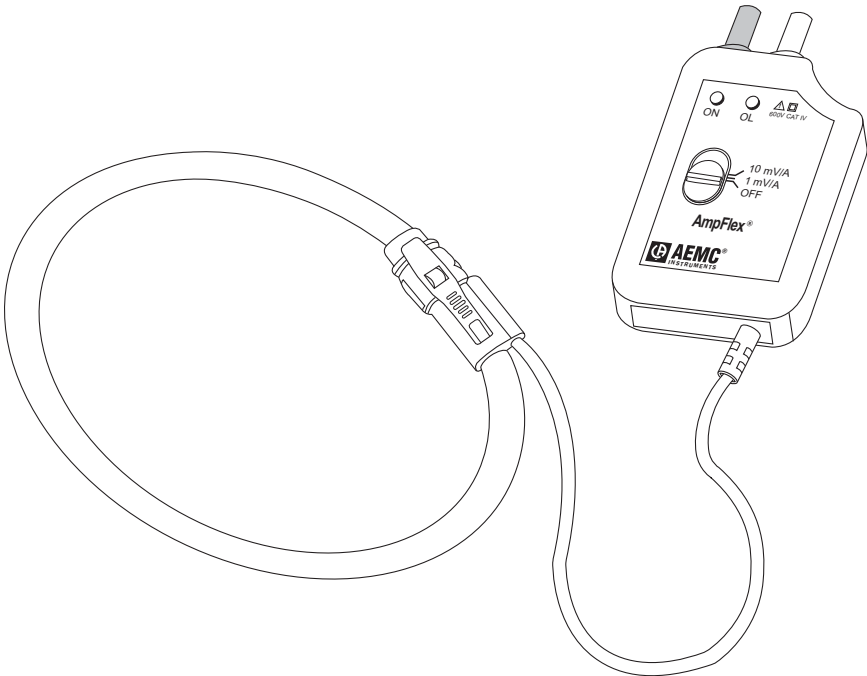


AmpFlex[®]

Flexible AC Current Probes

USER MANUAL



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**.

Serial #: _____

Catalog #: _____

Model #: AmpFlex® AC Current Probe

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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 **Warning** 

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

- Read the instruction manual completely and follow all the safety information before attempting to use or service this instrument.
- Wear protective clothing and gloves as required.
- Use caution on any circuit: potentially high voltages and currents may be present and may pose a shock hazard.
- Read the safety specifications section prior to using the current probe. Never exceed the max voltage ratings given.
- Safety is the responsibility of the operator. The AmpFlex® must be used only by qualified personnel using applicable safety precautions.
- ALWAYS de-energize the circuit before wrapping the AmpFlex® around bare conductors, bus bars, or near live parts. Do not wrap on live conductors.
- ALWAYS connect the electronic module to the display device before wrapping the AmpFlex® around the sample being tested.
- ALWAYS inspect the module, sensor, sensor cable, and output terminals prior to use. Replace any defective parts immediately. Use only factory parts.
- NEVER use the AmpFlex® on electrical conductors rated above 600V CAT IV; 1000V CAT III.

International Electrical Symbols



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



This symbol signifies CAUTION! and requests that the user refer to the user manual before using the instrument.



This symbol refers to a type B current sensor. Do not apply around or remove from HAZARDOUS LIVE conductors without additional protective means (de-energizing the circuit or wearing protective clothing suitable for high voltage work).

Definition of Measurement Categories

- CAT I:** For measurements on circuits not directly connected to the AC supply wall outlet such as protected secondaries, signal level, and limited energy circuits.
- CAT II:** For measurements performed on circuits directly connected to the electrical distribution system. Examples are measurements on household appliances or portable tools.
- 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 IV:** For measurements performed at the primary electrical supply (<1000V) such as on primary overcurrent protection devices, ripple control units, or meters

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.

Packaging

Your AmpFlex® consists of the following items:

- Flexible probe with electronic module
- User manual
- 9V battery

Description

The AmpFlex® is a flexible AC current transformer composed of a flexible sensor and an electronic module. The flexible sensor permits measurements on conductors where standard clamp-on probes could not be used. In particular, it can be installed in tight spaces, around breaker panels, around cable bundles, around wide or large bus bars, or even wrapped around irregular shapes. The Shape Memory feature enables the user to “pre-shape” the sensor before inserting it between or around conductors. This feature facilitates closing, enhances user safety, and alleviates the drooping effect typically associated with flexible sensors.

The AmpFlex® is lightweight and does not use magnetic cores like standard transformers. The transformation principle is based on an air core. It presents virtually no load to the system under test, has a low phase shift and excellent frequency response, and cannot be damaged by overloads.

The sensor assembly is waterproof and insulated for 600V CAT IV; 1000V CAT III. The AmpFlex® meets EN 61010-1, is CE marked, and is designed with materials and components to meet international agency approvals.

The AmpFlex® has an mV output proportional to the current measured for direct readings on DMMs, data loggers, oscilloscopes, and power or harmonic meters. TRMS measurements are taken when connected to a TRMS meter. The AmpFlex® is insensitive to DC currents and only the AC component of the measured signal is measured.

The length of the flexible sensor can be selected in lengths of 24", 36", and 48" in length. Consult the factory for custom lengths, ranges and/or features.

AmpFlex®

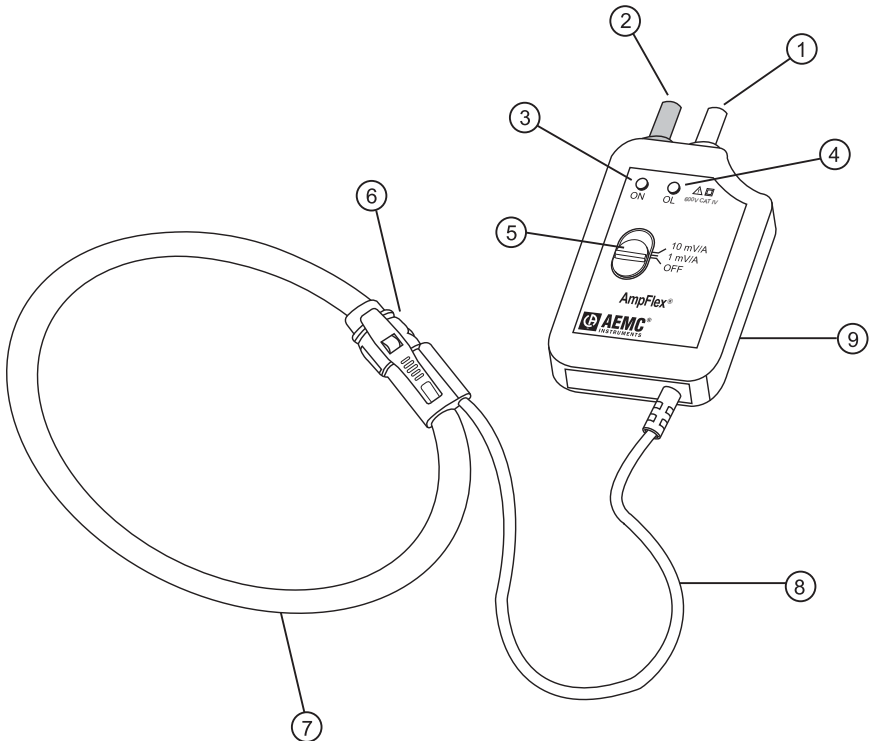


Figure 1

- | | |
|-----------------------------------|--|
| 1. Positive: Red Banana Plug (+) | 7. Flexible Sensor (Diameter 0.5", 12.5mm) |
| 2. Common: Black Banana Plug (-) | 8. Lead from Sensor to Module (6.5 ft, 2m) |
| 3. Power ON Indicator (Green LED) | 9. Electronic Module - Descriptive Label on Back Case (range, model, etc.) |
| 4. Overload Indicator (Red LED) | |
| 5. Range Selection Switch | |
| 6. AmpFlex® Connector/Latch | |

Features

- Models to measure from 0.5Arms to 30,000Arms
- Accuracy 1% of Reading
- TRMS measurements when connected to a TRMS instrument
- No core saturation or damage if overloaded
- Overrange LED for measurement circuitry
- 600V CAT IV; 1000V CAT III; EN 61010; CE Mark
- Waterproof sensor
- 9V battery for typical 150 hour continuous operation
- Shape Memory for custom pre-shaping of sensor before use (no drooping)
- Very high frequency response
- Low phase shift for power
- Insensitive to DC, measures only AC component on DC + AC signals
- Excellent linearity
- Lightweight

Accessories

Banana (Female) / BNC (Male) Adapter **Cat. # 2118.46**

For connection of the AmpFlex® to SLII Models L101, L102, L562, BNC terminals on scopes and other displaying instruments.

Standard Models

| Model | Measurement Range | Output | Sensor Length | Max Conductor Size | Cat. # |
|----------------|-------------------|-------------|---------------|--------------------|----------|
| 300-24-2-10 | 30/300A | 100/10mV/A | 24" (610mm) | 8" (190mm) | 2112.88 |
| 1000-24-1-1 | 1000A | 1mV/A | 24" (610mm) | 8" (190mm) | 2112.39 |
| 1000-24-2-1 | 100/1000A | 10/1mV/A | 24" (610mm) | 8" (190mm) | 2112.98 |
| 1000-36-2-1 | 100/1000A | 10/1mV/A | 36" (910mm) | 11" (290mm) | 2113.00 |
| 3000-24-2-0.3 | 300/3000A | 3.3/0.3mV/A | 24" (610mm) | 8" (190mm) | 2114.87* |
| 3000-24-1-1 | 3000A | 1mV/A | 24" (610mm) | 8" (190mm) | 2112.46 |
| 3000-36-1-1 | 3000A | 1mV/A | 36" (910mm) | 11" (290mm) | 2112.48 |
| 3000-24-2-1 | 300/3000A | 10/1mV/A | 24" (610mm) | 8" (190mm) | 2113.05 |
| 3000-36-2-1 | 300/3000A | 10/1mV/A | 36" (910mm) | 11" (290mm) | 2112.00 |
| 3000-48-2-1 | 300/3000A | 10/1mV/A | 48" (1220mm) | 15" (390mm) | 2112.01 |
| 6000-36-2-0.1 | 600/6000A | 1/0.1mV/A | 36" (910mm) | 11" (290mm) | 2113.21 |
| 30000-24-2-0.1 | 3000/30,000A | 1/0.1mV/A | 24" (610mm) | 8" (190mm) | 2113.33 |

*This model (Cat. #2114.87) is recommended to be used with our Simple Logger® II Models L101, L102 & L562.

All of our AmpFlex® models are designed to be used with recorders or power analyzers with a voltage AC input. A scale factor may need to be entered into the recorder to display the exact value.

Custom lengths and ranges are available. Contact us: sales@aemc.com

Specifications

| Model | 300A | 30/300A | 1000A | 100/1000A |
|--------------------------|------------|-------------------|------------|-----------------|
| Measurement Range | 5 to 300A | 5 to 300A | 5 to 1000A | 5 to 1000A |
| Accuracy | ±1% +200mA | ±1% +200mA | ±1% +200mA | ±1% +200mA |
| Output Signal | 10mV/A | 100mV/A or 10mV/A | 1mV/A | 10mV/A or 1mV/A |
| Crest Factor (mid-range) | 3.0 | 3.0 | 9.0 | 9.0 |
| Phase Shift @ 50/60Hz | 1.5° | 1.3° | 0.7° | 0.7° |
| Residual Noise | 200mA | 200mA | 200mA | 200mA |

| Model # | 3000A | 300/3000A | 3000/30000A | 600/6000A |
|--------------------------|------------|-----------------|------------------|------------------|
| Measurement Range | 5 to 3000A | 5 to 3000A | 5-30000A | 5 to 6000A |
| Accuracy | ±1% +200mA | ±1% +200mA | ±1% +1A | ±1% +500mA |
| Output Signal | 1mV/A | 10mV/A or 1mV/A | 1mV/A or 0.1mV/A | 1mV/A or 0.1mV/A |
| Crest Factor (mid-range) | 3.0 | 3.0 | 3.0 | > 10 |
| Phase Shift @ 50/60Hz | 0.7° | 0.7° | 0.5° | 0.5° |
| Residual Noise | 200mA | 200mA | 1A | 500mA |

*Reference Conditions: 25°C ± 5°K, 20 to 75% RH, 1 minute warm-up, battery at 9V ± 0.5V, conductor center, external DC magnetic field < 40A/m, no external AC magnetic field, no external electrical field, 10 to 100Hz, sine wave. See accuracy curves for low currents.

Common Specifications

ELECTRICAL

Accuracy: 1% of reading \pm residual noise

Frequency Range: 10 - 20,000Hz with current derating

Signal Output: 4.5V max

Working Voltage: 600V CAT IV; 1000V CAT III

Frequency Influence:

See Accuracy vs. Frequency curves on pages 18 and 19

Frequency Limitation:

See current derating curves (note no limitation on 300A Range) page 19

Influence of adjacent conductor in contact with sensor and with AC signal: 0.2% typical, 2% maximum

Influence of conductor position in sensor: 0.5% typical, 4% max

Influence of shape of sensor: Oblong shape: 0.2% typical, 1% max

Common Mode Rejection: 100dB typical, 80dB min

ENVIRONMENTAL SPECIFICATIONS

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

Storage Temperature Range: -40° to 158°F (-40° to +70°C)

Influence of Temperature:

Sensor: -14° to 194°F (-10° to 90°C); 0.15% per 18°F (10°C) typical, 0.5% per 18°F 10°C max

Module: -14° to 131°F (-10° to 55°C); 0.15% per 18°F (10°C) typical, 0.5% per 18°F (10°C) max

Influence of Relative Humidity:

10 to 90% RH: 0.2% typical, 0.5% maximum

Operating Relative Humidity:

50° to 86°F (10° to 30°C); 85° \pm 5% RH (without condensation)

104° to 122°F (40° to 50°C); 45° \pm 5% RH (without condensation)

Altitude:

Operating: 0 to 2000m, working voltage derating above

Non-operating: 0 to 12,000m

MECHANICAL SPECIFICATIONS

Module Output: Two 4 mm safety banana jacks
Standard 3/4" (19mm) spacing

Battery: 9V Alkaline (NEDA 1604A, IEC 6LR61) recommended

Battery Life: Useable from 9V to 7V, 150 hours typical (continuous use)

Low Battery: Power ON indicator (green LED) when battery voltage $\geq 7V$, LED blinks when battery voltage is low

Overload Indication: Red LED ON indicates the selected range is overloaded. Module output may not reflect the actual measurement

Dimensions (sensor):

24", 36", 48" & 60" nominal ($\pm 1"$), other lengths optional

Dimensions (Electronic Module): 4.9 x 2.5 x 1.1" (124 x 64 x 28mm)

Weight:

AmpFlex® 48" with battery: 0.95 lb

AmpFlex® 60" with battery: 1.13 lb

AmpFlex® 24" with battery: 0.74 lb

AmpFlex® 36" with battery: 0.89 lb

Connection Cable Length (sensor to module): 6.5 ft (2m)

Colors: Red sensor with dark gray connector and module, black connection cable (sensor to module)

Drop Test: Per IEC 68-2-32

Vibration: Per IEC 68-2-6

Mechanical Shock: Per IEC 68-2-27

Weatherproofing: Module: IP40 (EN 60529)

Sensor: IP 45 (EN60529)

SENSOR SPECIFICATIONS:

Weight: 10.8oz (302.4g)

Bend Radius: 0.75" (19mm) minimum

Bending Life: >10000 without performance deterioration

Waterproofing: IP 65

Resistance to Chemicals: Resistant to oils and aliphatic hydrocarbons

Diameter: 12mm ± 0.5mm

Outer Sheath Material: Polyurethane, UL94V0

Dielectric Strength: 7500V

Latch Spring Life: >10,000 maneuvers

MATERIAL SPECIFICATIONS

Module:

UL 94V2, Color dark gray, Polycarbonate

Sensor Latch:

Material: Lexan 500R, UL94V0

Cable Assembly to Sensor:

UL 94V0, 1000V rating

SAFETY SPECIFICATIONS



Electrical:

Double insulation or reinforced insulation between primary or secondary and outer case per EN 61010

- 600V CAT IV; 1000V CAT III

Pollution Degree 2

- 7.50kV, 50/60Hz, dielectric between secondary and the outer case

Electromagnetic Compatibility

- Immunity: meets BF EN 61326-1 Industrial environment category
 - Electrostatic discharge (meets EN 61000-4-2)
 - 8kV in air – level 3 – class B
 - 4kV on contact – level 2 – class B
 - 10V/m radiated electromagnetic field (in line with EN 61000-4-3) – class B
 - Rapid transients (in line with EN 61000-4-4)
 - 1kV – level 2 – class B
 - Electric shocks (in line with EN 61000-4-5)
 - 6kV – class B

Instrument Compatibility

The AmpFlex® is compatible with any multimeter, AC voltmeter, or other voltage measuring instrument with an input impedance greater than 1MΩ. To achieve the best overall accuracy, use the AmpFlex® with a AC voltmeter having an accuracy of 0.75% or better.

Operation

Please make sure that you have already read and fully understand the WARNING section on page 2.

Making Measurements with the AmpFlex®:

- Connect the electronic module to the AC Volt range of your DMM or measuring instrument. Select the appropriate module output voltage range. If the current magnitude is unknown, and if AmpFlex® has two ranges, select the lowest mV/A output setting.
- Wrap the flexible core around the conductor to be tested. If possible within range, select the higher mV/A AmpFlex® output range to obtain the best resolution. Do not exceed specified current range for the output. Do not use on selected range if overload LED goes on.
- Read the displayed value on the DMM and divide it by the range selected (i.e. if reading = 2.59V with the 10mV/A output range, the current flowing through the probe is $2590\text{mV} \div 10 = 259\text{A}$).
- For best accuracy, carefully center the conductor inside the flexible core, and avoid if possible, the proximity of other conductors which may create noise and interference (particularly near the latch).
- True RMS measurements are obtained when the AmpFlex® is connected to a True RMS meter. Note that the DC component is not measured.

Tips for Making Precise Measurements:

- When using the AmpFlex® with a meter, it is important to select the range that provides the best resolution. Failure to do this may result in measurement errors.
- For best results, select the highest AmpFlex® output signal possible and the most sensitive meter range for this output.
- Make sure the DMM or measuring instrument can accurately measure mVAC. Certain inexpensive DMM have poor resolution and accuracy when measuring low mV AC.
- For best accuracy, center the AmpFlex® around the conductor to be measured. (See figure 2).

Tips for Making Precise Measurements (continued):

- To increase the sensitivity or measure on low currents, the AmpFlex® may be wrapped several times around the conductor. **Remember to divide your reading by the number of turns for the actual measurement (see Figure 4).**
- The overall measurement accuracy is the sum of the AmpFlex® accuracy and the displaying instrument accuracy.

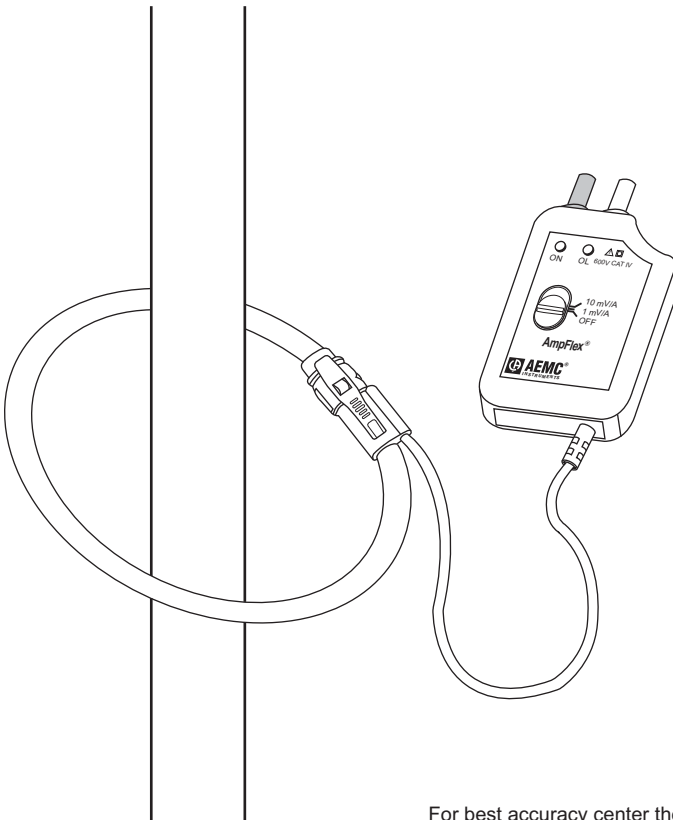


Figure 2

Tips for Making Precise Measurements (continued):

The AmpFlex® may be doubled around the conductor to be measured to double the output. (See Figures 3 and 4 to show the different values on a DMM while measuring 250AAC.)

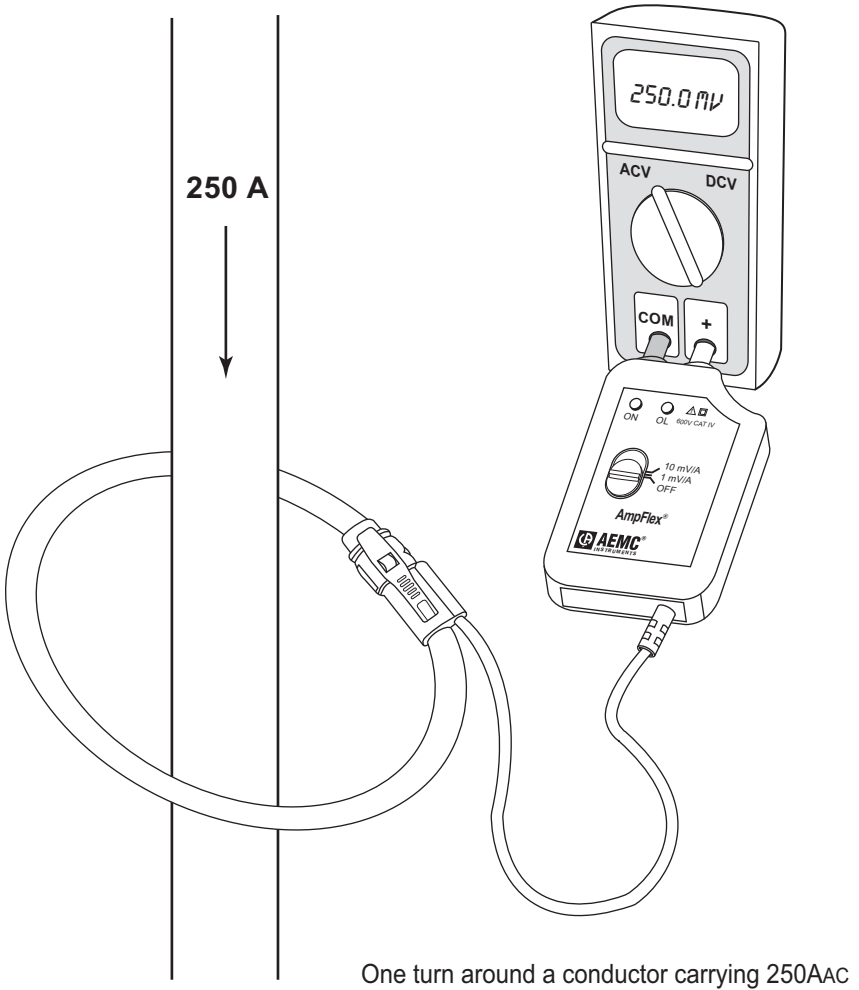
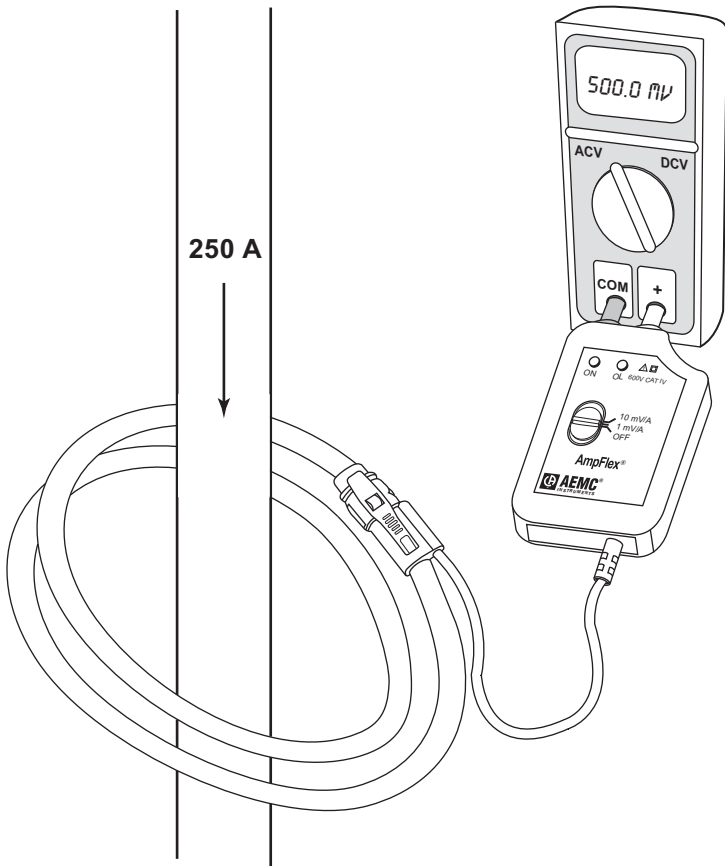


Figure 3

Tips for Making Precise Measurements (continued):

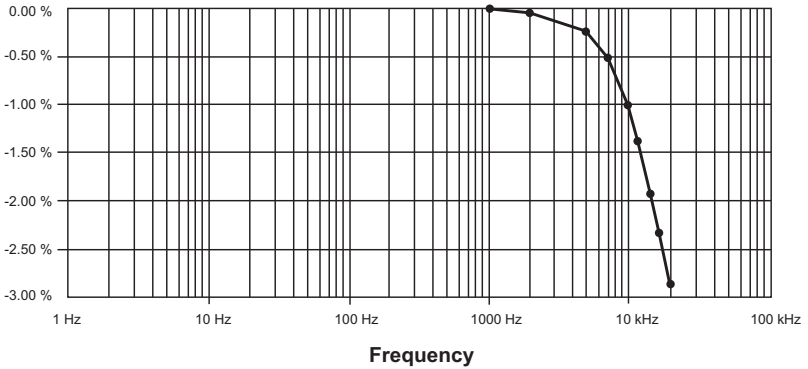


Double the turns to double the output
in low current applications or for higher sensitivity

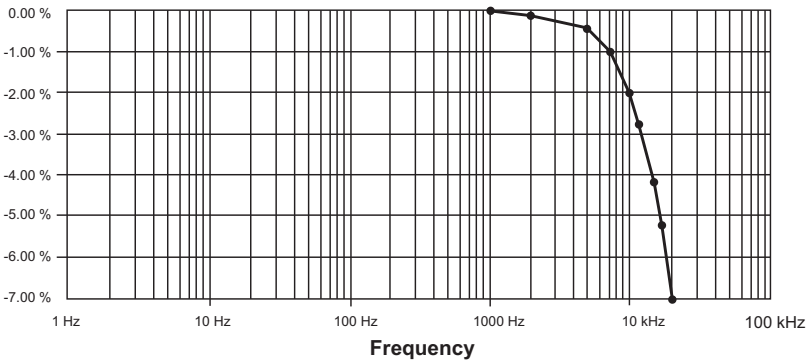
Figure 4

Typical Response Curves:

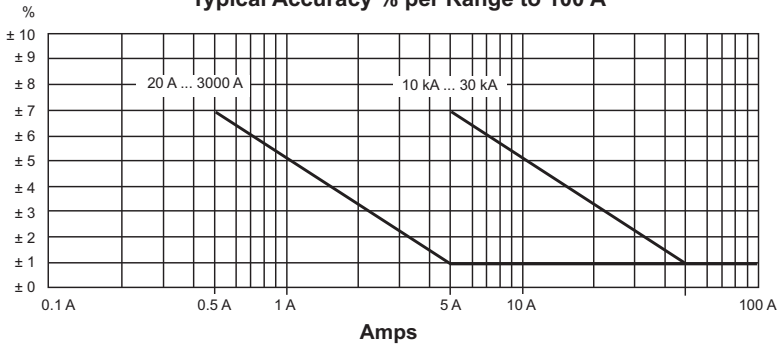
Typical Accuracy % vs. Frequency @ 100 A, 1 mV/A Output



Typical Accuracy % vs. Frequency @ 100 A, 10 mV/A

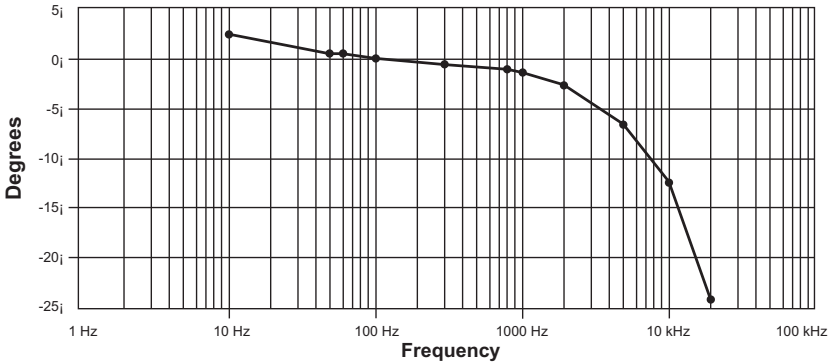


Typical Accuracy % per Range to 100 A

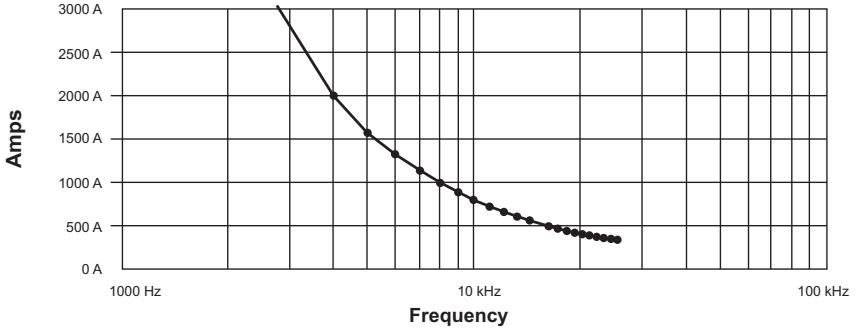


Typical Response Curves (cont.):

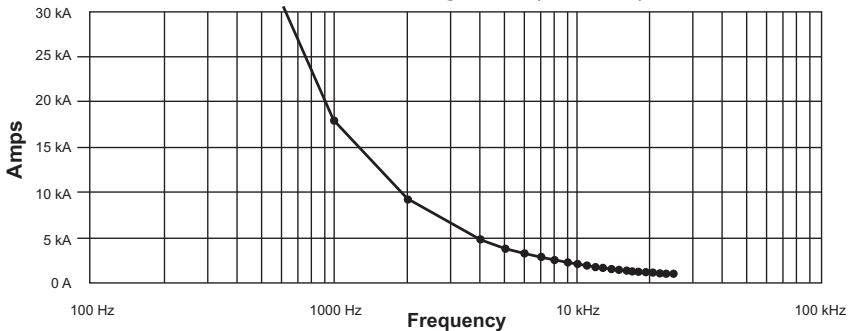
Typical Phase Shift vs. Frequency @ 200 A, 1 mV/A Output



Current Derating Curve (I < 3000 A)



Current Derating Curve (I > 3000 A)



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.
- Do not perform any service while the AmpFlex® is on any circuit.
- To avoid electrical shock and/or damage to the instrument, do not get water or other foreign agents into the electronic module.
- Also see warning on page 2.

Battery Replacement

- If the power ON indicator (green LED) blinks or does not light up, replace the battery.
- Remove the AmpFlex® from any circuit before replacing the battery.
- To replace the battery, open rear case, replace battery and reassemble. The green LED should go on when the module is turned on.

Cleaning

- It is important to keep the probe sensor latch mating surfaces clean and prevent foreign bodies from hampering the closing. The sensor may be gently cleaned with a soft cloth, soap and water. Dry immediately after cleaning. Avoid water penetration into the electronic module.
- Make sure the sensor, electronic module, and all leads are dry before any further use.

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).

Ship 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

(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, 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 AmpFlex® Probe is warranted to the owner for a period of 1 year 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 one-year 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: You must obtain a CSA# before returning any instrument.



Chauvin Arnoux®, Inc. d.b.a AEMC® Instruments
15 Faraday Drive • Dover, NH 03820, USA
www.aemc.com