input socket.
- ❷ Clear all the dirt on the socket.
- ❸ Clean every socket with a new cotton ball and detergent or lubricant.

The lubricant can prevent moisture from polluting the socket.

5.2 Replacing battery and fuse

⚠ In order to avoid any electric shock or personal injury as a result of incorrect readings, the meter's display unit will show the symbol . At such moment, immediately replace the battery.

Only the specified fuse can be used (630mA/250V,20A/250V quick-acting fuse)

To avoid any electric shock or personal injury, shut down the equipment and ensure the test lead has been taken off the circuit measured, before opening the battery cover to replace the old battery.

To replace the battery, follow the steps below:

- ❶ Turn off the power supply to the meter.
- ❷ Pull out all test leads from the input socket.
- ❸ Use a screwdriver to unscrew the bolts that have fixed the battery cover.
- ❹ Remove battery cover.
- ❺ Take off old battery or damaged protective tube.
- ❻ Install a new 4 x 1.5V AA battery or a new protective tube.
- ❼ Mount battery cover and tighten screws.