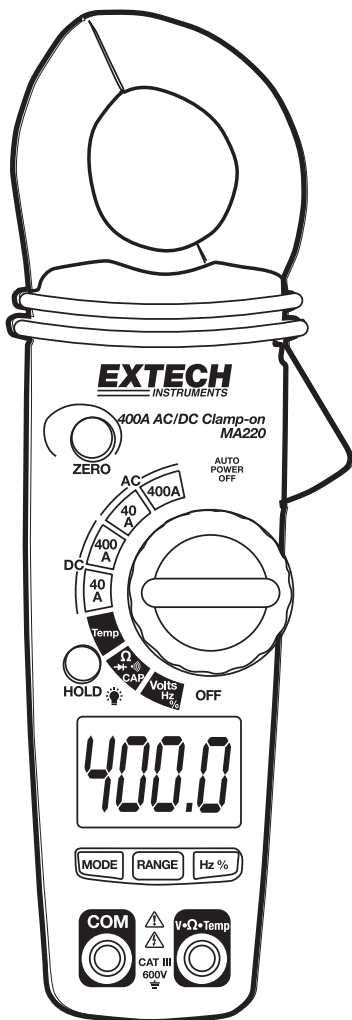# User's Guide

EXTECH
INSTRUMENTS

400A AC/DC Clamp Meter

Model MA220

Introduction

Thank you for selecting the Extech MA200 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

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

A UL mark does not indicate that this product has been evaluated for the accuracy of its readings.

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.

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% + 30 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:
	5.000KHz		10Vrms min.
	50.00KHz		5KHz~150KHz:
	150.0KHz		40Vrms min.
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)

Jaw size	0.9" (23mm) approx.
Display	4000 count LCD
Continuity	Audible tone < 150Ω approx.
Diode Test	Open circuit voltage < 1.5VDC;
	Test current 0.3mA (typical)
AC V bandwidth	50Hz to 400Hz
AC A bandwidth	50/60Hz
Low battery indication	"▯" is displayed
Overrange indication	"OL" is displayed
Auto Power OFF	After 30 minutes
Measurement rate	2 per second, nominal
Input Impedance	7.8MΩ (V DC and V AC)
Operating Temperature	41ºF to 104ºF (5ºC to 40ºC)
Storage Temperature	-4ºF to 140ºF (-20ºC to 60ºC)
Operating Humidity	Max 80% up to 87ºF (31ºC) decreasing linearly to 50% at 113ºF(45ºC)
Storage Humidity	<80%
Operating Altitude	6560ft. (2000meters) operating
Batteries	(2) 1.5V AAA batteries
Weight	0.44lb (200g)
Size	7.87" x 1.97" x 1.38" (200x50x35mm)
Safety	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.

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/Ω/Temp jack
12. Battery cover (rear)
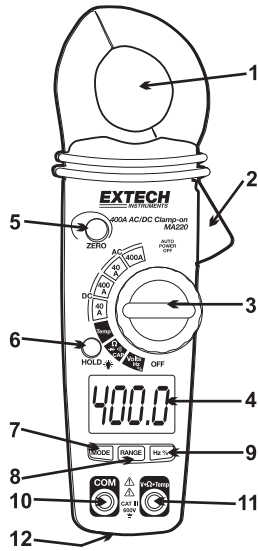
AC	AC (alternating current)
DC	DC (direct currrent)
▬	Minus sign
AUTO	AutoRange mode
ZERO	ZERO mode
•)))	Audible Continuity
HOLD	Data Hold mode
🔋	Low Battery icon
▸▸╂	Diode test mode
m	milli
V	Volts
A	Amps
K	kilo
M	Mega
Ω	Ohms
°F	Degrees Fahrenheit
°C	Degrees Centigrade

Operation

DC/AC Current Measurements

Warning: Disconnect the test leads from the meter before making current clamp measurements.
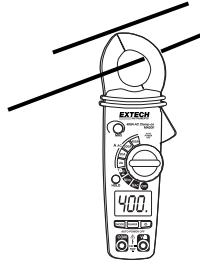
1. Set the Function switch to the **400ADC, 40ADC, 400AAC or 40AAC** range. If the range of the measured is not known, select the higher range first then move to the lower range if necessary.
2. For DC current measurement, press the ZERO key to null the meter display.
3. Press the trigger to open jaw. 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 Ω ⯈⊢ •))) **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 (VΩ) 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 Ω ⯈⊢ •))) **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 (VΩTemp) 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 (VΩ) 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 (VΩTemp) 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

Warranty

EXTECH INSTRUMENTS CORPORATION warrants this instrument to be free of defects in parts and workmanship for one year from date of shipment (a six month limited warranty applies on sensors and cables). If it should become necessary to return the instrument for service during or beyond the warranty period, contact the Customer Service Department at (781) 890-7440 ext. 210 for authorization. **A Return Authorization (RA) number must be issued before any product is returned to Extech.** The sender is responsible for shipping charges, freight, insurance and proper packaging to prevent damage in transit. This warranty does not apply to defects resulting from action of the user such as misuse, improper wiring, operation outside of specification, improper maintenance or repair, or unauthorized modification. Extech specifically disclaims any implied warranties or merchantability or fitness for a specific purpose and will not be liable for any direct, indirect, incidental or consequential damages. Extech's total liability is limited to repair or replacement of the product. The warranty set forth above is inclusive and no other warranty, whether written or oral, is expressed or implied.

Repair and Calibration Services

Extech offers complete repair and calibration services for all Extech products. For periodic calibration, NIST certification or repair of any Extech product, call customer service for details on services available. Extech recommends that calibration be performed on an annual basis to insure calibration integrity.

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> Repair/Returns: Ext. 210; Email: repair@extech.com
> Website: www.extech.com