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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.

Part No. MIT415_2000-171_V01 1107
www.megger.com

Megger

MIT415
Insulation and continuity tester

User Guide

⚠ 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 switched off, de-energised, securely isolated and proved dead before test connections are made when carrying out insulation and continuity tests.
- Circuit connections and exposed-conductive-parts and other metalwork of an installation or equipment under test **must not** be touched during testing.
- The live circuit warning and automatic discharge are additional safety features, which may fail, and therefore safe working practices **must** be observed.
- The voltage function will only work if the instrument is functional and switched on.
- After insulation tests, capacitive circuits **must** be allowed to discharge before disconnecting test leads.
- The instrument **should not** be used if any part of it is damaged.
- All test leads, probes and crocodile clips **must** be in good order, clean and with no broken or cracked insulation.
- Ensure that hands remain behind guards of probes/clips when testing.
- National Safety Authorities may recommend the use of fused test leads when measuring voltage on high-energy systems.
- Replacement fuses **must** be of the correct type and rating. Failure to fit the correctly rated fuse may result in a safety hazard and may cause damage to the instrument in the event of an overload.
- The battery cover **must** be in place whilst conducting tests.

NOTE

THE INSTRUMENT MUST ONLY BE USED BY SUITABLY TRAINED AND COMPETENT PERSONS.

Users of this equipment and/or their employers are reminded that National Health and Safety Legislation requires 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 inadvertent short circuits. Where the assessments show that the risk is significant then the use of fused test leads may be appropriate.

Symbols used on the instrument:

Caution: risk of electric shock

Caution: refer to accompanying notes

Displayed on the LCD during an insulation test, warns that a hazardous voltage may exist at the test lead probes also observe voltage discharges to a safe level.

On battery cover see section 2.0 notes 10 and 11.

At terminals do not exceed rated input voltage.

Equipment protected throughout by Double Insulation (Class II)

Equipment complies with relevant EU Directives

Equipment complies with 'C tick' requirements

Do not dispose of in the normal waste stream

Maximum input voltage 600 V rms

LCD Display

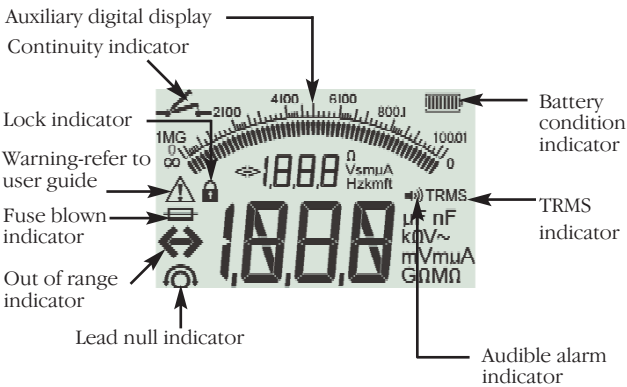

Figure 3 LCD display

In continuity mode, if a voltage greater than 25 V exists, testing will be automatically inhibited and voltage measurement will be displayed.

SP5 Switched probe

The SP5 switch probe allows the user to start a test by pressing the [TEST] button on the probe, instead of on the instrument. This allows for complete hands-free testing and increases user safety.

AC/DC voltage and frequency measurements

Note: Measured voltage must not exceed 600 V phase to earth or Phase to Phase.

Note on TRMS measurement:
IN TRMS mode the MIT415 will measure both AC and DC components of the supply voltage (AC+DC). In DC mode only the DC component is measured.

1. Rotate selector switch to the 'V' position.
2. Connect test leads to the circuit under test.
3. Press the [TRMS] button to select DC or return to TRMS.
4. The measured voltage will be displayed on the main digital scale in units of V or mV, as appropriate In TRMS mode, the measured frequency (Hz) will be simultaneously displayed.

Insulation resistance testing - general

Safety note:
Insulation resistance testing is performed at high DC voltages and is

hazardous if touched. Always observe the safety precautions when performing an insulation resistance test, and ensure all necessary health and safety precautions are observed.

Automatic Discharge: Capacitive circuits are automatically discharged when the test button is released following an insulation test.

The circuit under test must be completely de-energised and securely isolated before test connections are made.

Standard insulation resistance testing

1. Connect the test probes to the isolated circuit under test.
2. Turn the instrument 'ON' by rotating the selector switch to the desired test voltage.
3. Press and hold the [TEST] button to start the test.
4. The insulation resistance value, in both analogue and digital form is displayed together with the actual test voltage displayed on the secondary display.
5. The insulation test can be locked on, by pressing the lock button [🔒] whilst holding down the [TEST] button. To disable lock press the [TEST] button or lock [🔒] button.
6. By pressing the [uA/V/s] button, the leakage current can be displayed.
7. Release the [TEST] button before removing the test leads (to enable the instrument to discharge the circuit under test). If the display shows VOLTS, wait until it reaches zero.
8. On completion of testing, switch to the '**OFF**' position.

Insulation resistance testing – timed modes 't', PI and DAR

Three types of timed test are possible:

(a) Standard count down timer (t)

Timed tests are performed over a timed period defined by parameter 't' (also refer to Set-up procedures 13).

(b) Polarization Index (PI)

PI is the ratio between the insulation resistance values recorded at 1 minute (assigned t1) and at 10 minutes interval (assigned t2). i.e. after 1 minute and 10 minutes.

$$PI = 10 \text{ minute value} / 1 \text{ minute value}$$

(c) Dielectric Absorption Ratio (DAR)

DAR is the ratio between the insulation resistance values at 30seconds (assigned t1) and at 60 second interval (assigned t2). i.e. after 30seconds and 60seconds.

DAR = 60 second value/30 second value

During all insulation tests the symbol ⚠ will flash indicating that a test voltage is present.

(a) Insulation resistance testing-timed procedure.

1. Connect the test probes to the isolated circuit under test.
2. Turn the instrument 'ON' by rotating the selector switch to the required test voltage position.
3. Select the timed test (t) by pressing 'PI/DAR/t' function button repetitively until the desired function is displayed.
4. Once selected, press and hold the [TEST] button to start the test.
5. To abort the test early, press TEST or LOCK [🔒] buttons.
6. At the end of the tests, the voltage will be discharged.

(b) Insulation resistance testing – PI and DAR

The PI test will run for a period of 10minutes. After one minute a test result is stored (t1). After 10 minutes a second test result is stored (t2). The resultant ratio is then displayed on the screen. The same procedure applies for the DAR timed tests, however the test duration is 60 seconds, with the first result (t1) taken at 30 seconds and the second at 60 seconds (t2).

Results can be recalled to screen using the uA/v/s [▼] keys.
Note: DO NOT press PI/DAR/t [▲] as it will change the test mode and erase the current results.

Continuity testing [Ω] and buzzer [🔊]

1. Turn the instrument 'ON' by rotating the selector switch to the desired Ω position.
2. If required the test lead resistance can be set to Zero (null) by shorting the test leads together and pressing TEST. The null [⌀] symbol will show when this has been achieved and the display will read 0.00 Ω.
3. Press the [🔊] button to enable/disable the audible buzzer function. When enabled, the sounder symbol will be shown on the screen display. The pass threshold is set to 2 Ω by default, but is adjustable, as defined in Setup.

Note that the buzzer defaults to OFF on power-up.

4. Connect the test leads to the isolated conductor(s) under test.

5. Observe the test result, displayed automatically. The auxiliary display indicates the actual test current (e.g. 205 mA. The maximum is defined in setup menu.

Note: The test current displayed is the actual test current used during the test, which will depend on the resistance of the circuit under test.

Resistance measurements (kΩ Range)

1. Turn the instrument 'ON' by rotating the selector switch to the desired [kΩ] position.
2. Connect the test leads to the isolated conductors under test.
3. Observe the test result, displayed automatically.

Setup options

The setup position permits the user to adjust various threshold values and default settings. When SETUP is selected, the instrument firmware revision is displayed, followed by the buzzer alarm threshold.

Displayed	Meaning symbol	Default setting	Setting options
BUZ	Set top threshold for continuity buzzer in ohms. Buzzer sounds if result is less than set value.	2 Ω Ω	1, 2, 5, 10, 20
Loc	Lock button ON/OFF	ON	ON / OFF
ISC	Setup maximum continuity short-circuit current .	200 mA	20 mA, 200 mA (default 200 mA)

Setup procedure

1. Turn the instrument 'ON' by rotating the selector switch to the Setup position. The firmware version is displayed prior to the first setting BUZ.
2. Press the TEST button repeatedly to select the desired parameter, BUZ, Loc, ISC etc.
3. When the function to be changed is displayed, **press and hold** the TEST button to change the value. Each subsequent press increments the limit. Holding down the TEST button will automatically increment.
4. Changing a value will start the lock [] symbol flashing. This

indicates a value has been changed but not saved.

5. Save new limit by pressing the Lock [] button. Saved changed are effected when the Screen Lock symbol stops flashing and disappears.

Battery and fuse replacement

Battery condition and replacement
The battery condition indicator is displayed at all times that the instrument is switched on, as below: 100%, 75% and 50%.

Replacement batteries type is: 5 x LR6 (AA), 1.5 V alkaline, or 5 x 1.2V NiMH.

Note: NiMH or NiCAD rechargeable batteries show a lower charge than alkaline batteries, and may not give much warning before becoming exhausted.

Procedure to replace batteries
When the low battery symbol appears, the cells are nearly exhausted and should be replaced as soon as possible. To install or replace the cells, **disconnect the test leads**, switch the instrument **OFF** and loosen the screws holding the battery compartment cover in place. Remove the cover and lift out the cells. Ensure that the replacement cells are fitted with the correct polarity in accordance with the label in the battery compartment. 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.

Blown fuse indicator
To check the instrument fuse, switch to an insuation range and press the TEST button. If the fuse is ruptured, the flashing symbol is displayed.
Note: The voltmeter will continue to operate for voltages greater than 100 V at 50 Hz. To replace the fuse, disconnect the test leads, switch the instrument OFF and loosen the screws holding the battery compartment cover in place. Remove the cover and replace the fuse of the correct type and rating. Replace and re-secure the battery compartment cover.

Follow the same procedure as for battery replacement
A replacement fuse must be of the correct type and rating:
i.e. 500 mA (FF) H.B.C.50 kA min 1000 V (32mm x 6mm)

Preventive maintenance

When necessary, the instrument can be cleaned with a damp cloth.

Do not use alcohol based cleaners.

Specification
All quoted accuracies are at +20 °C.

Insulation
Nominal test voltages: 10 V, 25 V, 50 V, 100 V, 250 V, 500 V

Range full scale accuracy
All ranges ±2% ±2 digits up to 100 MΩ.

Then:
500 volts. ±3% ±2 digits ±0.4% per GΩ
250 volts. ±3% ±2 digits ±0.8% per GΩ
100 volts. ±3% ±2 digits ±2.0% per GΩ
50 volts. ±3% ±2 digits ±4.0% per GΩ
25 volts. ±3% ±2 digits ±8% per GΩ
10 volts. ±3% ±2 digits ±20% per GΩ

Analogue range:	1 GΩ full scale
Short circuit current:	2 mA +0% -50%
Terminal voltage:	-0% +20% ±1 V (Ii <1 mA)

Test current on load:
1 mA at min. pass value of insulation specified in BS7671, HD384 and IEC364, EN61152-2, 2 mA max.

EN61557 operating range:	0,10 MΩ to 1,00 GΩ
Leakage current range:	10 μA to 2000 μA
Leakage current:	10% ±3 digits
Voltage display:	3% ±3 digits ±0.5% of rated voltage

Dielectric absorption Ratio (DAR): 60sec / 30sec ratio

Notes:
(1) All ranges measure from 0,00 MΩ upwards.
(2) Above specifications only apply when high quality silicone leads are being used.

Continuity

EN61557 operating range:		0,01 Ω to 99,9 Ω (0 to 100 Ω on analogue scale)
Accuracy:		± 2% ± 2 digits (0 to 100 Ω)
Open circuit voltage:		5 V ± 1 V
Test current:	205 mA	(±5 mA) (0.01 Ω to 9.99 Ω)
	20 mA	(±1 mA) (10.0 Ω to 99.9 Ω)

Lead resistance zeroing: Up to 9,99 Ω

Buzzer:
Variable limit 1 Ω, 2 Ω, 5 Ω, 10 Ω, 20 Ω

Resistance
EN61557 operating range:
0,01 kΩ to 1000 kΩ (0 to 1 MΩ on analogue scale)
Accuracy: ±3% up to 50 kΩ then ±5% ±2 digits
Open circuit voltage: 5 V ±1 V
Short circuit current: 1.5 mA ±0.2 mA

Voltage range
0 to 600 V d.c. ± 2% ± 2 digits
10 mV to 600 V TRMS sinusoidal (40 – 400 Hz) ±2% ±2 digits
0 to 1000 V on analogue scale

Unspecified input level 0 – 10 mV (40 – 400 Hz)
For non sinusoidal waveforms additional specifications apply:
±3% ±2 digits 101 mV – 600 V TRMS and
±8% ±2 digits 10 mV – 100 mV TRMS

Default Voltmeter
Operates at >25 volts a.c. or d.c., on any range except OFF

Frequency: 15-400Hz (15Hz - 99,9Hz) ±0.5% ±1 digit (100Hz to 400Hz)

Power supply
5 x 1,5V cells type IEC LR6 (AA, MN1500, HP7, AM3 R6HP) Alkaline NiMH rechargeable cells may be used.

Battery life
2200 insulation tests with duty cycle of 5 sec on 55 sec off

Dimensions 220 x 92 x 50 mm (8.66in x 3.63in x 1.97in)

Weight 590gms, 775gms with boot (20.73oz (27.22oz))

Fuse
Use only a 500 mA (FF) 1000 V 32 x 6 mm ceramic fuse of high breaking capacity HBC 50 kA minimum. Glass fuses MUST NOT be fitted.

Safety Protection
The instruments meet EN 61010-1 (1995) to 600 V phase to earth, Category IV.
Refer to safety warnings (see section 2).

E.M.C.
In accordance with IEC 61326 including amendment No.1

Temperature effects

Temperature coefficient	<0,1% per °C up to 1 GΩ <0,1% per °C per GΩ above 1 GΩ

Environmental

Operating range:	-20°C to +55 °C
Operating humidity:	95% RH at 0°C to +35°C, 70% RH +35°C to +55°C
Storage temperature range:	-30°C to +80 °C
Calibration Temperature:	+20 °C
Maximum altitude:	2000 m
Dust and water protection:	IP54

Accessories

Includes accessories

2 wire test lead set and crocodile clips	6220-813
SP5 Remote switch probe	6220-812
Calibration certificate	
Rubber boot	6231-802
Instrument case	5410-420
User guide	2000-171

Optional accessories and replacements

Fused 2 wire test lead set and crocodile clips	6220-789

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
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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) 676-8579
Fax: +1 (610) 676-8625

or an approved repair company.

Returning an Instrument for Repair

If it is necessary to retun an instrument for repair, a Returns Authorisation number must first be obtained by contacting one of the addresses shown. You will be asked to provide key information, such as the instrument serial number and fault reported when the number is issued. This will enable the Service Department to prepare in advance for the receipt of your instrument, and to provide the best possible service to you.

The Returns Authorisation number should be clearly marked on the outside of the product packaging, and on any related correspondence. The instrument should be sent, freight paid to the appropriate address. If appropriate a copies of the original purchase invoice and of the packing note, should be sent simultaneously by airmail to expedite clearance through customs.

For instruments requiring repair outside the warranty period a repair estimate will be submitted to the sender, if required, before work on the instrument commences.

Approved Repair Companies

Megger operates fully traceable repair and calibration facilities complemented by a network of approved repair and calibration companies, to offer excellent in-service care for your Megger products. Megger's streamlined Returns Authorization system ensures your product is expected and enables you to track its progress on-line.