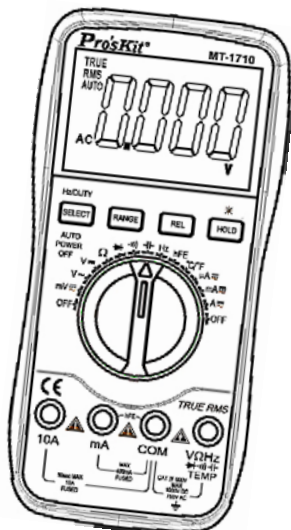


# Pro'sKit®

CE

MT-1710

3-3/4 True-RMS Auto Range Multimeter



User's Manual

1<sup>st</sup> Edition, 2013/11/21

©2013 Copyright by Prokit's Industries Co., Ltd.

## 1. INTRODUCTION


The instrument is a stable and high performance True-RMS digital multimeter driven by battery. With 25mm high LCD display, the digital multimeter is easier for users to read the digits. In addition, the design of backlight and overload protection is convenient for operation.

The function of MT-1710 is to measure DCV, ACV, DCA, ACA, Resistance, Capacitance, Frequency, Temperature, Transistor, Diode and Continuity test. The instrument which adopts dual-integral A/D converter is an excellent meter. It's an ideal tool for lab, factory and field use.


## 2. SAFETY NOTES


The meter meets the standard of IEC1010. Please read safety notes before operation.

- 1 · Do not input more than the limited voltage of 1000V DC or 750V AC RMS when measuring voltage.
- 2 · Safety voltage is less than 36V. When the voltage is higher than 36V DC, 25V AC, please check the connection, insulation of test leads to avoid electric shock.
- 3 · When switching function and range, test probes should be removed from testing point.
- 4 · Select correct function and range.
- 5 · To measure current, do not input over 10A current.
- 6 · Safety symbols:

 High Voltage

 GND


 Dual Insulation

 Refer to Manual

 Low Battery

## 3. SPECIFICATIONS

### 3.1 General Specifications

- Display Mode: LCD display
- Max. Indication: 3999 (3 3/4), auto polarity indication
- Measuring Method: Dual-slope integrating A/D converter system
- Sampling Rate: Approx. 3 times/second
- Over Range Indication: "OL"
- Low Battery: 
- Operating Environment: Temperature (0 ~ 40)°C, Humidity<80%RH
- Power: 9V battery.
- Dimension: 190mm×95mm×45mm.
- Weight: Approx 370g. (Not included battery)
- Accessories: Operation manual, holster, gift box, thermocouple, test leads

### 3.2 ELECTRICAL SPECIFICATIONS

Accuracy is  $\pm$  (RDG  $\times$  a% + the lowest digit) at (23 $\pm$ 5) $^{\circ}$ C, <75%RH.

#### DC Voltage mV:

Range	Accuracy	Resolution
400mV	$\pm$ (0.5%+4)	0.1mV

Input Impedance: > 40M $\Omega$

Overload Protection: 1000V DC or 750V AC peak value

#### DC Voltage :

Range	Accuracy	Resolution
4V	$\pm$ (0.5%+4)	1mV
40V		10mV
400V		100mV
1000V	$\pm$ (1.0%+6)	1V

Input Impedance: 10M $\Omega$

Overload Protection: 1000V DC or 750V AC peak value

#### AC Voltage mV (True RMS) :

Range	Accuracy		Resolution
	40Hz-200Hz	200Hz-1kHz	
400mV	$\pm$ (1.6%+8)	$\pm$ (1.6%+8) sine and triangular wave $\pm$ (8.0%+15) other wave	0.1mV

Input Impedance: > 40M $\Omega$

Overload Protection: 1000V DC or 750V AC peak value

Frequency Response: 40Hz-1 kHz

Display: True RMS

#### AC Voltage ( True RMS) :

Range	Accuracy		Resolution
	40Hz-200Hz	200Hz-1kHz	
4v	$\pm$ (1.0%+10)	$\pm$ (0.8%+10) sine and triangular wave $\pm$ (8.0%+15) other wave	1mV
40v			10mV
400V			100mV
750V			1V

Input Impedance : 10M $\Omega$

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

Frequency Response : 40Hz-1 kHz

Display: True RMS

**DC Current :**

Range	Accuracy	Resolution
400uA	$\pm(1.0\%+10)$	0.1uA
4000uA		1uA
40mA	$\pm(1.2\%+8)$	10uA
400mA		100uA
10A	$\pm(1.2\%+10)$	10mA

Max. Measuring Voltage Drop: Full scale mA range: 400mV  
A range: 100mV

Max. Input current: 10A (less than 10 seconds).

Overload protection: 400mA/250V fuse, 10A/250V fuse.

**AC Current (True RMS) :**

Range	Accuracy		Resolution
	40Hz-200Hz	200Hz-1kHz	
400uA	$\pm(1.5\%+10)$	$\pm(1.5\%+10)$ sine and triangular wave	$\pm(8.0\%+15)$ other wave
4000uA			
40mA			
400mA			
10A	$\pm(2.0\%+15)$	$\pm(2.0\%+15)$ sine and triangular wave	10mA

Max. Measuring Voltage Drop: Full scale mA range: 400mV  
A range: 100mV

Max. Input Current: 10A (less than 15 seconds).

Overload Protection: 400mA /250V fuse, 10A/250V fuse

Frequency Response: 40Hz-1kHz.

**Resistance :**

Range	Accuracy	Resolution
400Ω	$\pm(0.8\%+4)$	0.1Ω
4kΩ		1Ω
40kΩ		10Ω
400kΩ		100Ω
4MΩ		1kΩ
40MΩ	$\pm(1.2\%+10)$	10kΩ

Overload Protection: 250V DC/AC peak value

Open circuit voltage: 400mV

**Note:** When measuring 400Ω range, the test leads should be short-circuited to observe short-circuit impedance.

**Capacitance :**

Range	Accuracy	Resolution
10nF	$\pm(3.5\%+8)$	10pF
100nF		100pF
1u F		1nF
10uF		10nF
100uF		100nF
1mF/10mF/100 mF	$\pm(5.0\%+10)$	1 uF/10 uF/100 uF

Overload Protection: 250V DC/AC peak value

**Frequency :**

Range	Accuracy	Resolution
100Hz	$\pm(0.5\%+10)$	0.01Hz
1000Hz		0.1Hz
10kHz		1Hz
100kHz		10Hz
1MHz		100Hz
30MHz		1kHz

Input Sensitivity: 1.5V



Overload Protection: 250V DC/AC peak value

**hFE test :**

Range	Value	Test condition
NPN or PNP	0~1000	Basic current is approx. 10uA, Vce is approx. 3V

Warning: do not input voltage at the range for safety

**Diode and continuity Test :**

Range	Value	Test Condition
	Positive voltage drop of diode	The positive DC Current is approx. 0.5mA; negative voltage is approx. 1.5V.
	Buzzer sounds, the resistance is less than $40\pm 30\Omega$ .	Open circuit voltage: 0.5V

Overload Protection: 250V DC/AC peak value

Warning: do not input voltage at the range for safety.

## Temperature :

Range	Value	Test condition
(-20-1000)°C	<400°C ±(1.0%+5) ≥400°C ±(1.5%+15)	1°C
(-4-1832)°F	<752°F ±(1.0%+5) ≥752°F ±(1.5%+15)	1°F

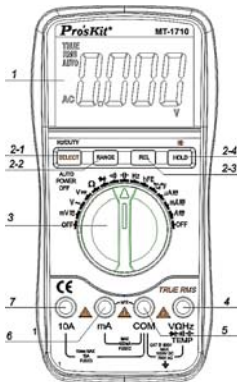
Sensor: K type

Warning: Do not input voltage at the range for safety.

## 4. OPERATION

### 4.1 Front Panel and Description :

- LCD: display the measuring value and unit.
- Function key
  - "select" key: Select DC/AC, frequency and duty cycle. Hz/DUTY Key: when measuring DCA, press the key to switch ACA. When measuring frequency, press the key to switch frequency/duty cycle (1~99%).
  - RANGE Key: Select the mode of automatic measurement and manual measurement. The default mode is automatic measurement and "AUTO" is displayed. Press the key to manual mode, and if you press one time, it will be turned to next level from low to high in turn. Press the key for 2 sec. and it will return to automatic measurement condition.
  - REL Key: Press the key at voltage, current and capacitance range, and then digits are reset to show relative value measurement. LCD displays "REL" symbol, and press it again to exit the function.
  - HOLD Key: Press the key, the present value is showed on LCD and display "HOLD". Press the button again to exit the function. Press the key for 2 sec. will turn to the backlight.
- Rotary Switch: Select measurement function and range.
- Voltage, Resistance, Frequency, temperature, diode, continuity jack.
- COM jack
- For measuring current less than 400mA jack.
- For measuring current 10A jack.



### 4.2 DC Voltage measurement :

- Insert the BLACK test lead to "COM" jack and RED test lead to the "VΩHz" jack.
- Switch the FUNCTION to "V" range.
- The default range is Auto, and "AUTO" is displayed. To press RANGE key

4. Connect the test leads to the tested point, the voltage and polarity that are connected with the red lead will appear on LCD.

**Note:**

1. Manual measurement if LCD displays "OL", it means over range. Please set the range knob to a higher range.
2. Do not measure over 1000V DCV, or the meter will be damaged.
3. Be careful to avoid contact with high voltage circuits when measuring high voltage.

#### **4.3 DC Voltage mV Measurement :**

1. Insert the BLACK test lead to "COM" jack and RED test lead to the "VΩHz" jack.
2. Set the FUNCTION switch to "mV" range.
3. Measuring less than 400mv voltage has no automatic measurement function at this range.
4. Connect the test leads to the tested point, the voltage and polarity that are connected with the red lead will appear on LCD.

**Note:**

1. If LCD displays "OL", it means over range. Please set the range knob to a higher range
2. Do not measure over 1000V DCV, or the meter will be damaged.
3. Be careful to avoid contact with high voltage circuits when measuring high voltage.

#### **4.4 AC Voltage mV True-RMS Measurement :**

1. Insert the BLACK test lead to "COM" jack and RED test lead to the "VΩHz" jack.
2. Switch the FUNCTION to "mV" range, and press the "select" key. LCD displays ACmV with no automatic measurement function at this range. Do not measure over 400mv voltage.
3. Connect the test leads to the tested point, the voltage of the two points that are connected with the test leads will appear on LCD.

**Note:**

1. If LCD displays "OL", it means over range. Please set the range knob to automatic AC voltage.
2. Do not measure over 400mV AC, or the meter will be damaged.

#### **4.5 AC Voltage True-RMS Measurement :**

1. Insert the black test lead to "COM" jack and the red one to "VΩHz" jack.
2. Switch the function to " $V \sim$ " range.
3. The default range is Auto range, and "AUTO" is displayed. To press RANGE key switch to manual range, and 400mV/4V/40V/400V/700V can be selected.
4. Connect the test leads to the test points, and the voltage of the two points that are connected with the test leads will appear on LCD.

**Note:**

1. Manual measurement, if LCD displays "OL", it means over range. Please set the range knob to a higher range.
2. Do not measure over 750V ACV, or the meter will be damaged.
3. Caution to avoid contact with high voltage circuits when measuring high voltage.

**4.6 DC Current Measurement :**

1. Insert the BLACK test lead to "COM" jack and RED test lead to the "mA" (max. 400mA) or "10A" jack (max. 10A).
2. Switch the FUNCTION to current range. Press "SELECT" key to select DC measure mode, connect the leads across to the tested circuit, the current value and polarity the red lead connect with will appear on LCD.

**Note:**

1. If the current range is unknown beforehand, please switch the FUNCTION to a high range and work down.
2. When the figure displayed "OL", it means over range. Please switch FUNCTION to a higher range.
3. The max input current is 400mA or 10A depended on the jack used.
4. Excessive current will blow the fuse.
5. Do not input over DCV 36V or ACV 25V on "COM", "mA" or "A" terminal.

**4.7 AC Current True-RMS Measurement :**

1. Insert the BLACK test lead to "COM" jack and RED test lead to the mA" (max. 400mA) or "10A" jack (max. 10A).
2. Switch the FUNCTION to current range. Press "SELECT" key to select AC measure mode, connect the leads across to the tested circuit, the current value will appear on LCD.

**Note:**

1. If the current range is unknown beforehand, please switch FUNCTION to a high range and work down.
2. If LCD displays "OL", it means over range. Please set the range knob to a higher range.
3. The max input current is 400mA or 10A depended on the jack used.
4. Excessive current will blow the fuse.
5. Do not input over DCV 36V or ACV 25V on "COM", "mA" or "A" terminal.


**4.8 Resistance Measurement :**

1. Connect the BLACK test lead to "COM" jack and RED test lead to the "VΩHz" jack.
2. Please switch the FUNCTION to "Ω" range.
3. Please press "RANGE" to Auto/Manual measurement.
4. To measure small resistance, please short-circuit test leads first, and press "REL" one time. Then, to measure the unknown resistance, and ensure measured value is accuracy.

**Note:**

1. To use manual method, if the resistance range is unknown beforehand, switch the FUNCTION to a higher range and work down.
2. When LCD displays "OL" signal, it means over-range. If measured resistance is more than  $1M\Omega$ , the meter may take a few seconds to stabilize. This is normal for high resistance setting.
3. When the input is not connected, i.e. at open circuit, the figure "OL" will be displayed for the over range condition.
4. When checking resistance in the circuit, be sure that the power has been switched off and all capacitors are fully discharged.
5. Do not input any voltage at this range.

#### **4.9 Capacitance Measurement :**

1. Switch the FUNCTION to " position.
2. Connect the BLACK test lead to "COM" jack and RED test lead to the "VΩHz" jack.
3. If the figure on LCD is not zero, press the "REL" key to zero.
4. Connect the tested capacitor to the leads, and the value will be displayed on LCD.

##### **Note:**

1. Capacitance range has no manual measurement function.
2. Before measuring each time, please press "REL" to ensure accurate measurement.
3. To avoid damage to the meter, please discharge all capacitors completely before capacitance measurement.
4. 200uF range input digits take approx. 15 seconds to stabilize.

#### **4.10 Frequency Measurement :**

1. Connect test leads or shield cable to "COM" and "VΩHz" jack.
2. Switch the FUNCTION to the "Hz" range, and connect test leads or cable to the source load for test.
3. Press "SELECT/Hz/Duty" to switch frequency/duty cycle, and displays the reading of frequency or duty cycle.



##### **Note:**



1. Frequency range has no manual measurement function.
2. Do not apply more than 250V DC/AC peak value to the input.
3. Indication is possible at voltage higher than 10V AC rms, but readings may be out of specification.
4. In the noisy environment, it is preferable to use shield cable for measuring small signal.
5. Be caution to avoid contacting high voltage circuits when measurement high voltage.

#### 4.11 hFE Measurement :

1. Switch the function to hFE range.
2. 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.

#### 4.12 Diode and Continuity Test :

1. Connect the BLACK test lead to "COM" jack and RED test lead to the "VΩHz" jack. (Notice the RED test lead should be +)
2. Switch the FUNCTION to "", and test the diode.
3. Forward measurement: Connect RED test lead to the positive of the test diode, BLACK test lead to the negative, then, reading of approx. forward voltage of this diode will be displayed on LCD.
4. Reverse measurement: Connect BLACK test lead to the positive of the test diode, RED test lead to the negative, the mark "OL" will be displayed.
5. Complete diode test should include both steps. If the result doesn't meet above result, it means the diode is out of order.
6. Switch the FUNCTION to "" range.
7. Connect the test probes to two points of circuit, if the resistance is lower than 50Ω, Buzzer will sound.

**Note:** Do not input voltage at  or  range.

#### 4.13 Temperature Measurement :

1. Switch the function key to "°C/°F" range.
2. Insert two ends of the temperature sensor into "COM" and "VΩHz" jack, and connect the work-point to the place where wanted to take temperature. The value will be displayed on LCD.
3. Press "Select" key to select centigrade/ Fahrenheit mode.

#### NOTE:

1. When the input terminal is in open circuit, it will display the "normal temp."
2. Do not change the thermocouple, or the accuracy can not be secured.
3. Do not input voltage at this range.

#### 4.14 Data hold :

Press "Hold" key, and the current data will be displayed on LCD; Press the key again, and it will cancel the hold function.

#### 4.15 Backlight :

Press "Hold" key for 2 sec. to turn on the backlight, and it will be automatically off after 10 sec.

#### **4.16 Auto Power Off :**

1. Whenever the meter is idle for 15mins, it is automatically off and enters sleep mode. The buzzer will sound before power-off. Press any key to turn on the power.
2. Press "SELECT" key before turning on the meter. The meter will cancel power-off function automatically.


### **5. WARNING**

1. When measuring voltage, please ensure that instrument is not connected or switched to a current or resistance range, or to the diode check. Always ensure that the correct terminals are used for the type of measurement to be made.
2. Pay more attention to measure voltage above 36Vdc, especially from sources where high energy is existed.
3. Avoid making connections to "live" circuits whenever possible.
4. When making current measurements ensure that the circuit is not "live" before opening it in order to connect the test leads.
5. Before making resistance measurements or diode test, please ensure that the circuit under test is de-energized.
6. Always ensure that the correct function and range is selected. If in doubt about the correct range to use, start with the highest and work downwards.
7. Please pay more attention when using the instrument to conjunction with a current transformer connected to the terminals if an open circuit occurs.
8. Ensure that the test leads and probes are good condition with no damage to the insulation.
9. Take care not to exceed the over-load limits as given in the specification.
10. The spec of replacement fuse must be the corrected type and rating.
11. Before opening the case of the instrument to replace battery or fuse, disconnect the test leads from any external circuit, set the selector switch to "OFF" position.

### **6. MAINTENANCE**

The meter is a precision instrument. Please don't change inner circuit without authorization.

- 1 Keep the multimeter dry. Keep the multimeter away from dust, dirt, and do not drop.
- 2 Multimeter should only be used and stored in normal temperature environments. Electronic devices' lives can be shortened under extreme temperature, and damage batteries, and distort or melt plastic part.
- 3 Hold the multimeter gently and carefully. Dropping it can damage the circuit boards and case and can cause the multimeter to work improperly although the holster can provide enough protection.
- 4 Wipe the multimeter with a damp cloth occasionally. Do not use harsh chemicals, cleaning solvents, or strong detergents to clean the multimeter.
- 5 Take out the battery if the meter will not be used for a long time.

- 6 When LCD displays “”, the battery should be replaced.
- Ensure that the instrument is not connected to any external circuit. Set the selector switch to OFF position and remove the test leads from terminals.
  - Remove the screw on the back of cover and take battery cover away.
  - Remove the 9V bad battery and replace it with a new battery of the same type. For the long-term usage, it is recommended to choose alkaline battery.
  - Install the batter cover, and turn the screws tightly.


7 Replace the fuse with same type and steps are as above replacements.

**NOTE:**

- Do not input over 1000V DC/AC voltage peak value.
- Do not measure voltage at current range, resistance range, diode and buzzer range.
- Do not use the meter if the battery is not replaced completely or the battery cover is not fixed.
- Before replacing battery or fuse, remove the test leads from the test point and turn power off.

## 7. TROUBLE SHOOTING

If the instrument does not work properly, the below methods can help you to solve the problems quickly. If the fault still can't be eliminated, please contact the maintenance center or the distributors:

Fault	Solution
No display	Power off , then turn on the power Replace battery
 symbol appearance	Replace battery
No current input	Replace fuse
Error value	Replace battery

**Note:**

- The instruction manual is subject to change without notice.
- The contents in the instruction manual are considered to be correct, if the users find any errors or omission, etc., please contact the manufacturer.
- The manufacturer hereby will not be responsible for any accident and damage caused by the incorrect operation.
- Except the above instructions, please Do Not use the meter for unusual purpose.

## 3-3/4 真有效值自動換檔電錶使用手冊

### 1. 產品概述


Pro'sKit MT- 1710 3-3/4 真有效值自動換檔電錶是一台性能穩定、可靠性高的電池驅動數位萬用電錶。它採用了 25mm 字高的 LCD 顯示器，擁有背光顯示及超載保護功能，更方便使用者操作。

該儀器具有測量 DCV、ACV、DCA、ACA、電阻、電容、頻率、溫度、電晶體、二極體和通斷測試的功能，採用雙積分 A/D 轉換的核心處理器，是一台性能優越的工具儀錶，適合在實驗室、工廠、家庭使用及無線電愛好者的理想工具。


### 2. 安全注意事項

該儀錶的設計符合 IEC1010 標準。操作之前，請先閱讀安全注意事項。

1. 測量電壓時，請勿輸入超過直流 1000V 電壓或交流 750V 有效值的極限電壓。
2. 電壓低於 36V 為安全電壓，當測量電壓高於 36V DC/25V AC，請檢查連接測試錶棒是否可靠接觸、正確連接、絕緣良好，以避免觸電。
3. 改變功能和測量範圍時，測試錶棒應離開測試點。
4. 謹防誤操作，選擇正確的功能和量程，該電錶雖然有全量程保護功能，但為了安全起見，請你多加注意。
5. 測量電流時，請勿輸入超過 10A 電流。
6. 安全符號

“”存在危險電壓，

“”接地

“”“雙絕緣”

“”必須參照說明書“

“”電池電量低

### 3. 技術指標

#### 3.1 一般規格：

顯示方式：液晶屏顯示

最大顯示：3999 (3 / 4)，自動極性指示

測量方法：雙斜率積分 A/D 轉換器

採樣速率：約 3 次/秒

超量程顯示：最高位顯示“OL”

電池電量低：“”

工作環境：溫度 (0~ 40) °C，濕度 < 80% RH

電源：9V 電池 (6F22 或同等規格)

尺寸：190 毫米× 95 毫米× 45 毫米

重量：大約 370 克 (不包括電池)

配件：使用說明書，TP01 熱電偶，測試錶棒，電晶體/電容測試座

#### 3.2 電氣規範：

準確度：±(讀數 x a%+最低有效位)，保證準確度環境：(23±5)°C，相對濕度 75%。

### 直流毫伏 (DCmV) :

量程	準確度	分辨力
400mV	$\pm(0.5\%+4)$	0.1mV

輸入阻抗：> 40M $\Omega$

超載保護：1000V 直流或 750V 交流峰值

### 直流電壓 (DCV) :

量程	準確度	分辨力
4V	$\pm(0.5\%+4)$	1mV
40V		10mV
400V		100mV
1000V	$\pm(1.0\%+6)$	1V

輸入阻抗：10M $\Omega$

超載保護：1000V 直流或 750V 交流峰值

### 交流毫伏真有效值 (ACmV True RMS) :

量程	準確度		分辨力
	40Hz-200Hz	200Hz-1kHz	
400mV	$\pm(1.6\%+8)$	$\pm(1.6\%+8)$ 正弦波和三角波 $\pm(8.0\%+15)$ 其他波形	0.1mV

輸入阻抗：> 40M $\Omega$

超載保護：1000V 直流或 750V 交流峰值

頻率回應：40Hz- 1kHz

顯示：真有效值

### 交流電壓真有效值 (ACV True RMS) :

量程	準確度		分辨力
	40Hz-200Hz	200Hz-1kHz	
4v	$\pm(1.0\%+10)$	$\pm(0.8\%+10)$ 正弦波和三角波 $\pm(8.0\%+15)$ 其他波形	1mV
40v			10mV
400V			100mV
750V			1V

輸入阻抗：10M $\Omega$

超載保護：1000V 直流或 750V 交流峰值

頻率回應：40Hz-1kHz

顯示：真有效值

## 直流電流 (DCA) :

量程	準確度	分辨力
400uA	$\pm(1.0\%+10)$	0.1uA
4000uA		1uA
40mA	$\pm(1.2\%+8)$	10uA
400mA		100uA
10A	$\pm(1.2\%+10)$	10mA

最大測量電壓降：滿量程 mA 為 400mV 的範圍，A 為 100mV

最大輸入電流：10A（不超過 10 秒）

超載保護：400mA /250V 保險絲，10A/250V 保險絲

## 交流電流真有效值 (ACA True RMS) :

量程	準確度		分辨力	
	40Hz-200Hz	200Hz-1kHz		
400uA	$\pm(1.5\%+10)$	$\pm(1.5\%+10)$ 正弦波和三角波	$\pm(8.0\%+15)$ 其他波形	0.1uA
4000uA				1uA
40mA				10uA
400mA				100uA
10A	$\pm(2.0\%+15)$	$\pm(2.0\%+15)$ 正弦波和三角波	10mA	

最大測量電壓降：滿量程 mA 為 400mV 的範圍，A 為 100mV

最大輸入電流：10A（不超過 10 秒）

超載保護：400mA /250V 保險絲，10A/250V 保險絲

頻率回應：40Hz-1kHz

## 電阻 ( $\Omega$ ) :

量程	準確度	分辨力
400 $\Omega$	$\pm(0.8\%+4)$	0.1 $\Omega$
4k $\Omega$		1 $\Omega$
40k $\Omega$		10 $\Omega$
400k $\Omega$		100 $\Omega$
4M $\Omega$		1k $\Omega$
40M $\Omega$	$\pm(1.2\%+10)$	10k $\Omega$

超載保護：250V 直流或交流峰值

開路電壓：400mV

注意：在使用 400 $\Omega$  量程時，應先將錶棒短路以觀察短路殘留阻抗。

## 電容 (F) :

量程	準確度	分辨力
10nF	$\pm(5.0\%+20)$	10pF
100nF	$\pm(3.5\%+8)$	100pF
1 $\mu$ F		1nF
10 $\mu$ F		10nF
100 $\mu$ F		100nF
1mF/10mF/100 mF	$\pm(5.0\%+10)$	1 $\mu$ F/10 $\mu$ F/100 $\mu$ F

過載保護：250V 直流或交流峰值

## 頻率 (Hz) :

量程	準確度	分辨力
100Hz	$\pm(0.5\%+10)$	0.01Hz
1000Hz		0.1Hz
10kHz		1Hz
100kHz		10Hz
1MHz		100Hz
30MHz		1kHz

輸入靈敏度：1.5V



過載保護：250V 直流或交流峰值

## 晶體管 hFE 參數測量：

量程	顯示值	測試條件
NPN or PNP	0~1000	偏置電流約 10 $\mu$ A, Vce 約 1.5V

警告：為了安全，在此量程請勿輸入電壓

## 二極體及通斷測試：

量程	顯示值	測試條件
	二極體正向下降	正向直流電流約 0.5mA. 反向電壓約 1.5V.
	蜂鳴器發出長聲，測試兩點電阻低於 40 $\pm$ 30 $\Omega$ .	開路電壓約 0.5V

過載保護：250V 直流或交流峰值

警告：為了安全，在此量程請勿輸入電壓

溫度 (°C/°F) :

量程	顯示值	測試條件
(-20-1000)°C	<400°C ±(1.0%+5) ≥400°C ±(1.5%+15)	1°C
(-4-1832)°F	<752°F ±(1.0%+5) ≥752°F ±(1.5%+15)	1°F

感測器：K 型

警告：爲了安全在此量程請勿輸入電壓

## 4. 使用方法

### 4.1 操作面板說明：

1. 液晶顯示器：顯示測量值和單位

2. 功能鍵

2-1. **“SELECT/HzDUTY”**鍵：交直流電壓電流 DC / AC 選擇，測量直流電壓電流時，按此鍵可切換測量交流電壓及電流。測量頻率時，切換測量占空比(1~99%)，測量溫度時，切換攝氏和華氏模式

2-2. **RANGE** 鍵：選擇自動測量和手動測量工作模式。儀錶起始是自動量程狀態，顯示“**AUTO**”符號，手動模式時，按一次增加一檔，由低到高依次循環。長按該鍵 2 秒，將返回自動測量狀態。

2-3. **REL** 鍵：在電壓、電流和電容檔時，按下此功能鍵，讀數歸零，進入相對值測量，液晶顯示“**REL**”符號，再按一次退出相對值測量功能。

2-4. **HOLD** 鍵：按下此鍵，LCD 顯示當前測量的數值，並顯示“**HOLD**”符號，再次按下此鍵，退出保持狀態。按下此功能鍵 2 秒，將打開背光功能

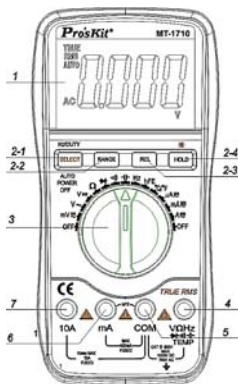
3. 旋鈕開關：用於改變測量功能及量程

4. 電壓、電阻、頻率、溫度、二極管插座

5. 公共插座

6. 測量小於 400mA 電流插座

7. 測量小於 10A 電流插座



### 4.2 直流電壓測量：

1 將黑色測試錶棒插入“**COM**”插孔，紅錶棒插入“**VΩHz**”插孔。

2 將功能開關轉至 **V** 範圍。

3 儀錶預設值是自動量程，顯示“**AUTO**”符號。按 **RANGE** 鍵切換到手動量程，400mV/4V/40V/400V/1000V 可以選擇。

4 將測試錶棒接觸測試點，紅錶棒所接的該點電壓與極性顯示在 LCD 上。

### 注意事項：

- 1 手動量程模式，如果 LCD 顯示“OL”，表明已超過量程範圍，需將測量範圍調高一檔位。
- 2 不要測量超過 1000V 以上直流電壓，否則會損壞儀錶。
- 3 注意測量高電壓電路時，應避免觸及高壓電路。

### **4.3 直流毫伏電壓測量：**

- 1 將黑色測試錶棒插入“COM”插孔，紅錶棒插入“VΩHz”插孔。
- 2 將功能開關旋至“mV”檔。
- 3 測量的電壓低於 400mV，在該檔位沒有自動量程功能。
- 4 將測試錶棒接觸測試點，紅錶棒所接的該點電壓與極性顯示在 LCD 上。

### 注意事項：

- 1 如果 LCD 顯示“OL”，表明已超過量程範圍，需將測量範圍轉致高一檔位，轉到有 AUTO 測量功能的檔位。
- 2 切勿用高壓>400mV 在該檔位測量，否則會損壞儀錶。

### **4.4.交流毫伏真有效值電壓測量：**

- 1 將黑色測試錶棒插入“COM”插孔，紅錶棒插入“VΩHz”插孔。
- 2 將功能開關“mV”檔，按“SELECT”鍵，顯示 ACmV，在此檔沒有自動測量符號“AUTO”，此檔位不要測量超過 400mV 的電壓。
- 3 將測試錶棒接觸測試點，錶棒所接的兩點電壓測量值顯示在 LCD 上。

### 注意事項：

- 1 如果 LCD 顯示“OL”，表明已超過量程範圍，需將測量範圍轉致高一檔位，轉到有 AUTO 測量功能的檔位。
- 2 切勿用高壓>400mV 在該檔位測量，否則會損壞儀錶。

### **4.5 交流電壓真有效值測量：**

- 1 將黑色測試錶棒插入“COM”插孔，紅色測試棒插入“VΩHz”插孔。
- 2 將功能開關設置在  $V \sim$  檔位。
- 3 預設值為自動量程模式，顯示“AUTO”符號。按 RANGE 鍵切換到手動量程模式，可選 400mV/4V/40V/400V/700V 量程。
- 4 將測試錶棒接觸測試點，錶棒所接的兩點電壓測量值顯示在 LCD 上。

### 注意事項：

- 1 手動量程模式如果 LCD 顯示“OL”，表明已超過量程範圍，應設置測量範圍旋鈕到一個更高的檔位。
- 2 不要測量超過 750V 的交流電壓，否則會損壞儀錶。
- 3 注意測量高電壓電路時，要避免接觸到高壓電路。

#### 4.6 直流電流測量：

- 1 將黑色錶棒插入“COM”插孔，紅錶棒插入“mA”(最大 400 毫安培)或“10A”(最大 10A)插孔。
- 2 將功能開關轉至電流檔位，按“SELECT”鍵選擇直流測量模式，然後將儀錶的錶棒串接到被測電路上，被測電流值及紅色錶棒點的極性將同時在 LCD 上顯示。

##### 注意事項：

- 1 如果被測量的電流值是未知的，應將量程開關轉到最高的檔位，然後依據顯示值轉到相應的檔位上。
- 2 如果 LCD 上顯示“OL”，則表示已經超過量程範圍，須將量程開關轉至高一檔。
- 3 最大輸入電流為 400mA 或 10A，視紅錶棒插入的位置而定，超過額定電會燒保險絲，甚至損壞儀錶。
- 4 禁止在“COM”、“mA”或“A”端，輸入高於直流 36V 或交流 25V 峰值電壓。

#### 4.7 交流電流真有效值測量：

- 1 將黑色錶棒插入“COM”插孔，紅錶棒插入“mA”(最大 400 毫安培)或“10A”(最大 10A)插孔。
- 2 將功能開關轉至電流檔位，按“SELECT”鍵選擇交流測量模式，然後將儀錶的錶棒串接到被測電路上，被測電流值及紅色錶棒點的極性將同時在 LCD 上顯示。

##### 注意事項：

- 1 如果被測電流大小是事先未知的，應將量程開關轉到最高開的檔位，然後依據顯示值轉到相應的檔位上。
- 2 如果 LCD 上顯示“OL”，則表示已經超過量程範圍，須將量程開關轉至高一檔。
- 3 最大輸入電流為 400mA 或 10A，視紅錶棒插入的位置而定，超過額定電流會燒斷保險絲，甚至損壞儀錶。
- 4 禁止在“COM”、“mA”或“A”端，輸入高於直流 36V 或交流 25V 峰值電壓。

#### 4.8.電阻測量：


- 1 將黑色錶棒插入“COM”插孔，紅錶棒插入“VQHz”插孔。
- 2 設功能開關切換到“Ω”檔。將紅，黑錶棒跨接在被測電阻上。
- 3 按“RANGE”選擇自動或手動測量。
- 4 如果測量小的電阻，應先將測試錶棒短路，按“REL”鍵一次，然後測量未知電阻，這樣才能顯示電阻的實際值。

##### 注意事項：

- 1 使用手動量程模式時，如果事先對電阻範圍未知，應該將測量量程設置到最高的檔位來進行。
- 2 如果液晶顯示幕上顯示“OL”，這意味著超過量程範圍，需要調高一檔。測量電阻 1MΩ 以上時，儀錶可能需要幾秒鐘的穩定，這是正常的。
- 3 當輸入端開路時，則顯示“OL”狀態。

- 4 當檢查電路中的電阻時，確保電路中的電源已關閉，所有電容完全放電才能測量。
- 5 請勿在電阻檔內輸入電壓。

#### 4.9 電容測量：

- 1 將功能開關轉至“ ”檔位。
- 2 將黑錶棒插入“COM”插孔，紅錶棒插入“VΩHz”插孔。
- 3 如果在 LCD 上顯示的數位不是零，按“REL”調整到零。
- 4 將被測電容對應引腳插入測試錶棒“VΩHz”插孔，被測電容負端接入“COM”插孔，測量值將被顯示在 LCD 上。

##### 注意事項：

- 1 電容測量沒有手動量程功能。
- 2 在每次測量之前，必須按“REL”鍵，以確保測量準確。
- 3 對被測電容應該完全放電後測量，以避免損壞儀錶。
- 4 200uF 以上測量讀數穩定，大約為 15 秒。

#### 4.10 頻率測量：

- 1 將錶棒或遮罩電纜插入“COM”和“VΩHz”插孔。
- 2 將功能開關轉至 Hz 檔位，將錶棒或電纜連接到被測信號源或負載下測量。
- 3 按“SELECT/Hz/DUTY”鍵選擇頻率/占空比測量模式，LCD 顯示屏顯示頻率或占空比數值。


##### 注意事項：


- 1 頻率量程沒有手動測量功能。
- 2 禁止超過 250V DC / AC 峰值輸入。
- 3 輸入超過 10V 交流有效值，可以測量但讀數可能超出誤差範圍。
- 4 在吵雜的環境中，測量小信號時最好使用遮罩電纜。
- 5 測量信號時，避免接觸高電壓電路。

#### 4.11 hFE 測量：

- 1 將功能開關轉至 hFE 檔位。
- 2 確認電晶體 NPN 或 PNP 型號、將發射極、基極和集電極分別插到相應附件測試座的正確的插孔，測量值將被顯示在 LCD 上。

#### 4.12 二極體和連續性測試：

- 1 連接黑色錶棒插入到“COM”插孔，紅錶棒插入“VΩHz”插孔。（注意紅色錶棒為+）
- 2 將功能開關轉至 檔位，可進行二極管測量。
- 3 **正向測量：**將紅色錶棒連接到被測二極體的正極，黑色錶棒連接到負極，顯示器顯示這種二極體的正向電壓。

- 4 **反向測量**：將黑色錶棒連接到被測二極體的正極，紅色錶棒連接到負極，顯示器顯示“OL”。
- 5 完整的二極體測試應該包括正反向測試，如果測試結果與以上不符，說明二極管損壞。
- 6 將功能開關轉至檔位，可進行通斷測量
- 7 把錶棒連接到待測電路的兩點，如果電阻小於  $40\pm 30\Omega$ ，則內置蜂鳴器發出聲音。

**注意**：請勿在或時輸入電壓。

#### 4.13 溫度測量：

- 1 將功能開關轉至“C/F”檔位。
- 2 將熱電偶傳感器的冷端(黑色插頭)負極插入“COM”端，熱電偶傳感器的工作端(紅色插頭)正極插入“VΩHz”插孔，將探測頭置於被測場地，測量值將被顯示在LCD上。
- 3 按“SELECT”鍵選擇攝氏/華氏顯示模式。

#### 注意事項：

- 1 當輸入端開路，將顯示“常溫”
- 2 請勿隨意更換測溫傳感器，否則將不能保證測量準確度。
- 3 嚴禁在溫度檔測量電壓。

#### 4.14 資料保持：

按“HOLD”鍵，當前的資料將顯示在LCD上；再次按下該鍵，將取消保持功能。

#### 4.15. 背光：

按“HOLD”鍵2秒打開背光，閒置10秒後將自動關閉。

#### 4.16 自動關機：

- 1 儀器閒置15分鐘後，將自動關閉並進入睡眠模式。斷電前蜂鳴器會鳴響。按任意鍵，即可再次打開電源。
- 2 先按“SELECT”鍵再開機，儀錶將取消自動電源關閉功能。


### 5.警告

1. 當測量電壓時，確保儀器沒有連接或切換到電流，電阻或二極體測量，始終確保正確的端口用於測量使用。
2. 小心測量電壓高於36VDC，特別是在高能量的來源場合。
3. 測量時，注意連接電路可能是帶電的狀況。
4. 測量電流時，確保連接方式正確可靠。
5. 在電阻測量或二極體測試時，確保被測電路沒有帶電。
6. 始終確保正確的功能和量測選擇範圍。如果不確定測量的範圍，建議從最高的量程向下嘗試使用設備。

7. 若儀器與電流互感器配合使用，應該小心開路時，端子部份的電壓狀況。
8. 確保測試線和表棒表面完好，表面沒有任何損壞絕緣的情況出現。
9. 注意不要超過允許的測量限制範圍使用。
10. 保險絲管的更換必須是正確的類型和規格。
11. 打開儀器更換電池或保險絲前，必需斷開測試表棒與任何外部電路的連接，將功能選擇開關置於“關”的位置。

## 6. 儀錶保養

該儀錶是一台精密的測量儀器，請使用者不要隨意修改內部電路，以免發生危險。


1. 保持萬用錶乾燥，並注意防塵，防水，防摔。
2. 不宜在高溫高濕、易燃易爆和強磁場環境下存放及使用儀錶。
3. 本儀器宜輕拿輕放，雖然有防震膠套保護，但嚴重跌落依然有可能損壞內部電路及殼體，影響儀器正常工作及使用。
4. 請使用濕布和溫和的清潔劑清潔儀錶外觀，不要使用研磨劑及酒精等烈性溶劑。
5. 如果長時間不使用，電池應更換。應該取出電池，防止電池漏液腐蝕儀錶。
6. 注意電池使用情況，當 LCD 顯示“”時，應該更換電池，步驟如下：
  1. 拆下後蓋上固定電池的螺絲，取下電池蓋。
  2. 取出 9V 不良電池，換上同類型的新電池。雖然任何 9V 電池都可使用，但為長時間使用，推薦使用鹼性電池。
  3. 裝上電池蓋，鎖緊螺絲。
7. 更換保險絲，步驟同上，更換保險絲時，請使用規格，型號相同的保險絲。

### 注意事項：

1. 不要輸入電壓超過直流 1000V 或 750V 交流峰值電壓。
2. 不要在電流檔、電阻檔、二極體和蜂鳴器檔測量電壓。
3. 如果電池沒有裝好或後蓋沒有上緊時，請不要使用此錶。
4. 在更換電池或保險絲前，請將測試錶棒從測量點移動開並關機。

## 7.故障排除

如果你的儀錶不能正常運作，下面的方法可以幫助你快速解決一般問題，如果故障仍無法排除，請與維修中心或經銷商聯繫，我們將儘快協助您處理。

故障現象	檢查部位及方法
沒顯示	電源未接通 電池失效，請更換
 符號出現	電池電力不夠，請更換電池
電流無法測量	保險絲損壞，請更換保險絲
測量誤差大	檢查並更換電池

本說明書如有變更，恕不通知。

本說明書基本內容正確，若有錯誤、遺漏之處，請與經銷商聯繫。

本公司不承擔由於用戶不正當操作所引起的事務和危害。

本說明書所講述的操作功能外，請勿將產品做其他特殊用途。

***Pro'sKit***<sup>®</sup>



寶工實業股份有限公司  
PROKIT'S INDUSTRIES CO., LTD.

<http://www.prokits.com.tw>

E-mail : [pk@mail.prokits.com.tw](mailto:pk@mail.prokits.com.tw)