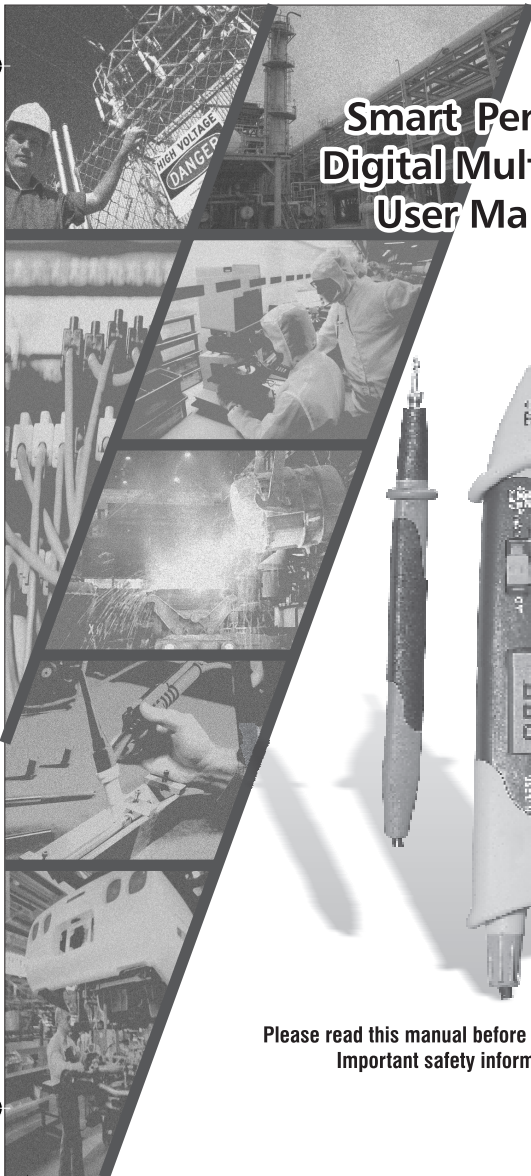


# Smart Pen-type Digital Multimeter User Manual



**Please read this manual before switching the unit on.  
Important safety information inside.**



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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 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 poses 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 to the meter that exceeds the specified maximum:

Input Limits	
Function	Maximum Input
V DC, V AC	600V DC or AC
mA DC/AC	600mA DC or AC
Resistance, Capacitance, Diode test, Continuity	250V DC/AC

## 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.

**WARNING**

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

**CAUTION**

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

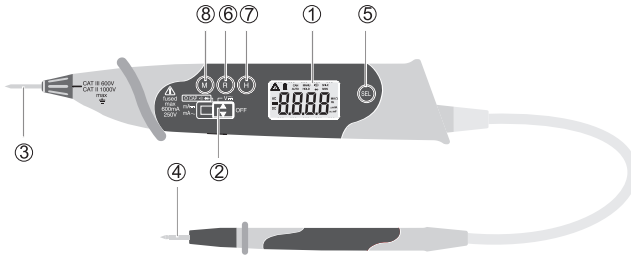


This symbol advises the user that the terminal(s) so marked must not be connected to a circuit point at which the voltage with respect to earth ground exceeds (in this case) 500 VAC or VDC.



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.

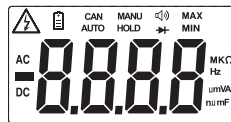
### 3.Controls And Jacks



1. 6000 count Liquid Crystal Display with symbolic signs
2. Function switch
3. Positive input test probe
4. COM (negative) input test probe
5. Mode selection button.
6. Range pushbutton
7. Data Hold pushbutton
8. MAX. Hold pushbutton

### 4.Symbols And Annunciators

- |          |                      |
|----------|----------------------|
|          | Continuity           |
|          | Diode test           |
| $\mu$    | micro (amps)         |
| m        | milli ( volts, amps) |
| k        | kilo (ohms)          |
| $\Omega$ | ohms                 |



## 5. Specifications

<b>The instrument complies with:</b>	EN61010-1.
<b>Insulation:</b>	Class2, Double insulation.
<b>Overvoltage category:</b>	CATIII 600V, CATII 1000V,
<b>Display:</b>	6000 counts LCD display with function indication.
<b>Polarity:</b>	Automatic, (-) negative polarity indication.
<b>Over range:</b>	"OL" mark indication.
<b>Danger symbol:</b>	"⚡" mark indication when the reading is exceeding 30V in ACV or DCV.
<b>Low battery indication:</b>	The "BAT" is displayed when the battery voltage drops below the operating level.
<b>Measurement rate:</b>	3 times per second (voltage mode)
<b>Auto scan mode:</b>	The meter automatically selects the proper mode and ranger.
<b>Auto power off:</b>	Meter automatically shuts down after approx. 10 minutes of inactivity.
<b>Operating environment:</b>	0°C to 50°C (32°F to 122°F) at <70% relative humidity.
<b>Storage temperature:</b>	-20°C to 60°C (-4°F to 140°F) at <80% relative humidity.
<b>For inside use, max height:</b>	2000m
<b>Pollution degree:</b>	2
<b>Power:</b>	Two 1.5V button batteries, NEDA 1604, IEC 6F22.
<b>Dimensions:</b>	230(H) x 35(W) x 20(D) mm
<b>Weight: Approx.:</b>	Approx.: 200g.

**Electrical Characteristics for Scan Mode**

Parameter	Test Condition	Typ Value
AC/DC voltage scan mode sensitivity@1KHz	10M $\Omega$ Input impedance	400mV
RDC scan mode CAP sensitivity		400pF
RDC scan mode DIODE sensitivity	Forward voltage	0.8V

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

**DC Voltage (Auto-ranging)**

Range	Resolution	Accuracy
600.0mV	0.1mV	$\pm 1.2\%$ of rdg $\pm 5$ dgts
6.000V	1mV	$\pm 1.5\%$ of rdg $\pm 5$ dgts
60.00V	10mV	
600.0V	100mV	

Input Impedance: 10M $\Omega$ .

Maximum Input: 600V dc or 600V ac rms.

**AC Voltage (Auto-ranging above 600mV)**

Range	Resolution	Accuracy
600.0mV	0.1mV	$\pm 1.5\%$ of rdg $\pm 30$ dgts
6.000V	1mV	$\pm 1.5\%$ of rdg $\pm 3$ dgts
60.00V	10mV	$\pm 2.0\%$ of rdg $\pm 3$ dgts
600.0V	100mV	

Input Impedance: 10M $\Omega$ .

Frequency Range: 50 to 400Hz

Maximum Input: 600V dc or 600V ac rms.

Note: The accuracy can not be assuring with the "600.0mV" range when the frequency range of AC Voltage is larger than 60Hz.



**DC Current (Auto-ranging for  $\mu\text{A}$  and mA)**

Range	Resolution	Accuracy
60.00mA	10 $\mu\text{A}$	$\pm 1.5\%$ of rdg $\pm 5$ dgts
600.0mA	100 $\mu\text{A}$	

Overload Protection: 0.8A/250V Fuse.

Maximum Input: 600mA dc or 600mA ac rms on mA ranges.

**AC Current (Auto-ranging for  $\mu\text{A}$  and mA)**

Range	Resolution	Accuracy
60.00mA	10 $\mu\text{A}$	$\pm 2.0\%$ of rdg $\pm 5$ dgts
600.0mA	100 $\mu\text{A}$	

Overload Protection: 0.8A/250V Fuse.

Frequency Range: 40 to 400 Hz

Maximum Input: 600mA dc or 600mA ac rms on mA ranges.

**Resistance (Auto-ranging)**

Range	Resolution	Accuracy
600.0 $\Omega$	0.1 $\Omega$	$\pm 1.2\%$ of rdg $\pm 4$ dgts
6.000k $\Omega$	1 $\Omega$	$\pm 1.0\%$ of rdg $\pm 2$ dgts
60.00k $\Omega$	10 $\Omega$	$\pm 2.0\%$ of rdg $\pm 2$ dgts
600.0k $\Omega$	100 $\Omega$	
6.000M $\Omega$	1k $\Omega$	
60.00M $\Omega$	10k $\Omega$	

Input Protection: 250V dc or 250V ac rms.

Note: When auto scan mode is set, continuity check is implemented in this mode.

When auto scan mode is set, the 60.00M $\Omega$  range is omitted.

**Capacitance (Auto-ranging)**

Range	Resolution	Accuracy
6.000nF	1pF	±5.0% of rdg ± 50 dgts
60.00nF	10pF	±5.0% of rdg ± 7 dgts
600.0nF	0.1nF	±3.0% of rdg ± 5 dgts
6.000uF	1nF	
60.00uF	10nF	
600.0uF	0.1uF	±5.0% of rdg ± 5 dgts
6.000mF	1uF	±5.0% of rdg ± 5 dgts
10.00mF	10uF	±10.0% of rdg ± 5 dgts

The 6.000mF and 10.00mF range is not available for scan mode.  
Input Protection: 250V dc or 250V ac rms.

**Diode Test**

Test current	Resolution	Accuracy
0.3mA typical	1 mV	±10% of rdg ± 5 dgts

Open circuit voltage: 2V dc typical.  
Beeper on: ≤30mv.  
Overload protection: 250V dc or ac rms.

**Audible continuity**

Audible threshold: Less than 30Ω Test current: <0.3mA  
Overload protection: 250V 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 10 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.

## 7. Sel Button

When power on or SEL button is pressed longer than one second, the meter will be power-on reset to auto scan mode. In auto scan mode, the meter automatically selects the mode and range. Pushing the SEL button less than one second could select the target measurement function.

- To select scan or DC/AC voltage.
- To select scan or resistor/continuity/diode/cap.

Pushing the button longer than two seconds, the meter will enter power down mode. If power down mode is entered, only press SEL button to last for one second or apply the power to V-terminal could re-power on the meter. The following figure shows the state transition.

## 8.R (Range) Button

When the meter is first turned on, it automatically goes into auto scan mode. 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 SEL button. The "AUTO" display indicator will turn on.
2. Press the R button. The "AUTO" display indicator will turn off and the "MANU" display indicator will turn on.
3. Press the R button to step through the available ranges until you select the range you want.
4. Press and hold the R button for more than 1 second to exit the ManualRanging mode and return to AutoRanging.

## 9.H (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 appear in the display.
2. Press the DATA HOLD button to return to normal operation.

## 10.M (MAX/MIN) Button

The meter displays the maximum or minimum value of input in the Max/Min mode. When Max/Min is pressed for the first time, the meter displays the maximum value. The meter displays the minimum value when it is pressed again. When Max/Min is pressed for the third time, the meter displays current value. The meter returns to normal operation when Max/Min is pressed and held for longer than one second. Press HOLD key in Max/Min mode makes the meter stop updating the maximum or the minimum value.

## 11. 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/AC position. Press SEL key to select the auto scan mode or the V DC mode.
2. Touch the test probe tips to the circuit under test. Be sure to observe the correct polarity.
3. 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.

## 12. AC Voltage Measurements

**Warning:** Risk of Electrocutation. 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 DC/AC position. Press MODE key to select the auto scan mode or the V AC mode.
2. Touch the test probe tips to the circuit under test.
3. Read the voltage in the display. The display will indicate the proper Decimal point, value and symbol (AC, V, etc.).

### 13.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.Set the function switch to the mA or A DC/AC position. Press SEL key to select the auto scan mode or the mA or A DC mode.
- 2.Remove power from the circuit under test, then open up the circuit at the point where you wish to measure current.
- 3.Touch the negative test probe tip to the negative side of the circuit. Touch the positive test probe tip to the positive side of the circuit.
- 4.Apply power to the circuit.
- 5.Read the current in the display. The display will indicate the proper decimal point, value and symbol.

### 14.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.Set the function switch to the mA or A DC/AC position. Press SEL key to select the auto scan mode or the mA or A AC mode.
- 2.Remove power from the circuit under test, then open up the circuit at the point where you wish to measure current.
- 3.Touch the negative test probe tip to the negative side of the circuit. Touch the positive test probe tip to the positive side of the circuit.
- 4.Apply power to the circuit.
- 5.Read the current in the display. The display will indicate the proper decimal point, value and symbol.

## 15. 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  $\Omega$   $\rightarrow$   $\rightarrow$   $\rightarrow$  cap position, and press SEL key to select the auto scan mode or resistance mode.
2. 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.
3. Read the resistance in the display. The display will indicate the proper decimal point, value and symbol.

## 16. 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  $\Omega$   $\rightarrow$   $\rightarrow$   $\rightarrow$  cap position, and press SEL key to select the auto scan mode or continuity mode until the  $\rightarrow$  symbol appears in the display.
2. Touch the test probe tips to the circuit or wire you wish to check.
3. If the resistance is less than approximately  $30\Omega$ , the audible signal will sound. The display will also show the actual resistance.

## 17. Diode Test

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

1. Set the function switch to  $\Omega$   $\rightarrow$   $\rightarrow$   $\rightarrow$  cap position, and press MODE key to select the auto scan mode or diode mode until the symbol  $\rightarrow$  appears in the display.
2. Touch the test probe tips to the diode or semiconductor junction you wish to test. Note the meter reading.
3. Reverse the probe polarity by switching probe position. Note this reading.
4. 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.

## 18. Capacitance Measurements

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

1. Set the function switch to the  $\Omega \rightarrow \text{cap}$  position, and press SEL key to select the auto scan mode or capacitance mode.
2. 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.
3. Read the capacitance in the display. The display will indicate the proper decimal point, value and symbol.

Note: In order to obtain an accurate reading, a capacitor must be discharge before measurement begins. The meter has a built-in discharge mode to automatically discharge the capacitor. In discharge mode, the LCD displays "DIS.C". Discharging through the meter is quite slow. We recommend users to discharge the capacitor with some other apparatus.

## 19. 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 left-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.



## 20. 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 battery to make sure that they are still good and that they are properly inserted.





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