



INSTRUCTIONS FOR:
8 FUNCTION MULTIMETER WITH THERMOCOUPLE
 MODEL No: **MM20.V3**

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.

1. SAFETY

1.1. PERSONAL PRECAUTIONS

- ✓ When using this multimeter, please observe all normal safety rules concerning:
 - Protection against the dangers of electrical 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 application and limitations of the multimeter as well as the potential hazards. **IF IN ANY DOUBT CONSULT A QUALIFIED ELECTRICIAN.**
- ✓ Before commencing testing, follow instructions below and select the correct input sockets, function and range on the multimeter.
- ✓ When the meter is connected to a circuit, do not touch any unused meter terminals.
- ✓ When the magnitude of the value to be measured is unknown beforehand, set the range selector to the highest value available.
- ✓ Before rotating the range selector to change functions, disconnect test probes from the circuit under test.
- ✗ **WARNING! Never perform resistance, transistor, diode or continuity measurements on live circuits.**
- ✓ Always take care when working with voltages above 35V DC or 25V AC rms. These voltages are considered a shock hazard.
- ✗ **WARNING! USE EXTREME CAUTION** when working with high voltages.
- ✓ Always keep fingers behind the probe barriers whilst measuring and **DO NOT** use when hands are wet..
- ✓ Before attempting to insert transistors for testing, ensure that the test leads have been disconnected.
- ✓ Components should not be connected to the transistor socket when taking voltage measurements with the test leads.
- ✗ **DO NOT** test voltages above 600V AC or DC - the circuitry of the multimeter will be destroyed.
- ✗ **WARNING! NEVER** connect the multimeter to a voltage source / live circuit when the rotary switch is set to any other function apart from Voltage testing.
- ✓ **ALWAYS** discharge filter capacitors in power supplies and disconnect the power when making resistance or diode tests.
- ✗ **WARNING!** Voltage checks on electrical outlets can be difficult and misleading because of the uncertainty of connection to the recessed electrical contacts. Other means should be used to ensure that the terminals are not "live".
- ✗ **DO NOT** use the multimeter in a potentially explosive atmosphere or where flammable material is present.
- ✓ **ONLY** operate the multimeter when the back cover is in place and fastened securely.
- ✓ If any abnormal readings are observed, the multimeter must be checked out by an authorised technician.
- ✓ **ALWAYS** turn off the multimeter and disconnect the test leads, before opening the back cover to replace the fuse or battery.
- ✓ When not in use, store the multimeter carefully in a safe, dry, childproof location out of direct sunlight. If storing for a long period of time, remove the battery. Storage temperature range: -15°C to 50°C.
- ✓ 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.

Note: The warnings, cautions and instructions referred to in this manual cannot cover all possible conditions and situations that may occur. It must be understood that common sense and caution are factors which cannot be built into this product, but must be applied by the operator.

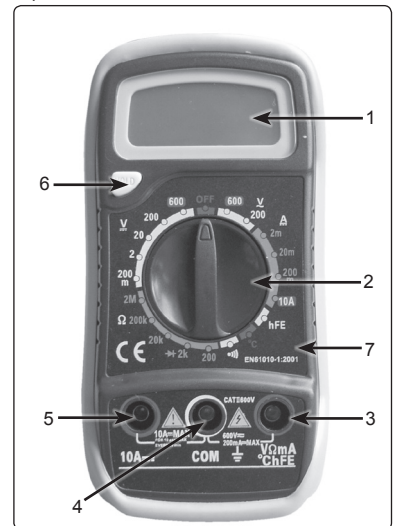
2. FEATURES

Heavy duty general purpose multimeter with clear and easy to read LCD display. Features data hold function, temperature probe and diode test facility. Housed in rugged rubber boot with integral stand. Supplied with full set of leads and probes.

Function	Red Lead Connection	Input Limits
V	VΩmA	600V DC
V~	VΩmA	600V AC (sine)
A ~	VΩmA	200mA DC
A 10A	10A DC	10A DC
hFE	VΩmA	0-1000
⊖	VΩmA	-40°C to 1000°C
▶	VΩmA	70Ω
2k	VΩmA	2kΩ
Ω	VΩmA	2MΩ

- Measures:**
- AC Voltage
 - DC Voltage
 - DC Current
 - Resistance
 - Temperature
 - Diode Test
 - Continuity Test
 - Transistor Test

- Layout:**
1. 12.5mm LCD Display
 2. Rotary Function Switch
 3. VΩmA Input Socket
 4. COM Input Socket
 5. 10A Input Socket
 6. Hold Button
 7. Transistor Socket




3. OPERATION

- ✗ **WARNING!** Ensure that you read, understand and apply the safety and operational instructions before connecting the multimeter. Only when the user is sure that they understand the procedures, is it safe to proceed with testing. Normal operating: temperature range: 0°C to 40°C, relative humidity less than 75%. **Remember** to turn off the multimeter when measurements are completed.
- NOTE: WHEN THE FIGURE '1' IS DISPLAYED, IT INDICATES AN OVER-RANGE SITUATION AND A HIGHER RANGE NEEDS TO BE SELECTED.**
- 3.1. MEASURING VOLTAGE (AC AND DC)**
 - 3.1.1. Connect the black test lead to the COM input socket and the red test lead to the VΩmA input socket.
 - 3.1.2. Set the rotary switch to the required V ~ (DC) or V ~ (AC) range, if unsure of the voltage range to be tested, set switch to the highest range first and then lower it until a satisfactory reading is obtained.
 - 3.1.3. Connect the test probes across the source or load under measurement.
 - 3.1.4. Turn on the power, the voltage will be displayed and the polarity of the red test lead connection will be indicated when measuring DC voltages.
- 3.2. MEASURING CURRENT (DC ONLY)**
 - 3.2.1. Connect the black test lead to the COM input socket and the red test lead to the VΩmA input socket, or for measuring in the 200mA to 10A range, use the 10A DC input socket.
 - 3.2.2. Set the rotary switch to the required A ~ (DC) range and connect the test probes in series with the load under measurement.
 - 3.2.3. The current measured will be displayed.

3.3. MEASURING RESISTANCE

- 3.3.1. Connect the black lead to the COM input socket and the red test lead to the the $V\Omega mA$ input socket (the polarity of the red lead is '+').
WARNING! When checking in-circuit resistance, ensure that the circuit under test has all power removed and all capacitors have been fully discharged before testing.
- 3.3.2. Set the rotary switch to the required Ω range and connect the test probes across the resistance under measurement.
- 3.3.3. When measuring resistance over $1M\Omega$, the meter may take a few seconds to get a stable reading. This is normal for high resistance measurements.


3.4. DIODE TESTING

- 3.4.1. Connect the black lead to the COM input socket and the red lead to the $V\Omega mA$ input socket (the polarity of the red lead is '+').
- 3.4.2. Set the rotary switch to the  position and connect the red lead to the anode and the black lead to the cathode of the diode under test.
- 3.4.3. The meter will show the approximate forward voltage drop of the diode in mV. If the leads are reverse connected, '1' is displayed.

3.5. TRANSISTOR TESTING

- 3.5.1. Determine whether the transistor to be tested is NPN or PNP type and set the rotary switch to the appropriate NPN or PNP - h_{FE} position.
- 3.5.2. Locate the Emitter, Base and Collector leads. Insert the leads of the transistor into the correct holes in the tester's front panel.
- 3.5.3. The meter will show the approximate h_{FE} value (0-1000) at test conditions of (approx) base current $10\mu A$ and V_{ce} 3.0V.

3.6. AUDIBLE CONTINUITY TEST

- 3.6.1. Connect the black lead to the COM input socket and the red lead to the $V\Omega mA$ input socket (the polarity of the red lead is '+').
- 3.6.2. Set the rotary switch to the  position and connect the test leads across the two points of the circuit under test.
- 3.6.3. If continuity exists (i.e. resistance is less than 70Ω), the built-in buzzer will sound.

3.7. MEASURING TEMPERATURE

- 3.7.1. Insert the red lead of the K-type thermocouple into the $V\Omega mA$ input socket on the front panel and the black lead into the COM input socket.
- 3.7.2. Set the rotary switch to the $^{\circ}C$ position.
- 3.7.3. Touch the object to be measured with the thermocouple probe and the ambient temperature will be displayed.
- WARNING!** To avoid electric shock, ensure that the thermocouple has been removed before changing to another function measurement.

4. SPECIFICATIONS

DC VOLTAGE		
Range	Accuracy	Resolution
200mV	$\pm 0.5\%$ of reading ± 2 digits	100 μV
2V	$\pm 0.8\%$ of reading ± 3 digits	1mV
20V	$\pm 0.8\%$ of reading ± 3 digits	10mV
200V	$\pm 0.8\%$ of reading ± 3 digits	100mV
600V	$\pm 0.8\%$ of reading ± 5 digits	1V

Overload protection: 220V rms AC for 200mV range and 600V DC or 600V rms AC for other ranges.

AC VOLTAGE		
Range	Accuracy	Resolution
200V	$\pm 2\%$ of rdg ± 2 digits	100mV
600V	$\pm 2\%$ of rdg ± 2 digits	1V

Overload protection: 600V DC or 600V rms AC.
 Response: Average responding, calibrated in rms of a sine wave. Frequency range: 40Hz - 400Hz

TEMPERATURE		
Range	Accuracy	Resolution
-40 $^{\circ}C$ to 400 $^{\circ}C$	$\pm 1.0\%$ of rdg $\pm 3^{\circ}C$	1 $^{\circ}C$
400 $^{\circ}C$ to 1000 $^{\circ}C$	$\pm 2.0\%$ of rdg $\pm 3^{\circ}C$	1 $^{\circ}C$

Overload protection: 220V rms AC


DC CURRENT		
Range	Accuracy	Resolution
2mA	$\pm 1.0\%$ of reading ± 2 digits	1 μA
20mA	$\pm 1.0\%$ of reading ± 2 digits	10 μA
200mA	$\pm 1.2\%$ of reading ± 2 digits	100 μA
10A	$\pm 2.0\%$ of reading ± 2 digits	10mA


Overload protection: 200mA/250V fuse
 Measuring Voltage drop: 200mV

TRANSISTOR h_{FE} TEST		
Range	Displaying range	Test Condition
(NPN or PNP)	0 - 1000	Current: 10 μA Vce: 3V

RESISTANCE		
Range	Accuracy	Resolution
200 Ω	$\pm 0.8\%$ of reading ± 5 digits	0.1 Ω
2k Ω	$\pm 0.8\%$ of reading ± 2 digits	1 Ω
20k Ω	$\pm 0.8\%$ of reading ± 2 digits	10 Ω
200k Ω	$\pm 0.8\%$ of reading ± 2 digits	100 Ω
2M Ω	$\pm 1.2\%$ of reading ± 3 digits	1k Ω

Maximum Open Circuit Voltage: 2.8V
 Overload protection: 220V rms for a maximum of 10 seconds for all ranges.

DIODE TEST	
Range	Description
	Display Approx. Voltage Drop


CONTINUITY TEST	
Range	Description
	Buzzes if resistance is below 70 Ω

4.1. Accuracy Calculation

Example: Test reading on 200Vdc range is 56.4V. Accuracy is $\pm 0.8\%$ of reading ± 3 digits. Reading ± 3 digit = 56.4 ± 3 on the last figure i.e. 56.1 to 56.7V. $\pm 0.8\%$ on this range gives 56.1 - 0.8% to 56.7 + 0.8% or 55.6 to 57.1V. Therefore the actual voltage lies between 55.6 and 57.1V.

Note: Accuracy is specified for a period of one year after calibration and at $23^{\circ}C \pm 5^{\circ}C$ with a relative humidity of less than 75%.

5. MAINTENANCE

- WARNING!** Before attempting to open the case, ensure that the test leads have been disconnected from measurement circuits to avoid electric shock hazard.
- 5.1. A fuse usually only blows due to operator error. To replace the fuse, remove the protective rubber boot and the two screws from the rear of the meter. Lift off the rear cover, replace the fuse and re-assemble the tester in reverse order, ensuring that the rear cover engages with the two lugs at the top of the tester.
- WARNING! ALWAYS** replace a fuse with one of the correct rating (200mA/250V).
- 5.2. If the battery sign  appears on the LCD display, it indicates that the battery should be replaced. Repeat the steps detailed in section 5.1. to remove the rear cover, replace the battery (9V PP9 type) by unplugging the old one and plugging a new one in and re-assemble in reverse order.
- 5.3. Occasionally clean the multimeter's casing using a slightly moistened cloth.

Environmental Protection.

Recycle unwanted materials instead of disposing of them as waste. All tools, accessories and packaging should be sorted, taken to a recycle centre and disposed of in a manner which is compatible with the environment.



When the product is no longer required, it must be disposed of in an environmentally protective way.



Battery Removal

- See Section 5.2.
- Remove and dispose of according to local authority guidelines. Under the Waste Batteries and Accumulators Regulations 2009, Jack Sealey Ltd are required to inform potential purchasers of products containing batteries (as defined within these regulations), that they are registered with Valpak's registered compliance scheme. Jack Sealey Ltd's Batteries Producer Registration Number (BPRN) is BPRN00705

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.

IMPORTANT: No liability is accepted for incorrect use of this product.

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



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