

UT221

Operating Manual



2000A Digital Clamp Meter

I. Overview

UT221 is a safe and reliable 3 1/2 bit AC and DC digital clamp meter with stable performance (hereinafter referred to as clamp meter). It is designed with large-scale integrated circuit and dual integral A/D converter as the core and provides full-range overload protection and novel structural design, which all together makes it a ideal tool with superb performance for electricians.

The instruction manual includes relevant safety information and warning indication, please read them carefully and strictly observes all warnings and notes.

Warning:

Prior to using clamp meter, please read the relevant " Safety Information " carefully.

II. Unpacking Inspection

Unpack and take out the instrument, please check carefully if the following items are missing or damaged.

1. Operating Manual-----1pc
2. Test Leads-----1 pair
3. Current Output Cable-----1pc
4. Wrist Strap-----1pc
5. Tool Box-----1pc

In case there is any missing or damaged item, please contact your supplier.

III. Safety Information

Please note the "warning signs and words". Warning specifies the condition or action that may cause threat to user or damage to the instrument or equipment to be measured.

The clamp ammeter is designed and produced strictly in accordance with GB4793 safety requirements, IEC/EN 61010-1,IEC/EN61010-2-032,IEC/EN61010-2-033 Over-Voltage CATIII 1000V, CATIV 600V, Double Insulation and Pollution Degree 2 standards. The supplied test leads together with the clamp meter live up to EN61010-031 CATIII 1000V, CATIV 600V and Double Insulation requirements. Use the Meter as specified in the manual; otherwise the protection provided by the Meter may be impaired.

1. Check the clamp meter and test leads before using, guard against any damage or abnormal phenomenon. If any abnormal condition was found: bare test pen, damaged chassis insulation, no display in LCD, or the clamp meter is thought not be able to work normally, please do not use it.
2. It is forbidden to use the clamp meter with back cover or the battery cover opened, or otherwise there will be electric shocking.
3. Keep finger within the finger guard of test leads, and do not contact the bare wire and connector, unused input terminal or the circuit being measured when clamp meter is in operation.
4. Set to a proper measurement range before making measurements. To avoid damage to the meter, prohibit switching the range during measurement.

5. Do not apply between the clamp ammeter terminals and ground the voltage over DC1000V/AC750V to guard against electric shocking and clamp meter damage.
6. Be careful in measuring voltage higher than 70Vdc or 33Vac rms, since there will be risk of electric shock.
7. Do not measure the voltage or current higher than the rating input value. Set the function range switch at the maximum range position if the scope of measured value couldn't be defined. Prior to measurement of in-line resistance, diode and continuity, cut off the power to the circuits and completely discharge all capacitors, otherwise it may impact the measuring accuracy.
8. When LCD display shows the icon "⚡", it is required to replace the battery in time to ensure the measurement accuracy. Take out battery when clamp meter is not in use for a long time.
9. To avoid damage to the clamp meter and personal injury, do not attempt to modify its internal wiring randomly.
10. Do not use or store the clamp meter near explosive, flammable, high-temperature, high-humidity and strong electromagnetic environments.
11. Clean the clamp meter case with soft cloth and neutral detergent. To prevent causing corrosion to the case, or damage to the instrument, it is forbidden to use abrasive material and solvent.

IV . Electrical Symbols

⊞	Dual insulation
⊞	Grounding
⚠	Warning prompt
~	AC (Alternating current)
—	DC (Direct current)
🔊	Buzzing on-off
➡	Diode
🔋	Low battery
~	AC or DC (Alternating current or direct current)
⚡	Danger! High voltage!
Ⓢ	Comply with EU standard
CAT IV	Equipment is designed to protect against transients from the primary supply level (e.g. an electricity meter, primary overcurrent protection devices).
CAT III	Equipment is designed to protect against transients in equipment in fixed installations (e.g. switches in fixed installation, industrial used equipments with permanent connection to fixed installations).

V. Meter Structure (See Figure 1)

1. Clamp body: Safety design to protect operator from touching the dangerous area
2. Clamp trigger: Press the trigger to open the clamp head, when release the trigger, clamp head will partially closed.
3. Functional key: Select basic functions.
4. Current signal output terminal: With output cable connected to the terminal, current waveform can be observed with use of a oscilloscope.
5. Measure input terminal: Measure the signal input
6. Input hole paddle: Move the paddle to select either input terminal or current output terminal.
7. LCD display area: Display the measurement data and functional symbols.
8. Dial switch: Select the measurement ranges.
9. Clamp jaw: Sensing device used to measure AC/DC current and covert current into voltage.

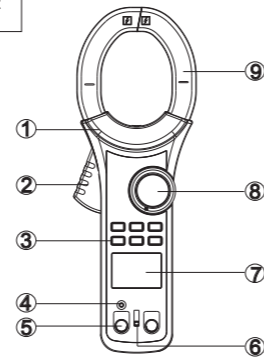


Figure 1

VI. Display Symbols (See Figure 2)

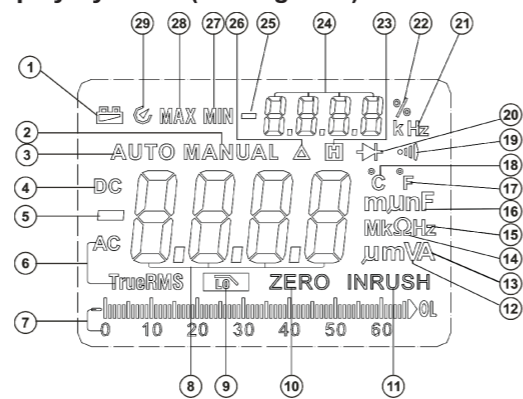


Figure 2

1. Low battery indicator;	19. Continuity test indicator;
2. Manual range indicator;	20. Diode test indicator;
3. Auto range indicator;	21. second-display frequency measurement unit (Hertz);
4. DC signal measurement indicator;	22. Duty cycle indicator;
5. Main display negative polarity indicator;	23. Data hold indicator;
6. AC signal true RMS measurement indicator;	24. Maximum display;
7. Analog bar and graded scale;	25. Second-display negative polarity indicator;
8. Main Display;	26. Relative measurement indicator;
9. Low-pass filtering indicator;	27. Minimum value measurement indicator;
10. Zeroing for DC current ranges.	28. Maximum value measurement indicator;
11. Inrush measurement indicator;	29. Auto shutdown indicator;
12. Voltage measurement unit (Volt, millivolt)	
13. Current measurement unit (Ampere);	
14. Resistance measurement unit(Ω, kΩ, MΩ)	
15. Main-display frequency measurement unit (Hert)	
16. Capacitance measurement unit (nF, uF, mF);	
17. Centigrade temperature unit;	
18. Fahrenheit temperature unit;	

VII. Key Function, Auto Shutdown and Buzzer

SELECT : To select functions

The key can be used to switch between Ω, →, ← functions.

MAX/MIN : To measure maximum/minimum value

Press the key to display and hold Max. measured value; press again to display and hold minimum measured value; repeat pressing to circulate the display. Long press for 2 seconds to exit Max/Min mode.

☀ :backlight key

At any gear, press the key to turn on backlight, after another press, backlight is turned off.

HOLD : reading hold key

Press the key to freeze the reading, repress to release and return back to normal measurement status. Turning dial switch or pressing SELECT button also quits HOLD mode.

INRUSH: Inrush measurement key

In order to measure start current of devices such motor, press INRUSH key under AC current function to activate INRUSH mode. Before the motor is turned on, main and second display shows"—". Once the start current is detected, second display will display and hold the inrush value measured during 100ms integral period.

After that, clamp meter performs normal AC current measurement, main display shows current value and second display shows inrush value. After inrush detection, it is able to enter INRUSH mode again by pressing INRUSH, with a 1s long press on INRUSH, quit the mode.

REL/ZERO: Relative value/zero clearing key.

Under all functions except DC current and frequency, it is able to enter relative value measurement mode by pressing REL. Under the REL mode, main display will show Dn-Df, Df is displayed on second display. Df (relative value) is the last measured value prior to pressing REL, while Dn is the current measured value. After another press on REL, normal operation status is restored.

Under DC current ranges, it is allowed to enter the auto zero clearing mode with a press on ZERO less than 1s. under auto zero clearing mode, main display will show Dn-Df, of which Df is the last measured value prior to pressing REL, while Dn is the current measured value. When no other function is activated, second display shows no any content. If still in ZERO mode, press ZERO again and Df will be refreshed and Dn-Df will also be updated accordingly. Long press ZERO key for more than 1s to exit the mode.

Validity of keys:

Not all the key operations under every range are valid. Only when the keys are valid, you then can execute corresponding functions or wake up the clamp meter from sleep mode. See the table below for details:

	☀	SELECT	MAX/MIN	HOLD	INRUSH	REL	ZERO
~	✓	×	✓	✓	✓	✓	×
A+Lo	✓	×	✓	✓	✓	✓	×
—	✓	×	✓	✓	×	×	✓
V	✓	×	✓	✓	×	✓	×
V+Lo	✓	×	✓	✓	×	✓	×
Ω	✓	✓	✓	✓	×	✓	×
→	✓	✓	✓	✓	×	✓	×
←	✓	✓	✓	✓	×	✓	×
Hz	✓	×	×	✓	×	×	×

Auto shutdown:

If functional keys and dial switch are inactive for 15mins, the clamp meter will automatically power off(sleep mode) to conserve the energy. Under this mode, present status will be saved and LCD indicates whether to go into sleep mode or not. To disable the auto shutdown mode, press and hold functional keys except HOLD, then turn on the meter.

⚠Note: Long pressing HOLD key and turning on the clamp meter will make the LCD display full icons, press HOLD again, the meter will access normal startup status.

Buzzer:

When pressing any key, if valid under the selected range, the buzzer beeps, otherwise it remains silent. If the measured voltage is <30mV under diode test, the buzzer emits a long beep; otherwise it remains silent. For the tested resistance <30Ω under continuity test, the buzzer emits a long beep, otherwise it remains silent. The buzzer emits three beeps 1 minute before auto shutdown, and one long beep just before power-off.

VIII. Technical Specifications

1. General specification

LCD:-----	maximum display 6000
Polarity display:-----	auto positive and negative polarity display
Overload display:-----	"OL" or "-OL"
Low voltage display:-----	"⚡" indicates that battery voltage is lower than working voltage, battery .
Sampling rate:-----	about 3/s;
Type of sensor:-----	Hall effect sensor for DC/AC measurement
Test position error:-----	an additional reading error of ±1.0% may be resulted when the tested object is not clamped at the center of clamp jaw.
Shock-resistant:-----	1m drop
Max. jaw opening:-----	diameter 63mm
Max. tested conductor:-----	diameter 60mm
Electromagnetic field impact:-----	the application of device near electromagnetic field may result in unstable display or inaccurate reading.
Power:-----	6F22 9V battery
Auto shutdown function:-----	15min (it can be cancelled as required);
Dimension:-----	298mm×107mm×47mm;
Weight:-----	about 726g (inclusive of battery);

2. Environment conditions

Working environment:-----	indoor
Altitude:-----	2000
Safety :-----	IEC61010-1;IEC61010-2-032; CATIII1000VCATIV600V
Pollution grade:-----	2;
Operating humidity and temperature:-----	0℃~ 30℃ (≤80%RH), 30℃~ 40℃ (≤75%RH), 40℃~ 50℃ (≤45%RH)
Storage humidity and temperature:-----	-20℃ ~ +60℃ (≤80%RH)

3. Electrical specification

Accuracy:-----	±(a% of reading +b digits), calibration per year
Ambient temperature:-----	23℃ ±5℃
Ambient humidity:-----	≤80% RH
Temperature coefficient:-----	0.1×(accuracy) /℃

(1) DC voltage (V)

Range	Resolution	Accuracy	Overload protection
6.600V	0.001V	±(0.8%+3)	1000V DC/AC
66.00V	0.01V	±(0.8%+1)	
660.0V	0.1V	±(0.8%+1)	
1000V	1V	±(1.0%+3)	

Input impedance ≥10M Ω

(2) AC voltage (V)

Range	Resolution	Accuracy	Overload protection
6.600V	0.001V	±(1.2%+5)	1000V DC/AC
66.00V	0.01V		
660.0V	0.1V		
750V	1V		

Main display: true RMS voltage
second display: frequency
Input impedance ≥10M Ω
Frequency response: 40~ 400Hz (≤400mV 50~ 100Hz)

(3) Resistance (Ω)

Range	Resolution	Accuracy	Overload protection
660.0 Ω	0.1 Ω	±(1.0%+2)	1000V DC/AC
6.600k Ω	0.001k Ω		
66.00k Ω	0.01k Ω		
660.0k Ω	0.1k Ω		
6.600M Ω	0.001M Ω	±(1.2%+2)	
66.00M Ω	0.01M Ω		

(4) Continuity test (•|)

Range	Resolution	Accuracy	Overload protection
•)	0.1 Ω	buzzer will sound when ≤30 Ω	1000V DC/AC
		Open-circuit voltage is about 1.2V	

(5) Diode test (→|←)

Range	Resolution	Accuracy	Overload protection
→ ←	0.001V	0.5V~0.8V Open-circuit voltage is about 3.3V	1000V DC/AC

(6) Frequency (Hz)

Range	Resolution	Accuracy	Overload protection
66.00Hz	0.01Hz	±(0.1%+3)	1000V DC/AC
660.0Hz	0.1Hz		
6.600kHz	0.001kHz		
66.00kHz	0.01kHz		
660.0kHz	0.1kHz		
6.600MHz	0.001MHz		
20.00MHz	0.01MHz		

Main display: frequency value
Second display: duty cycle
Sensitivity: When ≤100kHz ≥300mV rms
When >100kHz ≥600mV rms
Input amplitude a: 300mV≤a≤30V rms

(7) DC current (\bar{A})

Range	Resolution	Accuracy	Overload protection
660.0A	0.1A	±(2.5%+20)	2500A
2000A	1A	±(2.5%+5)	

(8) AC current (\tilde{A})

Range	Resolution	Accuracy	Overload protection
660.0A	0.1A	±(2.5%+20)	2500A
2000A	1A	±(2.5%+5)	

Main display: true RMS current
Main display: frequency
Frequency response: 50Hz~60Hz

IX. Operation Instruction

1. DC voltage measurement (\bar{V}) (See Figure 3)

(1) Insert test leads
Insert black test lead in COM and red test lead in “V” input terminal, prepare for measurement.

(2) Set to \bar{V} position
Turn the dial switch to turn on the clamp meter and set to \bar{V} position, the clamp meter enters into DC voltage mode.

(3) Connect the voltage to be measured
Place the red and black test leads at both ends of the voltage to be measured, clamp meter will automatically select the proper range, and LCD displays the measured DC voltage; if the potential at the red test leads is higher than the potential at the black test lead screen displays the positive voltage value, or otherwise the negative voltage value;

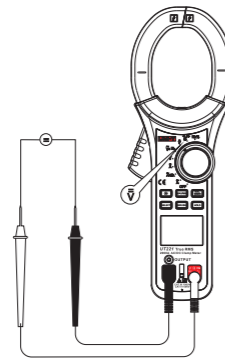


Figure 3

Warning:
Do not measure any voltage higher than 1000Vdc.

2. AC voltage measurement (\tilde{V}) (See Figure 4)

(1) Insert test leads
Insert black test lead in COM and red test lead in “V” input terminal, and prepare to measure.

(2) Set \tilde{V} function gear
Turn the dial switch to turn on the clamp meter and select \tilde{V} , the clamp meter enters into AC voltage mode.

(3) Connect the voltage to be measured
Place the red and black test leads at both ends of the voltage to be measured, clamp meter will automatically select the proper range, and main display will show the true RMS of AC voltage, while second display shows the frequency value of AC voltage;

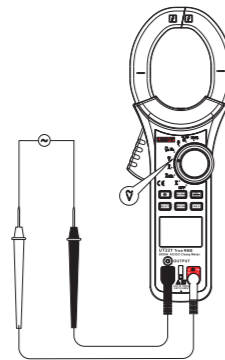


Figure 4

* When measuring AC voltage at a frequency <500Hz, turn dial switch to \tilde{V} position, the low pass filter inside instrument will be automatically activated to filter high-frequency interference caused by frequency above 7.5KHz and ensure stable reading;

Warning:
Do not measure any voltage higher than 750Vac.

3. Resistance measurement (Ω) (See Figure 5)

(1) Insert test leads
Insert black test lead in COM and red test lead in “ Ω ” input terminal, and prepare to measure.

(2) Set Ω position
Turn the dial switch to turn on the clamp meter and set to Ω position, the clamp meter enters into resistance mode.

(3) Select measurement function
The clamp meter defaults at resistance function, so there is no need to press SELECT button any more.

(4) Connect the resistance to be measured
Place the red and black test leads at both ends of the voltage to be measured, clamp meter will automatically select the proper range, and main display shows the currently measured resistance value;

Warning:
When measuring in-line resistor, please cut off the power to the circuits and discharge all capacitors before making connections. Separating the tested component from the circuits can help to obtain more accurate readings.

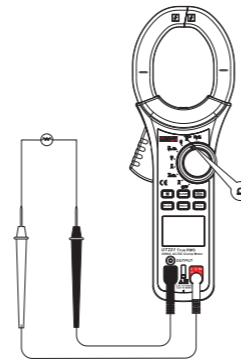


Figure 5

4. Diode test (→|←) (See Figure 6)

(1) Insert test leads
Insert black test lead in COM and red test lead in “→|←” input terminal, and prepare to measure.

(2) Set to Ω position
Turn the dial switch to turn on the clamp meter and set to Ω position, the clamp meter enters into resistance mode.

(3) Select measurement function
The clamp meter defaults at resistance function, press SELECT to access →|← mode.

(4) Connect the tested diode
Place the red and black test leads to positive and negative terminals of diode, screen main display will show the forward conduction voltage drop value of measured diode. When red and black test leads are inversely connected, the display shows “OL” over-loaded symbol.

Warning:
When testing in-line diode, please cut off the power to the circuits and discharge all capacitors before making connections. Separating the tested component from the circuits can help to obtain more accurate readings.

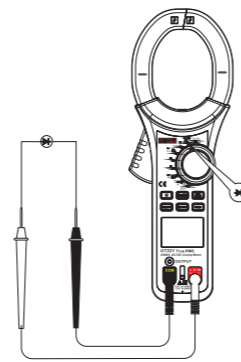


Figure 6

5. Continuity test (•|•) (See Figure 7)

(1) Insert test leads
Insert black test lead in COM and red test lead in “ Ω ” input terminal, and prepare to measure.

(2) Set to Ω position
Turn the dial switch to turn on the clamp meter and set to Ω position, the clamp meter enters into resistance mode.

(3) Select measurement function
The clamp meter defaults at resistance function, press SELECT to access •|• mode.

(4) Connect to the tested terminals
Place the test leads to two tested terminals, the buzzer will sound if the tested resistance <30 Ω ; the buzzer doesn't necessarily sound for resistance within 30 Ω ~100 Ω ; There is no beeping if the resistance >100 Ω .

Warning:
When testing for continuity, please cut off the power to the circuits and discharge all capacitors before making connections to tested terminals

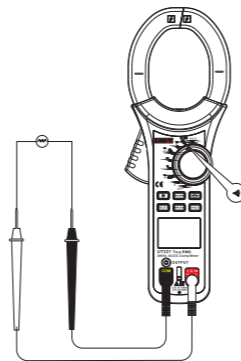


Figure 7

6. Frequency measurement(Hz) (See Figure 8)

(1) Insert test leads
Insert black test lead in COM and red test lead in “ Hz ” input terminal, and prepare to measure.

(2) Set to Hz position
Turn the dial switch to turn on the clamp meter and set to Hz position, the clamp meter enters into frequency mode.

(3) Connect to

Place the red and black test leads to both ends of the signal to be measured, the clamp meter will automatically select the proper range, and main display shows the signal frequency value, while slave display shows the duty ratio of current frequency signal.

Warning:
The maximum input range shall not exceed 30Vrms when measuring frequency.

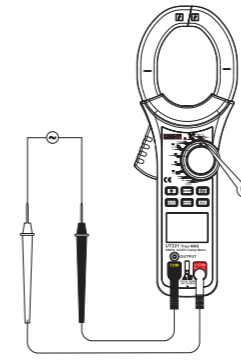


Figure 8

7. DC current measurement (\bar{A}) (See Figure 9)

(1) Set to \bar{A} position
Turn the dial switch to turn on the clamp meter and set to \bar{A} position, the clamp meter then enters into DC current mode.

(2) Clean \bar{A} remaining digits
The clamp meter may present some remaining digits under DC current ranges due to existing earth magnetics or to surrounding field even when no signal is input. So, prior measuring DC current, please press ZERO button to clear those digits first.

(3) Clamp the teste conductor
Open the clamp meter head, clamp the current lead to be measured and keep it at the center position of clamp head, then close it. The clamp meter will automatically select proper range, and the screen displays the positive measured current value when current direction is consistent with that of clamp head, or otherwise displays the negative one.

Warning:
The maximum measured current should not exceed DC2000A when measuring DC current. Do not attempt to measure large current continuously for a long time, for it may cause over-heating to magnetic circuits and then affect measurement accuracy.

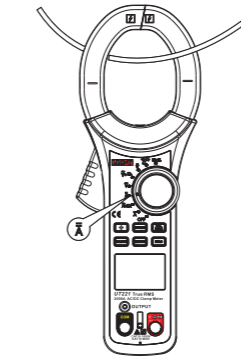


Figure 9

8. AC current measurement (\tilde{A}) (See Figure 10)

(1) Set to \tilde{A} position
Turn the dial switch to turn on the clamp meter and set to \tilde{A} position, the clamp meter then enters into AC current mode.

(2) Clamp the tested conductor
Open the clamp meter head, clamp the current lead to be measured and keep it at the center position of clamp head, then close it, the clamp meter will automatically select proper range, and main display shows the true RMS of AC current, while slave display displays the signal frequency value.

* When measuring AC current at a frequency <500Hz, turn dial switch to \tilde{A} position, the low pass filter inside instrument will be automatically activated to filter high-frequency interference caused by frequency above 7.5KHz and ensure stable reading;

Warning:
AC voltage measurement range should not exceed AC2000A; Do not measure signal with frequency higher than the specified rating. Do not attempt to measure large current continuously for a long time, for it may cause over-heating to magnetic circuits and then affect measurement accuracy.

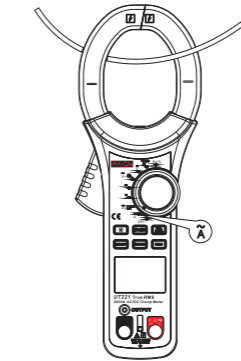


Figure 10

9. Current signal output function (See Figure 11)

UT221 clamp meter is also designed with signal output function. The current signal measured by clamp head can be converted into voltage signal with the ratio of 1A/1mV and outputted via specific output line, user can observe the waveform of current signal by connecting output signal to oscilloscope.

Warning:
Do not apply voltage above 5V into this output terminal, otherwise it may damage the internal circuits of the meter.

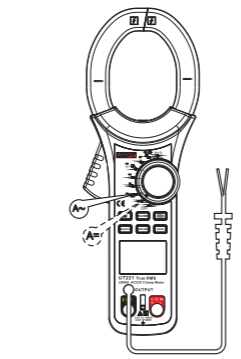


Figure 11

X. Maintenance (See Figure 12)

1. General maintenance
Warning: it is required to keep the test leads away prior to opening the base cap.

a. The clamp meter should be maintained and serviced by qualified professional serviceman or designated maintenance department.
b. Clean the outer case with cloth, it is forbidden to clean with cleaning agent containing abrasive material or solvent.

2. Replacing the battery
The 6F22 9V battery is used to supply power to for the clamp meter. Please install or replace battery as follows:

a. Shut down the clamp ammeter, move away the test pen from the input terminal.
b. Put the panel facing down, screw out the battery box screws, take off battery cap and take out battery, install new battery as per the indication of polarity.
c. It is required to install batteries of the same model. Do not use the unspecified battery
d. After installing new battery, load the battery cap and screw on screws.

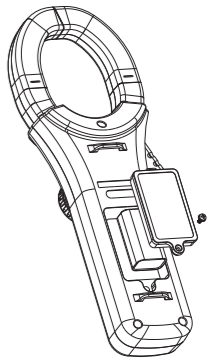


Figure 12

END

The manual information is subject to changes without prior notice.

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