



PROFESSIONAL AUTO-RANGING DIGITAL MULTIMETER

MODEL NO: **MM104.V2**

Thank you for purchasing a Sealey product. Manufactured to a high standard, this product will, if used according to these instructions, and properly maintained, give you years of trouble free performance.

IMPORTANT: PLEASE READ THESE INSTRUCTIONS CAREFULLY. NOTE THE SAFE OPERATIONAL REQUIREMENTS, WARNINGS & CAUTIONS. USE THE PRODUCT CORRECTLY AND WITH CARE FOR THE PURPOSE FOR WHICH IT IS INTENDED. FAILURE TO DO SO MAY CAUSE DAMAGE AND/OR PERSONAL INJURY AND WILL INVALIDATE THE WARRANTY. KEEP THESE INSTRUCTIONS SAFE FOR FUTURE USE.



Refer to instructions



Electrical shock hazard

1. SAFETY

1.1. PERSONAL PRECAUTIONS

- ✓ When using this meter, please observe all normal safety rules concerning:
Protection against the dangers of electric current.
Protection of the meter against misuse.
- ✓ Full compliance with safety standards can only be guaranteed if used with the test leads supplied. If necessary, they must be replaced with genuine Sealey leads with the same electronic ratings. Failure to do so will invalidate the warranty.
- ✗ **DO NOT** use leads if damaged or if the wire is bared in any way.

1.2. GENERAL SAFETY INSTRUCTIONS

- ✓ Familiarise yourself with the applications, limitations and hazards of the meter. If in any doubt consult a qualified electrician.
- ✓ When the meter is linked to a measurement circuit, **DO NOT** touch unused meter terminals.
- ✓ When the scale of the value to be measured is unknown set the selector to the highest range available.
- ✓ Before rotating the range selector to change functions, disconnect test leads from the circuit under test.
- WARNING!** Never perform resistance measurements on live circuits.
- ✓ Always be careful when working with voltages above 60Vdc or 30Vac rms. Keep your fingers behind the probe guards while measuring.
- ✓ When not in use, store the meter carefully in a safe, dry, childproof location. Storage temperature range -10°C to 50°C
- ✗ **DO NOT** apply voltage or current to the meter that exceeds the specified maximum.
- ✓ The user shall ensure that test probes are correctly selected in order to prevent danger. Probes shall be selected to ensure that adequate barriers guard against inadvertent hand contact with live conductors under test and that probes have minimal exposed probe tips. Where there is a risk of the probe tip short circuiting with other live conductors under test, it is recommended that the exposed tip length shall not exceed 4mm.

2. PER IEC1010 OVERVOLTAGE INSTALLATION CATEGORY

- 2.1. Overvoltage Category I
Equipment of overvoltage category I is equipment for connection to circuits in which measures are taken to limit the transient overvoltages to an appropriate low level.
note – examples include protected electronic circuits.
- 2.2. Overvoltage Category II
Equipment of overvoltage category II is energy-consuming equipment to be supplied from the fixed installation.
note – examples include household, office, and laboratory appliances.
- 2.3. Overvoltage Category III
Equipment of overvoltage category III is equipment in fixed installations.
note – examples include switches in the fixed installation and some equipment for industrial use with permanent connection to the fixed installation.
- 2.4. Overvoltage category IV
Equipment of overvoltage category IV is for use at the origin of the installation.
note – examples include electricity meters and primary over-current protection equipment

3. INTRODUCTION

Lightweight, compact digital multimeter with double moulded plastic housing and a 4000 counts LCD display. Drop-proof up to 2m. IP65 rated as “dust tight” and protected against low pressure water jets (all directions). Features display back light and forward facing work light. Conforms to EN 61010-1 and EN 61010-2-033 CATIII 600V safety requirements for electrical equipment for measurement, control and laboratory use.

Measures:

- AC and DC Voltage
- AC and DC Current
- Resistance

4. SPECIFICATION

Model No.....MM104.V2


FUNCTION	RANGE	ACCURACY
DC Voltage	400mV	±(1.0%reading+5digits)
	4V	± (1.0%reading+3digits)
	40V	
	400V	
	600V	
AC Voltage		50Hz to 60Hz
	4V	± (1.2%reading+3digits)
	40V	
	400V	
	600V	
All AC voltage ranges are specified from 5% of range to 100% of range		
DC current	400µA	± (1.0%reading+3digits)
	4000µA	
	40mA	
	400mA	± (1.2%reading+3digits)
	4A	
	10A	
	(20A: 30 sec max with reduced accuracy)	
AC Current		50Hz to 60Hz
	400µA	± (1.2%reading+3digits)
	4000µA	
	40mA	
	400mA	
	4A	± (1.8%reading+5digits)
	10A	
	(20A: 30 sec max with reduced accuracy)	
Resistance	400Ω	± (1.5%reading+5digits)
	4KΩ	
	40KΩ	
	400KΩ	
	4MΩ	
	40MΩ	± (2.5%reading+20digits)
Capacitance	40nF	± (4.5%reading+10digits)
	400nF	± (3.0%reading+5digits)
	4µF	
	40µF	
	400µF	± (5%reading+5digits)
Frequency (electrical)	10KHz	± (1.5%)
Duty Cycle	99.9%	± (1.2%)

Note: Accuracy is stated at 18°C to 28°C and less than 75% RH

Note: Accuracy specifications consist of two elements:

- (% reading) - This is the accuracy of the measurement circuit.
- (+ digits) - This is the accuracy of the analogue to digital converter.

Enclosure.....Double moulded
 Shock (Drop Test)..... 6.5 feet (2 meters)
 Transistor test.....No
 Diode Test.....Yes
 Continuity Check.....Audible signal will sound if the resistance is less than 50Ω (approx.), test current <0.35mA
 Temperature Sensor.....Requires type K thermocouple
 Input Impedance.....>10MΩ VDC & >10MΩ VAC
 AC Response.....TRMS
 ACV Bandwidth..... 50/60HZ(ALL WAVE) 45Hz to 1000HZ(SINE WAVE)

Crest Factor.....	≤3 at full scale up to 300V, decreasing linearly to ≤1.5 at 600V
Digits x Height.....	4x14mm
Overrange indication.....	"OL" is displayed
Auto Power Off.....	15 minutes (approximately) with disable feature
Polarity.....	Automatic (no indication for positive); Minus (-) sign for negative
Measurement Rate.....	3 times per second, nominal
Low Battery Indication.....	"  " is displayed if battery voltage drops below operating voltage
Battery.....	1.5V AAA x2 battery supplied
Fuses.....	mA, μ A ranges; 0.5A 600V ceramic fast blow A range; 10A/600V ceramic fast blow
Operating Temperature.....	41°F to 104°F (5°C to 40°C)
Storage Temperature.....	-4°F to 140°F (-20°C to 60°C)
Operating Humidity.....	Max 80% up to 87°F (31°C) decreasing linearly to 50% at 104°F (40°C)
Storage Humidity.....	<80%
Operating Altitude.....	7000ft. (2000meters) maximum.
Weigh.....	260g
Size.....	117x 62 x 45mm
Conformity.....	EN 61010-1, EN61010-2-033

1. Battery Cover
2. 4,000 counts LCD Negativity display
3. RANGE button
4. MAX/MIN button
5. Mode button
6. HOLD and Flashlight button
7. Function switch
8. COM input jack
9. 10A input jacks
10. Positive, mA, μ A input jack

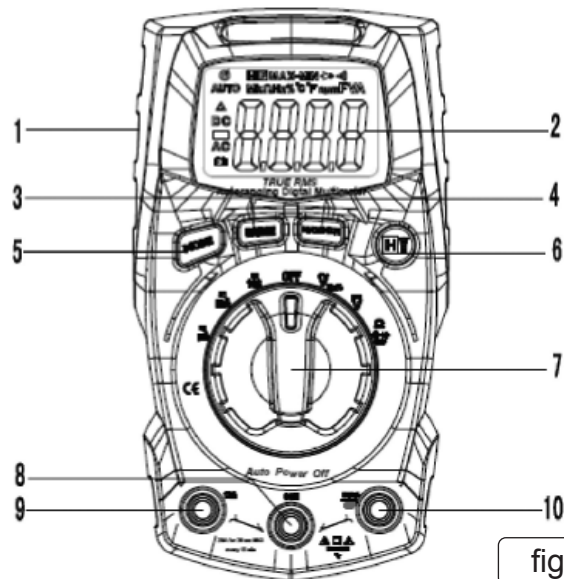




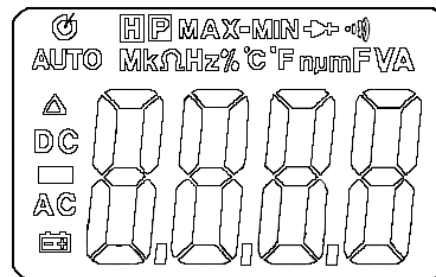


fig.1

	Auto power off
	Continuity
	Diode test
	Battery status
n	nano (10^{-9}) (capacitance)
μ	micro (10^{-6}) (amps, cap)
m	milli (10^{-3}) (volts, amps)
A	Amps
k	kilo (10^3) (ohms)
F	Farads (capacitance)
M	mega (10^6) (ohms)
Ω	Ohms
Hz	Hertz (frequency)
V	Volts
%	Percent (duty ratio)
AC	Alternating current
AUTO	Autoranging
DC	Direct current
HOLD	Display hold
MAX	Maximum
MIN	Minimum



5. OPERATION

- WARNING!** Risk of electrocution. High voltage circuits, both AC and DC are dangerous and should be measured with great care. Always turn the function switch to the off position when the meter is not in use.
 - WARNING!** If "OL" appears in the display during a measurement, the value exceeds the range that has selected. Change to a higher range.
- 5.1. DC VOLTAGE MEASUREMENTS**
- * **DO NOT** measure DC/AC voltages if a motor on the circuit is being switched ON or OFF. Large voltage surges may occur that can damage the meter
- 5.1.1. Set the function switch to the VDC position.
 - 5.1.2. Insert the black test lead into the negative COM jack.
Insert the red test lead into the positive V jack.
 - 5.1.3. Touch the black test probe tip to the negative side of the circuit
Touch the red test probe tip to the positive side of the circuit.
 - 5.1.4. Read the voltage in the display
- 5.2. AC VOLTAGE (FREQUENCY, DUTY CYCLE) MEASUREMENTS**
- WARNING!** Risk of electrocution. The probe tips may not be long enough to contact the live parts inside some 230V 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 a voltage on it. Make sure the probe tips are touching the metal contacts inside the outlet before assuming that no voltage is present.
- 5.2.1. Set the function switch to the VAC/Hz/% position.

- 5.2.2. Insert the black test lead plug into the negative COM jack.
Insert red test lead plug into the positive V jack.
- 5.2.3. Touch the black test probe tip to the neutral side of the circuit.
Touch the red test probe tip to the "hot" side of the circuit.
- 5.2.4. Read the voltage in the display.
- 5.2.5. Press the HZ/% button to indicate "Hz".
- 5.2.6. Read the frequency in the display.
- 5.2.7. Press the Hz/% button again to indicate "%".
- 5.2.8. Read the % of duty cycle in the display.

5.3. DC CURRENT MEASUREMENTS

- WARNING! DO NOT** make 20A current measurements for longer than 30 seconds. Exceeding 30 seconds may cause damage to the meter and/or the test leads.

- 5.3.1. Insert the black test lead plug into the negative COM jack.
- 5.3.2. For current measurements up to 6000 μ A DC, set the function switch to the μ A position and insert the red test lead plug into the μ A/mA jack.
- 5.3.3. For current measurements up to 600mA DC, set the function switch to the mA position and insert the red test lead plug into the μ A/mA jack.
- 5.3.4. For current measurements up to 20A DC, set the function switch to the 10A/HZ/% position and insert the red test lead plug into the 10A jack.
- 5.3.5. Press the MODE button to indicate "DC" on the display.
- 5.3.6. Remove power from the circuit under test, then open up the circuit at the point where you wish to measure current.
- 5.3.7. Touch the black test probe tip to the negative side of the circuit.
Touch the red test probe tip to the positive side of the circuit.
- 5.3.8. Apply power to the circuit.
- 5.3.9. Read the current in the display.


5.4. AC CURRENT (FREQUENCY, DUTY CYCLE) MEASUREMENTS

- WARNING! DO NOT** make a 20A current measurements for longer than 30 seconds. Exceeding 30 seconds may cause damage to the meter and/or the test leads.

- 5.4.1. Insert the black test lead plug into the negative COM jack.
- 5.4.2. For current measurements up to 6000 μ A AC, set the function switch to the μ A position and insert the red test plug into the μ A/mA jack.
- 5.4.3. For current measurements up to 600mA AC, set the function switch to the mA position and insert the red test lead plug into the μ A/mA jack.
- 5.4.4. For current measurements up to 20A AC, set the function switch to the 10A/HZ/% position and insert the red test lead plug into the 10A jack.
- 5.4.5. Press the MODE button to indicate "AC" on the display.
- 5.4.6. Remove power from the circuit under test, then open up the circuit at the point where you wish to measure current.
- 5.4.7. Touch the black test probe tip to the neutral side of the circuit.
Touch the red test probe tip to the "hot" side of the circuit.
- 5.4.8. Apply power to the circuit.
- 5.4.9. Read the current in the display.




5.5. 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 cables.

- 5.5.1. Set the function switch to the  Ω CAP position.
Insert the black test lead plug into the negative COM jack.
Insert the red test lead plug into the positive Ω jack.
- 5.5.2. Press the MODE button to indicate " Ω " on the display.
- 5.5.3. 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.
- 5.5.4. Read the resistance in the display.


5.6. CONTINUITY CHECK

- WARNING!** To avoid electrical shock. Never measure continuity on circuits or wires that have a voltage on them.

- 5.6.1. Set the function switch to the  Ω CAP position.
- 5.6.2. Insert the black lead plug into the negative COM jack.
Insert the red test lead plug into the positive Ω jack.
- 5.6.3. Press the MODE button to indicate ,  and " Ω " on the display
- 5.6.4. Touch the test probe tips to the circuit or wire you wish to check.
- 5.6.5. If the resistance is less than approximately 50 Ω , the audible signal will sound. If the circuit is open, the display will indicate "OL".


5.7. 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 cables.

- 5.7.1. Set the rotary function switch to the  Ω CAP position.
- 5.7.2. Insert the black test lead plug into the negative COM jack.
Insert the red test lead plug into the positive V jack.
- 5.7.3. Press the MODE button to indicate "nF" on the display.
- 5.7.4. Touch the test leads to the capacitor to be tested.
- 5.7.5. The test may take up to 3 minutes or more for large capacitors to charge. Wait until the readings settle before ending the test.
- 5.7.6. Read the capacitance value in the display.

5.8. DIODE TEST

- 5.8.1. Set the function switch to green  Ω CAP position.
- 5.8.2. Insert the black test banana plug into the negative COM jack and the red test lead banana plug into the positive V jack.

- 5.8.3. Press the MODE button to indicate  and V on the display.
- 5.8.4. Touch the test probes to the diode under test. Forward voltage will typically indicate 0.400 to 0.700V. Reverse voltage will indicate "OL". Shorted devices will indicated near OV and an open device will indicate "OL" in both polarities.

5.9. AUTORANGING/MANUAL RANGE SELECTION

When the meter is first turned on, it automatically goes into Autoranging. 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:

- 5.9.1. Press the RANGE key. The "AUTO" display indicator will turn off.
- 5.9.2. Press the RANGE key to step through the available ranges until you select the range you want.
- 5.9.3. To exit the Manual Ranging mode and return to Autoranging, press and hold the RANGE key for 2 seconds.

Note: Manual ranging does not apply for the Capacitance and Frequency functions.

5.10. MAX/MIN


Note: When using the MAX/MIN function in Autoranging mode, the meter will "lock" into the range that is displayed on the LCD when MAX/MIN is activated. If a MAX/Min reading exceeds that range, an "OL" will be displayed. Select the desired range BEFORE entering MAX/MIN mode.

- 5.10.1. Press the MAX/MIN key to activate the MAX/MIN recording mode. The display icon "MAX" will appear. The meter will display and hold the maximum reading and will update only when a new "max" occurs.
- 5.10.2. Press the MAX/MIN key again and the display icon "MIN" will appear. The meter will display and hold the minimum reading and will update only when a new "min" occurs.
- 5.10.3. To exit MAX/MIN mode press and hold the MAX/MIN key for 2 seconds.

5.11. DISPLAY BACKLIGHT

Positive Display and Backlight on when unit is turned on.

5.12. MODE

Press MODE key the selection of double measured functions which are present at display is possible. In particular this key is active in V--CAP-Ω position to select among resistance test, diode test, continuity test and capacitance test, and in current position to select between AC or DC current measurements.


5.13. HOLD / FLASH LIGHT

The hold function freezes the reading in the display. Press the HOLD key momentarily to activate or to exit the HOLD function. Press the HOLD key for >1 second to turn on or off the FLASH light function. The flash light and will automatically power OFF after 5 minutes of inactivity.

5.14. AUTO POWER OFF

The auto off feature will turn the meter off after 15 minutes. To disable the auto power off feature, hold down the MODE button and turn the meter on.

5.15. LOW BATTERY INDICATOR

The  icon will appear in the lower left corner of the display when the battery voltage becomes low. Replace the battery when this appears.

6. MAINTENANCE

- WARNING!** To avoid electric shock, disconnect the test leads from any source of voltage before removing the back cover or the battery or fuse covers.
 - WARNING!** To avoid electric shock, do not operate the meter until the battery and fuse covers are in place and fastened securely.
- 6.1. This MultiMeter is designed to provide years of dependable service, if the following care instructions are performed:
- 6.1.1. Keep the meter dry. If it gets wet, wipe it off.
- 6.1.2. Use and store the meter in normal temperatures. Temperature extremes can shorten the life of the electronic parts and distort or melt plastic parts.
- 6.1.3. Handle the meter gently and carefully. Dropping it can damage the electronic parts or the case.
- 6.1.4. Keep the meter clean. Wipe the case occasionally with a damp cloth. Do not use chemicals, cleaning solvents, or detergents.
- 6.1.5. Use only fresh batteries of the recommended size and type. Remove old or weak batteries so they do not leak and damage the unit.
- 6.1.6. If the meter is to be stored for a long period of time, the batteries should be removed to prevent damage to the unit.
- 6.2. **BATTERY INSTALLATION / REMOVAL**
- WARNING!** To avoid electric shock, disconnect the test leads from any source of voltage before removing the battery cover
- 6.2.1. Turn power off and disconnect the test leads from the meter.
- 6.2.2. Open the rear battery cover by removing the screw using a Phillips head screwdriver.
- 6.2.3. Insert the battery into battery holder, observing the correct polarity.
- 6.2.4. Put the battery cover back in place. Secure with the screw.
- WARNING!** To avoid electric shock do not operate the meter until the battery cover is in place and fastened securely.
- Note:** if the meter does not work, check the fuses and batteries to make sure that they are still good and that they are properly inserted.
- 6.3. **REPLACING THE FUSES**
- 6.3.1. Disconnect the test leads from the meter.
- 6.3.2. Remove the battery cover.
- 6.3.3. Gently remove the old fuse and install the new fuse into the holder.
- 6.3.4. Always use a fuse of the proper size and value (0.5A/600V fast blow for the 600mA range, 10A/600V fast blow for the 20A range).
- 6.3.5. Replace and secure the rear cover, battery and battery cover.
- WARNING!** To avoid electric shock do not operate the meter until the fuse cover is in place and fastened securely.

Parts support is available for this product. Please email sales@sealey.co.uk or telephone 01284 757500



WEEE REGULATIONS

Dispose of this product at the end of its working life in compliance with the EU Directive on Waste Electrical and Electronic Equipment (WEEE). When the product is no longer required, it must be disposed of in an environmentally protective way. Contact your local solid waste authority for recycling information.



ENVIRONMENT PROTECTION

Recycle unwanted materials instead of disposing of them as waste. All tools, accessories and packaging should be sorted, taken to a recycling centre and disposed of in a manner which is compatible with the environment. When the product becomes completely unserviceable and requires disposal, drain any fluids (if applicable) into approved containers and dispose of the product and fluids according to local regulations.

Note: It is our policy to continually improve products and as such we reserve the right to alter data, specifications and component parts without prior notice. Please note that other versions of this product are available. If you require documentation for alternative versions, please email or call our technical team on technical@sealey.co.uk or 01284 757505.

Important: No Liability is accepted for incorrect use of this product.

Warranty: Guarantee is 12 months from purchase date, proof of which is required for any claim.

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