

DVM1090



velleman
components

DIGITAL THERMOMETER

DIGITALE THERMOMETER

THERMOMETRE NUMERIQUE

DIGITALES THERMOMETER

MULTÍMETRO DIGITAL



User Manual
Gebruikershandleiding
Manuel d'utilisation
Gebrauchsanleitung
Manual

DVM1090 – DIGITAL MULTIMETER



1. Introduction & Safety Prescriptions

Thank you for buying the DVM1090. This digital multimeter has a large LCD, a data-hold function and a backlight. It is ideal for use in open air, workshops and schools and for home and hobby applications.

2. Safety

The meter was designed according to IEC-1010 concerning the safety requirements for electronic measuring instruments with an overvoltage category (CAT II) and pollution 2.

Respect the following safety instructions to ensure maximum personal safety and to keep the device itself in good working order :

- Protect yourself against electroshocks.
- Do not use this device for any other application than those described in this manual.
- Make sure the device was not damaged in transit.
- Make sure the insulation of the test leads is not damaged and/or the wire itself is not exposed.
- Full compliance with safety standards can only be guaranteed if the device is used with the supplied test leads. If necessary, they should be replaced with identical leads or leads with identical electric ratings. All test leads should be in good working order.
- Never exceed the specified limit values for the various measurement ranges.
- Do not touch unused terminals when the meter is connected to a circuit.
- Place the range selector switch in the highest position if the value to be measured is unknown beforehand.
- Do not measure voltages > 1000V above earth ground.
- Exercise extreme caution when working with voltages in excess of 60VDC or 30Vrms AC. Keep your fingers behind the probe barriers while using the device.
- Do not connect the leads to a voltage source while the function switch is in one of the following modes : current, resistance, capacitance, inductance, temperature, frequency, diode, transistor or continuity.
- Disconnect all test leads from the circuit to be tested prior to selecting a different function or range.
- When performing measurements on TV's or switching power circuits, the user should keep in mind that voltage surges may occur at test points. These surges may damage the meter.
- Never perform resistance, capacitance, inductance, diode and continuity measurements on live circuits.
- Never perform capacitance measurements unless the capacitor in question has been fully discharged.
- Have the device checked by a qualified technician in case of malfunction.
- Never use the meter if the back panel is not in place and firmly fixed.
- Do not use or store the device in areas exposed to direct sunlight, high temperatures or high humidity.

2.1. Symbols



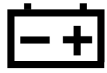
Important information with reference to safety, consult the manual !



Double insulation (Protection class II)



Earth ground



Low battery



DC (direct current)



Fuse



buzzer for continuity



AC (alternating current)




AC or DC (alternating current or direct current)

CAD II Overvoltage category II, pollution degree 2 per IEC1010-1

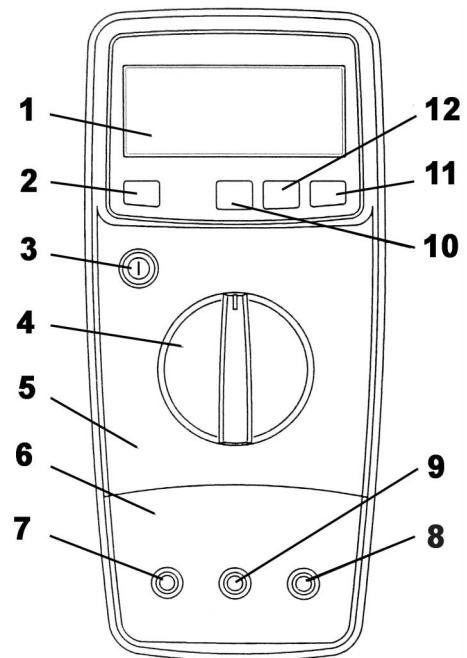
CAT III Overvoltage category III, pollution degree 2 per IEC1010-1

2.2 Maintenance

- Do not remove the back cover while a voltage is being applied. Only a qualified technician should handle repairs.
- Always disconnect the test leads from all current sources before opening the meter.
- Replace the battery when the  symbol is displayed.
- Replace blown fuses with an identical one or a fuse with identical voltage and current ratings : F 200mA/250V (quick-acting, max. resistance 2Ω), F 10A/250V (“quick-acting”).
- Use a damp cloth and a mild detergent to clean the device. Never apply abrasives or solvents to the meter
- Place the power switch in the OFF position when the device is not being used
- Remove the batteries to keep them from leaking if the device is to be stored for a prolonged period of time.

3. Front Panel Description


1. LCD display
2. L/C button : press this button prior to each individual capacitance and inductance measurement in order to calibrate the device.
3. Power button (ⓘ)
4. Range selector : used to select the desired function and range
5. Front panel
6. Battery cover
7. 10A jack
8. Capacitor and Ω, °C, A, V, Hz and H-jack
9. COM jack
10. DC/AC button (DC/AC) : used for AC/DC voltage and AC/DC current measurements. Place the button in the pressed-down position for AC current or voltage measurements or put it in the depressed position for DC current and voltage measurements.
11. Backlight button (LIGHT)
12. Data-hold button (HOLD)



4. Specifications

Max. accuracy is achieved during a one-year period after calibration. Ideal circumstances require a temperature of 18 to 28°C (64 to 82°F) and a max. relative humidity of 75%.

4.1 General Specifications

Measuring Method	Dual-slope integration A/D converter
Sampling Time	±0.4sec.
Display	LCD 25mm
Max. Display	1999 points (3 ½ digits)
Polarity Indication	“-“ indicates negative polarity
Overrange Indication	“1”
Displayed Measuring Unit	Unit of electrical capacity
Battery-Low Indication	“  ”-symbol is displayed
Maximum Altitude	7000ft (2000m)
Max. voltage between terminals and earth	1000V DC or AC
Fuse Protection	F 200mA/250V (quick-acting, max. resistance 2Ω), F 10A/250V (quick-acting)
Power Supply	9V-battery (e.g. 6F22)
Operating Temperature	0°C to +40°C (+32 to +104°F)
Storage Temperature	-10°C to +50°C (+10 to +122°F)
Dimensions	185 x 84 x 38mm
Weight	±300g (battery included)

4.2 Electrical Specifications

4.2.1. DC Voltage

Range	Resolution	Accuracy
200mV	0.1mV	±0.5% of rdg + 1 digit
2V	1mV	±0.5% of rdg + 3 digits
20V	10mV	±0.5% of rdg + 3 digits
200V	100mV	±0.5% of rdg + 3 digits
1000V	1V	±0.8% of rdg + 3 digits

Input Impedance : 10MΩ

Overload Protection : 250V DC or rms AC for the 200mV-range, 1000V DC or 700V rms AC for the ranges 2V to 1000V

Max. Input Voltage : 1000V DC

NOTE

Make sure the test leads are actually touching the circuit when performing measurements in the lower voltage ranges. The reading will fluctuate if the leads don't touch the circuit.

4.2.2. AC Voltage

Range	Resolution	Accuracy
200mV	0.1mV	±1.2% of rdg + 5 digits
2V	1mV	±1.0% of rdg + 5 digits
20V	10mV	±1.0% of rdg + 5 digits
200V	100mV	±1.0% of rdg + 5 digits
700V	1V	±1.2% of rdg + 5 digits

Input Impedance : 10M Ω
Overload Protection : 250V DC or rms AC for the 200mV-range, 1000V DC or 700V rms AC for the ranges 2V to 700V
Frequency Range : 40 to 400Hz
Response : average response, calibration in rms of a sine wave.
Max. Input Voltage : 700V rms AC

NOTE

Make sure the test leads are actually touching the circuit when performing measurements in the lower voltage ranges. The reading will fluctuate if the leads don't touch the circuit.

4.2.3. DC Current

Range	Resolution	Accuracy
2mA	1 μ A	±1.0% of rdg + 3 digits
20mA	10 μ A	±1.0% of rdg + 3 digits
200mA	100 μ A	±1.5% of rdg + 5 digits
10A	10mA	±2.0% of rdg + 10 digits

Overload Protection : F1 : F 200mA/250V fuse (quick-acting, max. resistance 2 Ω) for the ranges 2 to 200mA, F2 : F 10A/250V fuse (quick-acting) for the 10A-range.
Max. Input Current : mA jack : 200mA, 10A jack : 10A
Voltage Drop : 200mV

4.2.4. AC Current

Range	Resolution	Accuracy
2mA	1 μ A	±1.2% of rdg + 5 digits
20mA	10 μ A	±1.2% of rdg + 5 digits
200mA	100 μ A	±2.0% of rdg + 5 digits
10A	10mA	±3.0% of rdg + 10 digits

Overload Protection : F1 : F 200mA/250V fuse (quick-acting, max. resistance 2 Ω) for the ranges 2 to 200mA, F2 : F 10A/250V fuse (quick-acting) for the 10A-range.
Max. Input Current : mA jack : 200mA, 10A jack : 10A
Voltage Drop : 200mV
Frequency Range : 40 to 400HZ
Response : average response, calibration in rms of a sine wave.

4.2.5. Resistance

Range	Resolution	Accuracy
200Ω	0.1Ω	±1.0% of rdg ± 3 digits
2kΩ	1Ω	±1.0% of rdg ± 1 digits
20kΩ	10Ω	±1.0% of rdg ± 1 digits
200kΩ	100Ω	±1.0% of rdg ± 1 digits
2MΩ	1kΩ	±1.0% of rdg ± 1 digits
20MΩ	10kΩ	±1.0% of rdg ± 5 digits

Open-Circuit Voltage : ±700mV
Overload Protection : 250V DC or rms

4.2.6. Capacitance

Range	Resolution	Accuracy
2nF	1pF	±4.0% of rdg ± 8 digits
20nF	10nF	±4.0% of rdg ± 3 digits
200nF	0.1nF	±4.0% of rdg ± 3 digits
2μF	1nF	±4.0% of rdg ± 3 digits
20μF	10nF	±4.0% of rdg ± 5 digits

Overload Protection : F1 : F 200mA/250V fuse (quick-acting, max. resistance 2Ω)

4.2.7. Inductance

Range	Resolution	Accuracy
2mH	0.001mH	±4.0% of rdg ± 8 digits
20mH	0.01mH	±4.0% of rdg ± 3 digits
200mH	0.1mH	±4.0% of rdg ± 3 digits
2H	1mH	±4.0% of rdg ± 3 digits
20H	10mH	±4.0% of rdg ± 5 digits

Overload Protection : F1 : F 200mA/250V fuse (quick-acting, max. resistance 2Ω)
Tested Inductance : $Q \geq 10$, internal impedance $\leq 1k\Omega$

4.2.8. Temperature

Range	Resolution	Accuracy
-20 to 0°C	1°C	±5.0% of rdg + 4 digits
0 to 400°C	1°C	±1.0% of rdg ± 3 digits
401 to 1000°C	1°C	±2.0% of rdg ± 3 digits

Overload Protection : F1 : F 200mA/250V fuse (quick-acting, max. resistance 2Ω)

4.2.9. Frequency

Range	Resolution	Accuracy
20KHz	10Hz	$\pm 1.5\%$ of rdg + 5 digits


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

Overload Protection : 250V rms AC

4.2.10. Transistor hFE

Range	Function
hFE	Read the approximate hFE value (0-1000) of the transistor under test (ALL TYPES) from the display

4.2.11. Diode


Range	Resolution	Function
	1mV	Read the diode's approximate forward voltage value from the display

Forward DC Current : 1mA

Reversed DC Voltage : $\pm 2.8V$

Overload Protection : 250V DC or rms AC

4.2.12. Continuity

Range	Function
	Built-in buzzer sounds if continuity exists (resistance $< 50\Omega$)

Open Circuit Voltage : $\pm 2.8V$

Overload Protection : 250V DC or rms

4.2.13. TTL Logic

Range	Function
	The LCD displays ▼ when the logic level $\leq 0.8V$. The LCD displays ▲ when the logic level $\geq 2.0V$

5. Operating Instructions



5.1. Using the Data Hold Button

Press this button if you want the device to hold the measured value. Press this button again to disengage the data hold button.

5.2. Backlight

Press the **LIGHT** button when it's getting too dark to read the LCD.

The backlight extinguishes automatically after 5 seconds. Using the backlight often will shorten the life of your batteries.

The  symbol is displayed when the battery voltage is less than 7V. Note, however, that this symbol may be displayed because you are using the backlight (which uses a lot of power), even though the actual battery charge > 7V. In other words, you should only replace the battery if the  symbol is displayed when the backlight is not being used.

5.3. Selecting DC or AC




Press the **DC/AC** button to alternate between DC and AC measurements. The button is pressed in for AC voltage and AC current measurements.

5.4. Selecting L or C

Put the button in the pressed-down position for inductance and capacitance measurements. The component can now be tested.

Put the button in the depressed position for all other types of measurement.

5.5. Preparation for Measurement

1. Press the  button. The  symbol is displayed when the battery voltage < 7V, indicating that the battery needs to be replaced.
2. The  next to the input jack means that the input voltage or current should not exceed the specified limit values in order to prevent damage to the meter.
3. Select a function and a range with the range switch. Place the range selector in the highest position if the range is unknown beforehand.
4. First connect the black test lead (mass) and then the red one (+) to avoid electroshocks.

5.6. Measuring DC Voltage



Do not exceed the max. input voltage of 1000V DC !! Be very careful and avoid electroshocks when working with high voltages.

1. Connect the black test lead to the COM jack and the red test lead to the V jack.

2. Set the range switch at the desired V-range position.
3. Connect the test leads with the source or load under measurement.
4. Read the measured value from the LCD. The polarity of the red lead connection is also indicated.

REMARKS

- The LCD displays the overrange indication “1” if the measured value is too high for the range you are using. Select a higher range.
- Place the range selector in the highest position if the value to be measured is unknown beforehand.

5.7. Measuring AC Voltage



The input voltage should not exceed 700Vrms AC. Be very careful and avoid electroshocks when working with high voltages.

1. Connect the black test lead with the COM jack and the red test lead with the V jack.
2. Set the range switch at the desired V-range position.
3. Press the DC/AC button to install the AC measuring mode.
4. Connect the test leads with the source or load under measurement.
5. Read the value from the LCD.

REMARKS

- The LCD displays the overrange indication “1” if the measured value is too high for the range you are using. Select a higher range.
- Place the range selector in the highest position if the value to be measured is unknown beforehand.

5.8. Measuring DC Current



Deactivate the circuit to be tested before connecting it to the meter.

1. Connect the black test lead with the COM jack and the red test lead with the A jack for current measurements up to 200mA. Move the red lead to the 10A jack for measurements up to 10A.
2. Select the desired A-range with the range switch.
3. Connect the test leads in series with the load under measurement.
4. Read the measured value from the LCD. The measured voltage value and the polarity of the red connection are displayed.

REMARKS

- The LCD displays the overrange indication “1” if the measured value is too high for the range you are using. Select a higher range.
- Place the range selector in the highest position if the value to be measured is unknown beforehand.
- Respect the limit values \triangle : the max. current for socket A is 200mA, the max. current for the 10A socket is 10A. The fuse will blow if the limit values are exceeded.

5.9. Measuring AC Current



Deactivate the circuit to be tested before connecting it to the meter.

1. Connect the black test lead with the COM jack and the red test lead with the A jack for current measurements up to 200mA. Move the red lead to the 10A jack for measurements up to 10A.
2. Select the desired A-range with the range switch.
3. Select the AC measuring mode with the DC/AC button.
4. Connect the test leads in series with the load to be measured.
5. Read the value from the LCD.

REMARKS

- The LCD displays the overrange indication “1” if the measured value is too high for the range you are using. Select a higher range.
- Place the range selector in the highest position if the value to be measured is unknown beforehand.
- Respect the limit values \triangle : the max. current for socket A is 200mA, the max. current for the 10A socket is 10A. The fuse will blow if the limit values are exceeded.

5.10. Resistance Measurements



Disconnect the circuit to be tested and make sure that all capacitors are fully discharged before measuring the in-circuit resistance.

1. Connect the black test lead with the COM jack and the red test lead with the Ω jack.
2. Select the desired Ω range with the range switch.
3. Connect test leads with the resistance under measurement.
4. Read the value from the LCD.

REMARKS

- The LCD displays the overrange indication “1” if the measured value is too high for the range you are using. Select a higher range.
- The meter may need a few seconds to display a stable reading when measuring resistances $> 1M\Omega$.
- The overrange indication “1” is displayed when the input is not connected e.g. in case of an open circuit.

5.11. Capacitance Measurements



Disconnect the test leads from the circuits to be measured before testing a capacitor in order to avoid electroshocks. Also make sure the capacitors have been discharged fully before inserting them into the socket.

1. Connect the black test lead with the COM jack and the red test lead with the F jack.
2. Select the desired F range with the range switch and press the L/C button.
3. Make sure the capacitor has been fully discharged and connect the test leads with the capacitor to be tested.

4. Read the value from the LCD.
5. When frequent capacitance testing is needed you should connect the multifunction socket (included) with the COM & V/ Ω /A sockets. Insert the capacitor's pins in the "+" and "-" connectors of the multifunction socket.

REMARKS

- When measuring low capacities, the reading will include the capacity of the measuring leads. However, this will not influence the accuracy of your measurements.
- The device will need some time to produce a stable reading when measuring high capacitance values.

5.12. Inductance Measurements

1. Connect the black test lead with the COM jack and the red test lead with the H jack.
2. Place the range switch in the desired H range position and press the L/C button.
3. Connect the test leads with two points of the inductor to be tested.
4. Read the value from the LCD.
5. When frequent inductance testing is needed you should connect the multifunction socket (included) with the COM & V/ Ω /A sockets. Insert the inductor's pins in the "+" and "-" connectors of the multifunction socket.

REMARKS

Keep in mind that precise inductance measurements are impossible in close vicinity to strong magnetic fields.

5.13. Temperature Measurements



Do not connect the thermocouples with electrical circuits in order to avoid electroshocks.

1. Put the range switch in the °C-range position.
2. The LCD displays the current environmental temperature.
3. Insert "K"-type thermocouples into the COM jack and V/ Ω /A jack (or you can use the multifunction socket to connect a different type of K-thermocouple).
4. Read the value from the LCD.


5.14. Frequency Measurements

1. Connect the black test lead with the COM jack and the red test lead with the Hz jack.
2. Place the range switch in the 20KHz range position.
3. Connect the test leads with the source or load to be tested.
4. Read the value from the LCD.

REMARKS

- It is possible to obtain a reading with input voltages above 10Vrms, but the accuracy is not guaranteed.
- Use shielded cable to measure small signals in a noisy environment.

5.15. Diode Test

1. Connect the black test lead with the COM jack and the red test lead with the V jack.
2. Place the range switch in the  range position.
3. Connect the red lead with the anode and the black lead with the cathode of the diode to be tested.
4. Read the value from the LCD.


REMARKS

- The LCD will display the possible forward voltage drop of the diode.
- The overrange indication “1” will be displayed if the leads have not been connected properly.
- The overrange indication “1” is displayed when the input is not connected e.g. in case of an open circuit.

5.16. Continuity Test

Disconnect the test leads from the circuits to be measured before testing a capacitor in order to avoid electroshocks. Also make sure the capacitors have been discharged fully before inserting them into the test socket.

Deactivate the circuit to be tested and make sure all capacitors have been fully discharged prior to measuring the circuit's continuity.

1. Connect the black test lead with the COM jack and the red test lead with the Ω jack.
2. Place the range switch in the desired  range position.
3. Connect the test leads with two points of the circuit to be tested.
4. The built-in buzzer will sound if continuity exists.




REMARKS

- The overrange indication “1” is displayed when the input is not connected e.g. in case of an open circuit.

5.17. Transistor Test

1. Put the rotary switch in the hFE-position.
2. Plug the multifunction socket into the COM jack and the V jack.
3. Identify whether the transistor is NPN or PNP type and locate the emitter, the base and the collector. Insert the leads into the proper holes of the transistor on the multifunction socket for testing.
4. Read the value from the LCD.


5.18. TTL Logic Test

1. Connect the black test lead with the COM jack and the red test lead with the V jack.
2. Put the range switch in the  range position.
3. Connect the test leads with two points of the circuit to be tested.
4. When the logic level is $\leq 0.8V$, the LCD will display  and the buzzer will sound. The LCD displays  when the logic level $\geq 2.0V$.

6. Maintenance

6.1. Replacing the battery

In order to avoid electroshocks, you should disconnect the test leads before opening the case or the battery compartment.

1. The  sign appears on the LCD display when the battery needs to be replaced.
2. Loosen the fixing screw of the case and remove the battery cover on the front panel.
3. Insert the new 9V-battery and replace the battery cover.

6.2. Replacing the Fuse

Disconnect all test leads before replacing the fuse in order to avoid electroshocks. In order to avoid unnecessary fire risks, you should only use fuses with the following ratings : F1 : F 200mA/250mV (quick-acting, resistance $\leq 2\Omega$), F2 : F 10a/250V (quick-acting).

6.3. Replacing Test Leads

Only when you use the supplied test leads can we guarantee that you are complying fully with the safety standards. If necessary, they should be replaced with test leads of the same model or with the same ratings. Electric ratings of the test leads : 1000V 10A.

7. Accessories

- test leads : max. 1000V
- 9V-battery (e.g. 6F22)
- user manual
- holster
- thermocouple ("K"-type)
- multifunction test socket