protech

CAT III 1500V Solar PV Multimeter

HOBBYIST

User Manual

Please read and save all instructions to ensure safe and effective use of this product.

QM1506

CONTENTS

GENERAL INFORMATION & SAFETY INSTRUCTIONS

OVERVOLTAGE CATEGORY I

- Equipment of OVERVOLTAGE CATEGORY I is equipment for connection to circuits in which measures are taken to limit the transient overvoltage to an appropriate low level.
- Note – Examples include protected electronic circuits.

OVERVOLTAGE CATEGORY II

- Equipment of OVERVOLTAGE CATEGORY II is energy-consuming equipment to be supplied from the fixed installation.
- Note – Examples include household, office, and laboratory appliances.

OVERVOLTAGE CATEGORY III

- Equipment of OVERVOLTAGE CATEGORY III is equipment in fixed installations.
- Note – Examples include switches in the fixed installation and some equipment for industrial use with permanent connection to the fixed installation.

OVERVOLTAGE CATEGORY IV

- Equipment of OVERVOLTAGE CATEGORY IV is for use at the origin of the installation.
- Note – Examples include electricity meters and primary over-current protection equipment

WARNING: The manufacturer is not responsible for any potential injury from misuse.

- This meter has been designed for safe use, but must be operated with caution. The rules listed below must be carefully followed for safe operation.
- NEVER apply voltage or current to the meter that exceeds the specified maximum:
  - V DC or V AC: 1000VDC/AC rms
  - mA AC/DC: 800mA 1000V fast acting fuse
  - A AC/DC: 10A 1000V fast acting fuse (10A for 30 seconds max every 15 minutes)
  - Frequency, Resistance,Capacitance, Diode Test, Continuity: 600VDC/AC rms
  - PV 2000V DC or AC: 2000V (PV test probe)
  - Temperature:600VDC/AC rms
  - Surge Protection: 8kV peak per IEC 61010
- USE EXTREME CAUTION when working with high voltages.
- DO NOT measure voltage if the voltage on the “COM” input jack exceeds 1000V above earth ground.

- NEVER connect the meter leads across a voltage source while the function switch is in the current, resistance, or diode mode. Doing so can damage the meter.
- ALWAYS discharge filter capacitors in power supplies and disconnect the power when making resistance or diode tests.
- ALWAYS turn off the power and disconnect the test leads before opening the covers to replace the fuse or batteries.
- NEVER operate the meter unless the back cover and the battery and fuse covers are in place and fastened securely.
- If the equipment is used in a manner not specified by the manufacturer, the protection provided by the equipment may be impaired.
- Read, understand and follow Safety Rules and Operating Instructions in this manual before using this meter.
- The meter's safety features may not protect the user if not used in accordance with the manufacturer's instructions.
- Ensure that the test leads are fully seated in the input jacks and keep fingers away from the metal probe tips when taking measurements.
- Before changing functions using the selector switch, always disconnect the test leads from the circuit under test.
- Use only UL listed test leads with the proper safety category rating.
- Comply with all applicable safety codes. Use approved personal protective equipment when working near live electrical circuits - particularly with regard to arc-flash potential.
- Use caution on live circuits. Voltages above 30 V AC rms, 42 V ac peak, or 60 V dc pose a shock hazard.
- Do not use if the meter or test leads appear damaged.
- Verify operation before using meter by measuring a known live voltage.
- Do not use the meter in wet or damp environments or during electrical storms.
- Do not use the meter or near explosive vapors, dust or gasses.
- Do not use the meter if it operates incorrectly. Protection may be compromised.
- Do not operate meter while Low Battery warning is on. Replace batteries immediately.
- Do not apply voltage or current that exceeds the meter's maximum rated input limits.

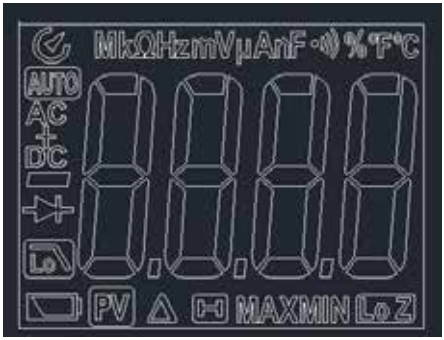
The instrument carries out the following measurements:

- DC Voltage
- AC, AC+DC TRMS Voltage
- AC/DC Current
- Low Z AC/DC Voltage
- Resistance and Continuity test
- Diode test
- Capacity
- Current and voltage frequency
- Solar power Photovoltaic Voltage
- Duty Cycle
- Temperature with K-type probe

PRODUCT OVERVIEW

NOTE: Tilt stand and battery compartment are on rear of unit

DISPLAY OVERVIEW



V	Volts
A	Amperes
~	Alternating current
⎓	Direct current
-	Minus sign
Ω	Ohms
	Continuity
	Diode test
F	Farads (capacitance)
Hz	Hertz (frequency)
%	Percent (duty ratio)
°F	Degrees Fahrenheit
°C	Degrees Centigrade
n	nano (10-9)
μ	micro (10-6)
m	milli (10-3)
k	kilo (103)

M	mega (106)
OL	Overload
	Auto Power Off
	Low battery
AUTO	Autoranging
HOLD	Display hold
	Low impedance
MAX/MIN	Maximum/Minimum
LPF	LOW PASS Filter
	Relative
AC+DC	AC + DC voltage
	Solar power Photovoltaic Voltage

BEFORE FIRST USE

Prior to using your product, please read all the safety and operating instructions thoroughly. Please ensure you follow the steps below before using the product. We recommend you keep the original packaging for storing the product when not in use.

Please pay close attention to the section entitled Important Safety and General Instructions. Find a safe and convenient place to keep this instruction manual for future reference.

Unpack the product but keep all the packaging materials until you have made sure your new product is undamaged and in good working order. Ensure you have all accessories listed in this manual. Plastic wrapping can be a suffocation hazard for babies and children so ensure all packaging materials are out of their reach.

OPERATING INSTRUCTIONS

RANGE button

The Auto range mode automatically selects the proper range for the measurement being made and is generally the best mode for most applications. For measurement situations requiring that a range be manually selected, perform the following:

1. Momentarily press the RANGE button. The “AUTO” indicator will no longer be shown on the LCD display.
2. Momentarily press the RANGE button to step through the available ranges until the desired range is selected.
3. To exit the Manual Ranging mode, press and hold the RANGE button until the “AUTO” indicator reappears.

NOTE: The range button does not work on Frequency, Duty Cycle, Capacitance or Temperature

MODE Button

Momentarily press the MODE button to select AC or DC, Frequency or Duty Cycle, Resistance, Continuity or Diode Test and °C or °F.

Voltage measurement mode, long press the MODE button 3S to skip the meter pen recognition

REL/AC + DC button

The RELATIVE function zeros out the reading on the display and stores it as a reference. Subsequent readings will be displayed as the relative difference between the actual measurement and the stored reference value. To activate, momentarily press the REL/AC + DC button. The "REL" indicator will appear on the LCD display along with the relative reading. Momentarily press the REL/HZ button again to return to normal operation.

NOTE: The meter does not Auto range when the Relative mode is active. The display will read OL if the difference exceeds the range. When this occurs, exit REL and use the RANGE button to select a higher range. REL does not work on Frequency, Duty Cycle, Temperature,or Low Z.

The AC + DC function measures both the AC and DC components to derive the effective RMS (AC + DC) value. The AC + DC mode is typically used when measuring voltage on unfiltered rectifier circuits. To activate, press and hold the REL/AC + DC button until "AC + DC" appears on the LCD display. Press and hold the REL/AC + DC button to exit AC + DC. The meter will return to AC voltage.

NOTE: AC + DC can only be accessed when the rotary function switch is set to voltage

MAX/MIN Button

1. Momentarily press the MAX/MIN button to activate the MAX/MIN mode. "MAX" will appear on the LCD display and the meter will display and hold the highest reading. The meter will update the reading when a higher "max" occurs.
2. Momentarily press the MAX/MIN button again to view the lowest reading. "MIN" will appear on the LCD display and the meter will display and hold the lowest reading. The meter will update the reading when a lower "min" occurs.
3. Momentarily press the MAX/MIN button once more to view the average reading. "AVG" will appear on the LCD display and the meter will display the running average. The meter will update the reading when the average value changes.
4. Press and hold the MAX/MIN button to end MAX/MIN and return to normal operation.

NOTE: The meter does not Autorange when the MAX/MIN mode is active. The display will read OL if the range is exceeded. When this occurs, exit MAX/MIN/AVG and use the RANGE button to select a higher range. MAX/MIN does not work on Frequency, Duty Cycle, Capacitance or Low Z.

HOLD Backlight button

To freeze the reading on the LCD display, momentarily press the HOLD button. The "HOLD" indicator will be displayed while the reading is being held. Momentarily press the HOLD button again to exit HOLD and return to normal operation.

To turn the backlight on, press and hold the HOLD button until the backlight turns on. To turn the backlight off, press and hold the HOLD button until the backlight turns off.

Flashlight/LPF Button

Momentarily press and the  LPF button to turn the flashlight on and off.

AC current mode, press the LPF button to enter the frequency conversion voltage test mode.

NOTE: The meter does not Autorange when the Peak mode is active. The display will read OL if the range is exceeded. When this occurs, exit Peak and use the RANGE button to select a higher range. Peak does not work on DCV,DCA, Frequency, Duty Cycle, Capacitanceor Low Z.

RANGE+POWER ON

Press and hold the RANGE button to power on, and the meter will cancel the current mode LEAD and FUSE alarm sounds.

HOLD+POWER ON

Press and hold the HOLD button and turn on the system, the meter will modify the priority of °C and °F

ALARM

1.LEAD ALARM

In current mode, when the pen is not inserted, the meter will display "LEAD" and beep tones; In PV mode, if no special meter pen is inserted, the meter will display "LEAD" and beep sounds; VAC/VDC, Temperature Frequency, Resistance,Capacitance, Diode Test, Continuity mode, the meter pen is inserted into the current input hole, and the meter will alternate the reading with "LEAD".

2. FUSE ALARM

In current measurement mode, if the fuse is open, the meter will display "FUSE" with a beep sound.

AC/DC Voltage Measurements

WARNING: Observe all safety precautions when working on live voltages.

1. Set the rotatory function switch to the V⎓ ~ HZ% position.
2. To select AC or DC, press the MODE button until the AC "~" or DC "⎓" symbol appears on the LCD display.
3. Insert the black test lead into the COM input jack and the red test lead into the V input jack.
4. Touch the test lead probes to the circuit under test. If measuring DC voltage, touch the red test lead to the positive side of the circuit and the black test lead to the negative side of the circuit.
5. Read the voltage on the LCD display

AC/DC PV Voltage Measurements

WARNING: Observe all safety precautions when working on live voltages. The solar test lead probes must be used, otherwise the meter keeps warning "LEAD"

1. Set the rotatory function switch to the PV position.
2. Insert the special meter pen for solar testing, automatically recognize, and you will enter the PV test interface.
3. If the fuse is blown and cannot enter, you can press and hold the MODE button for 3 seconds to force it into the test interface.
4. In this case, the corresponding button function can be operated
5. Touch the test lead probes to the circuit under test. If measuring DC voltage, touch the red test lead to the positive side of the circuit and the black test lead to the negative side of the circuit.
6. Read the voltage on the LCD display

Frequency and % Duty Cycle Measurements

WARNING: Observe all safety precautions when working on live live voltages. Do not measure frequency or duty cycle on circuits that exceed 600V.

1. Set the rotary function switch to the V ⎓ ~ HZ % position.
2. To select Frequency or % Duty Cycle, press the MODE button until the “Hz” or “%” symbol appears on the LCD display.
3. Insert the black test lead into the COM input jack and the red test lead into the V input jack.
4. Touch the test lead probes to the circuit under test.
5. Read the frequency or % duty cycle on the LCD display.

Low Z Voltage Measurements

WARNING: Observe all safety precautions when working on live voltages. Do not connect to circuits that exceed 600V AC/DC when the meter is set to Low Z. Do not use Low Z when testing circuits that could be harmed by this function’s low input impedance.

Low Z is used to check for “ghost” voltage. Ghost voltages are present when non-powered wires are in close proximity to powered wires. Capacitive coupling between wires make it appear that non-powered wires are connected to a real source of voltage. The Low Z setting places a load on the circuit, which greatly reduces the voltage reading when connected to ghost voltage.

1. Set the rotary function switch to the Low Z position.
2. Momentarily press the MODE button to select AC or DC voltage. The AC “~” or DC “⎓” symbol will appear on the LCD display.
3. Insert the black test lead into the COM input jack and the red test lead into the V input jack. If measuring DC voltage, touch the red test lead to the positive side of the circuit and the black test lead to the negative side of the circuit.
4. Touch the test leads to the circuit under test.
5. Read the voltage on the LCD display.

AC/DC Current Measurements

WARNINGS: Observe all safety precautions when working on live circuits. Do not measure current on circuits that exceed 1000V. Measurements in the 10A range should be limited to 30 seconds maximum every 15 minutes.

1. Insert the black test lead into the negative COM input jack.
2. For current measurements up to 10A, set the rotary function switch to the 10A position and insert the red test lead into the 10A input jack.
3. For current measurements up to 600mA, set the rotary function switch to the mA position and insert the red test lead into the µA mA input jack.
4. For current measurements up to 6000µA, set the rotary function switch to the µA position and insert the red test lead into the µA mA input jack.
5. Momentarily press the MODE button to select AC or DC current. The AC "~" or DC "⎓" symbol will appear on the LCD display.
6. Remove power from the circuit under test, then open up the circuit at the point where you wish to measure current.
7. Touch the test lead probes in series with the circuit being measured. For DC current, touch the red probe to the positive side of the circuit and touch the black probe to the negative side of the circuit.
8. Apply power to the circuit.
9. Read the current on the LCD display.

Resistance Measurements

WARNING: Never test resistance on a live circuit

1. Set the rotary function switch to the Ω position.
2. Momentarily press the MODE button until the Ω symbol appears on the LCD display.
3. Insert the black test lead into the COM input jack and the red test lead into the Ω input jack.
4. Touch the test lead probes to the component under test. If the component is installed in a circuit, it is best to disconnect one side before testing to eliminate interference with other devices.
5. Read the resistance in on the LCD display.

Continuity Test

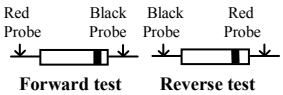
WARNING: Never test continuity on a live circuit.

1. Set the rotary function switch to the Ω position.
2. Momentarily press the MODE button until the " " symbol appears on the LCD display.
3. Insert the black test lead into the COM input jack and the red test lead into the Ω input jack.
4. Touch the test lead probes to the device or wire under test.
5. A beeper will sound if the resistance is approximately 50+_5Ωor less and the resistance value will be shown on the LCD display

Diode Test

WARNING: Never test resistance on a live circuit

1. Set the rotary function switch to the Ω position.
2. Momentarily press the MODE button until the " " symbol appears on the LCD display.
3. Insert the black test lead into the COM input jack and the red test lead into the Ω input jack.
4. Touch the test lead probes to the diode under test.
5. Forward voltage will indicate 0.4 to 0.7 on the display. Reverse voltage will indicate "OL". Shorted devices will indicate near 0 and an open device will indicate "OL" in both polarities.



Capacitance Measurements

WARNING: Safely discharge capacitors before taking capacitance measurements

1. Set the rotary function switch to the ⊣⊢ position.
2. Insert the black test lead into the COM input jack and the red test lead into the ⊣⊢ input jack.
3. Touch the test lead probes to the capacitor under test.
4. Read the capacitance value on the LCD display. It may take up to a minute to get a stable reading on large capacitors.

Temperature Measurements

WARNING: Do not touch the temperature probe to live circuits.

1. Set the rotary function switch to the °F °C position.
2. Momentarily press the MODE button to select readings in °F or °C.
3. Connect the Temperature Probe to the Banana Plug Adapter. Note the – and + markings on the adapter. Connect the adapter to the meter, making sure the – side goes into the COM input jack and the + side goes into the °F °C input jack.
4. Touch the tip of the Temperature Probe to the object being measured. Keep the probe touching the object until the reading stabilizes (about 30 sec).
5. Read the temperature on the LCD display

Battery Replacement

WARNING: To avoid electric shock, remove the test leads from the meter before removing the battery/fuse cover.

1. Lift up the tilt stand.
2. Loosen the one Phillips screw on the battery/fuse cover.
3. Remove the battery/fuse cover.
4. Replace the batteries with four AAA batteries.
5. Observe proper polarity as shown inside battery compartment.
6. Install the battery/fuse cover and tighten the screw.

WARNING: To avoid electric shock, do not operate meter until the battery/fuse cover are securely fastened to the meter.

Fuse Replacement

WARNING: To avoid electric shock, remove the test leads from the meter before removing the battery/fuse cover.

1. Lift up the tilt stand.
2. Loosen the one Phillips screw on the battery/fuse cover.
3. Remove the battery/fuse cover.
4. Gently remove fuse and install new fuse into the holder.
5. Always use a UL recognized fuse of the proper size and value: 800mA/1000V (6.3 x 32mm) fast blow for the µA/mA ranges and 10A/1000V (10 x 38mm) fast blow for the 10A range.
6. Install the battery/fuse cover and tighten the screw.

NOTE: There is a rubber cover that goes on top of the 800mA fuse. Carefully remove cover to access fuse. Reinstall cover after replacing fuse.

WARNING: To avoid electric shock, do not operate meter until the battery/fuse cover is securely fastened to the meter

SPECIFICATIONS

Accuracy is stated at 65°F to 83°F (18°C to 28°C), less than 70% relative humidity

Function	Range	Resolution	Accuracy ±(% of reading + digits)
AC Voltage	6.000V	1mV	±(1.0% + 5)
	60.00V	10mV	
	600.0V	0.1V	
	1000V	1V	±(1.2% + 5)

Input Protection: 1000V AC RMS or 1000V DC
Input Impedance: 10MΩ
AC voltage bandwidth: 50 to 1000Hz
All AC voltage ranges are specified from 5% of range to 100% of range

Function	Range	Resolution	Accuracy ±(% of reading + digits)
Low Z AC Voltage	6.000V	1mV	±(3.0% + 40)
	60.00V	10mV	
	600.0V	0.1V	

Input Protection: 600V AC RMS or 600V DC
Input Impedance: Approx. 3kΩ
AC voltage bandwidth: 50 to 1000Hz
All AC voltage ranges are specified from 5% of range to 100% of range

Function	Range	Resolution	Accuracy ±(% of reading + digits)
DC Voltage	600.0mV	0.1mV	±(0.5% + 8)
	6.000V	1mV	±(0.9% + 5)
	60.00V	10mV	
	600.0V	0.1V	
	1000V	1V	±(1.0% + 5

Input Protection: 1000V AC RMS or 1000V DC
Input Impedance: 10MΩ

Function	Range	Resolution	Accuracy ±(% of reading + digits)
Low Z DC Voltage	600.0mV	0.1mV	±(3.0% + 40)
	6.000V	1mV	
	60.00V	10mV	
	600.0V	0.1V	

Input Protection: 600V AC RMS or 600V DC
Input Impedance: Approx. 3kΩ

Function	Range	Resolution	Accuracy ±(% of reading + digits)
AC+DC Voltage	6.000V	1mV	±(3.0% + 40)
	60.00V	10mV	
	600.0V	0.1V	
	1000V	1V	±(2% + 5)

Input Protection: 1000V AC RMS or 1000V DC
Input Impedance: 10MΩ
AC voltage bandwidth: 50 to 60Hz
All AC voltage ranges are specified from 5% of range to 100% of range

Function	Range	Resolution	Accuracy ±(% of reading + digits)
PV DC Voltage	600.0mV	0.1mV	±(2% + 5)
PV AC Voltage	2000V	1V	±(2% + 5)

Need 2000V (PV test probe)

Function	Range	Resolution	Accuracy ±(% of reading + digits)
Frequency	9.999Hz	0.001Hz	±(1.0% + 5)
	99.99Hz	0.01Hz	
	999.9Hz	0.1Hz	
	9.999kHz	1Hz	

Input Protection: 600V AC RMS o 600V DC or
Sensitivity: >8V RMS

Function	Range	Resolution	Accuracy ±(% of reading + digits)
Duty Cycle	20.0% to 80.0%	0.1%	±(1.2% + 2)

Input Protection: 600V DC or 600V AC RMS
Pulse Width: 0.1 to 100mS
Frequency Range: 5Hz to 10kHz
Sensitivity: >8V RMS

Function	Range	Resolution	Accuracy ±(% of reading + digits)
AC Current	600.0µA	0.1µA	±(1.0% + 3)
	6000µA	1µA	
	60.00mA	10µA	
	600.0mA	0.1mA	
	10.00A*	10mA	±(2.0% + 8)

Overload Protection: µA/mA ranges: 800mA/1000V Fuse
10A range: 10A/1000V Fuse
AC current bandwidth: 50 to 400Hz
All AC Current ranges are specified from 5% of range to 100% of range
*10ACurrent ranges are specified from 6% of range to 100% of range

Function	Range	Resolution	Accuracy ±(% of reading + digits)
DC Current	600.0µA	0.1µA	±(1.0% + 3)
	6000µA	1µA	
	60.00mA	10µA	
	600.0mA	0.1mA	
	10.00A	10mA	±(1.5% + 3)

Overload Protection: µA/mA ranges: 800mA/1000V Fuse
10A range: 10A/1000V Fuse

Function	Range	Resolution	Accuracy ±(% of reading + digits)
Resistance	600.0Ω	0.1Ω	±(1.5% + 5)
	6.000kΩ	1Ω	
	60.00kΩ	10Ω	
	600.0kΩ	100Ω	
	6.000MΩ	1kΩ	
	60.00MΩ	10kΩ	

Input Protection: 600V DC or 600V AC RMS

Function	Range	Resolution	Accuracy ±(% of reading + digits)
Capacitance	99.99nF	10pF	±(5.0% + 35)*
	999.9nF	100pF	±(3.0% + 5)
	9.999µF	0.001µF	
	99.99µF	0.01µF	
	999.9µF	0.1µF	
	9.999mF	0.001mF	±(5.0% + 5)
	99.99mF	0.01mF	

Input Protection: 600V AC RMS or 600V DC
*Accuracy is not stated below 6nF

Function	Range	Resolution	Accuracy ±(% of reading + digits)
Temperature	-40°F to 1832°F	0.1°F-1°F	±(1.5% + 9°F)
	-40°C to 1000°C	0.1°C-1°C	±(1.5% + 5°C)

Input Protection: 600V AC RMS or 600V DC

WARRANTY

Our product is guaranteed to be free from quality and manufacturing defects for a period of 12 Months.

If your product becomes defective during this period, Electus Distribution will repair, replace, or refund where a product is faulty; or not fit for intended purpose.

This warranty will not cover modified product; misuse or abuse of the product contrary to user instructions or packaging label; change of mind and normal wear and tear.

Our goods come with guarantees that cannot be excluded under the Australian Consumer Law. You are entitled to a replacement or refund for a major failure and for compensation for any other reasonably foreseeable loss or damage. You are also entitled to have the goods repaired or replaced if the goods fail to be of acceptable quality and failure does not amount to a major failure.

To claim warranty, please contact the place of purchase. You will need to show receipt or other proof of purchase. Additional information may be required to process your claim. Should you not be able to provide proof of purchase with a receipt or bank statement, identification showing name, address and signature may be required to process your claim.

Any expenses relating to the return of your product to the store will normally have to be paid by you.

The benefits to the customer given by this warranty are in addition to other rights and remedies of the Australian Consumer Law in relation to the goods or services to which this warranty relates.

This warranty is provided by:

Electus Distribution
46 Eastern Creek Drive,
Eastern Creek NSW 2766
Ph. 1300 738 555