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ME36/0401



HHM290
TrueRMS Supermeter®



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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 application.

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.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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PATENT NOTICE:

U.S. PAT. 6,095,682; 6,123,453; B1 5,368,392; 5,524,984; 5,727,880; 5,465,838; 5,823,678; 5,823,679
European Patent No. 0644408 Other Patents Pending.

SAFETY INFORMATION

- Do Not use the meter if the meter or the test leads look damaged, or if you suspect that the meter is not operating properly.
- This meter is not recommended for high voltage industrial use. For example, it is not recommended for 440 VAC or 600 VAC industrial power mains measurement. The unit is intended for use as follows:
 - Low energy circuits up to 1000 VDC or 750 VAC.
 - High energy circuits up to 250 VAC or VDC.
 Accidental misuse by connection across a high voltage, high energy power source when the meter is set up for current (mA) measurement may be very hazardous.
- Do Not Operate the meter with the two test leads and the thermocouple probe connected at the same time. Unplug the test leads from the meter before making thermocouple temperature measurement. Unplug the thermocouple probe from the meter before making other types of measurements.
- Use caution when working above 60 VDC or 30 VAC. Such voltages pose a shock hazard.
- Turn off power to the circuit under test before cutting, unsoldering, or breaking the circuit. Small amounts of current can be dangerous.
- When using the test leads, keep your fingers behind the finger guards.
- Measuring voltages which exceeds the limits of this multimeter may damage the meter and expose the operator to a shock hazard. Always recognize the voltage limits as stated in this manual and on the meter.

- If the equipment is used in a manner not specified in this manual, the protection provided by the equipment may be impaired.
- Do Not Operate the meter in flammable or explosive environments.
- Protect the meter from moisture.
- Operate the meter with the two test leads provided.
- Do Not Operate the meter when the Battery Door is open.

ACCESSORIES	
Model No.	Description
HHM290-SC	Soft Carrying Case
HHM-TL	Replacement Test Leads
OS520-Adapter-110V	110 VAC Adapter, 9 VDC @ 200mA
OS520-Adapter-220V	220 VAC Adapter, 9 VDC @ 200mA

 **CAUTION**

- USE OF CONTROLS OR ADJUSTMENTS OR PERFORMANCE OF PROCEDURES OTHER THAN THOSE SPECIFIED HERE MAY RESULT IN HAZARDOUS LASER RADIATION EXPOSURE.
- DO NOT LOOK AT THE LASER BEAM COMING OUT OF THE LENS OR VIEW DIRECTLY WITH OPTICAL INSTRUMENTS. EYE DAMAGE CAN RESULT.
- USE EXTREME CAUTION WHEN OPERATING THE LASER SIGHTING.
- NEVER POINT THE LASER BEAM AT A PERSON.
- KEEP OUT OF REACH OF ALL CHILDREN.
- DO NOT ATTEMPT TO OPEN THE MULTI-METER OR LASER SIGHTING THERE ARE NO USER-SERVICEABLE PARTS.
- DO NOT OPEN BATTERIES, DISPOSE OF IN FIRE, HEAT ABOVE 100°C (212°F), EXPOSE CONTENTS TO WATER, RECHARGE, PUT IN BACKWARDS, MIX WITH USED OR OTHER BATTERY TYPES. IT MAY EXPLODE OR LEAK AND CAUSE PERSONAL INJURY.
- DO NOT USE THE METER NEAR ANY DEVICE THAT GENERATES STRONG ELECTROMAGNETIC RADIATION, IT MAY CAUSE TEMPORARY ERROR IN READING.

 **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 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.

MAINTENANCE

WARNING

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

Battery Replacement

Power is supplied by 6 pcs 1.5V (AA size) battery (UM-3 R6). 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.

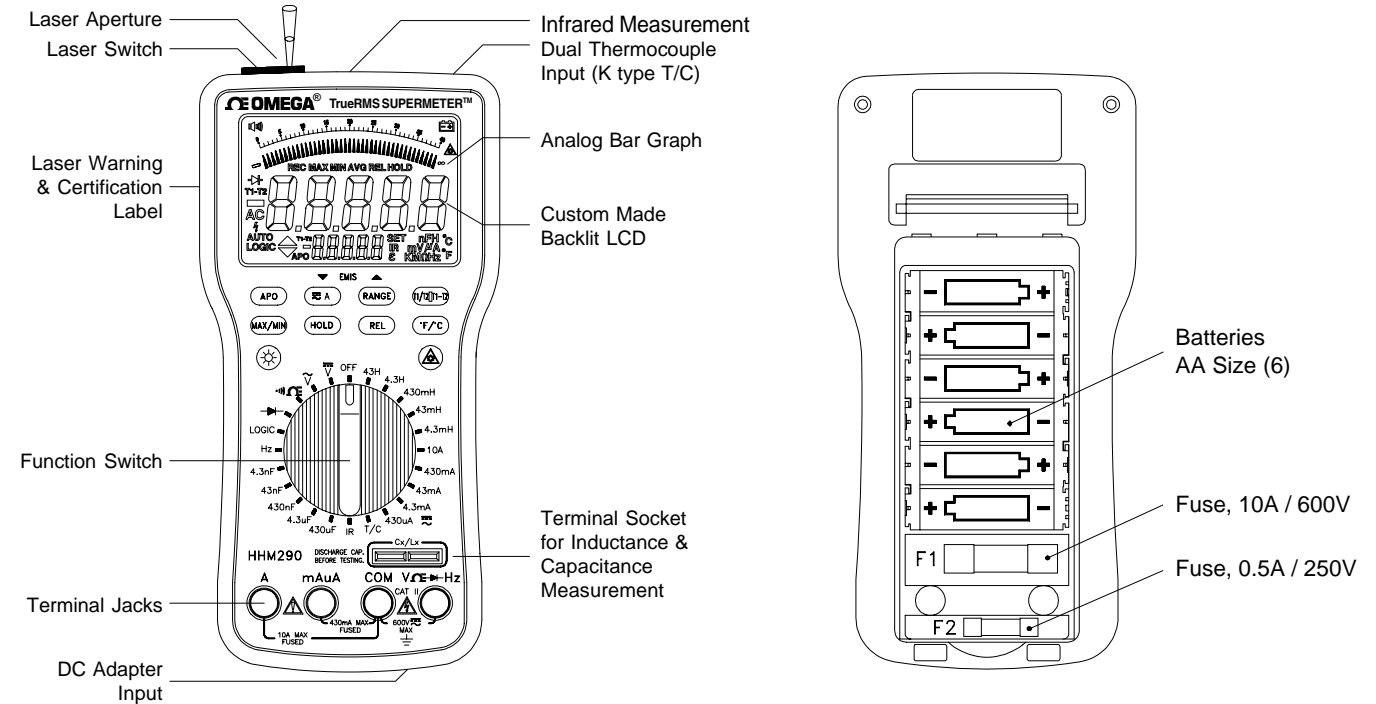
Fuse Replacement

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 two screws from the back of the meter and lift off the battery case. Replace F1 only with the original type 10A/600V, fast acting fuse. Replace F2 only with the original type 0.5A/250V, fast acting ceramic fuse.

Cleaning








Periodically wipe the case with a damp cloth and detergent, do not use abrasives or solvents. Clean the front lens by blowing off loose particles or using a damp, soft, clean cloth.

Back View Of Supermeter Battery Door Open



Safety Warnings and IEC Symbols


This device is marked with international safety and hazard symbols in accordance with IEC 1010. It is important to read and follow all precautions and instructions in this manual before operating or commissioning this device as it contains important information relating to safety and EMC. Failure to follow all safety precautions may result in injury and or damage to your equipment. Use of this device in a manner not specified by the manufacturer may impair protection provided within the unit.



IEC symbols	Description
	Caution-Risk of Electric shock
	Caution-Refer to Accompanying documents
	Direct Current
	Alternating Current
	Earth (Ground) Terminal
	Equipment protected throughout by Double Insulation
	Laser Symbol


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. For normal operation when changing ranges through OFF range, please wait for one second.

FUNCTIONS OF BUTTONS


 **Button**
When the unit is turned on, the Auto Power-On (APO) mode is disabled meaning that the meter shuts itself off after about 30 minutes of continuous operation. This feature saves battery life if the meter is un-attended.

Pressing the  button, enables the APO mode, and an APO icon appears on the display meaning that the meter will not shut itself off unless it is turned off by the user. This feature is also desirable when the meter is used to monitor a parameter for an extended period of time. Using the DC adapter, it will take over the battery power to save battery life. Pressing the  button again will disable the APO mode.

 **Button (Double Duty)**
Pressing this button will toggle between AC and DC current measurement. In infrared temperature measurement "IR" mode, pressing this button decreases the Emissivity value of the target.

How to specify the target emissivity

In order to determine an unknown target Emissivity:

1. Set the Function switch to T/C.
2. Plug in a K type surface thermocouple probe to the meter.
3. Measure the target temperature using the surface probe.
4. Unplug the surface probe from the meter.
5. Set the Function switch to IR.
6. Aim at the target. Press & hold the  button to turn on the laser beam for positioning.
7. Adjust the Emissivity button until the meter reads the same temperature measured via the thermocouple probe. Read the new Emissivity setting.

Measurement Considerations

1. Theory of Measurement

Every object emits infrared energy in accordance with its temperature. By measuring the amount of this radiant energy, it is possible to determine the temperature of the emitting object.

2. About Infrared

Infrared radiation is a form of light (electromagnetic radiation), and has the property that it passes easily through air while it is easily absorbed by solid matter. With an emission thermometer which operates by detecting infrared radiation accurate measurement is possible, irrespective of the air temperature or the measurement distance.

3. Emission Thermometer Structure

Infrared radiation which has been emitted from the object is focused upon an infrared radiation sensor, via an optical system. This includes a lens which is transparent to infrared radiation, and 5.3µm cut off filter. The output signal from the infrared radiation sensor is input to an electronic circuit along with the output signal from a standard temperature sensor (Thermopile).

4. Emissivity

All objects emit invisible infrared energy. The amount of energy emitted is proportional to the object's temperature and its ability to emit IR energy. This ability, called emissivity, is based upon the material that the object is made of and its surface finish. Emissivity values range from 0.10 for a very reflective object to 1.00 for a black body. Factory set emissivity value of 0.95, which cover 90% of typical applications.

5. If the surface to be measured is covered by frost or other material, clean it to expose the surface.
6. If the surface to be measured is highly reflective, apply masking tape or matt finish black paint to the surface.
7. If the meter seems to be giving incorrect readings check the front lens. There may be condensation or debris obstructing the lens; clean per instructions in the maintenance section.

Substance	Thermal emissivity	Substance	Thermal emissivity
Asphalt	0.90 to 0.98	Cloth (black)	0.98
Concrete	0.94	Human skin	0.98
Cement	0.96	Lather	0.75 to 0.80
Sand	0.90	Charcoal (powder)	0.96
Earth	0.92 to 0.96	Lacquer	0.80 to 0.95
Water	0.92 to 0.96	Lacquer (matt)	0.97
Ice	0.96 to 0.98	Rubber (black)	0.94
Snow	0.83	Plastic	0.85 to 0.95
Glass	0.90 to 0.95	Timber	0.90
Ceramic	0.90 to 0.94	Paper	0.70 to 0.94
Marble	0.94	chromium oxides	0.81
Plaster	0.80 to 0.90	Copper oxides	0.78
Mortar	0.89 to 0.91	Iron oxides	0.78 to 0.82
Brick (red)	0.93 to 0.96	Textiles	0.90

INFRARED ELECTRICAL

Temperature Range: -20°C to 550°C / -4°F to 1022°F

Display Resolution: 1°C / 1°F

Accuracy: 2% of reading or 3°F, whichever is greater, at 72°F ambient and Emissivity of 0.95 or greater

Temperature Coefficient: ±0.2% of reading or ±0.36°F/0.2°C, per °F/°C change in ambient temperature whichever is greater, above 82.4°F/28°C or below 64.4°F/18°C ambient temperatures

Response Time: 1.5 seconds

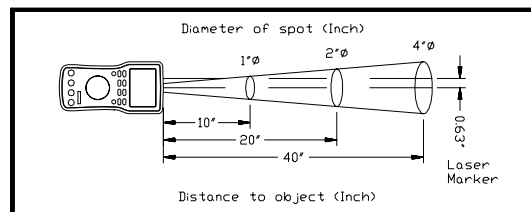
Spectral Response: 6 to 14µm nominal

Emissivity: 0.10 to 1.00 by step of 0.01

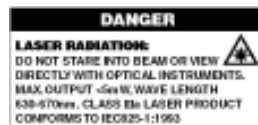
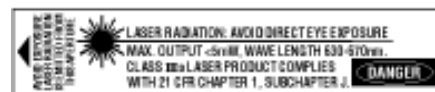
Detection Element: Thermopile

Optical Lens: Fresnel Lens

Field of View: 100mmØ at 1000mm (2.5"Ø at 25")



Spot size increases with distance from the probe tip as shown
(Spot Diameter measured at 90 % Energy)



K-type thermocouple ELECTRICAL

Temperature Scale: Celsius or Fahrenheit user-selectable

Measurement Range:

Thermocouple Range

K-TYPE -200°C to 1372°C, -328°F to 1999°F

Auto range: 0.1°C/1°C, 0.1°F/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.

±(0.1%rdg + 1°C) on -60°C to 1372°C

±(0.1%rdg + 2°C) on -60°C to -200°C

±(0.1%rdg + 2°F) on -76°F to 2501°F


±(0.1%rdg + 4°F) on -76°F to -328°F



Temperature Coefficient: ±0.2% of reading or ±0.36°F/0.2°C, whichever is greater, change in accuracy per °F/°C change in ambient operating temperature above 82.4°F/28°C or below 64.4°F/18°C.

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), SMP type.

Button (Double Duty)

Press  button to select the Manual Range mode and turn off the "AUTO" annunciator.


In the Manual Range mode. Each time you press  button, the range (and the input range annunciator) increments, and a new value is displayed. To exit the Manual Range mode and return to autoranging, press and hold down  button for 2 seconds. The "AUTO" annunciator turns back on.



In infrared temperature measurement "IR" mode, pressing this button increases the Emissivity value of the target.

Button


In thermocouple temperature "T/C" mode, pressing this button scrolls thru T1, T2, and (T1-T2) temperature readings.


Button

Press  to enter the MAX MIN AVG Recording mode (manual range only). The "REC", "APO" annunciator turns on and tenable the APO mode. Meter do not take records when the display reads overrange (+/- OL).


Push  to cycle through the maximum(MAX), minimum(MIN), average(AVG) and present readings. Press and hold down the  for 2 seconds to exit and erase recorded reading.


Button

Pressing the  key to enter the Data Hold mode, the "HOLD" annunciator is displayed. When HOLD mode is selected, the meter held the present readings and stops all further measurements.

Pressing the  key again to cancel HOLD mode causing meter to resume taking measurements.

Button


Press  to enter the Relative mode, zero the display, and store the displayed reading as a reference value. The relative mode annunciator "REL" is displayed.

Press  again to exit the relative mode.

Button

Pressing this button toggles the temperature display between Degrees Celsius(°C) or Degrees Fahrenheit(°F).

Button

Press  button to toggle on and off of display backlight. The backlight will switch-off automatically after 30 seconds.

Button

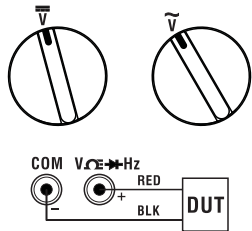
Press & hold to turn on the laser beam. Release the button to turn off the laser beam. When the laser beam is on, a laser icon appears on the display.

There is a switch in front of the laser aperture select between laser Dot or laser Circle.

Note: Unplug any thermocouple probes from the thermocouple input sockets before making any other types of measurements.

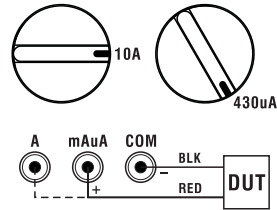
Voltage Measurements

1. Connect the red test lead to the "V Ω Hz" jack and the black test lead to the "COM" jack of the multimeter.
2. For DC measurement, set the Function switch "V" position. For AC measurement, set the Function switch "V" position.
3. Connect the other end of the test leads to the device or circuit being measured.



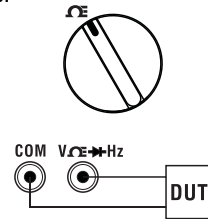
Current Measurements

1. Set the Function switch anywhere from 430 μ A to 10A depending on the range.
2. In the 10A position, connect test leads to "A" and "COM" jacks. In lower ranges, connect test leads to "mA μ A" & "COM" jacks.
3. For AC measurement, press the (E/A) button, and an AC icon will appear on the display.
4. Connect the multimeter **in Series** with the circuit being measured.



Resistance & Continuity Measurements

1. Set the Function switch to the resistance position.
2. Remove power from the device or circuit under test.
3. Connect the test lead to the "V Ω Hz" & "COM" jacks.
4. The beeper sounds once, if the resistance being measured is less than 30 Ohms.



CONTINUITY

Audible indication: <30 Ω
Overload protection: 500VDC or AC rms

DIODE TEST

Accuracy: $\pm(3.0\%rdg + 3dgt)$
Resolution: 100 μ V
Test current: 1.0 \pm 0.6mA
Test voltage: <3.5V

LOGIC TEST

Threshold: Logic Hi(\blacktriangle) (2.8 \pm 0.8V)
 Logic Lo(\blacktriangledown) (0.8 \pm 0.5V)
Frequency response: 20MHz
Detectable pulse width: 25nS
Pulse limits: >30% & <70% duty
Overload protection: 500VDC or AC rms

FREQUENCY

Ranges: 100Hz,1000Hz,10KHz,100KHz,500KHz
Resolution: 0.01Hz (under 100Hz)
Accuracy: $\pm(0.1\% rdg + 3dgt)$
Sensitivity: 1Vrms min
Overload protection: 500VDC or AC rms

CAPACITANCE

Ranges: 4.3nF,43nF,430nF,4.3 μ F,430 μ F
Resolution: 0.1pF
Accuracy: $\pm(5.0\%rdg + 10dgt)$
Test frequency: 4.3nF,43nF ranges 1KHz
 430nF,4.3 μ F ranges 270Hz
 430 μ F range 27Hz

INDUCTANCE

Ranges: 4.3mH,43mH,430mH,4.3H,43H
Resolution: 1 μ H
Accuracy: $\pm(5.0\%rdg + 20dgt)$ on 4.3mH range
 $\pm(5.0\%rdg + 10dgt)$ on 43mH to 43H ranges
Test frequency: 4.3mH,43mH ranges 1KHz
 430mH,4.3H ranges 270Hz
 43H range 27Hz
Test conditions: quality factor > 5 in 270Hz

LASER SIGHTING

Laser sighting: 12 point Laser circle
Wavelength(Color): 650-670nm(RED)
Operating distance: 2 to 25 feet
Maximum Optical Power output: <5mW at 75°F ambient
 temperature Class IIIa Laser Product
Safety Classification: Class 3A
FDA Classification: Complies with 21 CFR Chapter 1,
 Subchapter J

DC VOLTS

Ranges: 430mV(manual),4.3V,43V,430V,1000V

Resolution: 10µV

Accuracy: ±(0.25%rdg + 1dgt)

Input impedance: >10MΩ

Overload protection: 1000VDC or 750VAC rms

Low Energy circuits: Up to 1000VDC

High Energy circuits: Up to 250VDC

AC VOLTS (50Hz-2KHz)

Ranges: 400mV(manual),4.0V,40V,400V,750V

Resolution: 10µV

Accuracy: ±(% of reading+no. of digits)

Range	50Hz-100Hz	100Hz-500Hz	500Hz-2KHz
400mV	±(2.0%rdg+3dgts)	N/A	N/A
4.0V	±(0.75%rdg+2dgts)		
40V			
400V			±(1.5%rdg+3dgts)
750V			

Input impedance: >10MΩ

Overload protection: 1000VDC or 750VAC rms

Low Energy circuits: Up to 750VAC

High Energy circuits: Up to 250VAC

DC CURRENT

Ranges: 430µA,4.3mA,43mA,430mA,10A

Resolution: 10nA

Accuracy: ±(0.5%rdg + 1dgt) on 430µA to 430mA ranges
±(2.0%rdg + 1dgt) on 10A range

Burden voltage: 1.4V on all ranges, except
1.5V on 10A range

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

AC CURRENT (50Hz-1KHz)

Ranges: 400µA,4.0mA,40mA,400mA,10A

Resolution: 10nA

Accuracy: ±(1.0%rdg + 2dgts) on 400µA to 400mA ranges
±(2.5%rdg + 2dgts) on 10A range

Burden voltage: 1.4V on all ranges, except
1.5V on 10A range

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

RESISTANCE

Ranges: 430Ω,4.3KΩ,43KΩ,430KΩ,4300KΩ,43MΩ

Resolution: 10mΩ





Accuracy: ±(0.3%rdg + 3dgts) on 430Ω to 4300KΩ ranges
±(1.5%rdg + 4dgts) on 43MΩ range

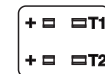
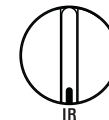
Audible indication: < 30Ω on 430Ω range

Open circuit volts: 1.2Vdc (3.0Vdc on 430Ω range)

Overload protection: 500VDC or AC rms

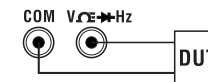
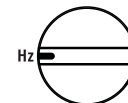
Infrared (Non-Contact) Temperature Measurements

1. Set the Function switch to "IR" position.
2. Press the  or  buttons to set the Emissivity of the target.
3. Aim at the target. Press & hold the  button to turn on the laser beam. There is a switch in front of the laser beam aperture which projects either Laser Dot or Laser Circle. The laser dot indicates the center of the optical field of view. The laser circle indicates the perimeter of the field of view. There is a 0.63 inches offset between the laser aperture and the center of the optical field of view. The laser beam only turns on when the  button is pressed & held Releasing the button turns off the laser beam.
4. The target must be larger than the optical field of view of the multimeter (Spot Size).
5. Read the temperature.





Frequency Measurements

1. Set the Function switch to the "Hz" position.
2. Connect the test leads from the point of measurement to the "V" & "COM" jacks of the meter.
3. Read the frequency.



Note: Unplug the test leads from the multimeter before making any type of thermocouple temperature measurements.

Thermocouple Temperature Measurements

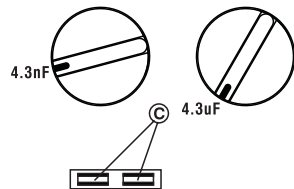
1. Set the Function switch to "T/C" position.
2. The multimeter can accept up to two K type thermocouple inputs.
3. Plug in the thermocouple probe(s) to the mating built-in connector(s) in the meter.
4. The temperature is displayed in either Degree Celsius (°C) or Degree Fahrenheit (°F). To change the temperature Engineering unit, press the  button.
5. Press the  button to display T1, T2, or T1-T2.

Note: Unplug the test leads and thermocouple probes from the multimeter before making any capacitance or inductance measurement.

Capacitance Measurements

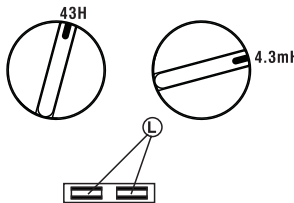
Do Not apply external voltage to the Cx Lx sockets. Make sure that the capacitor is fully discharged, otherwise damage to the meter may result.

1. Set the Function switch to the desired capacitance range (μF to nF).
2. Insert the capacitor leads into the Cx Lx sockets.
3. Read the capacitance value.



Inductance Measurements

1. Set the Function switch to the desired inductance range (mH to H).
2. Insert the inductor leads into the Cx Lx sockets.
3. Read the inductance value.



Diode Tests

1. Connect the red test lead to the "V Ω " 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 1K Ω . In this case the diode must be disconnected from the circuit for accurate testing.

Logic Measurements

1. Set the Function/Range switch to the Logic position.
2. Connect the red test lead to the "V Ω " 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 bus 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.

SPECIFICATIONS

Display: Backlit liquid crystal display (LCD) with a maximum digital reading of 43000 counts. Includes an Analog Bar Graph of 40 counts.

Display Resolution:

Range: 0-4.3 \rightarrow .0001
 0-43 \rightarrow .001
 0-430 \rightarrow .01
 0-4300 \rightarrow .1
 0-43000 \rightarrow 1

Polarity: Automatic, positive implied, negative polarity indication.

Overrange: "OL" or "-OL" is displayed.

Low battery indication: The "⚡" is displayed when the battery voltage drops below the operating level.

Measurement rate:

2/sec, nominal; 1/sec, temperature.
 20/sec, Analog display.

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 \pm 5°C, <75% relative humidity.

Safety: According to EN61010-1 protection class II overvoltage category (CAT II 600V) pollution degree 2.

Auto Power off: 30minutes after rotary switch and push button no changes. (except MAX/MIN function)

Power: 6 pcs 1.5V (AA size).

DC Adaptor :DC 9Vmin. - 12Vmax. (LOAD 50mA min.) Use a certified (CE, VDE) current limited adapter.

Battery life: 100 hours typical.

Dimensions: 202mm (H) x 100mm (W) x 50mm (D).

Weight: Approx. 18.5 oz. (525g) including battery.

Accessories: The unit comes with a protective Rubber Boot, a pair of test leads, 6 AA size Batteries, One Spare fuse, Type K Beaded wire thermocouple, and the instruction manual.

Tripod Mount: ¼" - 20 UNC.