OMEGA

HHM31
Digital Multimeter

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OMEGA

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SAFETY INFORMATION

The following safety information must be observed to ensure maximum personal safety during the operation of this meter:

1. Do not use the meter if the meter or test leads look damaged, or if you suspect that the meter is not operating properly.
2. This meter is not recommended for high voltage industrial use; for example, not for measurements of 440 VAC or 600 VAC industrial power mains. The unit is intended for use with low energy circuits to 600VDC or AC or high energy circuit to 250 VAC or DC. Accidental misuse by connection across a high voltage, high energy power source when the meter is set up for mA measurement may be very hazardous.
3. Turn off power to the circuit under test before cutting, unsoldering, or breaking the circuit. Small amounts of current can be dangerous.
4. Use caution when working above 60V dc or 30V ac rms. Such voltages pose a shock hazard.
5. When Using the probes, keep your fingers behind the finger guards on the probes.
6. Measuring voltage which exceeds the limits of the multimeter may damage the meter and expose the operator to a shock hazard. Always recognize the meter voltage limits as stated on the front of the meter.
7. If the equipment is used in a manner not specified by the manufacturer, the protection provided the equipment may be impaired.

SPECIFICATIONS

Display: 3½ digit liquid crystal display (LCD) with a maximum reading of 1999.
Polarity: Automatic, positive implied, negative polarity indication.
Overrange: (OL) or (-OL) is displayed.
Zero: Automatic.
Low battery indication: the "🔋" is displayed when the battery voltage drops below the operating level.
Measurement rate: 2.5 times per second, nominal.
Operating Environment: 0°C to 40°C at < 70% relative humidity.
Storage Temperature: -20°C to 60°C, 0 to 80% R.H. with battery removed from meter.
Accuracy: Stated accuracy at 23°C ± 5°C, <75% relative humidity.
Safety: According to EN61010-1 protection class II overvoltage category (CAT II 600V) pollution degree 2.
Power: single standard 9-volt battery, NEDA 1604, JIS 006P, IEC 6F22.
Battery life: 200 hours typical.
Dimensions: 192mm (H) x 91mm (W) x 52.5mm (D).
Weight: 365g including battery.
Accessories: One pair test leads, One spare fuse installed, 9V battery and Operating Instructions.

DC VOLTS
Ranges: 200mV,2V,20V,200V,600V
Resolution: 100µV
Accuracy: ±(0.35%rdg + 1dgt)
Input impedance: 10MW
Overload protection: 500VDC or AC rms on 200mV range
600VDC or AC rms on all other ranges

AC VOLTS (50Hz - 500Hz)
Ranges: 200mV,2V,20V,200V,600V
Resolution: 100µV
Accuracy: ±(1.0%rdg + 4dgts) on 200mV to 200V ranges
±(2.0%rdg + 4dgts) on 600V range
Input impedance: 10MW
Overload protection: 500VDC or AC rms on 200mV range
600VDC or AC rms on all other ranges

DC CURRENT
Ranges: 200µA,20mA,200mA,10A
Accuracy: ±(0.5%rdg + 1dgt) on µA,mA ranges
±(3.0%rdg + 1dgt) on 10A range
Input protection: 0.5A / 250V fast blow ceramic fuse
10A / 600V fast blow ceramic fuse

AC CURRENT (50Hz - 500Hz)
Ranges: 200µA,20mA,200mA,10A
Accuracy: ±(1.2%rdg + 4dgts) on µA,mA ranges
±(3.5%rdg + 4dgts) on 10A range
Input protection: 0.5A / 250V fast blow ceramic fuse
10A / 600V fast blow ceramic fuse

RESISTANCE

Ranges: 200Ω,2KΩ,20KΩ,200KΩ,2MΩ,20MΩ
Accuracy: ±(0.4%rdg + 4dgts) on 200Ω range
±(0.4%rdg + 1dgt) on 2KΩ to 2MΩ ranges.
±(3.0%rdg + 4dgts) on 20MΩ range
Open circuit volts: 0.3Vdc (3.0Vdc on 200Ω range)
Overload protection: 500VDC or AC rms

CONTINUITY

Audible indication: less than 100Ω
Overload protection: 500VDC or AC rms

DIODE TEST

Test current: 1.0mA±0.6mA
Accuracy: ±(3.0%rdg + 3dgt)
Open circuit volts: 3.0Vdc typical
Overload protection: 500VDC or AC rms

CAPACITANCE

Ranges: 2nF,20nF,200nF,2µF,20µF
Accuracy: ±(2.0%rdg + 10dgts)
Test frequency: 2.5Hz

FREQUENCY (Autoranging)
Ranges: 2KHz,20KHz,200KHz,2000KHz,15MHz
Accuracy: ±(0.1%rdg + 1dgt)
Sensitivity: 2.0Vrms min
Overload protection: 500VDC or AC rms
Effect Reading: 10 - 1999

TEMPERATURE ELECTRICAL
Temperature Scale: Celsius or Fahrenheit user-selectable
Measurement Range: -50°C to 1300°C, (-58°F to 2000°F)
Resolution: 1°C or 1°F, 0.1°C or 0.1°F
Accuracy: Accuracy is specified for operating temperatures over the range of 18°C to 28°C (64°F to 82°F), for 1 year, not including thermocouple error.
±(0.3%rdg + 1°C) -50°C to 1000°C
±(0.5%rdg + 1°C) 1000°C to 1300°C
±(0.3%rdg + 2°F) -58°F to 2000°F
Temperature Coefficient: 0.1 times the applicable accuracy specification per °C from 0°C to 18°C and 28°C to 50°C (32°F to 64°F and 82°F to 122°F).
Input Protection: 24V dc or 24V ac rms maximum input voltage on any combination of input pins.
Input Connector: Accepts standard miniature thermocouple connectors (flat blades spaced 7.9mm, center to center).

OPERATION

Before taking any measurements, read the Safety Information Section. Always examine the instrument for damage, contamination (excessive dirt, grease, etc.) and defects. Examine the test leads for cracked or frayed insulation. If any abnormal conditions exist do not attempt to make any measurements.

Max. Hold and Back-Light (☼>2sec) Switch :

Press "MAX" to toggle in and out of the Maximun Hold mode.(holding the highest reading.) In the MAX mode, the MAX annunciator is displayed and maximun reading are stored in display register, If the new reading is higher than the reading being displayed, the higher reading is transferred to the display register. A "higher" reading is defined as the reading with the higher absolute value.

The MAX hold function is disable in the frequency count mode, but the MAX annunciator is still displayed.

Press this button for two seconds to turn the Back-Light on. As this also activates the MAX hold mode, briefly press the button to return to normal display. The Back-Light will switch-off automatically after about 20 seconds.

T1,T2, T1-T2 Temperature Measurement

WARNING
Remove test leads being measured.

1. Set the Function/Range switch to the T1 thermocouple, T2 thermocouple or the difference between the two thermocouples (T1-T2), and The LCD indicates which is selected.
2. Selecting the Temperature Scale:
   Readings are displayed in either degrees Celsius(°C) or degrees Fahrenheit(°F). To change the temperature scale, press the "°C/°F "key.
3. Selecting the Display Resolution
   The meter allows two choices of resolution:
   High resolution: 0.1°C or 0.1°F
   Low resolution: 1.0°C or 1.0°F
   To select the alternate display resolution, press the corresponding "0.1°/ 1°" key.
4. Connect a type k thermocouple to the jack on the instrument. Place the probe or thermocouple tip on or in the material to be measured and take the temperature reading directly from the display.

Voltage Measurements

1. Connect the red test lead to the "VW" jack and the black test lead to the "COM" jack.
2. Set the Function/Range switch to the desired voltage range and press the "AC/DC" switch to toggle between the desired voltage type. If magnitude of voltage is not known, set switch to the highest range and reduce until a satisfactory reading is obtained.
3. Connect the test leads to the device or circuit being measured.
4. For dc, a (-) sign is displayed for negative polarity; positive polarity is implied.

Current Measurements

1. Set the Function/Range switch to the desired current range and press the "AC/DC" switch toggle between to the desired current type.
2. For current measurements less than 200mA, connect the red test lead to the µAmA jack and the black test lead to the COM jack.
3. For current measurements over 200mA or greater, connect the red test lead to the 10A jack and the black test lead to the COM jack.
4. Remove power from the circuit under test and open the normal circuit path where the measurement is to be taken. Connect the meter **in series** with the circuit.
5. Use caution when measuring 10 amps on 10A range for 60s, please waiting for 10 minutes for next measurement of 10 amps for safety reason.

Resistance and Continuity Measurements

1. Set the Function/Range switch to the desired resistance range or continuity position.
2. Remove power from the equipment under test.
3. Connect the red test lead to the "VW" jack and the black test lead to the "COM" jack.
4. Touch the probes to the test points. In ohms, the value indicated in the display is the measured value of resistance. In continuity test, the beeper sounds continuously, if the resistance is less than 100W.

WARNING

The accuracy of the functions might be slightly affected, when exposed to a radiated electromagnetic field environment, eg, radio, telephone or similar.

Diode Tests

1. Connect the red test lead to the "VW" jack and the black test lead to the "COM" jack.
2. Set the Function/Range switch to the " ⊣◀ " position.
3. Turn off power to the circuit under test.
4. Touch probes to the diode. A forward-voltage drop is about 0.6V (typical for a silicon diode).
5. Reverse probes. If the diode is good, "OL" is displayed. If the diode is shorted, ".000" or another number is displayed.
6. If the diode is open, "OL" is displayed in both directions.
7. If the junction is measured in a circuit and a low reading is obtained with both lead connections, the junction may be shunted by a resistance of less than 1kW. In this case the diode must be disconnected from the circuit for accurate testing.

Capacitance Measurements

1. Set the Function/Range switch to the desired capacitance range.
2. Never apply an external voltage to the ⊣⊢ sockets. Damage to the meter may result.
3. Insert the capacitor leads directly into the ⊣⊢ socket.
4. Read the capacitance directly from the display.

Frequency Measurements

1. Set the Function/Range switch to the Hz position.
2. Connect the red test lead to the "VW" jack and the black test lead to the "COM" jack.
3. Connect the test leads to the point of measurement and read the frequency from the display.

MAINTENANCE

WARNING
Remove test leads before changing battery or fuse
or performing any servicing.

Battery Replacement

Power is supplied by a 9 volt "transistor" battery. (NEDA 1604 IEC 6F22). The "🔋" appears on the LCD display when replacement is needed. To replace the battery, remove the two screws from the back of the meter and lift off the battery case. Remove the battery from battery contacts.

Fuse Replacement

If no current measurements are possible, check for a blown overload protection fuse. There are two fuses; F1 for the "mA" jack and F2 for the "10A" jack. For access to fuses, remove the four screws from the back of the meter and lift off the battery cover and case. Replace F1 only with the original type 0.5A/250V, fast acting ceramic fuse. Replace F2 only with the original type 10A/600V, fast acting ceramic fuse.

Cleaning

Periodically wipe the case with a damp cloth and detergent, do not use abrasives or solvents.

HHM31 CALIBRATION PROCEDURE

Note: Only qualified technicians who have access to the items, as following should perform the following calibration procedure.

Equipments: The class of calibrator had better 10 times greater than the measured meter.

DCV Calibration

Set the function /range to the DC 200mV，then apply 190.0mV to the V-Ω and COM input jacks.

Adjust R41 until display reads 1900±1dgt then disconnect the source from the measured meter.

DCA Calibration

Set the function /range to the 10A, set the output of the current calibrator for 1.9A, and connect it the 10A and COM jacks.

Adjust the shunt resistor until the display reads 1.9A, if the reading over 1.9A then add solder onto the shunt resistor, below 1.9A then cut CuMn Shunt Resistor slightly with diagonal cutters or shave away some of solder from the Shunt.

Temperature Calibration

Insert the K type thermocouple to the female connector, and the other side of this probe to Temperature Calibrator. We must allow the K type to stabilize for at least 1 minute and make sure “+” and “-“ polarity is right position.

1. Set the range to the T1/0.1°C, and then apply 0°C to T1 input (T2 input open) adjust R845 and R846 (fine adj.) until LCD reading reads 0.0±0.1°C.

2. Set the range to the T1/0.1°F, and then apply 0°F to T1 input (T2 input open) adjust R804 until LCD reading reads 0.0±0.1°F.

3. Set the range to the T1/0.1°F, and then apply 165°F to T1 input (T2 input open) adjust R891 until LCD reading reads 165.0±0.1°F.

4. Set the range to the T1/1°F, and then apply 1832°F to T1 input (T2 input open) adjust R824 until LCD reading reads 1832±1°F.

5. Set the range to the T1/1°C, and then apply 1000°C to T1 input (T2 input open) adjust R806 until LCD reading reads 1000±0°C.

6. Set the range to the T2/0.1°C, and then Apply 0°C to T2 input (T1 input open) adjust R82 and R83 (fine adj.) until LCD reading reads 0.0±0.1°C.

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.

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