



INSTRUCTION MANUAL

MT22

1000V AC/DC MULTIMETER



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1. SAFETY INFORMATION

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

- Do not use the meter if the meter or test leads look damaged, or if you suspect that the meter is not operating properly.
- Never earth yourself when taking electrical measurements. Do not touch exposed metal pipes, outlets, fixtures, etc., which might be at earth potential. Keep your body isolated from earth by using dry clothing, rubber shoes, rubber mats, or any approved insulating material.
- Turn off power to the circuit under test before cutting, unsoldering, or breaking the circuit. Small amounts of current can be dangerous.
- Use caution when working above 60V DC or 30V AC RMS. Such voltages pose a shock hazard.
- When using the probes, keep your fingers behind the finger guards on the probes.
- Measuring voltage which exceeds the limits of the multimeter may damage the meter and expose the operator to a shock hazard. Always recognise the meter voltage limits as stated on the front of the meter.
- Never apply voltage or current to the meter that exceeds the specified maximum:

2. SAFETY SYMBOLS



This symbol adjacent to another symbol, terminal or operating device indicates that the operator must refer to an explanation in the Operating Instructions to avoid personal injury or damage to the meter.



This WARNING symbol indicates a potentially hazardous situation, which if not avoided, could result in death or serious injury.



This CAUTION symbol indicates a potentially hazardous situation, which if not avoided, may result damage to the product.



This symbol advises the user that the terminal(s) so marked must not be connected to a circuit point at which the voltage with respect to earth ground exceeds (in this case) 500 VAC or VDC.

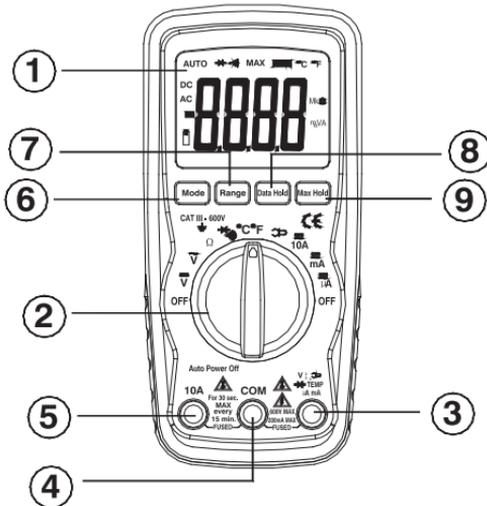


This symbol adjacent to one or more terminals identifies them as being associated with ranges that may, in normal use, be subjected to particularly hazardous voltages. For maximum safety, the meter and its test leads should not be handled when these terminals are energized.

Input Limits	
Function	Maximum Input
V DC or V AC	CAT II-1000V DC /AC
	CAT III-600V DC /AC
mA DC/AC	200mA DC/AC
A DC/AC	10A DC/AC (30 seconds max every 15 minutes)
Resistance, Diode test, Continuity Temperature	500V DC/AC

3. CONTROLS AND JACKS

- | | |
|---|---|
| 1 - 2000 count Liquid Crystal Display with symbolic signs | 6 - Mode push button: selection Continuity/Diode, AC/DC, Temperature(C/F) |
| 2 - Function switch | 7 - Range push button |
| 3 - Positive input jack | 8 - Data Hold push button |
| 4 - COM (negative) input jack | 9 - MAX. Hold push button |
| 5 - 10A (positive) input jack for 10A DC or AC measurements | |



4. SYMBOLS AND ANNUNCIATORS

	Continuity
BAT	Low Battery
	Diode
DATA HOLD	Data Hold
AUTO	AutoRanging
AC	Alternating Current or Voltage
DC	Direct Current or Voltage

5. SPECIFICATIONS

Function	Range
The instrument complies with:	EN61010-1
Insulation:	Class 2, Double insulation
Overvoltage category:	CAT III 600V, CAT II 1000V
Display:	2000 counts LCD display with function indication
Polarity:	Automatic, (-) negative polarity indication
Overrange:	"OL" mark indication
Low battery indication:	The "BAT" is displayed when the battery voltage drops below the operating level
Measurement rate:	2 times per second, nominal
Auto power off:	Meter automatically shuts down after approx. 15 minutes of inactivity
Operating environment:	0°C to 50°C (32°F to 122°F) at < 70% relative humidity
Storage temperature:	-20°C to 60°C (-4°F to 140°F) at < 80% relative humidity
For inside use, max height:	2000m
Pollution degree:	2
Power:	One 9V battery, NEDA 1604, IEC 6F22
Dimensions:	150 (H) x 70 (W) x 48 (D) mm
Weight: Approx.:	255g

Accuracy is given at 18°C to 28°C (65°F to 83°F), less than 70% RH

5.1. DC Voltage (Auto Ranging)

Range	Resolution	Accuracy
200.0mV	0.1mV	±0.5% of rdg ±2 dgts
2.000V	1mV	±1.2% of rdg ±2 dgts
20.00V	10mV	
200.0V	100mV	
600V(CAT III)	1V	±1.5% of rdg ±2 dgts
1000V(CAT II)		±1.5% of rdg ±4 dgts

Input Impedance: 10MΩ.

Maximum Input: 600V DC/AC RMS.(CATIII)

Maximum Input: 1000V DC/AC RMS.(CATII)

5.2. AC Voltage (Auto-ranging except 200mV)

Range	Resolution	Accuracy
200.0mV	0.1mV	±1.5%of rdg ±30 dgts
2.000V	1mV	±1.2% of rdg ±3 dgts
20.00V	10mV	±1.5% of rdg ±3 dgts
200.0V	100mV	
600V(CAT III)	1V	±2.0% of rdg ±4 dgts
1000V(CAT II)		±2.0% of rdg ±8 dgts

Input Impedance: 10MΩ.

Frequency Range: 50 to 60Hz

Maximum Input: 600V DC/AC RMS. (CAT III)

Maximum Input: 1000V DC/AC RMS. (CAT II)

5.3. DC Current (Auto-ranging for uA and mA)

Range	Resolution	Accuracy
200.0uA	0.1uA	±1.0% of rdg ±3 dgts
2000uA	1uA	±1.5% of rdg ±3 dgts
20.00mA	10uA	
200.0mA	100uA	
10A	10mA	±2.5% of rdg ±5 dgts

Overload Protection: 0.2A / 250V and 10A / 250V Fuse.

Maximum Input: 200mA DC or 200mA AC RMS on uA / mA ranges, 10A DC or AC RMS on 10A range.

5.4. AC Current (Auto-ranging for μA and mA)

Range	Resolution	Accuracy
200.0 μA	0.1 μA	$\pm 1.5\%$ of rdg ± 5 dgts
2000 μA	1 μA	$\pm 1.8\%$ of rdg ± 5 dgts
20.00mA	10 μA	
200.0mA	100 μA	
10A	10mA	$\pm 3.0\%$ of rdg ± 7 dgts

Overload Protection: 0.2A / 250V and 10A / 250V Fuse.

Frequency Range: 50 to 60 Hz

Maximum Input: 200mA DC or 200mA AC RMS on μA / mA ranges, 10A DC or AC RMS on 10A range.

5.5. Clamp-on Adaptors DC Current

Range	Resolution	Accuracy
200A	0.1A	$\pm 1.0\%$ of rdg ± 3 dgts (meter only, Clamp-on Adaptor accuracy not included)
2000A	1A	

Sensor: Clamp-on Adaptor
(Note: not provided)

200A Range Input Sensitivity: 1mV/A

2000A Range Input Sensitivity: 1mV/A

Overload protection: 500V DC or AC RMS.

5.6. Clamp-on Adaptor AC Current

Range	Resolution	Accuracy
200A	0.1A	$\pm 1.5\%$ of rdg ± 3 dgts (meter only, Clamp-on Adaptor accuracy not included)
2000A	1A	

Sensor: Clamp-on Adaptor
(Note: not provided)

200A Range Input Sensitivity: 1mV/A

2000A Range Input Sensitivity: 1mV/A

Frequency Range: 50 to 60 Hz

Overload protection: 500V DC or AC RMS.

5.7. Resistance (Auto-ranging)

Range	Resolution	Accuracy
200.0 Ω	0.1 Ω	$\pm 1.2\%$ of rdg ± 4 dgts
2.000k Ω	1 Ω	$\pm 1.0\%$ of rdg ± 2 dgts
20.00k Ω	10 Ω	$\pm 1.2\%$ of rdg ± 2 dgts
200.0k Ω	100 Ω	
2.000M Ω	1k Ω	
20.00M Ω	10k Ω	$\pm 2.0\%$ of rdg ± 3 dgts

Input Protection: 500V DC or 500V AC RMS.

5.8. Temperature

Range	Resolution	Accuracy
-50°C~+1000°C	1°C	$\pm 3\%$ of rdg ± 5 dgts
-58°F~ ± 1832 °F	1°F	$\pm 3\%$ of rdg ± 8 dgts

Sensor: Type K Thermocouple
Overload protection: 500V DC or AC RMS.

5.9. Diode Test

Range	Resolution	Accuracy
0.3mA typical	1 mV	$\pm 10\%$ of rdg ± 5 dgts

Open circuit voltage: 1.5V DC typical
Overload protection: 500V DC or AC RMS.

5.10. Audible continuity

Audible threshold: Less than 100 Ω ; Test current: <0.3mA
Overload protection: 500V DC or AC RMS.

6. OPERATION



WARNING: Risk of electrocution. High-voltage circuits, both AC and DC, are very dangerous and should be measured with great care.

1. ALWAYS turn the function switch to the OFF position when the meter is not in use. This meter has Auto OFF that automatically shuts the meter OFF if 15 minutes elapse between uses.
2. If "OL" appears in the display during a measurement, the value exceeds the range you have selected.

NOTE: On some low AC and DC voltage ranges, with the test leads not connected to a device, the display may show a random, changing reading. This is normal and is caused by the high-input sensitivity. The reading will stabilize and give a proper measurement when connected to a circuit.

6.1. MODE BUTTON

To select Diode/Continuity or DC/AC voltage, current, temperature (°C/°F)

6.2. RANGE BUTTON

When the meter is first turned on, it automatically goes into Auto ranging. This automatically selects the best range for the measurements being made and is generally the best mode for most measurements. For measurement situations requiring that a range be manually selected, perform the following:

1. Press the RANGE button. The "AUTO" display indicator will turn off.
2. Press the RANGE button to step through the available ranges until you select the range you want.
3. Press and hold the RANGE button for 2 seconds to exit the Manual Ranging mode and return to Auto Ranging.

6.3. DATA HOLD BUTTON

The Data Hold function allows the meter to "freeze" a measurement for later reference.

1. Press the DATA HOLD button to "freeze" the reading on the indicator. The indicator "HOLD" will be appear in the display.
2. Press the DATA HOLD button to return to normal operation.

6.4. MAX HOLD BUTTON

The max. Hold position is used to measure the maximum value. The maximum measured value is up dated continuously. Press the button once again to release the hold and allow a further measurement.

6.5. DC VOLTAGE MEASUREMENTS

CAUTION: Do not measure DC voltages if a motor on the circuit is being switched ON or OFF. Large voltage surges may occur that can damage the meter.

1. Set the function switch to the V DC position ("mV" will appear in the display).
2. Insert the black test lead banana plug into the negative (COM) jack and the red test lead banana plug into the positive (V) jack.
3. Touch the test probe tips to the circuit under test. Be sure to observe the correct polarity (red lead to positive, black lead to negative).
4. Read the voltage in the display. The display will indicate the proper decimal point and value. If the polarity is reversed, the display will show (-) minus before the value.

6.6. AC VOLTAGE MEASUREMENTS



WARNING: Risk of Electrocution. The probe tips may not be long enough to contact the live parts inside some 240V outlets for appliances because the contacts are recessed deep in the outlets. As a result, the reading may show 0 volts when the outlet actually has voltage on it. Make sure the probe tips are touching the metal contacts inside the outlet before assuming that no voltage is present.

CAUTION: Do not measure AC voltages if a motor on the circuit is being switched ON or OFF. Large voltage surges may occur that can damage the meter.

1. Set the function switch to the V AC position.
2. Insert the black test lead banana plug into the negative (COM) jack and the red test lead banana plug into the positive (V) jack.
3. Touch the test probe tips to the circuit under test.
4. Read the voltage on the display. The display will indicate the proper decimal point, value and symbol (AC, V, etc.).

6.7. DC CURRENT MEASUREMENTS

CAUTION: Do not make current measurements on the 10A scale for longer than 30 seconds. Exceeding 30 seconds may cause damage to the meter and/or the test leads

1. Insert the black test lead banana plug into the negative (COM) jack.
2. For current measurements up to 2000 μ A DC, set the function switch to the μ A position and insert the red test lead banana plug into the (μ A) jack.
3. For current measurements up to 200mA DC, set the function switch to the mA range and insert the red test lead banana plug into the (mA) jack.
4. For current measurements up to 10A DC, set the function switch to the A position and insert the red test lead banana plug into the 10A jack.
5. Press the AC/DC button until "DC" appears on the 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 black test probe tip to the negative side of the circuit. Touch the red test probe tip to the positive side of the circuit.
8. Apply power to the circuit.
9. Read the current in the display. The display will indicate the proper decimal point, value and symbol.

6.8. AC CURRENT MEASUREMENTS



WARNING: To avoid electric shock, do not measure AC current on any circuit whose voltage exceeds 250V AC.

CAUTION: Do not make current measurements on the 10A scale for longer than 30 seconds. Exceeding 30 seconds may cause damage to the meter and/or the test leads.

1. Insert the black test lead banana plug into the negative (COM) jack.
2. For current measurements up to 2000 μ A AC, set the function switch to the μ A position and insert the red test lead banana plug into the (μ A) jack.
3. For current measurements up to 200mA AC, set the function switch to the mA range and insert the red test lead banana plug into the (mA) jack.
4. For current measurements up to 10A AC, set the function switch to the A position and insert the red test lead banana plug into the 10A jack.
5. Press the AC/DC button until "AC" appears on the 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 black test probe tip to the negative side of the circuit. And touch the red test probe tip to the positive side of the circuit.
8. Apply power to the circuit.
9. Read the current in the display. The display will indicate the proper decimal point, value and symbol.

6.9. CLAMP-ON ADAPTOR AC/DC CURRENT MEASUREMENTS

1. Set the function switch to the A DC/AC (clamp-on adaptor) position
2. Insert the clamp-on adaptor black test lead banana plug into the negative (COM) jack and the red test lead banana plug into the positive (V) jack.
3. Press the MODE button until "AC/DC" appears in the display.
4. Press the trigger to open jaw. Fully enclose one conductor to be measured.
5. Read the AC/DC current on the display.

NOTE: The output analog signal Sensitivity of The AC/DC CLAMP-ON ADAPTOR is 1mV/A

6.10. RESISTANCE MEASUREMENTS



WARNING: To avoid electric shock, disconnect power to the unit under test and discharge all capacitors before taking any resistance measurements. Remove the batteries and unplug the line cords.

1. Set the function switch to the Ω position.
2. Insert the black test lead banana plug into the negative (COM) jack and the red test lead banana plug into the positive Ω jack.
3. Touch the test probe tips across the circuit or part under test. It is best to disconnect one side of the part under test so the rest of the circuit will not interfere with the resistance reading.
4. Read the resistance on the display. The display will indicate the proper decimal point, value and symbol.

6.11. CONTINUITY CHECK



WARNING: To avoid electric shock, never measure continuity on circuits or wires that have voltage on them.

1. Set the function switch to the $\rightarrow \rightarrow$ position.
2. Insert the black lead banana plug into the negative (-) jack (COM) and the red test lead banana plug into the positive (+) jack (Ω).
3. Press the $\rightarrow \rightarrow$ button until the $\rightarrow \rightarrow$ symbol appears in the display.
4. Touch the test probe tips to the circuit or wire you wish to check.
5. If the resistance is less than approximately 30Ω , the audible signal will sound. The display will also show the actual resistance.

6.12. DIODE TEST



WARNING: To avoid electric shock, do not test any diode that has voltage on it.

1. Set the function switch to $\rightarrow \rightarrow$ position.
2. Press the $\rightarrow \rightarrow$ button until the \rightarrow symbol appears in the display.
3. Insert the black test lead banana plug into the negative (-) jack (COM) and the red test lead banana plug into the positive (+) jack (Ω).
4. Touch the test probe tips to the diode or semiconductor junction you wish to test. Note the meter reading
5. Reverse the probe polarity by switching probe position. Note this reading.
6. The diode or junction can be evaluated as follows:
 - A. If one reading shows a value and the other reading shows OL, the diode is good.
 - B. If both readings show OL, the device is open.
 - C. If both readings are very small or 0, the device is shorted.

NOTE: The value indicated in the display during the diode check is the forward voltage

6.13. TEMPERATURE MEASUREMENTS

 **WARNING:** To avoid electric shock, disconnect both test probes from any source of voltage before making a temperature measurement.

1. If you wish to measure temperature in °F, set the function switch to the °F range. If you wish to measure temperature in °C, set the function switch to the °C range.
2. Insert the black test lead banana plug into the negative (COM) jack and the red test lead banana plug into the positive (V) jack, making sure to observe the correct polarity.
3. Touch the Temperature Probe head to the part whose temperature you wish to measure. Keep the probe touching the part under test until the reading stabilizes (about 30 seconds).
4. Read the temperature on the display. The digital reading will indicate the proper decimal point and value.

 **WARNING:** To avoid electric shock, be sure the thermocouple has been removed before changing to another measurement function.

6.14. REPLACING THE BATTERY

 **WARNING:** To avoid electric shock, disconnect the test leads from any source of voltage before removing the battery door.

1. When the batteries become drained or drop below the operating voltage, "BAT" will appear in the right-hand side of the LCD display. The battery should be replaced.
2. Follow instructions for installing battery. See the Battery Installation section of this manual.
3. Dispose of the old battery properly.

 **WARNING:** To avoid electric shock, do not operate your meter until the battery cover is in place and fastened securely.

6.15. BATTERY INSTALLATION

 **WARNING:** : To avoid electric shock, disconnect the test leads from any source of voltage before removing the battery cover.

1. Disconnect the test leads from the meter.
2. Open the battery cover by loosening the screw using a phillips head screwdriver.

3. Insert the battery into battery holder, observing the correct polarity.
4. Put the battery cover back in place. Secure with the two screws.

 **WARNING:** To avoid electric shock, do not operate the meter until the battery cover is in place and fastened securely.

NOTE: If your meter does not work properly, check the fuses and battery to make sure that they are still good and that they are properly inserted.

6.16. REPLACING THE FUSES

 **WARNING:** To avoid electric shock, disconnect the test leads from any source of voltage before removing the fuse cover.

1. Disconnect the test leads from the meter and any item under test.
2. Open the fuse cover by loosening the screw on the cover using a phillips head screwdriver.
3. Remove the old fuse from its holder by gently pulling it out.
3. Install the new fuse into the holder.
4. Always use a fuse of the proper size and value (10A/250V fast blow for the 10A range).
1. Put the fuse cover back in place. Insert the screw and tighten it securely.

 **WARNING:** To avoid electric shock, do not operate your meter until the fuse cover is in place and fastened securely.



MAJOR TECH (PTY) LTD

South Africa

🌐 www.major-tech.com

✉ sales@major-tech.com

Australia

🌐 www.majortech.com.au

✉ info@majortech.com.au

