



Pocket size digital multimeter

MS8221



Users Manual



CONTENTS

1	SAFETY INFORMATION.....	4
1.1	PRELIMINARY	4
1.2	DURING USE	5
1.3	SYMBOL.....	6
1.4	MAINTENANCE	7
2	DESCRIPTION	7
3	SPECIFICATIONS	9
3.1	GENERAL SPECIFICATIONS	9
3.2	Measurement specifications	10
3.2.1	DC VOLTAGE	11
3.2.2	AC VOLTAGE	11
3.2.3	DC CURRENT	12
3.2.4	AC Current (A/B/D model).....	12
3.2.5	Resistance	13
3.2.6	Diode test.....	13
3.2.7	Audible continuity test	13

3.2.8	Audible continuity test (Only B model)	14
3.2.9	Temperature (Only C model)	14
4	OPERATING INSTRUCTION	15
4.1	Voltage measurement	15
4.2	Current measurement	15
4.3	Resistance measurement	17
4.4	Diode test.....	17
4.5	Continuity test	18
4.6	Temperature measurement	18
	(Only C model)	18
4.7	Battery test (only D model).....	19
4.8	Transistor measurement (only B model)	
	20	
5	MAINTENANCE	20
5.1	General Maintenance	20
5.2	Fuse replacement	21
5.3	Battery replacement	22

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 IEC61010 concerning electronic measuring instruments with an overvoltage category CAT III 600V and pollution 2.

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

With proper use and care, the digital meter will give you years of satisfactory service.

1.1 PRELIMINARY

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

- When poor condition under harsh preservation or shipping conditions caused, inspect and confirm this meter without delay.
- Test leads must be in good condition. Before using verify that the insulation on test leads is not damaged and/or the leads wire is not exposed.
- Full 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.

1.2 DURING USE

- Before using, you must select the right input jack, function and range.
- Never exceed the protection limit values indicated in specifications for each range of measurement.
- When the value scale to be measured is unknown beforehand, set the range selector at the highest position.
- Do not measure voltage if the voltage on the terminals exceeds 600V above earth ground.
- Always be careful when working with voltages above 60V DC or 30V AC rms, keep fingers behind the probe barriers while measuring.
- Before rotating the transform switch to change functions and ranges, disconnect test leads from

the circuit under test.

- Never perform resistance, temperature, diode and continuity measurements on live circuits.
- Never use the meter under the condition of the explosive air, steam or dirt.
- If any faults or abnormalities are observed, the meter can not be used any more and it has to be checked out.
- Never use the meter unless the rear case is in place and fastened fully.
- Please do not store or use meter in areas exposed to direct sunlight, high temperature, humidity or condensation.

1.3 SYMBOL

 **Caution:** refer to the instruction manual. Incorrect use may result in damage to the device or its components.

 Earth

 This instrument has double insulation.

 Fuse: F 250mA/600V 10A/600V

1.4 MAINTENANCE

- 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.
- Before opening the battery cover or case of the meter, always disconnect test leads from all tested circuits.
- To avoid the wrong reading causing electricity attack, when the meter displays “”, you must change the battery.
- For continue protection against fire, replace fuse only with the specified voltage and current ratings: F 250mA/600V (quick acting), 10A/600V (quick acting).
- Do not use abrasives or solvents on the meter, use a damp cloth and mild detergent only.
- Always set the power switch to the OFF position when the meter is not in use.
- If the meter is to be stored for a long period of time, the batteries should be removed to prevent damage to the unit.

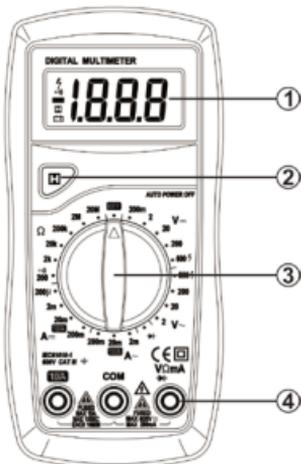
2 DESCRIPTION

- This meter is a portable professional measuring instrument with handsome LCD easily reading.

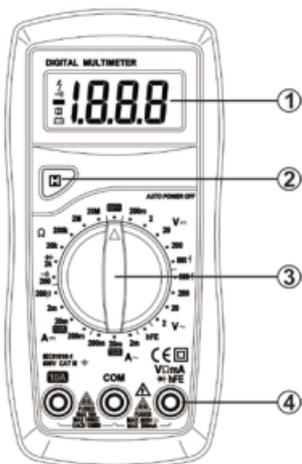
- Single operation of a transform switch makes measurement convenient. Overload protection and low battery indication are provided, this meter is ideal for use in the fields, workshop, school, hobby and home applications.
- This meter is with the functions of data hold.

NAME OF COMPONENTS

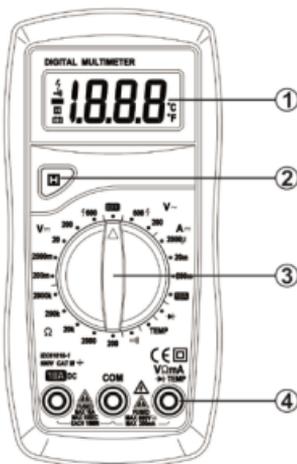
1. LCD display
2. Hold key
3. Rotary switch
4. Terminals



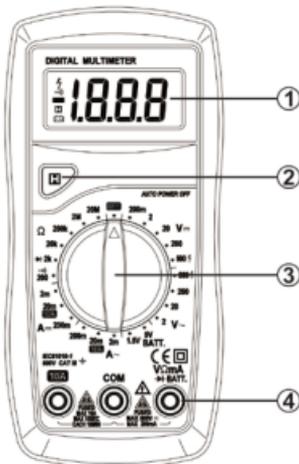
A model



B model



C model



D model

3 SPECIFICATIONS

3.1 GENERAL SPECIFICATIONS

- Environment conditions:
600V CAT.III
Pollution degree: 2. Altitude < 2000 m.
- Operating temperature:
0~40°C (32°F to 104°F), (<80% RH,
non-condensing)
- Storage temperature:
-10~50 °C(14°F to 122°F), (<70% RH, battery

removed)

- Temperature Coefficient:
 $0.1 \times (\text{specified accuracy}) / ^\circ\text{C}$ ($<18^\circ\text{C}$ or $>28^\circ\text{C}$)
- MAX. Voltage between terminals and earth ground:
600V AC rms or 600V DC
- Fuse Protection: mA: F 250mA/600V $\varnothing 6.3 \times 32$,
10A: 10A/600V $\varnothing 6.3 \times 32$
- Display: LCD, 1999counts, updates 2-3/sec.
- Over Range indication: LCD will display "1".
- Low battery indication:
The "" is displayed on the LCD.
- Polarity indication: "-" displayed automatically.
- Power source: 9V 
- Battery type: 6F22 9V
- Dimensions: 158(L) \times 74(W) \times 40(H) mm.
- Weight: 220g. Approx. (battery included).

3.2 Measurement specifications

Accuracy: \pm (% of reading + number of digits) at 18°C to 28°C (64°F to 82°F) with relative humidity to 80%.
(Accuracy is specified for a period one year after calibration)

3.2.1 DC VOLTAGE

Range	Resolution	Accuracy	
		A/B/D model	C model
0.2V	0.1mV	$\pm 0.5\% \pm 2$	$\pm 0.5\% \pm 2$
2V	1mV	$\pm 0.5\% \pm 3$	$\pm 0.5\% \pm 3$
20V	0.01V		$\pm 0.8\% \pm 3$
200V	0.1V		
600V	1V	$\pm 0.8\% \pm 2$	$\pm 0.8\% \pm 5$

- Input impedance: A/B/D model: $10M\Omega$

C model: $1M\Omega$

- Max. input voltage: 200mV range: 250VDC or AC rms

2V - 600V ranges: 600VDC or 600V rms

3.2.2 AC VOLTAGE

Range	Resolution	Accuracy	
		A/B/D model	C model
2V	1mV	$\pm 0.8\% \pm 4$	-
20V	10mV		-
200V	0.01V		$\pm 1.2\% \pm 5$
600V	1V	$\pm 1.2\% \pm 3$	

- Input impedance: A/B/D model: $10M\Omega$

C model: $1M\Omega$

- Max. input voltage: 200mV range: 250VDC or AC rms

- 2V -600V ranges: 600VDC or 600V rms
- Frequency range: A/B/D model: 40Hz-1000Hz
C model: 40Hz-400Hz
 - Response: Average, calibrated in rms of sine wave.

3.2.3 DC CURRENT

Range	Resolution	Accuracy		
		A/B model	D model	C model
200uA	0.1uA	$\pm 0.8\% \pm 2$	NULL	NULL
2mA	1 uA	$\pm 0.8\% \pm 2$		$\pm 1.5\% \pm 2$
20mA	10 uA			
200mA	100uA	$\pm 1.2\% \pm 2$		
10A	10mA	$\pm 2.0\% \pm 5$		$\pm 3.0\% \pm 2$

Overload protection: F250mA/600V 10A/600V.

Max. Input Current: mA Jack: 200mA, 10A Jack: 10A

3.2.4 AC Current (A/B/D model)

Range	Resolution	Accuracy
2mA	1 μ A	$\pm 1.2\% \pm 3$
20mA	10 μ A	
200mA	0.1mA	$\pm 2.0\% \pm 3$
10A	10mA	$\pm 3.0\% \pm 7$

Overload protection: F250mA/600V 10A/600V.

Max. input current: mA: 200mA dc or 200mA ac rms

10A: 10A 15 sec. Max

Frequency Range: 40Hz-1kHz
Indication: Average (rms of sine wave)

3.2.5 Resistance

Range	Resolution	Accuracy	
		A/B/D model	C model
200Ω	0.1Ω	±0.8%±3	±1.0%±3
2KΩ	1Ω	±0.8%±2	±1.0%±2
20KΩ	10Ω		
200KΩ	100Ω		
2MΩ	1kΩ		
20MΩ	10kΩ	±1.0%±2	-

Overload protection: 250V DC or 250V AC rms.

3.2.6 Diode test

➔ Display: read approximate forward voltage of diode

Forward DC Current: approx. 1mA

Reversed DC Voltage: approx. 2.8V

Overload protection: 250V DC or 250V AC rms

3.2.7 Audible continuity test

🔊 Built-in buzzer sounds if resistance is less than approx. 50Ω.

Open circuit voltage: approx. 2.8V

Overload protection: 250V DC or 250V AC rms

3.2.8 Audible continuity test (Only B model)

Range	Description	Test Condition
hFE	Display read approx. HFE value (0-1000) of transistor under test (all type).	Base Current approx. 10 μ A, Vce approx. 2.8V.

3.2.9 Temperature (Only C model)

Range	Resolution	Accuracy
-20 $^{\circ}$ C to 0 $^{\circ}$ C	1 $^{\circ}$ C	\pm 5.0% \pm 4
0 $^{\circ}$ C to 400 $^{\circ}$ C		\pm 1.0% \pm 3
400 $^{\circ}$ C to 1000 $^{\circ}$ C		\pm 2.0% \pm 3

- Overload Protection: 250V DC or rms AC

3.2.10 Battery Test (Only D model)

Range	Accuracy	Discharge current
1.5V	\pm 0.8% \pm 2	100mA
9V		6mA

Overload protection: 1.5V: F250mA/600V fuse

9V: 250Vdc or 250Vac rms

4 OPERATING INSTRUCTION

4.1 Voltage measurement

- Set rotary switch to the desired V $\overline{\text{---}}$ or V \sim range.
- Connect the black and red test leads to the COM and V terminals respectively.
- Connect the test leads to the circuit being measured
- Read the displayed value. The polarity of red test lead connection will be indicated when making a DCV measurement.
- When only the figure "1" is displayed, it indicates overrange situation and the higher range has to be selected.



To avoid electrical shock and/or damage to the instrument, do not attempt to take any voltage measurement that might exceeds 600Vdc or 600Vac rms. Do not apply more than 600Vdc or 600Vac rms between the common terminal and the earth ground.

4.2 Current measurement

- Set the rotary switch to the desired A $\overline{\text{---}}$ or A \sim range.
- Connect the black test lead to the COM terminal and

the red test leads to the mA terminal for a maximum of 200mA. For a maximum of 10A, move the red test lead to the 10A terminal.

- Connect test leads in series with the load in which the current is to be measured.
- Read the displayed value. The polarity of red test lead connection will be indicated when making a DCA measurement.
- When only the figure "1" displayed, it indicates overrange situation and the higher range has to be selected.

*** C model don't have ACA measurement function.**



To avoid damage to the meter, use the proper terminals, function, and range for your measurement.

NOTE:

- When only the figure 'OL' is displayed, it indicates overrange situation and the higher range has to be selected.
- When the value scale to be measured is unknown beforehand, set the range selector at the highest position.
- “” means the socket of INPUT maximum current is 200mA, over current will destroy the fuse. 10A's maximum current is 10A, load 15sec each 10min.

4.3 Resistance measurement

- Connect the black test lead to the COM jack and the red test lead to the Ω jack.
- Set the transform switch at the Ω range position.
- Connect test leads across the resistance under measurement.
- You can get reading from LCD.



To avoid electrical shock and/or damage to the instrument, disconnect circuit power and discharge all high-voltage capacitors before measuring resistance.

NOTE:

- For measuring resistance above $1M\Omega$, the meter may take a few seconds to stabilize reading. This is normal for high resistance measuring.
- If the resistance being measured exceeds the maximum value of the range selected or the input is not connected, an overrange indication "1" will be displayed..

4.4 Diode test

- Set the rotary switch to  range.
- Connect the black and red test leads to the COM and Ω terminals respectively.
- Connect the red test lead to the anode, black test lead to the cathode of the diode under testing.

- The meter will show the approx. forward voltage of the diode. If the lead connection is reversed, only figure "1" displayed.



To avoid electrical shock and/or damage to the instrument, disconnect circuit power and discharge all high-voltage capacitors before testing diodes.

4.5 Continuity test

- Set the rotary switch to  range.
- Connect the black and red test leads to the COM and Ω terminals respectively.
- Connect the test leads to the resistance in the circuit being measured.
- When the test lead to the circuit is below 50Ω , a continuous beeping will indicate it.



To avoid electrical shock and/or damage to the instrument, disconnect circuit power and discharge all high-voltage capacitors before testing for Continuity.

4.6 Temperature measurement

(Only C model)

- Set the transform switch at the TEMP range position.

- The LCD display will show the current environment temperature.
- When measuring the temperature with thermocouple, 'K' type probe for this meter can be used. Insert the black plug to the COM jack and the red one to the TEMP jack, touch the end of the temperature sensor to the area or surface of the object for measurement.
- You can get reading from LCD.



To avoid electrical shock, do not connect the thermocouples with the electriferous circuit.

4.7 Battery test (only D model)

- Set the rotary switch to desired **BATT.** range.
- Connect the black and red test leads to the COM and V Ω terminals respectively.
- Connect the test leads across the battery terminals under measurement.
- Read LCD display and determine if the battery is OK.

4.8 Transistor measurement (only B model)



To avoid electrical shock and/or damage to the instrument, before attempting to insert transistors for testing, always be sure that test leads have been disconnected from any measurement circuits.

- Set the rotary switch to hFE range, plug the transistor adaptor.
- Determine whether the transistor to be tested is NPN or PNP type and locate the Emitter, Base and Collector leads.
- Insert leads of the transistor into proper holes of the hFE socket.
- The meter will show the approx. hFE value at test condition of base current $10\mu\text{A}$ and V_{ce} 2.8V.

5 MAINTENANCE

5.1 General Maintenance

Periodically wipe the case with a damp cloth and mild detergent. Do not use abrasives or solvents.

Dirt or moisture in the terminals can affect readings.

To clean the terminals:

- Turn the meter off and remove all test leads.
- Shake out any dirt that may be in the terminals.

- Soak a new swab with a cleaning and oiling agent (such as WD-40).
- Work the swab around in each terminal. The oiling agent insulates the terminals from moisture-related contamination.



To avoid electrical shock or damage to the meter, do not get water inside the case. Remove the test leads and any input signals before opening the case

5.2 Fuse replacement

To replace the Meter's fuse (see the Figure):

- Set the rotary switch to **OFF** range.
- Disconnect test leads from any inputs terminals.
- Use a screwdriver to unscrew the 5 screws secured on the back casing.
- Separate the back casing from the top casing.
- Replace the fuse only with specified ratings:
F 250mA/600V F 10A/600V
- Replace the back casing and secure by the 5 screws.



Before replacing the fuse, disconnect test leads from any circuit under test. To prevent damage or injury, replace the fuse only with specified ratings.

5.3 Battery replacement

To replace the battery (see the Figure):

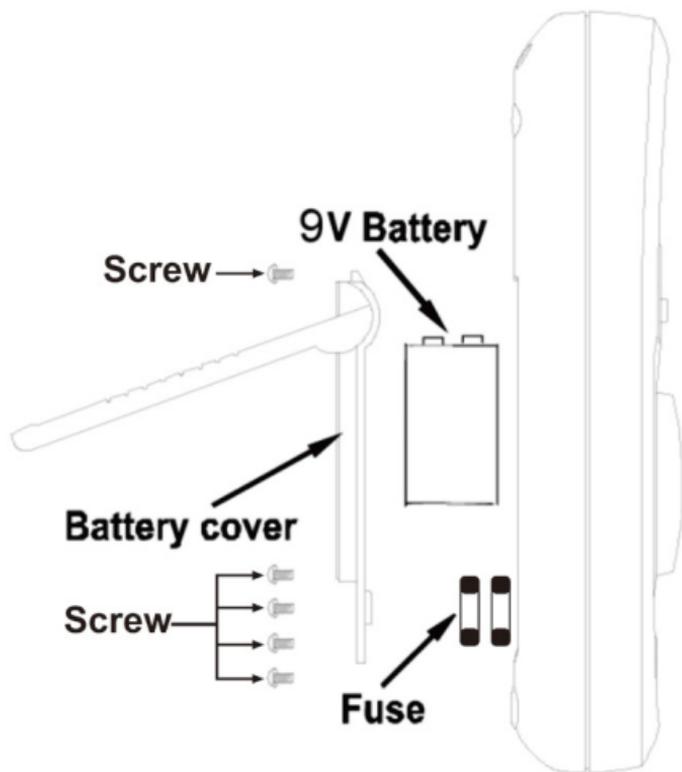
- When the battery voltage drop below proper operation range the  symbol will appear on the LCD display and the battery need to be replaced.
- Turn the meter off and remove all test leads.
- Use a screwdriver to unscrew the two screws secured on the battery cover, and remove the battery cover.
- Replace the battery with three new 9V battery (6F22).
- Reinstall the battery cover and secure by the two screws.



Before replacing the battery, disconnect test leads from any circuit under test, turn the meter off and remove test leads from the input terminals.

ACCESSORIES

- | | |
|--|--------------|
| (1) Test Leads | one set |
| (2) Battery:9V, 6F22 | three pieces |
| (3) Instruction Manual in English | one piece |
| (4) Thermocouple (K type) (Only C model) | one piece |



CAUTION

Using this appliance in an environment with a strong radiated radio-frequency electromagnetic field (approx. 3V/m), may influence its measuring accuracy. The measuring result can be strongly deviating from the actual value.



LUMEL

LUMEL S.A.

ul. Słubicka 4, 65-127 Zielona Góra, Poland
tel.: +48 68 45 75 100, fax +48 68 45 75 508
www.lumel.com.pl

MS8221-09