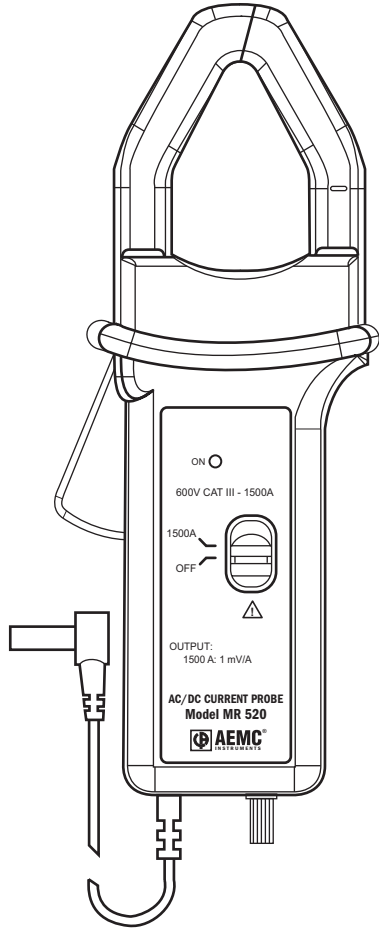
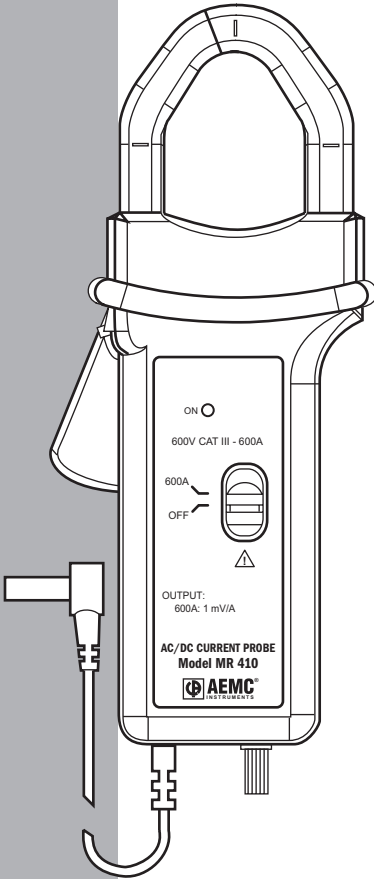


■ AC/DC CURRENT PROBE

# MR410

# MR520



# Statement of Compliance

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Chauvin Arnoux®, Inc. d.b.a. AEMC® Instruments certifies that this instrument has been calibrated using standards and instruments traceable to international standards.

We guarantee that at the time of shipping your instrument has met its published specifications.

**An NIST traceable certificate may be requested at the time of purchase, or obtained by returning the instrument to our repair and calibration facility, for a nominal charge.**

The recommended calibration interval for this instrument is 12 months and begins on the date of receipt by the customer. For recalibration, please use our calibration services. Refer to our repair and calibration section at [www.aemc.com](http://www.aemc.com).

**Serial #:** \_\_\_\_\_

**Catalog #:** 1200.70/1200.71

**Model #:** MR410 / MR520

Please fill in the appropriate date as indicated:

Date Received: \_\_\_\_\_

Date Calibration Due: \_\_\_\_\_



Chauvin Arnoux®, Inc.  
d.b.a AEMC® Instruments  
[www.aemc.com](http://www.aemc.com)

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## **INTRODUCTION**



These safety warnings are provided to ensure the safety of personnel and proper operation of the instrument.

- Read this instruction manual completely and follow all the safety information before attempting to use or service this instrument.
- Use caution on any circuit: Potentially high voltages and currents may be present and may pose a shock hazard.
- Read the safety specifications section before using the Model MR410 or MR520. Never exceed the maximum working voltage ratings given.
- Safety is the responsibility of the operator!
- Never open the back of the instrument while connected to any circuit or input.
- ALWAYS connect the Model MR410 or MR520 to the display device before clamping the probe onto the sample under test.
- Always inspect the instrument and lead prior to use. Replace any defective parts immediately.
- NEVER use the Model MR410 or MR520 on electrical conductors rated above 600V.

### **1.1 International Electrical Symbols**



This symbol signifies that the instrument is protected by double or reinforced insulation. Use only specified replacement parts when servicing the instrument.



This symbol on the instrument indicates a WARNING and that the operator must refer to the user manual for instructions before operating the instrument. In this manual, the symbol preceding instructions indicates that if the instructions are not followed, bodily injury, installation/sample and product damage may result.



Risk of electric shock. The voltage at the parts marked with this symbol may be dangerous.



This is a type A current sensor. This symbol signifies that application around and removal from HAZARDOUS LIVE conductors is permitted.

## 1.2 Definition of Measurement Categories

- CAT IV:** For measurements performed at the primary electrical supply (<1000V) such as on primary overcurrent protection devices, ripple control units, or meters.
- CAT III:** For measurements performed in the building installation at the distribution level such as on hardwired equipment in fixed installation and circuit breakers.
- CAT II:** For measurements performed on circuits directly connected to the electrical distribution system. Examples are measurements on household appliances or portable tools.

## 1.3 Receiving Your Shipment

Upon receiving your shipment, make sure that the contents are consistent with the packing list. Notify your distributor of any missing items. If the equipment appears to be damaged, file a claim immediately with the carrier and notify your distributor at once, giving a detailed description of any damage. Save the damaged packing container to substantiate your claim.

## 1.4 Ordering Information

- AC/DC Current Probe Model MR410  
(Lead - 1mV/A - 600A max) ..... **Cat. #1200.70**
- AC/DC Current Probe Model MR520  
(Lead - 1mV/A - 1500A max) ..... **Cat. #1200.71**

*Both models include a 9V battery and a user manual.*

### 1.4.1 Accessories and Replacement Parts

- Banana plug adapter (to non-recessed plug) ..... **Cat. #1017.45**
- Banana (female) - BNC (male) adapter ..... **Cat. #2118.46**

**Order Accessories and Replacement Parts Directly Online**

*Check our Storefront at [www.aemc.com/store](http://www.aemc.com/store) for availability*

## **PRODUCT FEATURES**

### **2.1 Description**

The MR probes are designed to meet the latest safety and performance standards. Two different hook-shaped jaws are offered, both permitting the user to “pry” into or “hook” onto cables (will accept 2 x 500 MCM) or small bus bars.

The MR series uses Hall effect technology. The electronics and batteries are self-contained in the handles. The output of the AC/DC probes is 1mV/A.

When taking DC measurements, a mechanical DC zero allows the user to adjust for any DC offset. There is no output filtering - True RMS with DC components is possible.

The phase shift is excellent, making the MR series well suited for power and power quality applications.

Model MR410 measures 400AAC (600A peak), 600ADC.

Model MR520 measures 1000AAC (1500A peak), 1500ADC.

Both the MR410 and MR520 have proportional mV output for direct readings on multimeters, recorders, loggers and other instruments accepting banana plugs.

An optional banana plug to BNC adaptor is available as an accessory.

## 2.2 MR410 Features

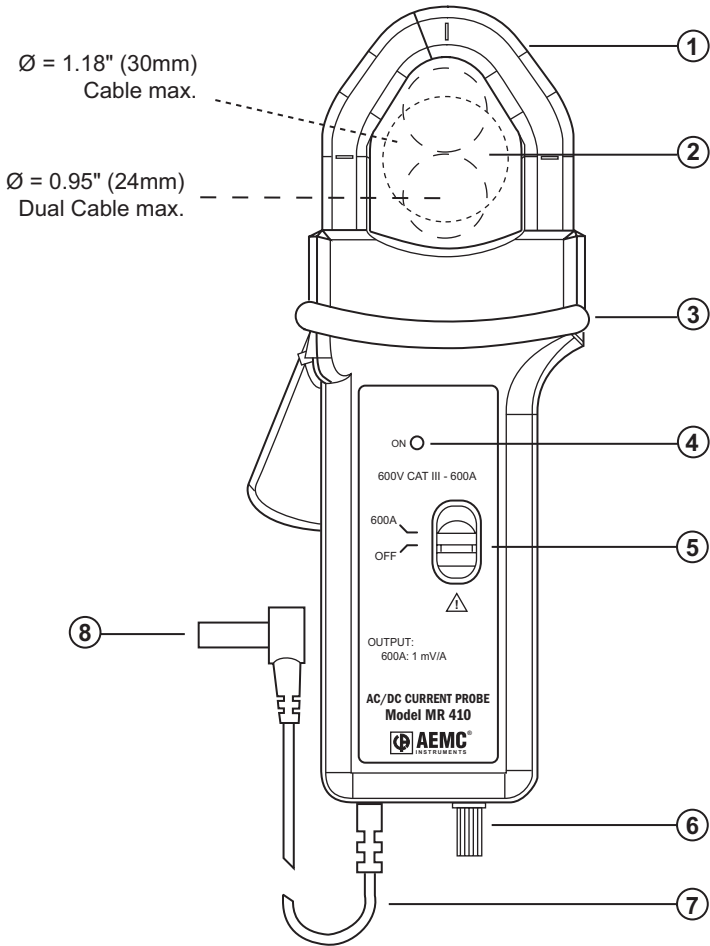


Figure 1

1. Jaws
2. Conductor
3. Protective non-slip guard
4. Green light (on when battery voltage  $\geq 6.5V$ )
5. Two-position range selection switch
6. Zero adjustment knob
7. Lead, 5 ft (1.5m)
8. Safety banana plug  $\varnothing 4mm$



## 2.3 MR520 Features

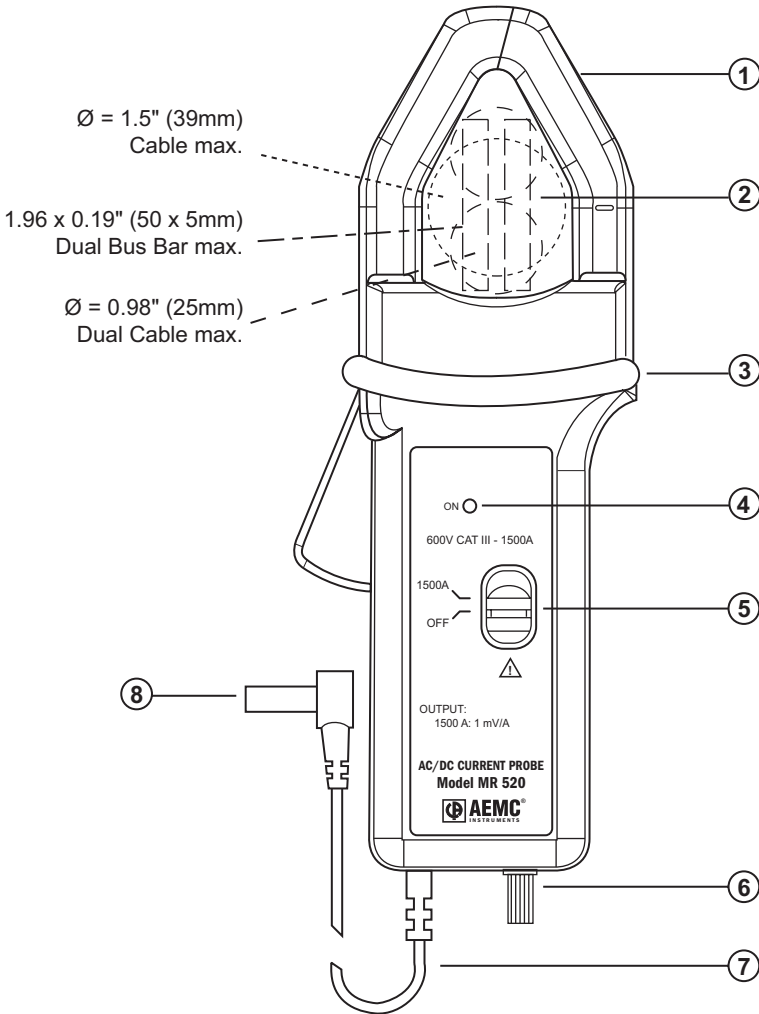


Figure 2

1. Jaws
2. Conductor
3. Protective non-slip guard
4. Green light (on when battery voltage  $\geq 6.5V$ )
5. Two-position range selection switch
6. Zero adjustment knob
7. Lead, 5 ft (1.5m)
8. Safety banana plug  $\varnothing 4mm$

## 2.4 DMM / Display Compatibility

The Models MR410 and MR520 current probes are compatible with any multimeter voltmeter or other voltage measuring instrument which has the following features:

- Input jack that accepts 4mm safety banana plug
- Range and resolution capable of displaying 1mV of output per amp of measured current
- Voltmeter accuracy of 0.3% or better to take full advantage of the probe accuracy
- Input impedance of  $1\text{M}\Omega/100\text{ pF}$  or greater

When the probe is making a measurement, the current-carrying conductor is not broken and remains electrically isolated from the probe output.

As a result, the probe output common may be either floated (isolated) or grounded.



### **Warning: User Safety**

Always use a DMM, voltmeter or other displaying device, appropriately rated for safety.

## **SPECIFICATIONS**

### **3.1 MR410 Specifications**

#### **3.1.1 Electrical**

**Measurement Range:** 1 to 400AAC (600A Peak); 1 to 600ADC

**Accuracy\*:** 1 to 100A: 1.5% reading  $\pm$  1A; 100 to 400A: 2.0% reading;  
400 to 600ADC only: 2.5% reading

**Phase Shift:** 45 to 65Hz; 10 to 200A:  $\leq 2.5^\circ$   
200 to 400A:  $\leq 2^\circ$

**Overload:** 1500ADC and 1000AAC continuous up to 1kHz

**Influence of frequency:** 65 to 440Hz: 2% reading; 440 to 1000Hz: 5% reading; 1kHz to 5kHz: -3dB

#### **3.1.2 Mechanical**

**Jaw Opening:** 1.2" (31mm)

**Maximum Cable Diameter:** One 1.18" (30mm) or two 0.95" (24mm) or two bus bars 1.2 x 0.4" (31.5 x 10mm)

**Dimensions (without zero knob):** 8.8 x 3.82 x 1.73" (224 x 97 x 44mm)

**Weight:** 15 oz (440g)

### **3.2 MR520 Specifications**

#### **3.2.1 Electrical**

**Measurement Range:** 1 to 1000AAC (1500A Peak); 1 to 1500ADC

**Accuracy\*:** 1 to 100A: 1.5% reading  $\pm$  1A  
100 to 800A: 2.5% reading  
800 to 1000A: 4% reading  
1000 to 1400ADC only: 4% reading

**Phase Shift:** 45 to 65Hz  
10 to 200A:  $\leq 2.5^\circ$ ; 200 to 1000A:  $\leq 1.5^\circ$

**Overload:** 1500AAC and 1000ADC continuous up to 1kHz

## 3.2.2 Mechanical

**Jaw Opening:** 1.55" (40mm)

**Maximum Cable Diameter:** One 1.5" (39mm) or two .98" (25.4mm) or two bus bars 1.96 x .19" (50 x 5mm) or one bus bar 1.96 x .49" (50 x 12.5mm)

**Dimensions (without zero knob):** 9.31 x 3.82 x 1.73" (236.5 x 97 x 44mm)

**Weight:** 1.06 lbs (480g)

*\*Reference conditions: 18° to 28°C, 20 to 75% RH, external magnetic field <40 A/m, no DC component, no external current carrying conductor, test sample centered,  $1M\Omega \leq 100pF$  load, zero adjustment prior to measurement [DC only] DC to 65Hz, battery voltage  $9V \pm 0.1V$ .*

## 3.3 Common Specifications (MR410 & MR520)

### 3.3.1 Electrical

**Output Signal:** 1mV/A

**Frequency Range:** DC to 10kHz @ -3 dB

**Noise:** DC to 1kHz:  $\leq 1mV$  peak to peak  
DC to 5kHz:  $\leq 1.5mV$  peak to peak  
0.1Hz to 5kHz:  $\leq 500\mu V$  peak to peak

**Rise and Fall Time:** Rise:  $\leq 100\mu s$  from 10 to 90% Vout  
Fall:  $\leq 120\mu s$  from 10 to 90% Vout

**Load Impedance:**  $>100k\Omega/100pF$

**Insertion Impedance:**  $0.39m\Omega$  @ 50Hz,  $58m\Omega$  @ 1000Hz

**Working Voltage:** 600Vrms

**Common Mode Voltage:** 600Vrms

**Influence of Adjacent Conductor:**  
 $< 10mA/A$  at 50Hz at 23mm from the probe

**Influence of Conductor in Jaw Opening:** 0.5% reading (DC to 440Hz)

**Power Source:** 9V alkaline (NEDA 1604A, IEC 6LR61)

**Battery Life:** Approximately 100H typical

**Low Battery:** Green LED on when battery voltage  $\leq 6.5V$

### 3.3.2 Mechanical

**Output:** Double insulated 5 ft (1.5m) lead with safety banana plugs

**Zero Adjustment:**  $\pm 10A$  approx. by 10 turn knob at base of case

**Case Protection:** IP30 per IEC 529

**Drop Test:** 1.0m on 38mm of oak on concrete; test according to EN 61010

**Mechanical Shock:** 100G, test per IEC 68-2-27

**Vibration:** Test per IEC 68-2-6

**Frequency Range:** 5 to 15Hz, Amplitude: 1.5mm  
15 to 25Hz, Amplitude: 1mm  
25 to 55Hz, Amplitude: 0.25mm

**Handle:** UL 94 V0

**Jaws:** UL 94 V0

### 3.3.3 Environmental

**Operating Temperature Range:** 14° to 131°F (-10° to +55°C)

**Storage Temperature Range:** -40° to 176°F (-40° to +80°C)

**Temperature Influence:**  $\leq 300^\circ \text{ ppm}/^\circ\text{K}$  or  $1\%/10^\circ\text{K}$   
 $\leq 0.2A/^\circ\text{K}$  on Zero

**Operating Relative Humidity:**

10° to 35°C: 90  $\pm$  5% RH (without condensation)

40° to 55°C: 70  $\pm$  5% RH (without condensation)

**Humidity Influence:** 10 to 90% RH @ reference temperature  $\leq 0.1\%$  R

**Altitude:** Operating: 0 to 2000m  
Non-operating: 0 to 12,000m

### 3.3.3 Safety



**Electrical:**

EN 61010-2-32, 600V CAT III, Pollution: 2

**Electromagnetic Compatibility:**

EN 50081-1 Class B

EN 50082-2 Electrostatic discharge IEC 1000-4-2

Radiated field IEC 1000-4-3

Fast transients IEC 1000-4-4

Magnetic field at 50/60 Hz IEC 1000-4-8

## **OPERATION**

### **4.1 Making Measurements**

- Plug the probe into the display device (e.g., DMM, logger).

Note the polarity of the probe output banana plugs (red = positive [+], black = negative [-]).

- Select the appropriate range on the display device.

Note that the probe's output is 1mV/A.

- Turn display device power on.
- Turn on the instrument. The Green LED should be on. If the Green LED does not come on or goes off after a few minutes, it is necessary to replace the battery (see "Battery Replacement" § 5.1.1).

#### **4.1.1 DC Measurement**

- Select the appropriate DC mV or V range on the DMM or measuring instrument.
- "Zero" the probe - with the probe disconnected from test samples (no conductor in probe jaw window), push in and turn the zero adjustment knob to obtain a reading better than 0.5mV on the DMM.
- For best accuracy, especially on low-level measurement, it is recommended that you zero the probe before each measurement.
- Clamp the probe around the conductor to be tested. The DMM or display device should now display the measured conductor current. A positive reading indicates current flowing in the direction of the arrow located on the side of the jaw. A negative reading indicates current flow in the opposite direction of the arrow.
- Apply the conversion ratio (1mV/A) to get the value of the current. (e.g. If the multimeter reading is 250mVDC, the measured current is 250ADC).

## 4.1.2 AC Measurement

- Select the appropriate AC mV or V range on the DMM or measuring instrument.
- The DC zero adjustment is not required when measuring AC current with a voltmeter that is AC coupled. The DC zero adjustment is required if you are using a voltmeter that is DC coupled.
- Select the appropriate mVAC or VAC range on the DMM or measuring instrument.
- Clamp the probe around the conductor to be tested. The display device should now display the measured conductor current.
- Apply the conversion ratio (1mV/A) to get the value of the current.

## 4.1.3 Indicator Lights: Green LED

- The Green LED indicates that the probe is on and that the battery is good.
- It will not light under low battery conditions.
- Replace the 9V battery if it is not lit.

## 4.2 Tips For Getting the Best Accuracy

The Models MR410 and MR520 are capable of measuring DC and frequency currents over a wide range. Here are some key considerations for getting the most accuracy from your display instrument:

- When using the Models MR410 and MR520 with a DMM or other meter, it is important to select the range that provides the best resolution.
- Make sure that probe jaw mating surfaces are free of dust and contamination.
- Beware of short-circuit currents. Large in-rush DC currents (which can occur when power is first applied in a circuit) and large high-current transients may cause varying degrees of residual readings.
- If in doubt of a particular reading, remove the probe from the conductor under test and check to see that the display device returns to zero. If not, it will be necessary to rezero the probe.

### 4.3 Operation Examples

#### DC Current Measurement Example for MR410

- Conductor carrying 25A<sub>DC</sub> in the direction of the arrow
- DMM placed in DC volts mode
- DMM displays 25.0mV<sub>DC</sub> = 25A<sub>DC</sub>

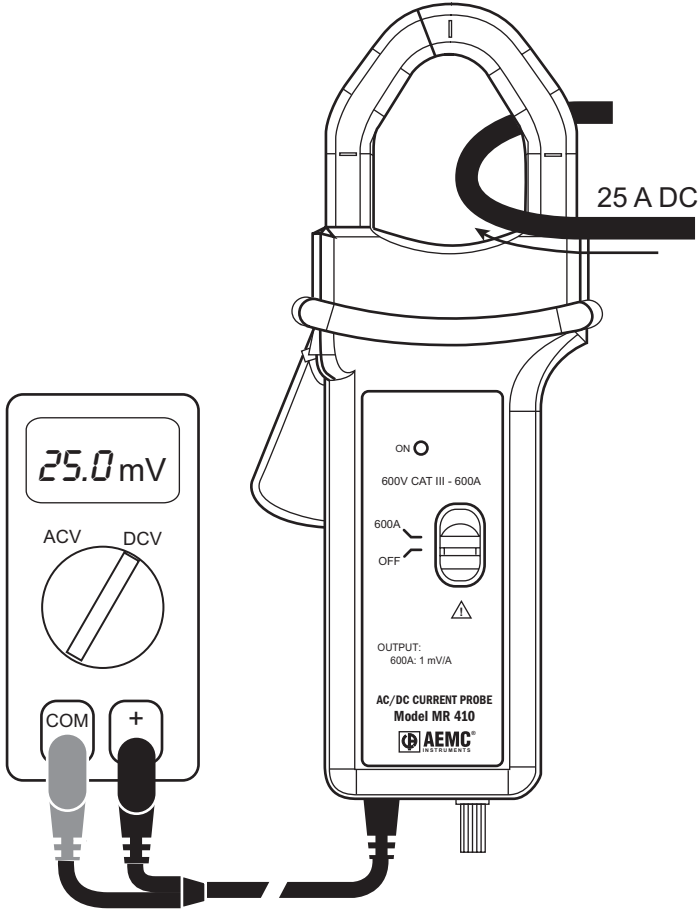


Figure 3



## Measuring the DC Component of an (AC+DC) Waveform for MR410

- Conductor carrying 300ADC + 25.0AAC
- DMM placed in DC volts mode
- DMM displays 300.0mVDC = 300ADC

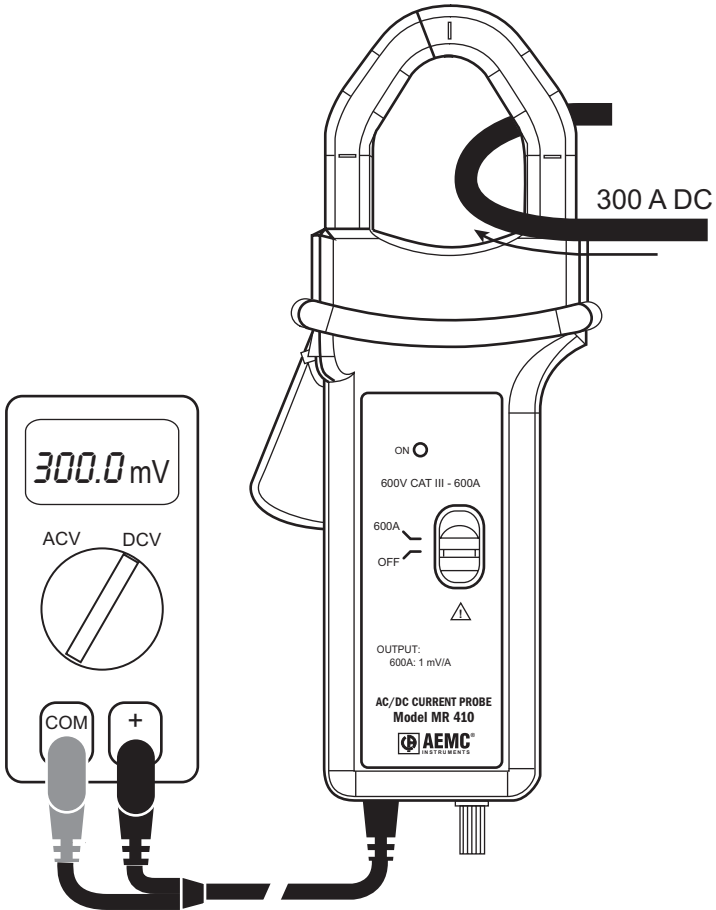


Figure 4

## Measuring the AC Component of an (AC+DC) Waveform for MR520

- Conductor carrying 20ADC + 250AAC
- Voltmeter placed in AC volts mode
- Voltmeter displays 250.0mVAC = 250AAC

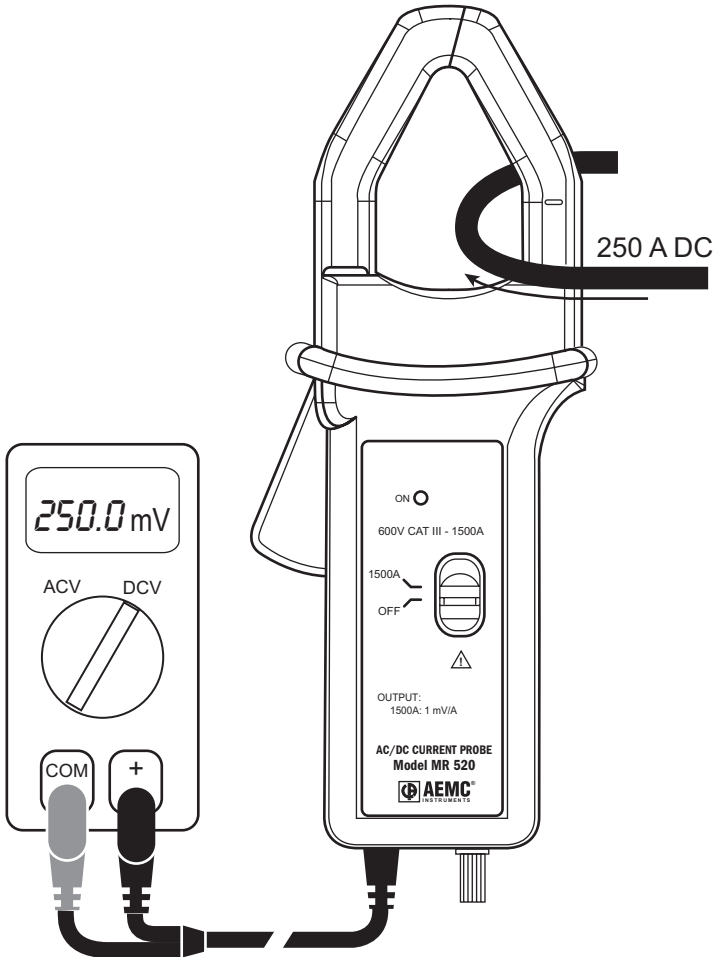
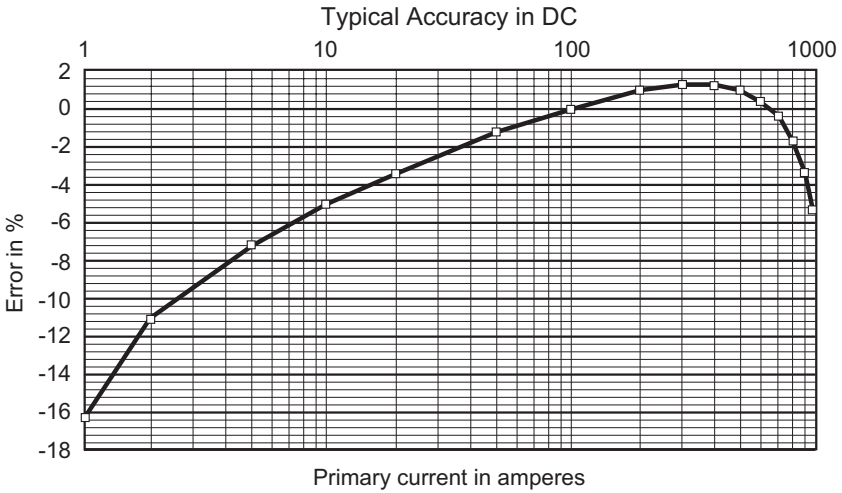


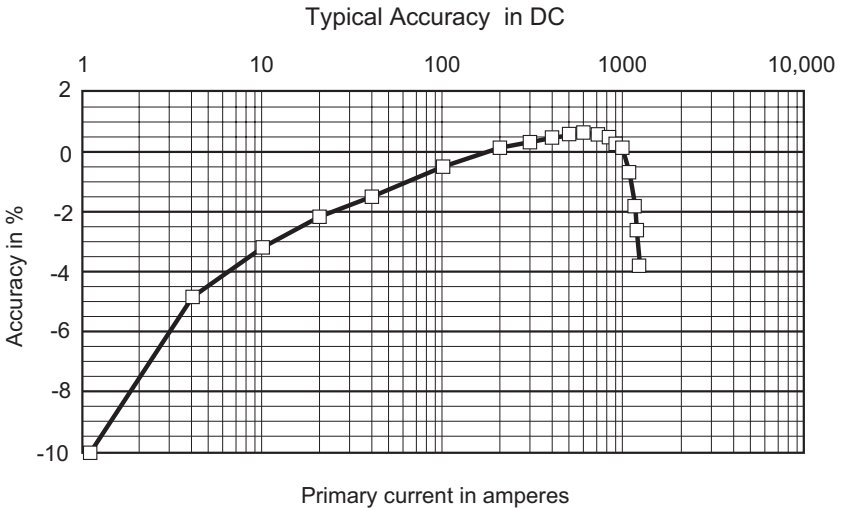
Figure 5

## 4.4 Typical Response Curves

### Model MR410



### Model MR520



## **MAINTENANCE**

### **5.1 Maintenance**



#### **WARNING:**

- For maintenance use only specified replacement parts.
- To avoid electrical shock, do not attempt to perform any servicing unless you are qualified to do so.
- To avoid electrical shock and/or damage to the instrument, do not get water or other foreign agents into the case. Turn the current probe OFF and disconnect the unit from all the circuits before opening the case.

#### **5.1.1 Battery Replacement**

When the probe is turned on, the green LED should light up. If it does not, replace the 9V battery.

- Completely disconnect the probe from the circuit under test, and from the DMM or measuring instrument.
- Turn the probe OFF.
- Unscrew the battery compartment screw and remove cover.
- Replace the battery and put the cover back on.



Do not replace the battery while the probe is in use.

#### **5.1.2 Cleaning**

- Clean the body of the clamp with a cloth lightly moistened with soapy water.
- Wipe clean with a cloth moistened with clean water and dry.
- Do not use solvent.

## **Repair and Calibration**

To ensure that your instrument meets factory specifications, we recommend that it be scheduled back to our factory Service Center at one-year intervals for recalibration, or as required by other standards or internal procedures.

### **For instrument repair and calibration:**

You must contact our Service Center for a Customer Service Authorization Number (CSA#). This will ensure that when your instrument arrives, it will be tracked and processed promptly. Please write the CSA# on the outside of the shipping container. If the instrument is returned for calibration, we need to know if you want a standard calibration, or a calibration traceable to N.I.S.T. (Includes calibration certificate plus recorded calibration data).

**Ship To:** Chauvin Arnoux®, Inc. d.b.a. AEMC® Instruments  
15 Faraday Drive  
Dover, NH 03820 USA  
Phone: (800) 945-2362 (Ext. 360)  
(603) 749-6434 (Ext. 360)  
Fax: (603) 742-2346 or (603) 749-6309  
E-mail: repair@aemc.com

(Or contact your authorized distributor)

Costs for repair, standard calibration, and calibration traceable to N.I.S.T. are available.

**NOTE: You must obtain a CSA# before returning any instrument.**

## **Technical and Sales Assistance**

If you are experiencing any technical problems, or require any assistance with the proper operation or application of your instrument, please call, fax or e-mail our technical support team:

**Contact:** Chauvin Arnoux®, Inc. d.b.a. AEMC® Instruments  
Phone: (800) 945-2362 (Ext. 351)  
(603) 749-6434 (Ext. 351)  
Fax: (603) 742-2346  
E-mail: techsupport@aemc.com

## **Limited Warranty**

The Model MR410 and MR520 are warranted to the owner for a period of two years from the date of original purchase against defects in manufacture. This limited warranty is given by AEMC® Instruments, not by the distributor from whom it was purchased. This warranty is void if the unit has been tampered with, abused or if the defect is related to service not performed by AEMC® Instruments.

**Full warranty coverage and product registration is available on our website at [www.aemc.com/warranty.html](http://www.aemc.com/warranty.html).**

**Please print the online Warranty Coverage Information for your records.**

### **What AEMC® Instruments will do:**

If a malfunction occurs within the warranty period, you may return the instrument to us for repair, provided we have your warranty registration information on file or a proof of purchase. AEMC® Instruments will, at its option, repair or replace the faulty material.

**REGISTER ONLINE AT:  
[www.aemc.com](http://www.aemc.com)**

## **Warranty Repairs**

### **What you must do to return an Instrument for Warranty Repair:**

First, request a Customer Service Authorization Number (CSA#) by phone fax or email from our Service Department (see address below), then return the instrument along with the signed CSA Form. Please write the CSA# on the outside of the shipping container. Return the instrument, postage or shipment pre-paid to:

**Ship To:** Chauvin Arnoux®, Inc. d.b.a. AEMC® Instruments  
15 Faraday Drive • Dover, NH 03820 USA  
Phone: (800) 945-2362 (Ext. 360)  
(603) 749-6434 (Ext. 360)  
Fax: (603) 742-2346 or (603) 749-6309  
E-mail: [repair@aemc.com](mailto:repair@aemc.com)

**Caution:** To protect yourself against in-transit loss, we recommend you insure your returned material.

**NOTE: You must obtain a CSA# before returning any instrument.**





05/18

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