

# OMEGA

HHM23  
Digital Multimeter



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

## **SAFETY INFORMATION**

The following safety information must be observed to insure maximum personal safety during the operation at 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.

**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:** 100 $\mu$ V

**Accuracy:**  $\pm(0.35\%rdg + 1dgt)$

**Input impedance:** 10M $\Omega$

**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:** 100 $\mu$ V

**Accuracy:**  $\pm(1.0\%rdg + 4dgts)$  on 200mV to 200V ranges  
 $\pm(2.0\%rdg + 4dgts)$  on 600V range

**Input impedance:** 10M $\Omega$

**Overload protection:** 500VDC or AC rms on 200mV range  
600VDC or AC rms on all other ranges

## DC CURRENT

**Ranges:** 200 $\mu$ A,2mA,20mA,200mA,10A

**Accuracy:**  $\pm(0.5\% dg + 1dgt)$  on  $\mu$ A,mA ranges  
 $\pm(3.0\%rdg + 1dgt)$  on 10A range.

**Input protection:** 0.5A / 250V fast blow ceramic fuse  
10A / 600V fast blow ceramic fuse

## **AC CURRENT (50Hz - 500Hz)**

**Ranges:** 200 $\mu$ A, 2mA, 20mA, 200mA, 10A

**Accuracy:**  $\pm(1.2\%rdg + 4dgts)$  on  $\mu$ A, mA ranges  
 $\pm(3.5\%rdg + 4dgts)$  on 10A range

**Input protection:** 0.5A / 250V fast blow ceramic fuse  
10A / 600V fast blow ceramic fuse

## **RESISTANCE**

**Ranges:** 200 $\Omega$ , 2K $\Omega$ , 20K $\Omega$ , 200K $\Omega$ , 2M $\Omega$ , 20M $\Omega$

**Accuracy:**  $\pm(0.4\%rdg + 4dgts)$  on 200 $\Omega$  range  
 $\pm(0.4\%rdg + 1dgt)$  on 2K $\Omega$  to 2M $\Omega$  ranges  
 $\pm(3.0\%rdg + 4dgts)$  on 20M $\Omega$  range

**Open circuit volts:** 0.3Vdc (3.0Vdc on 200 $\Omega$  range)

**Overload protection:** 500VDC or AC rms

## **CONTINUITY**

**Audible indication:** less than 100 $\Omega$

**Overload protection:** 500VDC or AC rms

## **DIODE TEST**

**Test current:** 1.0mA $\pm$ 0.6mA

**Accuracy:**  $\pm(3.0\%rdg + 3dgts)$

**Open circuit volts:** 3.0Vdc typical

**Overload protection:** 500VDC or AC rms

## **CAPACITANCE**

**Ranges:** 2nF,20nF,200nF,2 $\mu$ F,20 $\mu$ F

**Accuracy:**  $\pm(2.0\%rdg + 10dgts)$

**Test frequency:** 2.5Hz

## **FREQUENCY** (Autoranging)

**Ranges:** 2KHz,20KHz,200KHz,2000KHz,15MHz

**Accuracy:**  $\pm(0.1\%rdg + 1dgt)$

**Sensitivity:** 1.0Vrms min

**Overload protection:** 500VDC or AC rms

**Effect Reading:** 10 - 1999

## **LOGIC TEST**

**Threshold:** Logic Hi ( $2.8 \pm 0.8V$ )

Logic Lo ( $0.8 \pm 0.5V$ )

**Indication:** 40 msec beep at logic low

**Frequency response:** 20MHz

**Detectable pulse width:** 25nS

**Pulse limits:**  $>30\%$  &  $<70\%$  duty

**Overload protection:** 500VDC or AC rms

## **TRANSISTOR hFE**

**Ranges:** 0 - 1000

**Base current:** 10 $\mu$ Adc approx. ( $V_{ce}=3.0V_{dc}$ )

# 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 Feature

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.

## Voltage Measurements

1. Connect the red test lead to the "V $\omega$ " 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  $\mu$ mA 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 "V $\bar{w}$ " 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 100 $\bar{w}$ .



## 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 "V<sub>w</sub>" 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.

## **Transistor Gain Measurements**

1. Set the Function/Range switch to the desired hFE range (PNP or NPN type transistor).
2. Never apply an external voltage to the hFE sockets. Damage to the meter may result.
3. Plug the transistor directly into the hFE socket. The sockets are labeled E, B and C for emitter, base, and collector.
4. Read the transistor hFE (dc gain) directly from the display.

## **Frequency Measurements**

1. Set the Function/Range switch to the Hz position.
2. Connect the red test lead to the "V<sub>w</sub>" 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.

## **Logic Measurements**

1. Set the Function/Range switch to the LOGIC position.
2. Connect the red test lead to the "V<sub>w</sub>" jack and the black test lead to the "COM" jack.
3. Connect the red test lead to the test point and the black lead to the common buss of the logic circuit.
4. A " ▲ " on the display indicates TTL logic high and a " ▼ " indicates a TTL logic low. Both indicators are on when the point of measurement is toggling high and low.

# 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.

## 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.

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## 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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