User Manual
ENGLISH

AEMC® INSTRUMENTS
CHAUVIN ARNOUX GROUP

# AC/DC Current Probe

# Model SL306


## CURRENT MEASUREMENT PROBES

Measure Up
WITH AEMC INSTRUMENTS®

Chauvin Arnoux®, Inc. d.b.a. AEMC® Instruments
15 Faraday Drive • Dover, NH 03820 USA
Phone: (603) 749-6434 or (800) 343-1391

# 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 the instrument's 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/calibration.

**Serial #:** _____

**Catalog #:** **2153.08**

**Model #:** **SL306**

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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# 1. INTRODUCTION

Thank you for purchasing an AEMC® Instruments **AC/DC Currrent Probe Model SL306**.

For the best results from your instrument and for your safety, you must read the enclosed operating instructions carefully and comply with the precautions for use. Only qualified and trained operators should use this product.

## 1.1 INTERNATIONAL ELECTRICAL SYMBOLS

| | |
|---|---|
|  | Signifies that the instrument is protected by double or reinforced insulation. |
|  | **CAUTION - Risk of Danger!** Indicates a **WARNING**. Whenever this symbol is present, the operator must refer to the user manual before operation. |
|  | To identify the phase, or the direction, of the primary current. |
|  | Application or withdrawal authorized on conductors carrying dangerous voltages. Type A current sensor as per IEC 61010-2-032. |
|  | Battery |
|  | USB socket |
|  | This symbol indicates Important information to acknowledge. |
|  | This product complies with the Low Voltage & Electromagnetic Compatibility European directives. |
|  | In the European Union, this product is subject to a separate collection system for recycling electrical and electronic components in accordance with directive WEEE 2012/19/EU. |
|  <br>  | Chauvin Arnoux® and AEMC® Instruments have adopted an Eco-Design approach in order to design this instrument. Analysis of the complete lifecycle has enabled us to control and optimize the effects of the product on the environment. In particular this instrument exceeds regulation requirements with respect to recycling and reuse. |

## 1.2 DEFINITION OF MEASUREMENT CATEGORIES

**CAT IV:** Corresponds to measurements performed at the primary electrical supply (< 1000 V).

*Example: primary overcurrent protection devices, ripple control units, and meters.*

**CAT III:** Corresponds to measurements performed in the building installation at the distribution level.

*Example: hardwired equipment in fixed installation and circuit breakers.*

**CAT II:** Corresponds to measurements performed on circuits directly connected to the electrical distribution system.

*Example: measurements on household appliances and portable tools.*

## 1.3 PRECAUTIONS FOR USE ⚠

This device is compliant with safety standard IEC/EN 61010-2-032 or BS EN 61010-2-032, for voltages up to 600 V in CAT III or 300 V in CAT IV.

Failure to observe the safety instructions may result in electric shock, fire, explosion, and destruction of the instrument and of the installations.

- The operator and/or the responsible authority must carefully read and clearly understand the various precautions to be taken in use. Sound knowledge and a keen awareness of electrical hazards are essential when using this instrument.
- Use personal protection equipment (PPE) that meets or exceeds the environment in which the operator is working.
- If you use this instrument other than as specified, the protection it provides may be compromised, thereby endangering you.
- Do not use the instrument on networks of which the voltage or category exceeds those mentioned in this document.
- Do not use the instrument if it seems to be damaged, incomplete, or poorly closed.
- Before each use, check the condition of the insulation on the leads and housing. Any item of which the insulation is deteriorated (even partially) must be set aside for repair or scrapping.
- When handling the instrument, keep your fingers behind the guard.
- Do not expose the current probe to sprays of water.
- All troubleshooting and metrological checks must be done by competent, accredited personnel.
- Use **ONLY** a wall plug adapter rated ≤ 1 A.

## 1.4 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.

## 1.5 ORDERING INFORMATION

**AC/DC Current Probe Model SL306 (1.5 $A_{AC}$, 2 $A_{DC}$, 1 mV/mA (1 V/A) & 60 $A_{AC}$, 80 $A_{DC}$, 10 mV/A, Lead)..... Cat. #2153.08**

*Includes (1) 9 V (6LR61) alkaline battery and a user manual.*

### 1.5.1 Accessories

Adapter – Banana (Female) – BNC (Male) (XM-BB)
600 V CAT III (Model SL306 only) **.....Cat. #2118.46**

Cable – 6 ft. USB Type A - Type B micro (Replacement for Models L452, 1110, 1227, 1246, 1510, 1821, 1822, 1823) and use with wall adapter for MR415 to MR527 series, SL306, & SL361 **..... Cat. #2138.66**

Adapter – Replacement US Wall Plug to USB for Models L452, 1510, MH60 {Accessory for Models 1110,1227, 1246, 1821,1822, 1823, MR415 to MR527 series, SL306, & SL361} **..... Cat. #2153.78**

**Order Accessories and Replacement Parts Directly Online**
Check our Storefront at www.aemc.com/store for availability

# 2. PRODUCT FEATURES

## 2.1 DESCRIPTION

The AC/DC Current Probe Model SL306 is used to measure currents from 5 mA to 80 $A_{DC}$ or 60 $A_{AC}$ without breaking the circuits in which they flow.

It measures the waveform and amplitude of the current, in the form of a voltage.

Its shape allows it to access hard-to-reach places.

This probe can be used with many measuring instruments having banana inputs. It can be used with a multimeter, a wattmeter, a recorder, that is capable of measuring 1 mV of input.

It can be powered by a battery and at 5 $V_{DC}$ via the micro-USB connector.

The instrument features:

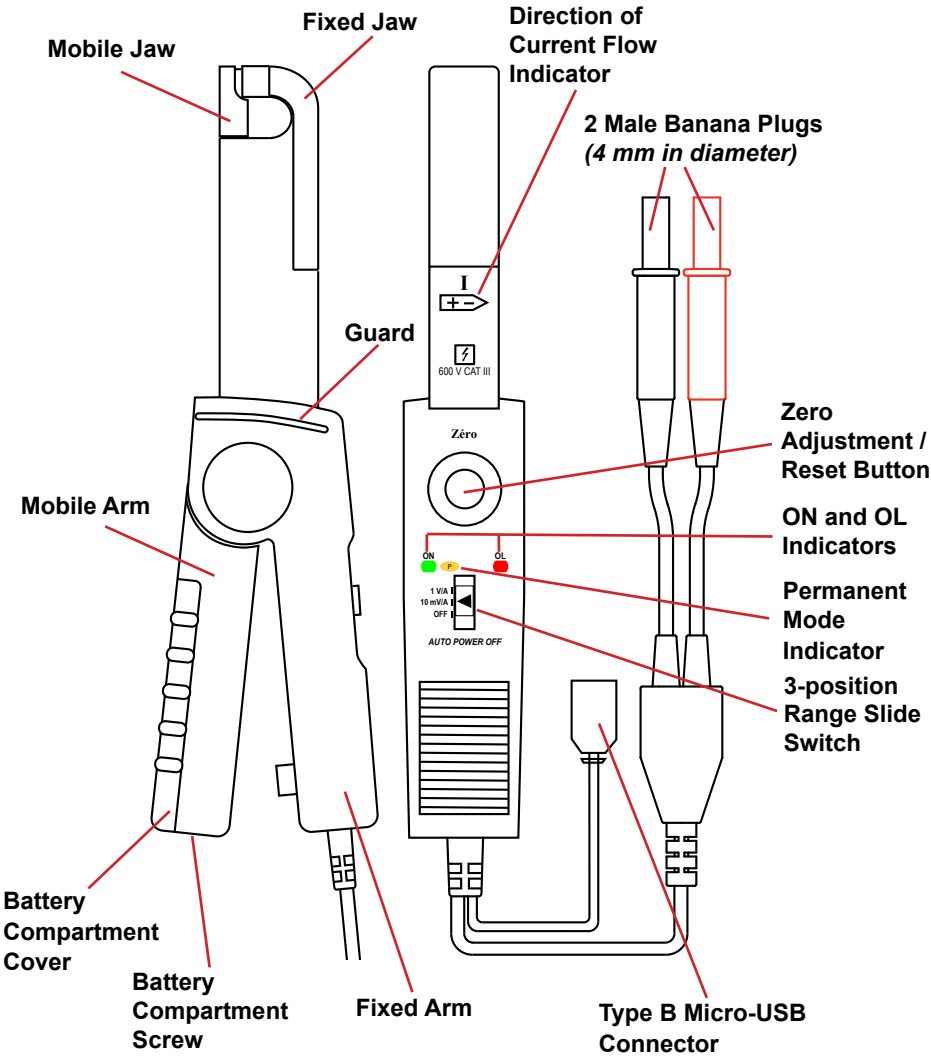
- a reset push button,
- a range overload indicator,
- a power supply indicator,
- automatic standby to prolong battery life.

## 2.2 COMPATIBILITY

The AC/DC Current Probe Model SL306 is compatible with any DMM, voltmeter, or other voltage-measuring instrument that has the following features:

- Range and resolution capable of displaying 1 mV of input.
- Voltmeter accuracy (uncertainty) of 0.75 % or better to take full advantage of the accuracy of the probe.
- Minimum input impedance of >10 kΩ.
- Jaw opening can accommodate up to a single 4/0 AWG (11.684 mm diameter) conductor.

## 2.3 FEATURES




**WARNING: Always keep hand behind the guard.**

# 3. OPERATION

## 3.1 TURNING INSTRUMENT ON

Switch the instrument **ON** by pushing the slide switch to the 1 V/A or the 10 mV/A setting.

The 1 V/A setting corresponds to the 2 A range.

The 10 mV/A setting corresponds to the 80 A range.

The ON indicator lights green. If it blinks, there remains less than 4 h of use. If it fails to light, you must replace the battery (see § 5.2), or plug into the USB power (optional) see § 3.6.

## 3.2 ZERO ADJUSTMENT

- Switch the probe on.
- Connect the probe to the measuring instrument. The phase is on the red lead.
- Make sure that the probe is not on a conductor and that its jaws are correctly closed.
- Place the probe in the position it will be in during the measurement.
- Press the zero adjustment button.
- The **OL** indicator lights for approximately three seconds to indicate that the zero adjustment is in progress in the two ranges.
- If the zero has been correctly adjusted, the **OL** indicator goes off. If it remains on, the zero could not be adjusted.

  In this case, check that the clamp is not on any conductor and that its jaws are correctly closed, then press the zero adjustment button again.

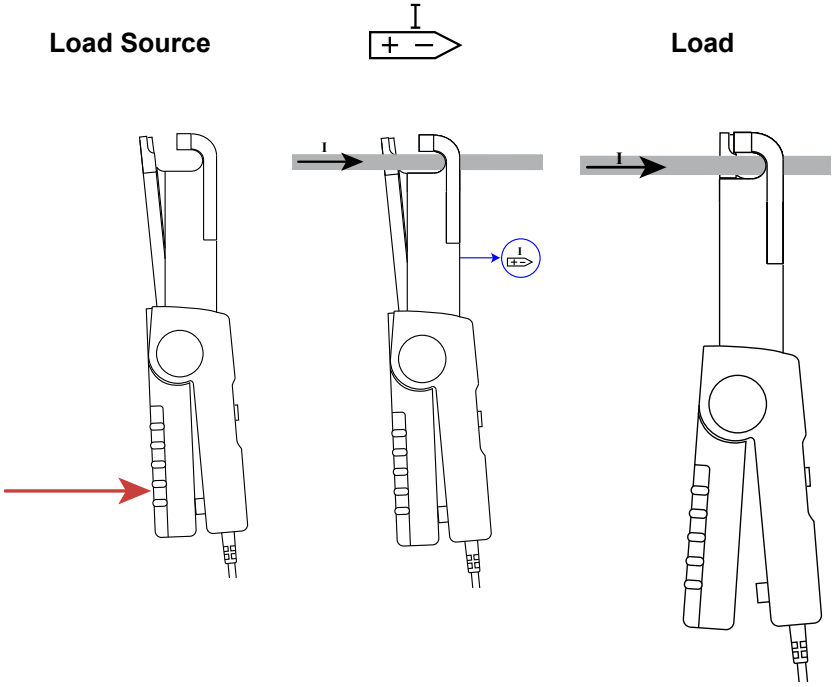
  Or switch the probe off and back on, and it is the last adjustment stored that will be used.

## 3.3 MEASUREMENT

**NOTE:** The zero must be adjusted before each meaasurement.

**WARNING: Always connect the probe to the instrument before clamping onto the circuit under test.**

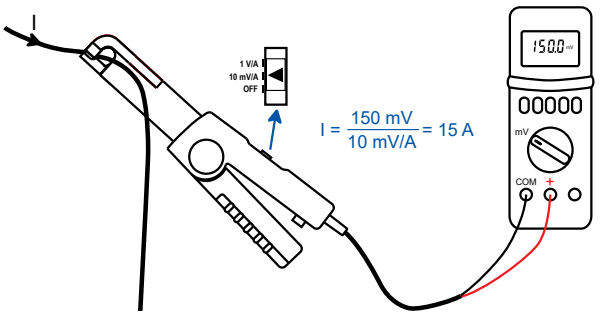
- Once the zero has been adjusted, press the mobile arm of the probe handle to open the jaws.
- Clamp the cable carrying the current to be measured.
- The arrow on the probe must point in the presumed direction of current flow.




- Release the mobile arm gently and make sure that the jaws are correctly closed.
- The value measured is displayed on the measuring instrument.

If the **OL** indicator lights, it means that the current is too strong to be measured. If you are in the 1 V/A range, switch to the 10 mV/A range.

■ Apply the conversion factor corresponding to the setting of the switch.




**Range 2 A** **1 V/A**

**Range 80 A** **10 mV/A**

**NOTE:** Remember to unclamp the probe from the conductor before disconnecting it from your meter or instrument.

## 3.4 AUTO OFF

At the end of 10 minutes of operation with no sign of the user's presence (a **press** on the zero adjustment button or an action on the switch), the probe switches to standby and the **ON** indicator goes off.

To wake up the probe, **press** the zero adjustment button or set the switch to a position other than **OFF**.

To disable auto off (operation in permanent mode P), **press** the zero adjustment button when starting up the instrument. The **ON** indicator blinks to indicate that the request has been taken into account, then lights steady orange when you release the zero adjustment button.

When the probe is switched off (switch set to **OFF**), the auto off function is re-activated.

## 3.5 INSTRUMENT INDICATORS

| ON Indicator | |
|---|---|
| | **Off:** Instrument Off |
| | **Lighted green:** Instrument On |
| | **Blinking green:** The battery will have to be replaced in less than 4 h. |
| | **Lighted orange:** Permanent operation P (auto off deactivated) |

| OL Indicator | |
|---|---|
| | **Off:** The measurement is correct. |
| | **Lighted red:** The measurement exceeds the range. |
| 3 s | **Lighted red for 3 seconds:** The zero adjustement is in progress. |

## 3.6 POWER ADAPTER (OPTIONAL)

For long-term measurements, you can connect the clamp to an external power source using the optional line power adapter. You can use any micro-USB adapter that supplies 5 $V_{DC}$ with a minimum 50 mA output or more.

When the instrument is powered via the micro-USB connector, automatic standby is disabled.

The insulation between the type B micro-USB connector and the measurement output is 600 V CAT III. This makes it possible to connect the clamp, without risk, to measuring instruments having inputs that are not insulated.

**WARNING: The type B micro-USB connector must not be in contact with conductors or uninsulated parts at dangerous voltage.**

# 4. SPECIFICATIONS

## 4.1 REFERENCE CONDITIONS

| Quantity of influence | Reference values |
|---|---|
| Temperature | 23 °C ± 5 °C |
| Relative Humidity | (20 to 75) % RH |
| Position of the Conductor | centered |
| Frequency of the Measured Signal | DC, (45 to 65) Hz sine wave |
| Powered | by battery: (6.5 to 9) V<br>external supply: 5 V ± 0.1 V |
| External Electric Field | zero |
| External DC Magnetic Field (earth's field) | < 40 A/m |
| External AC Magnetic Field | zero |
| Impedance of the Measuring Instrument | ≥ 1 MΩ and ≤ 100 pF |

**The intrinsic uncertainty** is the error specified for the reference conditions.

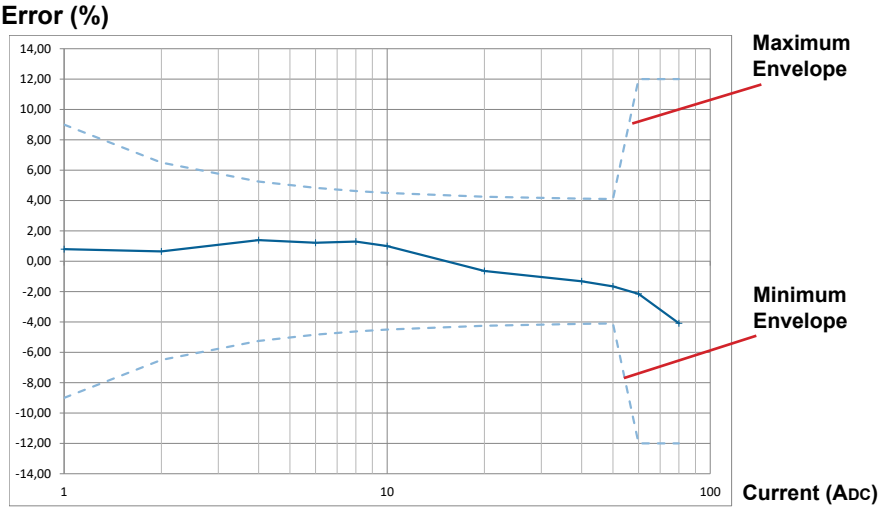
It is expressed as a percentage of the output signal (R) plus an offset in mV: ± (a % R + b).

## 4.2 ELECTRICAL SPECIFICATIONS

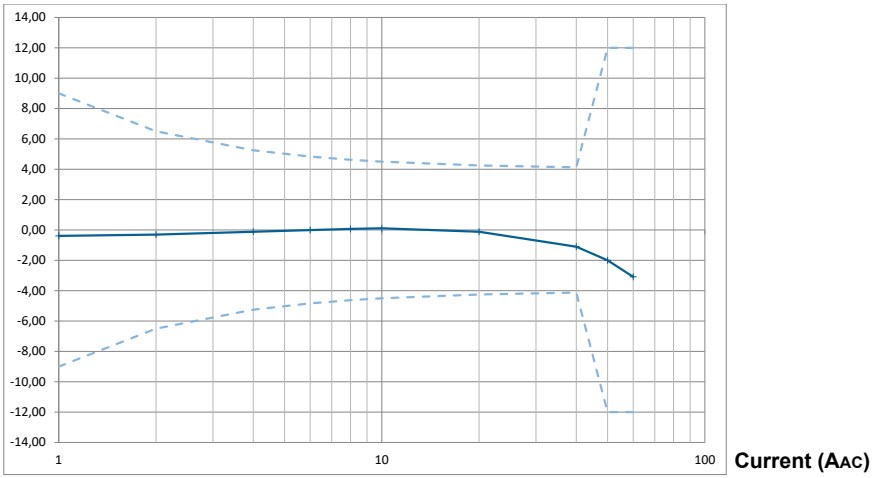
| Range | 1 V/A (2 A) | 10 mV/A (80 A) | |
|---|---|---|---|
| **Specified Measurement Range** | (0.005 to 2) $A_{DC}$<br>(0.005 to 1.5) $A_{AC}$ | (0.05 to 50) $A_{DC}$<br>(0.05 to 40) $A_{AC}$ | (50 to 80) $A_{DC}$<br>(40 to 60) $A_{AC}$ |
| **Intrinsic Uncertainty** | ≤ ± (2 % R + 5 mV) | ≤ ± (4 % R + 0.5 mV) | ≤ ± 12 % R |
| **Phase Shift (DC to 65 Hz)** | ≤ 1 ° | ≤ 1 ° | ≤ 1 ° |

## 4.2.1 Typical Curves

### Typical phase shift error curve for a DC current, 10 mV/A range




### Typical phase shift error curve for a 60 Hz AC current, 10 mV/A range




## 4.2.2 Noise

| Typical Noise Level at Output | DC | AC |
|---|---|---|
| 10 mV/A range | ±120 $\mu V_{DC}$ | 180 $\mu V_{RMS}$ |
| 1 V/A range | ±8 $mV_{DC}$ | 4 $mV_{RMS}$ |

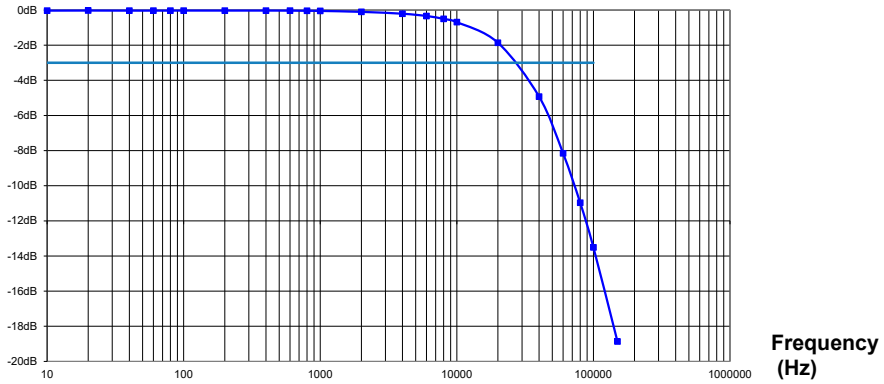
### 4.2.3 Zero Adjustment

Minimum zero adjustment range: ±1.5 $A_{DC}$ in steps of approximately 1.2 mA.

### 4.2.4 Frequency Response

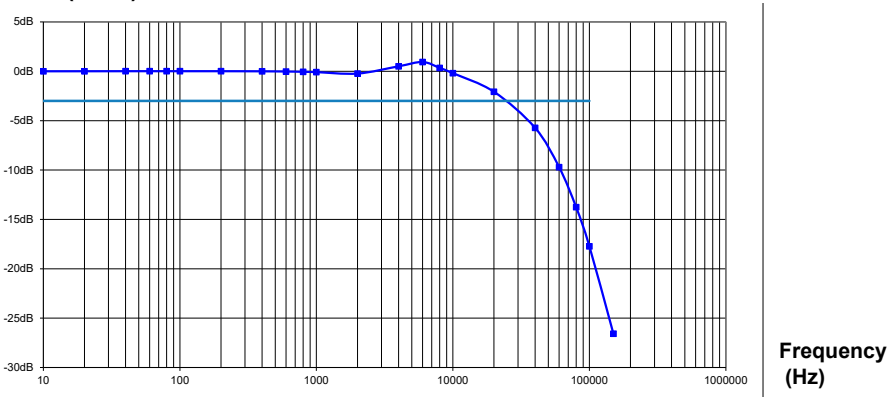
**Typical amplitude error curve as a function of frequency, I = 1 A, 10 mV/A range**

**Error (dB%)**



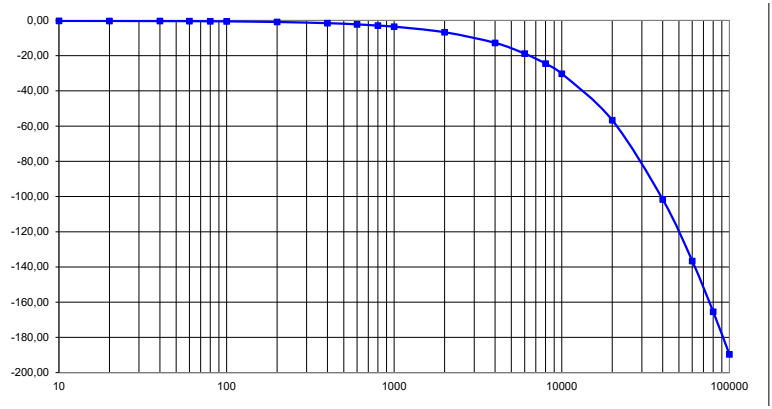

**Typical amplitude error curve as a function of frequency, I = 0.5 A, 1 V/A range**

**Error (dB%)**



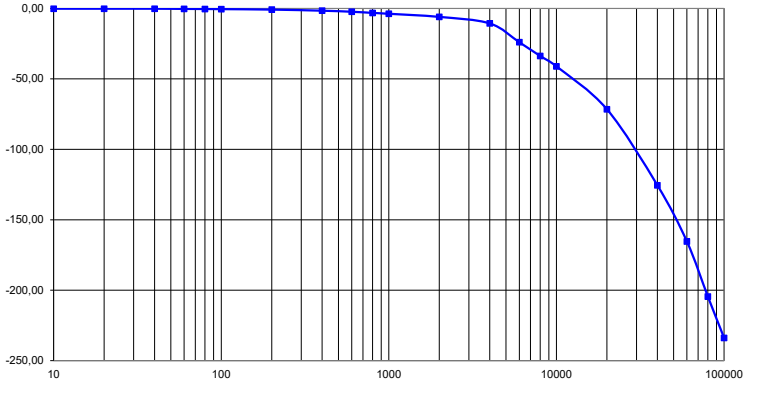
**Typical amplitude error curve as a function of frequency, I = 1 A, 10 mV/A range**

**Phase Shift (°)**




**Typical amplitude error curve as a function of frequency, I = 0.5 A, 1 V/A range**

**Phase Shift (°)**



### 4.2.5 Frequency Characteristics

| Range | 1 V/A | 10 mV/A |
|---|---|---|
| Bandwidth to 3 dB down | (DC to 100) kHz | |
| Rise time (10 to 90) % and fall time (90 to 10) % | 3 µs | |
| Response time to 10 % | 1.8 µs | |
| Insertion impedance at 10 kHz | 2 mΩ | |
| Insertion impedance at 50 kHz | 10 mΩ | |

## 4.3 VARIATIONS IN THE RANGE OF USE

| Quantity of Influence | Range of Influence | Error in % of Reading | |
|---|---|---|---|
| | | Typical | Maximum |
| **Temperature** | (-10 to + 50) °C | Drift of the zero ±10 mA/°C | |
| | | | Drift of the gain ±800 ppm/°C |
| **Relative Humidity** | (0 to 85) % RH | | < 0.5 % |
| **Frequency** | DC to 20 kHz | | see curves |
| **Position of the Conductor** | | | ±0.5 % |
| **Adjacent Conductor** | carrying a current of 10 A at 60 Hz | | ±4 mA/A |
| **Load** | RL=10 kΩ | -2.1 % | |
| **Common Mode AC** | voltage at 50 Hz | | ±1 mA/100 V |
| **Radiated Fields** | 10 V/m 80 MHz to 1 GHz | | ±4 A |
| **Remanence** | for 80 $A_{DC}$ | ±370 $mA_{DC}$ | |

## 4.4 POWER SOURCES

The instrument is powered by a 9 V battery (type 6LR61 or NEDA 1604A).

The typical battery life is 80 h with an alkaline battery.

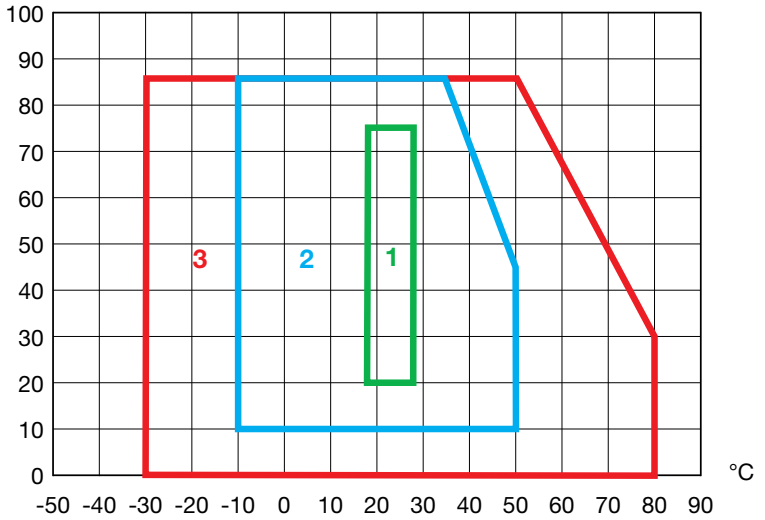
The instrument can be powered by an external supply (5 $V_{DC}$, 50 mA) via the type B micro-USB connector.

## 4.5 ENVIRONMENTAL CONDITIONS

The device must be used in the following conditions:

| | | |
|---|---|---|
| **1 =** | **Range of reference:** | (18 to 28)°C (64.4 to 82.4) °F from (20 to 75) % RH |
| **2 =** | **Operating range:** | (-10 to 50) °C (14 to 122) °F from (10 to 45) % RH<br>(-10 to 35) °C (14 to 95) °F from (10 to 85) % RH |
| **3 =** | **Storage range:** | (-30 to 80) °C (-22 to 176) °F from (0 to 30) % RH<br>(-30 to 50) °C (-22 to 122) °F from (0 to 85) % RH |

**% RH**




Indoor use.

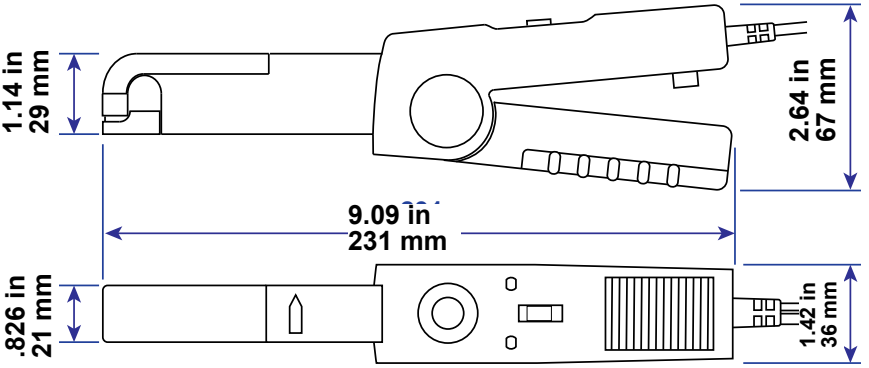
**Pollution degree:** 2

**Altitude:** < 6562 ft, < 2000 m

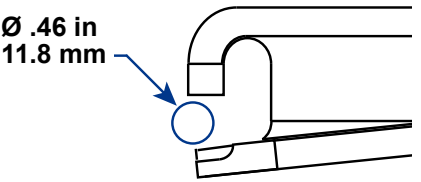
**Transport altitude:** ≤ 39,370 ft, ≤ 12,000 m

## 4.6 MECHANICAL SPECIFICATIONS

Dimensions (L x W x H): (9.09 x 1.42 x 2.64) in (231 x 36 x 67) mm
Weight: approximately 11.6 oz (330 g) with battery
Measurement Lead Length: 5 ft (1.5 m)
USB Cord Length: 5.9 in (15 cm)




Clamping capacity:
.46 in (11.8 mm) in diameter




Protection by the housing

- IP 20 per IEC 60529
- Resistance of the jaws per IEC/EN 61010-2-032 or BS EN 61010-2-032

## 4.7 CONFORMITY TO INTERNATIONAL STANDARDS

UL approval pending.

The instrument is compliant with IEC/EN 61010-2-032 or BS EN 61010-2-032, 600 V in CAT III.

Double insulation or reinforced insulation between the primary or secondary and the outer case of the handle per EN 61010-2-032 ⧈.

Type of current sensor per IEC/EN 61010-2-032 or BS EN 61010-2-032:

Type A ϟ.

## 4.8 ELECTROMAGNETIC COMPATIBILITY

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

# 5. MAINTENANCE

**WARNING: 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.**

- To ensure optimum performance, it is important to keep the probe jaw mating surfaces clean at all times. Failure to do so may result in error in readings.
- For maintenance use only specified factory 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 allow water or other foreign substances into the case.
- Disconnect the unit from all circuits and test cables before opening the case.

## 5.1 CLEANING

- Disconnect the instrument completely and turn the rotary switch to **OFF**. Also make sure that no cable is clamped.
- Use a damp soft cloth and dry rapidly with a dry cloth or forced air.
- Do not use alcohol, solvents or hydrocarbons.
- The air gaps of the clamp must always be kept clean.
- Do no leave the probe in very damp places, or exposed to splashes of any liquid substances.

## 5.2 REPLACING THE BATTERY

**WARNING: Risk of electric shock. Disconnect all input(s) from the unit or remove the probe from any conductor before opening the battery cover to change the battery.**

If the green battery indication LED does not light up when the probe is turned on, the battery will need to be replaced.

Do not replace the battery while probe is in use.

Disconnect the current probe from the circuit.

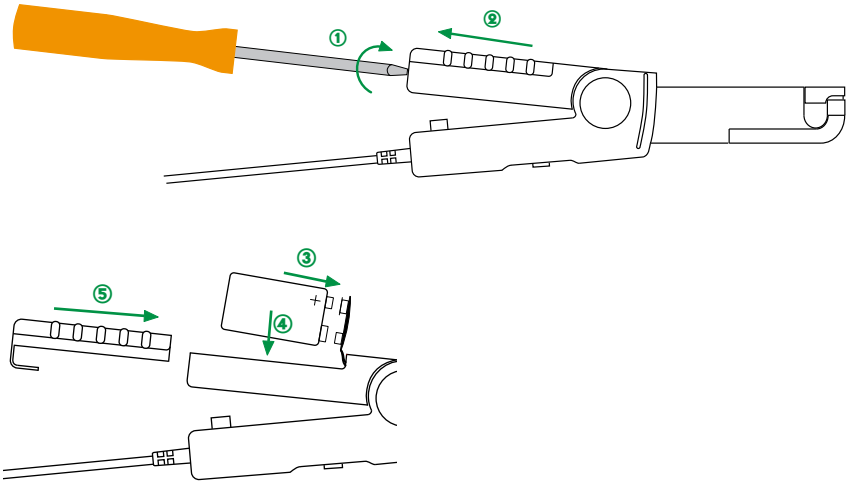
Turn the current probe **OFF**.

To replace the battery:

1. Use a screwdriver to remove the screw securing the battery compartment cover.
2. Slide the battery compartment cover away and off from the current probe.
3. Connect the battery to the snap-on connector; take care with the polarity.

**NOTE:** You can use a rechargeable Ni-MH battery, but the life will be shorter. The instrument does not charge rechargeable batteries.

4. Place the battery in its compartment.
5. Slide the battery compartment cover back in place; make sure that it is completely and correctly closed.
6. Screw the battery compartment cover screw back in place.



## 5.3 REPAIR AND CALIBRATION

To ensure that your instrument meets factory specifications, we recommend that the instrument be sent 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#). Send an email to repair@aemc.com requesting a CSA#, you will be provided a CSA Form and other required paperwork along with the next steps to complete the request. Then return the instrument along with the signed CSA Form. 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)
E-mail: repair@aemc.com

**(Or contact your authorized distributor.)**

Contact us for the costs for repair, standard calibration, and calibration traceable to N.I.S.T.

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

## 5.4 TECHNICAL ASSISTANCE

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

Chauvin Arnoux®, Inc. d.b.a. AEMC® Instruments
Phone: (800) 343-1391 (Ext. 351)
E-mail: techsupport@aemc.com
www.aemc.com

## 5.5 LIMITED WARRANTY

The instrument is warrantied 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.**

**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 repair or replace the faulty material at our discretion.

**REGISTER ONLINE AT: www.aemc.com/warranty.html**

### 5.5.1 Warranty Repairs

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

First, send an email to repair@aemc.com requesting a Customer Service Authorization Number (CSA#) from our Service Department. You will be provided a CSA Form and other required paperwork along with the next steps to complete the request. 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)
E-mail: repair@aemc.com

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

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

**NOTES:**

**NOTES:**

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