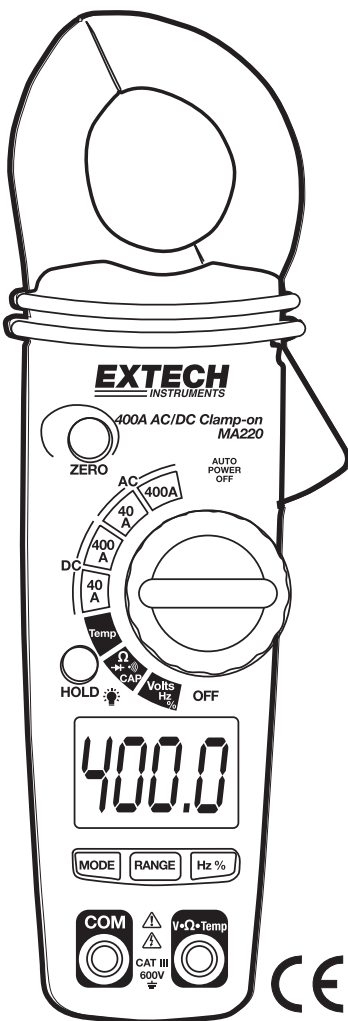


# User's Guide

# **EXTECH**<sup>®</sup> **INSTRUMENTS**

## 400A AC/DC Clamp Meter

### Model MA220



## **Introduction**

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Thank you for selecting the Extech MA220 AC/DC Clamp Meter. This meter measures AC/DC Current, AC/DC Voltage, Resistance, Capacitance, Frequency, Duty Cycle, Temperature, Diode Test, and Continuity. This professional meter, with proper care, will provide years of safe reliable service.

## **Safety**

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### **International Safety Symbols**



This symbol, adjacent to another symbol or terminal, indicates the user must refer to the manual for further information.



This symbol, adjacent to a terminal, indicates that, under normal use, hazardous voltages may be present



Double insulation

### **SAFETY NOTES**

- Do not exceed the maximum allowable input range of any function
- Do not apply voltage to meter when resistance function is selected.
- Set the function switch OFF when the meter is not in use.
- Remove the battery if meter is to be stored for longer than 60 days.

### **WARNINGS**

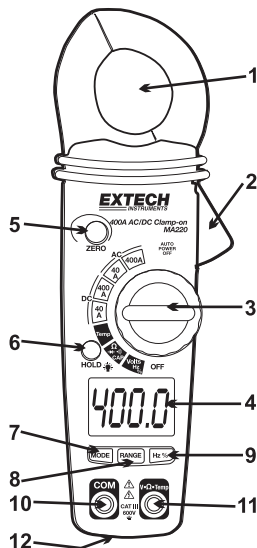
- Set function switch to the appropriate position before measuring.
- When measuring volts do not switch to current/resistance modes.
- Do not measure current on a circuit whose voltage exceeds 240V.
- When changing ranges using the selector switch always disconnect the test leads from the circuit under test.
- Do not exceed the maximum rated input limits.

### **OVERVOLTAGE CATEGORY III**

This meter meets the IEC 610-1-95 standard for OVERVOLTAGE CATEGORY III. Cat III meters are protected against overvoltage transients in fixed installation at the distribution level. Examples include switches in the fixed installation and some equipment for industrial use with permanent connection to the fixed installation.

## Meter Description

1. Conductor jaws
2. Jaw opening trigger
3. Function select switch
4. LCD Display
5. ZERO button
6. Data Hold and Backlight Button
7. Mode select button
8. Range select button
9. Hz/%/Duty Cycle button
10. COM input jack
11. V/ $\Omega$ /Temp jack
12. Battery cover (rear)



**AC** AC (alternating current)

**DC** DC (direct current)

**—** Minus sign

**AUTO** AutoRange mode

**ZERO** ZERO mode

**•)))** Audible Continuity

**HOLD** Data Hold mode

**🔋** Low Battery icon

**→|** Diode test mode

**m** milli

**V** Volts

**A** Amps

**K** kilo

**M** Mega

**$\Omega$**  Ohms

**°F** Degrees Fahrenheit

**°C** Degrees Centigrade



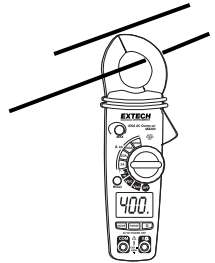
## Operation

**Notice:** Read and understand all **WARNING** and **CAUTION** statements listed in the safety section of this operation manual prior to using this meter. Set the function select switch to the OFF position when the meter is not in use.

### DC/AC Current Measurements

**Warning:** Disconnect the test leads from the meter before making current clamp measurements.

1. Set the Function switch to the **400ADC, 40ADC, 400AAC or 40AAC** range. If the range of the measured is not known, select the higher range first then move to the lower range if necessary.
2. For DC current measurement, press the ZERO key to null the meter display.
3. Press the trigger to open jaw. Fully enclose one conductor to be measured.
4. The clamp meter LCD will display the reading.



### DC/AC Voltage Measurements

1. Set the rotary function switch to the **Volts/Hz/%** position.
2. Insert the black test lead banana plug into the negative (COM) jack and the red test lead banana plug into the positive (V/Ω/Temp) jack
3. Select AC or DC with the **MODE** button
4. Connect the test leads to the circuit under test
5. Read the voltage on the display. The display will indicate the proper decimal point and value.



### Resistance Measurements

1. Set the function switch to the **Ω** **▶•))) CAP** position.
2. Insert the black test lead banana plug into the negative (COM) jack  
Insert the red test lead banana plug into the positive (VΩ Temp) jack.
3. Touch the test probe tips across the circuit or part under test. It is best to disconnect one side of the part under test so the rest of the circuit will not interfere with the resistance reading.
4. Read the resistance on the display. The display will indicate the proper decimal point and value.

### Continuity Check


1. Set the function switch to the **Ω** **▶•))) CAP** position.
2. Push the mode button to indicate **•)))** on the display.
3. Insert the black lead banana plug into the negative (COM) jack  
Insert the red test lead banana plug into the positive (VΩ) jack.
4. Touch the test probe tips to the circuit or wire you wish to check.
5. If the resistance is less than approximately 150Ω, the audible signal will sound. If the circuit is open, the display will indicate "OL."

## Diode Test

1. Turn the rotary switch to the  $\Omega$   CAP position.
2. Insert the black test lead banana plug into the negative (COM) jack and the red test lead banana plug into the positive (V $\Omega$ ) jack.
3. Push the mode button to indicate  on the display.
4. Touch the test probes to the diode under test. Typically for a normal diode, forward voltage will indicate 0.4V to 0.7V. Reverse voltage will indicate "OL". Shorted devices will indicate near 0V and an open device will indicate "OL" in both polarities.

## Capacitance Measurements

**Warning:** To avoid electrical shock, disconnect power to the unit under test and discharge all capacitors before taking any capacitance measurements. Remove the batteries and unplug the line cords.

1. Set the function switch to the  $\Omega$   CAP position.
2. Push the mode button to indicate nF on the display.
3. Insert the black lead banana plug into the negative (COM) jack and insert the red test lead banana plug into the positive (V $\Omega$ Temp) jack.
4. Press the ZERO key to null the meter display.
5. Touch the test probe tips to the capacitor you wish to check.
6. Read the capacitance value on the display.

## Frequency or % Duty Cycle Measurements

1. Turn the rotary switch to the **Volts Hz %** position.
2. Insert the black test lead banana plug into the negative (COM) jack and the red test lead banana plug into the positive (V $\Omega$ ) jack.
3. Select Hz or % with the **HZ/%** button.
4. Touch the test probe tips to the circuit under test.
5. Read the frequency on the display.

## Temperature Measurements

1. Turn the rotary switch to the **Temp** position.
2. Insert the Temperature Probe into the negative (COM) and the (V $\Omega$ Temp) jacks, making sure to observe correct polarity.
3. Select °C or °F with the **MODE** button.
4. Touch the temperature probe head to the part whose temperature you wish to measure. Keep the probe touching the part under test until the reading stabilizes.
5. Read the temperature on the display.

**Warning:** To avoid electrical shock, be sure the thermocouple has been removed before changing to another measurement function.

## Auto/Manual Ranging

The meter turns on in Autoranging mode. Press the **RANGE** button to enter manual ranging. Each press of the range button will step to the next range as indicated by the units and decimal point location. Press and hold the **RANGE** button for two seconds to return to Autoranging mode.

**Note:** Manual ranging does not function in AC Current or Diode and Continuity check functions. In Temperature function, it will change the resolution from 0.1° to 1°.

## Data Hold

To freeze the LCD meter reading, press the **HOLD** button. While data hold is active, the **HOLD** display icon appears on the LCD. Press the HOLD button again to return to normal operation.

## Backlight

Press and hold the **HOLD** button for >2 seconds to turn the backlight on/off.

**Note:** The HOLD feature will activate when the backlight is turned on. Press the HOLD button again to exit the Hold feature.

## Zero Button

Zeros Capacitance and DC Current measurements. Also allows the user to offset the meter by using the displayed value as the zero reference value. Press the **ZERO** key momentarily to activate and to exit Zero mode.

## Maintenance

**WARNING:** To avoid electrical shock, disconnect the meter from any circuit, remove the test leads from the input terminals and turn OFF the meter before opening the case. Do not operate with open case.

## 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 to be used for periods of longer than 60 days, remove the batteries and store them separately

## Battery Replacement

1. Remove the two rear Phillips head screws
2. Open the battery compartment
3. Replace the two 1.5V AAA batteries.
4. Re-assemble the meter

You, as the end user, are legally bound (**Battery ordinance**) to return all used batteries and accumulators; **disposal in the household garbage is prohibited!**


You can hand over your used batteries / accumulators at collection points in your community or wherever batteries / accumulators are sold!



**Disposal:** Follow the valid legal stipulations in respect of the disposal of the device at the end of its lifecycle

## Specifications

Function	Range		Accuracy (of reading)
DC Current	40.00 ADC	0-20.00 ADC	± (2.5% + 6 digits)
		20.00-40.00 ADC	± (3% + 6 digits)
	400.0 ADC	0-300.0 ADC	± (2.5% + 6 digits)
		300.0-400.0 ADC	± (3.5% + 6 digits)
AC Current	40.00 AAC	0-20.00 AAC	± (3% + 10 digits)
		20.00-40.00 AAC	± (5% + 10 digits)
	400.0 AAC	0-300.0 AAC	± (3% + 10 digits)
		300.0-400.0 AAC	± (5% + 10 digits)
DC Voltage	400.0mV		± (0.8% + 3 digits)
	4.000V		
	40.00V		± (1.5% + 3 digits)
	400.0V		
	600V		± (2.0% + 3 digits)
AC Voltage	400.0mV		± (1% + 10 digits)
	4.000V		
	40.00V		± (2% + 5 digits)
	400.0V		
	600V		± (2% + 5 digits)
Resistance	400.0Ω		± (1.0% + 4 digits)
	4.000kΩ		
	40.00kΩ		± (1.5% + 2 digits)
	400.0kΩ		
	4.000 MΩ		± (2.5% + 3 digits)
	40.00MΩ		± (3.5% + 5 digits)
Capacitance	40.00nF		± (5% + 3 digits)
	400.0nF		± (3% + 5 digits)
	4.000μF		± (3.5% + 5 digits)
	40.00μF		
	100.0μF		± (5% + 5 digits)
Frequency	5.000Hz		± (1.5% + 5 digits)
	50.00Hz		± (1.2% + 2 digits)
	500.0Hz		Sensitivity: 5~5KHz: 10Vrms min.
	5.000KHz		5KHz~150KHz: 40Vrms min.
	50.00KHz		
	150.0KHz		
Duty Cycle	0.5% to 99.0%		± (1.2% + 2 digits)
	Pulse Width: 100μs-100ms, Frequency: 5Hz to 150KHz		
Temperature	-50.0 to 400.0°C	-50.0 to -20.0°C	± 7°C
		-20.0 to 400.0°C	± (3% + 5 °C)
	400 to 1000°C	400 to 1000°C	
	-58.0 to 400.0°F	-58.0 to 0°F	± 14°F
		0 to 400.0°F	± (2.5% + 6 digits)
	400 to 1832°F	400 to 1832°F	± (3% + 7°F)

<b>Jaw size</b>	23mm (0.9") approx.
<b>Display</b>	4000 count LCD
<b>Continuity</b>	Audible tone < 150Ω approx.
<b>Diode Test</b>	Open circuit voltage < 1.5VDC; Test current 0.3mA (typical)
<b>AC V bandwidth</b>	50Hz to 400Hz
<b>AC A bandwidth</b>	50/60Hz
<b>Low battery indication</b>	"  " is displayed
<b>Overrange indication</b>	"OL" is displayed
<b>Auto Power OFF</b>	After 30 minutes
<b>Measurement rate</b>	2 per second, nominal
<b>Input Impedance</b>	7.8MΩ (V DC and V AC)
<b>Operating Temperature</b>	5°C to 40°C (41°F to 104°F)
<b>Storage Temperature</b>	-20°C to 60°C (-4°F to 140°F)
<b>Operating Humidity</b>	Max 80% up to 31°C (87°F) decreasing linearly to 50% at 45°C (113°F)
<b>Storage Humidity</b>	<80%
<b>Operating Altitude</b>	2000 meters (6560ft) operating
<b>Batteries</b>	(2) 1.5V AAA batteries
<b>Weight</b>	200g (0.44lb)
<b>Size</b>	200x50x35mm (7.87" x 1.97" x 1.38")
<b>Safety</b>	For indoor use and in accordance with the requirements for double insulation to IEC1010-1 (1995): EN61010-1 (1995) Overvoltage Category III, Pollution Degree 2.

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