MT 22
OPERATING INSTRUCTION
AUTORANGING MULTIMETER

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SAFETY INFORMATION

The following safety information must be observed to insure maximum personal safety during the operation of 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 ground yourself when taking electrical measurements. Do not touch exposed metal pipes, outlets, fixtures, etc., which might be at ground potential. Keep your body isolated from ground 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 recognize 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.

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.

<table>
<thead>
<tr>
<th>Function</th>
<th>Maximum Input</th>
</tr>
</thead>
<tbody>
<tr>
<td>V DC or V AC</td>
<td>CATII-1000V DC/AC</td>
</tr>
<tr>
<td></td>
<td>CATIII-600V DC/AC</td>
</tr>
<tr>
<td>mA DC/AC</td>
<td>200mA DC/AC</td>
</tr>
<tr>
<td>A DC/AC</td>
<td>10A DC/AC (30 seconds max every 15 minutes)</td>
</tr>
<tr>
<td>Resistance, Diode test, Continuity Temperature</td>
<td>500V DC/AC</td>
</tr>
</tbody>
</table>

**CONTROLS AND JACKS**

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

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

SPECIFICATIONS

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, NFDA 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

DC Voltage (Auto-ranging)

<table>
<thead>
<tr>
<th>Range</th>
<th>Resolution</th>
<th>Accuracy</th>
</tr>
</thead>
<tbody>
<tr>
<td>200.0mV</td>
<td>0.1mV</td>
<td>±0.5% of rdg ± 2 dgs</td>
</tr>
<tr>
<td>2.000V</td>
<td>1mV</td>
<td>±1.2% of rdg ± 2 dgs</td>
</tr>
<tr>
<td>20.00V</td>
<td>10mV</td>
<td>±1.2% of rdg ± 2 dgs</td>
</tr>
<tr>
<td>200.0V</td>
<td>100mV</td>
<td>±1.2% of rdg ± 2 dgs</td>
</tr>
<tr>
<td>600V(CATIII)</td>
<td>1V</td>
<td>±1.5% of rdg ± 4 dgs</td>
</tr>
<tr>
<td>1000V(CATIII)</td>
<td>10V</td>
<td>±1.5% of rdg ± 4 dgs</td>
</tr>
</tbody>
</table>

Input Impedance: 10MΩ.

Maximum Input: 600V dc/ac rms.(CATIII)

Maximum Input: 1000V dc/ac rms.(CATIII)
### AC Voltage (Auto-ranging except 200mV)

<table>
<thead>
<tr>
<th>Range</th>
<th>Resolution</th>
<th>Accuracy</th>
</tr>
</thead>
<tbody>
<tr>
<td>200.0mV</td>
<td>0.1mV</td>
<td>±1.5% of rdg ± 30 digits</td>
</tr>
<tr>
<td>2.000V</td>
<td>1mV</td>
<td>±1.2% of rdg ± 3 digits</td>
</tr>
<tr>
<td>20.00V</td>
<td>10mV</td>
<td>±1.5% of rdg ± 3 digits</td>
</tr>
<tr>
<td>200.0V</td>
<td>100mV</td>
<td>±1.5% of rdg ± 3 digits</td>
</tr>
<tr>
<td>600V</td>
<td>1V</td>
<td>±2.0% of rdg ± 4 digits</td>
</tr>
<tr>
<td>1000V</td>
<td></td>
<td>±2.0% of rdg ± 8 digits</td>
</tr>
</tbody>
</table>

Input Impedance: 10MΩ.
Frequency Range: 50 to 60Hz.
Maximum Input: 600V dc/ac rms. (CATIII)
Maximum Input: 1000V dc/ac rms. (CATIII)

### DC Current (Auto-ranging for uA and mA)

<table>
<thead>
<tr>
<th>Range</th>
<th>Resolution</th>
<th>Accuracy</th>
</tr>
</thead>
<tbody>
<tr>
<td>200.0uA</td>
<td>0.1uA</td>
<td>±1.0% of rdg ± 3 digits</td>
</tr>
<tr>
<td>2000uA</td>
<td>1uA</td>
<td>±1.5% of rdg ± 3 digits</td>
</tr>
<tr>
<td>20.00mA</td>
<td>10uA</td>
<td>±1.5% of rdg ± 3 digits</td>
</tr>
<tr>
<td>200.0mA</td>
<td>100uA</td>
<td>±2.5% of rdg ± 5 digits</td>
</tr>
<tr>
<td>10A</td>
<td>10mA</td>
<td>±2.5% of rdg ± 5 digits</td>
</tr>
</tbody>
</table>

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.

### AC Current (Auto-ranging for uA and mA)

<table>
<thead>
<tr>
<th>Range</th>
<th>Resolution</th>
<th>Accuracy</th>
</tr>
</thead>
<tbody>
<tr>
<td>200.0uA</td>
<td>0.1uA</td>
<td>±1.5% of rdg ± 5 digits</td>
</tr>
<tr>
<td>2000uA</td>
<td>1uA</td>
<td>±1.8% of rdg ± 5 digits</td>
</tr>
<tr>
<td>20.00mA</td>
<td>10uA</td>
<td>±1.8% of rdg ± 5 digits</td>
</tr>
<tr>
<td>200.0mA</td>
<td>100uA</td>
<td>±3.0% of rdg ± 7 digits</td>
</tr>
<tr>
<td>10A</td>
<td>10mA</td>
<td>±3.0% of rdg ± 7 digits</td>
</tr>
</tbody>
</table>

Overload Protection: 0.2A / 250V and 10A / 250V Fuse.
Frequency Range: 50 to 60Hz.
Maximum Input: 200mA dc or 200mA ac rms on uA / mA ranges.
10A dc or ac rms on 10A range.

### Clamp-on Adaptors DC Current

<table>
<thead>
<tr>
<th>Range</th>
<th>Resolution</th>
<th>Accuracy</th>
</tr>
</thead>
<tbody>
<tr>
<td>200A</td>
<td>0.1A</td>
<td>±1.0% of rdg ±3 digits</td>
</tr>
<tr>
<td>2000A</td>
<td>1A</td>
<td>(meter only, Clamp-on Adaptor accuracy not included)</td>
</tr>
</tbody>
</table>

Sensor: Clamp-on Adaptor (Note: not provide)
200A Range Input Sensitivity: 1mV/A
2000A Range Input Sensitivity: 1mV/A
Overload protection: 500V dc or ac rms.
### Clamp – on Adaptor AC Current

<table>
<thead>
<tr>
<th>Range</th>
<th>Resolution</th>
<th>Accuracy</th>
</tr>
</thead>
<tbody>
<tr>
<td>200A</td>
<td>0.1A</td>
<td>±1.5% of rdg ±3 dgt (meter only, Clamp-on Adaptor accuracy not included)</td>
</tr>
<tr>
<td>2000A</td>
<td>1A</td>
<td></td>
</tr>
</tbody>
</table>

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

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.

### Resistance (Auto-ranging)

<table>
<thead>
<tr>
<th>Range</th>
<th>Resolution</th>
<th>Accuracy</th>
</tr>
</thead>
<tbody>
<tr>
<td>200.0Ω</td>
<td>0.1Ω</td>
<td>±1.2% of rdg + 4 dgt</td>
</tr>
<tr>
<td>2.00kΩ</td>
<td>1Ω</td>
<td>±1.0% of rdg + 2 dgt</td>
</tr>
<tr>
<td>20.00kΩ</td>
<td>10Ω</td>
<td>±1.2% of rdg + 2 dgt</td>
</tr>
<tr>
<td>200.0kΩ</td>
<td>100Ω</td>
<td></td>
</tr>
<tr>
<td>2.00MΩ</td>
<td>1kΩ</td>
<td>±2.0% of rdg + 3 dgt</td>
</tr>
<tr>
<td>20.00MΩ</td>
<td>10kΩ</td>
<td></td>
</tr>
</tbody>
</table>

Input Protection: 500V dc or 500V ac rms.

### Temperature

<table>
<thead>
<tr>
<th>Range</th>
<th>Resolution</th>
<th>Accuracy</th>
</tr>
</thead>
<tbody>
<tr>
<td>-50°C to +100°C</td>
<td>1 °C</td>
<td>±3% of rdg ±5dgt</td>
</tr>
<tr>
<td>-55°F to +183°F</td>
<td>1°F</td>
<td>±3% of rdg ±8dgt</td>
</tr>
</tbody>
</table>

### Diode Test

<table>
<thead>
<tr>
<th>Test current</th>
<th>Resolution</th>
<th>Accuracy</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.5mA typical</td>
<td>1 mV</td>
<td>±10% of rdg ±5 dgt</td>
</tr>
</tbody>
</table>

Open circuit voltage: 1.5V dc typical
Overload protection: 500V dc or ac rms.

### Audible Continuity

Audible threshold: Less than 100Ω; Test current: <0.3mA
Overload protection: 500V dc or ac rms.

### 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. Change to a higher range.

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.

MODE BUTTON
To select Diode/Continuity or DC/AC voltage, current, Temperature (C/F)

RANGE BUTTON
When the meter is first turned on, it automatically goes into AutoRanging. This automatically selects the best range for the measurements being made and is generally the best mode for most measurements. For measurement situations requiring 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.

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.

MAX HOLD BUTTON
The max. Hold position is used to measure the maximum value. The maximum measured value is updated continuously. Press once again the button, will release the hold and allow a further measurement.

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.

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 in the display. The display will indicate the proper decimal point, value and symbol (AC, V, etc.).

**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 2000μA DC, set the function switch to the μA position and insert the red test lead banana plug into the (μA) 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 in 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.

**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 2000μA AC, set the function switch to the μA position and insert the red test lead banana plug into the (μA) 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 in 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.

**CLAMP-ON ADAPTOR AC/DC CURRENT MEASUREMENTS**

1. Set the function switch to the AC/DC (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 in the display.

**NOTE:** The output analog signal Sensitivity of The AC/DC CLAMP-ON ADAPTOR is 1mV/A
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 in the display. The display will indicate the proper decimal point, value and symbol.

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 阿根 symbol 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 閃光灯 button until the 閃光灯 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.

DIODE TEST

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

1. Set the function switch to 関奥 symbol position.
2. Press the 閘閘 button until the 閘閘 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.
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 in 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.

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 exhausted 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 door is in place and fastened securely.

BATTERY INSTALLATION

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

1. Disconnect the test leads from the meter.
2. Open the battery door by loosening the screw using a Phillips head screwdriver.
3. Insert the battery into battery holder, observing the correct polarity.
4. Put the battery door back in place. Secure with the two screws.

**WARNING:** To avoid electric shock, do not operate the meter until the battery door 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.

**REPLACING THE FUSES**

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

1. Disconnect the test leads from the meter and any item under test.
2. Open the fuse door by loosening the screw on the door using a Phillips head screwdriver.
3. Remove the old fuse from its holder by gently pulling it out.
4. Install the new fuse into the holder.
5. Put the fuse door back in place. Insert the screw and tighten it securely.

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