

UT89X/UT89XD Digital Multimeter

1. Introduction

UT89X/UT89XD are 6000-count true RMS digital multimeters. A unique feature is the NCV function which can quickly identify live and neutral wires through light intensity. In addition, the UT89X can measure temperature and detect live/neutral wire through a single test lead by contact. The UT89XD can perform LED measurements. The whole series are designed with audio/visual alarm, allowing you to observe the test result more intuitively. The flashlight and the auto backlight features are also convenient when measuring in the dark. With ergonomic design and durable double injection build, UT89X series are perfect measurement tools for electricians and hobbyists.

Features:

- 1) Double injection, durable and ergonomic
- 2) Audio/visual alarm (applied in voltage/current/capacitance/diode/transistor/continuity/NCV/LED measurement)
- 3) Up to 1000V voltage measurement
- 4) Up to 20A current measurement
- 5) NCV measurement with voltage levels can measure voltage down to about AC 12V/50Hz and distinguish live/neutral wires by sensing.
- 6) Live measurement: single probe to identify live/neutral wire by contact (UT89X)
- 7) Up to 100mF capacitance measurement
- 8) LED measurement can output voltage about 12V/5mA (UT89XD)
- 9) LCD auto backlight and flashlight
- 10) Design according to CAT III 600V, CAT II 1000V safety requirements and the following directive standards:
LVD Directive (2014/35/EU):
EN 61010-1:2010
EN 61010-2-030:2010
EN 61010-2-033:2012 (for hand-held meters with voltage measurement function)
EMC Directive (2014/30/EU):
EN 61326-1:2013
EN 61326-2-2:2013

2. Accessories

Open the package box and take out the device. Please check whether the following items are deficient or damaged, and conduct your supplier immediately if they are.

- 1) User manual ----- 1 pc
- 2) Test leads ----- 1 pair
- 3) K-type (NiCr-NiSi) thermocouple ----- 1 pc (UT89X)
- 4) 1.5V AAA battery ----- 4 pcs
- 5) Warranty card ----- 1 pc
- 6) Indicator function description color card ----- 1 pc

3. Safety Instructions

3.1 Safety Standards

- CAT III 600V, CAT II 1000V, double insulation, and material pollution grade II.
- CAT safety level: Category III is suitable for measuring circuits connected to the power distribution section of a building's low voltage power supply unit.

3.2 Safety Instructions

- 1) Do not use the device if the battery cover or the rear cover is not covered up or it will pose a shock hazard!
 - 2) Please check the insulation layer of the test lead before use; it should be in good condition without any damage or broken wires.
 - 3) When "LO" symbol appears on the screen, it indicates that the battery is low. Replace the battery in time to ensure measurement accuracy.
 - 4) Functional dial should be switched to proper position.
 - 5) The measured signal is not allowed to exceed the specified limit to prevent electric shock and damage to the meter!
 - 6) Never switch the functional dial when measuring to avoid damage to the meter!
 - 7) After each measurement, disconnect the test leads with the circuit.
For current measurement, switch off the power supply first, and then disconnect the test leads with the circuit.
 - 8) Be cautious when the measured voltage is higher than DC 60V or AC 30Vrms to avoid electric shock!
 - 9) Do not use or store the meter in high temperature and high humidity environments. The performance of the meter may be affected.
 - 10) Do not change the internal circuit of the meter to avoid damage to the meter and users!
 - 11) Clean the case with a damp cloth and mild detergent. Do not use abrasives or solvents!
 - 12) Please operate the meter according to this manual, otherwise the protective measures of the meter may be invalid.
 - 13) Replace the test lead if the insulation layer is damaged.
- Warning: The replaced test leads should comply with EN 61010-031 safety standard, CAT III 600V, CAT II 1000V and can measure current above 20A.

4. Electrical Symbols

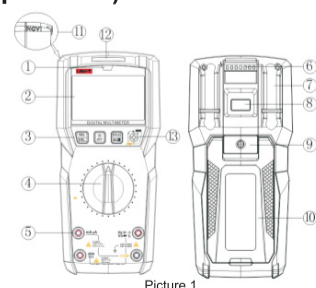
	AC/DC		High voltage hazard
	Warning		Grounding
	Double insulation		Low battery indication

5. General Specifications

- 1) Max voltage between input terminal and ground: please refer to the technical index for more details.
- 2) 20A terminal: 20A 250V fast-acting fuse (Φ5x20mm)
- 3) mA/μA terminal: 630mA 250V fast-acting fuse (Φ5x20mm)
- 4) Display count: 6000
Max capacitance: 99.9mF
- 5) Others:
Range: Auto/manual
Polarity: Auto
Refreshes 2-3 times/s; "OL" appears when over-range.
Display: TN screen
Operating temperature: 0°C~40°C (32°F~104°F)
Storage temperature: -20°C~60°C (-4°F~140°F)
Relative humidity: 0°C~below 30°C ≤75%, 30°C~40°C ≤50%
Operating altitude: 0~2000m
- 6) Battery: AAA 1.5V × 4
- 7) Low battery indication: LCD displays "LO" symbol
- 8) Dimension: about 175mm × 81mm × 48.5mm
- 9) Weight: about 345g (including batteries)
- 10) EMC:
RF field (1V/m): overall accuracy = specified accuracy + 5% of range
RF field (>3V/m): no specified calculation

6. External Structure (picture 1)

- 1) Auto backlight sensing window
- 2) LCD screen
- 3) Functional buttons
- 4) Functional dial
- 5) Input terminals
- 6) Hook
- 7) Multifunctional test lead slot
- 8) Flashlight
- 9) Battery cover screw
- 10) Case holder
- 11) NCV sensing part
- 12) Audio/visual alarm indicator
- 13) Transistor test ports



7. UT89X/UT89XD LCD screen (picture 2a/2b)



Picture 2a



Picture 2b

Symbol	Description
	Caution: AC/DC voltage is higher than 30V
	Data hold
	Negative reading
AC/DC	AC/DC measurement
	Low battery indicator
AUTO	Auto range
	Diode measurement
	Continuity measurement
	Relative value measurement
Ω, kΩ, MΩ	Resistance unit
mV, V	Voltage unit
μA, mA, A	Current unit
nF, μF, mF	Capacitance unit
Hz, %	Frequency unit, duty ratio
°C/°F	Temperature unit: Celsius degree, Fahrenheit degree
	Transistor amplification factor
NCV	Non-contact voltage measurement
Live	Contact-type live/neutral wire measurement
LED	LED measurement
	Auto power off
BL	Auto backlight

8. Functional Dial and Buttons

Position	Description	Position	Description
	DC voltage measurement	NCV	Non-contact voltage measurement
	AC voltage measurement	hFE	Transistor measurement
	AC current measurement	Ω	Resistance measurement
	DC current measurement	100mF	Capacitance measurement
Live	Contact-type live/neutral wire measurement (UT89X only)		Diode PN junction voltage/continuity measurement
OFF	Shutdown	LED	LED measurement (UT89XD only)
Hz, %	Frequency/duty ratio measurement	°C/°F	Temperature measurement (UT89X only)

button:

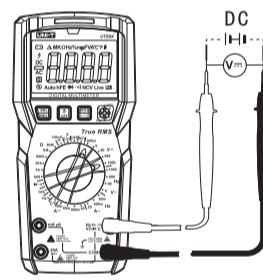
- 1) Continuity/diode: short press (<2s) to cycle through continuity and diode measurement.
 - 2) Hz%: short press (<2s) to cycle through frequency and duty ratio measurement.
 - 3) ACV: short press (<2s) to cycle through frequency and AC voltage measurement.
 - 4) ACA: short press (<2s) to cycle through frequency and AC current measurement.
 - 5) °C/°F: short press (<2s) to cycle through Celsius degree and Fahrenheit degree measurement.
 - 6) NCV: short press (<2s) to cycle through the sensing range of EFH1 and EFL0.
 - 7) In the off state, press and hold the SEL/REL key, then rotate the dial to turn on the device. The product enters the non-sleep mode, and the buzzer produces 5 beeps every 15 minutes, reminding the user to turn off the product.
 - 8) Long press (>2s) REL key to enter/exit REL measurement mode, LCD will display the REL symbol (applied to V, mV, uA, mA, A, CAP, Ω measurement).
- button: press to turn on/off the auto backlight.
- button: short press (<2s) and the displayed value will be locked, and the LCD will display the "L" symbol; short press again and the value will be unlocked. Long press (>2s) this button to turn on/off the flashlight.

9. Operation Instructions

Please first check the internal 1.5Vx4 batteries. If the battery voltage is low when the device is turned on, "LO" symbol will appear on the screen. User needs to replace batteries in time before use. Please also pay special attention to the warning sign "Δ" beside the test lead terminals, which indicates that the tested voltage or current must not exceed the values listed on the device.

9.1 DC Voltage Measurement (picture 3)

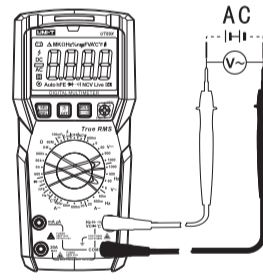
- Steps:
- 1) Switch the dial to **V** position (range: 600mV/6V/60V/600V/1000V);
 - 2) Connect the red test lead to $\frac{+}{-}$ terminal, black to COM terminal;
 - 3) Connect the probes to the correct test points in the circuit to measure voltage.



Picture 3

9.2 AC Voltage Measurement (picture 4)

- Steps:
- 1) Switch the dial to **V~** position (range: 6V/60V/600V/1000V);
 - 2) Connect the red test lead to $\frac{+}{-}$ terminal, black to COM terminal;
 - 3) Connect the probes to the correct test points in the circuit to measure voltage.



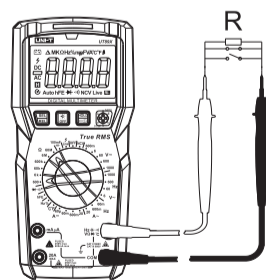
Picture 4

Warnings:

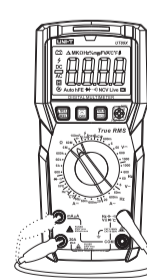
- Do not input voltage over 1000Vrms. It is possible to measure higher voltage. However, it may cause damage to the meter.
- Be cautious to avoid electric shock when measuring high voltage.

Notes:

- Before using the device, it is suggested to measure a known voltage for verification.
- The meter input impedance is about 10MΩ. This load may cause measurement error when measuring the high impedance circuit. In most cases, if the circuit impedance is under 10kΩ, the error can be ignored (≤0.1%).
- The input impedance of DC mV scale is infinite (≥1000MΩ), and it does not attenuate when measuring weak signals, so the measurement accuracy is high. However, when the test leads are disconnected, there may be a value on the screen, which is normal and will not affect the measurement result.
- Readings of AC measurement are true RMS.
- At AC voltage position, short press (<2s) SEL/REL button to enter frequency measurement. Frequency measurement range: 45Hz~1kHz (for reference). Min measurement amplitude: 10% of voltage range.



Picture 5a



Picture 5b

9.3 Resistance Measurement (picture 5a)

- Steps:
- 1) Switch the dial to **Ω** position (range: 600Ω/6kΩ/60kΩ/600kΩ/6MΩ/60MΩ), make sure the circuit power is turned off;
 - 2) Connect the red test lead to $\frac{+}{-}$ terminal, black to COM terminal;
 - 3) Connect the probes to the circuit test points to measure the resistance.

Notes:

- If the measured resistor is open or the resistance exceeds the maximum range, the "OL" symbol will be displayed on the screen.
- Before measuring the on-line resistance, switch off the power supply of the circuit, and fully discharge all capacitors.

- When measuring low resistance, the test leads will produce 0.1Ω~0.3Ω measurement error. To obtain accurate measurement, short-circuit the test leads and use the REL function.
- If the resistance is greater than 0.5Ω when the test leads are shorted, please check if the test leads are loose or damaged.
- When measuring high resistance at 60MΩ range, it is normal to take a few seconds to steady the readings.
- The internal 630mA and 20A fuses can be checked by the 6MΩ measurement function. Please refer to Picture 5b for more details: Insert the red probe to the 630mA or 20A input terminal to measure the resistance. If both fuses are blown, the "OL" symbol will appear on the screen.

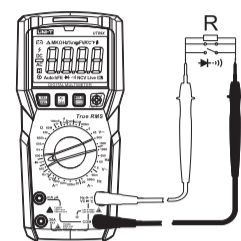
9.4 Continuity and Diode Measurement (picture 6)

Continuity measurement steps:

- 1) Switch the dial to position, and make sure the circuit power is turned off;
- 2) Connect the red test lead to $\frac{+}{-}$ terminal, black to COM terminal;
- 3) Connect the probes to the circuit test points;
- 4) Measured resistance >30Ω: The circuit is broken; buzzer makes no sound; red indicator is on.

Measured resistance ≤30Ω: The circuit is in good conduction status; buzzer beeps continuously; green indicator is on.

If "OL" appears on the screen, the circuit is in open status.

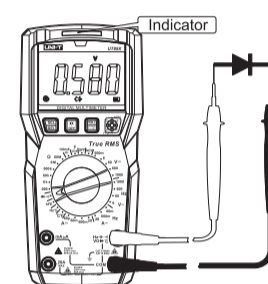


Picture 6

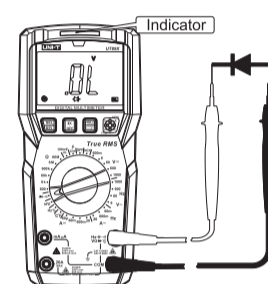
Diode measurement steps:

- 1) Switch the dial to position;
- 2) Short press (<2s) SEL/REL button to activate the diode measurement;
- 3) Connect the red test lead to $\frac{+}{-}$ terminal, black to COM terminal;
- 4) Connect the red probe to diode anode, black to diode cathode;
- 5) Reading <0.12V: red indicator will be on with continuous beeps, indicating the diode may break down;
Reading within 0.12V~2V: green indicator will be on with one beep, indicating the diode is in good condition (for reference).
- 6) If the diode is open or its polarity is reversed, the "OL" symbol will appear on the screen.

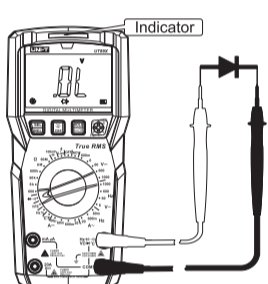
Silicon PN junction: about 500~800mV (normal value).



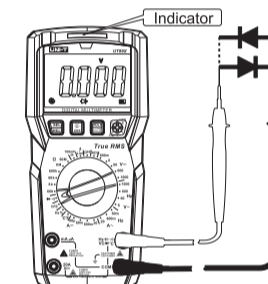
Good diode (forward bias)



Good diode (reverse bias)



Bad diode (open)



Bad diode (shorted)

Warning:

- Do not input voltage higher than DC 60V or AC 30V to avoid personal injury!

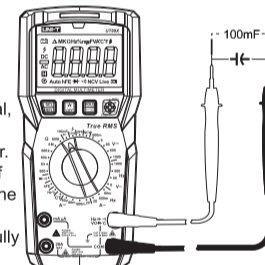
Notes:

- Before checking the continuity or measuring the diode online, switch off the power supply of the circuit, and fully discharge all capacitors.
- Diode test voltage range: about 3V

9.5 Capacitance Measurement (picture 7)

Steps:

- 1) Switch the dial to 100mF position, the green indicator should be on.
- 2) Connect the red test lead to $\frac{+}{-}$ terminal, black to COM terminal;
- 3) Connect the probes to the pins of capacitor.
- 4) When measuring large volume capacitor, if the yellow indicator is on, it indicates that the capacitor is being charged, and the green indicator will be on when the capacitor is fully charged, then wait for the steady reading.



Picture 7

Warning:

- Please fully discharge all capacitors before measuring (especially for capacitors with high voltage) to avoid damage to the meter and personal injury.

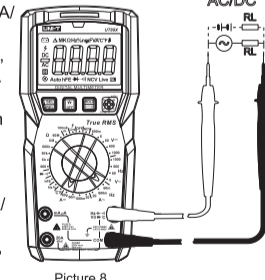
Notes:

- If the measured capacitor is short-circuited or the capacitance exceeds the maximum range, the "OL" symbol will appear on the screen.
- When measuring large volume capacitors, it may take a few seconds to obtain steady readings.
- When there is no input, the meter displays a fixed value (intrinsic capacitance).
- For small capacitance measurement, this fixed value must be subtracted from the measured value to ensure measurement accuracy. Or users can choose the relative measurement function (REL) to automatically subtract the intrinsic capacitance.

9.6 AC/DC Current Measurement (picture 8)

AC current measurement steps:

- 1) Switch the dial to **A~** position (range: 60mA/600mA/20A);
- 2) According to the current being measured, connect the red test lead to mA/μA or 20A terminal, black to COM terminal;
- 3) Connect the test probes with the circuit in series.



Picture 8

DC current measurement steps:

- 1) Switch the dial to **A** position (range: 60μA/60mA/600mA/20A);
- 2) According to the current being measured, connect the red test lead to mA/μA or 20A terminal, black to COM terminal;
- 3) Connect the test probes with the circuit in series.

Warnings:

- To prevent possible electric shock, fire or personal injury, switch off the power supply of the circuit before measuring the current, and then connect the meter with the circuit in series.
- Please choose the correct input terminal and function to measure. If the range of the measured current is unknown, select the maximum range and then accordingly reduce.
- There are fuses inside the 20A and mA/μA terminals. Do not connect the test leads with any circuit in parallel to avoid damage to the meter and personal injury.

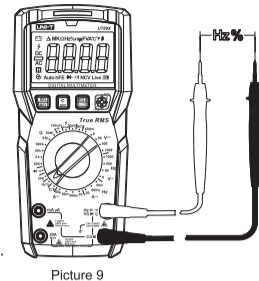
Notes:

- Readings of AC measurement are true RMS.
- If the tested current is 6A~10A, the max measurement time should not exceed 60 seconds, and the next test should be after 1 minute.
If the tested current is ≥10A, the max measurement time should not exceed 10 seconds, and the next test should be after 15 minutes.
- When measuring AC current, short press (<2s) SEL/REL button to display AC frequency.

9.7 Frequency/Duty Ratio Measurement (picture 9)

Steps:

- 1) Switch the dial to Hz % position.
- 2) Connect the red test lead to V_{Ω} terminal, black to COM terminal.
- 3) The frequency value is displayed on the screen.
- 4) Short press (<2s) SEL/REL button to perform duty ratio measurement.
- 5) The duty ratio percentage is displayed on the screen.
- 6) When measuring AC voltage or AC current, you can short press (<2s) the SEL/REL button to switch to frequency measurement.



Picture 9

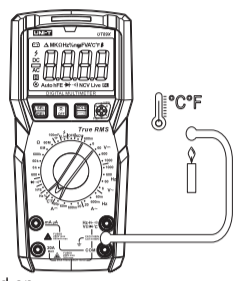
Warning:

- Do not input voltage higher than DC 60V or AC 30V to avoid personal injury!

9.8 Temperature Measurement (picture 10) (UT89X only)

Steps:

- 1) Switch the dial to °C/F position;
- 2) Plug the K-type thermocouple "+" end to V_{Ω} terminal and the other end to COM terminal;
- 3) Short press (<2s) SEL/REL button to switch between °C and °F.



Picture 10

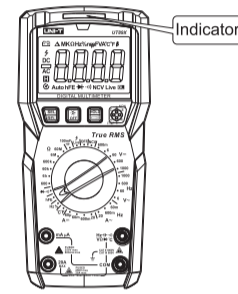
Notes:

- Only K-type (NiCr-NiSi) thermocouple is applicable (The measured temperature should be less than 230°C/446°F).
- "OL" symbol appears when the meter is turned on.
- °F=1.8x°C+32

9.9 Transistor Measurement (picture 11)

Steps:

- 1) Switch the dial to hFE position and make sure that the test leads are not connected to any circuit;
- 2) Insert the three pins of the transistor to the corresponding polarity holes on socket;
- 3) The reading on the screen is the amplification factor of the measuring transistor. Amplification factor >50: green indicator is on, indicating that the amplification is good. Amplification factor ≤50: yellow indicator is on, indicating that the amplification is poor.



Picture 11

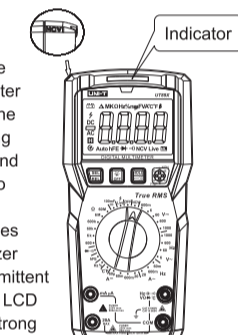
Warning:

- Do not input any voltage at any test lead terminals during the transistor measurement to avoid personal injury!

9.10 NCV (Non-contact Voltage) Measurement (picture 12)

Steps:

- 1) Switch the dial to NCV position.
- 2) In NCV sensing level 2 (default, LCD displays "EFH"), the voltage range is >48V-220V. Place which is at the upper left corner of the multimeter near the live AC power cord. If the voltage of the measured power cord is in the range of sensing level 2, the yellow indicator will start flashing and the buzzer will beep intermittently. According to the intensity of the induced voltage, the yellow indicator flashes with varied frequencies (flashes fast when the intensity is strong), and the buzzer beeps with different intermittent time (the intermittent time is short when the intensity is strong). The LCD displays the induction intensity from weak to strong by "-", "—", "—", "—". If the measured power cord is >220V, the red LED will be on.
- 3) If the measured power cord voltage is <48V, users need to short press (<2s) the SEL/REL button to switch to sensing level 1 (LCD displays "EFL"). If the voltage of the measured power cord is in the range of sensing level 1, the green indicator will start flashing and the buzzer will beep intermittently. According to the intensity of the induced voltage, the green indicator flashes with varied frequencies (flashes fast when the intensity is strong), and the buzzer beeps with different intermittent time (the intermittent time is short when the intensity is strong). The LCD displays the induction intensity from weak to strong by "-", "—", "—", "—".
- 4) Short press (<2s) SEL/REL button again to switch to sensing level 2 (LCD displays "EFH") measurement.



Picture 12

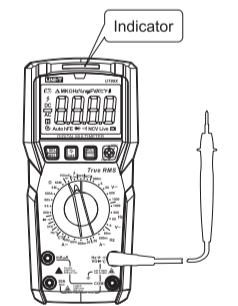
Notes:

- The sensing level varies with the distance between the sensing part and the measured AC power cord.
- The sensing voltage level is for reference only and no specific measurement is made. The frequency of the induced voltage is applicable to 50Hz/60Hz.
- During the NCV measurement, users need to hold the multimeter case by hand.

9.11 Contact Type Live/Neutral Wire Measurement (picture 13) (UT89X only)

Steps:

- 1) Switch the dial to Live position.
- 2) Connect the red test lead to V_{Ω} terminal. Do not connect any test leads or conductors to the other three terminals.
- 3) Insert the red probe to the AC power socket.
- 4) The live or neutral wire in the socket can be identified by the audio/visual alarm. If the live wire is contacted, the red indicator flashes and the buzzer beeps. If the neutral wire is contacted, the red indicator is off and the buzzer makes no sound.



Picture 13

Warnings:

- Do not input voltage over 1000Vrms. It is possible to measure higher voltage.
- However, it may cause damage to the meter.
- Be cautious to avoid electric shock when measuring high voltage.

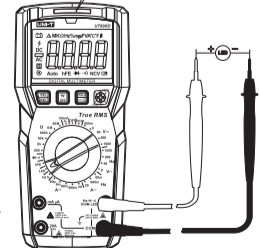
Notes:

- When the live wire is >60V, the red indicator will flash and the buzzer will beep. According to the voltage value of the live wire, the indicator flashes with varied frequencies, and the buzzer beeps with different intermittent time.
- The measured voltage is for reference only and no specific measurement is made. The frequency of the induced voltage is applicable to 50Hz/60Hz.
- During the Live measurement, users need to hold the center part of the multimeter case by hand.
- When the LIVE function is applied to the intensive high-voltage electric field measurement, the accuracy for the device to judge the "live wire" may be unstable. In this case, it should be judged by the LCD display in combination with the sound frequency.

9.12 LED Measurement (picture 14) (UT89XD only)

Steps:

- 1) Switch the dial to LED position.
- 2) Connect the red test lead to V_{Ω} terminal, black to COM terminal.
- 3) Connect the red probe to LED anode, black to LED cathode.
- 4) Reading <11.1V: green indicator will be on, indicating that the LED light has a forward voltage drop, and the LED light should be on. Reading >11.1V: indicator will be off, indicating that the voltage drop value of the LED light is out of the measurement range.
- 5) Press the HOLD key to keep the value, and the green indicator will be on.



Picture 14

9.13 Others:

If there is no operation for 15 minutes, the meter will automatically shut down to save power. Before the auto shutdown, the buzzer will make five consecutive beeps and one long beep and then enter the sleep state. You can wake up the device by pressing any button, and the buzzer will beep once. To disable auto shutdown, switch the dial to OFF position, long press SEL/REL button and turn on the meter, the \mathcal{C} symbol disappears on the LCD with three beeps. Restart the meter to restore the Auto-off function.

Buzzer warning:

- Input DCV/ACV voltage $\geq 1000V$: buzzer warning and red indicator is on, high voltage symbol appears, indicating that the range is at its limit.
 - Current $\geq 10A$: buzzer warning and the red indicator is on, indicating that the measured current is relatively large and the measurement time should be controlled.
- * Low battery detection: when the battery is lower than about 4.5V±0.1V, the low battery symbol " \mathcal{B} " appears.

10. Technical Index

Accuracy: ± (a% of reading + b digits), 1 year warranty

Ambient temperature: 23°C±5°C (73.4°F±9°F)

Relative humidity: ≤75%

Notes:

- To ensure accuracy, operating temperature should be within 18°C~28°C and the fluctuation range should be within ±1°C.
- Temperature <18°C or >28°C: add temperature coefficient error 0.1 x (specified accuracy)/°C

10.1 DC Voltage Measurement

Range	Resolution	Accuracy
600mV	0.1mV	± (0.5%+4)
6.000V	1mV	± (0.5%+3)
60.00V	10mV	± (0.7%+3)
600.0V	100mV	
1000V	1V	± (0.7%+10)

Input impedance: *mV range $\geq 1000M\Omega$, *other ranges: about 10M Ω .

(The reading might be unstable at mV range when no load is connected, and it becomes stable once the load is connected, $\leq \pm 5$ digits)

Max input voltage: $\pm 1000V$

Input voltage $\geq 1000V$: audio/visual alarm

Input voltage >1010V: "OL" appears on LCD

10.2 AC Voltage Measurement

Range	Resolution	Accuracy	Range	Resolution	Accuracy
6.000V (45~400Hz)	1mV	± (0.8%+5)	6.000V (400~1000Hz)	1mV	± (1.0%+8)
60.00V (45~400Hz)	10mV		60.00V (400~1000Hz)	10mV	± (1.5%+8)
600.0V (45~400Hz)	100mV	± (1.0%+12)	600.0V (400~1000Hz)	100mV	± (1.8%+12)
1000V (45~400Hz)	1V		1000V (400~1000Hz)	1V	

Input impedance: about 10M Ω .

* True RMS display.

Frequency response: 45~1KHz

* Non-sine wave frequency response: 45Hz~400Hz

AC crest factor at 3000 counts: allows ≤ 3.0

AC crest factor at 6000 counts (full range): ≤ 1.5

According to the crest factor, the additional error is calculated as follows:

a) Add 4% when crest factor is 1~2

b) Add 6% when crest factor is 2~2.5

c) Add 8% when crest factor is 2.5~3

* AC voltage frequency measurement: 45Hz~1kHz. Min measurement amplitude: 10% of voltage range.

* Accuracy guarantee range: 1~100% of range, shorted circuit allows least significant digit <10

Max input voltage: 1000Vrms

Input voltage >1000V: audio/visual alarm

Input voltage >1010V: "OL" appears on LCD

10.3 Resistance Measurement

Range	Resolution	Accuracy
600.0 Ω *	0.1 Ω	± (0.8%+5)
6.000k Ω	0.001k Ω	± (0.8%+3)
60.00k Ω	0.01k Ω	
600.0k Ω	0.1k Ω	± (1.5%+5)
6.000M Ω	0.001M Ω	
60.00M Ω	0.01M Ω	± (1.5%+25)

Measurement result = reading of resistance – reading of shorted test leads

Open circuit voltage: *about 1V (test current is about 0.4mA)

Overload protection: 600V-PTC

10.4 Continuity, Diode Measurement

Range	Resolution	Remark
•••	0.1 Ω	Set value: Open circuit: resistance >30 Ω , no beep; Well-connected circuit: resistance $\leq 30\Omega$, audio/visual alarm
•••	0.001V	Open circuit voltage: about 3V (test current is about 1.2mA) Silicon PN junction normal voltage: about 0.5~0.8V, with audio/visual alarm

Overload protection: 600V-PTC

Reading <0.12V: red indicator will be on with continuous beeps, indicating the diode may break down;
Reading within 0.12V-2V: green indicator will be on with one beep, indicating the diode works well.

10.5 Transistor Measurement

Range	Resolution	Remark
1000 β	1 β	(NPN/PNP)Vce $\approx 1.8V$, Ib $\approx 5\mu A$.

10.6 Capacitance Measurement

Range	Resolution	Accuracy
6.000nF	1pF	±(5%+35)
60.00nF	10pF	
600.0nF	100pF	±(2.5%+20)
6.000 μF	1nF	
60.00 μF	10nF	
600.0 μF	100nF	
6.000mF	1 μF	±(6.0%+10)
60.00mF	10 μF	± (10%+0D)
100.0mF	100 μF	± (10%+0D)

Overload protection: 600V-PTC

Measured capacitance $\leq 600nF$: It is recommended to select REL mode for ensuring accuracy (open circuit allows least significant digit <20).

10.7 DC Current Measurement

Range	Resolution	Accuracy	
μA	60 μA	0.01 μA	
mA	6 mA (仅UT89XD)	1 μA	± (0.8%+8)
	60mA	10 μA	
	600mA	0.1mA	
A	20A	10mA	±(2%+5)

Overload protection:

μA mA range: F1 fuse ($\phi 5 \times 20$)mm 630mA 250V

20A range: F2 fuse ($\phi 5 \times 20$)mm 20A 250V

Input >10A: audio/visual alarm

Input >20.1A: "OL" appears on LCD

10.8 AC Current Measurement

Range	Resolution	Accuracy	Range	Resolution	Accuracy
60mA (45~400Hz)	10 μA	±(1.0%+12)	60mA (400~1000Hz)	10 μA	±(1.5%+12)
600mA (45~400Hz)	0.1mA	±(2.0%+3)	600mA (400~1000Hz)	0.1mA	±(2.5%+5)
A (45~400Hz)	10mA	±(3.0%+5)	20A (400~1000Hz)	10mA	±(3.5%+8)

* True RMS display. Frequency response: 45~1KHz

* Non-sine wave frequency response: 45Hz~400Hz

AC crest factor at 3000 counts: allows ≤ 3.0

AC crest factor at 6000 counts (full range): ≤ 1.5

According to the crest factor, the additional error is calculated as follows:

a) Add 4% when crest factor is 1~2

b) Add 6% when crest factor is 2~2.5

c) Add 8% when crest factor is 2.5~3

* AC current frequency measurement: 45Hz~1KHz.

Min measurement range: mA gear position>35mA, 20A gear position>5.5A.

Accuracy guarantee range: 1~100% of range, open circuit allows least significant digit <2.

Input >10A: audio/visual alarm

Input >20.1A: "OL" appears on LCD.

Overload protection: (similar to DC current overload protection)

10.9 Frequency/Duty Ratio Measurement

Range	Resolution	Accuracy	
Frequency	9.999Hz ~ 10MHz	0.001Hz~100kHz	± (0.1%+4)
Duty ratio	0.1% ~ 99.9%	0.1%	±(2%+5)

Measurement range: 10Hz~10MHz (auto range)

$\leq 100kHz$: 100mVrms \leq input amplitude $\leq 30V$ rms

>100kHz~1MHz: 200mVrms \leq input amplitude $\leq 30V$ rms

>1MHz: 600mVrms \leq input amplitude $\leq 30V$ rms

The duty ratio is only applied to square wave measurement

($\leq 10kHz$, 300mVrms \leq input amplitude $\leq 30V$ rms)

Frequency $\leq 1kHz$: duty ratio is 10.0%~95.0%

Frequency >1kHz: duty ratio is 30.0%~70.0%

Overload protection: 600V-PTC

10.10 Temperature Measurement (UT89X only)

Range	Resolution	Accuracy
-40°C ~ 0°C	1°C	± (6%+5)
0°C ~ 400°C	1°C	± (2%+4)
400°C ~ 1000°C	1°C	± (2%+5)
-40°F ~ 32°F	1°F	± (6%+9)
32°F ~ 752°F	1°F	± (2%+8)
752°F ~ 1832°F	1°F	± (2%+9)

Overload protection: 600V-PTC

10.11 LED measurement (UT89XD only)

Range	Resolution	Accuracy
11.1V	0.01V	±(10%)

Open circuit voltage: about 12V.

Short circuit current: $\leq 5mA$ (11.10V: OL appears).

Overload protection: 600V-PTC

10.12 LED Three-color Indicator

Function	LED Indicator Color	Description
NCV	LED off	>12V
	LED on (green)	>12V-48V: green LED flickers from slow to fast, buzzer beeps from slow to fast.
	LED on (yellow)	>48V-220V: yellow LED flickers from slow to fast, buzzer beeps from slow to fast.
	LED on (red)	>220V: red LED is on.
LIVE (UT89X only)	LED off	<60V
	LED on (red)	>60V: red LED flickers from slow to fast, buzzer beeps from slow to fast to indicate different voltage level.
LED (UT89XD only)	LED off	OL
Continuity	LED on (green)	<11.1V
	LED off	OL
	LED on (red)	Non-conducting (>30 Ω)
Diode	LED on (green)	Conducting ($\leq 30\Omega$)
	LED on (red)	Conducting (0.12V-2V)
	LED off	Breakdown (<0.12V)
Transistor	LED on (green)	>2V
	LED on (yellow)	Amplification factor >50
	LED off	Amplification factor ≤ 50
Capacitance	LED on (green)	Amplification factor =0
	LED off	<20pF
	LED on (yellow)	The capacitor is fully charged
Voltage	LED on (green)	The capacitor is charging
	LED off	DCV <1000V, ACV <1000V
	LED on (red)	DCV ≥ 1000