

# 3 1/2 DIGIT DIGITAL MULTIMETER WITH TRANSISTOR, FREQUENCY AND CAPACITANCE OPERATION MANUAL

## 1. SAFETY RULES

- This meter is designed and tested in accordance with EN publication 61010-1, installation category II overvoltage 600V, and pollution degree 2.
- This meter has been tested according to the following EMC Directives
  - 89/336/EEC (EMC of Nov., 1992, Electromagnetic Compatibility)
  - 73/23/EEC Product safety law of Low Voltage Directive, EN61010-1 (04.93)
- This meter is designed to be indoor use at temperature 5°C to 40°C and altitude up to 2,000m.
- To ensure that the meter is used safely, please follow all safety and operating instructions in this operation manual. If the meter is not used as described in this operation manual, the safety features of this meter might be impaired.
- Do not use the meter when the meter or test lead looks damaged, or when you suspect that the meter is not operating properly.
- When using the probes, keep your fingers behind the finger guards on the probes.
- Disconnect the live test lead before disconnecting the common test lead.
- Make sure power is off before cutting, unsoldering, or breaking the circuit. Small amount of current can be dangerous.
- Do not apply more than 600Vdc or 600Vac rms between a terminal and earth ground.
- To avoid electrical shock, use CAUTION when working above 60Vdc or 25Vac rms. Such voltages pose a shock hazard.
- Never make measurements with the battery cover or bottom case off.
- To avoid electrical shock or damage to the meter, do not exceed the input limits.

## 2. INTERNATIONAL SYMBOLS

	Important information see manual		Diode
	AC		Continuity
	DC		Ground
			Double insulation

## 3. SPECIFICATION

### 3.1 General Specifications

Display	: 3 1/2 digit LCD with maximum reading of 1999.
Polarity	: Automatic, (-) negative polarity indication.
Zero adjustment	: Automatic.
Over range indication	: Only the message "1" is displayed.
Power	: Single, standard 9 volt battery NEDA 1604, JIS 006P, IEC6F22.
Auto Power Off	: Approximate 15 minutes. <b>(Pressing twice the Power Key to resume).</b>
Dimension	: 94 (W) x 205 (H) x 62 (D) mm.
Weight	: Approx. 620 g (including battery and packaging).

### 3.2 Electrical Specifications

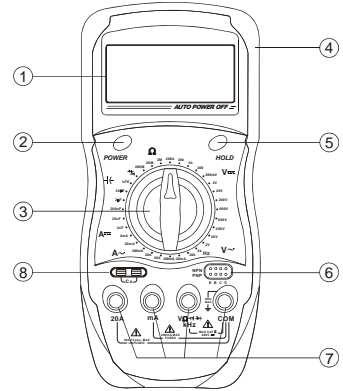
Accuracies are ± (% of reading + no. of least significant digits) at 23°C ± 5°C, <75% RH.

DC Voltage	Range	Resolution	Accuracy	Input Impedance	Overload Protection		
	200mV	0.1mV				±(0.8% + 1)	10MΩ
2V	0.001V	600V DC/AC rms					
20V	0.01V						
200V	0.1V						
600V	1V						
AC Voltage	Range	Resolution	Accuracy	Freq. Response	Input Impedance 10MΩ		
	2V	0.001V				±(0.8% + 3)	40-400Hz
	20V	0.01V					
	200V	0.1V					
600V	1V	±(1.2% + 3)					
On 2V range, if short nor open the two test leads, display reading is 10 digits, this 10 digits should not be subtracted from measurement results.							
DC Current	Range	Resolution	Accuracy	Volt. drop	Overload Protection		
	2mA	0.001mA				±(0.8% + 3)	200mV
	20mA	0.01mA					
	200mA	0.1mA	±(1.0% + 3)	15sec. Max. Unfused			
20A	0.01A	±(2.0% + 5)					
AC Current	Range	Resolution	Accuracy	Volt. drop	Freq. Response	Overload Protection	
	20mA	0.01mA					±(1.2% + 3)
	200mA	0.1mA					
	20A	0.01A	±(3.0% + 5)	15sec. Max. Unfused			
20A	0.01A	±(3.0% + 5)					
Resistance	Range	Resolution	Accuracy	Open circuit volt.	Overload Protection		
	200Ω	0.1Ω				±(0.8% + 2)	<0.7V
	2kΩ	0.001kΩ					
	20kΩ	0.01kΩ					
	200kΩ	0.1kΩ					
	2MΩ	0.001MΩ					
	20MΩ	0.01MΩ	±(1.0% + 2)				
200MΩ*	0.1MΩ	±(5.0% + 10)	<3V				
On 200MΩ range, if short the two test leads, display reading is 10 digits, this 10 digits should be subtracted from measurement results.							
Capacitance	Range	Resolution	Accuracy	Test Freq.	Overload Protection		
	2nF	0.001nF				±(2.5% + 5)	400Hz
	20nF	0.01nF					
	200nF	0.1nF					
	2μF	0.001μF					
	20μF	0.01μF					
20μF	0.01μF						
On 2nF range, if Cx socket without DUT, display reading is 10 digits, this 10 digits should not be subtracted from measurement results.							
Frequency	Range	Resolution	Accuracy	Vmin > 150mV Vmax < 10V	Overload Protection 250VDC/AC rms <30sec		
	2kHz	0.001kHz				±(1.5% + 5)	
20kHz	0.01kHz						

▶	Test voltage	Test current	Open circuit Volt.	Overload Protection 250VDC/AC rms <30sec
		Approx. 2.8V	Approx. 1mA	
• )	Range	Test current	Open circuit Volt.	Overload Protection 250VDC/AC rms <30sec
	Buzzer sounds when resistance value ≤ 60Ω	Approx. 1.0mA	2.8V	
Transistor Test	Range	hFE value	Test volt.(Vce)	Base current
	hFE	0-1000	Approx. 2.8V	Approx. 10μA

## 4. PANEL DESCRIPTIONS

- 3 1/2 digits LCD display
- Power Key
- Function selector
- Rubber Holster
- Hold Key
- Transistor socket
- Input and common socket
- Capacitor socket



## 5. OPERATION

### ⚠ WARNING

- When measuring voltage ensure that the instrument is not connected or switched to a current or resistance or temperature or to the diode check/continuity range. Always ensure that the correct terminals are used for the type of measurement to be made.
- Use extreme care when measuring voltage above 50V, especially from sources where high energy exists.
- Avoid making connections to "live" circuits whenever possible.
- When conducting current measurements ensure that the circuit is not "live" before opening it in order to connect the test leads.
- Before conducting resistance measurements or continuity / diode test, ensure that the circuit under test is de-energised.
- Always ensure that the correct function and range is selected. If in doubt about the correct range, starts with the highest and works downwards.
- Extreme care should be taken when using the instrument to conjunction with a current transformer connected to the terminals. High voltage may be produced at the terminals if an open circuit occurs.
- Ensure that the test leads and probes are in good condition with no damage to the insulation.
- Take care not to exceed the over-load limits as given in the specifications.
- Fuse for replacement must be of the correct type and rating.

### 5.1 DC and AC Voltage measurement

- Connect the black test lead to the "COM" socket and red test lead to the "VΩkHz" socket.
- Set the function selector to "V=" or "V~" position to measure DCV or ACV.
- Connect the test leads across the source or loads under measurement.

### 5.2 DC Current measurement

- Connect the black test lead to the "COM" socket and red test lead to the "mA" socket for measurement up to 200mA.
- Set the function selector to desired resistance range "A=" position.
- Connect the test leads in series with the current source to be measured.
- For current measurement from 200mA to 20A (Unfused) follow generally the above procedure but connect the red test lead to "20A" socket.

### 5.3 AC Current measurement

- Connect the black test lead to the "COM" socket and red test lead to the "mA" socket for measurement up to 200mA.
- Set the function selector to desired resistance range "A~" position.
- Connect the test leads in series with the current source to be measured.
- For current measurement from 200mA to 20A (Unfused) follow generally the above procedure but connect the red test lead to "20A" socket.

### 5.4 Resistance measurement

- Connect the black test lead to the "COM" socket and red test lead to the "VΩkHz" socket.
  - Set the function selector to desired resistance range Ω position
  - Connect the leads across the circuit to be tested.
- ⚠ CAUTION: Ensure that the circuit to be tested is "dead".  
Maximum input over-load : 250V rms < 30sec.

### 5.5 Diode test

- Connect the black test lead to the "COM" socket and red test lead to the "VΩkHz" socket.
- Set the function selector to ▶ (same as •|) position.
- Connect the black and red test leads to the cathode (-) and anode (+) ends of the diode to be tested respectively.
- Read the forward voltage drop (junction) value from the display. If reverse connected the test leads to diode, display shows over-load.

### 5.6 Continuity test

- Connect the black test lead to the "COM" socket and red test lead to the "VΩkHz" socket.
  - Set the function selector to •|) (same as ▶) position.
  - Connect the leads across the circuit to be tested, if the resistance less than or equal to approx. 60Ω, buzzer will be activated.
- ⚠ CAUTION: Ensure that the circuit to be tested is "dead".  
Maximum input over-load : 250V rms < 30sec.


### 5.7 Transistor hFE test

- Set the function selector to "hFE" position.
- Determine whether the transistor is of NPN or PNP type and locate the E, B and C leads. insert the leads into the proper holes in the socket "hFE" on the front panel.
- The display will read the approximate hFE value at the test condition of base current 10μA

A, Vce 3.0V


#### 5.8 Capacitance Measurement

- 1) Set the function selector to desired resistance range "**Ω**" position.
- 2) Insert the capacitor into the capacitor "**Cx**" socket

 CAUTION: Ensure that the capacitor to be tested is "de-energised".

#### 5.9 Frequency measurement


- 1) Connect the black test lead to the "**COM**" socket and red test lead to the "**VΩHz**" socket.
- 2) Set the function selector to desired frequency range "**Hz**" position.

 CAUTION: Ensure that the circuit to be tested is "dead".  
Maximum input over-load : 250V rms < 30sec.

#### 5.10 Data Hold

The hold key is used to hold data during measurement. Pressing the key, reading is held and "**H**" appears in the left side of the display. Pressing the key again to release the hold function.

### 6. MAINTENANCE

 CAUTION

BEFORE ATTEMPTING BATTERY AND FUSE REMOVAL OR REPLACEMENT,  
DISCONNECT TEST LEADS FROM ANY ENERGISED CIRCUITS TO AVOID SHOCK  
HAZARD.

#### 6.1 Fitting and replacing the battery and fuse

- 1) Ensure that the instrument is not connected to any external circuit, set the function selector to OFF position and remove the test leads from the terminals.
- 2) Remove the screw of the battery compartment on the bottom of the back case.
- 3) Replace the spent battery or fuse with the same type and rating.
- 4) Reinststate the battery compartment, tighten and securing screw.

#### 6.2 Cleaning

Periodically wipe the case with a soft damp cloth and mild household cleanser. Do not use abrasives or solvents. Ensure that no water gets inside the equipment to prevent possible shorts and damage.

**FOR TECHNICAL ASSISTANCE,  
PLEASE CONTACT:**