

User Manual
ENGLISH



AmpFlex[®] Flexible AC Current Probe



CURRENT MEASUREMENT PROBES

Measure Up
WITH AEMC INSTRUMENTS



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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.

Serial #:

Catalog #: _____

Model #: _____


Please fill in the appropriate date as indicated:

Date Received:

Date Calibration Due: _____



TABLE OF CONTENTS








1. INTRODUCTION	5
1.1 PRECAUTIONS FOR USE 	6
1.2 RECEIVING YOUR SHIPMENT.....	6
1.3 PACKAGING.....	6
2. PRODUCT FEATURES	7
2.1 DESCRIPTION	7
2.2 AMPFLEX®.....	8
2.3 FEATURES.....	9
2.4 ACCESSORIES.....	9
2.5 STANDARD MODELS	10
3. OPERATION	11
3.1 MAKING MEASUREMENTS WITH THE AMPFLEX®	11
3.2 TIPS FOR MAKING PRECISE MEASUREMENTS	12
3.3 TYPICAL RESPONSE CURVES	15
4. SPECIFICATIONS	17
4.1 COMMON SPECIFICATION.....	18
4.1.1 Electrical.....	18
4.1.2 Environmental Specifications	18
4.1.3 Mechanical Specifications	19
4.1.4 Sensor Specifications	19
4.1.5 Material Specifications.....	20
4.1.6 Safety Specifications	20
4.2 INSTRUMENT COMPATIBILITY	20
5. MAINTENANCE	21
5.1 BATTERY REPLACEMENT.....	21
5.2 CLEANING	21
5.3 REPAIR AND CALIBRATION	22
5.4 TECHNICAL ASSISTANCE	22
5.5 LIMITED WARRANTY	23
5.5.1 Warranty Repairs.....	23

1. INTRODUCTION

Thank you for purchasing an AEMC® Instruments AmpFlex® Flexible AC Current Probe.

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.

Symbols and Definitions

	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
	Refers to a type B current sensor. Application or withdrawal not authorized on conductors carrying dangerous voltages. Type B current sensor as per IEC 61010-2-032
	Indicates Important information to acknowledge
	This product complies with the Low Voltage & Electromagnetic Compatibility European 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 of Hazardous Substances.
	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

Definition of Measurement Categories (CAT)

- 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.

1.1 PRECAUTIONS FOR USE

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 600 V CAT IV; 1000 V CAT III.

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. 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.

1.3 PACKAGING

Your AmpFlex® shipment consists of the following items:

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

2. PRODUCT FEATURES

2.1 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, has excellent frequency response, and cannot be damaged by overloads.

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

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 in, 36 in, and 48 in lengths. Consult the factory for custom lengths, ranges and/or features.

2.2 AMPFLEX®

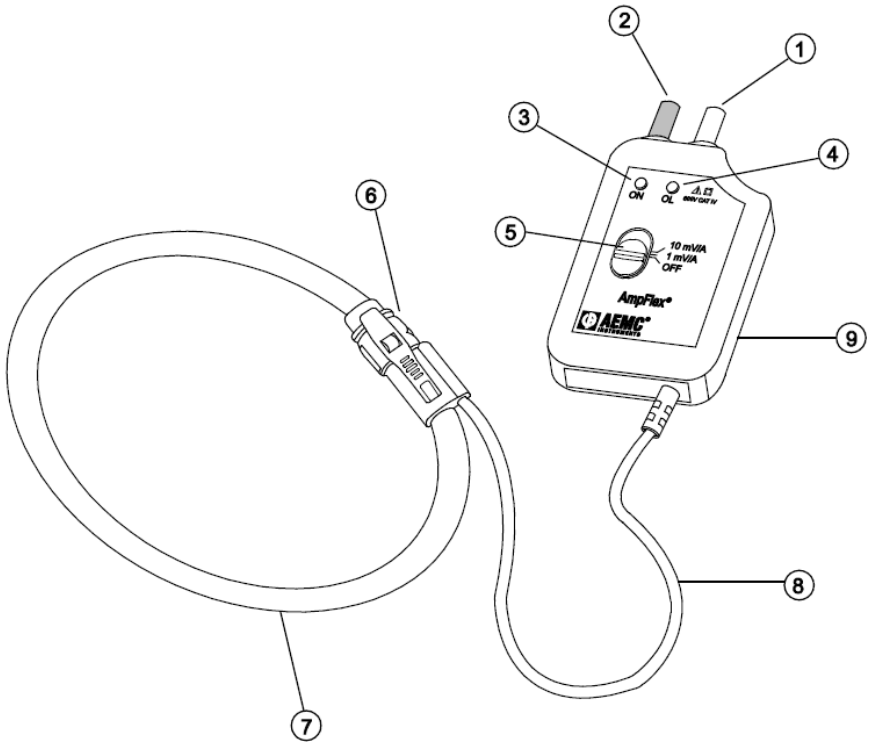


Figure 1

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

2.3 FEATURES

- Models to measure from 0.5 ARMS to 30,000 ARMS.
- Accuracy: 1 % of reading.
- TRMS measurements when connected to a TRMS instrument.
- No core saturation or damage if overloaded.
- Overrange LED for measurement circuitry.
- 600 V CAT IV; 1000V CAT III; EN 61010; CE Mark.
- Waterproof sensor.
- 9 V battery for typical 150 h 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.

2.4 ACCESSORIES

Banana (Female) / BNC (Male) AdapterCat. # 2118.46

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

2.5 STANDARD MODELS

Model	Measurement Range	Output	Sensor Length	Max Conductor Size	Cat. #
300-24-2-10	30/300 A	100/10 mV/A	24 in (610 mm)	8 in (190 mm)	2112.88
300-120-2-10	30/300 A	100/10 mV/A	120 in (3048 mm)	38 in (965 mm)	2113.39
1000-24-1-1	1000 A	1 mV/A	24 in (610 mm)	8 in (190 mm)	2112.39
1000-24-2-1	100/1000 A	10/1 mV/A	24 in (610 mm)	8 in (190 mm)	2112.98
1000-36-2-1	100/1000 A	10/1 mV/A	36 in (910 mm)	11 in (290 mm)	2113.00
3000-24-1-1	3000 A	1 mV/A	24 in (610 mm)	8 in (190 mm)	2112.46
3000-36-1-1	3000 A	1 mV/A	36 in (910 mm)	11 in (290 mm)	2112.48
3000-24-2-1	300/3000 A	10/1 mV/A	24 in (610 mm)	8 in (190 mm)	2113.05
3000-36-2-1	300/3000 A	10/1 mV/A	36 in (910 mm)	11 in (290 mm)	2112.00
3000-48-2-1	300/3000 A	10/1 mV/A	48 in (1220 mm)	15 in (390 mm)	2112.01
6000-36-2-0.1	600/6000 A	1/0.1 mV/A	36 in (910 mm)	11 in (290 mm)	2113.21
30000-24-2-0.1	3000/30,000 A	1/0.1 mV/A	24 in (610 mm)	8 in (190 mm)	2113.33
3000-36-2-0.1	3000/30000 A	1/0.1 mV/A	36 in (910 mm)	11 in (290 mm)	2113.35

All 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.

3. OPERATION

Please ensure that you have already read and fully understand the Precautions for Use section on page 6.

3.1 MAKING MEASUREMENTS WITH THE AMPFLEX®

- Connect the electronic module to the AC Volt range of your Digital Multi-Meter (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 = 2.59 V with the 10 mV/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.

3.2 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 mVAC.
- For best accuracy, center the AmpFlex® around the conductor to be measured (see figure 2).
- To increase sensitivity or measure on low currents, the AmpFlex® may be wrapped several times around the conductor. **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.

For best accuracy, center the AmpFlex®

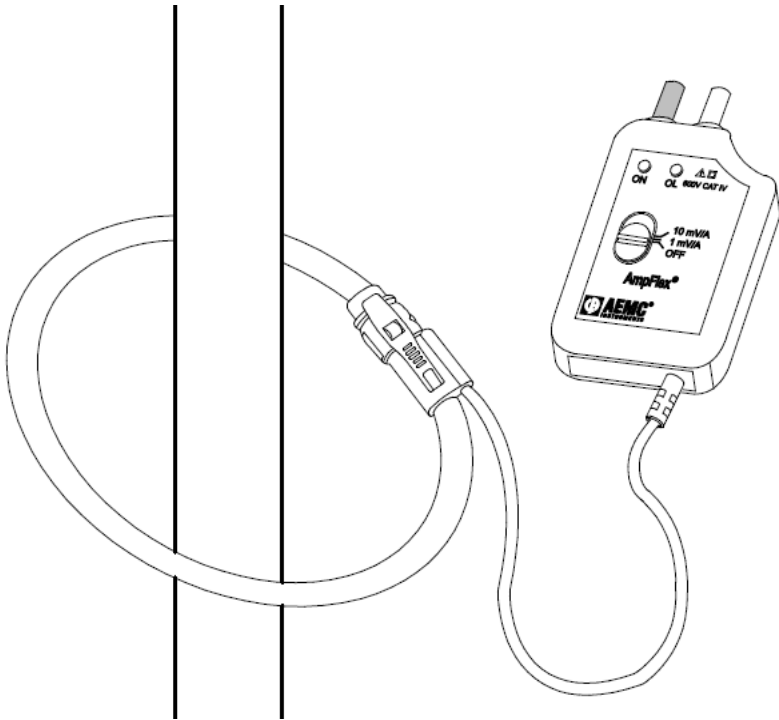


Figure 2

- 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 250 AAC).

One turn around a conductor carrying 250 AAC

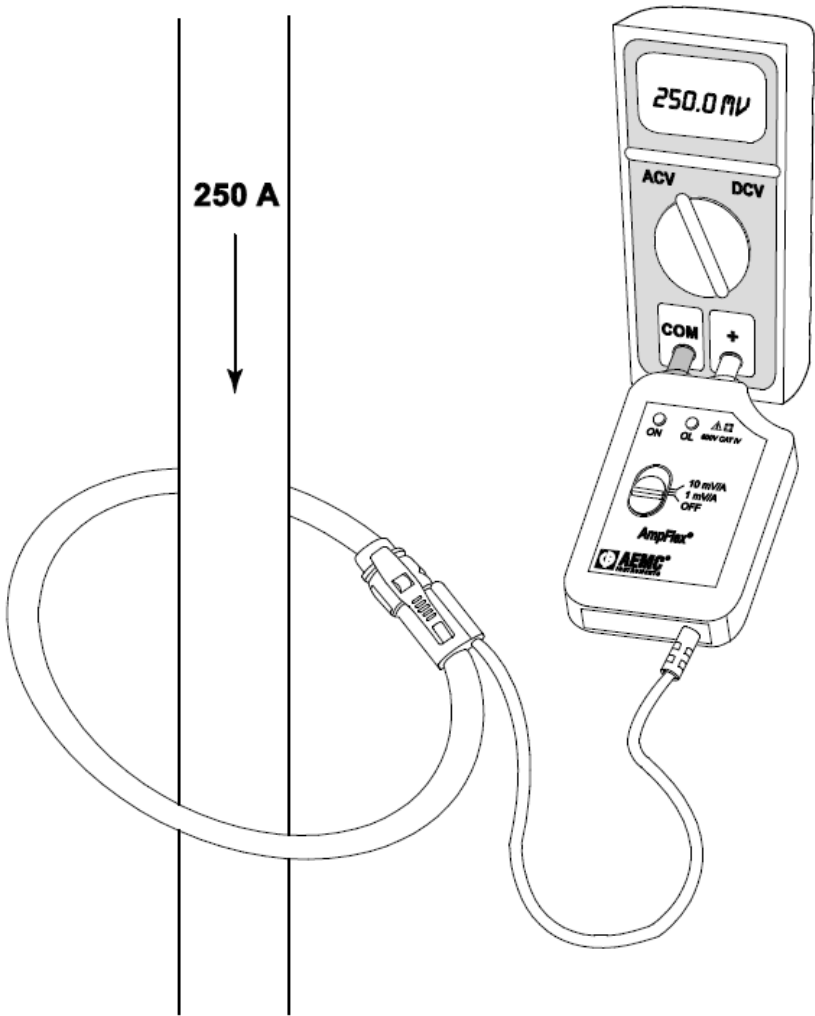


Figure 3

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

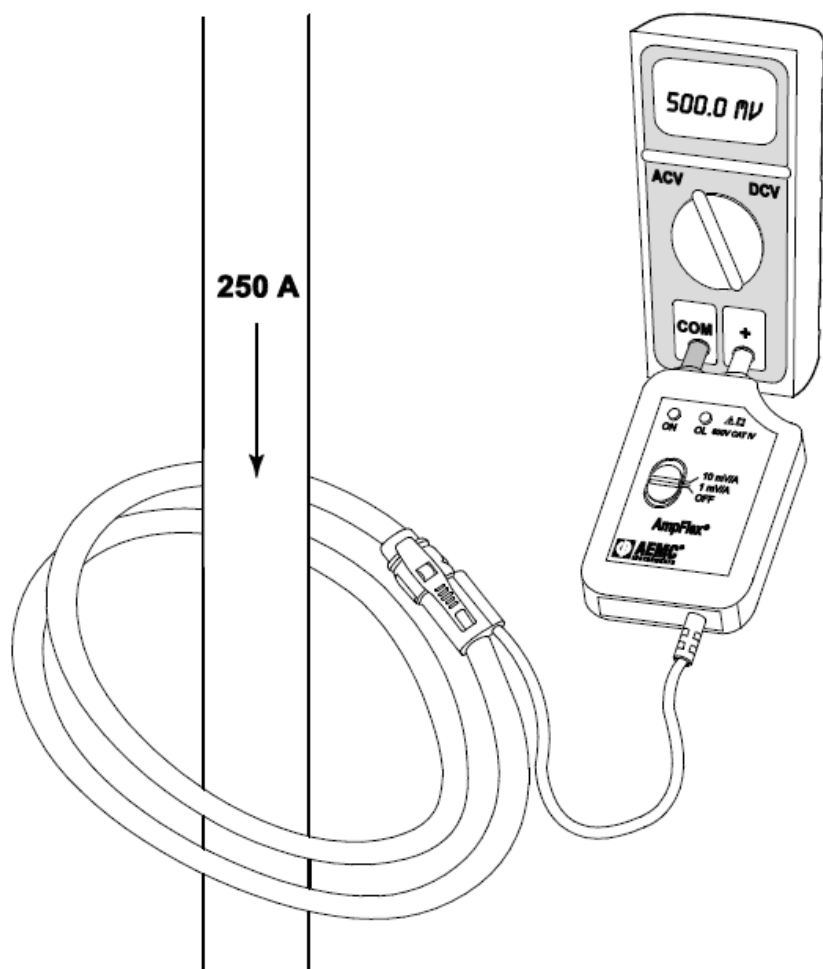
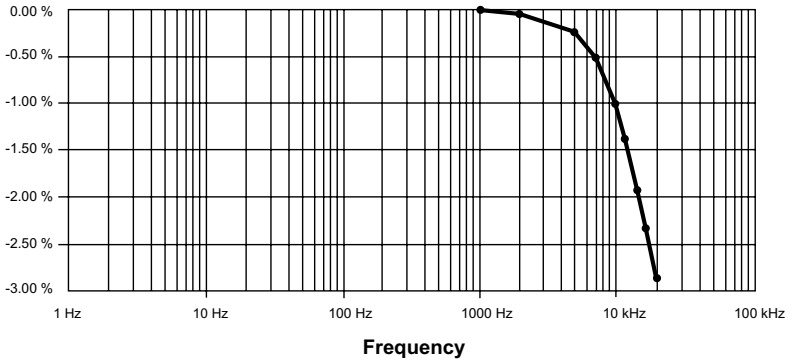


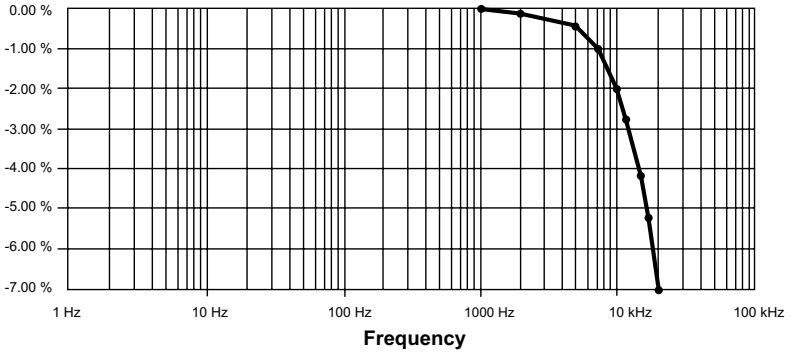
Figure 4

3.3 TYPICAL RESPONSE CURVES

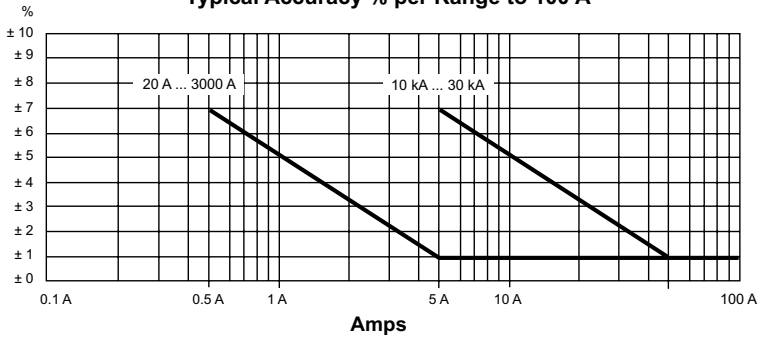
Typical Accuracy % vs. Frequency @ 100 A, 1 mV/A Output



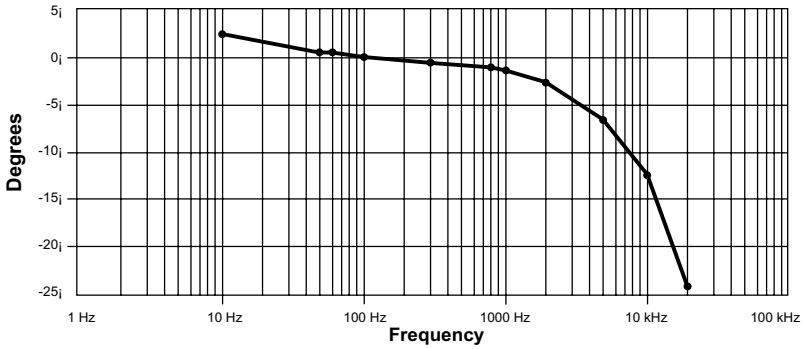
Typical Accuracy % vs. Frequency @ 100 A, 10 mV/A



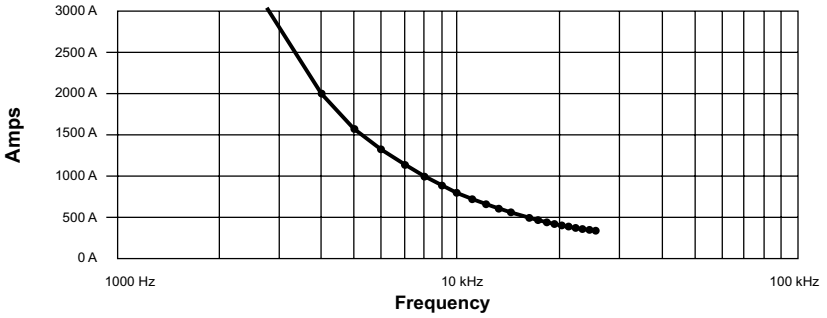
Typical Accuracy % per Range to 100 A



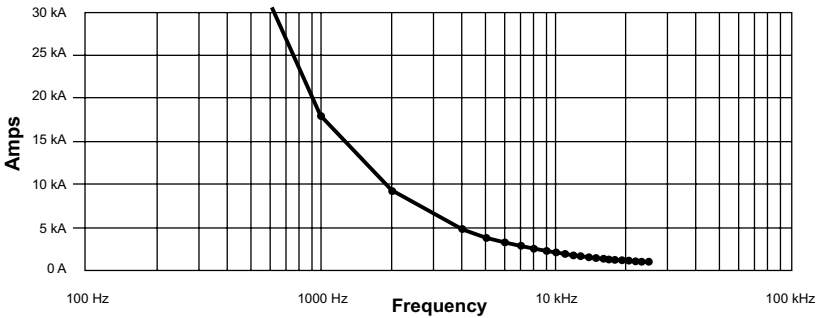
Typical Phase Shift vs. Frequency @ 200 A, 1 mV/A Output



Current Derating Curve ($I < 3000$ A)



Current Derating Curve ($I > 3000$ A)



4. SPECIFICATIONS

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

Model	3000 A	300/3000 A	3000/30,000 A	600/6000 A
Measurement Range	(5 to 3000) A	(5 to 3000) A	(5 to 30000) A	(5 to 6000) A
Accuracy	±1 % +200 mA	±1 % +200 mA	±1 % +1 A	±1 % +500 mA
Output Signal	1 mV/A	10 mV/A or 1 mV/A	1 mV/A or 0.1 mV/A	1 mV/A or 0.1 mV/A
Crest Factor (mid-range)	3.0	3.0	3.0	> 10
Phase Shift @ 50/60 Hz	0.7 °	0.7 °	0.5 °	0.5 °
Residual Noise	200 mA	200 mA	1 A	500 mA

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

4.1 COMMON SPECIFICATION

4.1.1 Electrical

Accuracy: 1 % of reading \pm residual noise.

Frequency Range: (10 to 20,000) Hz with current derating.

Signal Output: 4.5 V max.

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

Frequency Influence:

See Accuracy vs. Frequency curves on pages 15 and 16.

Frequency Limitation:

See current derating curves (NOTE: no limitation on 300 A Range) page 16.

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: 100 dB typical, 80 dB min.

4.1.2 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 2000) m, working voltage derating above.

Non-operating: (0 to 12,000) m.

4.1.3 Mechanical Specifications

Module Output:

Two 4 mm safety banana jacks.
Standard 3/4 in (19 mm) spacing.

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

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

Low Battery:

Power ON indicator (green LED) when battery voltage 7 V, 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 in, 36 in, and 48 in nominal (± 1 in), other lengths optional.

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

Weight:

AmpFlex® 24 in with battery: 0.74 lb.

AmpFlex® 36 in with battery: 0.89 lb.

AmpFlex® 48 in with battery: 0.95 lb.

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

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).

4.1.4 Sensor Specifications

Weight: 10.8 oz (302.4 g).

Bend Radius: 0.75 in (19 mm) minimum.

Bending Life: > 10,000 without performance deterioration.

Waterproofing: IP 65.

Resistance to Chemicals: Resistant to oils and aliphatic hydrocarbons.

Diameter: 12 mm \pm 0.5 mm.

Outer Sheath Material: Polyurethane, UL94V0.

Dielectric Strength: 7500 V.

Latch Spring Life: > 10,000 maneuvers.

4.1.5 Material Specifications

Module: UL 94V2, Color dark gray, Polycarbonate.

Sensor Latch: Material: Lexan 500R, UL94V0.

Cable Assembly to Sensor: UL94V0, 1000V rating.

4.1.6 Safety Specifications

Electrical:

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

- 600 V CAT IV; 1000 V CAT III.

Pollution Degree 2.

- 7.50 kV, 50/60 Hz, 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).
 - 8 kV in air – level 3 – class B.
 - 4 kV on contact – level 2 – class B.
 - 10 V/m radiated electromagnetic field (in line with EN 61000-4-3) – class B.
Rapid transients (in line with EN 61000-4-4).
 - 1 kV – level 2 – class B.
 - Electric shocks (in line with EN 61000-4-5).
 - 6 kV – class B.

4.2 INSTRUMENT COMPATIBILITY

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

5. MAINTENANCE



Warning

- For maintenance use only specified replacement parts.
- To avoid electrical shock, do not attempt to perform any repair or service on the instrument 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.

5.1 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.

5.2 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.

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.

(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, e-mail or fax our technical support team:

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.

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.

5.5.1 Warranty Repairs

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.



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