10-FUNCTION PROFESSIONAL AUTO-RANGING DIGITAL MULTIMETER

MODEL NO: **MM21**

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


Warning


Keep in dry area protect from rain

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.
- ✓ Familiarise yourself with the application and limitations of the multimeter as well as the potential hazards. **IF IN ANY DOUBT CONSULT A QUALIFIED ELECTRICIAN.**

1.2. GENERAL SAFETY INSTRUCTIONS

- ✓ 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.
- ❑ **WARNING!** Inspect test leads and probes for cracks, breaks or crazes in the insulation before using the meter.
- × **DO NOT** use leads if damaged or if the wire is bared in any way.
- × **DO NOT** use the meter if it has been damaged.
- ✓ Measurement category III is for the measurements performed on circuits directly connected to the low voltage installation. This meter has been designed according to IEC-61010-1 concerning electronic measuring instruments with an overvoltage category (CAT III 600V) and pollution degree 2.
- ❑ **WARNING!** Use extreme caution when working with high voltages.
- ✓ Perform a risk assessment of tasks to be carried out before using the meter.
- ✓ 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 60V DC or 30V AC rms. These voltages are considered a shock hazard.
- ✓ Always keep fingers behind the probe barriers whilst measuring and **DO NOT** use when hands are wet.
- × **DO NOT** touch the test leads, tips or the circuit being tested.
- ✓ Choose the proper range and function for the required measurement. **DO NOT** try voltage or current measurements that may exceed the ratings marked on the Function/Range switch.
- ✓ When testing for the presence of a voltage or current, make sure the meter is functioning correctly. Take a reading of a known voltage or current before accepting a zero reading.
- × **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.
- ❑ **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”.
- ✓ Avoid damaging the meter when testing voltage. Disconnect the test leads from the test points before changing functions.
- × **DO NOT** attempt a voltage measurement with the test leads in the mA/A terminal.
- × **DO NOT** perform resistance measurements on live circuits.
- ✓ **ALWAYS** discharge filter capacitors in power supplies and disconnect the power when making resistance or diode tests.
- × **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: -10°C to 60°C.
  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.
- ❑ **WARNING!** Engines produce carbon monoxide which is odourless and causes slower reaction time which could lead to serious injury. An engine in operation should be in a well ventilated area, or the vehicle’s exhaust connected to an adequate fume removal system.

- ✓ When working on a vehicle which is being tested or repaired, ensure that the handbrake is on and the front wheels are chocked to avoid the vehicle moving and causing injury.
- ✓ Wear suitable eye protection when testing or repairing a vehicle.
- ✓ When measuring current, connect the meter in series with the load.
- ✓ Disconnect the live test lead before disconnecting the common test lead.
- ✓ The mA/A terminals are protected by fuses. To avoid possible injury or damage, use only in circuits limited to 10A for 60 seconds.
- ✓ To maintain the accuracy of the meter, replace the discharged battery immediately when the symbol '**BAT**' appears on the meter display.
- ✓ Avoid measurement errors from outside interference. Keep the meter away from spark plug and coil wires.
- ✓ 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.

1.2. MAINTENANCE SAFETY

- ✓ Before opening case, always disconnect test leads from all energized circuits.
- ✓ For continuous protection against fire, replace fuse only with ratings: F 10A /600V Ø6x30 (Quick Acting)
- × **NEVER** use the meter unless the back cover is closed completely.
- × **DO NOT** use abrasives or solvents on the meter. To clean it use only a damp cloth and mild detergent.

1.3. PROBE ASSEMBLY OPERATION

- ✓ If the probe assembly is used in a manner not specified by the manufacturer, the protection provided by the probe assembly may be impaired.
- ✓ The applicable measurement category of a combination of a probe assembly and an accessory is the lower of the measurement categories of the probe assembly and of the accessory.
- ✓ Inspect the probes for damage to ensure safe use.
- ✓ Exceeding the electrical limits of this meter is dangerous and will expose you to serious or possibly fatal injury. Carefully read and understand the specification limits of this meter together with the warnings and cautions in this safety section.
- ✓ Follow all safety and operating instructions to ensure the meter is used safely and is kept in good condition. With proper use and care, your digital multimeter will give you years of satisfactory service.

2. INTRODUCTION

High-precision auto-ranging multimeter. Conforms to EN 61010-1 CATIII 600V safety requirements for electrical equipment for measurement, control and laboratory use. Features temperature measurement capability, data hold and auto-power-off function. Non-contact voltage detection (NCVD) enables one-handed use. The live test feature can test for live feeds with a single probe. Supplied with probe including a thermocouple probe and integral upright stand for use on the workbench. Clear and easy-to-read LCD display.

3. SPECIFICATION

Attribute	Value
AC Voltage (Accuracy):	2V/20V/200V/600V
DC Voltage (Accuracy):	2V/20V/200V/600V
AC Current (Accuracy):	2000mA/10.00A
DC Current (Accuracy):	2000mA/10.00A
Resistance (Accuracy):	200Ω /2kΩ/20kΩ/200kΩ 2MΩ/20MΩ
Auto Range:	ACV/DCV/Resistance/ Continuity/Diode /Temperature/ NCV/mA/A
Capacitance (Accuracy):	N/A
Temperature (Accuracy):	-200°C to 1200°C
Frequency (Accuracy):	N/A
Duty Cycle:	No
Continuity Audible:	Yes
Diode Test:	Yes

Attribute	Value
Backlit/Touch	Yes
Transistor Test:	No
Hi-Impact Rubber Case:	No
Digits x Height:	4 x 17mm
Low Battery Indicator:	Yes
Battery (Supplied):	2 x 1.5V (AAA)
Information:	Data-Hold. Auto-Power-Off. Integral Stand & Live Test.
Size (L x W x D):	130 x 62 x 30mm
Weight:	138g approx. (battery included)
Conformity:	EN 61010-1

Probe Specification	
Voltage	600V
Measurement Category	Category III

Probe Symbols			
	Hazardous voltage		Caution - Read Instructions
	Conforms to standard		Double Insulated

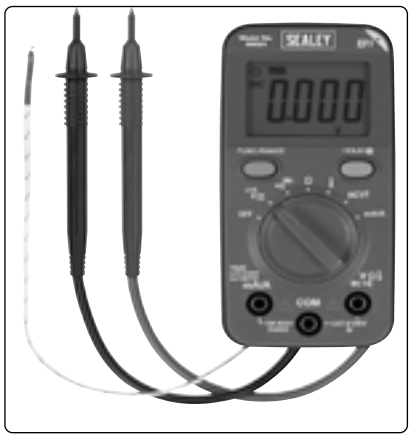
ADDITIONAL SPECIFICATIONS

Environment conditions:	600V CAT III
MAX. Voltage between terminals and earth ground:	600V AC rms or 600V DC.
Pollution degree:	2
Altitude:	< 2000m
Operating temperature:	0~40°C (32°F~104°F)
Storage temperature:	-10~60°C (14°F~140°F)
Fuse Protection:	10A /600V Ø6 x 30 (Quick Acting).
Sample Rate:	3 times/sec for digital data.
Display:	LCD display. Automatic indication of functions and symbols
Range selection:	Automatic/manual.
Over Range indication:	Display "OL".
Low battery indication:	Yes
Polarity indication:	"−" displayed automatically.
Hazardous voltage indication:	>36V " ⚡ " displayed.
Current Mis-plug alarm:	Alarm light/Beep.
Auto Power off:	30 Minutes.

NOTE: Accuracy is specified for one year after calibration, at operating temperatures of 18°C to 28°C, with relative humidity at 0% to 75%. Accuracy specifications take the form of: ±(% of Reading + Number of Least Significant Digits).

3.1. VOLTAGE

FUNCTION	RANGE	RESOLUTION	ACCURACY
DC Voltage $V_{\overline{\text{mV}}}$	2.00V	1mV	±(0.5% of rdg +3 Digits)
	20.00V	10mV	
	200.0V	100mV	
	600V	1V	
AC Voltage1,2 V~	2.000V	1mV	±(1.0% of rdg + 6 digits)
	20.00V	10mV	±(1.0% of rdg + 3 digits)
	200.0V	100mV	
	600V	1V	
1. Frequency Range: 40Hz~1kHz RMS. 2. AC minimum measurement: 5% of lowest range; 3. Overload Protection: 600V dc or 600V ac rms.			



When the testing environment is below CAT III, the meter can meet the range of 50-1000V for non-contact voltage detect and 100-1000V for LIVE test. In both cases they are not connecting ground or neutral.

3.2. NON-CONTACT VOLTAGE DETECT

VOLTAGE	FREQUENCY	INDICATION
50~1000V	50Hz~400Hz	4Bars display/ Alarm light/Beep

3.3. LIVE TEST

VOLTAGE	FREQUENCY	INDICATION
100~1000V	50Hz~400Hz	“H” display/ Alarm light/Beep

3.4. TEMPERATURE MEASUREMENT (K-TYPE THERMOCOUPLE)

RANGE	RESOLUTION	ACCURACY
-200 to 1200°C	1°C	±(2% of rdg +3 digits)
-328 to 2192°F	1°F	±(2% of rdg +6 digits)

3.5. DIODE TEST

FUNCTION	RANGE	RESOLUTION	ACCURACY
Diode Test ⏚	1.000 V	0.001V	1.0% uncertainty
Overload protection: 600V DC or 600V AC rms. Test Condition: Forward DC current approximately 1mA. Reversed DC voltage approximately 1.5V			

3.6. RESISTANCE

FUNCTION	RANGE	RESOLUTION	ACCURACY
Resistance Ω	200.0Ω	0.1Ω	±(0.5% of rdg+3 digits)
	2.000kΩ	1Ω	±(0.5% of rdg+2 digits)
	20.00kΩ	10Ω	
	200.0kΩ	100Ω	
	2.000MΩ	1kΩ	
	20.00MΩ	10kΩ	±(1.5% of rdg+3 digits)
Overload protection: 600V DC or 600V AC rms.			

3.7. CURRENT

FUNCTION	RANGE	RESOLUTION	ACCURACY
DC Current mA ⎓	2000mA	1mA	±(1.0% of rdg+3 digits)
	10.00A	10mA	±(1.5% of rdg+3 digits)
AC Current MA~	2000mA	1mA	±(1.5% of rdg+3 digits)
	10.00A	10mA	±(2% of rdg+3 digits)
Overload protection: 10A range model: Maximum input 10A DC or AC RMS. F 10A/600V fuse. Overload indication: OL Displayed. >1A for 1min load on then 10min load off. Make sure A terminal socket has a good connection.			

3.8. CONTINUITY CHECK

FUNCTION	RANGE	RESOLUTION	DESCRIPTION
Continuity Test •))	200.0Ω	0.1Ω	Continuity beeper ≤ 50Ω
Overload protection: 600V DC or 600V AC rms. Test Condition: Open circuit voltage: approx. 0.5V			

4. OPERATION

4.1. VOLTAGE MEASUREMENT

4.1.1. Set rotary switch to the V range.
4.1.2. Press the FUNC key to select DCV or ACV measuring mode.
4.1.3. Connect black and red test lead plug to the COM and V terminal.
4.1.4. Connect the test leads probe to the circuit being measured
4.1.5. Read the displayed value. The polarity of red test lead connection will be indicated when making a DCV measurement.

4.2. CURRENT MEASUREMENT

4.2.1. Turn off power to the circuit. Discharge all high voltage capacitors.
4.2.2. Set the rotary switch to the mA/A position. Connect the black and red test leads to the COM and mA/A terminal.
4.2.3. Press the SELECT key to select DCA or ACA measuring mode.
4.2.4. Break the circuit path to be tested.
4.2.5. Connect the black probe to the more negative side of the break.
4.2.6. Connect the red probe to the more positive side of the break.
4.2.7. Reversing the leads will give a negative reading, but will not damage the Meter.
4.2.8. Turn on power to the circuit; then read the display.
4.2.9. Turn off power to the circuit and discharge all high voltage capacitors.
4.2.10. Remove the Meter and restore the circuit to normal operation.

4.3. LIVE TEST

4.3.1. Hand hold the meter. Set rotary switch to the V range.
4.3.2. Press the FUNC key to select LIVE measuring mode.
4.3.3. Connect the red test leads to the circuit being measured.
4.3.4. “H” will been shown when connecting the red test leads to the LIVE wire.

4.3.5. NON-CONTACT VOLTAGE DETECT (NCV/EF) TEST

4.3.6. Set the rotary switch to NCV range.
4.3.7. Place upper right corner of device (marking NCV) close to test wire/socket.
4.3.8. It will show 4 bars according to LIVE voltage level and distance.

4.4. RESISTANCE MEASUREMENT

4.4.1. Set the rotary switch to Ω range.
4.4.2. Connect black and red test lead plugs to the COM and V terminal.
4.4.3. Connect the test leads to the circuit or resistor being measured and read the displayed value.
4.4.4. **DO NOT** input a Voltage source at this mode.

4.5. TEMPERATURE MEASUREMENT

4.5.1. Set the rotary switch to Temperature range.

4.5.2. Connect the K-type thermocouple sensor to COM and V terminal and read the displayed value.

4.6. DIODE TEST

4.6.1. Set the rotary switch to range. Press FUNC key to select.

4.6.2. Connect black and red test lead plug to the COM and V terminal.

4.6.3. For forward-bias readings on any semiconductor component, place the red test lead on the component's anode and place the black test lead on the component's cathode.

4.6.4. The meter will show the approx. forward voltage of the diode.

4.6.5. **DO NOT** input a Voltage source at this mode.

4.7. AUDIBLE CONTINUITY TEST

4.7.1. Set the rotary switch to range.

4.7.2. Connect black and red test lead plug to the COM and V terminal.

4.7.3. Connect the testleads probe to the target.

4.7.4. When the circuit is below 50Ω a continuous beeping will indicate it.

4.7.5. **DO NOT** input a Voltage source at this mode.

4.8. KEY FUNCTIONS

4.8.1. HOLD KEY / BACKLIGHT KEY

4.8.1.1. Data Hold function: Press once (short press)

4.8.1.2. Data Hold mode makes the meter stop updating the display.

4.8.1.3. Backlight and flash light on/off. Press and hold for 3 seconds.

4.8.2. FUNC KEY / RANGE KEY

4.8.2.1. Function key: Press once (short press)

4.8.2.2. Switches alternate function at the current knob selection.

4.8.2.3. Range key: Keep press 3 seconds (long press).

4.8.2.4. Switches AUTO/MANUAL range mode.

4.8.3. AUTO POWER OFF FUNCTION

4.8.3.1. Symbol will indicate when function is enabled. The Meter enters the "sleep mode" and blanks the display when the Meter is not used for 30 minutes.

4.8.4. DISABLE AUTO POWER OFF FUNCTION(CONTINUOUS ON)

4.8.4.1. Keep press FUNC. Key and turn on the meter then release FUNC. Key, will disable AUTO POWER OFF function. Symbol will disappear.

4.8.5. CURRENT PLUG-IN ALARM

4.8.5.1. When test lead is plugged in at mA/A terminal, and the measurement function is not current selected function, a beeper will be heard and the RED LED will illuminate.

4.8.6. DANGER VOLTAGE ALARM

4.8.6.1. Device getting a Hazardous voltage >36V, a lightning symbol will be displayed.

4.8.7. BATTERY & FUSE REPLACEMENT

4.8.7.1. If the sign appears on the LCD display, it indicates that the battery should be replaced. Remove the screw on the back cover and open the battery case. Replace the exhausted batteries with two new 1.5V batteries of the same type (AAA).

4.8.7.2. The fuse rarely needs replacement. Failure is almost always as a result of operator's error. Open the case and replace the blown fuse with the same rating specified (10A Model F 10A /600V Ø6x30.)

- ❑ **WARNING!** Before attempting to open the case, always be sure that test leads have been disconnected from measurement circuits. Close case and tighten screws completely before using the multimeter to avoid electrical shock hazard.
- ❑ **WARNING!** To avoid electric shock, **DO NOT** use the multimeter until it has been fully re-assembled.

5. MAINTENANCE

- ❑ **WARNING! DO NOT** attempt to repair or service the multimeter unless you are qualified to do so and have the relevant calibration, performance test, and service information. To avoid electrical shock or damage to the meter **DO NOT** get water inside the case.

5.1. Periodically wipe the case with a slightly damp cloth and mild detergent. **DO NOT** use solvents.

5.2. Turn the multimeter off when not in use and remove the batteries if stored for a long period of time.

- × **DO NOT** store the multimeter in a place of high humidity or high temperature.

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.

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.

BATTERY REMOVAL

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 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 is required for any claim.

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