

**Megger**<sup>®</sup>

**MIT510**  
**5kV Digital Insulation Tester**

**USER MANUAL**

 **SAFETY WARNINGS**

- The circuit under test must be switched off, de-energised, isolated and checked to be safe before insulation test connections are made. Make sure the circuit is not re-energised whilst the instrument is connected.
- Circuit connections must not be touched during an insulation test.
- After completing a test, capacitive circuits must be completely discharged before disconnecting the test leads.
- Turning the instrument off, and manually discharging circuits on completion of tests is recommended as standard procedure, before touching the test leads.
- It is rare, but in certain circumstances, breakdown of the circuit under test may cause a loss of display, presence of HV on the test leads will still be shown by a flashing red LED. If this happens, stop the test immediately by pressing the '**TEST**' or '**Power ON/OFF**' button then ensure the circuit is manually discharged before touching any connections.
- Test leads, including crocodile clips, must be in good order, clean and with no broken or cracked insulation.
- The instrument should not be used if any part of it is damaged.
- Water on the surface of the instrument may lead to erroneous results. It is recommended that the instrument is not used in wet weather conditions.
- This instrument is not intrinsically safe and must not be used in hazardous atmospheres.

**NOTE**

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

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## Symbols used on the instrument are:



Caution: risk of electric shock



Caution: refer to accompanying notes



Equipment protected throughout by Double Insulation (Class II)



Equipment complies with current EU directives.

## INTRODUCTION

The MIT510 is a compact microprocessor controlled high voltage d.c. insulation tester, powered by internal rechargeable battery or mains supply. A comprehensive LCD display shows resistance, current, capacitance, voltage and timer measurements digitally, with resistance being shown in analogue as well.

Features include:

- Resistance or current measurement- front panel selectable
- Resistance measurement range - 10 k $\Omega$  to 15 T $\Omega$
- Front panel selectable test voltages - 250 V, 500 V, 1000 V, 2500 V, 5000 V
- Incremental timer (minutes & seconds) – measures during test
- Load capacitance measurement – displayed at end of a test
- LCD backlight – front panel selectable
- Battery level/charging indicator
- Mains (line) input presence LED
- High voltage warning flashing LED shows when greater than 50 V present on test leads
- High voltage warning LCD "flash" shows when greater than 50 V present on test leads
- 8 hours continuous testing on full charge.

### Cleaning

Disconnect the instrument and wipe it with a clean cloth slightly dampened with soapy water or Isopropyl alcohol (IPA).

## POWER LEAD AND CHARGING

If the power lead supplied is not suitable for your type of mains outlet, do not use an adaptor. Always use a power lead fitted with the correct plug.

**NB:** A plug severed from the power lead is a hazard if plugged into a live socket. Severed plugs must be destroyed immediately.

The instrument is fitted with a two-pin IEC60320 power inlet. Most power leads are made with three-core cable so the ground connection will not be used.

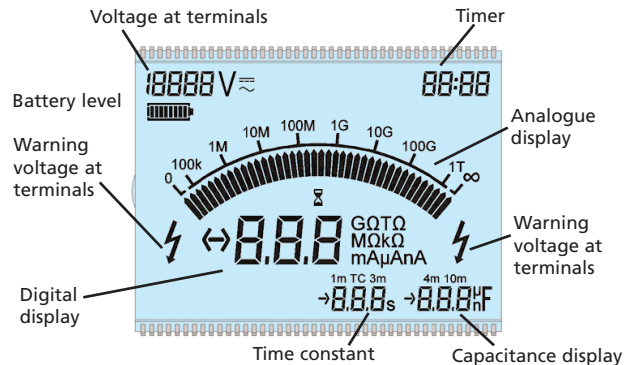
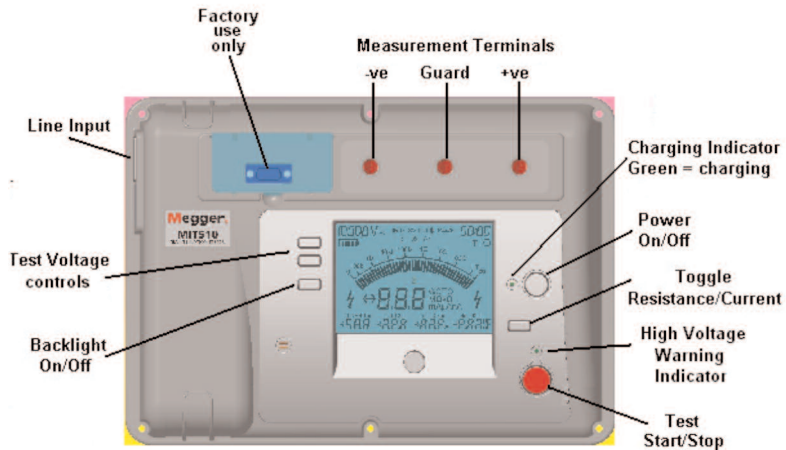
Power lead cable colour coding:

	<b>International</b>	<b>USA</b>
Earth/Ground	Yellow/Green	Green
Neutral	Blue	White
Live (Line)	Brown	Black

If using a fused plug ensure it is fitted with a 3 Amp fuse.

The instrument can be powered from 95 - 240 V rms,  $\pm 10\%$  50/60Hz. With power connected the battery will charge as long as a test is not in progress. The **Power On/Off** button has a green LED which illuminates when mains power is present.

For best battery lifetime, charge the battery after each use. A completely exhausted battery will take 14 hours to recharge.



1. Check connections to load - see **SAFETY WARNINGS**
2. To turn on, press Power On/Off button and release after display responds. The instrument first will perform a self-check during which Ini is displayed. After Ini disappears the instrument is ready for use.
3. Check voltage at terminals display to be sure the load is safe to energise.
4. Set test voltage required with **V▲** and **V▼** buttons.
5. To start a test, press **TEST** button and release after red LED shows. If external voltage at terminals < 50 V, testing starts.
6. **TEST** button red LED and display warning symbols will flash during a test to show high voltage present at terminals.

7. Timer will count up from zero during test.
8. To stop the test press **TEST** button.
9. Timer will stop.
10. Analogue display shows insulation resistance.
11. Digital display shows resistance or current selected by pressing **Ω/I** button.
12. Load capacitance will be calculated and displayed after the end of the test.
13. Time-constant will be displayed after the end of the test.

## INSTRUMENT CONTROLS AND INDICATORS

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### **Power On/Off button:**

The instrument will only turn on if this button is pressed, held and then released after the display responds.

If pressed and released before the display responds the instrument will not turn on.

If pressed and held continuously the instrument will not turn on.

This sequence is a safety feature to prevent the instrument inadvertently turning on.

To power the instrument down at any time, press **Power On/Off** again. The instrument will also power down after 10 minutes of inactivity.

Once powered, the display will first show **Ini** while it does a self-check. When **Ini** disappears, the instrument is ready for use.

### **V▲ and V▼ buttons:**

Using these buttons one of five test voltages can be selected: 250 V, 500 V, 1000 V, 2500 V or 5000 V. The selected voltage is shown on the display.

If there is an external voltage greater than 50 V on the test leads the display will show this voltage instead. The instrument will not do a test if this is the case.

After a test has started, the display shows the voltage on the test leads only. If the test voltage is changed during a test, the new test voltage will

be displayed briefly before the display again shows the voltage on the test leads.

After a test has been stopped, the display shows the test voltage selected once the load has discharged to below 50 V.

### **TEST button:**

A test will only start if this button is pressed, held and then released as soon as the red HV LED lights. When the test starts the red HV LED flashes and the display flashes the HV warning symbols.

If pressed and released before red LED shows a test will not start.

If pressed and held continuously the instrument will immediately stop the test.

This sequence is a safety feature to prevent the instrument inadvertently starting a test.

If an external voltage greater than 50 V is present on the test leads, this will be shown by the red HV LED and the display HV warning symbols flashing. Testing will be disabled until this voltage falls below 50 V.

Testing will stop if the **TEST** button is pressed again.

After a test has finished, the instrument will discharge the load which may take some time. Always check the load has been discharged before touching the test leads.

### **Ω/I button:**

Pressing this button toggles the digital display between the insulation resistance and current.

### **button:**

Pressing this button toggles the display backlight on and off.

### **"HV On" LED:**

This is a red LED next to the **TEST** button on the front panel. As long as there is a voltage greater than 50 V, from an internal or external source, on the test inputs, the LED flashes.

### **"Charging Indicator" LED:**

This is a green LED next to the **Power On/Off** button on the front panel. When mains power is present it shows green.

### **Test Terminals:**

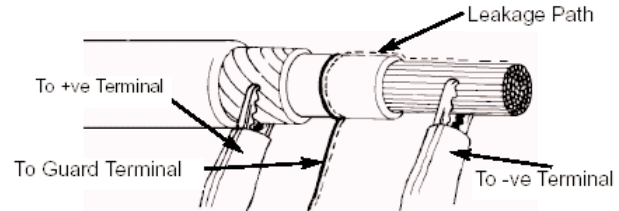
There are three test terminals marked +, - and G. These terminals are designed to accept only the test leads supplied. Shutters across the terminals prevent accidental ingress of dirt and other objects. Test lead plugs interlock with the shutters and are released by rotating the test lead plug a quarter turn.

The Guard terminal is explained below and only used in cases where surface leakage currents need to be eliminated. Most measurements use just the + and - terminals. The instrument's internal voltage generator drives the + terminal with respect to the - terminal, current being measured in the - terminal.

### **The Guard Terminal:**

For basic insulation tests and where there is little possibility of surface leakage affecting the measurement, it is unnecessary to use the guard terminal i.e. if the insulator is clean and there are unlikely to be any adverse

current paths. However in cable testing, there may be surface leakage paths across the insulation between the bare cable and the external sheathing due to the presence of moisture or dirt. Where it is required to remove the effect of this leakage, particularly at high testing voltages, a bare wire may be bound tightly around the insulation and connected via



the  
third  
test  
lead  
to the  
guard

terminal 'G'.

The guard terminal is at the same potential as the negative terminal. Since the leakage resistance is effectively in parallel with the resistance to be measured, the use of the guard causes the current flowing through surface leakage to be diverted from the measuring circuit. The instrument therefore reads the leakage of the insulator, ignoring leakage across its surface.

### Factory programming socket:

This is a 9 pin socket under the hinged cover and is not for customer use.

### Battery Bar Graph:

This is a battery symbol on the LCD display composed of 9 segments. The battery is monitored continuously and the percentage of charge remaining is shown in the table below.

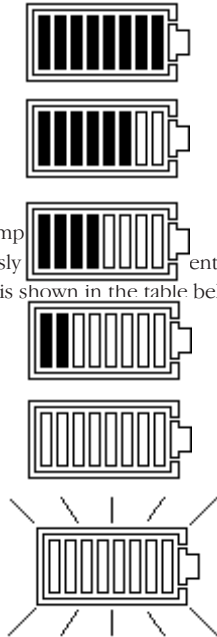
Fully charged battery

75% charged battery

50% charged battery

25% charged battery

Some testing still possible but battery may fail at any time



Symbol flashes when there is not enough charge to do a test and the instrument turns itself off

When mains power is present the indicator shows the battery is being charged by animating the segments of the bar graph.

### Voltage at Terminals:

When not testing, the voltage displayed is the test voltage previously selected.

If there is an external voltage greater than 50 V present, this will be displayed regardless of changes made to the test voltage. In this case the instrument will not do a test, the **TEST** button red LED and display warning symbols will flash to warn of the hazard until the external voltage becomes less than 50 V.

When testing, the voltage displayed is the voltage present at the test terminals of the instrument.

If the test voltage is changed, by pressing either of the  $V\blacktriangle$  and  $V\blacktriangledown$  buttons during a test, the new test voltage is displayed momentarily before the voltage at the test terminals is displayed again.

### Timer:

The timer shows minutes and seconds. At the start of a test the timer will start from zero and at the end of a test it will stop. The duration of the last test remains on the display until another test is started.



## SPECIFICATION

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### Digital Display:

The digital display shows the resistance or current being measured during a test. The  $\Omega$ / I button toggles between the two. After a test the display shows the last measurement made until V▲, V▼ or TEST buttons are pressed.

### Analogue display:

This simulates an analogue meter movement to give the user a better "feel" for how a measurement is progressing. The analogue display shows resistance only.

### Capacitance display:

At the end of a test the capacitance of the circuit under test is calculated and displayed. After a test the display shows the last measurement made until V▲, V▼ or TEST buttons are pressed.

### Time Constant:

At the end of a test the time-constant of the circuit under test is calculated and displayed. After a test the display shows the last measurement made until V▲, V▼ or TEST buttons are pressed.

### Voltage input range:

85-260 V, 50/60Hz

### Battery life:

6 hours continuous testing at 5 kV

### Test voltages:

250 V, 500 V, 1000 V, 2500 V, 5000 V

### Accuracy (23°C):

±5% to 1 T $\Omega$

±15% 1 T $\Omega$  to 7.5 T $\Omega$

±20% 5 T $\Omega$  to 10 T $\Omega$  ±5 counts

### Guard:

2% error guarding 500 k $\Omega$  leakage with 100 M $\Omega$  load

### Display range:

Digital display      10 k $\Omega$  to 15 T $\Omega$

Analogue display    100 k $\Omega$  to 1 T $\Omega$

### Short circuit/charge current:

3 mA

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**Capacitor charge time:**

≤ 5 seconds per  $\mu\text{F}$  at 3mA

**Capacitor discharge time:**

≤ 5 seconds per  $\mu\text{F}$  to discharge from 5000 V to 50 V

**Capacitance measurement:**

1 nF to 50  $\mu\text{F}$  (dependant on measurement voltage)

**Capacitance measurement accuracy (23°C):**

±5% ±5 nF

**Voltage output accuracy (0°C to 30°C):**

0 - +4% of nominal test voltage at 100 M $\Omega$  load

**Current measurement range:**

±0.01 nA to ±5 mA

**Current measurement accuracy (23°C):**

±5% ±0.2 nA at all voltages

**Display:**

Analogue/Digital 3 digits

**Interference rejection:**

2mA rms

**Timer range:**

Counts up to 99 minutes from start of test

**Test regimes**

Auto IR

**Lead set:**

Three flexible silicon insulated leads with compact clamp.

**Safety:**

Meets the requirements of EN61010-1:2001 CAT III 300V

**EMC:**

Meets the requirements of EN61326-1:1998 for use in heavy industrial areas.

**Environmental****Operating temperature:**

-10°C to 50°C

**Storage temperature:**

-25°C to 65°C

**Ingress protection (lid closed):**

IP65

**Humidity:**

90% RH non-condensing at 40°C

**Dimensions:**

305 x 194 x 360 (mm) (12 x 7.6 x 14.2 inches)

**Weight:**

6.75 kg (15lb) approx

## ACCESSORIES

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	<b>Order Code</b>
<b>Included Accessories</b>	
3m lead set	8101-181
User guide on CD-ROM	6172-929
<b>Optional Accessories</b>	
3m lead set with straight jaw clamps	6220-797
15m lead set	8101-183
3m lead set, insulated clamps	Contact Megger

## REPAIR AND WARRANTY

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England.

Tel: +44 (0) 1304 502 243

Fax: +44 (0) 1304 207 342

U.S.A.

Tel: +1 610 676 8579

Fax: +1 610 676 8625

or an approved repair company.

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

or

Megger  
Valley Forge Corporate Centre  
2621 Van Buren Avenue  
Norristown PA 19403

### **Returning and Instrument for Repair**

If it is necessary to return 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**

A number of independent instrument repair companies have been authorised for repair work on most Megger instruments, using genuine Megger spare parts. A list of approved companies is available from the UK

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**Megger Limited**  
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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.**

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