



**MANUAL DE INSTRUÇÕES
DO MULTÍMETRO DIGITAL
MODELO MD-6456
*Inglês***

Novembro 2016

**Leia atentamente as instruções
contidas neste manual antes de
iniciar o uso do multímetro**

Table of Contents

<i>The Statement</i>	1
Safety Statement	1
Safety Instructions	2
Safety Operation Specifications	2
Safety Symbols	5
<i>Overview</i>	6
Display	6
Buttons	7
Rotary Switch	7
Input Socket.....	8
At the top.....	9
<i>Measurement Operation</i>	10
Manual and Automatic Range	10
Relative Value Measurement.....	10
Maximum Value/Minimum Value/Maximum-minimum Value Hold.....	11
USB Interface Function	12
Measure AC or DC Voltage.....	13
Measure DC or AC mV Voltage	14
Measure Frequency and Duty Ratio	16
Measure AC or DC Current.....	17
Measure Resistance	18

Measure Connectivity	19
Measure Capacitance	20
Measure Diode.....	21
Measure Temperature.....	22
Measure Transistor.....	24
<i>Auto Power-off Function</i>	25
<i>Backlight Function</i>	25
<i>Data Hold</i>	26
<i>General Technical Specifications</i>	27
<i>Accuracy Specifications</i>	28
DC Voltage.....	28
AC Voltage.....	29
DC Current.....	29
AC Current.....	30
Resistance	30
Capacitance.....	31
Frequency and duty ratio	31
Diode Test	32
Connectivity Test.....	32
Temperature	33
<i>Maintenance</i>	34
Clean the Instrument.....	34
Replace Battery and Fuse	34

The Statement

In accordance with the international copyright law, without permission and written consent, do not copy the contents of this manual in any form (including storage and retrieval or translation into languages of other countries or regions). The manual is subject to change in future edition without prior notice.

Safety Statement

Caution

“**Caution**” mark refers to the condition and operation which may cause damage to the instrument or equipment.

It requires that you must be careful during the execution of the operation. If incorrectly perform the operation or do not follow the procedure, it may damage the instrument or equipment. In the circumstances that such conditions are not met or not fully understood, please do not continue to perform any operation indicated by the caution mark.

Warning

“**Warning**” mark indicates the condition and operation which may cause danger to users.


It requires that you must pay attention during the execution of this operation. If incorrectly perform the operation or do not follow the procedure, it may result in personal injury or casualties. In the circumstances that such conditions are not met or not fully understood, please do not continue to perform any operation indicated by the warning mark.

Before using the instrument, please read this manual carefully and pay attention to the relevant safety warning information.

Safety Instructions

The instrument is designed in accordance with the safety requirements on electronic measurement instruments in International Electrical Safety Standards IEC61010. The instrument is designed and manufactured strictly in accordance with provisions in IEC61010-1 CAT.III/1000V, over-voltage safety standard CAT.IV/600V and pollution level 2.

Safety Operation Specifications

 **Warning:** In order to avoid possible electric shock or personal injury and other safety accidents, please abide by the following specifications:












- Before using the instrument, please read this manual carefully, and pay attention to the safety warning information.
- Check whether there are any cracks or damage on the plastic parts of the outer cabinet before using the instrument, if any, please do not use it.

- Before using the instrument, please check whether the instrument works properly, if it's not or it has been damaged, please do not use.
- Before using the instrument, please carefully check the insulator around the input terminals of the instrument, please do not use if any damage.
- Before using the instrument, please check whether there's any crack or damage on the probe, if any, please replace the probe with same specifications.
- Before using the instrument, please check whether there's any damage, metal exposed or sign of wear on the insulating layer of the probe, if any damage, please do not use.
- Before using the instrument, please use it to measure a known voltage to verify whether the instrument works properly.
- Use the instrument strictly in accordance with the operation in the manual, otherwise the protection function provided by the instrument may be damaged or weakened.
- The instrument shall be used in accordance with the specified measurement category, voltage or current rating.
- Please comply with local and national safety code. Wear personal protection equipment (such as approved rubber gloves, masks and flame retardant clothes, etc.) to prevent being damaged by electric shock and electric arc due to exposed hazardous live conductor.
- Before connecting the instrument to the circuit under test, be sure to choose the correct input terminal and switch position.
- The voltage applied between input terminals or between any terminal and earth point cannot exceed the

specified ratings of the instrument.

- Please be careful if the measurement exceeds 30V AC true RMS, 42V AC peak or 60V DC. There may be danger of electric shock at this kind of voltage.
- When it shows low battery indicator, please replace the battery in time in case of any measurement error.
- Do not use the instrument around explosive gas, steam or in wet environment.
- When using the probe, please put your fingers behind the finger protector of the probe.
- When measuring, please connect the zero line or the ground line firstly, then connect the live wire; but when disconnecting, please disconnect the live wire firstly, then disconnect the zero line and ground line.
- Before opening the outer cabinet or battery cover, please remove the probe on the instrument. Do not use the instrument in the circumstances that the instrument is taken apart or battery cover is opened.
- It only meets the safety standards when the instrument is used together with the supplied probe. If the probe is damaged and needs to replace, the probe with same model number and same electrical specifications must be used for replacement.

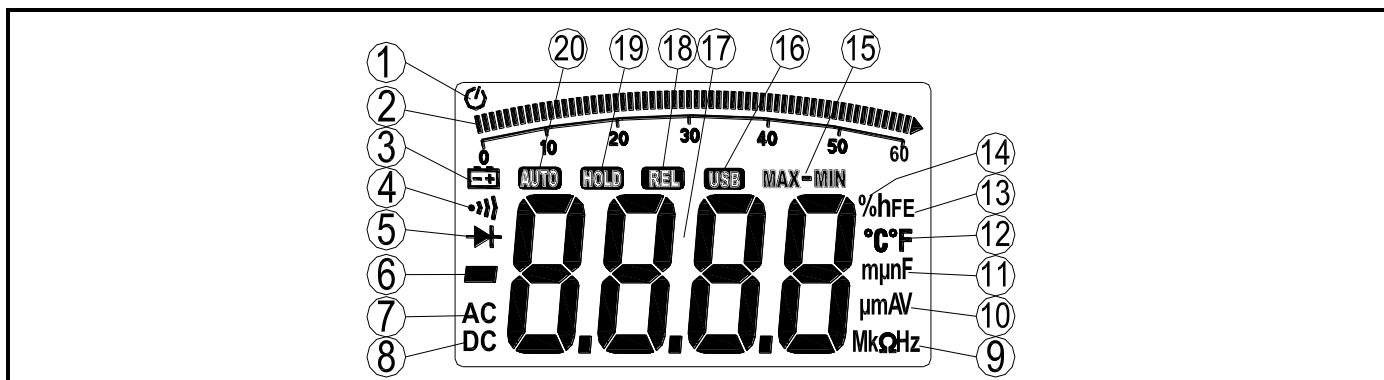
Safety Symbols

	High voltage warning
	AC (Alternating current)
	DC (Direct current)
	AC or DC
	Warning, important safety signs
	Ground
	Fuse
	Equipment with double insulation or reinforced insulation protection
	Battery undervoltage
	Product complies with all relevant European laws
	The additional product label shows that do not discard this electrical/electronic product into household garbage.
CAT. III 1000V	CAT III 1000 V over-voltage protection
CAT. IV 600V	CAT IV 600 V over-voltage protection









Overview

The instrument is a hand-held measurement instrument, a true RMS high precision multimeter with simulation bar and digital dual display. With large LCD screen and backlight, it's easy for user to read, with overload protection and battery undervoltage indication. Whether for professionals, factories, schools, amateurs or family, it's an ideal multi-functional instrument.

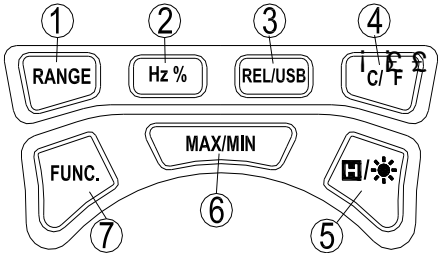








Display








✂	Auto Power-off indicator	Ⓛ	DC indicator	📁	Maximum/Minimum value measurement
🌊	Simulation bar, indicating rapid change trend	✉	Resistance or frequency unit	📁	USB interface open indication
🔋	Battery undervoltage indicator	📄	Voltage or current unit	📄	Data display area
🔔	Connectivity measurement	📄	Capacitance unit	📄	Relative value measurement

	indicator				indicator
	Diode measurement indicator		Temperature unit		Data hold indicator
	Minus		Transistor indicator		Automatic range indicator
	AC indicator		Duty ratio unit		

Buttons

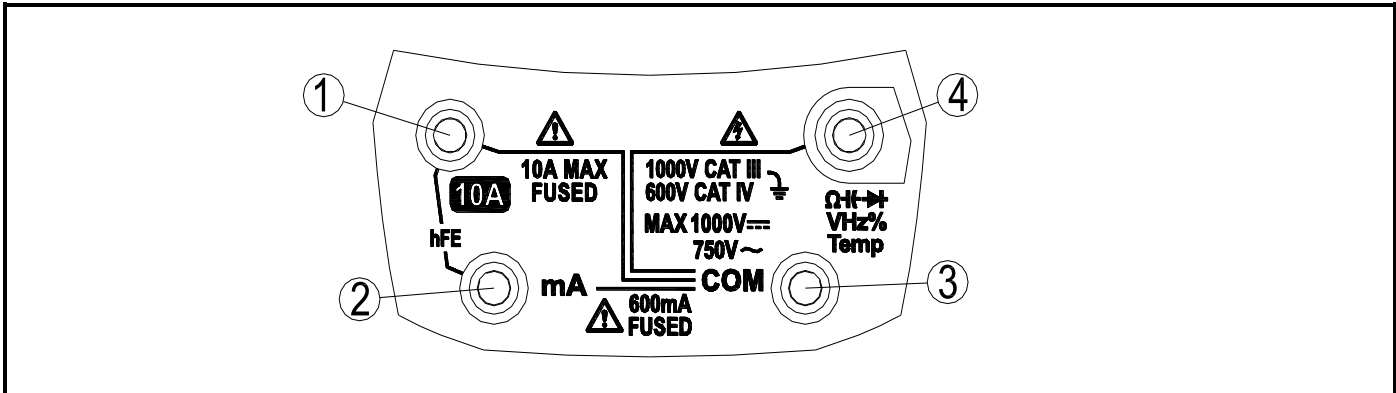
		RANGE: switch between automatic range and manual range
		Hz%: switch between frequency and duty ratio
		REL/USB: turn on relative measurement and USB
		°C/°F: switch between centigrade and Fahrenheit
		 /H: turn on backlight and data hold
		MAX/MIN: turn on Maximum value, minimum value, maximum-minimum measurement
		FUNC.: switch among function selections

Rotary Switch

		OFF		AC or DC voltage, press FUNC. button to switch
		AC or DC voltage mV, press FUNC. button to switch		
		Frequency, duty ratio, press Hz% button to switch		
		Resistance, diode, connectivity, capacitance, press FUNC. button to		

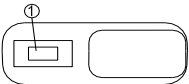
		switch
		Temperature measurement, press °C/°F button to switch unit
		Transistor amplification test
		AC and DC current microampere measurement, press FUNC. button to switch
		AC and DC current milliampere measurement, press FUNC. button to switch
		AC and DC current ampere measurement, press FUNC. button to switch
		OFF

Input Socket



✂	Used for AC and DC current measurement (can measure maximum 10A), input socket for frequency/duty ratio measurement (frequency measurement in current mode); when testing transistor, multi function test socket "IN" input socket.
✂	Used for AC and DC microampere (μA) and milliampere (mA) measurement (can measure maximum 600mA) and input socket for frequency/duty ratio (frequency measurement in current mode); when testing transistor, multi function test socket "COM" input socket.
⚡	Used for public terminal of all measurement; negative input socket of K type thermocouple temperature measurement.
🔔	Input socket for voltage, resistance, connectivity, diode, capacitance, frequency, duty ratio measurement; positive input socket of K type thermocouple temperature measurement.




At the top

	✂ USB socket, used to connect to the computer.
---	--

Measurement Operation

Manual and Automatic Range

The instrument is equipped with manual and automatic range. In automatic range mode, the instrument will select the best range for the input signal detected, so it is convenient that the user does not need to re-select range when changing the measuring signal. The instrument can also be set to manual range. It is defaulted as automatic range mode after the unit is turned on or function is switched, the instrument displays “AUTO” symbol. The operations of entering or quitting manual range are as follows:


1. In automatic range mode, press  button, “AUTO” symbol hides.
2. Press  button to increase the range, when reached the maximum range, the instrument will return to the minimum range.
3. Press and hold  button for 2 seconds to quit manual range mode, the instrument displays “AUTO” symbol.

Note: duty ratio, connectivity, diode, temperature and transistor measurement function has only one range.


Relative Value Measurement

The instrument is equipped with relative value measurement function. In this mode, the instrument display value=actual value-set reference value. Operations of entering or quitting relative measurement are as follows:

1. Set the instrument to the measurement function you need, contact the probe to the measured object which you want to set as reference value, the instrument displays the measured value.

2. Press  button and store the measured value as reference value, enter the relative measurement mode, the instrument displays “REL” symbol.

3. Measure, the instrument will display “actual value-set reference value”.


4. Then press  button and quit relative value measurement mode, the “REL” symbol hides.


Note: frequency, duty ratio, diode, connectivity, temperature and transistor measurement has no relative value measurement mode.


Maximum Value/Minimum Value/Maximum-minimum Value Hold


The instrument is equipped with maximum value, minimum value and maximum-minimum value hold function. Operations of entering or quitting this function are as follows:

1. Set the instrument to the measurement function you need.

2. Press  button to enter maximum value hold mode, the instrument displays “MAX” symbol.

3. Press  button again to enter minimum value hold mode, the instrument displays “MIN” symbol.



4. Press  button again to enter maximum-minimum value hold mode, the instrument displays “MAX-MIN” symbol.

5. Press and hold  button longer than 2 seconds, the instrument returns to normal measurement mode.

Note: Frequency, duty ratio, diode, connectivity and transistor measurement does not have this function.

USB Interface Function

The instrument is equipped with USB interface function, instrument measured data can be uploaded to the computer for display, record and analysis via USB port. Operations of entering or quitting this function are as follows:

1. Scroll the rotary switch of the instrument to any shift except “OFF”.
2. Press and hold  button longer than 2 seconds, the instrument displays “USB” symbol, the function of instrument data transmission is enabled.
3. Press and hold  button longer than 2 seconds, the “USB” symbol hides, the function of instrument data transmission is off.

Note: please refer to the interface software operation instructions for detailed operations.

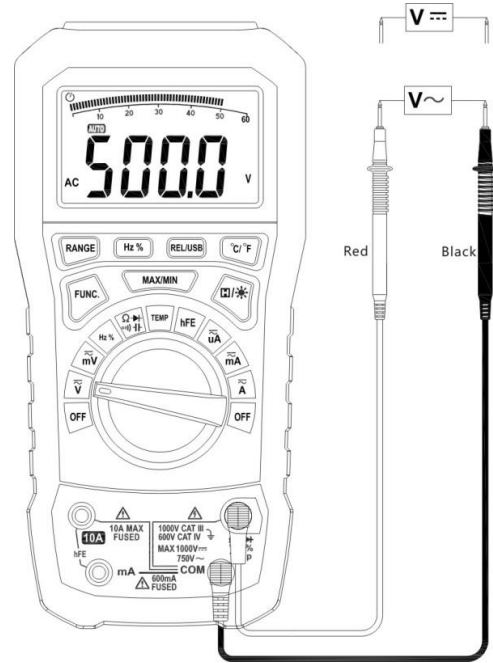
Measure AC or DC Voltage

As shown in the figure on the right:

1. Scroll the rotary knob to \bar{V} , press “FUNC.” button and switch to AC voltage or DC voltage function.
2. Insert the red probe in “ \bar{V} ” socket, and the black probe in “COM” socket.
3. Contact the probe to the measured circuit (connect to the measured power supply or circuit in parallel), measure the voltage.
4. Read the measurement result on the screen.

Note:

1. In AC voltage function, press Hz% button to measure the frequency and duty ratio of the AC voltage source, please refer to Measure Frequency.
2. The AC voltage value measured by using this instrument is true RMS (root mean square). For sine wave and other wave (no DC offset), such as square wave, triangle wave and step wave, these measurements are accurate.



Warning!

Do not allow measurement of any voltage higher than DC 1000V or AC 750VRMS, otherwise it may cause instrument damage, electric shock or personal injuries.

Do not allow applying voltage exceeding DC 1000V or AC 750V RMS between a public terminal and the earth, otherwise it may cause instrument damage, electric shock or personal injuries.

Measure DC or AC mV Voltage

As shown in the figure on the right:

1. Scroll the rotary knob to “ \overline{mV} ”, press “FUNC.” button and switch to DC or AC voltage function.
2. Insert the red probe in “ \overline{V} ” socket and the black probe in “COM” socket.
3. Contact the probe to the measured circuit (connect to the measured power supply or circuit in parallel), measure the voltage.
4. Read the measurement result on the screen.

Note:

1. In AC voltage function, press Hz% button to measure the frequency and duty ratio of the AC voltage source, please refer to Measure Frequency.
2. The AC voltage value measured by using this instrument is true RMS (root mean square). For



sine wave and other wave (no DC offset), such as square wave, triangle wave and step wave, these measurements are accurate.

3. The maximum range for AC/DC mV (60/600mV) voltage measurement is 600mV, input impedance up to $10^{11}\Omega$, and the weak signal of measurement will not weaken, therefore the measurement precision is high. But it's normal in the circumstances that the probe is in open circuit or contacting the measured circuit, the probe will be back to zero as long as in short circuit, the reading will stabilize.

 **Warning!**

Do not allow measurement of any voltage higher than DC 1000V or AC 750VRMS, otherwise it may cause instrument damage, electric shock or personal injuries.

Do not allow applying voltage exceeding DC 1000V or AC 750V RMS between a public terminal and the earth, otherwise it may cause instrument damage, electric shock or personal injuries.

Measure Frequency and Duty Ratio

As shown in the figure on the right:

1. Scroll the rotary knob to “Hz%”, press “Hz%” button and switch between frequency and duty ratio. (or in AC voltage or AC current shift frequency and duty ratio can also be measured)
2. Insert the red probe in “**Hz%** Temp” socket and the black probe in “COM” socket.
3. Contact the probe to the measured circuit (connect to the measured power supply or circuit in parallel), measure the frequency or duty ratio.
4. Read the measurement result on the screen.



Warning!

1. Do not allow measurement of any voltage higher than DC 1000V or AC 750VRMS, otherwise it may cause instrument damage, electric shock or personal injuries.
2. Do not allow applying voltage exceeding DC 1000V or AC 750V RMS between a public terminal and the earth, otherwise it may cause instrument damage, electric shock or personal injuries.

Caution: To avoid any damage on the instrument or the equipment, do not input frequency or duty ratio signal higher than 10V RMS.


Measure AC or DC Current

As shown in the figure below:

1. According to the current of measurement scroll the rotary knob to any shift among “ $\tilde{\mu}\text{A}$ ”, “ $\tilde{\text{mA}}$ ” and “ $\tilde{\text{A}}$ ”, press “FUNC.” button and switch to AC or DC function.
2. According to the shift of measurement insert the red probe in “mA” socket or 10A socket, and the black probe in “COM” socket.
3. Disconnect the power supply of the measured circuit, connect the probe to the measured circuit in series, and turn on the power supply of the circuit.
4. Read the measurement result on the screen.

Warning!



Do not allow measurement of any voltage higher than DC 1000V or AC 750V RMS, otherwise it may cause instrument damage, electric shock or personal injuries. The power supply of the measured circuit must be switched off firstly, otherwise it may cause electric shock or personal injuries.

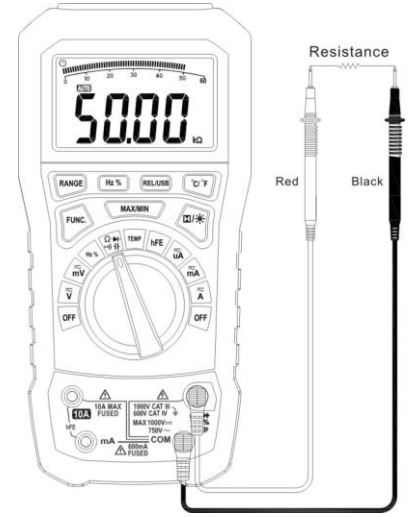
 **Caution: to avoid any damage on the instrument or equipment, please check the fuse before measurement, and use correct input socket.**



Measure Resistance

As shown in the figure on the right:

1. Scroll the rotary knob to “”, press “FUNC.” button and switch to resistance measurement function and ensure the power supply of the measured circuit has been cut off.
2. Insert the red probe in “” socket, and the black probe in “COM” socket.
3. Contact the probe to the measured circuit or both ends of the resistor.
4. Read the measurement result on the screen.



Warning!



Before measuring resistance, connectivity, capacitance or diode, please turn off the power supply and discharge all the high voltage capacitors, otherwise it may cause instrument damage, electric shock or personal injuries.

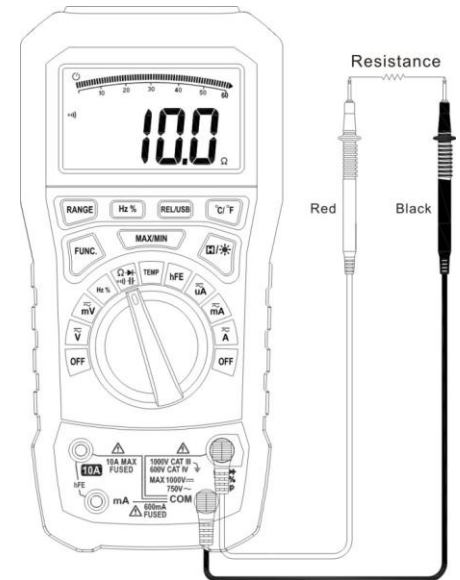
Note:

Because the test current of the instrument will pass through all the routes between the probe, therefore the measured value of the resistors in the circuit is usually different from the rating of the resistor.

Measure Connectivity

As shown in the figure on the right:

1. Scroll rotary knob to , press “FUNC.” button and switch to connectivity measurement function, and ensure that the power supply of the measured circuit has been cut off.
2. Insert the red probe in  “Temp” socket, and the black probe in “COM” socket.
3. Contact the probe to the measured circuit or both ends of the resistance.



- If the resistance of the measured resistance or circuit is lower than 50Ω , the buzzer will sound.
- At the same time the resistance of the measured circuit is displayed on the screen.

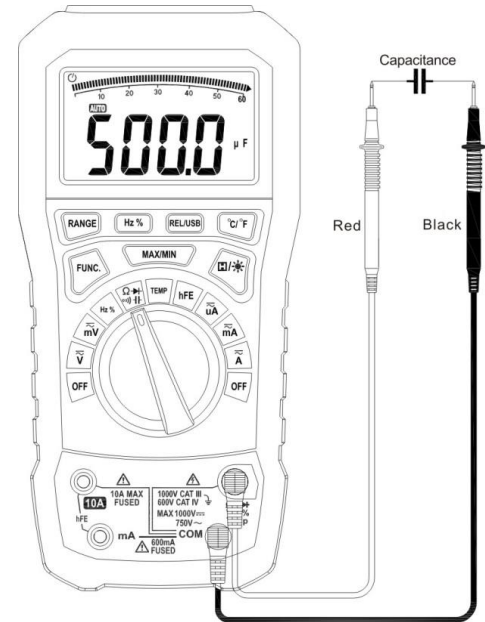
⚠ Warning!

Before measuring resistance, connectivity, capacitance or diode, please turn off the power supply and discharge all the high voltage capacitors, otherwise it may cause instrument damage, electric shock or personal injuries.

Measure Capacitance

As shown in the figure on the right:

- Scroll the rotary knob to **$\Omega \rightarrow$** , press “FUNC.” button and switch to capacitance measurement function.
- Insert the red probe in **$\Omega \rightarrow$ Temp** socket, and the black probe in “COM” socket.
- Contact the probe to both ends of the capacitor.
- After the reading is stable, read the measurement result on the screen.



⚠ Warning!



Before measuring resistance, connectivity, capacitance or diode, please turn off the power supply and discharge all the high voltage capacitors, otherwise it may cause instrument damage, electric shock or personal injuries.

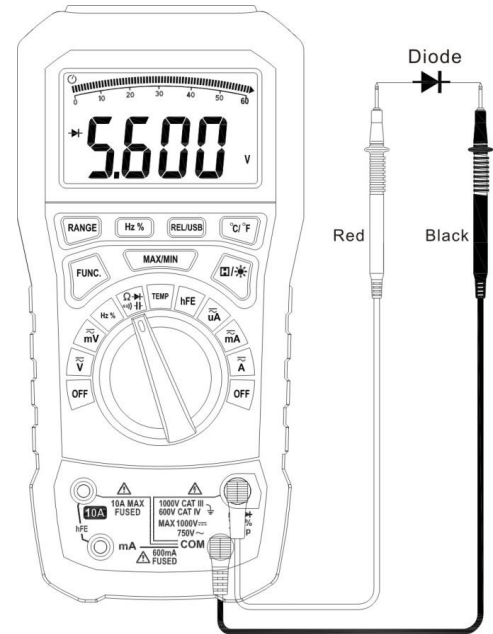
Note:

1. In the circumstance that the input is open circuit, the instrument may display reading, press “REL” button to make it back to zero and measure again.
2. When measuring small capacitance (below 100nF), you’d better enable the relative value measurement function to reduce the measurement error brought by the base number of the probe or instrument.

Measure Diode

As shown in the figure on the right:

1. Scroll the rotary knob to “”, press “FUNC.” button and switch to diode measurement function.
2. Insert the red probe in “” socket, and the black probe in “COM” socket.



3. Contact the red probe to the anode of the measured diode, and the black probe to the cathode of the measured diode.
4. Read the measurement results on the screen.
5. If the polarity of the probe and the diode are opposite, the instrument displays “OL”, which can be used to differentiate the anode and cathode of the diode.

 **Warning!**


Before measuring resistance, connectivity, capacitance or diode, please turn off the power supply and discharge all the high voltage capacitors, otherwise it may cause instrument damage, electric shock or personal injuries.

Note:

The instrument can display as high as 1.5V diode forward bias. A typical diode forward bias is in the range from 0.3V to 0.8V; however, readings may be different due to the different resistances of other circuits between the probes.

Measure Temperature

1. Scroll the rotary knob to “TEMP”.
2. Insert K type thermocouple in the input socket of the instrument, insert the positive end of the

thermocouple (red) in “” socket, and the negative end (black) in “COM” socket.

3. Contact the probe of the thermocouple to the measured object, read the result from the main display area on the screen.
4. Press “°C/°F” button, switch between centigrade and Fahrenheit unit.

Note:

1. **When the thermocouple is not inserted or open circuit, the instrument will display the temperature of the environment.**
2. **The instrument is not suitable for measuring the temperature of a rapidly changing environment.**
3. **The cold junction compensation of the thermocouple is set in the instrument, and it takes longer time to reach thermal balance with the measurement environment. So when measuring it needs to be placed in the measurement environment for a longer time to obtain more accurate readings.**
4. **The instrument uses K type thermocouple probe.**

 **Warning!**

When measuring temperature by thermocouple, the probe of the thermocouple cannot contact the charged object, otherwise it may cause instrument damage, electric shock or personal injuries.

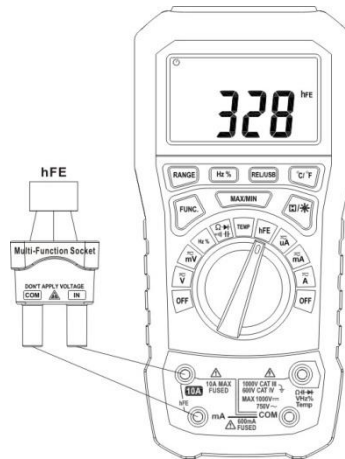
Caution:

Please do not fold the thermocouple wire into acute angle. Repeatedly bending the wire over a period of time may cause the broken of the wire.

Measure Transistor

As shown in below figure:

1. Scroll the rotary knob to “hFE”, and remove the probe from the instrument.
2. Insert the multi functional test socket in “10A” and “mA” sockets as shown in the figure on the right.
3. Insert the transistor in the corresponding socket of the multi functional test socket.
4. Read the measurement results on the screen.



Warning!

Please do not use multi functional test socket in voltage and current measurement. Otherwise it may cause instrument damage, electric shock or personal injuries.

Caution:

When using multi functional test socket, please pay attention to the direction of the insertion, if insert reverse the test result will be wrong.



Auto Power-off Function

- If there's no any operation within 15 minutes after the unit is turned on, the instrument will enter the sleep state, it will power off automatically to save the battery power.
- After power off automatically, if toggle rotary switch or press any button, the instrument returns to work.
- If press "FUNC." button to turn on the unit and cancel auto power-off function.





Note: When USB function is enabled, the instrument will not enter the sleep state.

Backlight Function



The instrument is equipped with backlight function for the convenience that the user accurately read the measurement results in places with bad lighting conditions. Operations of turning on or off the backlight are as follows:

1. Press and hold "" button longer than 2 seconds to turn on the backlight.
2. Press and hold "" button longer than 2 seconds again to turn off the backlight; or after about 15 seconds the backlight will turn off automatically.


Note:

1. The backlight source is LED, the working current is larger, although the instrument is equipped with a timing circuit (the timing time is about 15 seconds, that is, it will turn off automatically about 15 seconds after the backlight is turned on), often using the backlight will shorten the battery life, so in unnecessary circumstances, the use of backlight source should be minimized.
2. When the battery voltage is $\leq 4.8V$, the display shows “” (undervoltage) symbol. But in the circumstance of using the backlight, when the battery voltage is $\geq 4.8V$, because its larger working current makes the battery voltage drop, “” symbol may be displayed (when “” symbol displays, the accuracy of the measurement cannot be guaranteed), at this time it's fine that do not replace the battery, continue to use it in the circumstance of not using backlight until “” symbol is displayed, then make replacement.

Data Hold

1. In the process of measurement, if reading hold is needed, press “” button, the display value on the screen will be maintained.
2. Press “” button again to clear the state of reading hold.

General Technical Specifications

- Environment condition of using:
600V CAT.IV and 1000V CAT.III
Pollution level: 2
Altitude < 2000m
Working environment temperature and humidity: 0~40°C (<80% RH, <10°C non condensing).
Storage environment temperature and humidity: -10~60°C (<70% RH, remove the battery).
- Temperature coefficient: 0.1× accuracy/°C (<18°C or >28°C).
- MAX. Voltage between terminals and earth ground:1000V DC or 750V AC RMS
- Fuse protection: mA: fuse **F600mA/250V** fast speed fuse; 10A shift: **F10A/250V** fast speed fuse
- Sampling rate: about 3 times/second.
- Display: 6000 counter readout. Automatically display the unit symbols according to the shift of the measurement function.
- Over range indication: it displays “OL”.
- Low battery indication: when the battery voltage is lower than the normal working voltage, “” will be displayed.
- Input polarity indication: automatically display “-”.
- Power requirement: 4 x 1.5V AA batteries.
- Dimension: 204(L) ×94(W) × 57(H) mm.
- Weight: about 410g (including batteries).

Accuracy Specifications

The accuracy applies within one year after the calibration.

Reference condition: the environment temperature 18°C to 28°C, the relative humidity is no more than 80%, accuracy: \pm (% reading + word) .

DC Voltage

Range	Resolution	Accuracy	Input impedance: 10M Ω (60/600mV range is 10¹¹Ω) Overload protection: 1000V DC or 750V AC (RMS) Maximum input voltage: 1000V DC Note: Measure in mV (60/600mV) voltage, input impedance is as high as 10¹¹Ω, and weak signal of measurement does not weaken, so the measurement precision is high. But in the circumstance that the probe is open circuit it will display numbers, which is normal, as long as in short circuit the probe will return to zero or the probe is inserted to the measured point, the reading will stabilize.
60mV	0.01mV	$\pm(0.7\% \text{ reading}+2)$	
600mV	0.1mV		
6V	1mV		
60V	10mV		
600V	100mV		
1000V	1V		

AC Voltage

Range	Resolution	Accuracy	Input impedance: 10M Ω (60/600mV range is 10¹¹Ω) Overload protection: 1000V DC or 750V AC (RMS) Maximum input voltage: 750V AC (RMS) Frequency range: 10Hz ~ 1kHz; response: true RMS Note: Measure in mV (60/600mV) voltage, input impedance is as high as 10¹¹Ω, and weak signal of measurement does not weaken, so the measurement precision is high. But in the circumstance that the probe is open circuit it will display numbers, which is normal, as long as in short circuit the probe will return to zero or the probe is inserted to the measured point, the reading will stabilize.
60mV	0.01mV	$\pm(0.8\% \text{ reading} + 3)$	
600mV	0.1mV		
6V	1mV		
60V	10mV		
600V	100mV		
750V	1V	$\pm(1.0\% \text{ reading} + 3)$	

DC Current

Range	Resolution	Accuracy	Overload protection: $\mu\text{A}/\text{mA}$ range: 600mA/250V fuse (fast speed fuse) 10A range: 10A/250V fuse (fast speed fuse) Maximum input current: mA socket: 600mA 10A socket: 10A When measuring large current, continuous measurement should be not longer than 15 seconds, after measurement the instrument should be cooled down after twice of the measurement time, and then enter small current measurement.
600 μA	0.1 μA	$\pm(1.2\% \text{ reading} + 3)$	
6000 μA	1 μA		
60mA	10 μA		
600mA	100 μA		
6A	1mA	$\pm(2.0\% \text{ reading} + 10)$	
10A	10mA		

AC Current

Range	Resolution	Accuracy	Overload protection: $\mu\text{A}/\text{mA}$ range: 600mA/250V fuse (fast speed fuse) 10A range: 10A/250V fuse (fast speed fuse) Maximum input current: mA socket: 600mA 10A socket: 10A Frequency range: 10Hz~1kHz Response: true RMS When measuring large current, continuous measurement should be no longer than 15 seconds, after measurement the instrument should be cooled down after twice of the measurement time, then enter small current measurement.
600 μA	0.1 μA	$\pm(1.5\% \text{ reading} +3)$	
6000 μA	1 μA		
60mA	10 μA		
600mA	100 μA		
6A	1mA	$\pm(3.0\% \text{ reading} +10)$	
10A	10mA		

Resistance

Range	Resolution	Accuracy	Open circuit voltage: about 0.25V Overload protection: 1000V DC or 750V AC (RMS)
600 Ω	0.1 Ω	$\pm(1.2\% \text{ reading} +5)$	
6k Ω	1 Ω		
60k Ω	10 Ω		
600k Ω	100 Ω		
6M Ω	1k Ω		
60M Ω	10k Ω	$\pm(2.0\% \text{ reading} +5)$	

Capacitance

Range	Resolution	Accuracy	Overload protection: 1000V DC or 750V AC (RMS) Note: Parameter does not include error caused by the capacitor and capacitor substrate of the probe (in 100nF range may be up to a few nF). The user can use the relative value measurement function to reduce the error.
10nF	0.001nF	±(3.0% reading+3)	
100nF	0.01nF		
1000nF	0.1nF		
10μF	0.001μF		
100μF	0.01μF		
1000μF	0.1μF		
10mF	0.001mF		

Frequency and duty ratio


Range	Resolution	Accuracy	Through shift of Hz: 1) Measurement range: 0 ~ 10MHz 2) Input voltage range: 0.2~10V AC (the input voltage should be increased with the increase of the measured frequency) 3) Overload protection: 1000V DC or 750V AC (RMS) Through shift V: 1) Measurement range:0 ~ 100kHz 2) Input voltage range: 0.5~750V AC (the input voltage should be increased with the increase of the measured frequency) 3) Maximum input voltage: 1000V DC or 750V AC (RMS) Through shifts of μA, mA, A:
10Hz	0.001Hz	±(1.0% reading + 5)	
100Hz	0.01Hz		
1000Hz	0.1Hz		
10kHz	0.001kHz		
100kHz	0.01kHz		
1000kHz	0.1kHz		
10MHz	0.001MHz		

1~99%	0.1%	± 3.0%	1) Measurement range:0 ~ 100kHz 2) Input signal range: ≥ ¼ range (the input current should be increased with the increase of the measured frequency) 3) Input protection: μA, mA range: F600mA/250V ultra-speed fuse; 10A range: F10A/250V ultra-speed fuse
-------	------	--------	--


Note:

Compared with the range of measurement by using the “Hz” function of voltage and current shifts, using shift “Hz” to measure the frequency has larger range and higher sensitivity.

Diode Test

Range	Resolution	Accuracy	Forward DC current is about 1mA Reverse DC voltage is about 1.5V Overload protection:1000V DC or 750V AC (RMS)
	1mV	It displays the approximate forward voltage value of the diode.	

Connectivity Test

Range	Function	Open circuit voltage is about 0.5V Overload protection:1000V DC or 750V AC (RMS)
	The resistance of the measured circuit is less than 50Ω, the buzzer contained in the instrument will sound.	

Temperature

Range	Resolution	Accuracy		Overload protection: 1000V DC or 750V AC (RMS)
°C	1°C	-20°C ~ 0°C	± 5.0% reading or ± 3°C	
		0°C ~ 400°C	± 1.0% reading or ± 2°C	
		400°C ~ 1000°C	± 2.0% reading	
°F	1°F	-4°F ~ 32°F	± 5.0% reading or ± 6°F	
		32°F ~ 752°F	± 1.0% reading or ± 4°F	
		752°F ~ 1832°F	± 2.0% reading	


1. The above accuracy specifications are specified in the same operating environment after kept the instrument in a fixed state for at least 1 hour. If the instrument is exposed to the environment of high humidity (condensation) during the storage period, please ensure that the instrument should be kept in the same operating environment at least 2 hours.
2. Accuracy does not contain the tolerance of the thermocouple probe.
3. The temperature is calculated and calibrated in accordance with the safety standard EN/IEC-60548-1 and NIST175.

Maintenance

Clean the Instrument

If there's dust on the terminal or the terminal is wet, it may cause measurement error. Please clean the instrument according to the steps below:

1. Switch off the power supply of the instrument, and remove the test probe.
2. Turn over the instrument and shake out the dust accumulated in the input socket. Wipe the outer cabinet with a damp cloth and mild detergent, do not use abrasive or solvent. Wipe contacts in each input socket with a clean cotton swab soaked in alcohol.

 **Warning: please always keep the inside of the instrument clean and dry to avoid electric shock or instrument damage.**

Replace Battery and Fuse

Replace Battery:

1. Turn off the power supply of the instrument, and remove the probe on the instrument.
2. Use screwdriver to unscrew two screws fixing the battery cover, remove the battery cover.
3. Remove old batteries, replace with new batteries of the same specifications. Please note the polarity of the battery according to the positive and negative polarity marks inside of the battery cover.
4. Install the battery cover to its original position, fix and lock the battery cover with screws.

 **Warning!**

1. **To prevent electric shock or personal injury caused by error reading, please replace the battery promptly when the battery power is low. Please do not make battery short circuit or reverse battery polarity to discharge the batteries.**
2. **To ensure safety operation and product maintenance, when the instrument will not be used for an extended period of time, please remove the batteries to avoid any product damage caused by battery leakage.**

Replace Fuse:

1. Turn off the power supply of the instrument, and remove the probe on the instrument.
2. Use screwdriver to unscrew four screws fixing the back cover (four corners of the instrument), and remove the back cover.
3. Remove the burnt fuse, replace with new fuse of the same specifications, and ensure that the fuse is clamped in the safety clip.
4. Install the back cover, fix and lock it with screws.

 **Warning:**

To avoid possible electric shock, personal injury or instrument damage, please use the fuse with same specifications or specified specifications.



www.iceL-manaus.com.br

nov 2016
ver 6456-ingl