

Megger[®]

Megger Limited

Archcliffe Road, Dover
Kent CT17 9EN England
T +44 (0) 1304 502 101
F +44 (0) 1304 207 342

Megger

PO BOX 9007, Valley Forge
PA 19484-9007 USA
T +1 (610) 676 8500
F +1 (610) 676 8610

Megger

4271 Bronze Way, Dallas, Texas
75237-1017 USA
T +1 (800) 723 2861
T +1 (214) 330 3203
F +1 (214) 337 3038

Megger SARL

29 Allée de Villemomble
93340 Le Raincy, France
T +33 (1) 43.02.37.54
F +33 (1) 43.02.16.24

OTHER TECHNICAL SALES OFFICES

Toronto CANADA, Mumbai India and BAHRAIN.

Megger products are distributed in 146 countries worldwide.

This instrument is manufactured in the United Kingdom.

The company reserves the right to change the specification or design without prior notice.

Megger is a registered trademark

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Megger[®]

**BMM500 Series
Insulation & continuity testers**

USER GUIDE

GUIDE D'UTILISATEUR

BENUTZERANLEITUNG

GUÍA DEL USUARIO

prior notice.

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Symbols used on the instruments are:



Caution, risk of electric shock.



Caution, refer to User Guide.



Equipment protected throughout by Double Insulation (Class II).



Equipment complies with current EU Directives.



Equipment must not be connected to voltage sources >600V CAT II. Suitable for electrical installations CAT III 300V to Earth



SAFETY WARNINGS

- **Safety Warnings** and **Precautions** must be read and understood before the instrument is used. They **must** be observed during use.
- The circuit under test **must** be de-energised and isolated **before** connections are made except for voltage measurement.
- Circuit connections **must** not be touched during a test.
- After insulation tests, capacitive circuits **must** be allowed to discharge **before** disconnecting the test leads.
- The Live Circuit Warning and Automatic Discharge are additional safety features and **should not** be regarded as a substitute for normal safe working practice.
- Replacement fuses **must** be of the correct type and rating. Failure to fit the correctly rated fuse will result in damage to the instrument in the event of an overload.
- Test leads, including crocodile clips, must be in good order, clean and have no broken or cracked insulation.
- Ensure that hands remain behind guards of probes/clips when testing.
- U.K. Safety Authorities recommend the use of fused test leads when measuring voltage on high energy systems.

NOTE

THE INSTRUMENTS MUST ONLY BE USED BY SUITABLY TRAINED AND COMPETENT PERSONS

Users of this equipment and/or their employers are reminded that Health and Safety Legislation require them to carry out valid risk assessments of all electrical work so as to identify potential sources of electrical danger and risk of electrical injury such as from inadvertent short circuits. Where the assessments show that the risk is significant then the use of fused test leads constructed in accordance with the HSE guidance note GS38 'Electrical Test Equipment for use by Electricians' should be used.

Description

Congratulations on your purchase of a genuine Megger insulation/continuity tester. Megger has over 100 years experience in insulation testing which is reflected in its product designs. Your BMM500 has been carefully developed to address the real needs and benefits of the user.

The Megger **BMM500** Series instruments are battery powered Insulation and Continuity testers, with a measurement capability from 0,01 Continuity to 10G Insulation.

Offering multi-voltage facilities, the instruments take full advantage of microprocessor technology and feature a large liquid crystal display combining digital and analogue readings. The analogue display has the benefit of indicating trends and fluctuations in readings, while the digital readout gives direct accurate results. The display is also backlit giving clear visibility even in low light conditions.

The BMM500 Series instruments have the unique capability of being able to measure voltages down to a resolution of 0,1mV. This

gives the user the option to fit a wide variety of transducers to further enhance the capabilities of the BMM Series instruments, eg temperature or humidity measurement.

A customised connector on the top of the instrument enables the optional Megger **SP1** Switched Probe to be used for two handed probe operation.

The 250V, 500V and 1000V ranges can be used to test electrical installations in compliance with BS7671 (16th Edition IEE Wiring Regulations) IEC364 and HD384, since each range has a 1mA minimum test current at the minimum pass values of insulation specified in these documents. Designed to IEC1010-1 the BMM500 Series are protected against connection to a 300V Category III supply. The instruments have a basic accuracy of $\pm 2\%$ at 20°C. The instruments are waterproof and dustproof to IP54. This helps maintain accuracy and ensures maximum reliability in harsh environments.

Operation

Refer to Safety Warnings before using the instrument

Testing is automatically inhibited if:

- An external voltage >55V is present when switched to any insulation range position
- An external voltage >10V is present on all other ranges (excluding **OFF/V**).

The external voltage is indicated on the display, on insulation ranges an audible bleeper will sound if a test is attempted.

Live Circuit Warning


When more than 25V is applied to the terminals in the insulation ranges, the instrument defaults to a voltmeter and gives an audible warning. On all other switch positions except **OFF/V** when approx 10V is applied the default voltmeter will be activated. Testing will be inhibited.

Voltage Testing on High Energy Systems

Use extreme care when using or measuring voltages above 30V, particularly in high energy


systems. Fused test leads are available as optional accessories for local situations where increased protection is required.

Auto-shut Off

To conserve battery life, Auto-shut Off (preceded by a series of bleeps) operates after approx. 10 minutes of instrument inactivity on insulation, 5 minutes on all other ranges. If the instrument is switched on whilst holding the  key, the Auto shut-off time is extended to 60 minutes. To restore operation after Auto-shut Off, select OFF followed by the required switch position.

Note: *It is recommended that the instrument is switched to the OFF position when not in use.*

Backlight

The backlight is activated by pressing the  key. The backlight will remain illuminated for approx. one minute before automatically switching off to conserve battery life,

Operation

alternatively the  key can be re-pressed.

Insulation Tests (M) (See fig. 1)



The insulation tests apply a known voltage to the circuit under test and measure the resulting leakage current. The circuit under test **must be** completely de-energised and isolated **before** test connections are made.

Insulation tests are only initiated when the **TEST** button is pressed.

1. Set the range switch to the test voltage required.
2. Connect the test leads, first to the instrument, and then to the isolated item under test.
3. Press the **TEST** button to activate the test voltage. Take the reading.
4. Release the **TEST** button at the end of the test.
5. Any capacitive circuits charged during a test will automatically discharge. If significant voltage remains the voltage warning will occur and the voltage present displayed.

6. Remove the test leads only when no voltage is indicated.

Locking Test Button (ltb)

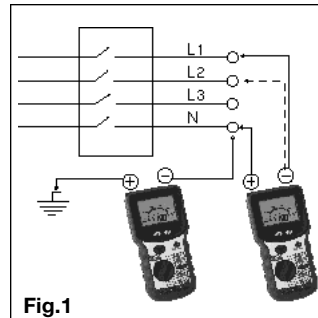
When it is desired to do a long insulation test, the test can be 'locked on' by pressing the  key while the test button is held down. The warning  will appear on the display and both buttons may be released whilst the test continues. The next press of the test button will terminate the test.

Note: *There is a short delay on the first operation of '1000V' range, each time the range is selected. This is to prevent accidental application of 1kV.*

Polarisation Index Testing

Polarisation Index (PI) is the term applied to the Dielectric Absorption Ratio when resistance values are measured after 1 minute and again after 10 minutes. Polarization Index is then the resistance value after 10 minutes divided by the resistance value after 1 minute. The test can be run at any voltage. More detailed information

Operation



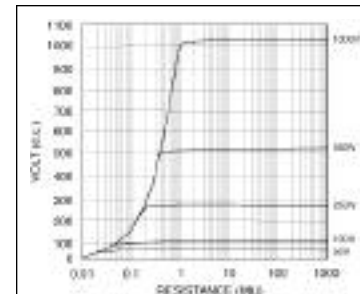
on PI Testing and value assessment can be found in Megger Limited publications listed in the Accessories page.

Automatic Discharge

When the **TEST** button is released after an insulation test (or re-pressed if *ltb* feature is enabled), a 200k load is automatically switched across the terminals to discharge the item under test. Any voltage present will be

indicated on the display so that the discharge can be monitored.

Typical Terminal Voltage Characteristics



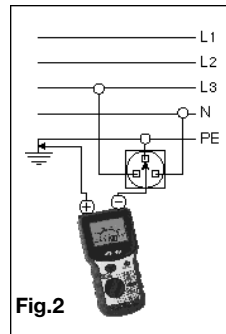
Continuity Testing () (See fig.2)

The continuity tests are activated when the probes make contact of less than a few k . The tests apply a constant current and measure the resulting volt drop across the circuit under test. The test operates without the need to press the **TEST** button. When the test leads are removed

Operation


the reading will hold for a few seconds and then reset. This range is not suitable for diode testing since the automatic contact detector will not be activated when connected to a diode.

1. Set the selector switch to .
2. Connect the test leads.
3. The test will activate automatically.
4. After the test probes are disconnected, the reading will be held for a few seconds.



Zeroing of Test Lead Resistance

The resistance of the test leads can be nulled on the continuity range (up to 9,99 Ω). The null information is retained in non-volatile memory and so will be remembered when the instrument is switched off.

1. Select the Continuity range.
2. Short the test leads across a known good conductor using prods.
3. When the reading has stabilised, press the **TEST** button. The zero offset symbol  will appear.
4. To release the zero offset press the **TEST** button again.


Possible sources of error


Measurements and results can be effected by the following:

- The impedance of operating circuits connected in parallel
- Impedance such as inductors that vary during the measurement
- Apoor connection to the circuit under test.



Operation

Continuity Bleeper

The continuity bleeper sounds continuously when a resistance below the threshold level is detected. This can be selected from several values between 2 and 3k . To change the level press the  button. Short bleeps will sound for values above the threshold but below approx. 3k

1. Set the selector switch to 
2. Connect the test leads.

Display (5 level selected):	Audible:
<5	continuous bleep
<3k	short bleep
>3k	no bleep

To turn off the audible tone and replace it with a visual indication of continuity, press the TEST button whilst switched to the  range.  will be displayed momentarily and will appear when resistances below the threshold are measured.


Resistance Tests (k)

This is a low voltage (5V) low current (25µA) test for sensitive electronic equipment. It operates in the same way as the continuity ranges.

1. Set the selector switch to k .
2. Connect the test leads.
3. The test will activate automatically.

The resistance range is protected by a high impedance method and therefore if the instrument is connected to a live circuit the fuse will not blow as on the insulation, continuity and buzzer ranges. The instrument will merely indicate the applied over-voltage.

Diode Testing

This range can also be used for diode testing, the positive terminal being the source of the test current. A forward biased semi-conductor junction will typically measure 15 to 30k and the diode symbol  is shown on the display. A reverse junction will measure much higher. These features together with the small test

Operation


current and wide measurement range(0,01k to 10000k) make the resistance range very useful for general purpose testing.


Voltage Tests (V)

If >1V a.c. or d.c. is present at the terminals the measured voltage is indicated on the display. The voltage display will function within specification even if the fuse has blown.

If the voltmeter operation is in question, test the voltmeter on a known source.

1. Set the selector switch to V.
2. Connect the test leads.
3. After a short settling time, the reading will be displayed automatically.


To view the frequency of the a.c. V being measured, press the  key. The frequency will be displayed in the range 16Hz - 460Hz.

To view a.c. V press the  key.

Millivolt Tests (mV)

The measured a.c. or d.c. voltage is indicated

on the display.

1. Set the selector switch to mV.
2. Select either ac or dc mV using the  key.
3. Connect the test leads.
4. After a short settle time, the reading will be displayed automatically.


Measuring Other Parameters


The BMM500 Series can be used to measure numerous quantities from temperature to current to windspeed through the use of mV output probes. Any compatible probe with a known output ratio can be used. eg: a temperature probe with output ratio of 1mV/°C will cause the display to indicate directly in °C Certain probes require zeroing, eg windspeed anemometer. The mV zero option described below provides this facility

Zeroing of d.c. mV (no a.c. mV zero facility)


To zero the d.c. mV range, short the leads together in the d.c. mV position, wait for the reading to settle and then press the **TEST**

Operation

button. Up to 9,9mV can be zeroed on the d.c. mV range. The symbol  will appear to indicate the zero has been adjusted.

1. Select the d.c. mV range.
2. Short the test leads together.
3. When the reading has stabilised, press the **TEST** button. The zero offset symbol  will appear.
4. To release the zero offset press the **TEST** button again.


Battery Replacement

When the low battery symbol  appears, the cells are nearly exhausted and should be replaced as soon as possible. Use Alkaline cells IEC LR6 (AA) or NiCd/NiMH rechargeable. To install or replace the cells, disconnect the test leads, switch the instrument to **OFF** and loosen the captive screws on the rear of the battery compartment. Remove the cover and disconnect the battery holder from the battery leads. Ensure that the replacement cells are

fitted with the correct polarity in accordance with the label in the battery holder. Reconnect the battery holder to the battery leads. Replace and re-secure the battery compartment cover. Remove the cells if the instrument is not going to be used for an extended period of time.

The BMM500 Series incorporates an electronic contact detector to minimise the chance of blowing the fuse even if accidentally applied to a live circuit whilst switched to the continuity range. In the unlikely event of the fuse needing replacement, a spare is located under the battery cover.

Fuse Checking and Replacement

To check the instrument fuse, switch to an insulation range and press the **TEST** button. The symbol  will appear if the fuse is ruptured. To replace the fuse, disconnect the test leads, switch the instrument **OFF** and loosen the captive screws holding the battery compartment cover in place. Remove the cover and replace the fuse. Replace and re-secure

Operation

the battery compartment cover.

Using the Megger SP1 Switched Probe

Operation: The Megger **SP1** is an accessory for designated Megger installation test instruments. When fitted in the specially designed connector, **in place of** the existing 'Low' lead, the **SP1** acts as a remote test button to operate the instrument and as a 'Low' probe. This simplifies instrument control and two-handed probing. The **SP1** is suitable for use with Megger insulation test instruments up to 1kV output test voltage.

Safety: Meets the safety requirements for double insulation to IEC1010-2-031 (1995), EN61010-2-031 (1995), IEC1010-1 (1995), EN61010-1 (1995) Category III*, 300V phase to earth. The probe is fitted with an internal, non-replaceable fuse, to protect the user should the probe be used accidentally in conjunction with a test lead in the low terminal.

* Relates to transient overvoltage likely to be found in fixed installation wiring.



Do not use the probe if any part of it is damaged.

Specification

(All quoted accuracies are at +20°C.)

Insulation Ranges

Nominal Test Voltage (d.c.): 250V, 500V, 1000V

Test voltage accuracy: +15% maximum on open circuit

Short circuit current: < 2 mA

Test Current on load: 1mA at min. pass value of insulation specified in BS7671, HD384 and IEC364, 2mA max.

Accuracy Range

1000V 10G

500V 5G

250V 2G

Full Scale Accuracy

±2% ±2 digits ±0,2% per G

±2% ±2 digits ±0,4% per G

±2% ±2 digits ±0,8% per G

Note: Above specifications only apply when high quality silicone leads are being used.

Measuring Range: 0,01M to 10G
(0-100G on analogue scale).

EN61557 Operating range: 0,10M to 1G

Specification

Continuity

Measuring Range:	0,01 to 99,9 (0-10 on analogue scale)
EN61557 Operating range:	0,10 to 99,9
Accuracy:	$\pm 2\% \pm 2$ digits
Open circuit voltage:	5V ± 1 V
Test current:	210mA ± 10 mA(0-2)
Zero offset at probe tips:	0,10 typical
Lead resistance zeroing:	Up to 9,99
Noise rejection:	1V rms 50/60Hz
Buzzer:	Selectable: operates at less than 2 , 5 , 20 , 50 , 200 , 500 , 3k approx.

Resistance

Measuring Range:	0,01k to 9,99M (0 to 100M on analogue scale)
Accuracy:	$\pm 3\% \pm 2$ digits
Open circuit voltage:	5V ± 1 V
Short circuit current:	25 μ A $\pm 5\mu$ A

Specification

Voltage

Measuring Range: $\pm 1\text{V}$ to $\pm 600\text{V}$
(0 to 1000V on analogue scale)

Accuracy: 0-600V d.c. $\pm 2\%$ ± 3 digit
0-600V a.c (50/60Hz) $\pm 2\%$ ± 3 digits
0-600V 400Hz a.c. $\pm 5\%$ ± 3 digits

Input resistance: approx 200k Ω

Detector Threshold: 1V

Millivolts

Measuring Range: $\pm 0,1\text{mV}$ to $\pm 1999\text{mV}$
(0 to 1000mV on analogue scale)

Accuracy: 0,1mV to 10mV d.c. or a.c. (50/60Hz) $\pm 2\%$ ± 5 digits
10mV to 1999mV d.c. or a.c. (50/60Hz) $\pm 2\%$ ± 3 digits
0,1mV to 10mV a.c. (16-460 Hz) $\pm 5\%$ ± 7 digits
10mV to 1999mV a.c. (16-460 Hz) $\pm 5\%$ ± 5 digits

d.c. milliVolts zeroing: Up to 9,9mV

Input resistance: $>3\text{M}$

Specification

Basic and service errors for Insulation and Resistance ranges

The basic error is the maximum inaccuracy of the instrument under ideal conditions, whereas the service error is the maximum inaccuracy taking into effect of battery voltage, temperature, interference, and system voltage and frequency, where applicable. After determining the service error, we can then calculate the measurement range. This is the range of measurement over which the error in service is less than 30% of the reading. Digital instruments are affected by the number of digits error – for example a value 0,10 measured with the continuity range may give a display in the range 0,07 to 0,13 which is a maximum error of 30%. Therefore the measurement range measuring low resistance is 0,10 to 99,9 . When checking that a measurement does not exceed a limit, the service error needs to be taken into account and these tables enables this to be done quickly and easily. These will guarantee that the value being measured is greater than or less than the limit value specified as appropriate.

Insulation Resistance – M			
Limit	Min. Indicated Reading	Limit	Min. Indicated Reading
0,10	0,14	2,00	2,12
0,20	0,25	3,00	3,16
0,30	0,35	4,00	4,20
0,40	0,46	5,00	5,24
0,50	0,56		
0,60	0,66		
0,70	0,77		
0,80	0,87		
0,90	0,98		
1,00	1,08		

Specification

Continuity Resistance –			
Limit	Min. Indicated Reading	Limit	Min. Indicated Reading
0,10	0,06	2,00	1,88
0,20	0,15	3,00	2,84
0,30	0,25	4,00	3,80
0,40	0,34	5,00	4,76
0,50	0,44	10,00	9,56
0,60	0,54	20,00	18,8
0,70	0,63	30,00	28,4
0,80	0,73	40,00	38,0
0,90	0,82	50,00	47,6
1,00	0,92	100,00	92,0

SAFETY

The instruments meet the requirements for double insulation to IEC 1010-1 (1995), EN 61010-1 (1995) to Category III*, 300V phase to earth (ground) without the need for separately fused test leads. If required, fused test leads are available as an optional accessory.

* Relates to the transient overvoltages likely to be met in fixed wiring installations.

Complies with the following parts of EN61557, Electrical safety in low voltage systems up to 1000V a.c. and 1500V d.c. – Equipment for testing, measuring or monitoring of protective measures:-

- Part 1 – General requirements
- Part 2 – Insulation resistance
- Part 4 – Resistance of earth connection and equipotential bonding

FUSE

500mA(F) 600V, 32x 6mm Ceramic HBC 10kA minimum.

E.M.C.

The instruments meet EN 61326-1.

Specification

POWER SUPPLY

Battery Type: 6x1,5V Alkaline cells IEC LR6 type or 1.2V NiCd or NiMH re-chargeable cells.

Battery Life (typical): 2100 5-sec 1kV insulation tests
3200 5-sec 500V insulation tests
4000 5-sec 250V insulation tests
2700 5-sec continuity tests
4700 5-sec k tests

ENVIRONMENTAL CONDITIONS

Operating range: -10 to +50°C
Operating humidity: 90% RH at 40°C max.

Storage temperature range: -30 to +70°C
Calibration Temperature: +20°C
Maximum altitude: 2000 m
Dust and water protection: IP54
Temperature coefficient: <0,1% per °C

WEIGHT: 742g

DIMENSIONS: 110mm x 220mm x 45mm

CLEANING: Wipe with a clean cloth dampened with soapy water or Isopropyl Alcohol(IPA)

Specification

Specification

ACCESSORIES

Supplied:	Part Number
Test lead set	6220-437
Pouch	6420-124
Switch Test Probe	6220-606 (NA Version only)

Optional:	
Fused lead set, FPK8	6111-218
Switch Test Probe SP1	6220-606
Test Record Cards (Pack of 20)	6111-216

Publications:	
'AStitch in Time'	AVTM21-P8B
'Testing Electrical Installations'	6231-605

Repair and Warranty

The instrument circuit contains static sensitive devices, and care must be taken in handling the printed circuit board. If the protection of an instrument has been impaired it should not be used, and be sent for repair by suitably trained and qualified personnel. The protection is likely to be impaired if, for example, the instrument shows visible damage, fails to perform the intended measurements, has been subjected to prolonged storage under unfavourable conditions, or has been exposed to severe transport stresses.

New Instruments are Guaranteed for 3 Years from the Date of Purchase by the User.

Note: Any unauthorized prior repair or adjustment will automatically invalidate the Warranty.

Instrument Repair and Spare Parts

For service requirements for Megger Instruments contact:-

Megger Limited

Archcliffe Road
Dover
Kent CT17 9EN
England
Tel: +44 (0) 1304 502243
Fax: +44 (0) 1304 207342

or

Megger

Valley Forge Corporate Center
2621 Van Buren Avenue
Norristown, PA 19403
U.S.A.
Tel: +1 (610) 676-8500
Fax: +1 (610) 676-8625

or an approved repair company.

Repair and Warranty

Approved Repair Companies

A number of independent instrument repair companies have been approved for repair work on most Megger instruments, using genuine Megger spare parts. Consult the Appointed Distributor / Agent regarding spare parts, repair facilities and advice on the best course of action to take.

Returning an Instrument for Repair

If returning an instrument to the manufacturer for repair, it should be sent freight pre-paid to the appropriate address. A copy of the Invoice and of the packing note should be sent simultaneously by airmail to expedite clearance through Customs. A repair estimate showing freight return and other charges will be submitted to the sender, if required, before work on the instrument commences.