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ENGINEERING, INC.
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HHM59
DIGITAL CLAMP METER

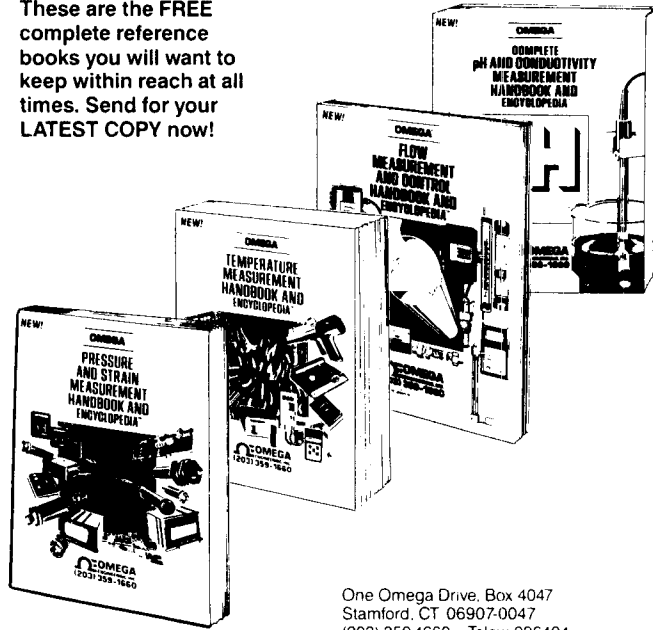


Operator's Manual



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HHM59 DIGITAL CLAMP METER

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SECTION 1. INTRODUCTION

1.1 DESCRIPTION

The OMEGA® HHM59 meter is completely portable, LCD, 3-1/2 digit clamp meter with insulation test function (with optional 500V insulation tester unit). Designed for use by electricians, technicians, servicemen and hobbyists who require an instrument that is accurate, reliable, and always ready for use. It is powered by a standard 9V transistor radio type battery, providing 150-200 operating hours, depending upon the type of battery and usage. It has a rugged design, is easy to hold in operator's hand, and convenient to use.

1.2 OPERATING FEATURES

AC Current	0.01A to 1000A (with Peak Hold function)
Insulation Test	100K Ω to 2000M Ω (With optional 500V insulation tester unit, Model HHM59-IT)
AC Voltage	0.1V to 750V
DC Voltage	100 μ V to 1000V
Resistance	100m Ω to 2M Ω
Continuity Test	< 100 Ω with audio tone
Temperature	0 to 1000°C, 0 to 1400°F

The meter display is a liquid crystal assembly providing a readable display in all light conditions. The decimal point is automatically positioned, and the polarity sign (minus) is lighted for negative DC measurement (plus is understood if no sign appears), so that the display is direct reading in units selected at the rotary switch. Overrange measurements are indicated by blanking all but the most significant digit, decimal point, and polarity sign (if negative). In addition the display includes a low battery indication. If low battery is indicated, operator should replace the used battery with a new one. See Section 4, Battery Installation.

SECTION 2. UNPACKING

Remove the Packing list and verify that all equipment has been received. If there are any questions about the shipment, please call the OMEGA Customer Service Department at 1-800-622-2378.

Upon receipt of shipment, inspect the container and equipment for any signs of damage. Take particular note of any evidence of rough handling in transit. Immediately report any damage to the shipping agent.

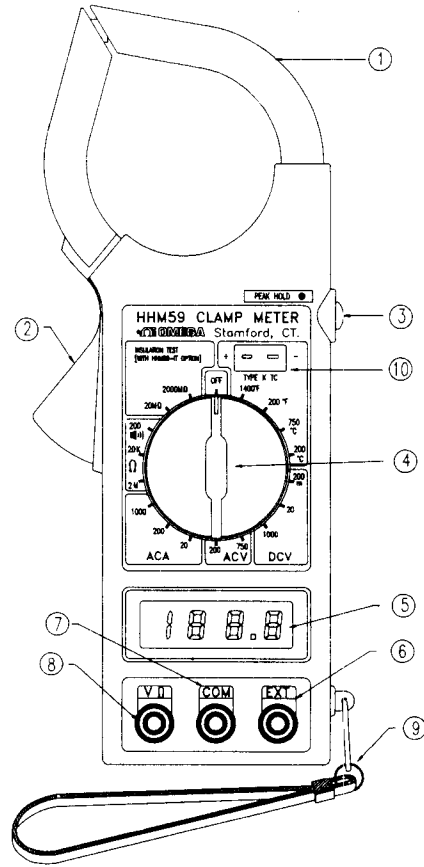
NOTE

The carrier will not honor any claims unless all shipping material is saved for their examination. After examining and removing contents, save packing material and carton in the event reshipment is necessary.

Please note that the following items should be in the box:

<u>Quantity</u>	<u>Description</u>
1	HMM59
1	Instruction Manual
1	Wrist Strap
1	9V Lithium Battery
1	Carrying Case with strap
1	Pair of Test Leads
1	Type K Beaded Wire Thermocouple

SECTION 3. OPERATION



1. Transformer Jaws:
Pick up the AC current flowing through the conductor.
2. Trigger:
Press the lever to open the transformer jaws. When the lever is released, the jaws will close again.
3. Peak Hold Switch:
A push switch, (Push On/push OFF, do not pull to select function). When measuring the peak value of the starting current of motors, set the switch to the "Peak-Hold" position.
4. Rotary Switch:
A rotary switch is used to select measurement Function and Range.
5. Display:
3-1/2 digit (1999), decimal point, minus polarity, overrange and LO BAT indicators.
6. EXT Input Connector:
Use to accept insulation tester unit EXT banana plugs when measuring insulation resistance.
7. COM Input Connector:
LOW input for all voltage, resistance, continuity measurement. Will accept banana plugs. When measuring insulation resistance, used to accept insulation tester unit COM banana plugs.
8. V. Ω Input Connector:
High input for all voltage, resistance, continuity, measurement, will accept banana plugs. When measuring insulation resistance, used to accept insulation tester unit V. Ω banana plugs.
9. Drop-Proof Wrist Strap:
Prevents the instrument from slipping off the hand while in use.
10. Temperature Female Connector:
Thermocouple input for all temperature measurements. Used to accept male connector of K-type thermocouples.

3.1 AC CURRENT MEASUREMENT

1. Make sure that "Peak Hold" switch is not pressed.
2. Set Function/Range Switch to the ACA 1000A range. If the display indicates one or more leading zeros, shift to the 200A or 20A range to improve the resolution of the measurement.
3. Press the trigger to open the transformer jaws and clamp one conductor only. It is impossible to make measurements when two or three conductors are clamped at the same time.
4. Display reading is flow of AC current through the conductor.
5. Press the trigger to open the transformer jaws and remove clamp meter from the conductor.

3.2 PEAK-HOLD AC CURRENT MEASUREMENT.

1. Set Function/Range Switch to the ACA 20A, 200A or 1000A position.
2. Press the trigger to open the transformer jaws and clamp one conductor only.
3. Press the peak-hold switch to peak-hold position.
4. Turn on the tested equipment's power switch to get the peak value of the starting current.

3.3 INSULATION RESISTANCE TESTER (OPTIONAL MODEL HHM59-IT)

1. Set Function/Range Switch to the insulation test 2000M Ω range. It is normal for the display to be unstable.
2. Insert the three banana plugs of the insulation tester unit (Model HHM59-IT) into the clamp meter V. Ω . COM, EXT jacks.

3. Set the insulation tester unit range switch to the 2000M Ω position.
4. Connect the test leads of the insulation tester unit L.E input jacks, to the equipment under test (equipment's power must be OFF).
5. Set the insulation tester power switch to the ON position.
6. Depress the 500V Insulation Resistance Pushbutton. The "500V ON" red LED lamp will light. Clamp meter display reading is the insulation resistance value. If the reading is below 19M Ω , change clamp meter and insulation tester unit to 20M Ω range. This can increase the accuracy.
7. If the insulation tester unit is not in use, place the power switch to power OFF position, and remove the test leads from the E.L input jacks. This will increase battery life and prevent electrical shock hazard.

SECTION 4. BATTERY INSTALLATION

When the display shows "LO BAT", erroneous readings will occur and the battery should be immediately replaced. To change the 9V battery, go through the following steps:

1. slide open the battery cover on back side of the unit,
2. remove the old battery from the connector,
3. snap a new battery into the same connector and
4. reclose the battery cover.

CAUTION

FAILURE TO TURN OFF THE MULTIMETER/THERMOMETER BEFORE INSTALLING THE BATTERY COULD RESULT IN DAMAGE TO THE INSTRUMENT AND THE BATTERY.

IF THE BATTERY IS CONNECTED INCORRECTLY, YOU COULD DAMAGE THE INSTRUMENT.

A replacement 9V lithium battery may be ordered from OMEGA ENGINEERING (part no. U9VL).

SECTION 5. CALIBRATION

Under normal operating conditions, the meter should be calibrated once a year to maintain the specifications. Use the following procedure to calibrate the meter. This procedure assumes an ambient temperature of $23 \pm 2^{\circ}\text{C}$ (70° to 77°F) and a relative humidity of less than 80%. The temperature of the units should be allowed to stabilize for at least 30 minutes before calibration begins. Refer to Figure 5-1.

1. DCV CALIBRATION PROCEDURE

- A. Set Function/Range Switch to DC 200mV range.
- B. Input 190.0mV DC from calibrator.
- C. Read display and adjust R45 for 189.9–190.1 display reading.

2. PEAK-HOLD AC CURRENT ZERO ADJUST PROCEDURE.

- A. Set Function/Range Switch to AC 200A range.
- B. Display will read 00.0. Press the peak-hold switch to peak-hold position and adjust R19 for 00.0 display reading.
- C. Release the peak-hold function.

3. AC CURRENT CALIBRATION PROCEDURE

- A. Set Function/Range Switch to AC 200A range.
- B. AC 10A (50Hz or 60Hz) current flow through 10 turn conductor wire from calibrator.
- C. Press the trigger to open the transformer jaws and clamp the 10 turn conductor wire, (conductor in center of jaws will increase the accuracy).
- D. Read display and adjust R50 for 99.9–100.1 display reading.

4. PEAK-HOLD AC CURRENT CALIBRATION PROCEDURE.

This procedure is a continuation of AC current calibration procedure.

- E. Press the peak-hold switch to peak-hold position.
- F. Read display and adjust R21 for 99.9–100.1 display reading.

5. TEMPERATURE ZERO ADJUST PROCEDURE

- A. Set Function/Range Switch to 200°C range.
- B. Immerse the probe tip into 0°C bath for 30 seconds.
- C. Adjust R66 (200ΩVR) for 00.0 display reading.
- D. Set Function/Range Switch to 200°F range.
- E. Adjust R73 (250KVR) for 32.0 display reading.

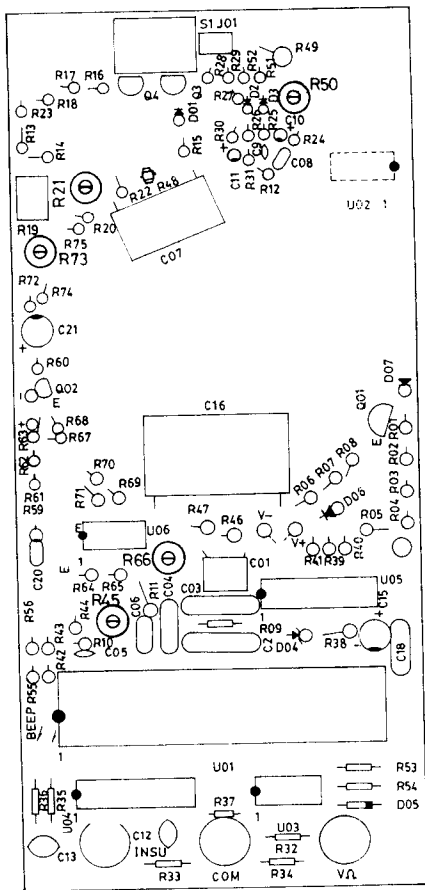


Figure 5-1. Board Layout

SECTION 6. SPECIFICATIONS

The following specifications assume a 1-year calibration cycle and an operating temperature of 18°C to 28°C (64°F to 82°F) at relative humidity up to 80% unless otherwise noted.

6.1 AC Current (Average sensing, calibrated to rms of sine wave)

Range	Resolution	Accuracy (50Hz–60Hz)
20A	10mA	± (3% of reading +5 digits)
200A	100mA	± (2% of reading +5 digits)
1000A	1A	± (2% of reading +5 digits) for 800A and below ± (3% of reading +5 digits) for other current.
Overload Protection:		1200A within 60 seconds.
Jaw Opening:		2" (5cm)

6.2 AC Current (Peak hold function)

Range	Resolution	Accuracy (50Hz–60Hz)
20A	10mA	± (6% of reading +10 digits)
200A	100mA	± (4% of reading +10 digits)
1000A	1A	± (4% of reading +10 digits) for 800A and below. ± (6% of reading +10 digits) for others
Display reading:		Peak value, calibrated to rms of since wave.
Acquisition time:		100mS
Display decay Rate:		< 4-digit per 60 seconds.
Application:		use for measuring transient signal

6.3 Insulation Test (With optional 500V insulation tester unit, Model HHM59-IT).

Range	Resolution	Accuracy
20M Ω	10K Ω	\pm (2% of reading +2 digits)
2000M Ω	1M Ω	\pm (4% of reading +2 digits) for 500M Ω and below. \pm (5% of reading +2 digits) for others.

6.4 AC Voltage (Average sensing, calibrated to rms of sine wave)

Range	Resolution	Accuracy (50Hz--500Hz)
200V	0.1V	\pm (1.2% of reading + 10 digits)
750V	1V	\pm (1.2% of reading + 10 digits)

Input impedance: 450K Ω on all ranges.
Overload Protection: 750V AC/DC on all ranges.

6.5 DC Voltage

Range	Resolution	Accuracy
200mV	100 μ V	\pm (0.5% of reading + 1 digit)
20V	10mV	\pm (0.5% of reading + 1 digit)
1000V	1V	\pm (0.5% of reading + 1 digit)

Overload protection: 1000V DC/peak AC on all ranges.
Input impedance: 1M Ω on all ranges.

6.6 Resistance

Range	Resolution	Accuracy
200 Ω	0.1 Ω	\pm (1% of reading, + 3 digits)
20K Ω	10 Ω	\pm (1% of reading + 2 digits)
2M Ω	1K Ω	\pm (1% of reading + 2 digits)

Overload protection: 500V DC/rms AC on all ranges.
Open circuit voltage: $<0.35V$ on all ranges, except $<3.2V$ on 200 Ω range. The low power ohm ranges will not turn on silicon junction, so in-circuit resistance measurements can be made with these ranges.

6.7 Continuity Test

Range: 200 Ω
Buzzer sound: With resistance less than 100 Ω .
Overload Protection: 500V DC/rms AC.

6.8 Temperature

Range	Resolution	Accuracy
200 $^{\circ}C$	0.1 $^{\circ}C$	\pm (2% of reading + 1 $^{\circ}C$)
750 $^{\circ}C$	1 $^{\circ}C$	\pm (3% of reading + 1 $^{\circ}C$)
200 $^{\circ}F$	0.1 $^{\circ}F$	\pm (2% of reading + 2 $^{\circ}F$)
1400 $^{\circ}F$	1.1 $^{\circ}F$	\pm (3% of reading + 2 $^{\circ}F$)

Overload protection: 60VDC/24CAC on all ranges

6.9 Environment

Temperature	
Normal Operation:	18°C–28°C (64°F–82°F)
Usable condition:	0°C–50°C (32°F–122°F)
Storage:	–20°C –+60°C (–30°F–140°F) battery removed and < 80% R.H.
Relative Humidity:	max. 80%
Temperature Coefficient:	Less than 0.15 times the applicable accuracy specifica- tion for 0°C to 18°C (32°F to 64.4°F) and 28°C to 50°C (82.4°F to 122°F).


6.10 Function Characteristics

Measurement method:	Dual slope integration.
Reading Rate:	3 readings/Sec.
Polarity:	Automatic, indicated minus, assumed plus.
Overload indication:	Blanking of all digits, except MSD, decimal point and polarity sign.
Power requirements:	9V Battery.
Battery life:	Up to 200 hours typical with Alkaline. Up to 150 hours typical with Zinc carbon.
Battery indication:	Display indicates LO BAT when approximately 20% of battery life remains.
Display:	LCD, 3-1/2 digit (1999 count), 0.5" high.

Dimension: 9" L x 2.7" W x 1.5" H.
(23cm L x 7cm W x 3.7" H)
approx

Weight: 11 ounces (310 grams)
including battery, approx.

6.11 Input Overload Protection

The symbol  on the front panel of the instrument is an international symbol meaning "REFER TO OPERATION INSTRUMENTS" Warning and safety precautions to avoid personal injury and instrument damage.

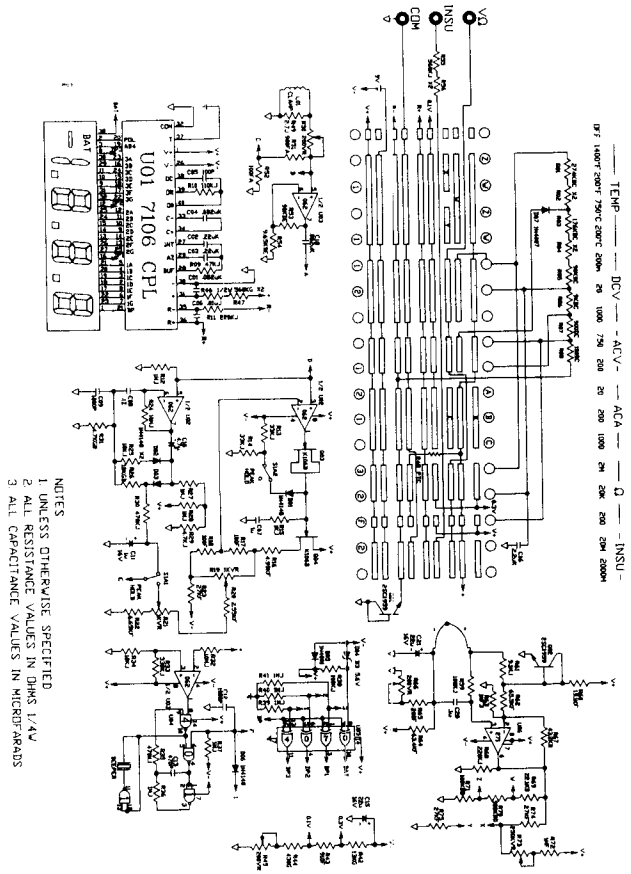
Caution:

Exceeding the maximum input overload limits can damage the meter. Each measurement function equipped with input overload protection. The overload limits for each function and range are as follows:

Function	Range	Input	Max. Input
DC V	200mV 20V 1000V	V Ω and COM	500V DC, 350V AC (15 Sec. 200mV Range) 1200V DC, 850V AC (all other Ranges)
ACV	200V, 750V	V Ω and COM	1200V DC, 850V AC
ACA	20A, 200A, 1000A		1200A
Ω Continuity Test	200 Ω , 20K Ω , 2M Ω)	V Ω and COM	500V DC/rms AC
Insulation Tester	20M Ω 2000M Ω	V Ω and COM EXT and COM	500V DC/rms AC
Temperature	200°C, 750°C 200°F, 1400°F	Temperature Female Connector	60VDC/24VAC

To avoid electrical shock and/or instrument damage do not connect the COM input terminal to any source of more than 500 volts DC or AC rms above earth ground.

SECTION 7. SCHEMATICS



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TEMPERATURE

- Thermocouple, RTD & Thermistor Probes, Connectors, Panels & Assemblies
- Wire: Thermocouple, RTD & Thermistor
- Calibrators & Ice Point References
- Recorders, Controllers & Process Monitors

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- Instrumentation

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WARRANTY

OMEGA warrants this unit to be free of defects in materials and workmanship and to give satisfactory service 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 our customers receive maximum coverage on each product. If the unit should malfunction, it must be returned to the factory for evaluation. Our 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. However, 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 or which are damaged by misuse are not warranted. These include contact points, fuses, and triacs.

THESE UNITS ARE INHERENTLY DANGEROUS AND ARE INTENDED TO BE INSTALLED AND USED ONLY BY QUALIFIED PERSONNEL. NO WARRANTY EXTENDED HEREIN WILL APPLY IF SUCH UNIT IS INSTALLED OR USED BY UNQUALIFIED PERSONNEL. THERE ARE NO WARRANTIES EXCEPT AS STATED HEREIN. THERE ARE NO OTHER WARRANTIES, EXPRESSED OR IMPLIED, INCLUDING BUT NOT LIMITED TO THE IMPLIED WARRANTIES OF MERCHANTABILITY AND OF FITNESS FOR A PARTICULAR PURPOSE. OMEGA ENGINEERING, INC. IS NOT RESPONSIBLE FOR ANY DAMAGES OR LOSSES CAUSED TO OTHER EQUIPMENT, WHETHER DIRECT, INDIRECT, INCIDENTAL, SPECIAL, OR CONSEQUENTIAL, WHICH THE PURCHASER MAY EXPERIENCE AS A RESULT OF THE INSTALLATION OR USE OF THE PRODUCT. THE BUYER'S SOLE REMEDY FOR ANY BREACH OF THIS AGREEMENT BY OMEGA ENGINEERING, INC. OR ANY BREACH OF ANY WARRANTY BY OMEGA ENGINEERING, INC. SHALL NOT EXCEED THE PURCHASE PRICE PAID BY THE PURCHASER TO OMEGA ENGINEERING, INC. FOR THE UNIT OR UNITS OR EQUIPMENT DIRECTLY AFFECTED BY SUCH BREACH.

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And International TELEX: 996404 FAX: (203) 359-7700

Return Requests/Inquiries:

Direct all warranty and repair requests/inquiries to OMEGA Customer Service Department, telephone number (203) 359-1660. BEFORE RETURNING ANY INSTRUMENT, PLEASE CONTACT THE OMEGA CUSTOMER SERVICE DEPARTMENT TO OBTAIN AN AUTHORIZED RETURN (AR) NUMBER. The designated AR number should then be marked on the outside of the return package.

To avoid processing delays, also please be sure to include:

1. Returnee's name, address, and phone number.
2. Model and Serial numbers.
3. Repair instructions.

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

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