

72-2590/72-2595 Operating Manual



Modern Digital Multimeters

I. Overview

Brand-new 72-2590/72-2595 series are 2000-count handheld digital multimeters featuring stable and reliable operations. They are designed with large-scale integrated circuits and dual integral AD converter and offer overload protection for all ranges. The series can measure DC and AC voltage, DC and AC current, resistance, capacitance, diode, temperature, frequency, battery and continuity, which makes it a perfect solution for your work.

II. Contents of product

- 1. Operating Manual1 piece
 - 2. Test Leads1 pair
 - 3. Cross point type thin-line K thermocouple sensor 1 piece (only for 72-2595)
- If any of these items are missing please contact your point of purchase.

III. Safety Information

This instrument is designed and manufactured in compliance with: G84793, IEC61010-1, CAT III 600V, Pollution Degree 2 and Double insulation standards.

Warning

- Please operate the instrument as specified in the manual, otherwise the protection offered by the instrument will be compromised.
- ◆ Do not operate the multimeter while the battery cover is removed or while the back of the case has been removed.
 - ◆ Ensure the range switch is set in the correct position before beginning any measurements. During testing the switch must not be changed or the unit can be damaged.
 - ◆ Check and ensure the insulation of the test leads is in good condition without tears or exposed metal.
 - ◆ The red and black test leads should be inserted into the correct terminals and ensured they are secure.
 - ◆ Exceeding the test limit values will lead to electric shock and damage of the unit.
 - ◆ Use only the replacement fuse with the same model or identical electrical specifications.
 - ◆ In order to avoid electric shock, ensure that the potential difference between common ports "COM" and the earth does not exceed 600V.
 - ◆ When the LCD shows the low battery symbol, change the battery immediately to

ensure the measuring accuracy. A loss of accuracy could lead to incorrect measurements.

- ◆ Turn off the power after finishing the measurement. If the meter is not being used for an extended period of time remove the battery.
- ◆ Do not operate this instrument under high temperature or high humidity. The instrument must not be stored in a damp environment. If the instrument is affected with damp, its performance will be affected.
- ◆ Do not modify the internal circuits of the meter.
- ◆ Clean the instrument casing with a slightly damp cloth and mild agent. Do not use abrasives and solvents.
- ◆ Please check whether the instrument is in good condition before use.
- ◆ CAT III: Measurement category III is for measurements performed in the building installation. Examples are measurements on distribution boards, circuit-breakers, wiring, including cables, bus-bars, junction boxes, switches, socket-outlets in the fixed installation and equipment for industrial use and equipment.
- ◆ Only use test leads that are in compliance with IEC 61010-031, and rated CAT III 600V.

	Lower battery level		Earth Terminal		Caution
	Buzzer		Alternating Current		Direct Current
	Fuse		Double insulation		Diode

IV. Product Features

1. There are 30 ranges for function selection.
2. LCD display with visible zone 63 X 29mm.
3. Over-range indication "OL".
4. Display Count 1999.
5. Overload protection for the full range.
6. Auto Power Off.
7. Temperature Range: Working 0 to 40°C (32 to 104°F); Storage -10 to 50°C (14 to 122°F).
8. Low battery indication: on upper left corner of LCD.
9. Data Hold.
10. Physical dimensions: 186mm x 91mm x 39mm.
11. Weight: Approximate 300g (Main unit, holster, tilt stand, battery, excluding test leads).

V. Technical Specification

Accuracy: guarantee period is 1 year.
Ambient temperature 23°C ± 5°C.
Relative humidity: <75%.

DC voltage

Range	Resolution	Accuracy	
		72-2590	72-2595
200mV	100µV	± (0.5%+1)	
2 V	1 mV		
20 V	10mV		
200 V	100mV		
600 V	1 V	±(0.8 %+2)	

Impedance Input: 10MΩ for all ranges

AC voltage

Range	Resolution	Accuracy	
		72-2590	72-2595
2 V	1 mV	± (0.8%+3)	
20 V	10mV		
200 V	100mV		
600 V	1 V		
		±(1.5%+5)	

Impedance Input: 10MΩ for all ranges
Frequency range: 45Hz-400Hz
Overloading protection: 600Vrms or 850Vp-p peak
Display: Mean value (RMS value of sinewave)

DC current

Range	Resolution	Accuracy	
		72-2590	72-2595
200 µA	0.1µA	± (0.8%+1)	N/A
2 mA	1µA	± (0.8%+1)	
20 mA	10µA	N/A	± (0.8%+1)
200 mA	100µA	± (1.5%+1)	
10 A	10 mA	± (2.0%+5)	

Overload protection: µA, mA input: 500mA/600V Φ6x32mm.

A input : 10A/600V Φ6x32mm.

Maximum input current: 10A (For current over 5A, measuring time must exceed 15 seconds).

Measured voltage drop: 200mV for full range.

AC current

Range	Resolution	Accuracy	
		72-2590	72-2595
200 µA	0.1µA	± (1.0%+3)	N/A
2 mA	1µA	± (1.0%+3)	
20 mA	10µA	N/A	± (1.0%+3)
200 mA	100µA	± (1.8%+3)	
10 A	10 mA	± (3.0%+5)	

Overload protection: uA, mA input: 500mA/600V Φ6x32mm.

A input end: 10A/600V Φ6x32mm.

Maximum input current 10A (For currents over 5A, measurement time must exceed 10 seconds and an interval of more than 15 minutes between measurements is required).

Measured voltage drop: 200mV for full range.

Display: Mean value (RMS value of sinewave).

Resistance

Range	Resolution	Accuracy	
		72-2590	72-2595
200 Ω	0.1 Ω	± (1.2%+2)	
2 kΩ	1 Ω	± (1.0%+2)	
20 kΩ	10 Ω		
200 kΩ	100 Ω		
2 MΩ	1 kΩ	± (1.2%+2)	
20 MΩ	10 kΩ	± (1.5%+2)	
200 MΩ	100 kΩ	± [5.0% (reading-10)+10]	
		N/A	

Open circuit voltage: ≤ 700mV (for range of 200Ω, the open circuit voltage approx 2.9V).

Overloading protection: 600V for all ranges, DC or AC RMS.

Relative Humidity <65% for measurements at 200MΩ range.

Capacitance

Range	Resolution	Accuracy	
		72-2590	72-2595
2 nF	1 pF	N/A	± (4.0%+3)
20 nF	10 pF	N/A	± (4.0%+3)
200 nF	100 pF	N/A	± (4.0%+3)
2 µF	1 nF	± (4.0%+3)	
200 µF	100 nF	≤ 50 µF ± (5.0%+4) >50µF, for reference only.	

Testing Signal: Approx 200Hz, 40mVrms

Temperature

Range	Resolution	Accuracy
TEMP °C (-40 °C~1000 °C)	1 °C	-40 °C~0 °C
		0 °C~400 °C
		400 °C~1000 °C
TEMP °F (-40 °F~1832 °F)	2 °F	-40 °F~32 °F
		32 °F~752 °F
		752 °F~1832 °F

Continuity and Diodes

Range	Description	Testing conditions
	Display the forward voltage of the diode (approximate value), in mV	Forward DC current approx 1mA Reverse DC voltage approx 2.8V
	Resistance $\leq 10\Omega$ will cause the buzzer to sound and display an approximate resistance value in Ω	Open circuit voltage approx 2.8V

Overloading protection: 600V DC or AC effective value

Battery measurement (only for 72-2590)

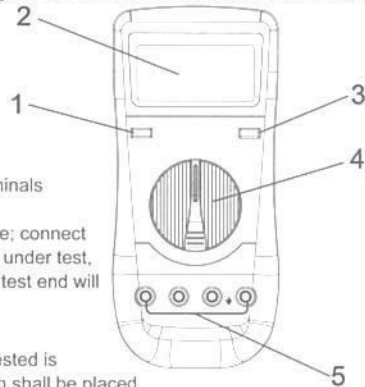
Range	Resolution	Accuracy	Description
12 V	10 mV	$\pm(2.5\%+2)$	Built in load resistance: 240 Ω
9 V	10 mV		Built in load resistance: 1.8k Ω
1.5 V	1mV		Built in load resistance: 30 Ω

Overloading protection: 500mA/600V fuse

VI. Operating Instructions

Precautions before operation:

- Press the POWER switch to check 9V battery. In case of lower battery voltage level the low battery indicator will be shown on the display. If the battery low indicator shows, replace the battery immediately.
- The input terminals input voltage or current shall not exceed the indicated value.
- Multimeter Description



- Power switch
- LCD display
- Data hold
- Rotary switch
- Input Terminals

Measuring DC Voltage

- Insert test leads into input terminals (Red to V and black to COM).
- Set the rotary switch to V range; connect test leads to the power or load under test, and the positive polarity of the test end will indicate.

Note

- If the range of voltage to be tested is unknown, the functional switch shall be placed at the maximum range, which will be lowered if necessary as measurements are acquired.
- If the display only shows "OL", it indicates the signal is out of range. In this case, the functional switch shall be placed at higher range.
- " Δ " indicates that you must not input a voltage more than 600V. Excess voltages can damage the meter.
- Special attention must be given to measurement of high voltage as they present the risk of electric shock.

Measuring AC Voltage

- Insert test leads into input terminals (Red to V and black to COM).

- Set the rotary switch to V~ range, and connect the test leads to the power or load under test.

Notice

" Δ " indicates that you must not input a voltage more than 600V.

Measuring DC current

- Insert the black test lead into COM terminal. For currents ≤ 200 mA, insert the red test lead into mA terminal. If current is higher, insert red test lead into 10A terminal.
- Set the rotary switch to DC current range, and connect the test leads to the tested circuit in series. The flow of current relative to the red test lead will be displayed on the screen.

Notice

- If the scope of current to be tested is not known, the functional switch shall be placed at the maximum range which will be gradually lowered for testing.
- If the display only shows "OL", it indicates over range. In this case, the functional switch shall be placed at higher range.
- "A" indicates that the maximum input current is 200mA. The built-in fuse of 500mA/600V $\Phi 6 \times 32$ mm can effectively protect the circuit from burn-out. The 10A range use a fuse of 10A/600V $\Phi 6 \times 32$ mm for protection.

Measuring AC Current

- Insert the black test lead into COM terminal. For currents ≤ 200 mA, insert the red test lead into mA terminal. If the current goes up to 10A, insert the red test lead into 10A terminal.
- Set the rotary switch to A~ range, and connect the test leads to the tested circuit in series.

Measuring Resistance

- Insert the test leads into the input terminals (Red to Ω and black to COM).
- Set the rotary switch to Ω range, and connect the test leads to the tested resistor in parallel.

Notice

- If the resistance to be tested is more than the maximum value of the range selected, over-range "OL" will be displayed. Select a higher range. For resistance more than 1M Ω and above, the reading can become stable after several seconds; this is normal for high resistance reading.
- When no input is present, such as open-circuit conditions, the instrument will display "OL".
- When you check the impedance of internal circuits, the power supply to the circuit to be tested must be cut off and all capacitors must be totally discharged.
- The test leads can add up to 1.0M Ω at 200M Ω settings. This can be checked by short-circuiting the leads to find their impedance. This value can then be subtracted from any measurements taken. For example, 101.0M Ω is shown in measurement of 100 M Ω resistances and the 1.0 should be subtracted from the full reading.

Measuring Capacitance

Prior to connection to the capacitance to be tested, note that the time for zero reset is needed for each change of range. Existing drift reading cannot influence the testing precision.

Notice

- Although the capacitance ranges have been protected internally, you still need to discharge all tested capacitors so as to avoid any damage to the instrument or any measurement error.
- When measuring capacitance, insert the capacitor into the capacitance testing seat.

- In measuring large capacitance, it will take a certain time period to get a stable reading.

- Unit 1000pF=1nF, 1000nF=1 μ F

Measuring Frequency

- Insert test leads into input terminals (Red to Hz and black to COM).
- Set the rotary switch to kHz range; connect test leads to frequency source. You can read the frequency reading directly from the display.

Measuring Temperature

- When measuring the temperature, insert the cold end (free end) of the thermocouple sensor into the temperature terminals and at the same time note the polarity. Place the working end (temperature measuring end) on or inside the object to be tested. You can read the temperature directly from the display which is expressed in $^{\circ}$ C or $^{\circ}$ F.

Testing Diodes and Continuity

- Insert test leads into input terminals (Red to V Ω and black to COM, "+" for red test lead). Then set the rotary switch to DIODE terminal, and connect the test leads to the tested diode. The displayed reading is the approximate value of the forward voltage drop of diode.
- Connect test leads to the circuit under test, if the resistance between the tested ends is $< 10\Omega$, the built-in buzzer sounds.

Auto Power Off

- The meter features an Auto Power off function. When idle time of the instrument reaches 15 minutes, the power automatically turns off and the instrument goes into sleep mode. In this case, the instrument consumes approx. 7 μ A current.
- If you want to restart the meter after power off, press the power switch twice.

Maintenance

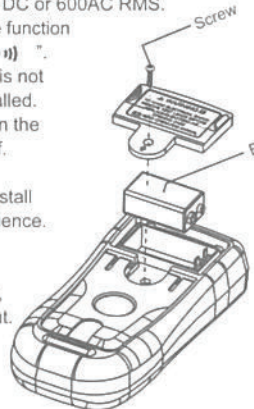
This digital universal meter is an electronic precision instrument.

- Do not connect to voltages higher than 600V DC or 600AC RMS.
- Do not connect to the voltage source when the function switch is at "current ranges", " Ω " and " \rightarrow (buzzer symbol)".
- Do not use this instrument when the battery is not well connected or its back cover is not installed.
- You can only change the battery or fuse when the test leads are removed and the power is off.

Battery installation or replacement

This product uses 9V battery. Refer to Fig. 2, install or replace the battery as per the following sequence.

- Turn off the meter and remove the test leads from the input terminals.
- Remove the screws on the battery box cover, then remove the cover and take the battery out.
- After the new battery is installed, replace the battery cover and replace the screws.



INFORMATION ON WASTE DISPOSAL FOR CONSUMERS OF ELECTRICAL AND ELECTRONIC EQUIPMENT.

When this product has reached the end of its life it must be treated as Waste Electrical & Electronics Equipment (WEEE). Any WEEE marked products must not be mixed with general household waste, but kept separate for the treatment, recovery or recycling of the materials used. Contact your local authority for details of recycling schemes in your area.



Tenma Test Equipment
405 S. Pioneer Blvd
Springboro, Oh
www.tenma.com