

# Pro'sKit®

## MT-1220 / MT-1225

### 3 1/2 Digital Multimeter



**User's Manual**  
**1<sup>st</sup> Edition, 2022**

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## ※ General Information

The meter is a multi-function instrument with high measurement accuracy, fast response, and high safety level. Embedded with a special IC up to 2000 counts, this IC is composed of high-precision A/D converter with high-speed digital processor. It is with accurate measurement, high resolution, fast operation, complete software calibration, no change in long-term use in accuracy, which is suitable for professional engineers, maintenance engineers, teaching, etc.

Please read carefully this operation manual and pay attention to safety guidelines before operating this meter.

### 1.1 Safety Information

#### 1.1.1 Safety Instructions

- Before operating this meter, the operator must observe all standard safety procedures in the two respects below:
  - A. Safety procedures against electric shock
  - B. Safety procedures against unintended use
- To ensure your personal safety, please use the test lead that accompanies the meter. Before operating this meter, ensure that the test lead is flawless.

#### 1.1.2 Safety Considerations

- When the meter is used in the vicinity of the equipment that produces strong electromagnetic interferences, the reading on the meter will grow unstable and even produce serious errors.
- Don't operate the meter or pen-shaped meter whose appearance is damaged.
- The safety function of the meter will become null if the meter is not properly operated.
- The meter must be operated with great care when working in the vicinity of an exposed conductor or bus line.
- The meter is prohibited from being used in the vicinity of any explosive gas, vapor or dust.
- The measurement must be made with correct input terminals and functions and within the allowable measuring range.
- To prevent the meter from being damaged, the value to be input shall not exceed the extremes allowed by each measuring range.
- When the meter has already been connected to the line being measured, the operator is prohibited from touching the input terminal that is not in service.
- When the voltage measured exceeds DC60V or AC30V (valid value),

the operator shall be careful enough to avoid electric shock.

- When making measurement with a test lead, place your fingers behind its protective ring.
- When switching to another measuring range, be sure that test lead has already been taken off the measured circuit.
- For all DC functions, to prevent potential electric shock as a result of incorrect reading, please first use AC functions to check the absence of any AV voltage. Then, select DC voltage measuring range equivalent to or greater than that for AC voltage.
- Before the tests on electric resistance, diode, continuity, the operator must cut off the power supply to the circuit to be measured, and discharge all high-voltage capacitors within the circuit to be measured.
- The electric resistance measurement or continuity test cannot be carried out in any live electrical circuit.
- Before the current measurement, the operator must first examine the protective tube of the meter. Before connecting the meter to the circuit to be measured, the operator must first power off the aforesaid circuit.
- Before repairing TV sets or measuring power switching circuit, the operator must be careful enough to prevent high amplitude voltage impulse from damaging the meter.
- This meter uses 3 x 1.5V AAA batteries that must be correctly installed into the battery compartment.
- When  appears, the batteries must be replaced immediately. The low level of a battery will result in incorrect reading on the meter, which is likely to bring electric shock or personal injury to the operator.
- In measurement, category II voltage shall not exceed 600V respectively.
- The meter shall not be in service if its case (or part of its case) is dismantled.

### 1.1.3 Safety Symbol:

The safety symbols that appear on the meter's body and in this Operation Manual:

	Warning, an important safety symbol. The operator must consult this Operation Manual before using the meter. Unintended use may lead to the damage to the device or its components.
	High voltage warning
	Equipment with double insulation or reinforced insulation protection
	AC (alternating current)

	DC (direct current)
	Ground
	Fuse
CAT. II 600 V	Over-voltage protection
	Conform with European Union standard

### 1.1.4 Maintenance Practices for Safety

- The operator must first pull out the test lead when the meter's case is opened or the battery cover is dismantled.
- The designated replacement parts must be used at the moment of maintenance.
- The operator must cut off all relevant power supplies before opening the meter. At the same time, the operator must avoid damage to the meter's elements by ensure that he himself doesn't carry any static.
- The meter can only be calibrated, repaired and maintained by professionals.
- When the meter's case is opened, the operator must understand the fact that the presence of some capacitance may promise the dangerous voltages even if the power supply to the meter is cut off.
- The operator should stop using and maintain the meter immediately if any abnormality has been observed on the meter. The operator must see to it that the meter cannot be in service unless it is proved conforming.
- When the meter is left idle for a long period, the operator shall remove the battery and place it in a place free from high temperature and humidity.

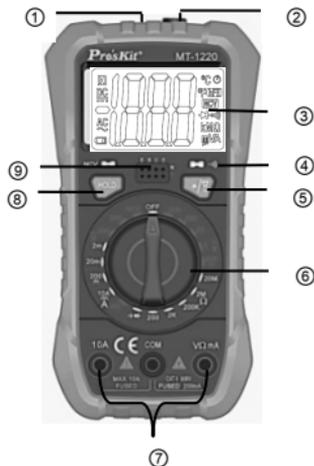
### 1.2 Input Protection Measures

- The meter can sustain the maximum input voltage of 600V (DC/AC) at the moment of voltage measurement.
- The limit voltage is 250 ACV or the equivalent RMS voltage when the resistance, continuity or diode is under measuring.
- The protective tube (F200mA/250V) is used for protection purpose when mA current measurements are carried out. The protective tube (F10A/250V) is used for protection purpose when A current measurements are carried out.

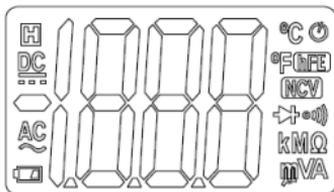
## 2. General Description

### 2.1 Schematic Diagram

- ①. LED light
- ②. Non-contact voltage indicator
- ③. LCD screen
- ④. Buzzer
- ⑤. Backlight & LED key
- ⑥. Rotary switch
- ⑦. Input socket
- ⑧. Data hold key
- ⑨. hFE socket



### 2.2 Symbols Description



Symbol	Description
	Low battery ⚠️ <b>To avoid electric shock or personal injury as a result of incorrect reading, promptly replace the battery when the low battery symbol appears.</b>
	Auto power off
	Negative input polarity
	Input voltage AC
	Input voltage DC
	Diode test or Continuity test
	Data hold
	Non-contact AC voltage detection
	hFE test
	Voltage unit

<b>A, mA, <math>\mu</math>A</b>	Current unit
<b><math>\Omega</math>, k<math>\Omega</math>, M<math>\Omega</math></b>	Resistance unit

## 2.3 Functional Keys Description

Key	Function
<b>HOLD</b>	Press the key to hold the measured value for the current moment. Press the key again to cancel this function.
	Short press the key to turn on backlight and short press again to exit. It will automatically off after about 15 seconds with no operation Long press the key to turn on the illumination function and the backlight at the same time. Short press the key again to turn off the illumination function. It will automatically off after about 30 seconds with no operation

## 2.4 Input Socket Description

Input socket	Description
<b>COM</b>	All public input terminals to be measured are connected to test leads in black or the public output plugs of exclusive multi-function test sockets.
<b>V<math>\Omega</math>mA</b>	Positive input terminals (connected to a test lead in red) for voltage measurement, electric resistance, diode measurement, beep on/off test, mA positive input terminal (connected to a test lead in red).
<b>10A</b>	10A positive input terminal (connected to a test lead in red).

## 2.5 Accessories

- |                     |          |
|---------------------|----------|
| 1. Operation Manual | X 1 pce  |
| 2. Test lead        | X 1 pair |

## 3. Operational Guidelines

### 3.1 Auto Power Off

If no operations are made in 15 minutes following the initialization, the meter will sound to remind the operator to automatically cut off power supply and enter the state of dormancy. The meter can be rebooted when the operator presses any key in the auto power off mode.

## 3.2 Measurement guidelines

### 3.2.1 AC Voltage and DC Voltage Measurement

The meter provides DC voltage measuring ranges as follows: 200.0mV, 2.000V, 20.00V, 200.0V and 600V, and AC voltage measuring ranges: 200.0V and 600V.

**⚠ To avoid any electric shock and/or damage to the meter, do not attempt a voltage measurement if the voltage (valid value) is over 600V DC or AC current.**

**To avoid any electric shock and/or damage to the meter, don't attempt to impose between any public terminal and ground any voltage whose valid value is over 600V for DC or AC current.**

- Turn the rotary switch to the position  $\sim V$  or  $\overline{\overline{=}}V$ .
- Connect the test lead in black and test lead in red to COM input socket and V input socket respectively.
- 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)
- Read the measured voltage value on LCD screen. When DC voltage measurement is attempted, the display unit will show the voltage polarity of the circuit connected to the pen-shaped meter in red.

### 3.2.2 Electric Resistance Measurement

Ohm is the unit of electric resistance ( $\Omega$ ).

The measuring ranges of electric resistance of this meter are 200.0 $\Omega$ , 2.000k $\Omega$ , 200.0k $\Omega$ , 2.000M $\Omega$  and 20.00M $\Omega$

**⚠ To avoid the meter or the measured equipment from damage, do not attempt a resistance measurement unless the operator has already cut off all power sources for the circuit to be measured and fully discharged all high-voltage capacitors.**

- Turn the rotary switch to the appropriate position.
- Connect the test lead in black and test lead in red to COM input socket and V/ $\Omega$  input socket respectively.
- Use another two ends of the test lead to measure the electric resistance of the circuit to be measured.
- Read the measured electric resistance value on LCD screen.

## Notes:

- The measured value of the electric resistance of the circuit differs a bit from the rated value of the electric resistance.
- To ensure measurement accuracy, in attempting a low resistance measurement, first put two pen-shaped meters in short circuit and capture the resistance reading of these short circuits. Then subtract the aforesaid reading from the measured resistance.
- When the meter is in open circuit, the display unit will show "OL" that indicates the measured value is over the measuring range.

### 3.2.3 Diode or Beep Continuity Test

 ***To avoid the meter or the measured equipment from damage, do not attempt a diode test unless the operator has already cut off all power sources for the circuit to be measured and fully discharged all high-voltage capacitors.***

#### Diode test outside the circuit:

- Turn the rotary switch to the position .
- Connect the test leads in black and in red to COM input socket and V/ $\Omega$  input socket respectively.
- Connect the test leads in black and in red to the positive and negative poles of the diode to be tested respectively.
- The meter displays the forward bias value of the diode to be tested. If the polarity of the test lead is reversed, the meter will display "OL".

#### Steps for a continuity test:

- Connect the test lead in black and test lead in red to COM input socket and V/ $\Omega$  input socket respectively.
- Use another two ends of the test lead to measure the resistance of the circuit to be measured. If the measured distance the beeper will sound continuously, and the LED will be on.

### 3.2.4 hFE Measurement

 ***To avoid any electric shock and/or damage to the meter, do not attempt a frequency measurement if the voltage is over 36V for DC current or AC current (valid value).***

- Turn the rotary switch to the position hFE.
- Check the transistor is NPN or PNP type, insert the emitter, base and collector separately to the correct hole, the approximate value will be displayed on LCD.

### 3.2.5 Current Measurement

The meter provides DC current measuring ranges as follows: 2mA, 20.00mA, 200.0mA and 10.00A.

 ***Do not attempt a measurement on the current in a circuit, if when the voltage between the open-circuit voltage and the ground is over 250V. If the fuse is blown at the moment of measurement, you are likely to damage the meter or get yourself hurt.***

***To avoid any damage to the meter or equipment to be measured, do not attempt a current measurement unless you have examined the meter's protective tube. In attempting a measurement, you should use the correct input sockets, function positions and measuring ranges. When a test lead is inserted into the current input socket, do not put the other end of the test lead in parallel connection with any circuit.***

- Turn the rotary switch to the appropriate position.
- Connect the test lead in black to COM input socket. Connect the test lead in red to a mA input socket when the measured current is less than 200mA; connect the test lead in red to a 10A input socket when the measured current is 200mA~10A.
- Disconnection of the circuit to be measured Connect the test lead in black to the end of disconnected circuit (the voltage is lower) and connect the test lead in red to the end of the disconnected circuit (voltage is higher).
- Connect the power to the circuit and capture the displayed reading. If the display unit only shows "OL", it means the input is over the selected measuring range. At this moment, turn the rotary switch to a higher measuring range.

### 3.2.6 Temperature Measurement

- Turn the rotary switch to the appropriate position (°C).
- Insert the cathode of thermocouple's cold end to " COM" jack and anode to " V/Ω" terminal, put the working end on or in the tested object, temperature value can be read on LCD in Celsius.

### 3.2.7 NCV Test (Non-contact Voltage Detection)

Turn the rotary switch to NCV position, and place the top of the meter approach the conductor. If the meter detects the AC voltage, the indicators for signal density (high, medium and low) will be on in accordance with the

detected density, while the beeper will sounds alarms at different frequencies.

**Note:**

- Voltage may still remain in the absence of any indication. The operator shall not rely on non-contact voltage detector to check the presence of voltage. The detection operation may be affected by various factors, including socket design, insulation thickness and type.
- When the voltage is input into the meter's input terminal, the voltage sensor LED may be on as a result of induced voltage.
- External sources of interference (like flashlight and motor) may trigger non-contact voltage detection.

## 4. Technical Parameters

### 4.1 Overall Parameters

- Operating environment:  
600V CAT II, Pollution level: 2  
Altitude: < 2000 m  
Working temperature & humidity: 0~40°C  
(The requirements will not be considered when temperature is less than 10°C and relative humidity is below 80%).  
Storage temperature & humidity: -10~60°C  
(Batteries shall be removed when RH is below 70%).
- Coefficient of temperature:  $0.1 \times \text{accuracy} / ^\circ\text{C}$  (<18 °C or >28 °C).
- Allowable max voltage between terminal to be measured and ground: 600V DC or AC (valid value)
- Protection of protective tube: mA position: protective tube F 200mA/250V; A position protective tube F 10A/250V
- Rotation rate: approximately 3 revolutions/second
- Display unit: 2000 counts displayed on LCD screen. Automatically display the symbol for unit in accordance with measurement function position.
- Outrange indication: the LCD screen will display "OL".
- Battery Low indication: "  " will appear when the battery's voltage is below the normal working voltage.
- Input polarity indication: "-" will automatically appear.
- Power: 3 x 1.5V AAA battery
- Dimensions: 148mm(L)×79mm(W)×48mm(H).
- Weight: Approximately 210g (not included batteries or test leads)

## 4.2 Precision Indicator

Accuracy:  $\pm$ (% reading + digit)

The accuracy warranty will run for 1 year upon the ex-factory date.

Reference conditions: Ambient temperature is between 18°C and 28°C and relative humidity is no more than 80%.

### 4.2.1 DC Voltage

Measuring range	Resolution	Accuracy
200mV	0.1mV	$\pm$ (0.5% Reading + 5 digits)
2V	1mV	
20V	10mV	
200V	100mV	
600V	1V	$\pm$ (0.8% Reading +5 digits)

Input impedance: 1M $\Omega$

Maximal input voltage: 600V DC or AC valid value

### 4.2.2 AC Voltage

Measuring range	Resolution	Accuracy
200V	100mV	$\pm$ ( 1% readings +10 digits )
600V	1V	$\pm$ ( 1.2% readings +10 digits )

Input impedance: 1M $\Omega$

Maximal input voltage: 600V DC or AC valid value

Frequency response: 40Hz-400Hz

### 4.2.3 Electric Resistance

Measuring range	Resolution	Accuracy
200 $\Omega$	0.1 $\Omega$	$\pm$ (1% Reading + 3 digits)
2k $\Omega$	1 $\Omega$	
200k $\Omega$	100 $\Omega$	
2M $\Omega$	1k $\Omega$	
20M $\Omega$	10k $\Omega$	$\pm$ (1.5% Reading +3 digits)

Overload protection: 250V DC/AC

Open-circuit voltage: 2.4V

### 4.2.4 Diode Test

Functions	Testing conditions
Diode test 	Forward DC current: approximately 0.8mA; Open-circuit voltage: approximately 2.4V. The display unit shows the approximate value of the diode's forward voltage drop.

o1))	The buzzer beeps when the resistance is less than 30Ω
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Overload protection: 250V DC/AC

#### 4.2.5 hFE Test

Functions	Value	Testing conditions
NPN or PNP	0~2000	Basic current is approx. 10uA, Vce is approx.2.8V

#### 4.2.6 DC Current

Measuring range	Resolution	Accuracy
2mA (only MT-1220)	0.001mA	±(1% Reading + 5 digits)
20mA	0.01mA	
200mA	0.1mA	
10A	0.01A	±(3.0% Reading + 10 digits)

Overload protection:

protective tube for mA measuring range (F200mA/250V) ;

protective tube for 10A measuring range (F10A/250V) .

When the measured current is over 5A, the duration of continuous measurement shall not be over 10 seconds. The current measurement shall be carried out 1 minute after the completion of previous measurement.

#### 4.2.7 Temperature (only MT-1225)

Measuring range	Resolution	Accuracy
-20°C~1000°C	1°C	±(1.0% Reading + 3 digits)

Overload protection: 250V DC/AC

## 5. Meter Maintenance

This section provides the basic information on maintenance, including the descriptions about replacement of protective tubes and batteries. Do not attempt the meter maintenance unless you are experienced in maintenance and have read the information on calibration, performance test and maintenance.

### 5.1 General maintenance



***To avoid any electric shock or damage to the meter, do not attempt to clean the inside of the meter. You must remove the line connecting a test lead to input signals, before opening the case or battery cover.***

You must regularly use damp cloth and a small quantity of detergent to clean the meter's shell. Don't attempt the use of any abrading or chemical solvent. The dirty or damp input socket may affect reading.

### Steps for cleaning input sockets:

- Disenable the meter and pull all test leads out of the input socket.
- Clean up all dirty substances on sockets.
- Use a new cotton ball with a detergent or lubricant to clean each socket, because lubricant can prevent the socket vulnerable to dampness from pollution.

## 5.2 Battery & Fuse Replacement



*To avoid any electric shock or personal injury as a result of incorrect reading, replace batteries once the symbol “” appear on the display unit.*

*To avoid any electric shock or personal injury, don't attempt to open the battery cover to replace batteries, unless you have already powered off the device and carried out an examination to ensure that the test lead has been disconnected from the circuit to be measured.*

### Battery Replacement:

1. Turn off the power of the meter.
2. Disconnect all test leads from the input socket.
3. Use a screwdriver to remove the screw of battery cover.
4. Take off the battery cover.
5. Take out the old batteries carefully and replace with 3 pcs 1.5 V AAA new batteries.
6. Fix the battery cover.

### Fuse Replacement

When fuse is blown, replace with the same type of fuse.

1. Turn off the power of the meter and take out the holster.
2. Use a screwdriver to remove the screw of back cover.
3. Take off the back cover.
4. Remove the blown fuse and replace with the same type of fuse
5. Screw the back cover
6. Put the holster back.

# MT-1220/MT-1225 3 1/2 數位電表使用說明書

## 1. 概述

MT-12 系列是測量精度高，回應速度快，安全可靠的多用數字儀錶，內嵌有 2000 計數的專用晶片，此晶片為高精度 AD 搭配高速數字處理器組成，具有測量準確，解析度高，運算速度快特點。整機軟體校準，長期使用精度有保證。能滿足電器，電子，電工，教學，專業工程師，維修人員，電子愛好者等各種應用及人群的使用，是一款理想的測試工具。

使用前，請仔細閱讀使用說明書並請注意有關安全工作準則。

### 1.1. 安全資訊

#### ■ 安全說明

使用本儀錶時，使用者必須遵守關於以下兩方面的全部標準安全規範：

A 防止電擊方面的安全規範

B 防止錯誤使用儀錶方面的安全規範

為保證人身安全，請使用隨錶提供的錶棒。在使用前，檢查並確保它們是完好的。

#### ■ 安全注意事項

- 在電磁干擾比較大的設備附近使用儀錶，儀錶的讀數會不穩定，甚至可能會產生較大的誤差。
- 當儀錶或錶棒外觀破損時，請不要使用。
- 若不正确使用儀錶，儀錶提供的安全功能可能會失效。
- 在裸露的導體或匯流排周圍工作時，必須極其小心。
- 禁止在爆炸性的氣體、蒸汽或灰塵附近使用本儀錶。
- 必須使用正確的輸入端、功能、量程來進行測量。
- 輸入值切勿超過每個量程所規定的輸入極限值，以防損壞儀錶。
- 當儀錶已連接到被測線路時，切勿觸摸沒有使用的輸入端。
- 當被測電壓超過 DC 60V 或 AC 30V 有效值時，小心操作防止電擊。
- 使用錶棒測量時，應將手指放在錶棒的護環後面。
- 在轉換量程之前，必須保證錶棒已經離開被測電路。
- 對於所有的直流功能，為避免由於可能的不正確讀數而導致電擊的危險，請先使用交流功能來確認是否有任何交流電壓的存在。然後，選擇一個等於或大於交流電壓的直流電壓量程。
- 在進行電阻、二極體測量或通斷測試前，必須先切斷被測電路電源，並將被測電路裏所有的高壓電容器放電。
- 不可在帶電的電路上測量電阻或進行通斷測試。
- 在進行電流測量前，應先檢查儀錶的保險管。在儀錶連接到被測電路之前，應先將被測電路的電源關閉。
- 在進行電視機維修或測量電源轉換電路時，必須小心被測電路中的高幅電壓脈衝以免損壞儀錶。
- 本儀錶使用 3 節 1.5V AAA 電池供電，電池必須正確安裝在儀錶的電池盒內。

- 當電池低電壓符號  出現時，應立即更換電池。電池電量不足會使儀錶讀數錯誤，從而可能導致電擊或人身傷害。
- 在進行測量類別 II 電壓測量時不可超過 600V。
- 儀錶的外殼（或外殼的一部分）被拆下時，切勿使用儀錶。

#### ■ 安全符號：

儀錶錶體及使用說明書中使用的符號：



警告，重要的安全標誌，使用前應參閱使用說明書。錯誤使用可能致設備或它的部件的損壞



高壓危險警示標誌



AC (交流)



DC (直流)



接地



雙重絕緣保護



保險絲

CAT.II II類 600 V 過電壓保護



符合歐盟(European Union)指令

#### ■ 安全的保養習慣

- 打開儀錶外殼或拆下電池蓋時，應先拔出測試錶棒。
- 維修儀錶時，必須使用指定的替換零部件。
- 在打開儀錶前，必須斷開一切有關的電源，同時也必須確保您沒帶有靜電以免損壞儀錶的元器件。
- 儀錶的校準以及維修操作必須由專業人員操作。
- 打開儀錶外殼時，必須注意到儀錶內的一些電容即使在儀錶關閉電源以後還保存著危險的電壓。
- 如果觀察到儀錶有任何異常，該儀錶應立即停止使用並送維修。並確保在檢查合格前不能被使用。
- 當長時間不用時，請將電池取下，並避免存放於高溫高濕的地方。

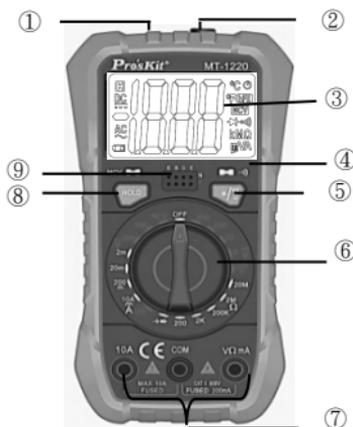
#### 1.2. 輸入保護措施

- 在進行電壓測量時，可承受最高輸入電壓是直流或交流電壓 600V。
- 在進行頻率、電阻、通斷和二極體測量時，可承受不超過交流電壓 250V 或等值的有效值電壓。
- 在進行 mA 電流測量時，通過保險管 ( F200mA/250V ) 保護；進行 A 電流測量時，通過保險管 ( F10A/250V ) 保護。

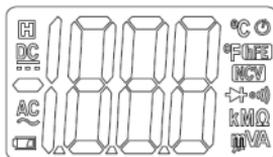
## 儀錶示意圖

### 1.3. 儀錶示意圖

- ① 輔助照明 LED
- ② 非接觸電壓感應探頭
- ③ 液晶顯示器
- ④ 蜂鳴指示 LED
- ⑤ 背光/輔助照明按鍵
- ⑥ 旋轉開關
- ⑦ 輸入插座
- ⑧ 數據保持按鍵
- ⑨ HFE 測試插孔



### 1.4. 顯示器符號說明



符號	說明
	電池低電壓指示/低電池電量。 ⚠ 為避免錯誤的讀數而導致遭受到電擊或人身傷害，本電池低壓符號顯示出現時，應儘快更換電池。
	自動關機功能指示符。
	輸入極性指示負極
	交流輸入指示。
	直流輸入指示。
	儀錶在二極體測試或通斷測試模式下。
	儀錶在資料保持模式下。
NCV	儀錶在非接觸交流電壓偵測模式下。
hFE	電晶體放大倍數測量
V, mV	V：伏特，電壓的單位 mV：毫伏， $1 \times 10^{-3}$ 或 0.001 伏特
A, mA	A：安培，電流的單位。 mA：毫安培， $1 \times 10^{-3}$ 或 0.001 安培。

$\Omega$ , $k\Omega$ , $M\Omega$	$\Omega$ : 歐姆, 電阻的單位。 $k\Omega$ : 千歐, 1000 歐姆。 $M\Omega$ : 兆歐, 1,000,000 歐姆。
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### 1.5. 功能按鍵說明

按 鍵	功 能 說 明
HOLD	按此鍵保持該瞬間的測量值。再按下就取消該功能。
	短按此鍵, 開啟背光, 再次短按該鍵, 關閉背光; 若無操作, 15 秒鐘後自動關閉。長按此鍵約 3 秒, 輔助照明開啟, 同時背光燈點亮, 短按可關掉照明及背光燈。若不按此鍵, 30 秒後自動關閉。

### 1.6. 輸入插座說明

輸入插座	描 述
COM	所有測量的公共輸入端與黑色測試錶棒或專用多功能測試座的公共輸出插頭相連。
V $\Omega$ mA	電壓、電流 mA、電阻、二極體、蜂鳴器通斷測量的正輸入端 (與紅色測試錶棒相連)。
10A	電流 10A 的正輸入端 (與紅色測試錶棒相連)。

### 1.7. 配件

使用說明書一本

測試錶棒一對

## 2. 操作指南

### 2.1. 常規操作

#### ■ 讀數保持模式

- 讀數保持模式可以將目前的讀數保持在顯示器上。改變測量功能檔位或再按一次 HOLD 鍵都可以退出讀數保持模式。
- 按一次“H”鍵, 讀數被保持且  符號同時顯示在液晶顯示器上。
- 再按一次“H”鍵將使儀錶恢復到正常測量狀態。

#### ■ 自動關機功能

開機約 15 分鐘後若無任何操作, 儀錶會發出滴滴聲音然後將自動切斷電源, 進入休眠狀態。在自動關機模式下按任何按鍵可重新開機。

### 2.2. 測量指南

#### ■ 測量交流和直流電壓

本儀錶的直流電壓量程為: 200.0mV、2.000V、20.00V、200.0V 和 600V; 交流電壓量程為: 200.0V、600.0V。

 不可測量任何高於 600V 直流或交流電壓, 以防遭到電擊和/或損壞儀錶。  
 不可在公共端和大地間施加超過 600V 直流或交流有效值的電壓以防遭到電擊和/或損壞儀錶。

- 將旋轉開關旋至  $V\sim$  或者  $V\text{---}$  檔位。
- 分別把黑色錶棒和紅色錶棒連接到 COM 插座和 V 輸入插座。
- 用錶棒另兩端測量待測電路的電壓值。(與待測電路並聯)
- 液晶顯示器讀取測量電壓值。在測量直流電壓時，顯示器會同時顯示紅色表筆所連接的電壓極性。

## ■ 測量電阻

電阻的單位是歐姆 ( $\Omega$ )

本儀錶的電阻量程為 200.0 $\Omega$ 、2.000k $\Omega$ 、200.0k $\Omega$ 、2.000M $\Omega$ 、20.00M $\Omega$

**⚠ 為避免儀錶或被測設備的損壞，測量電阻前，應切斷被測電路的所有電源並將所有高壓電容額充分放電。**

- 將旋轉開關旋至合適檔位。
  - 分別把黑色錶棒和紅色測試錶棒連接到 COM 插座和 V/ $\Omega$  輸入插座。
  - 用錶棒另兩端測量待測電路的電阻值。
  - 由液晶顯示器讀取測量電阻值。
- ※ 注意：
1. 在電路上所測量到的電阻值通常會和電阻的額定值有所不同。
  2. 在測量低電阻時，為了測量準確請先短路兩錶棒讀出錶棒短路的電阻值，在測量被測電阻後需減去該電阻值。
  3. 當儀錶開路時，顯示器將顯示“OL”，表示測量值超出量程範圍。

## ■ 二極體及蜂鳴器斷測試

**⚠ 為避免儀錶或被測設備的損壞，在二極體測量以前，應切斷被測電路的所有電源並將所有高壓電容額充分放電。**

※ 在電路外測試一個二極體：

- 將旋轉開關轉至  $\rightarrow|0|$  檔位
- 分別把黑色測試錶棒和紅色測試錶棒連接到 COM 插座和 V/ $\Omega$  輸入插座。
- 分別把黑色測試錶棒和紅色測試錶棒連接到被測二極體的負極和正極。
- 儀錶將顯示被測二極體的正向偏壓值。如果測試錶棒極性接反，儀錶將顯示“OL”。
- 在電路裏，正常的二極體仍應產生 0.5V 到 0.8V 的正向壓降；但反向偏壓的讀數將取決於兩錶棒之間其他通道的電阻值變化。

※ 通斷測試：

- 分別把黑色測試錶棒和紅色測試錶棒連接到 COM 插座和 V/ $\Omega$  輸入插座。
- 測試錶棒另兩端測量接被測電路兩端，如被測電路電阻小於約 50 $\Omega$ ，蜂鳴器會發出連續響聲，感應指示燈點亮。

## ■ 電晶體測量

**⚠ 不可在公共端和 hFE 端施加超過 36V 直流或交流有效值的電壓以防遭到電擊和/或損壞儀錶。**

- 將旋轉開關轉至 hFE 檔位。
- 判別電晶體是 NPN 或 PNP 型，然後將三極管的 e.b.c 三個腳插入 HFE 測試座的相應孔內。
- 液晶顯示器上讀得被測電晶體的 hFE 近似值。

## ■ 電流測量

本儀錶的直流電流量程為 2mA、20.00mA、200.0mA、10A

**⚠ 當開路電壓對地之間的電壓超過 250V 時，切勿嘗試在電路上進行電流測量。如果測量時保險管被燒斷，您可能會損壞儀錶或傷害到您自己。**  
**為避免儀錶或被測設備的損壞，進行電流測量以前，請先檢查儀錶的保險管。測量時，應使用正確的輸入插座、功能檔和量程。當測試錶棒被插進電流輸入插座上的時候，切勿把錶棒另一端並聯跨接到任何電路上**

- 將旋轉開關轉至合適檔位。
- 把黑色錶棒連接到 COM 插座。如被測電流小於 200mA 時將紅色測試錶棒連接到 mA 輸入插座；如被測電流在 200mA~10A 間，將紅色測試錶棒連接到 10A 輸入插座。
- 斷開待測的電路。把黑色測試錶棒連接到被斷開的電路（其電壓比較低）的一端，把紅色測試錶棒連接到被斷開的電路（其電壓比較高）的一端。
- 接上電路的電源，然後讀出顯示的讀數。如果顯示器只顯示“OL”，這表示輸入超過所選量程，旋轉開關應置於更高量程。

### ※ 測量溫度：

- 將旋轉開關旋至合適檔位。儀錶將顯示周圍環境溫度。
- 分別把熱電偶的正負極性連接到 COM 插座和 V/ $\Omega$  輸入插座，測溫探頭接觸待測物體表面。
- 由液晶顯示器讀取測量溫度值。

## ■ NCV 測試（非接觸電壓偵測）

- 將旋轉開關旋轉 NCV 檔位，將儀錶頂部貼近導體，如果儀錶探測到 30V 以上交流電壓時，儀錶根據探測到的信號強度，點亮相應信號強度指示燈（高、低），同時蜂鳴器發出不同頻率的報警聲。

### ※ 注意：

- 即使沒有指示，電壓仍然存在。不要依靠非接觸電壓探測器來判斷導線是否存在電壓。探測操作可能會受到插座設計、絕緣厚度及類型不同等因素的影響。
- 當儀錶輸入端子輸入電壓時，由於感應電壓的存在，電壓感應指示燈亦可能會亮。
- 外部環境的干擾源（如閃光燈，馬達等），可能會誤觸發非接觸電壓探測。

## 3. 技術指標

### 3.1. 綜合指標

#### ■ 使用環境條件：

- 600V CAT II 污染等級：2
- 海拔高度 < 2000 m。
- 工作環境溫濕度：0~40 °C（<80% RH，<10°C 時不考慮）。
- 儲存環境溫濕度：-10~60°C（<70% RH，取掉電池）。
- 溫度係數：0.1% 準確度 / °C（<18 °C 或 >28 °C）。
- 測量端和大地之間允許的最大電壓：600V 直流或交流有效值
- 保險管保護：mA 檔：保險管 F 200mA/250V；A 檔保險管 F 10A/250V
- 轉換速率：約 3 次/秒
- 顯示器：2000 counts 液晶顯示器顯示。按照測量功能檔位自動顯示單位符號。

- 超量程指示：液晶顯示器顯示“OL”。
- 電池低壓指示：當電池電壓低於正常工作電壓時，“ ”顯示。
- 輸入極性指示：自動顯示“-”號。
- 電源：3 x 1.5V AAA 電池
- 外形尺寸：148mm(L)×79mm(W)×48mm(H)。
- 重量：約 210g ( 不含表筆、電池 )。

### 3.2. 精度指標

- 準確度：± ( %讀數+字 )，保證期自出廠之日起一年。
- 基準條件：環境溫度 18°C至 28°C、相對濕度不大於 80%。

#### ■ 直流電壓

量程	解析度	準確度
200mV	0.1mV	± ( 0.5% 讀數 +5 字 )
2V	1mV	
20V	10mV	
200V	100mV	
600V	1V	± ( 0.8% 讀數 +5 字 )

輸入阻抗：1MΩ

最大輸入電壓：600V DC 或 AC 有效值。

#### ■ 交流電壓

量程	解析度	準確度
200V	100mV	± ( 1% 讀數 +10 字 )
600V	1V	± ( 1.2%讀數+10 字 )

輸入阻抗：1MΩ

最大輸入電壓：600V DC 或 AC 有效值。

頻率回應：40Hz-400Hz 平均值

#### ■ 電阻

量程	解析度	準確度
200Ω	0.1Ω	±(1% 讀數 +3 字)
2kΩ	1Ω	
200kΩ	100Ω	
2MΩ	1kΩ	
20MΩ	10kΩ	±(1.5% 讀數 +3 字)

超載保護：250V DC/AC

開路電壓：2.4 V

## ■ 二極體及蜂鳴器通斷

功能	測試條件
二極體測試 	正向直流電流：約 0.8mA；開路電壓：約 2.4V。 顯示器顯示二極體正向壓降的近似值。
	當被測電阻小於約 30Ω時，蜂鳴器響，同時指示燈亮

超載保護：250V DC/AC

## ■ 電晶體

量程	說明	測試條件
hFE	顯示器讀出 hFE 的近似值，( 0 -1000 )	基極電流約 10μA Vce 約 2.8V

## ■ 直流電流

量程	解析度	準確度
2mA(僅 MT-1220)	0.001mA	± ( 1% 讀數 +5 字 )
20mA	0.01mA	
200mA	0.1mA	
10A	0.01A	± ( 3% 讀數 +10 字 )

超載保護：mA 量程保險管 ( F200mA/250V )；10A 量程保險管 ( F10A/250V )。  
當測量電流大於 5A 時，連續測量時間不能長於 10 秒鐘，測量後須停止電流測量 1 分鐘。

## ■ 溫度測量(僅 MT-1225)

量程	解析度	準確度
-20°C ~ 1000°C	1°C	±(1.0% Reading + 3 digits)

超載保護：250V DC/AC

## 4. 儀錶維護

本節提供基本的維護資料，包括更換保險管和更換電池的說明。

除非您是有經驗的維修人員且有相關的校準、性能測試以及維修資料，否則不要嘗試去維修本儀錶

### 4.1. 一般維護



**為避免受到電擊或損壞儀錶，不可弄濕儀錶內部。在打開外殼或電池蓋前，必須把錶棒和輸入信號的連接線拆除。**

可使用濕布和少量洗滌劑清潔儀錶外殼，勿用研磨劑或化學溶劑。

輸入插座如果弄髒或潮濕可能會影響讀數。

### ■ 清潔輸入插座：

- 關閉儀錶，並將所有錶棒從輸入插座中拔出。
- 清除插座上的所有髒物。
- 用新的棉花球沾上清潔劑或潤滑劑，清理每個插座，潤滑劑能
- 防止和濕氣有關的插座污染。

### 4.2. 更換電池及保險絲



為避免錯誤的讀數而導致受到電擊或人身傷害，儀錶顯示器出現“符號時，應馬上更換電池。

只能使用指定的保險絲(F200mA/250V,F10A/250V 速熔保險絲)

為避免受到電擊或人身傷害，在打開電池蓋更換新電池之前，應關機並檢查測試鐵棒已從測量電路斷開。

#### ■ 更換電池或保險絲：

- 關斷儀錶電源。
- 將所有錶棒從輸入插座中拔出。

#### ■ 更換電池

- 用十字起子取出固定電池蓋的螺釘。
- 取下電池蓋。
- 拿掉舊電池，換上新的 3 x 1.5V AAA 電池。
- 裝上電池蓋，上緊螺釘。

#### ■ 更換保險絲

- 拿掉防護膠套。
- 用十字起子取出固定儀錶後蓋的螺釘。
- 取下儀錶後蓋。
- 拿掉損壞的保險絲，換上符合規格的新保險絲。
- 裝上儀錶後蓋，旋緊螺絲。
- 裝上防護膠套。



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