

# MM68 MULTIMETER

## INSTRUCTION MANUAL



**MARTINDALE**  
● ● ● ELECTRIC



**GENERAL SAFETY INFORMATION:** Always read before proceeding.

#### Warning

These instructions contain both information and warnings that are necessary for the safe operation and maintenance of this product. It is recommended that you read the instructions carefully and ensure that the contents are fully understood. Failure to understand and to comply with the warnings and instructions can result in serious injury, damage or even death.

In order to avoid the danger of electrical shock, it is important that proper safety measures are taken when working with voltages exceeding 30V AC RMS, 42V AC peak or 60V DC.

This product must only be used by a competent person capable of interpreting the results under the conditions and for the purposes for which it has been constructed. Particular attention should be paid to the Warnings, Precautions and Technical Specifications. Always check the unit is in good working order before use and that there are no signs of damage to it. Do not use if damaged.

Where applicable other safety measures such as use of protective gloves, goggles etc. should be employed.

Please keep these instructions for future reference. Updated instructions and product information are available at: [www.martindale-electric.co.uk](http://www.martindale-electric.co.uk)

**REMEMBER: SAFETY IS NO ACCIDENT**

#### MEANING OF SYMBOLS:



Equipment complies with relevant EU Directives



Caution - risk of danger & refer to instructions



Caution - risk of electric shock



Equipment protected by double or reinforced insulation (Class II)



End of life disposal of this equipment should be in accordance with relevant EU Directives



Direct current (DC)



Alternating current (AC)



Earth (ground)

**Thank you for buying one of our products. For safety and full understanding of its benefits please read this manual before use. Technical support is available from 01923 441717 and support@martindale-electric.co.uk.**

## **CONTENTS**

<b>1</b>	<b>Introduction</b>	<b>1</b>
1.1	Inspection	1
1.2	Description	1
1.3	Accessories	1
1.4	Battery Installation	
<b>2</b>	<b>Product Specific Safety Information</b>	<b>3</b>
2.1	Precautions	3
<b>3</b>	<b>Operation</b>	<b>5</b>
3.1	General	5
3.2	Low Battery Indication	5
3.3	Description of Terminals	5
3.4	Description of Press Buttons	6
3.5	Description of LCD Symbols	6
3.6	Auto Power Off	6
3.7	Max/Min	7
3.8	Relative Function	7
3.9	Backlight	7
3.10	Manual Range Selection	7
3.11	AC & DC Voltage Measurement	8
3.12	AC & DC Current Measurement	8
3.13	Resistance Measurement	8
3.14	Capacitance Measurement	9
3.15	Frequency Measurement	9
3.16	Duty Cycle Measurement	9
3.17	Continuity Testing	10
3.18	Diode Testing	10
<b>4</b>	<b>Maintenance</b>	<b>11</b>
4.1	Battery Replacement	11
4.2	Fuse Replacement	11
4.3	Test Lead Replacement	11
4.4	Calibration	12
4.5	Cleaning	12
4.6	Repair & Service	12
4.7	Storage Conditions	12
<b>5</b>	<b>Warranty</b>	<b>13</b>
	<b>Specifications</b>	

# 1. INTRODUCTION

## 1.1 Inspection

Examine the shipping carton for any sign of damage. Inspect the unit and any accessories for damage. If there is any damage then consult your distributor immediately.

## 1.2 Description

The MM68 is a 4½ digit multimeter with the following measurement functions:

- ◆ True rms AC voltage to 750V
- ◆ DC voltage to 1000V
- ◆ True rms AC current to 10A
- ◆ DC current to 10A
- ◆ Resistance to 220MΩ
- ◆ Capacitance to 22mF
- ◆ Frequency to 22MHz
- ◆ Continuity with audible indication
- ◆ Diode testing
- ◆ Duty cycle

Further functions are:

- ◆ Max/Min indication
- ◆ Auto power off
- ◆ Display backlight
- ◆ Relative function
- ◆ Auto ranging
- ◆ Incorrect connection warning

## 1.3 Accessories (included)

- ◆ TL16 test leads
- ◆ Spare 0.5A/500V, fast acting ceramic fuse
- ◆ 9V battery (installed)
- ◆ Instructions

## **1.4 Battery Installation**

Refer to section 4.1 (Battery Replacement) for the battery installation instructions for the MM68.

## 2. PRODUCT SPECIFIC SAFETY INFORMATION

**Measurement Category II (CAT II)** is applicable to test and measuring equipment connected directly to utilization points (socket outlets and similar points) of the low-voltage MAINS installation.

**Measurement Category III (CAT III)** is applicable to test and measuring equipment connected to the distribution part of the building's low-voltage MAINS installation.

**Measurement Category IV (CAT IV)** is applicable to test and measuring equipment connected at the source of the building's low-voltage MAINS installation.

### 2.1 Precautions

This product has been designed with your safety in mind, but please pay attention to the following warnings and cautions before use.

#### **Warning**

Before use check the unit for cracks or any other damage. Make sure the unit is free from dust, grease and moisture. Also check any associated leads and accessories for damage. Do not use if damaged.

#### **Warning**

Do not use if the battery/fuse cover is not fitted.

#### **Warning**

When this unit is used in combination with test leads, the measurement category of the combination is the lower measurement category of either this unit or the test leads used.

Likewise, if test lead accessories such as crocodile clips are also used, the measurement category will be the lowest measurement category in that combination.

 **Warning**

Always test this unit on an appropriate proving device or known voltage source before and after using it to determine if a hazardous voltage exists in a circuit to be tested.

 **Warning**

When using test leads, always keep your fingers behind the finger guard on the test lead probe.

 **Warning**

Measuring a voltage that exceeds the specified limits of the unit may damage the unit and expose the operator to a shock hazard. Always check the unit's specified limits before use.

 **Caution**

Avoid severe mechanical shock or vibration and extreme temperature.

### 3. OPERATION

#### 3.1 General

If the multimeter does not measure capacitance or current on the  $\mu\text{A}/\text{mA}$  ranges, the internal fuse (F1) may have blown (see section 4.2 Fuse Replacement).


If the multimeter does not measure current on the 10A the internal fuse (F2) may have blown (see section 4.2 Fuse Replacement).

If the magnitude of a parameter to be measured is unknown, but known to be within the maximum safe limits of the multimeter, then manually set the range to maximum. For example, if measuring DC voltage and the voltage magnitude is unknown, set the range to 1000V, then if required select autoranging for a satisfactory reading.


If a test lead is connected to the wrong input socket when a voltage range is selected then a warning buzzer will sound.

If the multimeter displays OL or -OL then the measurement limits of the range have been exceeded.

#### 3.2 Low Battery Indication

If the  symbol is displayed then the battery needs replacing (see section 4.1 Battery Replacement).

#### 3.3 Description of Terminals

 $\mu\text{A mA}$	Input terminal for AC & DC current measurements to 220 mA and capacitance measurements.
10A	Input terminal for AC & DC current measurements to 10A
COM	Common terminal for all measurements

**% Hz V** Input terminal for AC & DC voltage, resistance, continuity, diode, frequency and duty cycle measurements

### 3.4 Description of Press Buttons

**RANGE** Switches between auto and manual ranging

**MAX/MIN** Selects maximum/minimum function



Turns on/off the backlight



Selects the relative function

**Hz %**

Selects the frequency and duty cycle functions

### 3.5 Description of LCD Symbols

**APO** Auto power off is active

**RANGE** Manual ranging is selected



Diode testing function is selected



Continuity function is selected



Relative function is selected

**MAX**

Maximum indication is selected

**MIN**

Minimum indication is selected

**%, mV, V, A, nF,** Unit of measurement being displayed

**μF, mF, Ω, kΩ,**

**MΩ, Hz, kHz**



Indicates battery is low

**DC**

Indicates DC measurement

**AC**

Indicates AC measurement

### 3.6 Auto Power Off

The MM68 will auto power off after approximately 30 minutes.

Pressing any button will turn the MM68 back on.

To deactivate the auto power off function press and hold the RANGE button while simultaneously turning the MM68 function switch from OFF to any position. The APO annunciator will no longer be displayed.


### 3.7 Max/Min


To select the Max/Min function press the MAX/MIN button. Alternate between displaying the maximum and minimum measured values by pressing the MAX/MIN button.

To exit the Max/Min function hold down the MAX/MIN button for 2 seconds.


### 3.8 Relative Function

The relative function can be used to remove an offset/residual value from a measurement.

To select the relative function press the  button to store the offset/residual value. This will now be removed from all consequent readings while the relative function is selected.

Press the  button again to exit the relative function.

### 3.9 Backlight

Press the  button to turn on/off the backlight.

The backlight will automatically turn off after approx 4½ minutes.

### 3.10 Manual Range Selection

The MM68 powers up in autoranging mode.

To manually select a range press the RANGE button to hold the present range, then continue to press the RANGE button until the required range is selected. The sequence is lowest range to highest then directly back to lowest.

To return to autoranging hold the RANGE button for 2 seconds.

### **3.11 AC & DC Voltage Measurement**

Connect the black test lead to the COM terminal and the red test lead to the %HzV $\Omega$  terminal.

Set the rotary switch to either AC mV/V or DC mV/V and if required manually set the range.

Taking all necessary safety precautions connect the test leads to the circuit being measured and read the measured voltage from the display.

### **3.12 AC & DC Current Measurement**

Connect the black test lead to the COM terminal and the red test lead to the  $\mu$ A mA or 10A terminal depending on the magnitude of current to be measured.

Set the rotary switch to either the AC or DC ranges as required.

Taking all necessary safety precautions connect the test leads in series with the circuit being measured and read the measured current from the display.


### **3.13 Resistance Measurement**

Connect the black test lead to the COM terminal and the red test lead to the %HzV $\Omega$  terminal.

Set the rotary switch to  $\Omega$  and if required manually set the range.

Taking all necessary safety precautions connect the test leads to the circuit being measured and read the measured resistance from the display.

### 3.14 Capacitance Measurement

 Be sure the capacitor being tested is completely discharged before connecting the test leads.

Connect the black test lead to the COM terminal and the red test lead to the  $\overleftarrow{\text{C}}$  terminal.

Set the rotary switch to  $\overleftarrow{\text{C}}$  and if required manually set the range.

Taking all necessary safety precautions, and observing the correct polarity for electrolytic capacitors, connect the test probes to the capacitor to be measured and read the measured capacitance from the display.

### 3.15 Frequency Measurement

Connect the black test lead to the COM terminal and the red test lead to the %HzV $\Omega$  terminal.

Set the rotary switch to Hz% and if required press the Hz% button to select the frequency function. If required manually set the range.

Taking all necessary safety precautions connect the test leads to the circuit being measured and read the measured frequency from the display.

### 3.16 Duty Cycle Measurement


Connect the black test lead to the COM terminal and the red test lead to the %HzV $\Omega$  terminal.

Set the rotary switch to Hz% and press the Hz% button to select the duty cycle function.

Taking all necessary safety precautions connect the test leads to the circuit being measured and read the measured % duty cycle from the display.

### 3.17 Continuity Testing

Connect the black test lead to the COM terminal and the red test lead to the %HzV $\Omega$  terminal.

Set the rotary switch to .


Taking all necessary safety precautions connect the test leads to the circuit being tested.

The buzzer will sound if the resistance is  $<30\Omega$ .

### 3.18 Diode Testing

If the diode to be tested is in circuit be sure the circuit power is switched off.

Connect the black test lead to the COM terminal and the red test lead to the %HzV $\Omega$  terminal.


Set the rotary switch to .

Taking all necessary safety precautions connect the test leads to the diode being tested.

If the diode is good a forward bias will give a display reading of around 0.6 V (silicon diode) and a reverse bias will give a display of OL. If the diode is shorted or open circuit the display will indicate approx 0V or OL respectively for both forward and reverse bias.

## 4. MAINTENANCE


### 4.1 Battery Replacement

 To avoid shock or injury, disconnect the multimeter from any external circuits or components and remove the test leads before proceeding.

Replace the battery by removing the two screws from the battery cover and lifting the battery cover.

Fit a new 9V, NEDA 1604, JIS006P, IEC 6F22 battery and replace the battery cover and screws.

### 4.2 Fuse Replacement

 To avoid shock, injury or damage to the multimeter, disconnect the multimeter from any external circuits or components and remove the test leads before proceeding.

 Replace only with the fuse specified.


Replace the fuses by removing the three screws securing the rear casing, and lift off the rear casing.

Replace F1 only with the original type 0.5A/500V, fast acting ceramic fuse and replace F2 only with the original type 10A/500V, fast acting ceramic fuse.

Replace the rear casing and screws.

### 4.3 Test Lead Replacement

If the test leads become damaged they should be replaced.

 The replacement test leads must have the same (or better) overvoltage category rating as the TL16 leads supplied

#### **4.4 Calibration**

To maintain the integrity of measurements made using your instrument, Martindale Electric recommends that it is returned at least once a year to an approved Calibration Laboratory for recalibration and certification.

Martindale Electric is pleased to offer you this service. Please contact our Service Department for details.

Email: [service@martindale-electric.co.uk](mailto:service@martindale-electric.co.uk)

Tel: 01923 650660

#### **4.5 Cleaning**

The unit may be cleaned using a soft dry cloth. Do not use moisture, abrasives, solvents, or detergents, which can be conductive.

#### **4.6 Repair & Service**

There are no user serviceable parts in this unit other than those that may be described in section 3. Return to Martindale Electric if faulty. Our service department will quote promptly to repair any fault that occurs outside the guarantee period.

Before the unit is returned, please ensure that you have checked the unit, batteries, fuses, poor connections and leads.

#### **4.7 Storage Conditions**

The instrument should be kept in warm dry conditions away from direct sources of heat or sunlight, and in such a manner as to preserve the working life of the unit. It is strongly advised that the unit is not kept in a tool box where other tools may damage it.

## 5. WARRANTY AND LIMITATION OF LIABILITY

This Martindale product is warranted to be free from defects in material and workmanship under normal use and service. The warranty period is 2 years and begins on the date of receipt by the end user. This warranty extends only to the original buyer or end-user customer, and does not apply to fuses, disposable batteries, test leads or to any product which, in Martindale's opinion, has been misused, altered, neglected, contaminated, or damaged by accident or abnormal conditions of operation, handling or storage.

Martindale authorised resellers shall extend this warranty on new and unused products to end-user customers only but have no authority to extend a greater or different warranty on behalf of Martindale.

Martindale's warranty obligation is limited, at Martindale's option, to refund of the purchase price, free of charge repair, or replacement of a defective product which is returned to Martindale within the warranty period.

This warranty is the buyer's sole and exclusive remedy and is in lieu of all other warranties, expressed or implied, including but not limited to any implied warranty of merchantability or fitness for a particular purpose. Martindale shall not be liable for any special, indirect, incidental or consequential damages or losses, including loss of data, arising from any cause or theory.

Since some jurisdictions do not allow limitation of the term of an implied warranty, or exclusion or limitation of incidental or consequential damages, the limitations and exclusions of this warranty may not apply to every buyer. If any part of any provision of this warranty is held invalid or unenforceable by a court or other

decision-maker of competent jurisdiction, such holding will not affect the validity or enforceability of any other provision or other part of that provision.

Nothing in this statement reduces your statutory rights.

**MARTINDALE**  
ELECTRIC

## Specification

MM68

## Digital Multimeter



### ELECTRICAL

All specified accuracies are at  $23^{\circ}\text{C} \pm 5^{\circ}\text{C}$ ,  $<75\%$  RH for 1 year.

**Temperature Coefficient:** 0.1 x (specified accuracy) per  $^{\circ}\text{C}$ . ( $0^{\circ}\text{C}$  to  $18^{\circ}\text{C}$ ,  $28^{\circ}\text{C}$  to  $50^{\circ}\text{C}$ )

### DC VOLTS

**Ranges:** 220mV, 2.2V, 22V, 220V, 1000V

**Resolution:** 0.01mV, 0.0001V, 0.001V, 0.01V, 0.1 V

**Accuracy:**  $\pm (0.05\%$  of rdg + 5 dgts)

**Input impedance:** 220mV:  $>100\text{M}\Omega$ ;

2.2V:  $10\text{ M}\Omega$ ; 22V to 1000V:  $9.1\text{M}\Omega$ .

**Overload protection:** 1000V DC or 750 AC rms.

### TRUE RMS AC VOLTS

**Ranges:** 220mV, 2.2V, 22V, 220V, 750V

**Resolution:** 0.01mV, 0.0001V, 0.001V, 0.01V, 0.1V

**Accuracy:** 220mV range (50 Hz to 500 Hz)  $\pm (1.2\%$  of rdg + 10 dgts)

2.2V to 220V ranges (50 Hz to 500 Hz)  $\pm (1.2\%$  of rdg + 10 dgts)

(500 Hz to 2 kHz)  $\pm (2.0\%$  of rdg + 20 dgts)

750V range (50 Hz to 500 Hz)  $\pm (2.0\%$  of rdg + 20 dgts)

AC coupled true rms specified from 5% to 100% of range

**Crest factor:**  $\leq 3$

**Input impedance:** 220mV:  $>100\text{M}\Omega$ ; 2.2V:  $10\text{M}\Omega$ ; 22V to 750V:  $9.1\text{M}\Omega$

**Overload protection:** 1000V DC or 750 AC rms



# Specification

## MM68

### Digital Multimeter

#### DC CURRENT

**Ranges:** 220 $\mu$ A, 2200 $\mu$ A, 22mA, 220mA, 10A \*

**Resolution:** 0.01 $\mu$ A, 0.1 $\mu$ A, 0.001mA, 0.01mA, 0.001A

**Accuracy:** 220 $\mu$ A to 22mA ranges  $\pm$  (0.5% of rdg + 10 dgts)

220mA range  $\pm$  (1.0% of rdg + 10 dgts)

10A range  $\pm$  (2.0% of rdg + 10 dgts)

\* Current on 10 A range applied for 60 seconds max followed by a 10 minute cooling period

**Input protection:** 0.5A/500V fast blow ceramic fuse

10A/500V fast blow ceramic fuse

#### TRUE RMS AC CURRENT

**Ranges:** 220 $\mu$ A, 2200 $\mu$ A, 22mA, 220mA, 10A \*

**Resolution:** 0.01 $\mu$ A, 0.1 $\mu$ A, 0.001mA, 0.01mA, 0.001 A

**Accuracy:** 220 $\mu$ A to 220mA (50 Hz to 1 kHz)  $\pm$  (1.5% of rdg + 5 dgts)

10A range (50 Hz to 1 kHz)  $\pm$  (2.5% of rdg + 5 dgts)

\* Current on 10 A range applied for 60 seconds max followed by a 10 minute cooling period

AC coupled true rms specified from 5% to 100% of range

**Crest factor:**  $\leq$  3

**Input protection:** 0.5A/500V fast blow ceramic fuse

10A/500V fast blow ceramic fuse.

#### RESISTANCE

**Ranges:** 220 $\Omega$ , 2.2k $\Omega$ , 22k $\Omega$ , 220k $\Omega$ , 2.2M $\Omega$ , 22M $\Omega$ , 220M $\Omega$

**Resolution:** 0.01 $\Omega$ , 0.0001k $\Omega$ , 0.001k $\Omega$ , 0.01k $\Omega$ , 0.0001M $\Omega$ , 0.001M $\Omega$ , 0.1M $\Omega$

**Accuracy:** 220 $\Omega$  to 220k ranges  $\pm$  (0.5% of rdg + 10 dgts)

2.2M $\Omega$  range  $\pm$  (1.0% of rdg + 10 dgts)

22M $\Omega$  range  $\pm$  (2.0% of rdg + 10 dgts)

220M $\Omega$  range  $\pm$  (5.0% of rdg + 10 dgts)



# Specification

## MM68

## Digital Multimeter

**Open circuit voltage:** -0.45 V DC (-1.2 V DC on 220 $\Omega$  range)

**Overload protection:** 500 V DC or AC rms

### CAPACITANCE

**Ranges:** 22nF, 220nF, 2.2 $\mu$ F, 22 $\mu$ F, 220 $\mu$ F, 2.2mF, 22mF

**Resolution:** 0.001nF, 0.01nF, 0.0001 $\mu$ F, 0.001 $\mu$ F, 0.01 $\mu$ F, 0.0001mF, 0.001mF

**Accuracy:** 22nF range  $\pm$  (3.0% of rdg + 80 dgts)

220nF to 220 $\mu$ F ranges  $\pm$  (3.0% of rdg + 5 dgts)

2.2mF to 22mF range  $\pm$  (5.0% of rdg + 20 dgts)

**Overload protection:** 500 V DC or AC rms

### FREQUENCY

**Ranges:** 22Hz, 220Hz, 22kHz, 220kHz, 2.2MHz, 22MHz

**Resolution:** 0.01Hz, 0.1Hz, 0.001kHz, 0.01kHz, 0.0001MHz, 0.001MHz

**Accuracy:**  $\pm$  (0.1% of rdg + 3 dgts)

**Input sensitivity:** 2Hz ~ 2.2MHz:  $>2.5V_{rms}$ . 2.2MHz ~ 22MHz:  $>2.5V_{rms}$  and  $<5V_{rms}$

**Minimum input:** 22Hz range  $> 2Hz$ . 220Hz range  $> 20Hz$

**Minimum pulse width:**  $> 25ns$

**Duty cycle limits:**  $> 30%$  and  $< 70%$

**Overload protection:** 500VDC or AC rms

### DUTY CYCLE

**Range:** 10% to 95%

**Resolution:** 0.01%

**Pulse width:**  $>10us$

**Frequency range:** 10% to 95% (40Hz to 20kHz)

**Accuracy:** (5V logic)  $\pm$  (2.0% rdg + 5 dgts)

**Overload protection:** 500V DC or AC rms



# Specification

## MM68

## Digital Multimeter

### CONTINUITY

**Audible indication:**  $< 30\Omega$

**Response time:** 500ms

**Overload protection:** 500V DC or AC rms

### DIODE TEST

**Test current:** 1.2mA approx

**Resolution:** 0.1mV

**Accuracy:**  $\pm (2.0\% \text{ rdg} + 5 \text{ dgts})$

**Audible indication:**  $< 0.25\text{V}$

**Open circuit voltage:** 3.0V DC typical

**Overload protection:** 500V DC or AC rms

### GENERAL


**Display:**  $4\frac{1}{2}$  digit liquid crystal display with a maximum reading of 22000.

**Analog bargraph:** 22 segments with measurement 20 times per second.

**Polarity:** Automatic, positive implied, negative polarity indication

**Overrange:** (OL) or (-OL) is displayed

**Zero:** Automatic

**Low battery indication:**  symbol is displayed when the battery voltage drops below the operating level

**Measurement rate:** 3 times per second, nominal

**Auto power off:** After approx 30 minutes

**Operating environment:**  $0^{\circ}\text{C}$  to  $50^{\circ}\text{C}$  at  $< 70\% \text{ RH}$

**Storage temperature:**  $-20^{\circ}\text{C}$  to  $60^{\circ}\text{C}$  at  $< 80\% \text{ RH}$

**Altitude:** Up to 2000m

**Power:** Single standard 9 volt battery, NEDA 1604, JIS006P, IEC 6F22.

**Battery Life:** 150 hours typical with carbon-zinc



## Specification

MM68

Digital Multimeter

**Dimensions:** 165mm (H) x 78mm (W) x 42.5mm (D)

**Weight:** Approx. 285g

**Includes:** TL16 test leads, 1 x spare fuse, 9V battery (installed) and instructions

### **SAFETY:**

Conforms to BS EN 61010-1, CAT III 600 V, CAT II 1000V

Class II Double Insulation

Pollution Degree: 2 for indoor use

TL16 test leads conform to BS EN 61010-031, CAT III 1000V, CAT IV 600V, 10A.

**EMC:** Conforms to BS EN 61326.

## USER NOTES

## Check out what else you can get from Martindale:

- 17th Edition Testers
- Accessories
- Calibration Equipment
- Continuity Testers
- Electricians' Kits
- Environmental Products
- Full Calibration & Repair Service
- Fuse Finders
- Digital Clamp Meters
- Digital Multimeters
- Labels
- Microwave Leakage Detectors
- Motor Maintenance Equipment
- Multifunction Testers
- Non-trip Loop Testers
- Pat Testers & Accessories
- Phase Rotation Testers
- Proving Units
- Socket Testers
- Thermometers & Probes
- Test Leads
- Voltage Indicators
- Specialist Metrohm Testers (4 & 5kV)
- Specialist Drummond Testers



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