GB

DRAPER®

400 SERIES
MULTIMETER

41834

CE

IMPORTANT: Please read these instructions carefully to ensure the safe and effective use of this product and save these instructions for future reference. This manual has been compiled by Draper Tools and is an integrated part of the product with which it is enclosed and should be kept with it for future references.

This manual describes the purpose for which the product has been designed and contains all the necessary information to ensure its correct and safe use. We recommend that this manual is read before any operation or, before performing any kind of adjustment to the product and prior to any maintenance tasks. By following all the general safety instructions contained in this manual, it will ensure both product and operator safety, together with longer life of the product itself.

All photographs and drawings in this manual are supplied by Draper Tools to help illustrate the operation of the product.

Whilst every effort has been made to ensure accuracy of information contained in this manual, the Draper Tools policy of continuous improvement determines the right to make modifications without prior warning.

1. TITLE PAGE

1.1 INTRODUCTION:

USER MANUAL FOR:

SERIES 400 MULTIMETER

Stock no. 41834.
Part no. DMM402.

1.2 REVISIONS:

Date first published January 2018

As our user manuals are continually updated, users should make sure that they use the very latest version.

Downloads are available from: http://www.drapertools.com/manuals

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1.3 UNDERSTANDING THIS MANUALS SAFETY CONTENT:

WARNING! Information that draws attention to the risk of injury or death.

CAUTION! Information that draws attention to the risk of damage to the product or surroundings.

1.4 COPYRIGHT © NOTICE:

2.1 CONTENTS

Page content ..... Page

3. GUARANTEE

3.1 GUARANTEE

Draper tools have been carefully tested and inspected before shipment and are guaranteed to be free from defective materials and workmanship.
Should the tool develop a fault, please return the complete tool to your nearest distributor or contact Draper Tools Limited, Chandler's Ford, Eastleigh, Hampshire, SO53 1YF. England.
Telephone Sales Desk: (023) 8049 4333 or Product Helpline (023) 8049 4344.
A proof of purchase must be provided with the tool.
If upon inspection it is found that the fault occurring is due to defective materials or workmanship, repairs will be carried out free of charge. This guarantee period covering parts/labour is 12 months from the date of purchase except where tools are hired out when the guarantee period is 90 days from the date of purchase. This guarantee does not apply to normal wear and tear, nor does it cover any damage caused by misuse, careless or unsafe handling, alterations, accidents, or repairs attempted or made by any personnel other than the authorised Draper warranty repair agent.
Note: If the tool is found not to be within the terms of warranty, repairs and carriage charges will be quoted and made accordingly.
This guarantee applies in lieu of any other guarantee expressed or implied and variations of its terms are not authorised.
Your Draper guarantee is not effective unless you can produce upon request a dated receipt or invoice to verify your proof of purchase within the guarantee period.
Please note that this guarantee is an additional benefit and does not affect your statutory rights.
Draper Tools Limited.

4.1 GENERAL SPECIFICATIONS

Display:	Liquid crystal display (LCD) max. reading of 3999
Negative Polarity Indication:	Negative sign " - " shown on the display automatically
Sampling Rate:	About 2 to 3 times/sec
Over range Indication:	" OL " shown on the display
Low Battery Indication:	"  " shown on the display
Battery:	1.5V battery, AAA or equivalent, 6 pieces
Operating Environment:	Temperature: 0°C to 40°C Relative Humidity: < 75%
Temperature Coefficient:	0.2 x (specified accuracy)/°C (< 18°C or > 28°C)
Storage Environment:	Temperature: -30°C to 60°C Relative Humidity: < 85%
Operating Altitude:	0 to 2000 meters
Size:	190 x 89 x 62mm
Weight:	About 460g (including batteries)

DC Voltage

Range	Accuracy	Resolution
400mV	± (0.8% of rdg + 5 digits)	0.1mV
4V		0.001V
40V		0.01V
400V		0.1V
1000V		1V

Input impedance: 10MΩ.
Max. Allowable Input Voltage: 1000V.

AC Voltage

Range	Accuracy	Resolution
400mV	± (1.2% rdg + 5 digits)	0.1mV
4V	± (1.0% rdg + 5 digits)	0.001V
40V		0.01V
400V		0.1V
1000V		1V

Input impedance: 10MΩ.
Frequency range: 40Hz ~ 400Hz.
Response: Average, calibrated in rms of sine wave.
Max. Allowable Input Voltage: 1000V ac rms.

4. INTRODUCTION

Resistance

Range	Accuracy	Resolution
400Ω	±(1.0% rdg + 5 digits)	0.1Ω
4kΩ		0.001kΩ
40kΩ		0.01kΩ
400kΩ		0.1kΩ
4MΩ		0.1MΩ
40MΩ	±(1.5% rdg + 10 digits)	1MΩ

Open circuit voltage: < 0.7V.

Diode and Continuity Test

Range	Description	Remark
	The approximate forward voltage drop of the diode will be displayed.	Open-Circuit Voltage: about 2.5V Test Current: about 0.5mA
	The built-in buzzer will sound if the resistance is less than about 30Ω. The buzzer may or may not sound if the resistance is between 30Ω and 150Ω. The buzzer will not sound if the resistance is more than 150Ω.	Open-circuit voltage about 0.5V.

Overload protection：300V DC/AC rms.

Insulation resistance

Test Voltage	Display Range	Resolution	Test Current	Accuracy
100V	0.01 ~ 20.00MΩ	0.01MΩ	0.5mA @ 100kΩΩ	±(3%+5)
	20.0 ~ 100.0MΩ	0.1MΩ		
250V	0.01 ~ 20.00MΩ	0.01MΩ	0.5mA @ 250kΩΩ	±(3%+5)
	20.0 ~ 200.0MΩ	0.1MΩ		
500V	0.01 ~ 20.00MΩ	0.01MΩ	0.5mA @ 500kΩΩ	±(3%+5)
	20.0 ~ 200.0MΩ	0.1MΩ		
	200 ~ 500MΩ	1MΩ		±(5%+5)
1000V	0.01 ~ 20.00MΩ	0.01MΩ	0.5mA @ 1MΩΩ	±(3%+5)
	20.0 ~ 200.0MΩ	0.1MΩ		
	200 ~ 2000MΩ	1MΩ		±(5%+5)

Short-Circuit Test Current (nominal): 0.5 mA
Auto Discharge: Discharge time < 1 sec for C ≤ 1μF
Minimum Measurement: 0.1MΩ

4.2 HANDLING & STORAGE

Care must still be taken when handling, dropping this machine will have an effect on the accuracy.

The environment will have a negative result on its operation if you are not careful. If the air is damp, components will rust. If the machine is unprotected from dust and debris; components will become clogged.

5. HEALTH & SAFETY INFORMATION

5.1 SAFETY PRECAUTIONS

This instrument complies with IEC1010 (International Electrotechnical Commission promulgated safety standards). Design and production using the pollution level 2 safety requirements.

⚠Warning
To avoid electrical shock or personal injury.
Please read the safety information and “warnings and precautions” before use.

Warning: When measuring voltage above 30V, current above 10ma, AC power with an inductive load. Use caution not to touch exposed contacts due to the risk of electric shock, only use approved probes or clamps.

1. Before measuring, check whether the measurement function switch is in the correct position, check whether the test probe is connected correctly to avoid electric shock.
2. The meter is only to be used in conjunction with the supplied test leads to comply with safety standards. If the test leads are broken or damaged, replace the test leads of the same type or the same electrical specifications.
3. Do not use an unapproved fuse to replace the fuse inside the meter. Only replace with the same model or the same specifications of the fuse. Before changing, remove the test leads to ensure that there is no signal input.
4. Do not use unapproved batteries to replace the battery inside the meter. Replace only with the same model or the same electrical specifications of the battery. Before changing, remove the test leads to ensure that there is no signal input.
5. During electrical measurements, the body must not be directly in contact with the earth, use insulating materials to keep your body insulated from the earth.
6. Do not store or use in high temperature, high humidity, flammable, explosive and strong magnetic field environments.
7. Measurements exceeding the limit values of the instrument may damage the instrument and endanger the safety of the operator.
8. Do not attempt to calibrate or service the instrument.
9. When the LCD shows “⊟”, please replace the battery.
10. Do not insert the test leads to be inserted into the current terminals to measure the voltage!

1. LCD display window.
2. Function buttons.
3. Measurement function range switch.
4. Probe sockets.

6. IDENTIFICATION

6.1 FUNCTION BUTTONS - FIG. 1

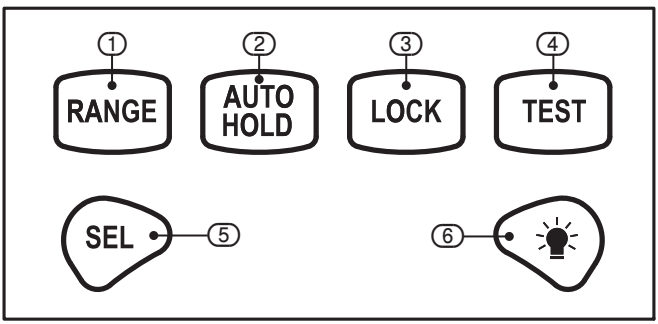


FIG.1

① RANGE
Used to switch the meter between autorange mode and manual range mode as well as to select desired manual range.

② AUTO HOLD
Used to enter or exit Display Hold mode or Auto Hold mode.

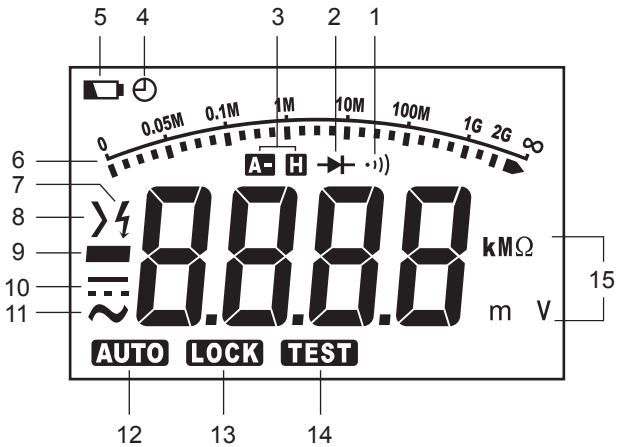
③ LOCK.
To lock the reading.

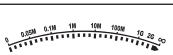
④ TEST
To start test.

⑤ SEL
Used to switch the meter between DC voltage and AC voltage measurement functions or between diode and continuity test functions.

⑥ " ☀ "
Press this " ☀ " button to turn on or off the back-light.

6.2 LCD - FIG. 2



#	Symbol	Meaning
1	•))	Continuity test is selected.
2	⊳|	Diode test is selected.
3	H	The meter is in Display Hold mode.
	A- H	The meter is in Auto Hold mode.
4	◴	Automatic power-off feature is enabled.
5	▭	The batteries are low and must be replaced immediately.
6		Analog bar-graph with scale (available in the insulation resistance function only).
7	ϟ	High voltage is present. Be cautious!
8	〉	Indicates an overrange condication in insulation resistance measurement.
9	▬	Negative sign
10	⎓	DC
11	~	AC
12	AUTO	Autorange mode is selected.
13	LOCK	Insulation resistance test is locked on.
14	TEST	Insulation resistance test is ongoing.

7. UNPACKING & CHECKING

7.1 PACKAGING

Carefully remove the product from the packaging and examine it for any sign of damage caused during shipping. Lay the contents out and check them. If any part is damaged or missing, do not attempt to use the tool and contact the Draper Helpline immediately (see back page for details).

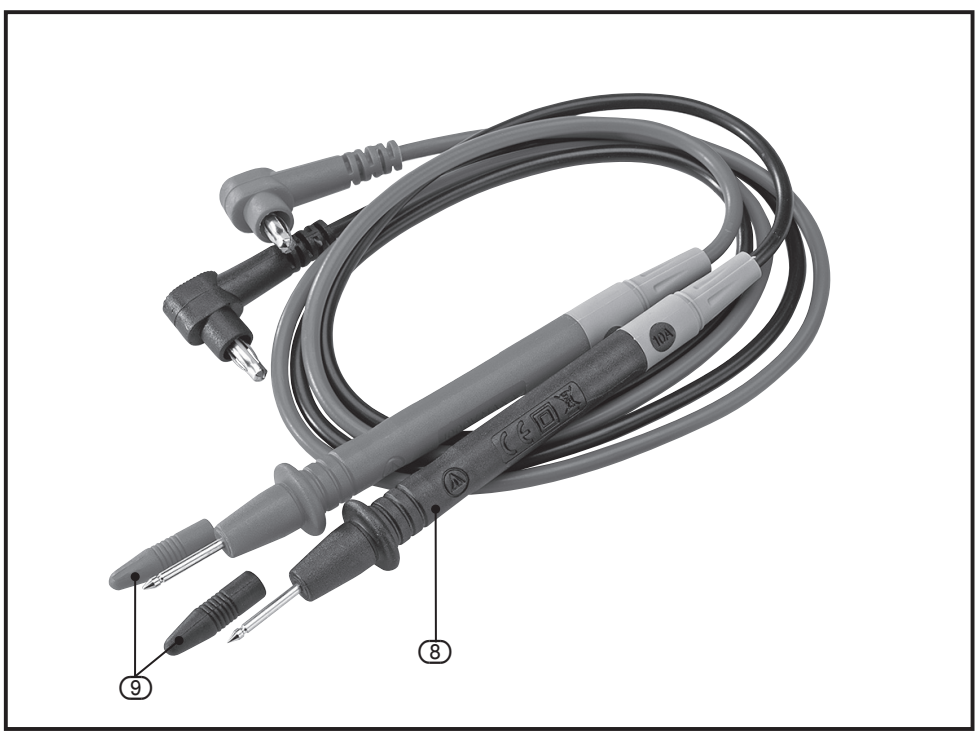
Retain the packaging material at least during the guarantee period: in case the machine needs to be returned for repair.

Warning! Some of the packaging materials used may be harmful to children, keep them out of reach from children.

Disposed of any packaging correctly and according to local regulations.

7.2 WHAT´S IN THE BOX?

As well as the product; there are several parts not fitted or attached to it.



⑧ Test probe

⑨ Test probe caps

8.1. MANUAL RANGING AND AUTORANGING

The meter defaults to autorange mode when switched on. When the meter is in autorange mode, the symbol " AUTO " is displayed.

1. Press the **RANGE** button to enter the manual range mode, the symbol " AUTO " will disappear.
   Each subsequent press of the **RANGE** button increases the range.
   After the highest range, the meter reverts back to the lowest range.
2. To exit the manual range mode, press and hold down the **RANGE** button for approx. 2 seconds. The meter returns to the autorange mode and " AUTO " is displayed.

8.2. USING DISPLAY HOLD MODE AND AUTO HOLD MODE

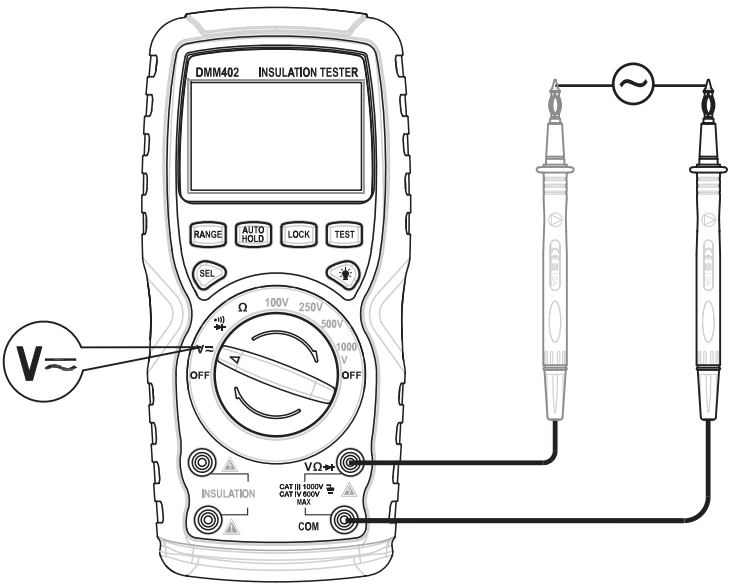
Press the AUTO HOLD button to enter the Display Hold mode. The present reading is held, and the symbol " H " appears on the display as an indication.

Press the AUTO HOLD button again to switch to the Auto Hold mode. The present reading is held, and the symbols " A- " and " H " appear on the display. Whenever the meter detects a new, stable reading, it beeps and displays the new reading. If you remove the test leads (open the input), the last held reading will be retained on the display. To exit the Auto Hold mode and return to normal operation, press the AUTO HOLD button once more; the symbols " A- " and " H " will disappear.

Note: For AC or DC voltage measurements, the measured voltage must be higher than 0.1V, and for insulation resistance measurements, the measured resistance must be higher than 0.1MΩ; otherwise the auto hold function may not work.

8. OPERATING INSTRUCTIONS

8.3 MEASURING DC OR AC VOLTAGE

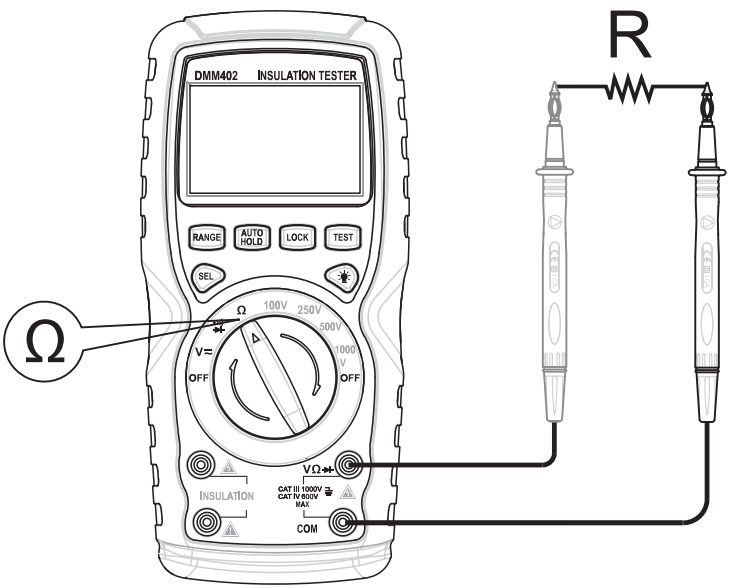


1. Connect the black test lead to the " **COM** " terminal and the red test lead to the " **VΩ⇥|** " terminal.
2. Set the measurement function range switch to the **V≂** position.
3. To select DC voltage measurement function, press the **SEL** button until the symbol " ⎓ " appears on the display.
   To select AC voltage measurement function, press the **SEL** button until the symbol " ~ " appears on the display.
4. Connect the test leads across the source or circuit to be tested.
5. Read the reading on the display. For DC voltage measurements, the polarity of the red test lead connection will be indicated as well.

Note:

1. To avoid electric shock to you or damage to the meter, do not apply a voltage higher than 1000V ac or 1000V dc between the terminals.
2. In manual range mode, if " **OL** " is shown on the display during measurement, select the next higher range.

8.4. MEASURING RESISTANCE

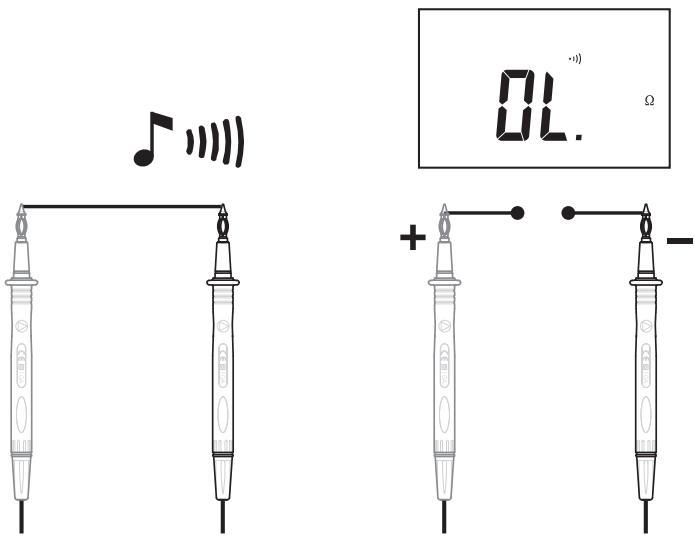


1. Connect the black test lead to the " **COM** " terminal and the red test lead to the " **VΩ** " terminal.
2. Set the measurement function range switch to position.
3. Connect the test leads across the resistor to be tested.
4. Read the reading on the display.

Note:

1. For measurements > 1MΩ, the meter may take a few seconds to stabilize reading. This is normal for high resistance measurements.
2. When the input is not connected, i.e. at open circuit, " **OL**" will be displayed as an overrange indication.
3. Before measurement, disconnect all power to the circuit to be tested and discharged all capacitors thoroughly.

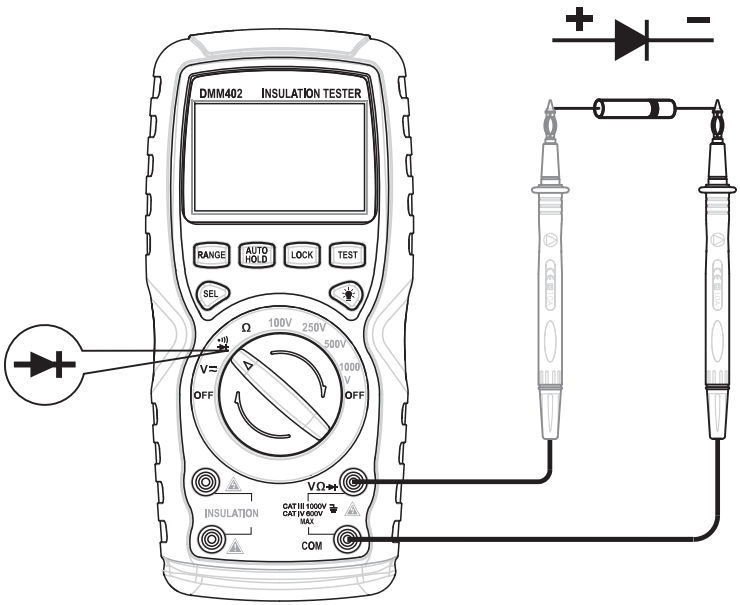
8.5 CONTINUITY TEST



1. Connect the black test lead to the " **COM** " terminal and the red test lead to the " **VΩ⊣+** " terminal.
2. Set the measurement function range switch to •)) position.
3. If the symbol " •)) " is not shown on the display, press the **SEL** button until the symbol " •)) " appears on the the display.
4. Connect the test leads across the circuit to be tested.
5. If the resistance is less than about 30Ω, the built-in buzzer will sound.

Note:
Before test, disconnect all power to the circuit to be tested and discharge all capacitors thoroughly.

8.6 DIODE TEST



1. Connect the black test lead to the " **COM** " terminal and the red test lead to the " **VΩ** " terminal. (Note: The polarity of the red lead is positive " **+** ".)
2. Set the measurement function range switch to position.
3. If the symbol " " is not shown on the display, press the **SEL** button until the symbol " " appears on the the display.
4. Connect the red test lead to the anode of the diode to be tested and the black test lead to the cathode of the diode.
5. The display shows the approximate forward voltage drop of the diode. If the connection is reversed, " **OL** " will be shown on the display.

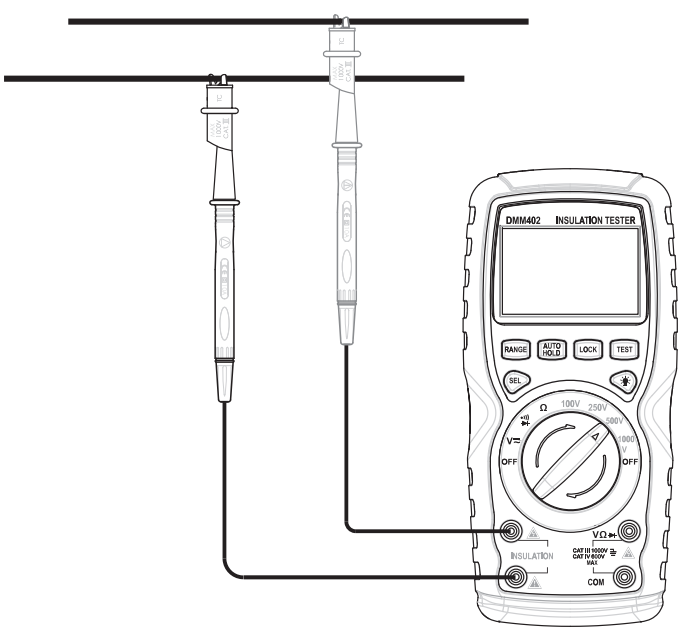
8. OPERATING INSTRUCTIONS

8.7 MEASURING INSULATION RESISTANCE

IMPORTANT
Turn off all power to the circuit to be tested and discharge all capacitors thoroughly before attempting insulation resistance test.

Warning:

1. After you set the measurement function range switch in a test voltage position (" **100V** ", " **250V** ", " **500V** ", or " **1000V** " position) and press the **TEST** button, the meter will output a high test voltage through the " **INSULATION** " terminals. Don't touch any naked conductor of the meter, the test leads (including clips) and the object under test; otherwise electric shock will occur.
2. Do not touch any object which is with charge or which may contain voltage.
3. After you finish insulation resistance test, discharge the tested object thoroughly.
4. During measurement, if the measured resistance exceeds the measuring range of the meter, the symbol " 〉 " will appear as an indication; and if the measured resistance is less than 0.1MΩΩ, the display will show " **Lo** ".
5. Before measurement, make sure that the object to be tested is without charge.



1. Connect the black test lead to a " **INSULATION** " terminal and the red test lead to the other " **INSULATION** " terminal.
2. Set the measurement function range switch to a desired test voltage position (" **100V** ", " **250V** ", " **500V** ", or " **1000V** " position). The display shows " **- - - -** ".
3. Connect the test lead probes to the circuit under test.
4. Press and hold the **TEST** button to start the test. The display shows the symbol " ϟ " to remind you that high voltage is being output, and shows the symbol " **TEST** " indicating that insulation resistance measurement is being performed.
   Note: If you press the **LOCK** button and then press the **TEST** button, the meter will perform insulation resistance measurement continuously until you press the **LOCK** button again.
5. Read the reading on the display.
6. Release the **TEST** button to stop the measurement. (If the symbols " **LOCK** " and " **TEST** " are being displayed, press the **LOCK** button to stop the measurement.)
7. After insulation resistance measurement stops, the tested object discharges through the Meter. To avoid electric shock and personal injury, do not disconnect the test leads from the tested object before the object is completely discharged.

8.8 AUTO POWER OFF

The display will blank and the meter will go into Sleep mode if you have not operated the meter for about 15 minutes. While in Sleep mode, you can arouse the meter from Sleep by pressing a button.

To disable the automatic power-off feature, hold down the **SEL** button while turning the meter on.

Note:
The meter will not turn off automatically when in Display Hold mode or Auto Hold mode or when the meter is performing insulation resistance test.

9. MAINTENANCE

9.1 BATTERY REPLACEMENT

Before attempting to open the battery cover or case, make sure that the test leads have been disconnected from the meter.

1. If "  "appears on the LCD display, it indicates that the battery should be replaced.
2. Loosen the screw fixing the battery cover and remove it.
3. Replace the used battery with a new one.
4. Refit the battery cover.

9.2 TEST LEADS REPLACEMENT

WARNING

Full in compliance with safety standards can be guaranteed only if used with test leads supplied. If necessary, they must be replaced with the same model or same electric ratings.

Electric ratings of the test leads: 1000V 10A.

10.1 EXPLANATION OF SYMBOLS

WEEE
Do not dispose of Waste Electrical & Electronic Equipment in with domestic rubbish

For indoor use.
Do not expose to rain.

Class II construction
(Double insulated)

Conforms to all relevant safety standards.

Earth

Fuse

Back light

Warning!
Read instruction manuals before operating and servicing this equipment.

Diode test

Attention.

High voltage / current!
Danger.

Voltage AC

Voltage DC

Resistance in Ohms

Continuity test buzzer

Data hold / Screen lock

Auto power off

Low battery display

11. DISPOSAL

11.1 DISPOSAL

- At the end of the machine's working life, or when it can no longer be repaired, ensure that it is disposed of according to national regulations.
- Contact your local authority for details of collection schemes in your area.
  In all circumstances:
  - Do not dispose of power tools with domestic waste.
  - Do not incinerate.
  - Do not abandon in the environment.
  - Do not dispose of WEEE* as unsorted municipal waste.

* Waste Electrical & Electronic Equipment.

CONTACT US

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Service/Warranty Repair Agent:
For aftersales servicing or warranty repairs, please contact the Draper Tools Helpline for details of an agent in your local area.

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