1 YEAR
WARRANTY

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User's Guide

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HHM-301
300 Amp Flex Clamp Adapter

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TABLE OF CONTENTS

INTRODUCTION

Thank you for purchasing the HHM301 Flex Clamp Adapter. Please read this user's manual carefully and thoroughly before using the instrument.

The HHM301 enables any clamp meter or multimeter to enclose a thick or hard-to-reach conductor, bundle of conductors, or busbar while increasing its AC current measurement range to up to 3000 Amperes.

The product has three components: a flexible probe, a current-to-voltage converter, and a pair of banana plug output leads. When formed into a loop, the probe is called a Rogowski coil. A Rogowski coil is a helical coil of wire inside a shield that is designed to be placed around a straight conductor, a bundle of conductors, or a copper busbar that typically carries large currents (>10A). The voltage induced in a Rogowski coil is proportional to the *rate of change* (derivative) of current in the straight conductor. In the HHM301, the integrator circuit needed to change the output of the Rogowski coil to a voltage signal proportional to current is located inside the current-to-voltage converter.

The converter allows the electrician to choose the HHM301's full-scale current's range and therefore its current-to-voltage conversion factor. The rotary switch on the converter has three positions: 30A, 300A and 3000A. With the switch in the 30A position, the unit converts current to voltage at a ratio of 100mV/A and outputs the result to the banana plug output leads. The leads are designed to be plugged into a multimeter or clamp meter operating in AC voltage measurement mode. The electrician can then use a simple formula to convert the meter's voltage reading back to a current measurement.

With the converter switch in the 300A position, the conversion factor change to 10mV/A; in the 3000A position, the conversion factor is 1mV/A. The three ranges offer the electrician three options for measuring very large currents each with a unique combination of range and resolution.

The converter is powered by 2 "AAA" batteries, which are supplied with the instrument.

KEY FEATURES

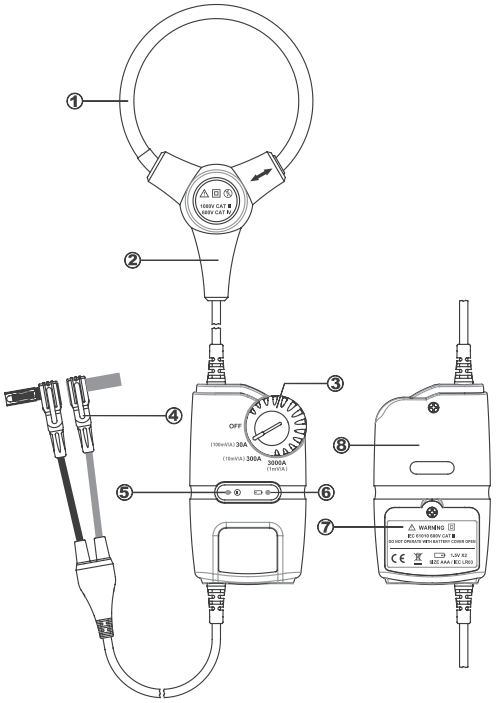
- Three full-scale ranges: 0 to 3000A, 0 to 300A, 0 to 30A
- 18 in. (458mm) long probe creates 6 in. diameter loop
- Measurements accurate within 1% of full-scale range
- Probe is safe for CAT III 1000V, CAT IV 600V use, converter is safe for CAT II 1000V, CAT III 600V use
- Powered by 2 "AAA"batteries (included)

WHAT'S IN THE BOX

The HHM301 (a converter plus a non-detachable probe plus non-detachable 90° banana plug output leads) comes fully assembled in a box along with 2 "AAA" batteries and this user's manual.

PRODUCT OVERVIEW

Fig. 1 shows the labels and positions of the controls, indicators and physical structures of the HHM301. Familiarize yourself with the functions and meanings of these controls, indicators and structures before moving on to the Setup Instructions and Operating Instructions.



① Flexible current probe (Rogowski coil)

② Probe coupling

③ Power/Range rotary switch

④ Banana plug output leads

⑤ Green (power on) LED

⑥ Red (low battery) LED

⑦ Battery compartment

⑧ Current-to-voltage converter

SAFETY INSTRUCTIONS

Warning

- Do not operate the HHM301 if the probe, converter or test leads appear to be damaged.
- When measuring bare conductors, use appropriate personal protective equipment (PPE) such as rubber gloves and headgear certified for high-voltage work.
- Also wear PPE if any circuits in the system remain “live” during the measurement.
- If the magnitude of the current to be measured is unknown, set the converter’s range switch to the highest (3000A) position to begin testing.

- Always de-energize the circuit under test before installing the flexible probe.
- Exercise extreme caution when measuring voltages greater than 60VDC or 30VAC.
- Never use the probe on a circuit with voltages higher than CAT III 600V.
- Never operate the HHM301 with the converter's battery compartment door open.

SETUP INSTRUCTIONS

INSTALL BATTERIES

⚠⚠ Warning ⚠⚠

Before changing batteries, move the flexible probe away from any live circuits and set the converter switch to the **OFF** position.

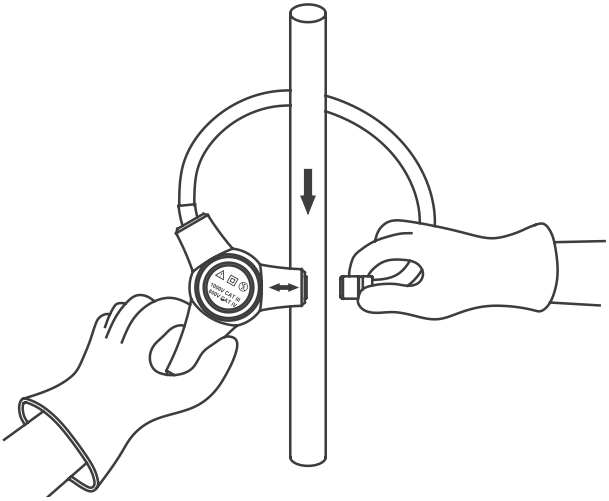
The HHM301's battery compartment (Fig. 1, Callout 7) is located at the back of the converter. To open the compartment, use a small Phillips-head screwdriver to remove the single screw securing the battery compartment cover. Be careful not to lose the small screw. Put the screw and the cover to the side.

Install the two supplied "AAA" batteries in the compartment, using the polarity marks stenciled inside it as a guide. Replace the battery compartment cover and secure it with the Phillips-head screw.

OPERATING INSTRUCTIONS

1. **Power on the HHM301** by turning the converter's rotary switch from the **OFF** position to the appropriate Range position: **30A**, **300A** or **3000A**. The green LED on the left side of the front panel (Fig. 1, Callout 5) will illuminate. If the magnitude of the current to be measured is unknown, initially set the switch to the **3000A** position. You can switch to a narrower range later to improve your measurement resolution if the magnitude of measured current is low enough to warrant doing so.
2. **Plug the banana plugs into the test jacks of your multimeter or clamp meter**, taking care to observe + (positive/red) and – (negative or common/black) polarity markings.
3. **On your multimeter or clamp meter, select AC voltage measuremen** in Auto Ranging mode, or a full-scale range of 3 to 10V in Manual Ranging mode.

4. **Pull the end of the probe closest to the ↔ mark on the probe coupling (Fig. 1, Callout 2) out of the coupling**, enclose the conductor(s) or busbar whose current you wish to measure, and then plug the end of the probe back into the coupling (see figure below).

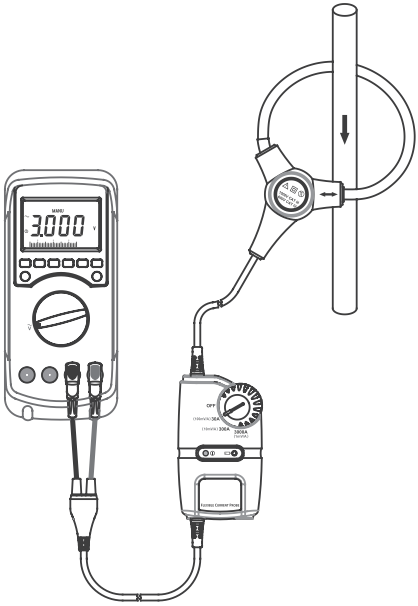


5. **Center the conductor(s)** inside the probe loop. For maximum accuracy, position the conductor(s) as close to the center of the loop as possible, given physical limitations. Measurement accuracy decreases by 1% for each 1 in. of positioning off-center.
6. **Read the measured voltage on your multimeter or clamp meter**. If you are using an Auto Ranging meter, the meter will automatically provide readings with the highest resolution. If you are using Manual Ranging, begin by selecting the meter's widest full-scale AC voltage range. Then try switching to a narrower range to improve your measurement resolution.
7. **Calculate the measured current from the displayed voltage reading** using the following formula:

Actual current = Voltage reading ÷ Conversion ratio

The conversion ratio for each of the three HHM301 measurement ranges is stenciled on the converter at the left of the range label. The ratios for the 3000A, 300A and 30A ranges are 1mV/A, 10mV/A, and 100mV/A, respectively.

As an example, consider an application in which your multimeter reads 3VAC with input from the HHM301 operating in the 30A range (see figure below).



The conversion factor for the 3A range is 100mV/A. Inserting these values into the formula yields the following result:

Actual current = Voltage reading ÷ Conversion ratio

X = 3V ÷ 100mV/A

Actual current = 30A

SPECIFICATIONS

- Measurement Ranges: 0 to 3000A (full-scale), 0 to 300A, 0 to 30A
- Conversion Ratios: 1mV/A in 3000A range; 10mV/A in 300A range; 100mV/A in 30A range
- Measurement Accuracy: ±1% of full-scale value
- Position Error: ±1% @ 1 in. from conductor; ±2% @ 2 in.; ±3% @ 3 in.
- Safety Ratings: CAT III 1000V, CAT IV 600V (probe); CAT II 1000V, CAT III 600V (controller)
- Probe Length: 18 in. (458mm); creates 6 in. diameter loop
- Probe Diameter: 0.33 in. (8.5mm)
- Cable Length (probe to converter): 6 ft. (1.8m)
- Bandwidth (-3dB): 10Hz to 10kHz
- Output Impedance: 10kΩ, minimum
- Operating Temperature: 32° to 122°F (0° to 50°C) @ <80%RH
- Dimensions of Converter: 4.7 x 2.8 x 1.0 in. (120 x 70 x 26mm)
- Weight (including batteries): 11.4 oz. (325g)
- Power Source: (2) “AAA” batteries (included)

OPERATING & MAINTENANCE TIPS

When the red LED on the right side of the converter's front panel (Fig. 1, Callout 6) illuminates, it's time to replace the two "AAA" batteries that power the unit (although measurements will remain valid for several hours after the light appears). To replace the batteries, follow the instructions on p. 5. A fresh pair of batteries should typically power 120 hours of operation.

The HHM301 is not equipped with an Auto Power Off circuit. To avoid draining the batteries, remember to set the converter's rotary switch to the **OFF** position after each measurement session.

Remove the batteries when storing the unit or when you do not expect to use it for a long time (months rather than weeks).

Do not operate the HHM301 in the presence of a flammable or explosive gas or near an arc welder or induction heater.

After subjecting the instrument to a large change in ambient temperature, wait at least 30 minutes before making measurements to guarantee the accuracy of readings.

Do not disassemble the HHM301 or immerse it in water.

Make sure that the probe, converter and test leads are clean, dry and free of surface contamination before using the instrument.

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's 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 malfunctions, 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 having been 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 in which wear is not warranted, include but are not limited to contact points, fuses, and triacs.

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

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