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1. SAFETY INFORMATION

⚠️ WARNING

To ensure safe operation, and in order to exploit to the full the functionality of the meter, please follow the directions in this section carefully.

This multimeter has been designed according to IEC-1010 concerning electronic measuring instruments with an overvoltage category (CAT II) and pollution 2.

Follow all safety and operating instructions to ensure that the meter is used safely and is kept in good operating condition.

1.1 PRELIMINARY

1.1.1 When using the meter, the user must observe all normal safety rules concerning:

- Protection against the dangers of electrical current
- Protection of the meter against misuse

1.1.2 When the meter is delivered, check that it has not been damaged in transit.

1.1.3 When poor condition under harsh preservation or shipping conditions caused, inspect and confirm this meter without delay.

"1"
1.1.4 Before using verify that the insulation on test leads is not damaged and/or the leads wire is not exposed.

1.2 DURING USE
1.2.1 Never exceed the protection limit values indicated in specifications for each range of measurement.
1.2.2 When the meter is linked to a measurement circuit, do not touch unused terminals.
1.2.3 When the value scale to be measured is unknown beforehand, set the range selector at the highest position.
1.2.4 Before rotating the range selector to change functions, disconnect test leads from the circuit under test.
1.2.5 When carrying out measurements on TV or switching power circuits always remember that there may be high amplitude voltages pulses at test points, which can damage the meter.
1.2.6 Never perform resistance measurements on live circuits.
1.2.7 Never perform capacitance measurements unless the capacitor to be measured has been discharged fully.

1.2.8 Always is careful when working with voltages above 60V DC or 30V AC rms, keep fingers behind the probe barriers while measuring.
1.2.8 If any faults or abnormalities are observed, the meter can not be used any more and it has to be checked out.
1.2.9 Never use the meter unless the rear case is in place and fastened fully.
1.2.10 Please do not store or use meter in areas exposed to direct sunlight, high temperature, humidity or condensation.

1.3 SYMBOLS

⚠️ Important safety information, refer to the operating manual.

⚠️ Dangerous voltage may be presence.

☑️ Double insulation (Protection class II).

1.4 MAINTENANCE

1.4.1 Please do not attempt to adjust or repair the meter by removing the rear case while voltage is being applied. A technician who fully understands danger involved
should only carry out such actions.

1.4.2 Before opening the battery cover of the meter, always disconnect test leads from all sources of electric current.

1.4.3 For continue protection against fire, replace fuse only with the specified voltage and current ratings: F 200mA/250V (quick acting).

1.4.4 Do not store in locations subject to excessive vibration.

1.4.5 Do not use abrasives or solvents on the meter, use a damp cloth and mild detergent only.

2. DESCRIPTION

2.1 NAMES OF COMPONENTS

- Red Scale
- Black Scale
- LCD Display
- Zero Adjustment
- Rotary Switch
- Pointer
- Test Leads
- Transistor Testing Socket
- Temperature Measuring Socket
- Capacitor Measuring Socket

2.2 FUNCTION AND RANGE SELECTOR

- This meter is a portable professional measuring instrument with LCD DIGITAL DISPLAY & ANALOGUE GAUGE, easily to be read for any kind of user.

- When using the meter, the digital is displayed simultaneously with moving of the...
A rotary switch is used to select functions as well as ranges.

3. SPECIFICATIONS

Accuracy is specified for a period of year after calibration and at 18°C to 28°C (64°F to 82°F) with relative humidity to 80%.

3.1 GENERAL SPECIFICATIONS

3.1.1 The analogue gauge exists the same function & range as the digital display exactly.

3.1.2 Max. Voltage Between Terminals And Earth Ground: 600V DC or 600V rms AC (sine)

3.1.3 Fuse Protection: F 200mA/250V

3.1.4 Display:
  - Digital: 18mm LCD, 3 1/2 digits
  - Analogue: pointer show

3.1.5 Polarity Indication:
  - Digital: Automatic switching, ‘-’ indicates negative polarity.
  - Analogue: Both ‘+’ or ‘-’ always show positive polarity.

3.1.6 Zero Adjustment:
  - Digital: automatic
  - Analogue: manual

3.1.7 Overrange Indication:
  - Digital: Display ‘1’ or ‘-1’
  - Analogue: Show ‘FULL SCALE’

3.1.8 Sampling Time:
  - Digital: approx. 0.4 second
  - Analogue: instantaneously responding

3.1.9 Power Supply: 9V battery, NEDA 1604 or 6F22

3.1.10 Low Battery Indication: ‘LO BAT’ displayed

3.1.11 Operating Temperature: 0°C to 40°C (32°F to 104°F)

3.1.12 Storage Temperature: -10°C to 50°C (10°F to 122°F)

3.1.13 Dimension: 199×105×45 mm

3.1.14 Weight: 350g (including battery)

3.2 ELECTRICAL SPECIFICATIONS (23±5°C)

3.2.1 DC Voltage
### 3.2.2 AC Voltage

<table>
<thead>
<tr>
<th>Range</th>
<th>Resolution</th>
<th>Digital Display</th>
<th>Analogue Gauge</th>
</tr>
</thead>
<tbody>
<tr>
<td>200mV</td>
<td>0.1mV</td>
<td>± (0.5% of rag + 1 digit) ±5% fs</td>
<td>Reading of black scale ×1mV</td>
</tr>
<tr>
<td>2V</td>
<td>1mV</td>
<td>± (0.5% of rag + 1 digit) ±5% fs</td>
<td>Reading of black scale ×0.01V</td>
</tr>
<tr>
<td>20V</td>
<td>10mV</td>
<td>± (0.5% of rag + 1 digit) ±5% fs</td>
<td>Reading of black scale ×0.1V</td>
</tr>
<tr>
<td>200V</td>
<td>100mV</td>
<td>± (0.5% of rag + 1 digit) ±5% fs</td>
<td>Reading of black scale ×1V</td>
</tr>
<tr>
<td>600V</td>
<td>1V</td>
<td>± (0.8% of rag + 2 digits) ±5% of arc</td>
<td>Reading of black scale ×10V</td>
</tr>
<tr>
<td>200V</td>
<td>0.1mV</td>
<td>± (1.2% of rag + 3 digits) ±5% fs</td>
<td>Reading of black scale ×1mV</td>
</tr>
<tr>
<td>2V</td>
<td>1mV</td>
<td>± (0.8% of rag + 3 digits) ±5% fs</td>
<td>Reading of black scale ×0.01V</td>
</tr>
<tr>
<td>20V</td>
<td>10mV</td>
<td>± (0.8% of rag + 3 digits) ±5% fs</td>
<td>Reading of black scale ×0.1V</td>
</tr>
<tr>
<td>200V</td>
<td>100mV</td>
<td>± (0.8% of rag + 3 digits) ±5% fs</td>
<td>Reading of black scale ×1V</td>
</tr>
<tr>
<td>600V</td>
<td>1V</td>
<td>± (1.2% of rag + 3 digits) ±5% of arc</td>
<td>Reading of black scale ×10V</td>
</tr>
</tbody>
</table>

- Input Impedance: 10MΩ
- Overload Protection: 200mV range: 250V DC or rms AC
  2V-600V ranges: 600V DC or 600V rms AC (sine)
- Frequency Range: 40 to 400Hz
- Test On 60Hz/50Hz
- Response: Average calibrated in rms of sine wave

### 3.2.3 DC Current

<table>
<thead>
<tr>
<th>Range</th>
<th>Resolution</th>
<th>Digital Display Accuracy</th>
<th>Analogue Gauge Accuracy</th>
<th>Read</th>
</tr>
</thead>
<tbody>
<tr>
<td>2mA</td>
<td>1µA</td>
<td>±(0.8% of rag + 1 digit)</td>
<td>±5% fs</td>
<td>Read of black scale × 0.01mA</td>
</tr>
<tr>
<td>20mA</td>
<td>10µA</td>
<td>±(0.8% of rag + 1 digit)</td>
<td>±5% fs</td>
<td>Read of black scale × 0.1mA</td>
</tr>
<tr>
<td>200mA</td>
<td>100µA</td>
<td>±(1.5% of rag + 1 digit)</td>
<td>±5% fs</td>
<td>Read of black scale × 1mA</td>
</tr>
</tbody>
</table>

- Overload Protection: F 200mA/250V fuse
- Voltage Drop: 200mV

### 3.2.4 AC Current

<table>
<thead>
<tr>
<th>Range</th>
<th>Resolution</th>
<th>Digital Display Accuracy</th>
<th>Analogue Gauge Accuracy</th>
<th>Read</th>
</tr>
</thead>
<tbody>
<tr>
<td>2mA</td>
<td>1µA</td>
<td>±(1.0% of rag + 3 digits)</td>
<td>±5% fs</td>
<td>Reading of black scale × 0.01mA</td>
</tr>
<tr>
<td>20mA</td>
<td>10µA</td>
<td>±(1.0% of rag + 3 digits)</td>
<td>±5% fs</td>
<td>Reading of black scale × 0.1mA</td>
</tr>
<tr>
<td>200mA</td>
<td>100µA</td>
<td>±(1.8% of rag + 3 digits)</td>
<td>±5% fs</td>
<td>Reading of black scale × 1mA</td>
</tr>
</tbody>
</table>

- Overload Protection: F 200mA/250V fuse
- Voltage Drop: 200mV
- Frequency Range: 40 to 400Hz
- Test on 60Hz/50Hz
3.2.5 Resistance

<table>
<thead>
<tr>
<th>Range</th>
<th>Resolution</th>
<th>Digital Display Accuracy</th>
<th>Analogue Gauge Accuracy</th>
<th>Read</th>
</tr>
</thead>
<tbody>
<tr>
<td>200Ω</td>
<td>0.1Ω</td>
<td>± (0.8% of rag + 3 digits)</td>
<td>±5% of arc</td>
<td>Reading of red scale ×1Ω</td>
</tr>
<tr>
<td>2kΩ</td>
<td>1Ω</td>
<td>± (0.8% of rag + 1 digit)</td>
<td>±5% of arc</td>
<td>Reading of red scale ×0.01kΩ</td>
</tr>
<tr>
<td>20kΩ</td>
<td>10Ω</td>
<td>± (0.8% of rag + 1 digit)</td>
<td>±5% of arc</td>
<td>Reading of red scale ×0.1kΩ</td>
</tr>
<tr>
<td>200kΩ</td>
<td>100Ω</td>
<td>± (0.8% of rag + 1 digit)</td>
<td>±5% of arc</td>
<td>Reading of red scale ×1kΩ</td>
</tr>
</tbody>
</table>

Response: Average calibrated in rms of sine wave

- Open Circuit Voltage: 1.2V
- Overload Protection: 250V DC or rms AC

3.2.6 Capacitance

<table>
<thead>
<tr>
<th>Range</th>
<th>Resolution</th>
<th>Digital Display Accuracy</th>
<th>Analogue Gauge Accuracy</th>
<th>Read</th>
</tr>
</thead>
<tbody>
<tr>
<td>2nF</td>
<td>1pF</td>
<td>± (4% of rag + 3 digits)</td>
<td>±6% of arc</td>
<td>Reading of black scale ×0.01nF</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Range</th>
<th>Resolution</th>
<th>Digital Display Accuracy</th>
<th>Analogue Gauge Accuracy</th>
<th>Read</th>
</tr>
</thead>
<tbody>
<tr>
<td>2MΩ</td>
<td>1kΩ</td>
<td>± (0.8% of rag + 1 digit)</td>
<td>±5% of arc</td>
<td>Reading of red scale ×0.01MΩ</td>
</tr>
<tr>
<td>20MΩ</td>
<td>10kΩ</td>
<td>± (1.0% of rag + 2 digits)</td>
<td>±5% of arc</td>
<td>Reading of red scale ×0.1MΩ</td>
</tr>
<tr>
<td>Value</td>
<td>Resolution</td>
<td>Digital Display Accuracy</td>
<td>Analogue Gauge Accuracy</td>
<td>Reading of black scale</td>
</tr>
<tr>
<td>--------</td>
<td>-----------</td>
<td>--------------------------</td>
<td>-------------------------</td>
<td>-----------------------</td>
</tr>
<tr>
<td>20nF</td>
<td>10pF</td>
<td>± (4% of range + 3 digits)</td>
<td>±6% of range</td>
<td>Reading of black scale x0.1nF</td>
</tr>
<tr>
<td>200nF</td>
<td>0.1nF</td>
<td>± (4% of range + 3 digits)</td>
<td>±6% of range</td>
<td>Reading of black scale x1nF</td>
</tr>
<tr>
<td>2μF</td>
<td>1nF</td>
<td>± (4% of range + 3 digits)</td>
<td>±6% of range</td>
<td>Reading of black scale x0.01μF</td>
</tr>
<tr>
<td>20μF</td>
<td>10nF</td>
<td>± (4% of range + 3 digits)</td>
<td>±6% of range</td>
<td>Reading of black scale x0.1μF</td>
</tr>
</tbody>
</table>

3.2.7 Frequency

<table>
<thead>
<tr>
<th>Range</th>
<th>Resolution</th>
<th>DIGITAL DISPLAY Accuracy</th>
<th>Analogue Gauge Accuracy</th>
<th>Reading of black scale</th>
</tr>
</thead>
<tbody>
<tr>
<td>20kHz</td>
<td>10Hz</td>
<td>± (15% of range + 5 digits)</td>
<td>±5% fs</td>
<td>Reading of black scale x0.1kHz</td>
</tr>
</tbody>
</table>

-Sensitivity: 200mV rms and input no more 10V rms

- 12 -

3.2.8 Temperature

<table>
<thead>
<tr>
<th>Range</th>
<th>Resolution</th>
<th>Digital Display Accuracy</th>
<th>Analogue Gauge Accuracy</th>
<th>Read</th>
</tr>
</thead>
<tbody>
<tr>
<td>-20°C to 1000°C</td>
<td>1°C</td>
<td>±5% of range + 4 digits</td>
<td>±6% of range</td>
<td>Reading of black scale x1°C</td>
</tr>
</tbody>
</table>

3.2.9 Diode

<table>
<thead>
<tr>
<th>Resolution</th>
<th>Test Current</th>
<th>Digital Display</th>
<th>Analogue Gauge</th>
<th>Read</th>
</tr>
</thead>
<tbody>
<tr>
<td>1mV</td>
<td>1mA</td>
<td>Digital Display</td>
<td>Reading of black scale x0.01V</td>
<td></td>
</tr>
</tbody>
</table>

- Open Circuit Voltage: 2.8V

3.2.10 Continuity
Function | Built-in buzzer will sound, if resistance is lower than 70Ω.
--- | ---

- 3.2.11 Transistor hFE

<table>
<thead>
<tr>
<th>Range</th>
<th>Base Current</th>
<th>Vce</th>
<th>Digital Display</th>
<th>Analogue Gauge</th>
<th>Read</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 to 1000β</td>
<td>10μA</td>
<td>2.8V</td>
<td></td>
<td>Reading of black scale ×1</td>
<td></td>
</tr>
</tbody>
</table>

4. OPERATING INSTRUCTION

4.1 PREPARATION FOR MEASUREMENT

4.1.1 Adjustment of pointer Zero position
Turn the zero position adjuster so that the pointer may align right to the zero position.

4.1.2 Range selection
Select a range proper for the item to be measured and set the rotary switch accordingly.

4.2 MEASURING VOLTAGE

4.2.1 Set the rotary switch at the desired V or V~ range position.
4.2.2 Connect test leads across the source or load under measurement.
4.2.3 Read LCD display or read the move of the pointer by black scale.
The polarity of the red lead connection will be indicated along with the voltage value when making DC voltage measurement.
4.2.4 When only the figure '1' or '-' is displayed, it indicates overrange situation and the higher range has to be selected.

4.3 MEASURING CURRENT

4.3.1 Set the rotary switch at the desired A or A~ range position.
4.3.2 Connect test leads in series with the load under measurement.
4.3.3 Read LCD display or read the move of the pointer by black scale.
The polarity of red connection will be indicated along with the voltage value when making DC Current measurement.
4.3.4 When only the figure '1' or '-' is displayed, it indicates overrange situation and the
higher range has to be selected.

4.4 MEASURING RESISTANCE

4.4.1 Set the rotary switch at the desired Ω range.
4.4.2 Connect test leads across the resistance under measurement.
4.4.3 Read LCD display or read the move of the pointer by red scale.
4.4.4 When only the figure '1' is displayed, it indicates overrange situation and the higher range has to be selected.

NOTE:
- For measuring resistance above 1MΩ, the meter may take a few seconds to get stale reading.
- When the input is not connected, i.e. at open circuit, the figure '1' will be displayed for the overrange condition.
- When checking in-circuit resistance, be sure the circuit under test has all power removed and that all capacitors have been discharged fully.

4.5 MEASURING CAPACITANCE

WARNING
To avoid electrical shock, remove test leads from measurement circuits before measuring the capacitance of a capacitor.

To avoid electric shock, be sure the capacitor measuring adapter has been removed before changing to another function measurement.

4.5.1 Set the rotary switch at the desired F range.
4.5.2 Before inserting capacitors under measurement into capacitance testing socket, be sure that the capacitors have been discharged fully.
4.5.3 Read LCD display or read the move of the pointer by black scale.

4.6 MEASURING TEMPERATURE

WARNING
To avoid electrical shock, remove test leads from measurement circuits before changing to another function measurement.

To avoid electrical shock, remove test leads from measurement circuits before
4.6.1 Set the rotary switch at the °C range position.
4.6.2 The 'LCD' and 'pointer' display will show the current environment temperature.
4.6.3 Inserts 'K' type thermocouple into the temperature measuring socket on the front panel and contact the object to be measured with the thermocouple probe.
4.6.4 Read LCD display or read the move of the pointer by °C scale.

4.7 MEASURING FREQUENCY
4.7.1 Set the rotary switch at the desired Hz range position.
4.7.2 Connect test leads across the source or load under measurement.
4.7.3 Read LCD display or read the move of the pointer by black scale.

NOTE:
1. Reading is possible at input voltages above 10Vrms, but the accuracy is not guaranteed.
2. In noisy environment, it is preferable to use shield cable for measuring small signal.

4.8 TESTING DIODE
4.8.1 Set the rotary switch at the ➤ range position.
4.8.2 Connect the red lead to the anode, the black lead to the cathode of the diode under testing.
4.8.3 Read LCD display or read the move of the pointer by black scale.
4.8.4 The meter will show the approximate forward voltage drop of the diode. If the lead connection is reversed, only figure '1' will be displayed.

4.9 CONTINUITY TEST
4.9.1 Set the rotary switch at the ➤ range position.
4.9.2 Connect test leads across two points of the circuit under testing.
4.9.3 If continuity exists (i.e., resistance less than about 70Ω), built-in buzzer will sound.
4.10 TESTING TRANSISTOR

⚠️ WARNING
To avoid electrical shock, remove test leads from measurement circuits before testing a transistor.

4.10.1 Set the rotary switch at the hFE range position.
4.10.2 Identify whether the transistor is NPN or PNP type and locate emitter, base and collector lead. Insert leads of the transistor to be tested into proper holes of the testing socket on the front panel.
4.10.3 Read LCD display or read the move of the pointer by black scale.

5. MAINTENANCE

5.1 BATTERY REPLACEMENT

⚠️ WARNING
Before attempting to remove the battery cover or open the case, be sure that test leads have been disconnected from measurement circuit to avoid electric shock hazard.

5.1.1 If the sign 'LO BAT' appears on the LCD display, it indicates that the battery should be replaced.
5.1.2 Loosen the screw fixing the battery cover and remove it.
5.1.3 Replace the exhausted battery with a new one.

5.2 FUSE REPLACEMENT

⚠️ WARNING
To avoid electrical shock, remove test leads from measurement circuits before replacing the fuse.

For protection against fire, replace fuses only with specified ratings: F 200mA/250V

5.2.1 Fuse rarely need replacement and blow almost always as a result of the operator's
Loosen the screw fixing the battery cover and remove it.
Replace the blown fuse with ratings specified.

5.3 TEST LEADS REPLACEMENT

**WARNING**

Full in compliance with safety standards can be guaranteed only if used with test leads supplied.
If necessary, they must be replaced with the same model or same electric ratings.
Measuring leads must be in good condition.
Electric ratings of the test leads: 1000V 5A

If the test leads be damaged, it must be replaced.
Loosen the screw fixing the battery cover and remove it.
Anew remove screw on the rear case and open it.

Then strip the wire and solder it at the position as aboriginal.

5.4 HOW TO USE THE COVER

- When this meter is out of use: Attach the cover to the panel face for safekeeping.
- When measuring: Attach it either to the rear case side or use it as a stand as illustrated in the cover.

5.5 STORE OF TEST LEADS

When placing the test leads in the storing space, roll it 3 times, then put in the test pin side first for store in the place (test leads store space) as illustrated.

6. ACCESSORIES

- Test Leads: Electric Ratings 1000V 5A
- Battery: 9V, NEDA 1604 or 6F22
- Fuse: F 200mA/250V
- Operating Manual
- Cover