■ AC/DC CURRENT PROBE

MR417
MR527

ENGLISH

User Manual

AEMC® INSTRUMENTS
CHAUVIN ARNOUX GROUP

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 N.I.S.T. 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**.

Serial #: _____

Catalog #: **1200.84 / 1200.85**

Model #: **MR417 / MR527**

Please fill in the appropriate date as indicated:

Date Received: _____

Date Calibration Due: _____

AEMC® INSTRUMENTS
CHAUVIN ARNOUX GROUP

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

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

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

Symbols

	WARNING, risk of DANGER! The operator must refer to these instructions whenever this danger symbol appears.
	Application or withdrawal authorized on conductors carrying dangerous voltages. Type A current sensor as per IEC 61010-2-032.
	Equipment is protected by double insulation.
	Battery.
	USB.
	Useful information or tip.
	Direction of the current.
	The product is declared recyclable following an analysis of the life cycle in accordance with standard ISO 14040.
	The CE marking guarantees conformity with European directives and with regulations covering EMC.
	The trash can with a line through it means that in the European Union, the product must undergo selective disposal for the recycling of electric and electronic material, in compliance with Directive WEEE 2002/96/EC.

Definition of Measurement Categories (CAT)

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

CAT III Corresponds to measurements on building installations.
Example: distribution panel, circuit-breakers, machines or fixed industrial devices.

CAT II Corresponds to measurements taken on circuits directly connected to low-voltage installations.
Example: power supply to domestic electrical appliances and portable tools.

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 destruction of the instrument and/or installations.

- The operator and/or the responsible authority must carefully read and clearly understand the various precautions to be taken in 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 scrapping.
- 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.

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.

Ordering Information

AC/DC Current Probe Model MR417 ..... Cat. #1200.84
Includes 9V battery, multi-language safety data sheet and user manual

AC/DC Current Probe Model MR527 ..... Cat. #1200.85
Includes 9V battery, multi-language safety data sheet and user manual

Replacement Parts/Accessories:

Cable – 6’ USB type A to Micro type B .....Cat. #2138.66

Adapter – US Wall plug to USB .....Cat. #2153.78

1 DESCRIPTION

The Models MR417 and MR527 are clamp-on current probes that measure DC currents up to 1400A, AC currents up to $1000A_{RMS}$ (1400A peak), and combined AC+DC currents without opening the circuit in which the currents flow. 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 $5V_{DC}$ via the optional micro-USB cable.

The MR417 and MR527 include the following features:

- overage indicator
- power supply indicator
- zero adjustment
- Auto Standby feature
- two ranges (sensitivity 1 and 10mV/A)
- micro-USB connector to connect an external power supply

1.1 Interface

1.1.1 MR417

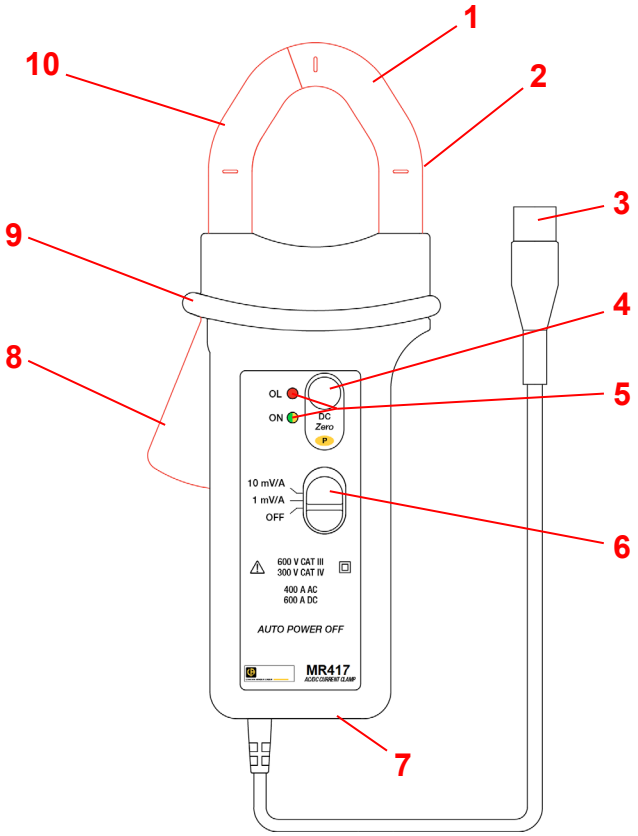


Figure 1 ***(MR417)***

Item	Functions
1	Fixed (non-mobile) jaw
2	Arrow indicating current flow direction
3	Male BNC connector
4	**DC Zero** button
5	**OL** (overload) and **ON** indicators. **ON** is green when Auto Standby is enabled, yellow when it disabled.
6	3-position slide switch
7	USB port
8	Trigger
9	Hand guard
10	Mobile jaw

1.1.2 MR527

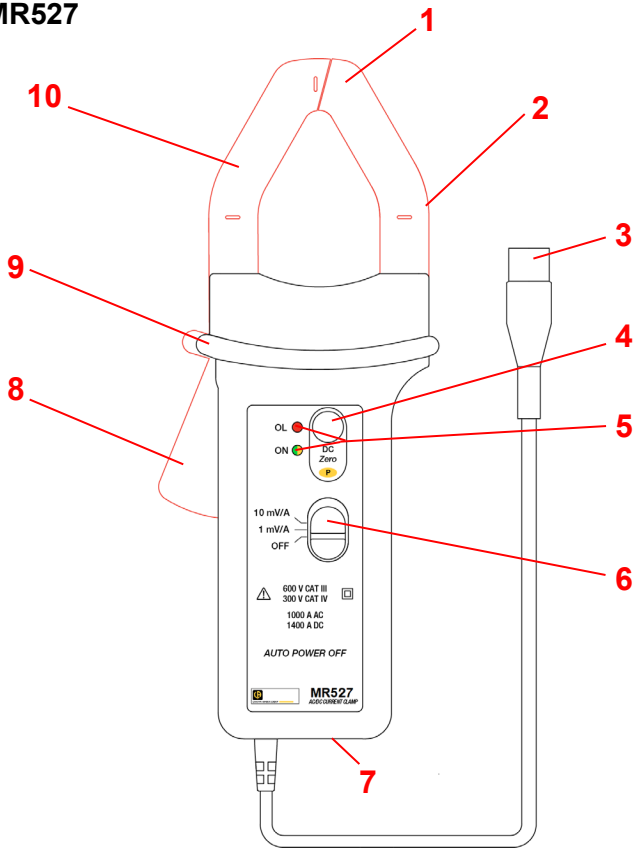


Figure 2 ***(MR527)***

Item	Functions
1	Fixed (non-mobile) jaw
2	Arrow indicating current flow direction
3	Male BNC connector
4	**DC Zero** button
5	**OL** (overload) and **ON** indicators. **ON** is green when Auto Standby is enabled, yellow when it disabled.
6	3-position slide switch
7	USB port
8	Trigger
9	Hand guard
10	Mobile jaw

2 OPERATION

2.1 Battery Installation

Before changing batteries: set the switch to OFF and remove the clamp from the circuit under measurement.

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.

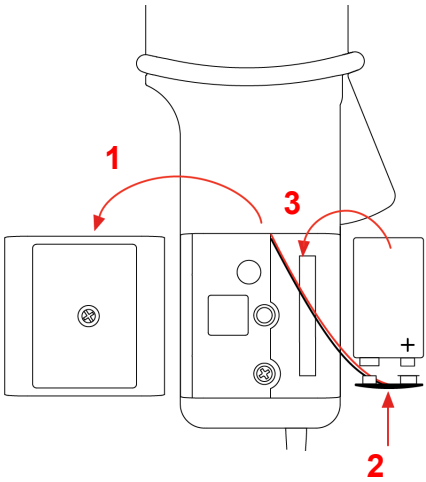


Figure 3

2.2 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 automatic standby is enabled (green) or disabled (yellow).

2.3 Turning ON the Instrument

Turn on the clamp by pushing 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 indicator blinks, less than 4 hours of battery life remains
- If indicator fails to light, replace the battery (see § 4.2)

2.4 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 goes OFF.

To reactivate the clamp, press **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; and then glows steady yellow when you release the **DC Zero** button.

2.5 DC Zero Adjustment

DC Zero must be adjusted before each measurement.

1. Remove the clamp from the circuit under measurement.
2. Turn the clamp ON.
3. Connect the clamp to the measuring instrument. The phase is on the red lead.
4. Press the **DC Zero** button.
5. The **OL** indicator lights for approximately three seconds to indicate that the zero adjustment is in progress.
6. If the zero has been correctly adjusted, the **OL** indicator goes OFF.

   If it remains ON, the zero cannot be adjusted. In this case, ensure the clamp is not on a conductor and that its jaws are correctly closed. Then press **DC Zero** again.

   Alternately, turn the clamp OFF and then back ON. The previous zero adjustment will remain in effect.

2.6 Measurements

2.6.1 Making a Measurement

After adjusting DC Zero:

1. 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 to be used in a power calculation, ensure the arrow on the clamp jaws (see Figures 1 and 2) points in the direction of the current flow: source ⇨ load.
3. Release the trigger, ensuring the jaws are completely and correctly closed.
4. Observe the measurement displayed on the measuring instrument.
5. If the **OL** indicator lights, 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**.

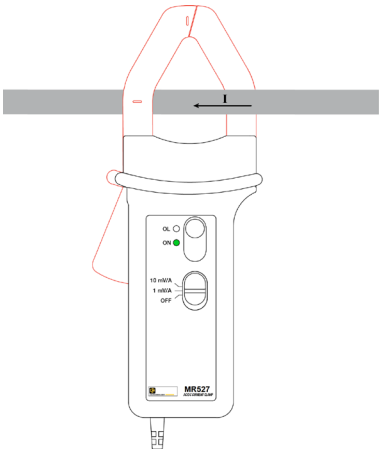


Figure 4 ***(MR527 shown)***

2.6.2 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 current up to 60A with 10mV corresponding to 1A. The MR527 measures current up to 1400A with 1mV corresponding to 1A, and current up to 150A with 10mV corresponding to 1A.

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

3 SPECIFICATIONS

3.1 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 impedance	≥ 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:
±(a% R + b)

3.2 Electrical Specifications

3.2.1 Electrical Specifications, 1mV/A Sensitivity

Output impedance: 215Ω

MR417

Specified Measurement range	0.5 to 100 $A_{AC/DC}$	100 to 400 $A_{AC/DC}$	400 to 500 $A_{AC/DC}$	500 to 600 A_{DC}
Intrinsic uncertainty	≤±(1.5% R + 1mV)	≤±2% R	≤±3% R	≤±4%R

MR527

Specified Measurement range	0.5 to 100 $A_{AC/DC}$	100 to 800 $A_{AC/DC}$	800 to 1000 $A_{AC/DC}$	1000 to 1400 A_{DC}
Intrinsic uncertainty	≤±(1.5% R + 1mV)	≤±2.5% R	≤±4% R	≤±5%R

Phase error (45 to 65Hz)

MR417

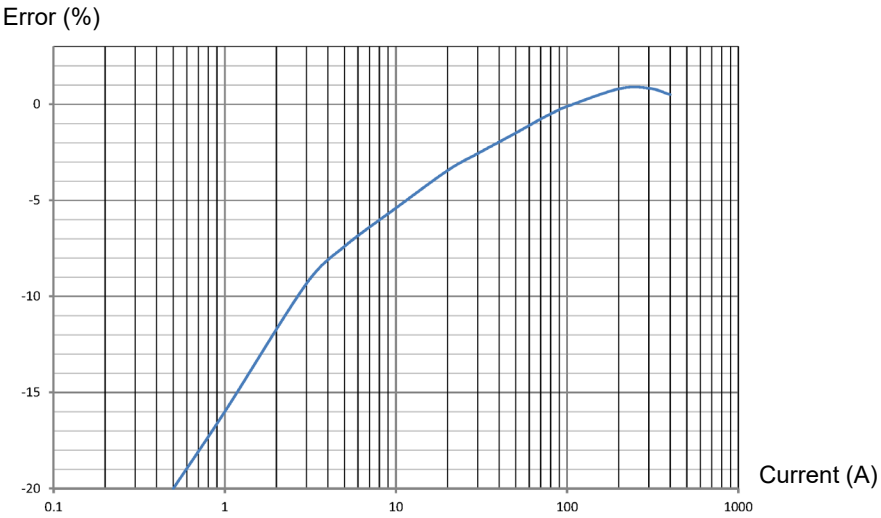
Specified Measurement range	3 to 300A_{AC}	300 to 400A_{AC}
Phase shift	≤ -2.2°	≤ -1.5°

MR527

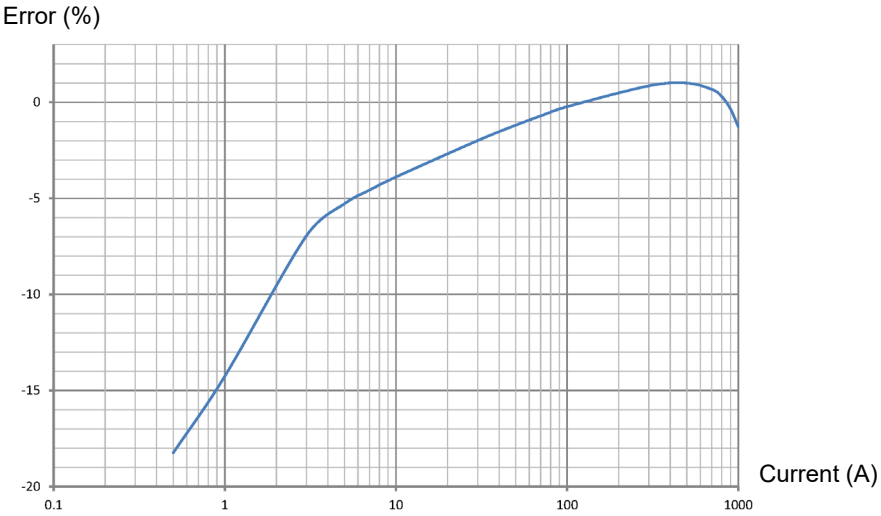
Specified Measurement range	3 to 200A_{AC}	200 to 1000A_{AC}
Phase shift	≤ -2°	≤ -1.5°

Typical amplitude error curve at 60Hz

MR417

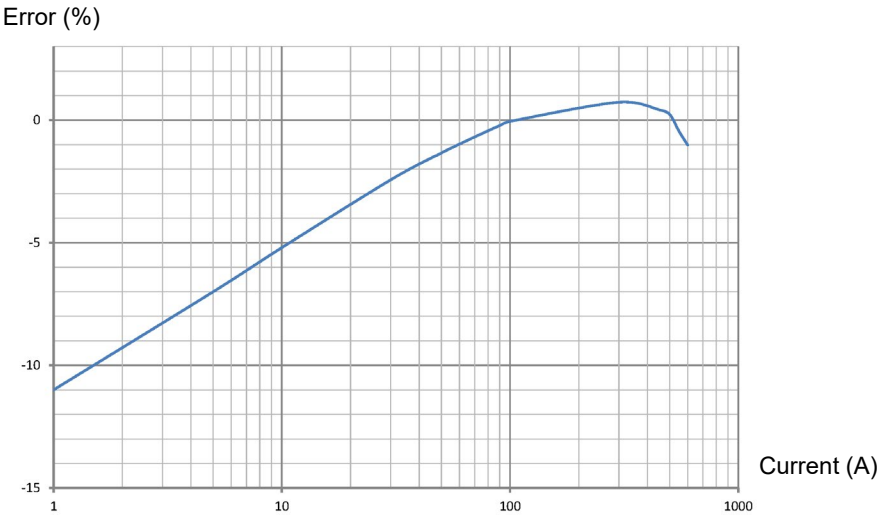


MR527



Typical amplitude error curve in DC

MR417



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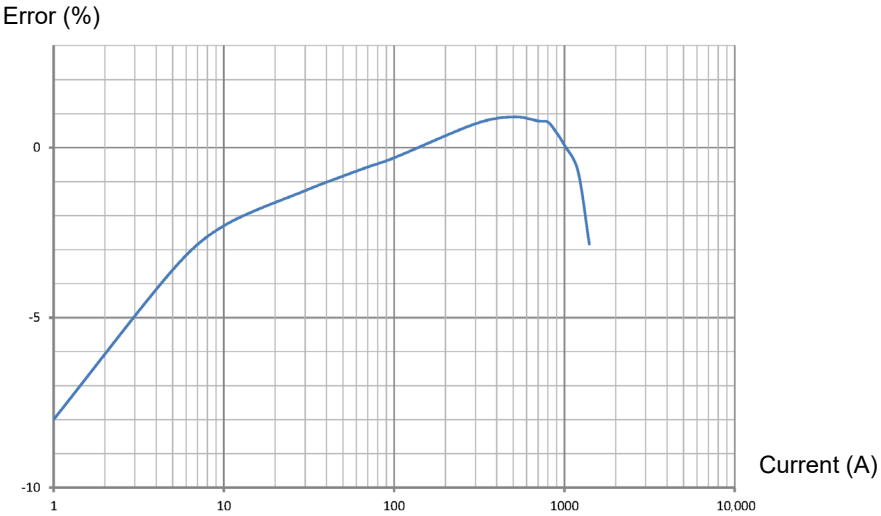
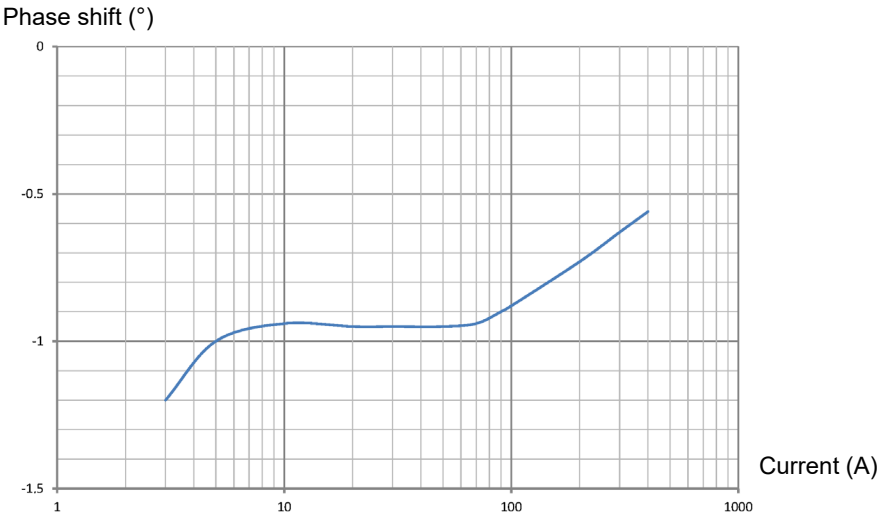


Typical phase error curve at 60Hz

MR417



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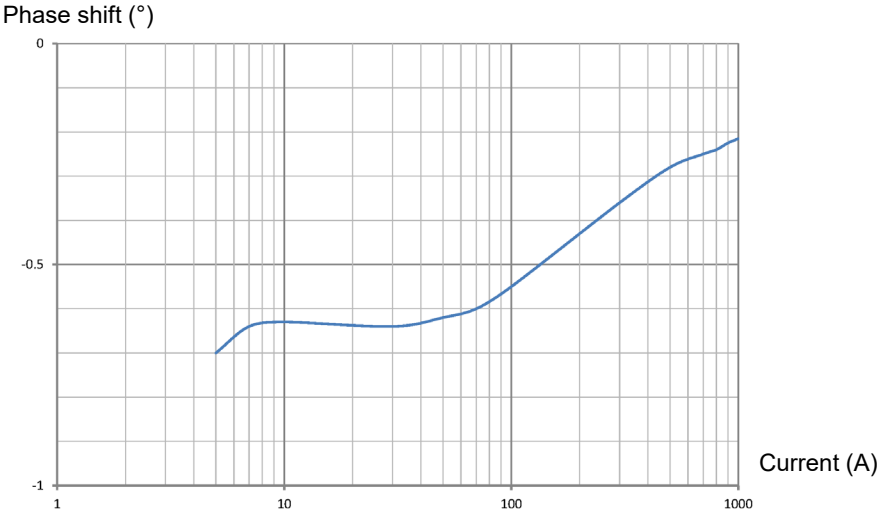


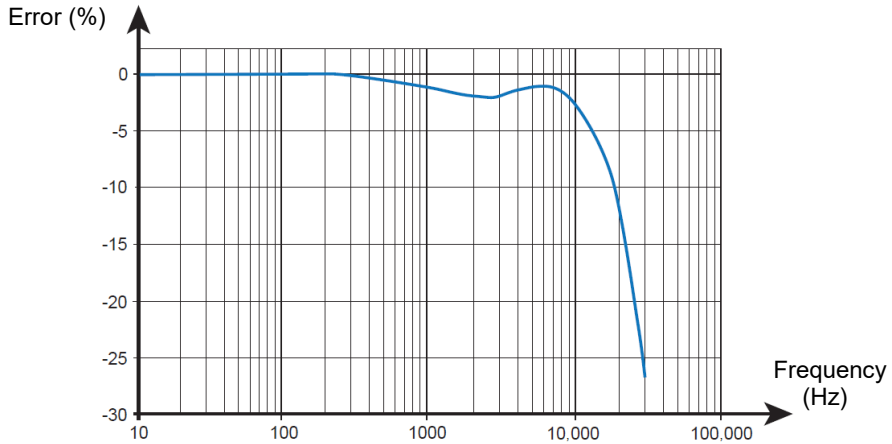
3.2.2 Frequency Specifications, 1mV/A Sensitivity

Bandwidth -3dB: DC to 30kHz

Frequency	50Hz	400Hz	1kHz	10kHz
Insertion impedance	<0.01mΩ	MR417: 0.01mΩ MR527: 0.05mΩ	MR417: 0.12mΩ MR527: 0.14mΩ	MR417: 2.8mΩ MR527: 3.4mΩ

Typical amplitude error versus frequency curve at 100A

MR417



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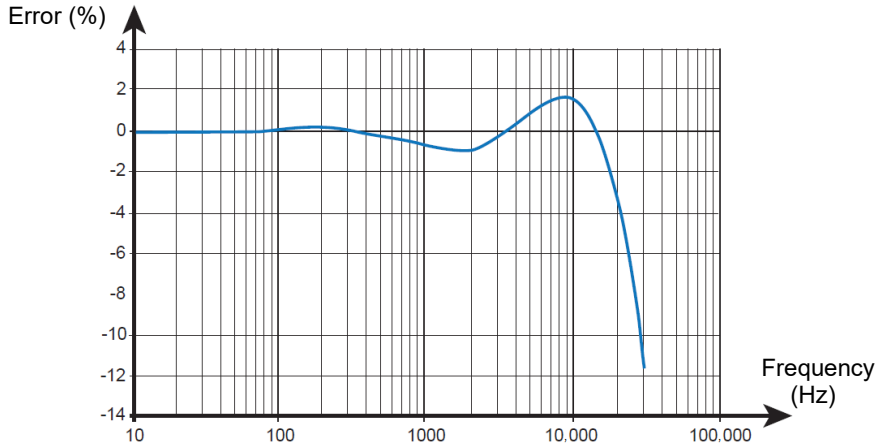
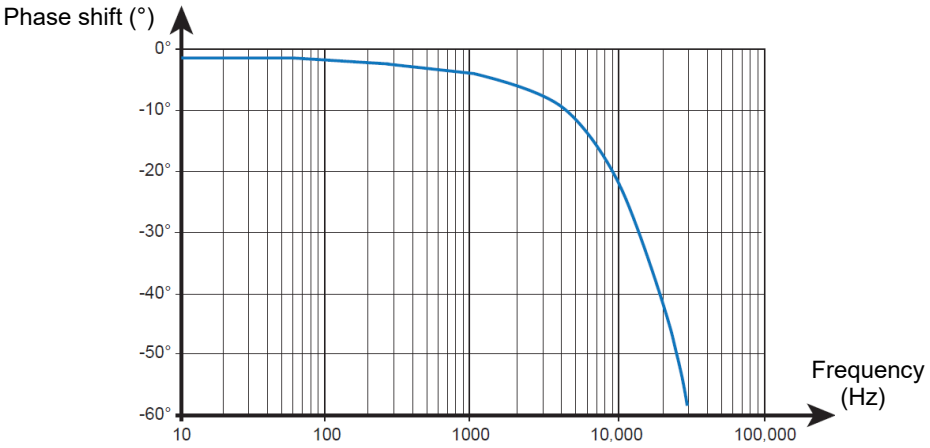


Typical phase versus frequency error curve at 100A

MR417



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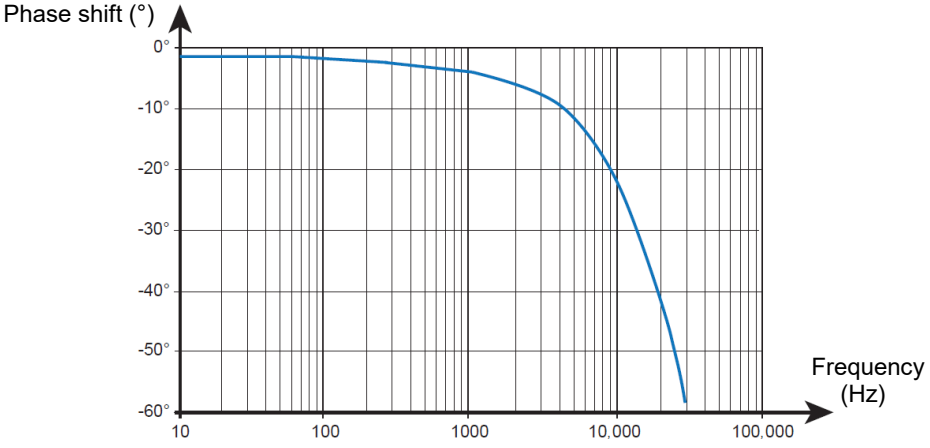
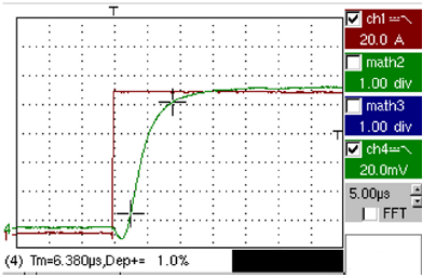
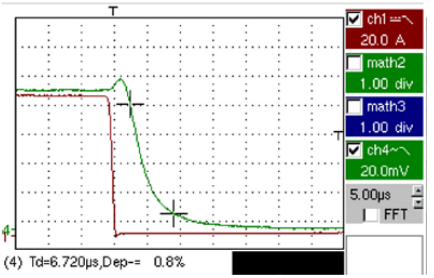


Pulse Response
Rise time (from 10 to 90%): ≤ 11µs
Fall time (from 90 to 10%): ≤ 11µs
AC noise on output: ≤ 1mV or $1A_{peak\text{-}to\text{-}peak}$
Delay time at 10%: ≤ 10µs





3.2.3 Electrical Specifications, 10mV/A Sensitivity

Output impedance: 215Ω

MR417

Specified Measurement range	0.5 to 30$A_{AC/DC}$	30 to 40$A_{AC/DC}$	40 to 60A_{DC}
Intrinsic uncertainty	≤±(3% R + 5mV)	≤±1.5% R	≤±1.5% R

MR527

Specified Measurement range	0.5 to 40$A_{AC/DC}$	40 to 100$A_{AC/DC}$	100 to 150A_{DC}
Intrinsic uncertainty	≤±(3% R + 5mV)	≤±1.5% R	≤±1.5% R

Phase error (45 to 65Hz)

MR417

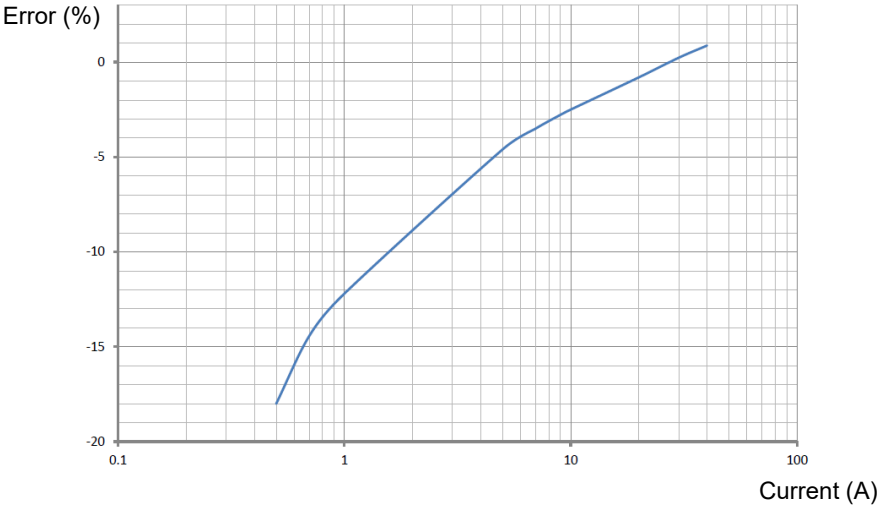
Specified Measurement range	1 to 20A_{AC}	20 to 40A_{AC}
Phase shift	≤ -3°	≤ -2.2°

MR527

Specified Measurement range	1 to 100A_{AC}
Phase shift	≤ -2°

Typical amplitude error vs current curve at 60Hz

MR417



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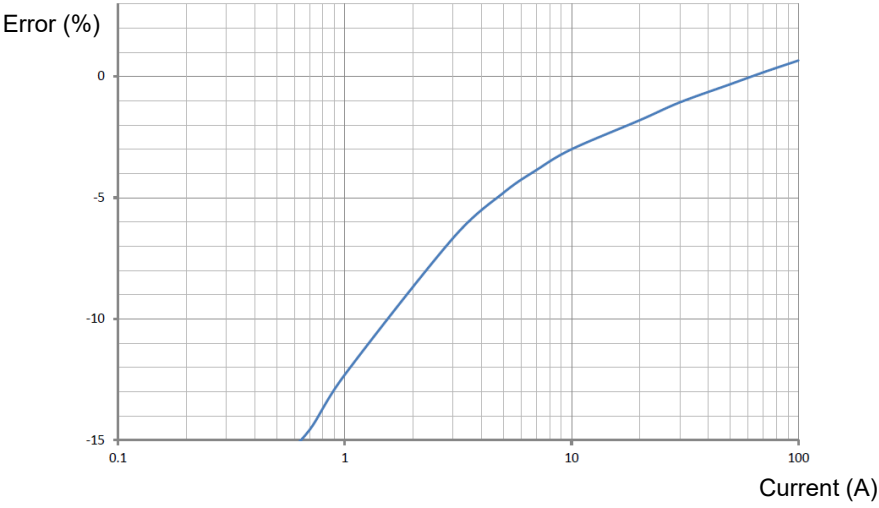
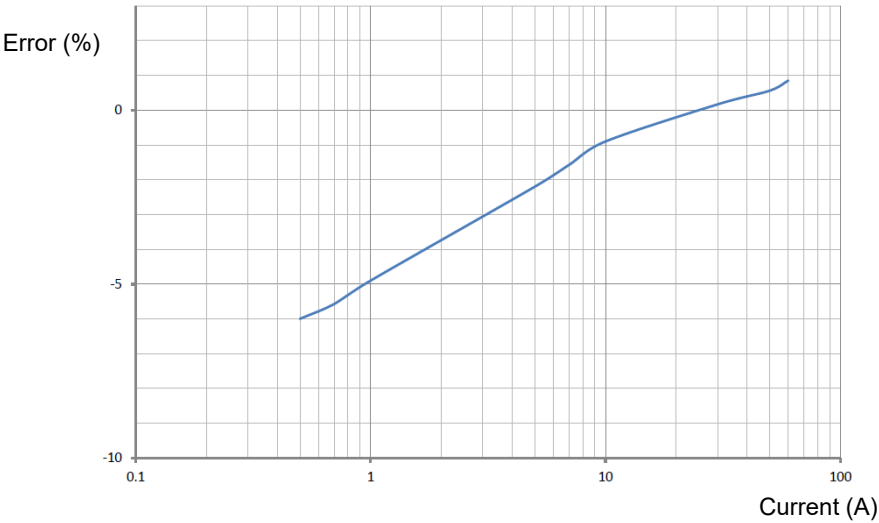


Typical amplitude error vs current curve in DC

MR417



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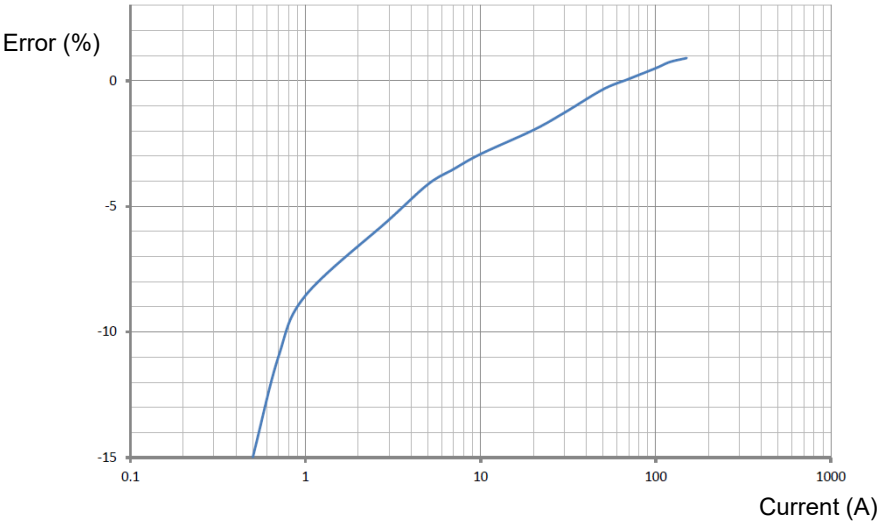
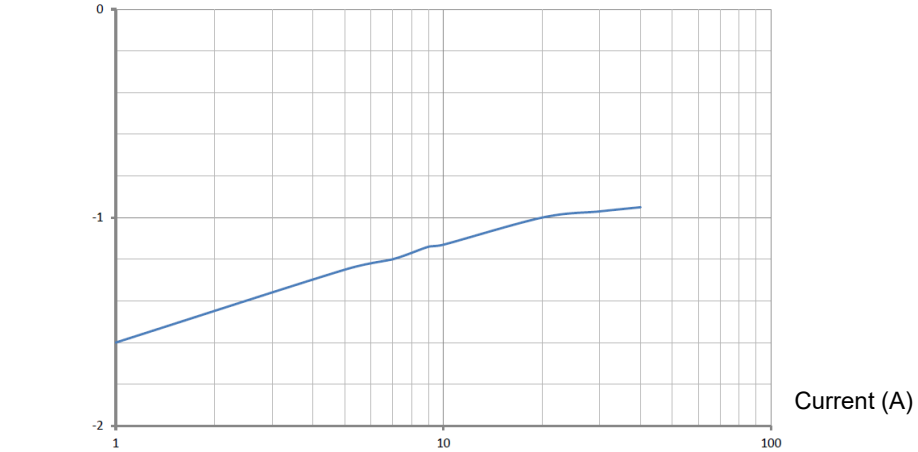


Typical phase vs current error curve at 60Hz

MR417



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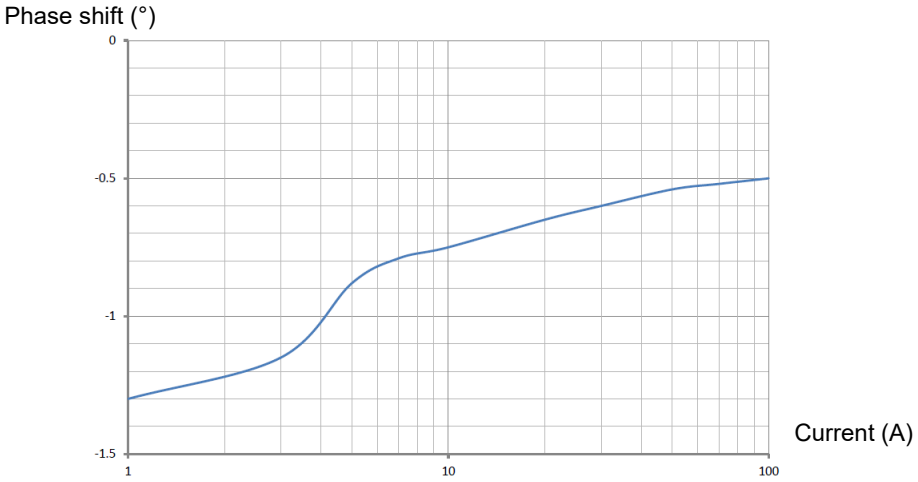


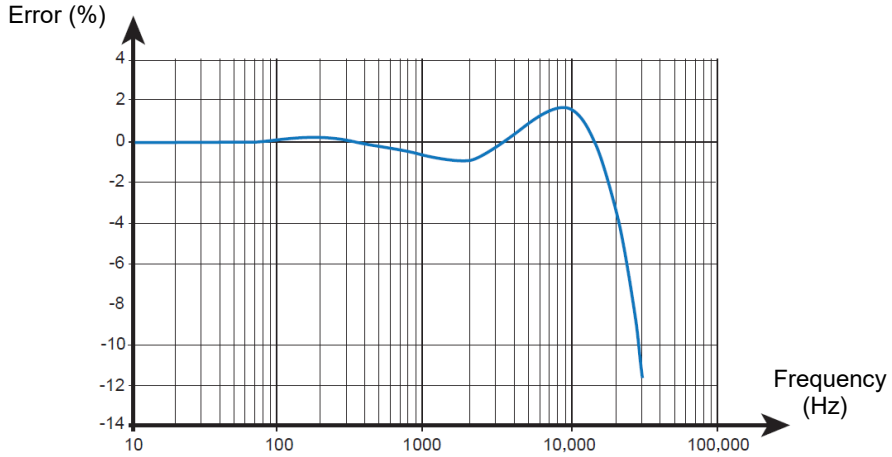
3.2.4 Frequency Specifications, 10mV/A Sensitivity

Bandwidth -3dB: DC to 30kHz

Frequency	50Hz	400Hz	1kHz	10kHz
Insertion impedance	<0.01mΩ	MR417: 0.01mΩ MR527: 0.05mΩ	MR417: 0.12mΩ MR527: 0.14mΩ	MR417: 2.8mΩ MR527: 3.4mΩ

Typical amplitude error versus frequency curve at 100A

MR417



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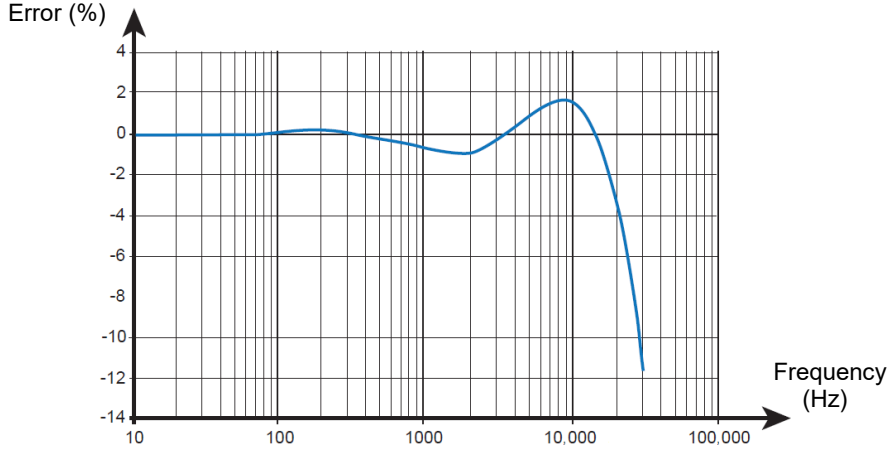
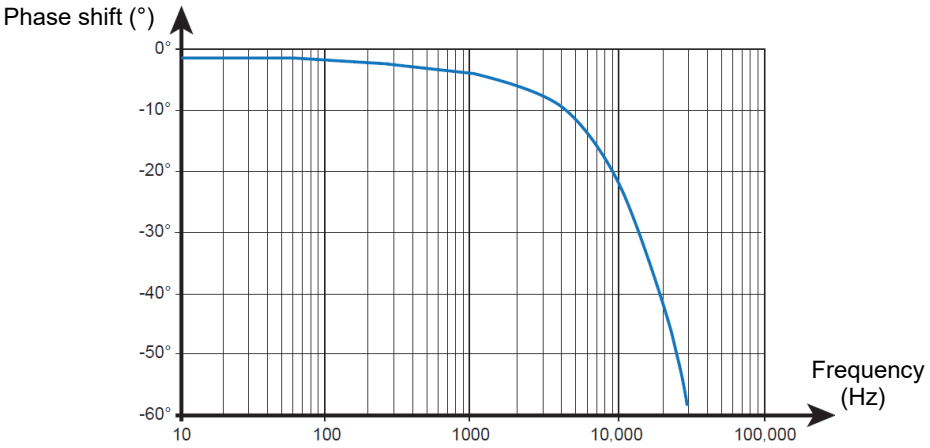


Typical phase versus frequency error curve at 100A

MR417



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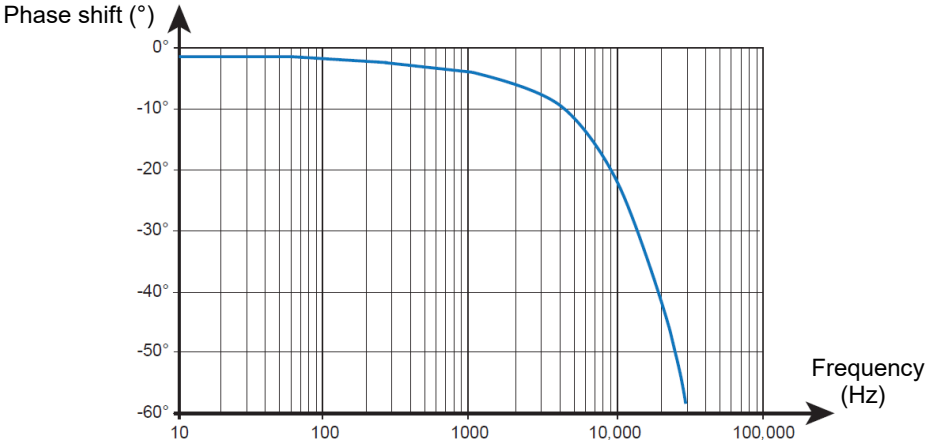
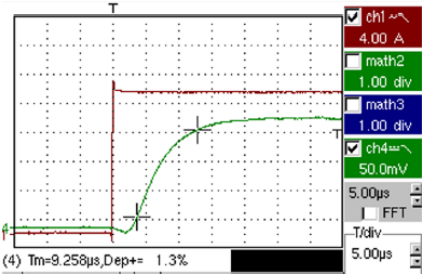
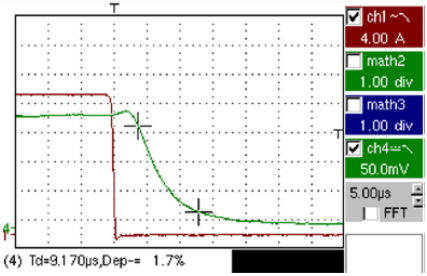


Pulse Response
Rise time (from 10 to 90%): ≤ 11µs
Fall time (from 90 to 10%): ≤ 11µs
AC noise on output: ≤ 3mV or 0.3$A_{peak\text{-}to\text{-}peak}$
Delay time at 10%: ≤ 10µs

Square wave response curves

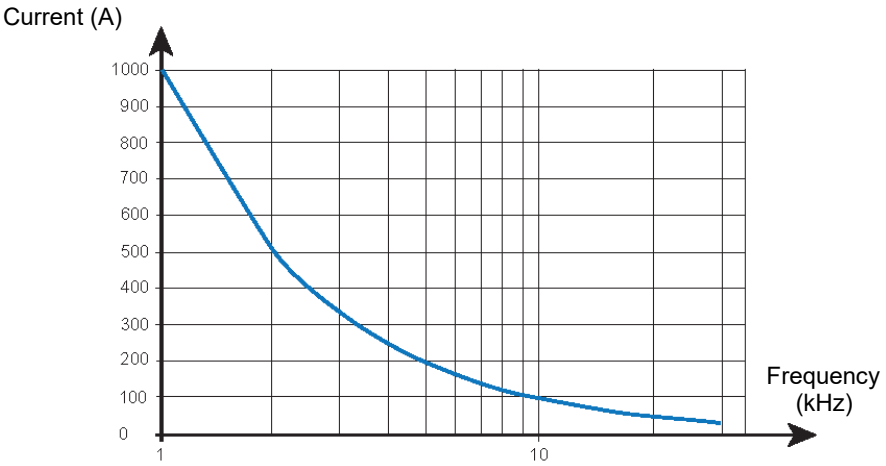




3.3 Operating Limits

- In DC: 3000A permanent
- In AC: 1000A permanent up to 1kHz
  from 1kHz, I_{MAX} = 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 versus frequency



3.4 Variations in the Range of Use

Quantity of influence	Range of influence	Error in % of reading	
		Typical	Maximum
Temperature	14 to 131°F (-10 to + 55°C)		0.3%
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		65dB A/V at 50Hz
Remanence		**MR417:** $50A_{DC}$: 1.2A $100A_{DC}$: 2.3A $200A_{DC}$: 3.4A $400A_{DC}$: 4.8A $600A_{DC}$: 5.5A $800A_{DC}$: 5.8A	
		MR527: $100A_{DC}$: 2.8A $200A_{DC}$: 3.5A $400A_{DC}$: 5A $800A_{DC}$: 5.3A $1200A_{DC}$: 5.7A $1400A_{DC}$: 5.8A	

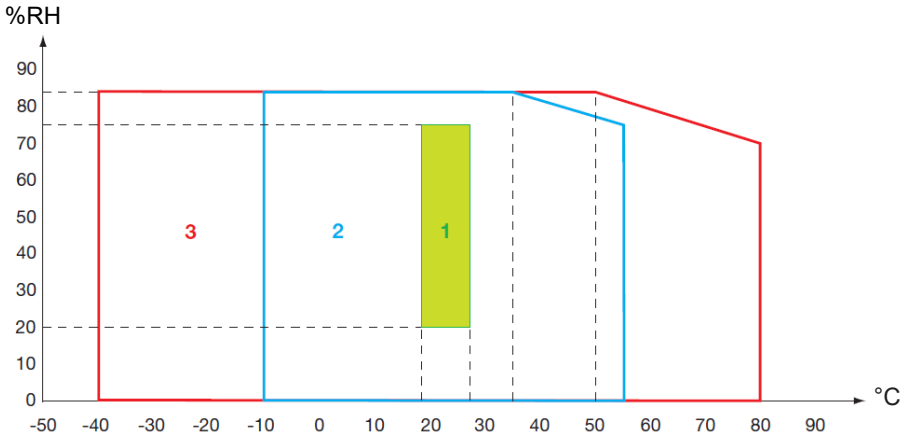
3.5 Power Supply

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 ($5V_{DC}$, 100mA) via the type B micro-USB connector.

3.6 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: < 6500’ (2000m)

Transport altitude: ≤ 40,000’ (12,000m)

3.7 Mechanical Specifications

MR417

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

Weight: approximately 15.5oz (440g)

Cable: 6.6’ (2m)

Maximum Conductor Size:

Cables: One 1.18” (30mm) or two 0.94” (24mm)
Bus Bar: One 1.97 x 0.39” (50 x 10mm) or two 1.23 x 0.39” (31.5 x 10mm) or three 0.98” x 0.31” (25 x 8mm)

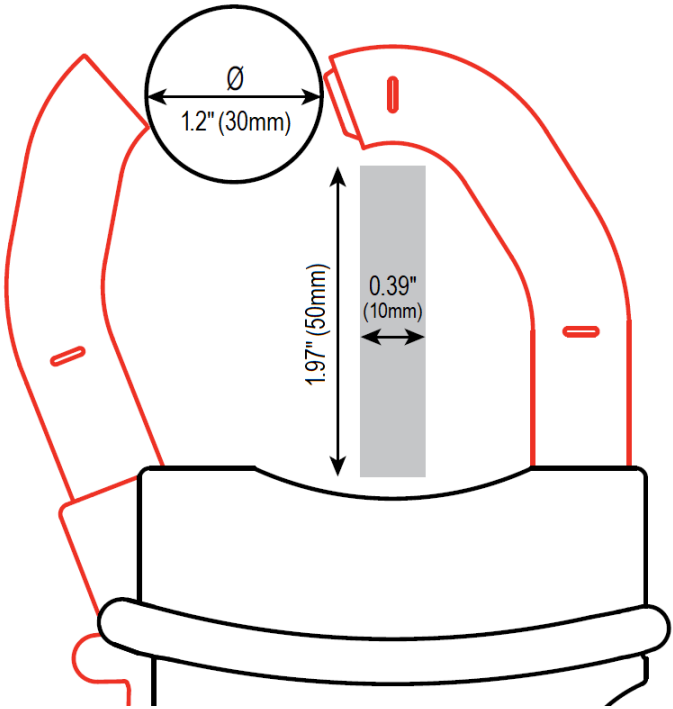


Figure 5

MR527

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

Weight: approximately 18.3oz (520g)

Cable: 6.6’ (2m)

Maximum Conductor Size:

Cables: One 1.5” (39mm) or two 1” (25.4mm)
Bus Bar: One 1.97 x 0.49” (50 x 12.5mm) or two 0.98 x 0.2” (25 x 5mm); 1.24” x 0.30” (31.5 x 10mm) or three 0.98” x 0.31” (25 x 8mm)

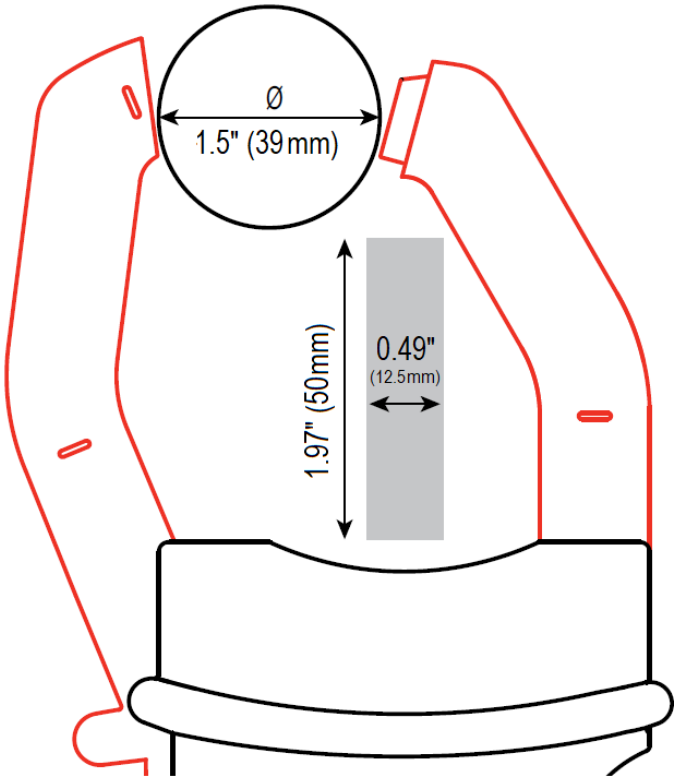


Figure 6

3.7.1 Housing Protection

Protection index:

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

Drop test per IEC 61010-2-032.

3.8 International Standards

The instrument is compliant with IEC 61010-2-032, 300V in CAT IV or 600V in CAT III.

Double or reinforced insulation ⧈

Type of current sensor per IEC 61010-2-032: type A ⧈

3.9 Electromagnetic Compatibility

The device is in conformity with standard IEC 61326-1.

4 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.

4.1 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.

4.2 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).
3. Remove the old battery.
4. Insert the replacement battery into the snap-in battery connector, and place it into the battery compartment.
5. Replace the battery compartment cover.

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

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
Dover, NH 03820 USA
Tel: (800) 945-2362 (Ext. 360)
(603) 749-6434 (Ext. 360)
Fax: (603) 742-2346 or (603) 749-6309
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.

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
200 Foxborough Boulevard
Foxborough, MA 02035, USA
Phone: (800) 343-1391
(508) 698-2115
Fax: (508) 698-2118
techsupport@aemc.com
www.aemc.com

NOTE: Do not ship instruments to our Foxborough, MA address.

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

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
Tel: (800) 945-2362 (Ext. 360)
(603) 749-6434 (Ext. 360)
Fax: (603) 742-2346 or (603) 749-6309
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.

NOTES

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Phone: (603) 749-6434 • Fax: (603) 742-2346
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