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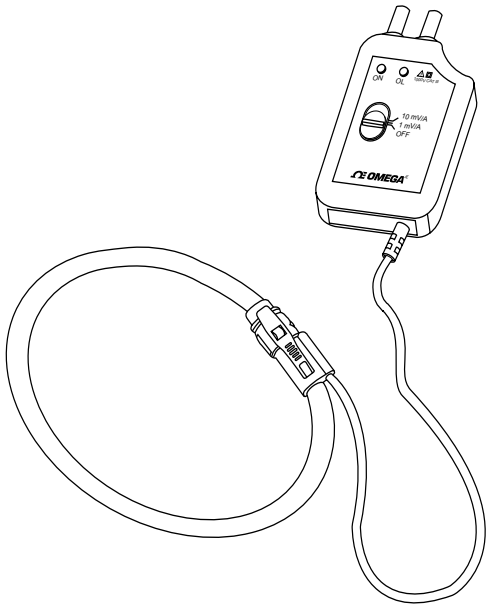

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Flexible AC Current Probes HHM800 Series

WARRANTY/DISCLAIMER

OMEGA ENGINEERING, INC. warrants this unit to be free of defects in materials and workmanship for a period of **13 months** from date of purchase. OMEGA Warranty adds an additional one (1) month grace period to the normal **one (1) year product warranty** to cover handling and shipping time. This ensures that OMEGA's customers receive maximum coverage on each product.

If the unit should malfunction, it must be returned to the factory for evaluation. OMEGA's Customer Service Department will issue an Authorized Return (AR) number immediately upon phone or written request. Upon examination by OMEGA, if the unit is found to be defective it will be repaired or replaced at no charge. OMEGA's WARRANTY does not apply to defects resulting from any action of the purchaser, including but not limited to mishandling, improper interfacing, operation outside of design limits, improper repair, or unauthorized modification. This WARRANTY is VOID if the unit shows evidence of having been tampered with or shows evidence of being damaged as a result of excessive corrosion; or current, heat, moisture or vibration; improper specification; misapplication; misuse or other operating conditions outside of OMEGA's control. Components which wear are not warranted, including but not limited to contact points, fuses, and triacs.

OMEGA is pleased to offer suggestions on the use of its various products. However, OMEGA neither assumes responsibility for any omissions or errors nor assumes liability for any damages that result from the use of its products in accordance with information provided by OMEGA, either verbal or written. OMEGA warrants only that the parts manufactured by it will be as specified and free of defects. OMEGA MAKES NO OTHER WARRANTIES OR REPRESENTATIONS OF ANY KIND WHATSOEVER, EXPRESSED OR IMPLIED, EXCEPT THAT OF TITLE, AND ALL IMPLIED WARRANTIES INCLUDING ANY WARRANTY OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE ARE HEREBY DISCLAIMED. LIMITATION OF LIABILITY: The remedies of purchaser set forth herein are exclusive and the total liability of OMEGA with respect to this order, whether based on contract, warranty, negligence, indemnification, strict liability or otherwise, shall not exceed the purchase price of the component upon which liability is based. In no event shall OMEGA be liable for consequential, incidental or special damages.

CONDITIONS: Equipment sold by OMEGA is not intended to be used, nor shall it be used: (1) as a "Basic Component" under 10 CFR 21 (NRC), used in or with any nuclear installation or activity; or (2) in medical applications or used on humans. Should any Product(s) be used in or with any nuclear installation or activity, medical application, used on humans, or misused in any way, OMEGA assumes no responsibility as set forth in our basic WARRANTY/DISCLAIMER language, and additionally, purchaser will indemnify OMEGA and hold OMEGA harmless from any liability or damage whatsoever arising out of the use of the Product(s) in such a manner.

RETURN REQUESTS/ INQUIRIES

Direct all warranty and repair requests/inquiries to the OMEGA Customer Service Department. BEFORE RETURNING ANY PRODUCT(S) TO OMEGA, PURCHASER MUST OBTAIN AN AUTHORIZED RETURN (AR) NUMBER FROM OMEGA'S CUSTOMER SERVICE DEPARTMENT (IN ORDER TO AVOID PROCESSING DELAYS). The assigned AR number should then be marked on the outside of the return package and on any correspondence.

The purchaser is responsible for shipping charges, freight, insurance and proper packaging to prevent breakage in transit.

FOR **WARRANTY** RETURNS, please have the following information available BEFORE contacting OMEGA:

1. P.O. number under which the product was PURCHASED,
2. Model and serial number of the product under warranty, and
3. Repair instructions and/or specific problems relative to the product.

FOR **NON-WARRANTY REPAIRS**, consult OMEGA for current repair charges. Have the following information available BEFORE contacting OMEGA:

1. P.O. number to cover the COST of the repair,
2. Model and serial number of product, and
3. Repair instructions and/or specific problems relative to the product.

OMEGA's policy is to make running changes, not model changes, whenever an improvement is possible. This affords our customers the latest in technology and engineering.

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It is the policy of OMEGA to comply with all worldwide safety and EMC/EMI regulations that apply OMEGA is constantly pursuing certification of its products to the European New Approach Directives. OMEGA will add the CE mark to every appropriate device upon certification.

The information contained in this document is believed to be correct but OMEGA Engineering, Inc accepts no liability for any errors it contains, and reserves the right to alter specifications without notice.

WARNING: These products are not designed for use in, and should not be used for, patient connected applications.

Notes:

Table of Contents

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 maximum voltage ratings given.
- Safety is the responsibility of the operator. The Flexible AC Current Probe must be used only by qualified personnel using applicable safety precautions.
- ALWAYS de-energize the circuit before wrapping the Flexible AC Current Probe 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 Flexible AC Current Probe 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 Flexible AC Current Probe on electrical conductors rated above 1000 V in overvoltage category III.

Maintenance

⚠ Warning

- For maintenance use only specified replacement parts.
- Avoid electrical shock: do not attempt to perform any servicing unless you are qualified to do so.
- Do not perform any service while the Flexible AC Current Probe is on any circuit.
- 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

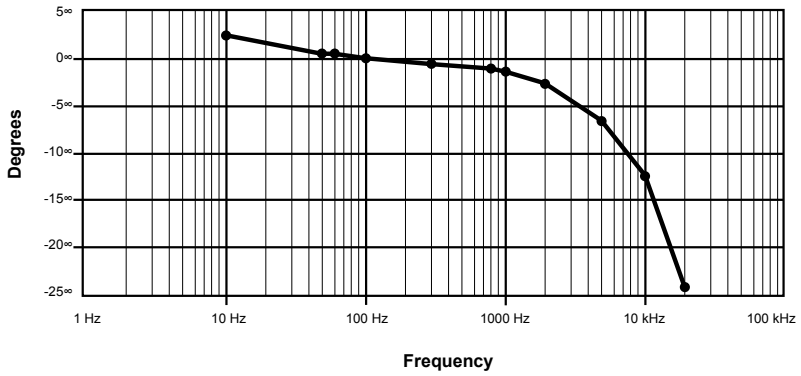
- If the power ON indicator (green LED) blinks or does not light up, replace the battery.
- Remove the Flexible AC Current Probe from any circuit before replacing the battery.
- To replace the battery, open rear case, replace battery and reassemble. The green LED should go on when the module is turned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

Cleaning

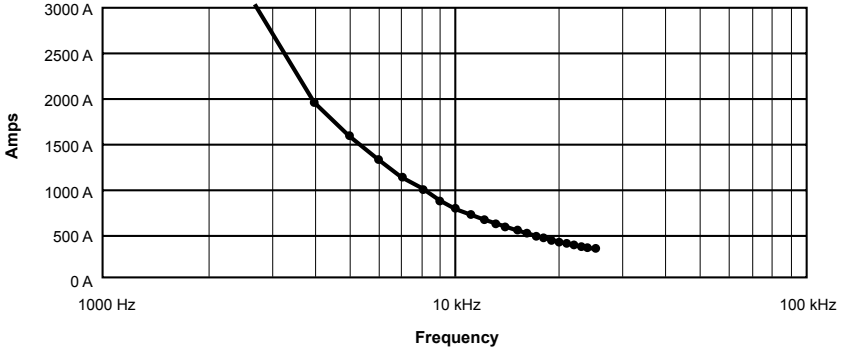
- It is important to keep the probe sensor latch mating surfaces clean and prevent foreign bodies from hampering the closing. The sensor may be gently cleaned with a soft cloth, soap and water. Dry immediately after cleaning. Avoid water penetration into the electronic module.
- Make sure the sensor,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

Typical Response Curves (cont.):

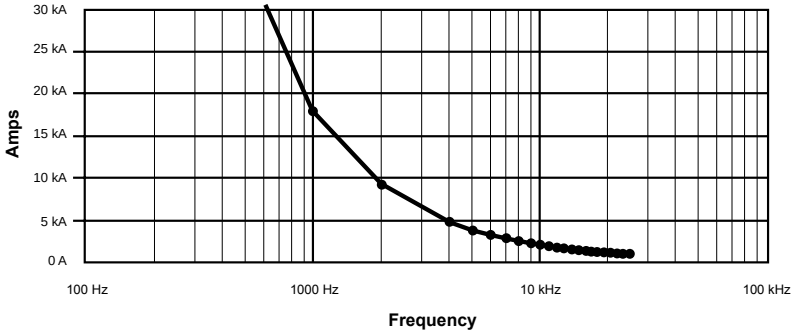
Typical Phase Shift vs. Frequency @ 200 A, 1 mV/A Output



Current Derating Curve (I < 3000 A)



Current Derating Curve (I > 3000 A)



International Electrical Symbols

This symbol signifies that the probes are protected by double or reinforced insulation. Use only 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.

Receiving Your Shipment

Upon receiving your shipment, make sure that the contents are consistent with the packing list. Notify Omega of any missing items. If the equipment appears to be damaged, file a claim immediately with the carrier and notify Omega at once, giving a detailed description of any damage.

Packaging

Your Flexible AC Current Probe consists of the following items:

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

Description

The Flexible AC Current Probe 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.

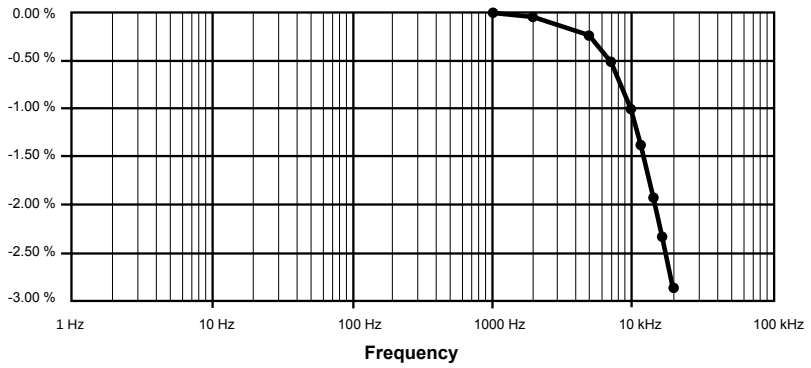
The Flexible AC Current Probe is lightweight. It does not use magnetic cores like standard transformers. The transformation principle is based on an air core. It presents virtually no load to the system under test, has a low phase shift and excellent frequency response, and cannot be damaged by overloads. The sensor assembly is waterproof and insulated for 1000 V Cat. III. The Flexible AC Current Probe meets IEC 1010, is CE marked (1997).

The Flexible AC Current Probe has a 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 Flexible AC Current Probe is insensitive to DC currents and only the AC component of the measured signal is measured.

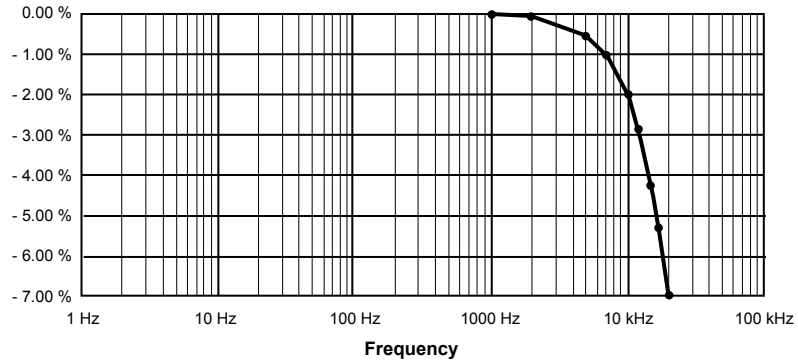
The length of the flexible sensor can be selected in lengths of 24", 36", and 48" in length. Consult the factory for custom lengths, ranges and/or features.

Typical Response Curves:

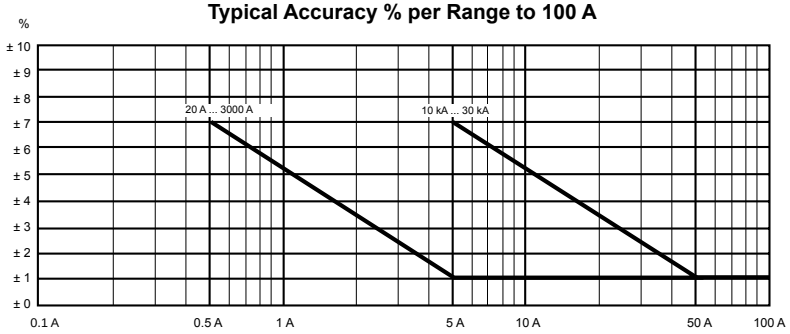
Typical Accuracy vs. Frequency @ 100 A, 1 mV/A Output



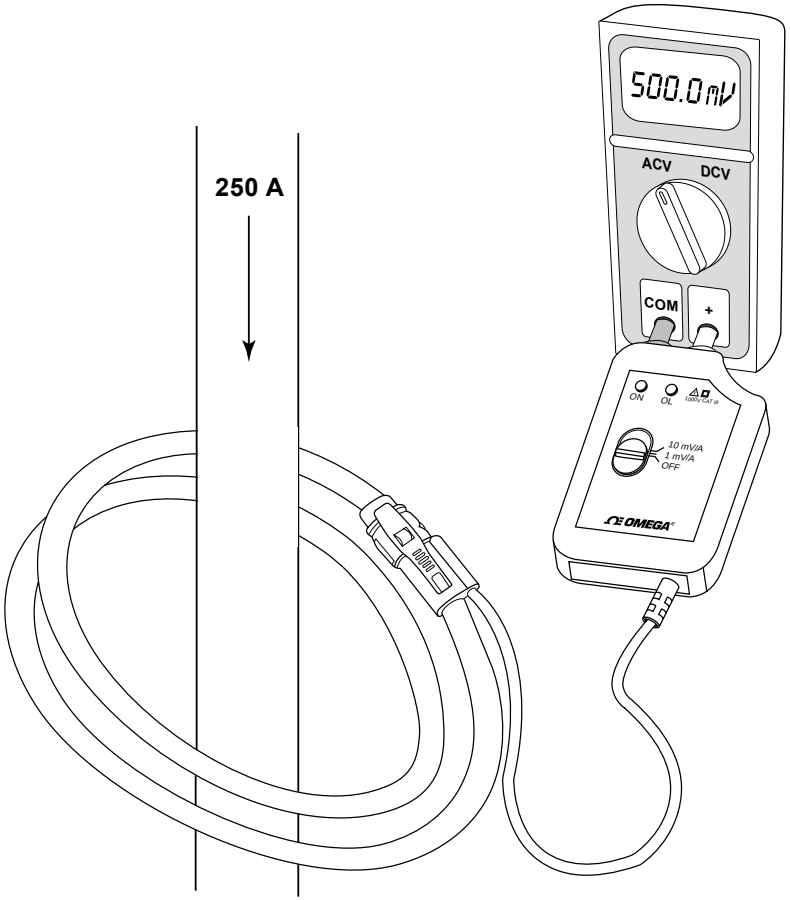
Typical Accuracy % vs. Frequency @ 100 A, 10 mV/A



Typical Accuracy % per Range to 100 A



Tips for Making Precise Measurements (continued):



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

Figure 4

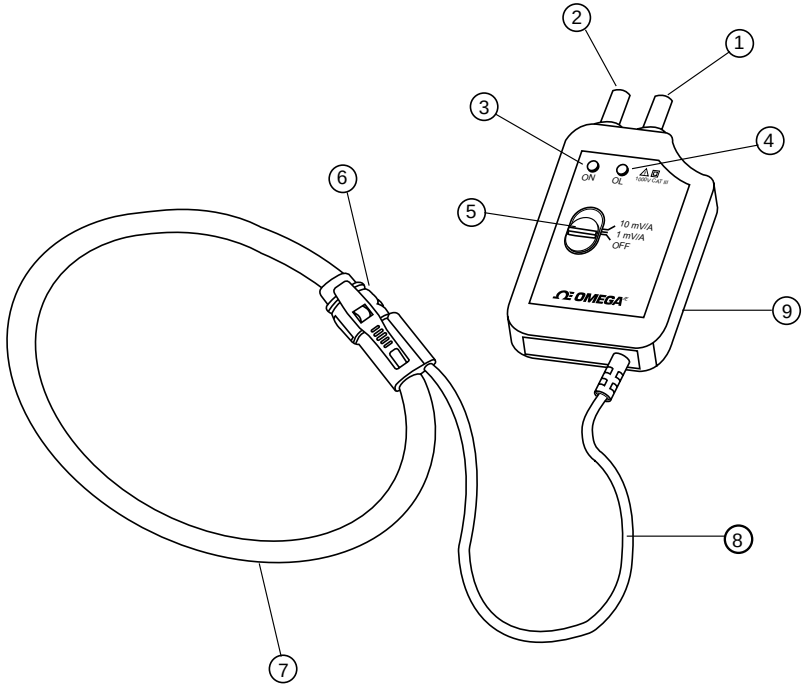


Figure 1

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. Connector/Latch
7. Flexible Sensor (Diameter 0.5", 12.5 mm)
8. Lead from Sensor to Module (6.5 ft, 2m)
9. Electronic Module - Descriptive Label on Back Case (range, model, etc.)

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
- 1000 V, IEC 1010 Cat III, CE Mark
- Waterproof sensor
- 9 V battery for typical 150 hr continuous operation
- Shape Memory™ for custom pre-shaping of sensor before use (no drooping)
- Very high frequency response
- Low phase shift for power measurements
- Insensitive to DC, measures only AC component on DC + AC signals
- Excellent linearity
- Lightweight

Accessories

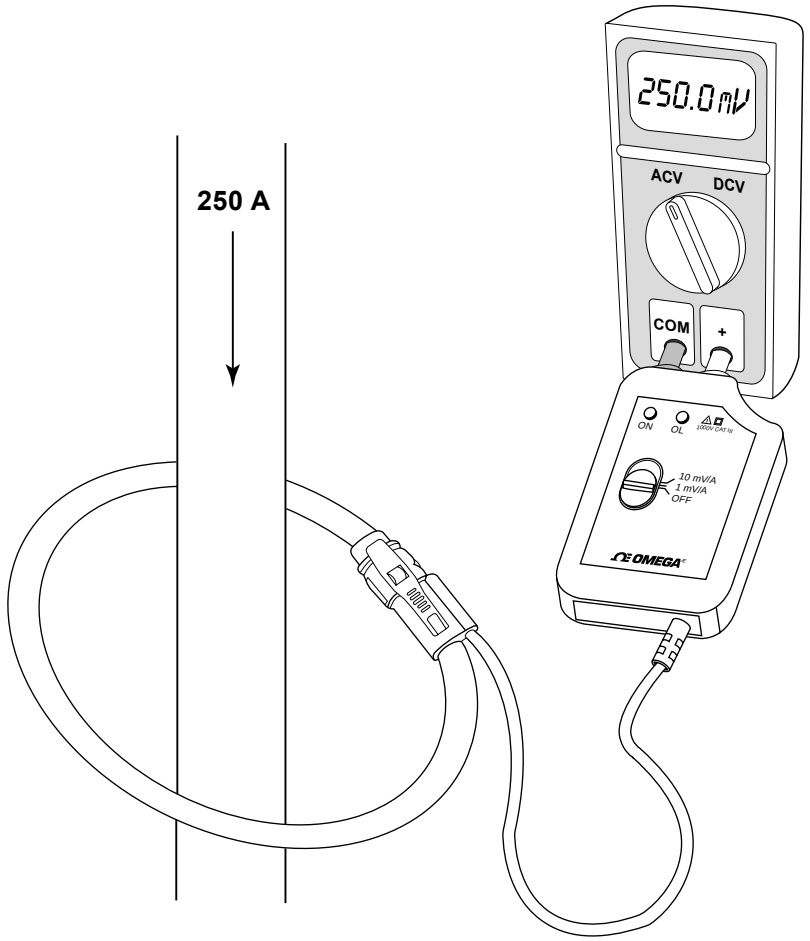
Banana (Female) / BNC (Male) Adapter (HHM70-CONN1)

For connection of Flexible AC Current Probe to BNC terminals on scopes and other displaying instruments.

*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 < 40 A/m, no external AC magnetic field, no external electrical field, 10 to 100 Hz, sine wave. See accuracy curves for low currents.

Tips for Making Precise Measurements (continued):

The Flexible AC Current Probe 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 A AC.)

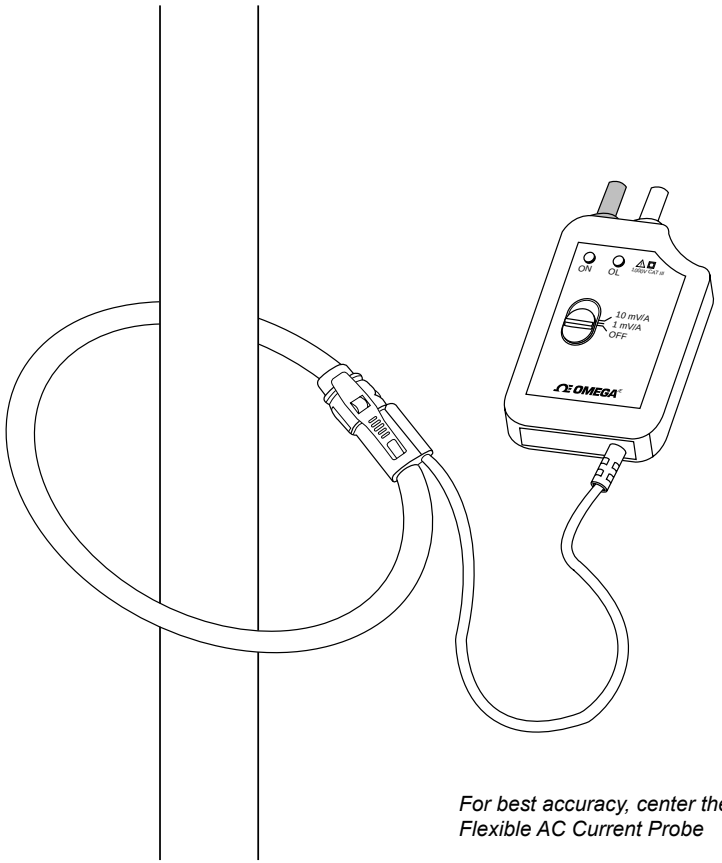


One turn around a conductor carrying 250 A AC

Figure 3

Tips for Making Precise Measurements (continued):

- To increase the sensitivity or measure on low currents, the Flexible AC Current Probe 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 Flexible AC Current Probe accuracy and the displaying instrument accuracy.



For best accuracy, center the Flexible AC Current Probe

Figure 2

Standard Models

Model Number	Current Range	Length	Diameter	# of Output Ranges	mV Outputs
HMM801	30 A	24 in / 610 mm	7.64 in / 190 mm	1	100 mV/A
HMM802	200 A	24 in / 610 mm	7.64 in / 190 mm	1	1 mV/A
HMM803	300 A	24 in / 610 mm	7.64 in / 190 mm	1	10 mV/A
HMM804	300 A	24 in / 610 mm	7.64 in / 190 mm	1	1 mV/A
HMM805	30/300 A	24 in / 610 mm	7.64 in / 190 mm	2	100 or 10 mV/A
HMM806	500 A	24 in / 610 mm	7.64 in / 190 mm	1	1 mV/A
HMM807	50/500 A	24 in / 610 mm	7.64 in / 190 mm	2	10 or 1 mV/A
HMM808	1000 A	24 in / 610 mm	7.64 in / 190 mm	1	1 mV/A
HMM809	100/1000 A	24 in / 610 mm	7.64 in / 190 mm	2	10 or 1 mV/A
HMM810	3000 A	24 in / 610 mm	7.64 in / 190 mm	1	1 mV/A
HMM811	300/3000 A	24 in / 610 mm	7.64 in / 190 mm	2	10 or 1 mV/A
HMM812	6000 A	24 in / 610 mm	7.64 in / 190 mm	1	0.1 mV/A
HMM813	600/6000 A	24 in / 610 mm	7.64 in / 190 mm	2	1 or 0.1 mV/A
HMM814	10,000 A	24 in / 610 mm	7.64 in / 190 mm	1	0.1 mV/A
HMM815	1000/10,000 A	24 in / 610 mm	7.64 in / 190 mm	2	1 or 0.1 mV/A
HMM816	30,000 A	24 in / 610 mm	7.64 in / 190 mm	1	0.1 mV/A
HMM817	3000/30,000 A	24 in / 610 mm	7.64 in / 190 mm	2	1 or 0.1 mV/A

HHM70-CONN1 - Accessory Adaptor (See Accessories, page 6)

*Standard length is 610 mm (24”). Please consult sales for availability and pricing for 910, 1220 and 1520 mm (36, 48 and 60”) models. Comes with 9V battery and operator’s manual.

Specifications

Model #	HHM801	HHM802	HHM803	HHM804	HHM805
Operating Range	30 A	200 A	300 A	300 A	30/300 A
Measurement Range	5-30 A	5-200 A	5-300 A	5-300 A	5-300 A
Output Signal	100 mV/A	1 mV/A	10 mV/A	1 mV/A	100 mV/A or 10 mV/A
Crest Factor (mid-range)	3.0	> 10	3.0	> 10	3.0
Phase Shift @ 50/60 Hz	1.3°	0.7°	0.7°	0.7°	1.3°
Residual Noise	200 mA	200 mA	200 mA	200 mA	200 mA
DC Offset	50 mV	2 mV	5 mV	2 mV	50 mV or 5 mV

Model #	HHM806	HHM807	HHM808	HHM809
Operating Range	500 A	50/500 A	1000 A	100/1000 A
Measurement Range	5-500 A	5-500 A	5-1000 A	5-1000 A
Output Signal	1 mV/A	10 mV/A or 1 mV/A	1 mV/A	10 mV/A or 1 mV/A
Crest Factor (mid-range)	> 10	> 10	9.0	9.0
Phase Shift @ 50/60 Hz	0.7°	0.7°	0.7°	0.7°
Residual Noise	200 mA	200 mA	200 mA	200 mA
DC Offset	2 mV	5 mV or 2 mV	2 mV	5 mV or 2 mV

Operation

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

Making Measurements with the Flexible AC Current Probe:

- 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 the Flexible AC Current Probe 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 Flexible AC Current Probe 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 mV ÷ 10 = 259A).
- 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 Flexible AC Current Probe is connected to a True RMS meter. Note that the DC component is not measured.

Tips for Making Precise Measurements:

- When using the Flexible AC Current Probe 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 Flexible AC Current Probe output signal possible and the most sensitive meter range for this output.
- Make sure the DMM or measuring instrument can accurately measure mV AC. Certain inexpensive DMM have poor resolution and accuracy when measuring low mV AC.
- For best accuracy, center the Flexible AC Current Probe around the conductor to be measured. (See figure 2).

MATERIAL SPECIFICATIONS

Module:
UL 94V2, Color dark gray, Polycarbonate

Sensor Latch:
Material: Lexan 500R, UL94V0

Cable Assembly to Sensor:
UL 94V0, 1000 V rating

SAFETY SPECIFICATIONS

CE

Electrical:

Double insulation or reinforced insulation between primary, secondary and outer case of handle per IEC 1010-1 @ 2 (indoor use)

- 1000 V Category III, Pollution Degree 2
- 600 V Common Mode
- 7.50 kV, 50/60 Hz, dielectric between secondary and the outer case

Instrument Compatibility

The Flexible AC Current Probe 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 Flexible AC Current Probe with a AC voltmeter having an accuracy of 0.75% or better.

Specifications

Model #	HHM810	HHM811	HHM812	HHM813
Operating Range	3000 A	300/3000 A	6000 A	600/6000 A
Measurement Range	5-3000 A	5-3000 A	5-6000 A	5-6000 A
Output Signal	1 mV/A	10 mV/A or 1 mV/A	0.1 mV/A	1 mV/A or 0.1 mV/A
Crest Factor (mid-range)	3.0	3.0	> 10	> 10
Phase Shift @ 50/60 Hz	0.7°	0.7°	0.5°	0.5°
Residual Noise	200 mA	200 mA	500 mA	500 mA
DC Offset	2 mV	5 mV or 2 mV	1 mV	2 mV or 1 mV

Model #	HHM814	HHM815	HHM816	HHM817
Operating Range	10,000 A	1000/10,000 A	30,000 A	3000/30,000 A
Measurement Range	5-10,000 A	5-10,000 A	5-30,000 A	5-30,000 A
Output Signal	0.1 mV/A	1 mV/A or 0.1 mV/A	0.1 mV/A	1 mV/A or 0.1 mV/A
Crest Factor (mid-range)	9.0	9.0	3.0	3.0
Phase Shift @ 50/60 Hz	0.5°	0.5°	0.5°	0.5°
Residual Noise	500 mA	500 mA	500 mA	500 mA
DC Offset	1 mV	2 mV or 1 mV	1 mV	2 mV or 1 mV

*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 < 40 A/m, no external AC magnetic field, no external electrical field, 10 to 100 Hz, sine wave. See accuracy curves for low currents.

Common Specifications

ELECTRICAL

Accuracy: 1% of reading

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

Signal Output: 4.5 V max.

Working Voltage: 1000 V, IEC 1010 Cat. III

Common Mode Voltage: 600 V

Frequency Influence:
See Accuracy vs. Frequency curves on pages 17 and 18.

Frequency Limitation:
See current derating curves (note no limitation on 300 A Range) pg. 18.

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% maximum

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

Common Mode Rejection: 100 dB typical, 80 dB minimum

ENVIRONMENTAL SPECIFICATIONS

Case Protection:
Sensor: IP65 per IEC 529
Electronic module: IP40 per IEC 529

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

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

Influence of Temperature:
Sensor: -10°C to 90°C: 0.15% per 10°C typical, 0.5% per 10°C max.
Module: -10°C to 55°C: 0.15% per 10°C typical, 0.5% per 10°C max.

Influence of Relative Humidity:
10 to 90% RH: 0.2% typical, 0.5% maximum

Operating Relative Humidity:
10 - 30°C 85 ± 5% RH (without condensation)
40 - 50°C 45 ± 5% RH (without condensation)

Altitude:
Operating: 0 to 2000 m, working voltage derating above
Non-operating: 0 to 12,000 m

MECHANICAL SPECIFICATIONS

Module Output:
Two 4 mm safety banana jacks
Standard 3/4" (19 mm) 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 ≥ 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" nominal (+/- 1"), other lengths optional

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

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)
Sensor: IP 65 (EN60529) - NEMA 4X

SENSOR SPECIFICATIONS:

Weight: 30g/10cm

Bend Radius: 0.75" (19mm) minimum

Bending Life: >10,000 without performance deterioration

Waterproofing: Permanent to spray, IP 65

Resistance to Chemicals: Resistant to oils and aliphatic hydrocarbons

Diameter: 12 mm +/- 0.5 mm

Outer Sheath Material: Polyurethane, UL94V0

Dielectric Strength: 7500 V

Latch Spring Life: >10,000 maneuvers