AC/DC CURRENT PROBE

MR417 MR527







Statement of Compliance

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.

Seriai #:					
Catalog #: 1200.84 / 1200.85					
Model #: MR417 / MR527					
Please fill in the appropriate date as indicated: Date Received:					
Date Calibration Due:					



Chauvin Arnoux®, Inc. d.b.a AEMC® Instruments **www.aemc.com**

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1. INTRODUCTION

Thank you for purchasing the Current Probe Model MR417 or MR527. For best results from your instrument and for your safety, please read the following operating instructions carefully and comply with the precautions for use.

This instrument is compliant with the IEC 61010-2-032 safety standards for voltages of 300V in measurement category IV or 600V in category III.

Symbols

	WARNING, risk of DANGER! The operator must refer to these instructions whenever this symbol appears.					
4	Application or withdrawal authorized on conductors carrying dangerous voltages. Type A current sensor per IEC/EN 61010-2-032 or BS EN 61010-2-032					
	Equipment is protected by double insulation.					
<u>-</u> +	Battery.					
-	USB.					
i	Useful information or tip.					
	Direction of the current.					
2	The instrument follows recycling directives.					
C€	The instrument complies with US directives.					
The UKCA marking certifies that the product is compliant with the requirements that apply in the United Kingdom, specifically regarding Low-Voltage Safety, Electromagnetic Compatibility, and the Restriction Hazardous Substances.						
X	Sorting for the recycling of electric and electronic waste.					

Definition of Measurement Categories (CAT)

CAT IV corresponds to measurements taken at the source of low-voltage installations. *Examples:* power feeders, counters, and protection devices.

CAT III corresponds to measurements on building installations.

Examples: distribution panels, circuit breakers, machines, and fixed industrial devices.

CAT II corresponds to measurements taken on circuits directly connected to low-voltage installations.

Examples: power supply to domestic electrical appliances and portable tools.

1.1 PRECAUTIONS FOR USE

These instructions are intended to ensure the safety of users and proper operation of the instrument. Failure to observe these safety instructions may result in electric shock, fire, explosion, and descruction of the instrument and/or installations.

- The operator and/or the responsible authority must carefully read and clearly understand the various precautions to take before and during use.
- Do not use the instrument on networks on which the voltage or category exceeds instrument specifications.
- Never exceed the protection limits stated in the specifications.
- Observe the environmental conditions of use, including relative humidity, altitude, degree of pollution, and place of use.
- Do not use the instrument if it appears to be damaged, incomplete, or not properly closed.
- Before each use, check the condition of the insulation on the leads, housing, and accessories. Any component on which the insulation is deteriorated (even partially) must be set aside for repair or disposal.
- When handling the instrument, keep your fingers behind the physical guards.
- Use suitable means of protection.
- All troubleshooting and metrological checks must be performed by competent and accredited personnel.

1.2 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. It the equipment appears to be damaged, file a claim immediately with the carrier and notify the distributor at once, giving a detailed description of any damage. Save the damaged packing container to substantiate your claim.

Ordering information

AC/DC Current Probe Model MR417	Cat #1200 84
Includes 9V battery, multi-language safety data sheet, and user manual	Cat. #1200.04
AC/DC Current Probe Model MR527	Cat. #1200.85
Replacement Parts/Accessories	
Cable - 6ft USB type A to Micro type B	Cat. #2138.66

2. DESCRIPTION

The Models MR417 and MR527 are clamp-on current probes that measure DC currents up to 1400A, AC currents up to 1000ARMs (1400A peak), and combined AC+DC currents without opening the circuit that the current is flowing through. They indicate the shape and amplitude of the current measured in the form of a voltage.

These instruments can be used with oscilloscopes. They can be powered by a battery or with 5Vpc via the optional micro-USB cable.

The MR417 and MR527 include the following features:

- Range overage indicator
- Power supply indicator
- Zero adjustment
- Auto Standby feature
- Two ranges (sensitivity 1 and 10mV/A)
- Micro-USB connector to connect a power supply

2.1 INTERFACE

2.1.1 MR417

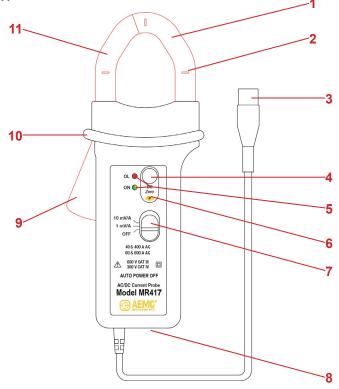


Figure 1 (MR417)

Item	Functions				
1	Fixed (non-mobile) jaw				
2	Arrow indicating current flow direction				
3	Male BNC connector				
4	DC Zero button				
5	5 OL (overload) and ON indicators. ON is green when Auto Standby is enabled and yellow when it is disabled.				
6 P (Permanent mode) indicator. Holding down the DC Zero button what turning ON the instrument enables Permanent mode. In this mode, A Standby is disabled (see §3.4).					
7	3-position slide switch				
8	USB port				
9	Trigger				
10	Hand guard				
11	Mobile jaw				

2.1.2 MR527

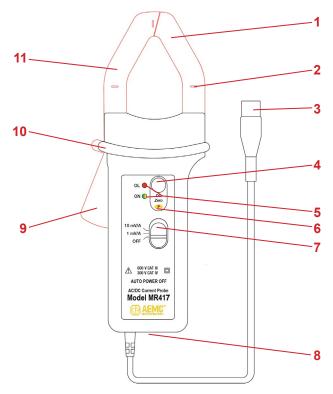


Figure 2 (MR527)

Item	Functions			
1	Fixed (non-mobile) jaw			
2	Arrow indicating current flow direction			
3	Male BNC connector			
4	DC Zero button			
5	5 OL (overload) and ON indicators. ON is green when Auto Standby is enabled and yellow when it is disabled.			
P (Permanent mode) indicator. Holding down the DC Zero button whiturning ON the instrument enables Permanent mode. In this mode, A Standby is disabled (see §3.4).				
7	3-position slide switch			
8	USB port			
9	Trigger			
10	Hand guard			
11	Mobile jaw			

3. OPERATION

3.1 BATTERY INSTALLATION

- Before changing the battery, set the switch to OFF and remove the clamp from the circuit being measured.
 - 1. Using a screwdriver, remove the battery compartment cover (1) from the back of the housing (see Figure 3).
 - 2. Connect the battery to the snap-on connector (2), observing polarity.
 - 3. Place the battery into the battery compartment (3).
 - 4. Replace the battery compartment cover and screw it onto the housing.

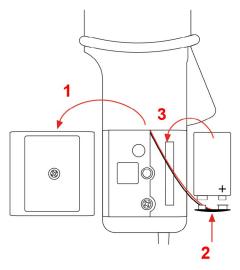


Figure 3

3.2 EXTERNAL POWER (OPTIONAL)

For long-term measurements, you can connect the clamp to external power via any micro-USB adapter that delivers 100mA or more. If external power is disconnected, the clamp automatically switches to battery operation.

The insulation between the type B micro-USB connector and the measurement output is 600V CAT III. This enables you to safely connect the clamp to measuring instruments with uninsulated inputs. The type B micro-USB connector must not be in contact with conductors or uninsulated parts at dangerous voltage.

When operating on external power, the Auto Standby feature is disabled. The color of the **ON** indicator shows whether the automatic standby is enabled (green) or disabled (yellow).

3.3 TURNING THE INSTRUMENT ON

To turn the clamp on, push the slide switch to the 1mV/A or 10mV/A setting:

MR417

1mV/A corresponds to the 600A range.

10mV/A corresponds to the 60A range.

MR527

1mV/A corresponds to the 1400A range. **10mV/A** corresponds to the 150A range.

The green **ON** indicator should light up:

- If the indicator blinks, less than 4 hours of battery life remains.
- If the indicator does not light up, replace the battery (see §4.2).

3.4 AUTO STANDBY

After 10 minutes of operation without user action (such as pressing the **DC Zero** button), the clamp automatically enters Standby mode. In this mode, the **ON** indicator will turn OFF.

To reactivate the clamp, press the **DC Zero** button or change the switch to any setting other than OFF.

To disable automatic Standby, press and hold down **DC Zero** when turning the instrument ON. The ON indicator blinks to indicate that the request has been applied. The ON indicator will show steady yellow after you release the **DC Zero** button.

3.5 DC ZERO ADJUSTMENT



The **DC Zero** must be adjusted before any series of measurements and after each disconnection and reconnection.

To adjust the DC Zero:

- With the clamp connected to the measuring instrument, select the desired measurement range (or sensitivity) on the switch.
- Make sure that there is no conductor in the clamp and that its jaws are closed correctly.
- Press the **DC Zero** button.
- The **OL** indicator will light up for approximately three seconds to indicate that the zero adjustment is in progress.
- The **OL** indicator will turn off to indicate that the operation has succeeded.
- If the **OL** indicator stays on, the zero could not be adjusted.
- Before repeating the operation, check that the jaws closed correctly (air gaps clean, no dust, no oxidation, etc.) and that there is no conductor in the clamp.
- Press the **DC Zero** button again.
- In the event of failure, or if the clamp is switched off (selector set to OFF), it is the last adjustment of the DC Zero that is kept.

Important: if the measurement range (or sensitivity) is changed, the DC Zero must be adjusted before any further measurements are made.

3.6 MEASUREMENTS

3.6.1 Making a Measurement

After adjusting the DC Zero:

- Press the clamp trigger to open the jaws.
- 2. Clamp the jaws around the conductor to be measured. Use the centering marks on the jaws to position the clamp around the conductor. If the measurement is for a power calculation, ensure the arrow on the clamp jaws (see Figures 1 and 2) points in the right direction of the current flow:

- 3. Release the trigger, ensuring the jaws are completely and correctly closed.
- 4. Observe the measurements displayed on the measuring instrument.
- 5. If the **OL** indicator lights up, the current is too high to be measured. If the sliding switch is set to the **10mV/A** range, change the setting to **1mV/A**.

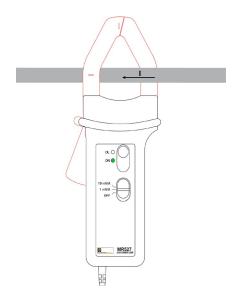


Figure 4 (MR527 shown)

3.6.2 Converting to Current

The MR417 and MR527 both provide two measurement ranges. The MR417 measures current up to 600A with 1mV of output corresponding to 1A and measures current up to 60A with 10mV corresponding to 1A. The MR527 measures current up to 1400A with 1mV corresponding to 1A and measures current up to 150A with 10mV corresponding to 1A.

To convert the clamp output to current, divide the voltage reading on the connected measuring device by the V/A coefficient. For example, in the MR527's 1400A range, a reading of 100mV corresponds to a current of 100A.

4. SPECIFICATIONS

4.1 REFERENCE CONDITIONS

Quantities of Influence	Reference Conditions		
Temperature	73.4°F ± 9°F (23°C ± 5°C)		
Relative humidity	20 to 75% RH		
Position of the conductor	Centered on the marks on the jaws		
Measurement frequency	DC to 65Hz sine wave		
External electrical field	Zero		
External DC magnetic field (Earth)	<40A/m		
External AC magnetic field	Zero		
Input impedence	≥1MΩ and ≤100pF		

The intrinsic uncertainty is the error defined under the reference conditions. It is expressed as a percentage of the output signal (R) plus an offset in mV: \pm (a% R + b)

4.2 ELECTRICAL SPECIFICATIONS

4.2.1 Electrical Specifications, 1mV/A Sensitivity

Output impedence: 215Ω

MR417

Specified Measurement Range	0.5 to 100Aac/Dc	100 to 400Aac/Dc	400 to 500Aac/dc	500 to 600Adc
Intrinsic uncertainty	≤ ± (2% R + 1.5mV)	≤ ± 2% R	≤ ± 3% R	≤ ± 4% R

MR527

Specified Measurement Range	0.5 to 100Aac/dc	100 to 800Aac/dc	800 to 1000Aac/Dc	1000 to 1400ADC
Intrinsic uncertainty	≤ ± (2% R + 1.5mV)	≤ ± 2.5% R	≤ ± 4% R	≤ ± 5% R

Phase error (45 to 65Hz)

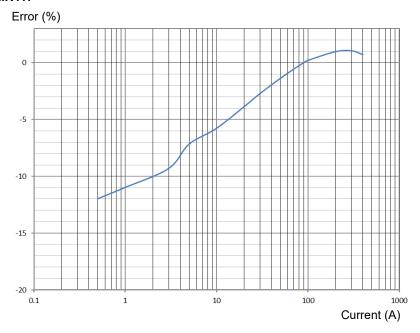
MR417

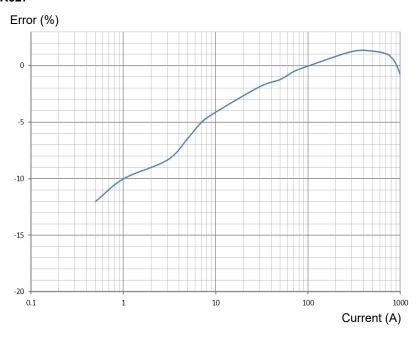
Specified Measurement Range	3 to 300Aac	300 to 400AAC
Phase shift	≤ -2.2°	≤ -1.5°

Specified Measurement Range	3 to 200Aac	200 to 1000Aac
Phase shift	≤ -2°	≤ -1.5°

Typical amplitude error curve at 60Hz

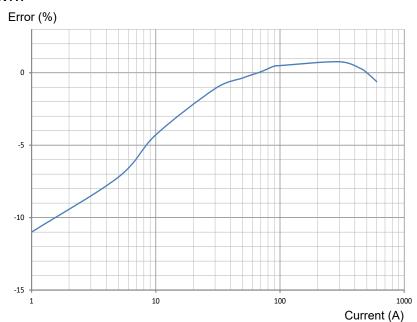
MR417



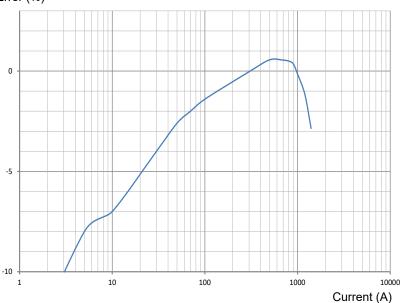


Typical amplitude error curve in DC

MR417



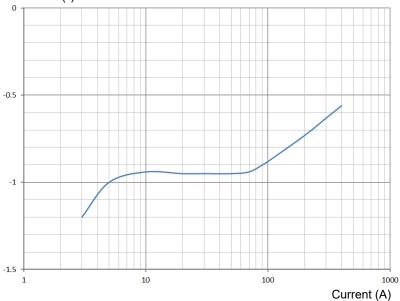




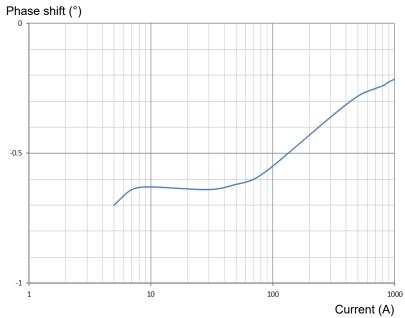
Typical phase error curve at 60Hz

MR417









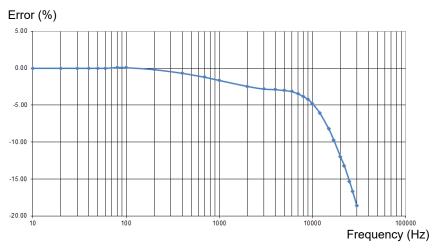
4.2.2 Frequency Specifications, 1mV/A Sensitivity

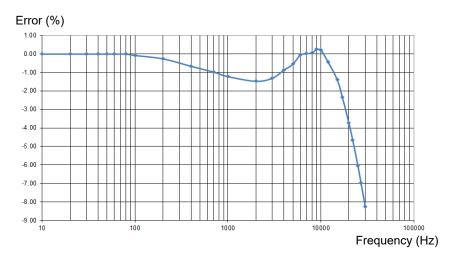
Bandwidth -3db: DC to 30kHz

Frequ	uency	50Hz	400Hz	1kHz	10kHz
	ertion dance	<0.01mΩ		MR417: 0.12mΩ MR527: 0.14mΩ	MR417: 2.8mΩ MR527: 3.4mΩ

Typical amplitude error versus frequency curve at 60A

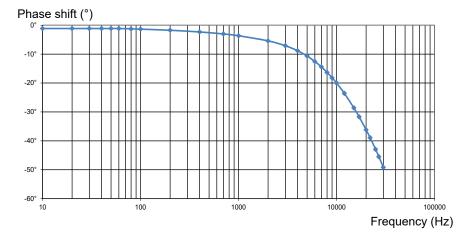
MR417

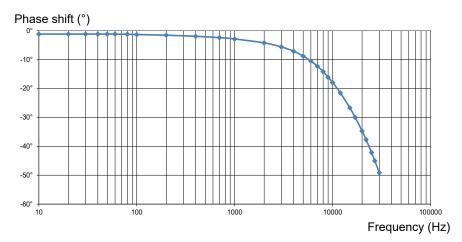




Typical phase versus frequency error curve at 60A

MR417



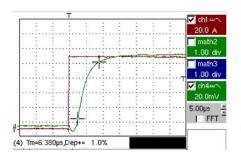


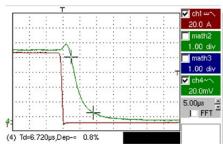
Pulse Response (MR417 and MR527)

Rise time (from 10 to 90%): \leq 11 μ s Fall time (from 90 to 10%): \leq 11 μ s

AC noise on output: ≤ 1mV or 1A_{peak-to-peak}

Delay time at 10%: ≤ 10µs





4.2.3 Electrical Specifications, 10mV/A Sensitivity

Output impedance: 215Ω

MR417

Specified measurement range	0.5 to 30Aac/dc	30 to 40Aac/dc	40 to 60ADC
Intrinsic uncertainty	≤ ± (3% R + 8mV)	≤± 1.5% R	≤± 1.5% R

MR527

Specified measurement range	0.5 to 40Aac/dc	40 to 100Aac/Dc	100 to 140ADC
Intrinsic uncertainty	≤ ± (3% R + 8mV)	≤± 1.5% R	≤± 1.5% R

Phase error (45 to 65Hz)

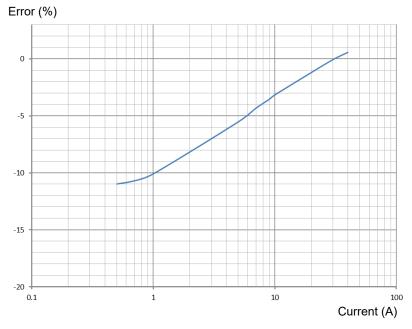
MR417

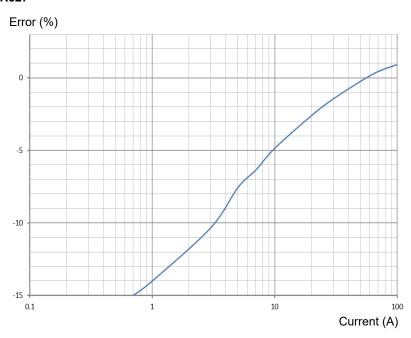
Specified measurement range	1 to 20Aac	20 to 40Aac
Phase shift	≤ -3°	≤ -2.2°

Specified measurement range	1 to 100Aac
Phase shift	≤ -2°

Typical amplitude error vs current curve at 60Hz

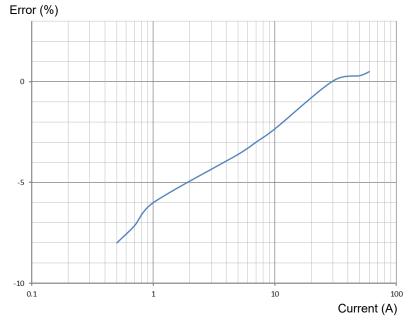
MR417

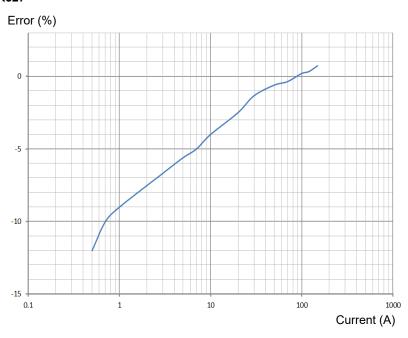




Typical amplitude error vs current curve in DC

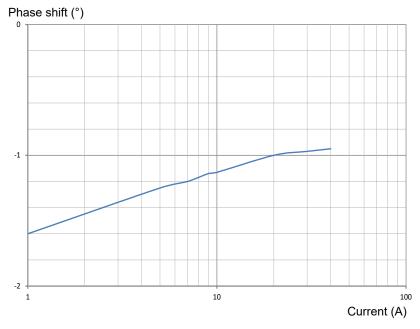
MR417

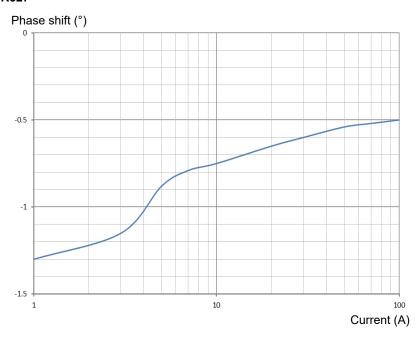




Typical phase vs current error curve at 60Hz

MR417



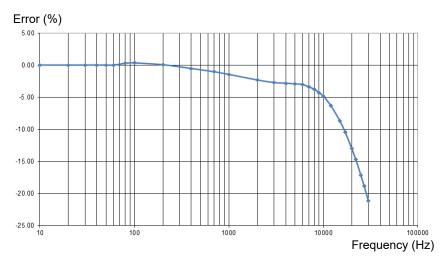


4.2.4 Frequency Specifications, 10mV/A Sensitivity

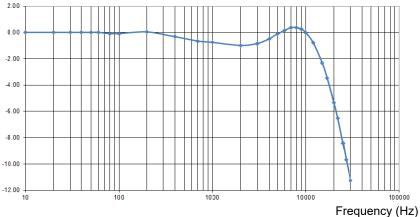
Bandwidth -3dB: DC to 30kHz

Frequency	50Hz	400Hz	1kHz	10kHz
Insertion impedence	<0.01mΩ		MR417: 0.12mΩ MR527: 0.14mΩ	-

Typical amplitude error versus frequency curve at 30A MR417

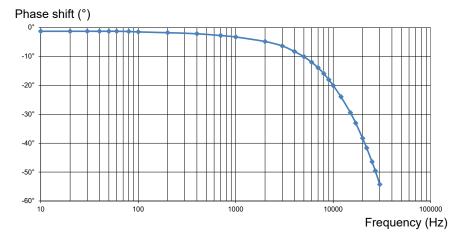


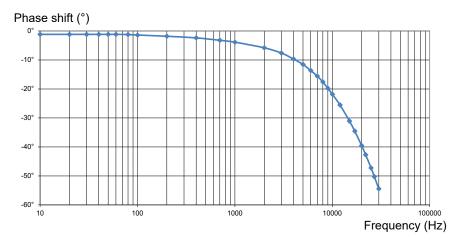




Typical phase versus frequency error curve at 100A

MR417



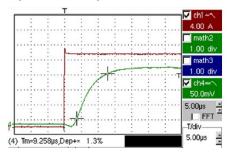


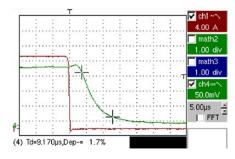
Pulse Response (MR417 and MR527)

Rise time (from 10 to 90%): \leq 11 μ s Fall time (from 90 to 10%): \leq 11 μ s AC noise on output: \leq 3mV or 0.3A

Delay time at 10%: ≤ 10µs

Square wave response curves

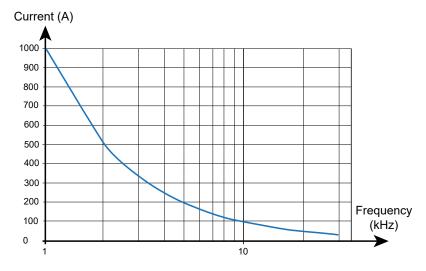




4.3 OPERATING LIMITS (MR417 AND MR527)

- In DC: 3000A permanent
- In AC: 1000A permanent up to 1kHz
- from 1kHz, IMAX = 1000/f (kHz)
- Conductor temperature: ≤ 194°F (90°C), 230°F (110°C) peak
- Temperature of the jaws: ≤ 176°F (80°C)

Curve of derating vs frequency



4.4 VARIATIONS IN THE RANGE OF USE

Quantity of	Danie dinference	Error in % of reading		
influence	Range of influence	Typical	Maximum	
Temperature	14 to 131°F (-10 to +55°C)		Drift of the zero ± 100mA/°C Drift of the gain 3%	
Relative humidity	10 to 85% RH		0.5%	
Frequency	10 to 400Hz 400Hz to 7kHz 7 to 30kHz		1% 3.5% see curves	
Position of the conductor 0.79" (20mm) in diameter			0.5%	
Adjacent conductor carrying a 50Hz AC current	Conductor 0.91" (23mm) from the clamp		10mA/A	
External 400A/m field at 50Hz	Cable centered		1.3A	
Common mode rejection	600V between jacket and secondary		90dB A/V at 50Hz	
Remanence		MR417: 50ADC: 1.2A 100ADC: 2.3A 200ADC: 3.4A 400ADC: 4.8A 600ADC: 5.5A 800ADC: 5.8A MR527: 100ADC: 2.8A 200ADC: 3.5A 400ADC: 5.4 800ADC: 5.3A 1200ADC: 5.7A 1400ADC: 5.8A		

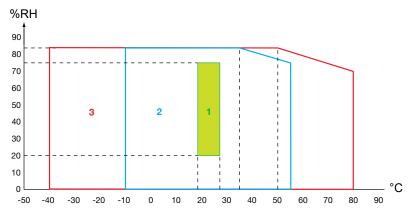
4.5 POWER SUPPLY

The instrument is powered by a 9V battery (type 6LR61, 6LF22, or NEDA 1604). The average battery life is 50 hours with an alkaline battery.

The instrument can also be powered by an external supply (5VDC, 100mA) via the type B micro-USB connector.

4.6 ENVIRONMENTAL CONDITIONS

The instrument must be used in the following environmental conditions.



1 = Range of reference

2 = Operating range

3 = Storage range

Indoor use

Degree of pollution: 2

Altitude: < 6500ft (2000m)

Transport altitude: ≤ 40000ft (12,000m)

4.7 MECHANICAL SPECIFICATIONS

MR417

Dimensions (L x W x H): 8.8 x 3.8 x 1.7in (224 x 97 x 44mm)

Weight: approximately 15.5oz (440g)

Cable: 6.6ft (2m)

Maximum Conductor Size:

Cables: One 1.18in (30mm) or two 0.94in (24mm)

Bus Bar: One 1.97 x 0.39in (50 x 10mm) or two 1.23 x 0.39in (31.5 x 10mm)

or three 0.98 x 0.31in (25 x 8mm)

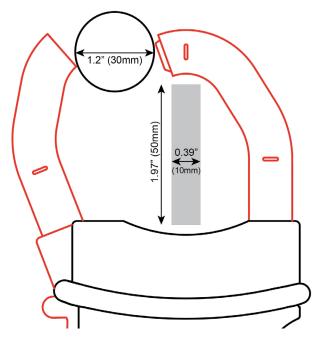


Figure 5

MR527

Dimensions (L x W x H): 9.3 x 3.8 x 1.7in (237 x 97 x 44mm)

Weight: approximately 18.3oz (520g)

Cable: 6.6ft (2m)

Maximum Conductor Size:

Cables: One 1.5in (39mm) or two 1in (25.4mm)

Bus Bar: One 1.97 x 0.49in (50 x 12.5mm) or two 0.98 x 0.2in (25 x 5mm); 1.24 x 0.30in (31.5 x 10mm) or three 0.98 x 0.31in (25 x 8mm)

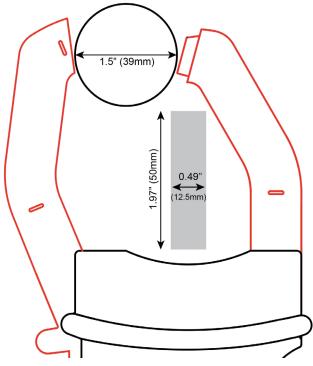


Figure 6

4.7.1 Housing Protection

Protection index:

- IP 40 per IEC 60529
- IK 06 per IEC 62262

Drop test per IEC/EN 61010-2-032 or BS EN 61010-2-032.

4.8 SAFETY SPECIFICATIONS

Electrical Conformity to International Standards:

This instrument is compliant with IEC/EN 61010-2-032 or BS EN 61010-2-032, 300V category IV and 600V category III.

Double or reinforced insulation .

Type of current sensor per IEC/EN 61010-2-032 or BS EN 61010-2-032: type A 1.

Electromagnetic Compatibility:

The device is in conformity with standard IEC/EN 61326-1 or BS EN 61326-1.

5. MAINTENANCE



Except for the battery, the instrument contains no parts that can be replaced by personnel who have not been specially trained and accredited. Any unauthorized repair or replacement of a part by an "equivalent" may gravely impair safety.

5.1 CLEANING

- · Disconnect the instrument completely.
- Use a soft cloth, dampened with soapy water.
- Rinse with a damp cloth and dry rapidly with a dry cloth or forced air.
- Do not use alcohol, solvents, or hydrocarbons.
- Keep the clamp jaws as clean as possible

5.2 BATTERY REPLACEMENT

The battery must be replaced if the **ON** indicator remains unlit when the instrument is turned **ON**

- 1. Disconnect the instrument completely and set the switch to OFF.
- 2. Remove the battery compartment cover from the instrument casing (see § 2.1).
- Remove the old battery.
- Insert the replacement battery into the snap-in battery connector and place it into the battery compartment.
- 5. Replace the battery compartment cover.



Depleted batteries must not be treated as ordinary household waste. Take them to the appropriate collection point for recycling.

5.3 REPAIR AND CALIBRATION

To ensure that your instrument meets factory specifications, we recommend that it be submitted 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).

Chauvin Arnoux®, Inc. d.b.a. AEMC® Instruments 15 Faraday Drive

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: All customers must obtain a CSA# before returning any instrument.

5.4 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, mail, fax or e-mail our technical support hotline:

Chauvin Arnoux®, Inc. d.b.a. AEMC® Instruments 15 Faraday Drive

Dover, NH 03820 USA

Phone: (800) 343-1391 (Ext. 351)

Fax: (603) 742-2346 or (603) 749-6309

E-mail: techsupport@aemc.com

www.aemc.com

5.5 LIMITED WARRANTY

The instrument is 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

Please print the online Warranty Coverage Information for your records.

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

5.5.1 Warranty Repairs

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

First, request a Customer Service Authorization Number (CSA#) by phone or by fax 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:

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

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

NOTE: All customers must obtain a CSA# before returning any instrument.





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