

# Pro'sKit®

CE

MT-1217

3 5/6 True RMS Digital Multimeter



**User's Manual**

1<sup>st</sup> Edition' 2020

©2020 Copyright by Prokit's Industries Co., Ltd.

# Contents

General-----	1
Open-Package Inspection-----	2
Safety Note -----	2
Instrument Panel& Button Function Description-----	5
Other Functions-----	6
Property-----	6
Instrument Maintenance-----	16
Fault Elimination-----	17

## General

This product is a 3 5/6 True-Rms digital multimeter, which is equipped with LCD display of text height 20mm and has the merits of clear reading, stable performance and high reliability. It can be used to measure DC voltage, AC voltage, DC current, AC current, resistance, capacity, frequency/duty cycle, non-contact voltage detection, diode and make on-and-off test. Meanwhile, it is available for unit symbol display, automatic/manual range switching, automatic power off and alarm function. The multimeter has high resolution and precision. Due to its complete functions, high measurement accuracy and convenient operation makes it ideal for general electrical testing and troubleshooting

## Open-Package Inspection


Open the package box and take out the meter, check carefully if the following accessories are absent or damaged. If there is any absence or damage, please contact the distributor immediately.










Digital multimeter	1 pce
User's manual	1 copy
Test leads	1 pair
Temperature Probe (K-Thermocouple)	1 pce
Test socket	1 pce

## Safety Note

The design of this meter is accordance with IEC61010 clause (the safety standard issued by International Electro technical Commission). Prior to the operation of the instrument, please read the safety considerations before use.

1. When DC voltage above 30V, AC voltage above 25V, current above 10mA, AC power line with inductive load or power line during electric fluctuation is measured, please beware of electric shock.
2. Prior to measurement, check if the measurement function switch is at the correct position. Check if the test lead is contacted reliably, connected correctly, and grounded well, etc. in order to avoid electric shock.
3. Only if the meter is used with the matched test lead, it can meet the requirement of safety standard. When the line of the test lead is damaged, it is necessary to replace another one of the same model or the same electrical specification.
4. Don't use other unconfirmed or disapproved fuse to replace the fuse inside the meter. Only the same model or same specification fuse can be replaced. Before the replacement, the test leads must be removed from the measuring point to ensure there is no longer any signal at the input terminal.
5. Don't use other unconfirmed or disapproved battery to replace the battery inside the meter. Only the same model or same electrical specification battery can be replaced. Before replacement, the test lead must be removed from the measuring point to ensure there is no longer any signal at the input terminal.
6. When electrical measurement is made, never let your body get in touch with ground directly, and don't touch uncovered metal terminal, output port, lead clamp, etc. where earth potential may exist. Dry clothes, rubber shoes, rubber cushion and other insulating material are usually used to keep your body insulated against ground.
7. Don't store and use it in the high-temperature, high-humidity, inflammable and strong magnetic field environment.

8. It may damage to the meter and endanger the operator's safety if the voltage value beyond the permitted ultimate voltage value is measured. The ultimate voltage value permitted for measurement is marked on the instrument panel; and never measure the value exceeding the standard. Don't input the ultimate value out of regulation in order to avoid electric shock and the damage to the meter.
9. When the test lead is inserted into the current socket, don't measure any voltage for fear that the meter should be damaged and the operator's safety be endangered.
10. Don't try calibrating or repairing the meter. When necessary, only the qualified professional personnel who have had special training or gained approval can make it.
11. During measurement, the requirement of measurement function must be in accordance with LCD display. Please be sure to disconnect the line of the test lead with the measured object first and ensure there is no any input signal. It is forbidden to switch the function/range selection switch during measurement
12. When " " is shown on LCD display, please replace battery immediately to ensure the measurement precision.
13. It is not allowed to insert the test lead into the current terminal to measure voltage!
14. Please don't change the circuits of the meter freely for fear that the meter is damaged and the safety be endangered.
15. Description of Safety Symbols

	Warning!		DCV
	Double Insulation		ACV
	Fuse		DCA
			ACA
	Low Battery		In accordance with the instruction of European Trade Union

## Instrument Panel & Function Button Description

1. Instrument model number
2. LCD Display: Display the measured data and unit.
3. Function Button

### 3.1 Hz/% (Frequency / Duty Cycle):

Press this button to select the frequency or duty cycle mode. The measurement mode of voltage / frequency / duty cycle could be selected by pressing this button in AC voltage or Hz setting

3.2 RANGE: Press this button to select the voltage/current test range

3.3 HOLD: Data hold

3.4 REL  $\Delta$ (Relative Value Measurement): The relative value measurement of capacity function could be conducted by pressing this button

3.5 Select(Function Switch): Press this button, the function could switch between resistance, capacity and  $\rightarrow \bullet \bullet \bullet$  , AC/DC current .

3.6 LCD backlight button

4. Knob Switch: It could be used to change the measurement function and range.

5. Input Terminals

5.1. 10A “+”input terminal.

5.2. mA “+” input and HFE input terminal

5.3. Voltage, Diode, Resistance, Capacity, Frequency, Buzzer Input terminal

5.4. COM: Current, Voltage, Diode, Buzzer, Resistance, Capacity, Temperature “+”, Frequency, Temperature “-”, HFE, Input terminal.

6. Non-contact Voltage Detection Area



## Other Functions

### Auto Power off

During measurement, the meter will automatically shut down (enter sleeping mode) to save power if function buttons and knob switch are not operated in 15 minutes. In auto power off mode, press any function buttons or rotate the knob switch, the instrument will get into the auto power on mode (working mode)

## Property

### General Feature


1-1 Display: LCD

1-2 Max Display: 5999(3 5/6) counts automatic polarity display and unit display

1-3 Measuring Method: Dual integral A/D converter

1-4 Sampling Rate: Approx. 3 times / sec.

1-5 Over Range Indication: Display "OL"

1-6 Low Battery Indication: " " Symbol appears;

1-7 Operation Environment: (0~40)°C, Relative Humidity:<80%

1-8 Storage Environment: (0~50)°C, Relative Humidity:<80%

1-9 Power: 9V battery x1 (NEDA1604/6F22 or equivalent)

1-10 Dimension (size): 182x90x46mm

1-11 Weight: Approx. 320g (not including 9V battery)

1-12 Accessories: user's manual (1 pc), color box (1 pc), 10A test leads (1 pair), K-Thermocouple(1 pc) , test socket (1 pc).

### Technical Feature

2-1. Accuracy:  $\pm (a\% \times \text{reading} + \text{digits})$ , at  $(23 \pm 5)^\circ\text{C}$ , relative Humidity <75%. One year calibration guarantee since the time dispatched from the factory.

2-2. Technical Specification

#### 2-2-1. DCV

1. Insert black test lead into the hole of "COM" and red test lead into "VΩHz"

2. Turn the knob switch to "**V<sub>~</sub>**".
3. The initiate state of the meter is in auto range status, which shows "AUTO" symbol. Press the "SELECT" button to select the manual measurement range.
4. Make the test lead contact to the tested point. The voltage and polarity of the point where the red pen is contacted will be displayed on the screen.

**⚠ Caution:**

1. Don't measure voltage over 1000V. Otherwise, the meter may be damaged.
2. When measuring high voltage, special attention should be given to personal safety and avoid your body getting in touch with high voltage circuit.

Range	Accuracy	Resolution
600mV	$\pm(0.5\%+4d)$	100uV
6V		1mV
60V		10mV
600V		100mV
1000V	$\pm(1.0\%+6d)$	1V

- Input Impedance: 10M $\Omega$  .
- Overload Protection: 1000V DC or AC peak value

### 2-2-2. ACV

- A) Insert black test lead into the hole of "COM" and red test lead into "V $\Omega$ Hz"
- B) Rotate function switch to "**V<sub>~</sub>**" setting , the initial state of the meter is in auto range status, which shows "AUTO" symbol
- C) Press "Range" button to select AC measurement.
- D) Make the test lead contact to the tested point. The voltage of the point where the red test lead is contacted will be displayed on the screen.

 **Caution:**

1. Don't measure voltages over 750V; otherwise, the meter will be damaged.
2. When measuring high voltage, special attention should be given to personal safety and avoid your body getting in touch with high voltage circuit.

Range	Accuracy	Resolution
600mV	$\pm(1.0\%+10d)$	0.1mV
6V	$\pm(0.8\%+6d)$	1mV
60V		10mV
600V		100mV
750V	$\pm(1.0\%+10d)$	1V

- Input Impedance:  $10M\Omega$  .
- Overload Protection: 1000V DC or 750 AC peak value.
- Frequency Response: (40~1000) Hz; True RMS display.
- The value of the AC voltage measured with this meter is True RMS (root mean square). These measurements are accurate for sine wave and other waves (without DC offset), square wave, triangular wave and step wave.

### 2-2-3. DCA

- A) Insert the black test lead into the "COM" input terminal and red test lead into the "mA " input terminal. (Max 600mA), or "10A "input terminal (Max 10A).
- B) Rotate function switch to Current ( $\mu A/mA/A$ ) setting. The initial state of the meter is in auto range status, which shows "DC" symbol. Then connect the test lead to the tested circuit in serial, the tested current value and the current polarity of the point where the red pen is contacted will be displayed on the screen simultaneously.

 **Caution:**

1. If "OL" is displayed on LCD, it indicates the tested current value has exceeded the present range limit, please select higher range to complete the measurement.
2. The Max input value is 600mA or 10A. (Depending on the terminal



where the red test lead is contacted)

Range	Accuracy	Resolution
600uA	$\pm(1.0\%+10d)$	0.1uA
6000uA		1uA
60mA		10uA
600mA		100uA
10A	$\pm(1.2\%+10d)$	10mA

- Max measurement voltage drop: Full range mA is 0.4V, A is 100mV;
- Max input current: 10A (less than 15 seconds);
- Overload Protection: 0.6A/250V resettable fuse, 10A/250V fuse.

#### 2-2-4. ACA

- A) Insert the black test lead into the “COM” input terminal and red test lead into the “mA” input terminal. (Max 400mA), or “10A” input terminal (Max 10A).
- B) Rotate function switch to Current setting. Press “SELECT” button to select the AC measurement mode. Then connect the test lead to the tested circuit in serial, the tested current value and the current polarity of the point where the red test lead is contacted will be displayed on the screen simultaneously.



#### Caution:

1. If “OL” is displayed on LCD, it indicates the tested current value has exceeded the present range limit. Please select higher range to complete the measurement.
2. The Max input value is 600mA or 10A. (Depending on the terminal where the red test lead is contacted.) The overrated current will lead to fuse melt or even damage the meter.

Range	Accuracy	Resolution
600uA	$\pm(1.5\%+10d)$	0.1uA
6000uA		1uA
60mA		10uA
600mA		100uA
10A	$\pm(2.5\%+15d)$	10mA

- Max measurement voltage drop: Full range mA is 0.4V, A is 100mV; Max input current: 10A (less than 15 seconds);
- Overload protection: 0.6A/250V restorable fuse, 10A/250V
  - Fuse; Frequency Response: 40~1000Hz True RMS display.
  - The value of the AC voltage measured with this meter is True RMS (root mean square). These measurements are accurate for sine wave and other waves (without DC offset), square wave, triangular wave and step wave.

### 2-2-5. Resistance ( $\Omega$ )

- Insert the black test lead into "COM" terminal and red test lead into "**V $\Omega$ Hz**" terminal.
- Rotate the range knob to " $\Omega$ " setting. The initial state of the meter is in auto range status, which shows "AUTO" symbol
- Connect the two test leads to the tested resistor.
- When measuring the low resistance, please short-circuit the test leads at first to test the wire resistance, and then deduct it from the actual resistance.


#### **Caution:**

- If "OL" is displayed on LCD, it indicates the tested resistance value has exceeded the present range limit, please select higher range to complete the measurement. When measuring the Resistor higher than 1M $\Omega$ , the instrument will take several seconds to make the reading stable. It is normal when measuring the high resistor.
- When the input terminal is open circuit, it will display "OL".
- When measuring in-line resistor, be sure that the power is off and all capacitors are discharged completely.

Range	Accuracy	Resolution
600 $\Omega$	$\pm(0.8\%+5d)$	0.1 $\Omega$
6k $\Omega$	$\pm(0.8\%+4d)$	1 $\Omega$
60k $\Omega$		10 $\Omega$
600k $\Omega$		100 $\Omega$
6M $\Omega$		1k $\Omega$
60M $\Omega$	$\pm(1.2\%+10d)$	10k $\Omega$


- Open voltage circuit: Less than 200mV;
- Overload Protection: 250V DC or AC Peak Value;

Note: When measuring at Range 600Ω, please short-circuit the test leads at first to test the wire resistance, and then deduct it from the actual resistance.


 **WARNING:** DO NOT input any voltage at resistance range for safety concern!

### 2-2-6. Diode and Continuity Test

- Insert the black test lead to “COM” terminal and the red test lead to “VΩHz” terminal. (The polarity of red test lead is “+”).
- Rotate range knob to “Ω”. Press “SELECT” to select the Diode measurement mode.
- Forward Measurement: Connect the red test lead to the diode positive polarity and the black test lead to the diode negative polarity. The approximate value of diode forward voltage drop will show on the display.
- Backward Measurement: Connect the red test lead to the diode negative polarity and the black test lead to the diode positive polarity. “OL” symbol will be displayed on the screen.
- The complete diode testing includes forward and backward measurement; if the result does not meet the above, it means the diode is bad.
- Press “SELECT” button to select the Continuity measurement mode.
- Connect the test leads to two points of the tested circuit. If the built-in buzzer sounds, the resistance between the two points is less than  $50\pm 30\Omega$ .

Range	Display	Test Condition
	Forward voltage Drop of diode	Forward DC Current is Approx. 0.5mA. Backward Voltage is Approx. 1.5V
	Buzzer makes a long sound if resistance is < $50\pm 30\Omega$	Open circuit voltage is approx. 0.5V

• Overload Protection: 250V DC or AC Peak Value.

 **WARNING:** DO NOT input any voltage at this range for safety concern!


### 2-2-7. Capacity (F)

- Rotate function switch to “Ω” setting.
- Press “SELECT” button to select the Capacity measurement mode.
- Insert the black test lead to “COM” terminal and red test lead to “VΩHz” terminal;
- Connect the tested capacity by the test leads, the screen will show capacitance parameter. (The relative value measurement could be conducted by pressing “REL” button.)

 **Caution:**

- Fully discharge the tested capacitor in case it may damage the meter.
- When measuring in-line capacitor, the power should be turned off and all capacitors should be discharged completely.
- It takes about 15 seconds to input stable reading at 200uF Range.

Range	Accuracy	Resolution
9.999nF	$\pm(5.0\%+35d)$	10pF
9.999nF~999.9uF	$\pm(3.5\%+8d)$	100pF/1nF/10nF/100nF
999.9uF~6mF	$\pm(3.5\%+35d)$	1uF/10 uF /100uF

 **WARNING:** DO NOT input any voltage at this range for safety concern!

### 2-2-8. Frequency (Hz) and Duty cycle

- Test Volt Frequency, connect test leads and shielded cable respectively to “COM” terminal and “VΩHz” terminal.
- Rotate function switch to “Hz” gear. Connect test leads and the cable to the signal source or the tested load. The tested signal will show on the screen.
- Press Hz/% button, the screen displays (%), and the measurement signal value shows duty cycle (%)

 **Caution:**

1. When inputting AC RMS over 10V, it could show reading, but excess vibration may appear.
2. It is recommended to test weak signals by shielded cable under noisy circumstances.
3. Select ACV gear when testing the frequency of high voltage. Then press “Hz/%” button to enter frequency measurement status.
4. Don't input voltage over 250V DC or AC peak value in case it may damage the meter.

Range	Accuracy	Resolution
9.999Hz~20MHz	$\pm(1\%+10d)$	0.001/0.01/ 0.1 / 1 /10 /100/1k/10kHz
0.1-99.9%	For your reference	0.1V

- Input Sensitivity: >0.7V RMS
- Overload Protection: 250V DC or AC Peak Value.

### 2-2-9. Temperature (°C/°F)

- A) Rotate function switch to “°C/°F” gear.
- B) Insert the cathode (black pin) of cold end (free end) of thermocouple into “COM” jack and anode into “VΩHz” terminal. Then put the working end (temperature measurement end) of thermocouple on the surface or inside the object to be tested. Then you can read temperature from the screen, and the data is in Centigrade. Press the SELECT button to Fahrenheit (°F).

 **Caution:**

1. When the input terminal is open-circuit, it will display the “OL” symbol on the screen.
2. Don't change the temperature probe at random, or the value accuracy could not be guaranteed.

### 3. Don't measure voltage at temperature range.


Range	Accuracy	Resolution
$(-20\sim 1000)^{\circ}\text{C}$	$<400^{\circ}\text{C}\pm(1.0\%+5\text{d})$ $\geq 400^{\circ}\text{C}\pm(1.5\%+15\text{d})$	$1^{\circ}\text{C}$
$-4^{\circ}\text{F}\sim 1832^{\circ}\text{F}$	$< 752^{\circ}\text{F}\pm(1.0\%+5\text{d})$ $\geq 752^{\circ}\text{F}\pm(1.5\%+15\text{d})$	$1^{\circ}\text{F}$

- Sensor: K Type Thermocouple (Nickel-chromium--nickel silicon) (banana plug).
- Overload Protection: 250V DC or AC Peak Value.

#### 2-2-10. Triode hFE test

- A) Turn the knob switch to "HFE" Range
- B) Insert the test accessory into "**COM**" and "**mA**" terminal.
- C) Verify the transistor type is NPN or PNP, insert the emitter, basic and collector to the proper jack on test accessory.

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

 **WARNING:** DO NOT input any voltage at this range for safety!

#### 2-2-11. NCV Detection (Non-Contact Voltage Detection)


Turn the rotary switch to NCV position and place the top of the meter approach to the conductor. If the meter detects the AC voltage  $\geq$  AC 90V 50/60Hz, the LED indicator will be on, while the beeper will sounds alarm at different frequencies.

Note:

1. 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.
2. When the voltage is input into the meter's input terminal, the voltage sensor LED may be on as a result of induced voltage.
3. External sources of interference (like flashlight and motor) may trigger non-contact voltage detection.

## **Instrument Maintenance**

This is a precision instrument and the user shall not modify the electric circuit as well.

1. Keep the instrument away from water, dust and shock.
2. Do not store and operate the meter under the condition of high temperature, high humidity, combustible, explosive and strong magnetic place.
3. Wipe the case with a damp cloth and detergent; do not use abrasives and alcohol.
4. If the instrument is not operated for a long time, please take out the battery to avoid leakage.
5. Pay attention to the status of the 9V battery. When the LCD displays flashing “” symbol, the battery shall be replaced.

### **Battery changes steps as below:**


- 5-1. Loosen the screw on the back cover and remove the battery case.
- 5-2. Remove the 9V battery and replace them with new one. Although a 9V battery of any standard can be used, but in order to lengthen the operation life, alkaline battery should be used.
- 5-3. Mount the battery case back and tighten the screw.

### **Precaution:**

1. Don't input voltage higher than DC 1000V or AC Peak Value.
2. Don't measure voltage at current, resistance, diode and buzzer range.
3. Don't use the instrument when the battery has not been mounted properly or the back cover has not been tightened.
4. Prior to the replacement of battery or fuse, please remove the test leads from the measuring point and switch off the meter.

## Trouble Shooting

If the instrument could not work properly, please try the following tips to solve some general problems. If the problems still exist, please contact the maintenance center or the distributor.

Problem	Solution
No display	Turn on power. Replace battery
 symbol appears	Replace battery.
No current input	Replace fuse
Error value	Replace battery

- This Instruction is subjected to change without any further notice.
- The content of this Instruction is considered correct. In case readers find any errors and missing parts, please contact the manufacturer.
- The Company shall not be held liable for any accidents and hazards resulted from the mal-operations by the user.
- The function elaborated by this Instruction shall not be taken as the reasons for using the product for special purposes.