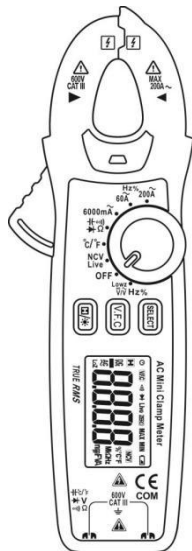


221C Mini Digital Clamp Meter


User's Guide



INTRODUCTION




This range clamp meter has been designed according to IEC-61010-2-032 concerning electronic measuring instruments with 600V CAT III and pollution 2. The model 221C clamp meter measures AC/DC Voltage, AC Current, Resistance, Capacitance, Frequency, Diode and Continuity Test, Temperature, and so on. It features a rugged design for heavy duty use. Proper use and care of this meter will provide many years of reliable service. To fully utilize this clamp meter, please keep this manual for reference carefully.

SAFETY

- ⚠ This symbol indicates that the operator must refer to an explanation in the user's guide to avoid personal injury or damage to the meter.
- Before the measurements, the meter should be preheated to 30 seconds
 - Inspect the condition of the test leads and the meter itself for any damage before operating the meter
 - The meter can be only be used with the equipped test leads to meet the requirements of safety standards. If the test leads need to be replaced, it must be the same electrical specification of the original test leads.
 - If the meter is operated in a noisy conditions, the readings of meter might be unstable, or even with the large errors due to interference.
 - Always remove the test leads before replacing the battery or fuses.
 - Use great care when making measurements if the voltages are greater 60VDC or 36V AC RMS, these voltages are considered a shock hazard.
 - Always discharge capacitors and remove power from the device under test before performing Diode, Resistance or Continuity tests.
 - To avoid damages to the meter, do not exceed the maximum limits of the input values shown in the specification.
 - In case the device is going to be unused for an extended period of time, remove the batteries to prevent them from draining.
 - When  icon appears at the display, please change the new battery to avoid wrong readings.

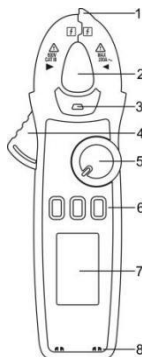
Safety Symbols

⚠ This symbol indicates the user must refer to the manual for further information.

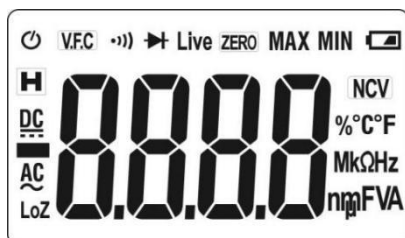
-  Earth ground
-  Double insulation
-  Dangerous voltage





Controls and Jacks

1. NCV sensor
2. Current clamp
3. NCV LED indicator
4. Clamp opening trigger
5. Rotary switch
6. Function buttons
7. LCD Display
8. Input jacks



Symbols of LDC Display




Symbol	Description	Symbol	Description
H	Data Hold		Low Voltage Indication
	Diode Test		Continuity Check
mV V	Unit of Voltage	%	Duty Cycle Measurement
Hz KHz MHz	Unit of Frequency	nF uF mF	Unit of Capacitance
Ω KΩ MΩ	Unit of Resistance	uA mA A	Unit of Current
DC	Direct Current	AC	Alternating Current
°F	Fahrenheit	°C	Centigrade
NCV	Non-Contact Voltage Detection	Live	Live Wire Identification
V.F.C	Variable-Frequency Voltage		Auto Power off

H - Data Hold Button

Press this button to hold the reading in LCD display, push one more time to exit data hold function

SELECT - Function Selection Button

Press this button to shift functions between °C/°F, /Ω/F, NCV/Live, V/Hz/%, A/Hz/%

- Backlight Button



Press the button for approx. 3sec. to activate the LCD backlight, hold Again to exit LCD backlight function

V.F.C Button

At the range \sqrt{V} press this button to activate V.F.C measurement

TECHNICAL SPECIFICATIONS

General Specifications:

- Operating temperature: 0-40 °C (<80%RH).
- Storage temperature: -10-60 °C (<70%RH, exclude batteries)
- Maximum input voltage between input socket and the earth: 600VRMS.
- The measuring principle: double integral A/D conversion
- The sampling rate: about 2 times/sec
- Display: Max. reading 5999
- Based on measuring function to show function icons into the LCD automatically
- Range selection: auto ranging switch
- Over range indication: "OL"
- Input polarity: display "-"
- Low battery indication:  Once the battery lowers the normal working voltage,  will be displayed in LCD
- Battery: 1.5V AAA*2
- Max jaw opening capacity: φ19mm
- The maximum measured conductor size: φ19mm
- Dimension: 178(L)×60(W)×32(H)mm
- Weight: about 165g (include batteries)
- Accessory: User Manual - 1pc, Test Leads - 1set, Temperature probe - 1pc

Measurement Specifications

Accuracy: ± (%readings + digit), warranty period: 12 months
Environment temperature: 18°C-28°C, humidity: ≤80%

* Under AC current measurement, put the conductor under test in the middle of clamp for getting the accurate value.

AC Current (ACA)

Range	Resolution	Accuracy
6000mA	1mA	±(2.5%+10d)
60.00A	0.01A	
200.0A	0.1A	

Frequency response: TRMS 50Hz-60Hz

DC Voltage (DCV)

Range	Resolution	Accuracy
600.0mV	0.1mV	±(0.7%+5d)
6.000V	0.001V	
60.00V	0.01V	
600.0V	0.1V	
600V	1V	

Input impedance: 10MΩ Max. input voltage: 600VDC or 600VAC RMS.

AC Voltage (ACV)

Range	Resolution	Accuracy
600.0mV	0.1mV	±(1.0%+10d)
6.000V	0.001V	
60.00V	0.01V	
600.0V	0.1V	
600V	1V	
V.F.C 600.0V	0.1V	±(4.0%+5d)

Input impedance: 10MΩ

Frequency response: TRMS 40-1000Hz

Max. input voltage::600VDC or 600VAC RMS.

Resistance (Ω)

Range	Resolution	Accuracy
600.0Ω	0.1Ω	±(1.0%+10d)
6.000kΩ	0.001KΩ	±(0.8%+5d)
60.00kΩ	0.01KΩ	
600.0kΩ	0.1KΩ	
6.000MΩ	0.001MΩ	
60.00MΩ	0.01MΩ	±(2.0%+10d)

Overload protection: 250VDC or 250VAC RMS

Diode and Continuity (→/○))

Raneg	Resolution	Function
→	0.001V	Display approximate forward voltage of diode, reverse shows "1" or "OL"
○))	0.1Ω	Built-in buzzer will be sounded if resistance is less than 70Ω±30Ω

Overload protection: 250VDC or 250VAC RMS

Temperature (TEMP)

Range	-20°C - 1000°C	
Resolution	1°C	
Accuracy	-20°C-0°C	±(5% + 4d)
	0°C-400°C	±(2% + 3d)
	400°C-1000°C	±(3% + 3d)
Range	0°F -1800°F	
Resolution	1°F	
Accuracy	-0°F -50°F	±(5% + 4d)
	50°F -750°F	±(2% + 3d)
	750°F -1800°F	±(3% + 3d)

Overload protection: 250VDC or 250VAC RMS

Frequency ACV (Hz)

Range	Resolution	Accuracy
10Hz~1kHz	0.001Hz~0.001kHz	±(0.5%+2d)

Input amplitude: ≥5V (DC level is zero)

Overload protection: 250VDC or 250VAC RMS

Capacitance (F)

Range	Resolution	Accuracy
10nF	0.001nF-0.01nF	±(4.0%+25d)
100nF-100uF	0.01nF-0.1uF	±(4.0%+15d)
1mF-60mF	1uF-10uF	±(5.0%+25d)

Overload protection: 250VDC or 250VAC RMS

Note

It is normal situation not return to zero once at lower value capacitance measurement, it should be subtract the displayed value.

OPERATING INSTRUCTION

Current Measurement

! To avoid electrical shock and or damage to the meter, do not attempt to take any voltage measurement that might exceed 600V.

- Set the rotary switch to proper current range
- Select the current range based on measurement
- Press the clamp opening trigger to open the jaws enclose one conducting wire, and close the jaws tightly
- Read the measured current value in the LCD display
- If display shows "OL", means overload, should select the higher range of Measurement

DC Voltage Measurement(Automatically identify AC/DC Voltage)

! The max. input DC voltage is 600V DC, to avoid electrical shock and/or damage the meter, do not attempt to take any voltage measurement that might exceed 600V DC

- set the rotary switch to $\frac{Lowz}{V/V}$ range
- Insert the black test lead plug into COM jack, insert red test lead plug into VΩ jack
- Touch the black test probe tip to the negative side of the circuit; touch the red test lead probe tip to the positive side of circuit
- Read the voltage value in the LCD display

NOTE:

- 1) This meter with the function on automatically identify ACV and DCV
- 2) Unstable display may occur, especially at the low voltage range measurement (like 200mV range), even no test leads insert at input terminals, and it is the normal situation and not influences the accuracy.
- 3) Press the V.F.C button t, the LCD display VFC icon and enter V.F.C measurement mode.

Resistance Measurement

! To avoid electric shock, disconnect power to the unit under test and discharge all capacitors before taking any resistance measurements

- Set the rotary switch to $\frac{f(=)}{\Omega}$ range, and press "SELECT" till Ω measurement
- Insert the black test lead plug into COM jack, and insert red test lead plug into VΩ jack.
- Touch the black test probe tip to one side of the resistance of under test; touch the red test probe tip to the other side
- Read the resistance value in the display

NOTE: In order to ensure the best accuracy in measurement of low resistance, short the test leads before the measurement and subtract this resistance value of the test leads

Diode Test

! To avoid electric shock, disconnect power to the unit under test and discharge all capacitors before taking diode test

- Set the rotary switch to $\frac{f(=)}{\Omega}$ range, and press "SELECT" button to → measurement.
- Insert the black test lead plug into COM jack, and insert red test lead plug into VΩ jack.
- Place the red test lead on the anode of diode and black test lead on the cathode of diode.
- The meter will show the approx. forward voltage of diode. Reverse voltage will indicate OL.

Continuity Check

! To avoid electric shock, disconnect power to the unit under test and discharge all capacitors before taking diode test

- Set the rotary switch to $\frac{f(=)}{\Omega}$ range, and press "SELECT" button to ○)) measurement.
- Insert the black test lead plug into COM jack, and insert red test lead plug into VΩ jack.
- Touch the test probe tips across the circuit or component under test
- If the resistance is <70Ω±30Ω, the audible signal will be sounded

Capacitance Measurement

! To avoid electric shock, disconnect power to the unit under test and discharge all capacitors before taking diode test

- Set the rotary switch to $\frac{f(=)}{\Omega}$ range, and press "SELECT" to → measurement
- Insert the black test lead plug into COM jack, and insert red test lead plug into VΩ jack.
- Touch the test probe tips across the capacitance under test
- Read the capacitance value in the display

Temperature Measurement

- Set the rotary switch to °C/°F range position
- Press "SELECT" to shift °C and °F
- The value of environmental temperature shows in display
- Insert the red terminal of temperature probe (K Type) into the VΩ jack, black terminal into COM jack, place the temperature probe tip where needed to measure
- Read the temperature value in the display

Non-Contact Voltage Detection (NCV)

- Set the rotary switch to NCV Live range, and press "SELECT" to NCV measurement mode
- Contact the top part of meter with the circuit under test, the indicating LED will be flashed and audible signal will be sounded once detecting the voltage

NOTE

- 1) The detection result is for reference, do not determine the voltage by NCV detection ONLY.
- 2) Detection may interfere by socket design, insulation thickness and other variable conditions.
- 3) The external interference sources, such as flashlight, motor, etc, may cause the wrong detection.

Line Test (Live Wire Recognition)

- Set the rotary switch to NCV Live range, and press "SELECT" to Live measurement
- Insert the black test lead plug into COM jack, and insert red test lead plug into VΩ jack
- Hold the insulation part of black test lead and not put into circuit under measurement; contact the red test lead to live wire, the buzzer of meter will be activated and red LED will be flickered, and the LCD display LIVE

NOTE:

When the circuit is in serious leakage (approx. over 15V), the red test lead even contact earth line, the buzzer of meter will be sounded and LED will be flickered.

MAINTENANCE


WARNING

- To avoid electric shock, disconnect the test leads from any source of voltage before removing the back cover or the battery or fuse covers.
- To avoid electric shock, do not operate the meter until the battery and fuse covers are in place and fastened securely.

Cleaning and Storage

Periodically wipe the case with a damp cloth and mild detergent, do not use abrasives or solvents. If the meter is not be used for a long time, remove the battery and store it separately.

Battery Installation

To avoid the false readings, replace the battery as soon as the battery indicator  appears.

- 1) Turn power off and disconnect the test leads from the meter.
- 2) Open the rear battery cover by using screwdriver.
- 3) Insert the battery into battery holder, observing the correct polarity.
- 4) Put the battery cover back in place, secure with the screws.