The **ESSENTIAL** and **ADVANCED** ranges

USER GUIDE

MIT515/2 / MIT525/2 / MIT1015 / MIT1025/2 / MIT1525/2

5 kV, 10 kV and 15 kV Insulation Resistance Testers

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For Patent information about this instrument refer to the following web site:

megger.com/patents

This manual supersedes all previous issues of this manual. Please ensure that you are using the most recent issue of this document. Destroy any copies that are of an older issue.

Declaration of Conformity

Hereby, Megger Instruments Limited declares that radio equipment manufactured by Megger Instruments Limited described in this user guide is in compliance with Directive 2014/53/EU. Other equipment manufactured by Megger Instruments Limited described in this user guide is in compliance with Directives 2014/30/EU and 2014/35/EU where they apply.

The full text of Megger Instruments EU declarations of conformity are available at the following internet address:

megger.com/eu-dofc

Contents

1. Safety warnings

⚠ **These must be read and understood before use. Retain these safety warnings for future reference.**

THE INSTRUMENT MUST BE OPERATED ONLY BY SUITABLY TRAINED AND COMPETENT PERSONS

National Health and Safety Legislation requires users of this equipment or their employers to carry out valid risk assessment of all work so as to identify potential sources of danger and to mitigate risk.

Safety warnings must be observed during use:

- If this equipment is modified or used in a manner not specified by the manufacturer, the protection provided by the equipment may be impaired.
- This instrument is not intrinsically safe and must not be used in hazardous atmospheres.
- The circuit under test must be switched off, de-energised, discharged, 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.
- Instrument terminals, test leads and the circuit under test must not be touched during an insulation test or when the test LED is flashing to indicate a hazardous condition on the measurement circuit.
- Lead continuity can be verified by momentarily shorting clips together at the lowest test voltage range.
- Only 15 kV rated Megger test leads with plug inserts of 75 mm must be used only on the S1-1568 and MIT1525/2.
- When powered by battery and with the mains supply disconnected, the pins on the mains socket may be electrostatically charged to a high voltage. There is not enough energy for this to be hazardous but, to reduce discomfort from accidental discharge do not touch exposed metal parts. On 15 kV products, it is strongly recommended that the earth (ground) terminal is connected to a convenient earth or uni-potential protection circuit. The user is fully protected for safety by double insulation and this connection need not be capable of taking a fault current.
- Capacitive charges can be lethal. After completing a test, capacitive circuits must be completely discharged before disconnecting the test leads.
- Tested items must be firmly shorted out with a shorting link, after discharge, until required for use. This is to guard against any stored dielectric absorption charge subsequently being released thereby raising the voltage to potentially dangerous levels.
- The voltage indicator and automatic discharge features must be regarded as additional safety features and not a substitute for normal safe working practice.
- It is rare, but in certain circumstances, breakdown of the circuit under test may cause the instrument to terminate the test in an uncontrolled manner, possibly causing a loss of display while the circuit remains energised. In this event, the unit must be turned off and the circuit discharged manually.
- Test leads and clips, must be in good order, clean and with no broken or cracked insulation. If the white wear indicator is visible, the lead must not be used.
- Instrument must be kept clean and free from dirt and contaminants.
- The instrument must not be used if any part of it is damaged.
- Insulation testing in wet conditions might be hazardous. It is recommended that this instrument is not used in these circumstances. If this is unavoidable, the user must take all necessary precautions.
- If performing a two-wire test without guard using the MIT1025/2 and S1-1068/2, insert the blue safety plug into the guard terminal.
- When operating in high noise environments such as HV switch yards, there could be noise voltage injected into the instrument that exceeds the safety insulation provided by the equipment. Should this happen, the instrument will abort any measurement in progress and display “Err 12” message accompanied by an audible warning.
  The unit under test must be earthed and made safe before accessing the instrument and the test connections.
- In the event the instrument has become unresponsive, remove mains supply from the equipment and switch the equipment off using the rotary switch. Ensure all external test pieces have been safely discharged before disconnecting from the instrument.

- Switch the instrument OFF and disconnect any AC source, measurement leads, and all other equipment before opening the case to change the battery. The instrument must not be operated with the case open. DANGER! Hazardous voltages are exposed with an AC source connected and the case open.
- Remote control can be conducted only with the remote control indicator beacon fitted to the instrument. Green beacon indicates the instrument is under remote control. Red beacon indicates the remote control communication not established. A test can be started at any time via remote control. Measurement connections must be handled only with the remote control indicator beacon removed from its socket so that the instrument cannot be operated remotely by accident.
- In the event of the instrument failing in remote control mode the test must be stopped manually by pressing the TEST button.

1.1 Battery Warning

- Do not disassemble or modify the battery. The battery contains safety and protection devices which, if damaged, may cause the battery to generate heat, rupture or ignite.
- Never heat the battery in a fire or otherwise.
- Do not pierce or damage the battery in any way.
- Do not subject the battery to strong impacts/shocks.
- Do not expose the battery to water, salt water or allow the battery to get wet.
- Never short circuit, reverse polarity or disassemble the battery pack.
- In the event of a battery cell leaking, do not allow the liquid to come into contact with the skin or eyes. If contact has been made, wash the affected area with copious amounts water and seek medical advice.
- Keep cells and batteries out of reach of children.
- Seek medical advice if a cell or battery has been swallowed.
- Do not leave a battery on prolonged charge when not in use.
- Retain the original product literature for future reference.
- If an instrument is suspected to contain a faulty battery, the battery must be removed before the instrument is shipped.
- Do not ship a faulty battery, either separately or connected to an instrument.
- Old batteries must be disposed of in accordance with local regulations.

1.2 Short term use ONLY

- The voltmeter in this instrument is suitable for short term use only, and must not be used as a substitute for safe working practices or relied upon for proving safe.

1.3 Product Safety Category - measurement connection:

WARNING : When using a test instrument, the applicable product safety category is always that of the lowest rated component in the measurement circuit.

CAT IV: Measurement category IV: Equipment connected between the origin of the low-voltage mains supply and the distribution panel. CAT IV applies to voltage measurement function of these instruments

CAT IV: Measurement category III: Equipment connected between the distribution panel and the electrical outlets

CAT IV: Measurement category II: Equipment connected between the electrical outlets and the user's equipment.

Measurement equipment may be safely connected only to circuits at the marked rating or lower.

1.4 Symbols used on the instrument

Icon	Description
	Caution: refer to user manual
	Warning: risk of electric shock!
	Equipment protected throughout by Double Insulation
	Line Power / mains
	Equipment complies with current EU directives.
	Equipment complies with current UK legislation.
	Equipment complies with current ‘C tick’ requirements
	Do not dispose of via landfill, sewage system or by fire.
	Functional earth
	Universal Serial Bus (USB)

2. The range

The Megger range of 5, 10 and 15 kV insulation testers are known worldwide for their rugged dependability, long service life and accurate, reliable measurements.
The extensive range of models means that there will always be a perfect match for your requirements. One common feature across the whole range is the Megger,
'no compromise' approach to safety. The Megger level of safety will always go further than simply complying with the relevant safety standards.

Another common feature is the **intuitive colour custom display**, with its ability to work in extreme environments and unbeatable viewing angle.

The range starts with the **MIT** (Megger Insulation Tester) models. These instruments provide an excellent level of noise immunity, test performance, and safety.

For customers requiring higher capacitance charge rates (testing long cables), working in electrically noisy environments (e.g. transmission voltages), remote operation, or data storage, the **S1** models are the ideal solution.

Once the best level has be selected, the only remaining choice is the maximum test voltage required.
The **Essential** models come in either 5 kV or 10 kV,
whilst **Advanced** and **Expert** come in either 5, 10 or 15 kV instruments.

Please see the selection chart on page 2 of this data sheet for more detailed information on the differentiating features across the range.

ESSENTIAL

MIT515/2 (5 kV)
MIT1015 (10 kV)

Scan the QR-code for information

The Essential models are perfect for performing
'go/no go' testing; no need to record test results; working in tough locations; using under 10 kV test voltage.

ADVANCED

MIT525/2 (5 kV)
MIT1025/2 (10 kV)
MIT1525/2 (15 kV)

Scan the QR-code for information

The Advanced models are an ideal choice if, in addition to the above, you need to record test results, transfer results to software/mobile app (via USB or Bluetooth LE), and want the benefits of more diagnostic insulation testing. The Advanced range also adds additional noise immunity for power distribution environments, and the ability to either increase or decrease the output current.

EXPERT

S1-568/2 (5 kV)
S1-1068/2 (10 kV)
S1-1568/2 (15 kV)

Scan the QR-code for information

The Expert range combines everything from the Essential and Advanced ranges. If you work in extreme environments, even 765 kV switch yards, want the additional safety and convenience of remote operation via a USB cable, and full control of the output current, this is the choice for you.

= New feature for 2025

	FEATURE	MIT515/2 MIT1015 ESSENTIAL	MIT525/2 MIT1025/2 MIT1525/2 ADVANCED	S1-568/2 S1-1068/2 S1-1568/2 EXPERT
Test capability	High Guard Terminal performance	■	■	■
	IR	■	■	■
	IR(t)	■	■	■
	PI Polarisation Index	■	■	■
	PI Predictor	■	■	■
	DAR Dielectric Absorption Ratio	■	■	■
	DD Dielectric Discharge		■	■
	Ramp test		■	■
	RE>Act mode	■	■	■
	PDC test		■	■
Test voltage	Max. voltages available	5 kv or 10 kV	5 kv, 10 kV or 15 kV	5 kv, 10 kV or 15 kV
Charging and burn mode current	Default maximum current	3 mA	3 mA	6 mA
	User selectable max. current values	N/A	1 mA, 3 mA, 6 mA (6 mA only from mains supply)	1 mA, 2 mA, 3 mA 4 mA, 5 mA, 6 mA (6 mA from internal battery and mains supply)
Noise immunity	Max. noise current with measurement withing accuracy spec.	3 mA (LV and MV <45 kV)	6 mA (HV <230 kV)	8 mA (EHV <1000 kV)
	Adaptive filter			■
	Negative current handling	■	■	■
	Averaging filter			■
Safety	CAT IV 1000 V		■	■
	CAT IV 600 V	■	■	■
	Hazardous peak voltage detection during IR measurement	■	■	■
Data storage / features	On board - time stamped		■	■
	Temperature value stored		■	■
	Humidity value stored			■
Communications	Test result transfer via wired USB		■	■
	Test results transfer via wireless Bluetooth LE		■	■
	Test result live streaming via wired USB		■	■
	Test result live streaming via wireless Bluetooth LE		■	■
	Remote control via wired USB			■
Display	New custom colour display	■	■	■
Accessories	Carry all holdall	■	■	■
	Deeper lid pouch	■	■	■
Software support	CertSuite Asset Lite compatible		■	■
	CertSuite Asset compatible		■	■
	Power DB Lite supplied free		■	■
	Power DB Advance or Pro support		■	■

3. General description

The new range of Insulation Resistance Testers (IRT) consists of four models; an entry level 5 kV and three fully featured units, one 5 kV, one 10 kV and one 15 kV.

3.1 Features

- Max resistance is 10 TΩ (5 kV), 20 TΩ (10 kV) and 30 TΩ (15 kV)
- MIT515/2 and MIT1015 with IR, IR(t), PI and DAR
- RE>Act test mode (Patent applied for)
- PI predictor function (**PI*p***)
- MIT525/2, MIT1025/2, MIT1525/2 diagnostic and over voltage tests - PI, DAR, DD, PDC, SV and ramp test
- Operate and charge on line power / mains (except during actual test)
- Light weight Li-ion battery
- CAT IV 600 V safety rating (MIT515/2, MIT525/2, MIT1025/2)
  CAT IV 1000 V safety rating (MIT1525/2) – applies to voltmeter function
- Advanced memory with time / date stamp
- AC and DC voltmeter (30 V to 660 V)
- Large LCD display with back-light
- Download of saved results and logs via isolated USB cable (MIT525/2, MIT1025/2, MIT1525/2 only)
- CertSuite Asset compatible with MIT515/2 via USB cable and Windows PC.
- PowerDB Lite software compatible with MIT525/2, MIT1025/2 and MIT1525/2.

4. Instrument controls and indicators

No.	Description	No.	Description
1	Positive (+) terminal	8	Central rotary switch
2	GUARD terminal	9	Save button – MIT525/2, MIT1025/2, MIT1525/2
3	Negative (-) terminal	10	Test mode rotary switch
4	USB device interface	11	LED indicating line power / mains
5	Four arrow buttons and OK button	12	Display
6	TEST button with associated HV warning lamp	13	Power socket
7	Backlight	14	Functional earth terminal – **MIT1525/2 Only**

Icon	Description	Icon	Description
	User lock voltage		Delete records
	Timer		Download via USB
	Save		Filter
	Open records		Alarm
	Battery		Breakdown mode
	Ramp test		Burn mode
	Danger HV		Refer to manual
	Fuse		Noise detected

5. Preparations for use

5.1 Initial instructions

- Remove instrument, power lead and pouch from the packing box
- Clip the test lead pouch to the lid
- Open the lid and familiarise yourself with the layout and position of the IEC 60320 power inlet on the left side of the panel. An isolated USB socket is found on the right side of the instrument
- Unpack leads and pack them into the lead pouch
- Read the product manual, especially the warnings
- A quick reference is provided in the instrument lid
- Keep the original packaging for re-use

5.2 Power lead and battery charging

- If the power lead supplied is not suitable for your line / mains connection, do not use an adaptor. Always use a power lead fitted with the correct plug
- Supply voltage: 90 to 265 V rms AC at 50 / 60 Hz
- A green LED illuminates when line power / mains is present
- The battery will charge as long as the mains supply is connected, except when a test is in progress
- For optimum battery life, charge the battery after each use. Full charge duration is up to 2½ hours but a first charge time of 3 hours is advised
- The battery must be charged between 0 °C and 40 °C ambient temperature. If the battery detects a temperature outside this range the battery symbol will flash

5.3 Power lead connection table

Connection	UK / International	USA
Earth (Ground)	Yellow / Green	Green
Neutral	Blue	White
Live (Line)	Brown	Black

5.4 Functional verification

Simply turning on the instrument will initiate a start-up process and the display will respond. If an error is detected 'Err' will be displayed with an associated error number.

The MIT insulation testers are supplied with a certificate which is automatically generated as part of Megger's final test procedure.

UKAS accredited certificates are available from Megger but this service is chargeable.

5.5 Storage

Instruments should be stored in storerooms which meet the storage temperature and humidity specifications listed in this document. If charging is incorporated in the storeroom the room must be well ventilated.

6. Operating instructions

6.1 General operation

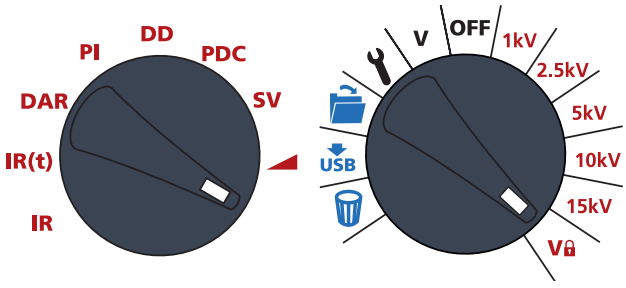
The MIT Insulation resistance testers (IRTs) are primarily controlled by two rotary switches and a TEST button used to start and stop a test (see section entitled, 'Instrument Control and Indicators'). The central rotary switch includes an 'OFF' position; the instrument switches on by rotating the switch either clockwise or anticlockwise from this position. A range of test voltages for insulation resistance tests up to 5 kV (MIT515/2 / MIT525/2),10 kV (MIT1015 and MIT1025/2) and 15 kV (MIT1525/2) are available, including a user selectable voltage range which can be set between 40V or 100 V and 5000 V, 10000 V or 15000 V depending on model. The 'lockable' test voltage range can be adjusted in the settings function.

The settings function is indicated by a spanner symbol and facilitates lock voltage, low resistance alarm, temperature, time / date adjustment. A light blue coloured section of the rotary switch denotes memory functions; open records, download via USB and delete records. A dedicated save button is provided on the MIT525/2, MIT1025/2 and MIT1525/2 models and all models have a backlight button.

A second rotary switch controls the insulation test mode providing for the following tests:

- All models have basic insulation resistance IR, timed insulation resistance IR(t), Dielectric Absorption Ratio (DAR) and Polarisation Index (PI) tests
- MIT525/2, MIT1025/2, MIT1525/2 have additional tests; Dielectric Discharge (DD), Step Voltage (SV) and ramp test

A cluster of directional buttons and an OK button are used in settings and memory functions. The up / down arrows also enable the test voltage to be adjusted during a test. Prior to the start of an IR or IR(t) test, holding down the left arrow button with a voltage level selected on the central rotary switch will activate burn mode. Burn mode is deactivated if the voltage range or mode is changed or by pressing the right arrow / breakdown button.



Instrument controls are simple to operate. The central rotary switch incorporates the OFF position. The left hand rotary switch selects insulation test type (test mode switch). The TEST button starts and stops a test.

Backlight

Save

Four arrow buttons and OK facilitate adjustment and selection of settings, voltages and modes. Breakdown / burn modes are set using the left and right arrow buttons. Back-light and save functions are dedicated buttons. All models have backlight and the MIT525/2, MIT1025/2 and MIT1525/2 have the Save button.

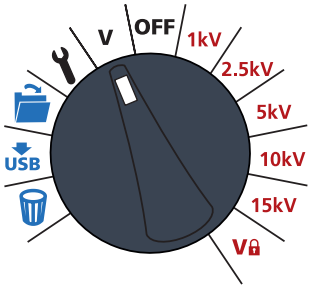
6.2 Breakdown vs. burn mode

In breakdown mode insulation tests are automatically stopped and display **Brd** when a fault causes the applied voltage to drop rapidly. Burn mode IR tests ignore breakdown and continue to test the insulation and are therefore destructive tests. Burn mode is used to purposely create a carbon track in insulation to facilitate fault location. Burn mode only operates at test voltages of 500 V and above.

6.3 Voltmeter

A voltmeter is incorporated in the instrument and measures AC / DC voltage from 30 V to 660 V. Frequency (Hz) is measured and displayed for AC voltages. Voltmeter mode is activated by switching to 'V' mode as illustrated.

Positive and negative terminals are used for the voltmeter function; do not connect the GUARD terminal when in voltmeter (V) mode.

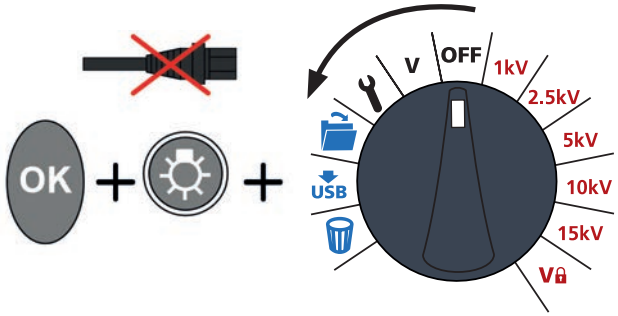


To assist user safety, the instrument will automatically switch to voltmeter mode if a voltage of 50 V or more is connected to the terminals. The measured voltage will be displayed accompanied by an intermittent beeper to warn the user that a dangerous voltage exists.

For further explanation ***See 10.2 Warning tones on page 31***.

6.4 Reset default settings

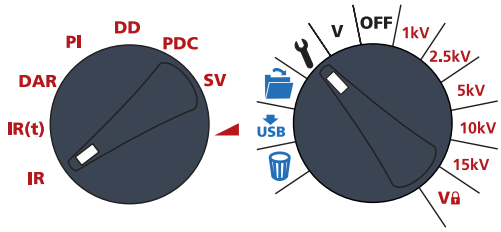
Remove AC source, press OK, backlight buttons and switch main rotary switch from OFF to setting icon.



7. Instrument control

7.1 Initial setup

It is important to setup the Real Time Clock (RTC) on models MIT525/2, MIT1025/2 and MIT1525/2 to ensure that records saved in the instrument are time / date stamped correctly. The MIT515/2 does not require time / date setting. The RTC has a separate battery to maintain settings even when the primary battery is removed.



To set the clock and date, select the settings function on the central rotary switch and turn the mode rotary switch to IR. Navigate using the left / right arrows to where the time and date is displayed.

Set the time using the up and down arrows. Change the hours and minutes then press OK to save.

Select the day / month format required, i.e. d:m for day:month or m:d for month:day and press the right arrow button, then set the date and press OK to save. A tick on the left of the display indicates that a setting is saved, a cross is displayed during adjustment indicates that it is not set. Exit settings by changing the central rotary switch to a different position.

A tick on the left of the display indicates that a setting is saved, a cross is displayed during adjustment indicates that it is not set. Exit settings by changing the central rotary switch to a different position.

7.2 Lock voltage

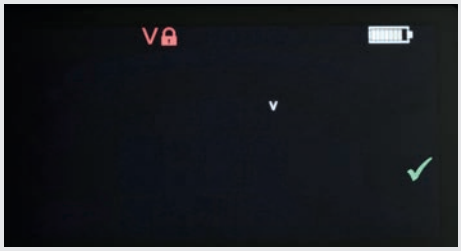
The user selectable ‘lock’ voltage range is set by adjusting the displayed voltage using the up and down arrow buttons. When the desired voltage is displayed, it is saved, by pressing the OK button. The setting does not change even if the instrument is switched off.

7.3 Test current selection

7.3.1 Short circuit test current limit setting

The **Advanced** range of insulation testers have the ability to adjust their test current limit to suit different applications. The default setting is 3 mA for the MIT models and the test current can be reduced to 1 mA or increased to 6 mA when rapid charging of high capacitance is required. Please note that 6 mA of charge current is only available when the instrument is powered from a mains / line supply.

To select the required test current set the instrument to IR and select the Settings icon .



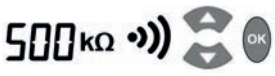
Use the keys until **out** is displayed. The active set current is displayed, together with a green tick confirming that setting.	
Use the arrow keys, until the required current is displayed.	
NOTE : after changing the current there is a red tick displayed. This indicates that the change has not set been saved.	
To save the setting press the OK button. When saved the green tick will be displayed.	

7.3.2 Short circuit test current in use

When selecting any insulation test voltage range the set test current limit is displayed on the bottom right side of the display. This is the set limit. When the insulation test is started and in operation the actual measured test current will be displayed in the same location on the display.	
NOTE : If a 6 mA test current limit was set the set current displayed on the insulation test screen will be 3 mA if the instrument is being powered by it's internal batteries. The 6 mA setting will only appear on the test screen when the instrument is being powered from an external mains / line supply.	

7.4 Alarm setting

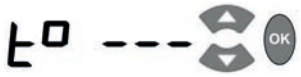
A low resistance alarm sounds when the resistance level of an insulator reaches the alarm, assuming alarm has been activated. The default alarm setting is 500 kΩ and inactive (X is displayed on the right of the display). Set central and mode rotary switches to the settings and IR positions respectively. Press the right arrow button once. The low resistance alarm can be set at the default value by simply pressing the OK button, or changed to a different alarm resistance level using the up / down arrow buttons and save it by pressing OK.



7.5 Recording temperature

The **Advanced** range of MIT testers are able to record insulation temperature measured by an independent thermometer. If you do not wish to record temperature do not change the default setting or reset it if it was previously set.

Move the central rotary switch to point to settings and press the right / left arrow buttons until 'tº ---' is displayed. The default setting is no temperature record. This can be changed by pressing up or down arrows to select either ºF or ºC temperature entry. Pressing OK will confirm the setting and result in a prompt for temperature to be entered whenever the save button is pressed after completing any test. Up and down arrows facilitate temperature entry in 1 ºC increments / decrements.



7.6 Breakdown / burn mode – in IR & IR(t) test modes

The insulation resistance 'IR' test operates in either 'Breakdown' or 'Burn' mode.

 Breakdown

 Burn

Default mode is breakdown.

Left and right arrow buttons  toggle between burn and breakdown mode when a voltage range is selected. In the breakdown mode the breakdown icon will be indicated.

In breakdown mode the test will automatically terminate and display Brd on detection of a breakdown to prevent damage to the insulation

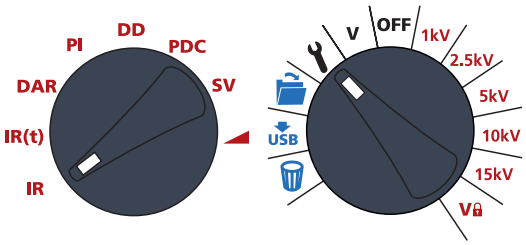
Burn mode disables the normal breakdown detection and test voltage continues after breakdown of the insulation. This enables the location of a failure to be detected but it is a destructive test. Hold the left arrow button for 2 seconds to switch to Burn mode.

Due to the potential damage that could occur, the unit produces two long beeps when starting a test with burn mode activated.

8. Measurement modes

8.1 Spot IR test

The spot insulation resistance test (IR) is selected on the test mode rotary switch. Select the IR setting and then the required test voltage using the preconfigured voltage ranges on the central rotary switch or the V🔒 user settable / lockable voltage range. All preconfigured voltage ranges, but not V🔒, are adjustable using up and down arrow buttons before and during the test, but the latter should be limited to the first 10 seconds of IR and IR(t) tests. Press and hold TEST to start the test.



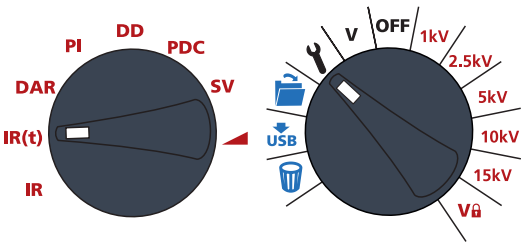
To set the user defined lock voltage V🔒, turn the central rotary switch to settings and the mode switch to IR. The preset voltage 5000 V will flash and can be changed using the up / down buttons. When the required maximum voltage is displayed, press the OK button to save the setting. This setting will remain until it is reset.

Whenever V🔒 is selected the set voltage is shown on the display. The voltage lock is useful when, for example, testing insulation of XLPE cables that should not be tested above 5000 V. The lock function will ensure it does not exceed the V🔒 voltage within the stated output voltage accuracy.

Time Constant (TC) = Rinsulation x Cinsulation

On test completion, insulation capacitance (C) and Time Constant (TC) associated with it is calculated and displayed.

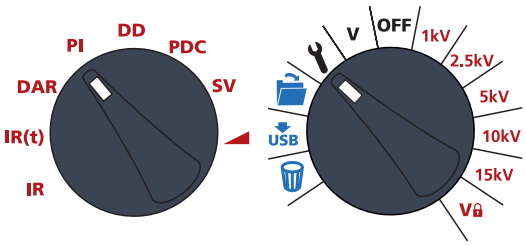
8.2 Timed IR test



A timed test IR(t) will automatically terminate an insulation test after a preset time. Default timer is set to 1 minute and is adjustable within the settings function. This is a useful feature which saves the user watching the display for the full duration of the test and the possibility of missing the 1 minute reading.

Turn the central rotary switch to the settings position. Select IR(t) on the test mode rotary switch. The default time of 1:00 minute will flash prompting the user to select a new time using the up / down arrow buttons. Press OK to set test duration and turn central rotary switch to desired test voltage. Press and hold TEST to start the test.

8.3 DAR, PI and PI predictor insulation tests



DAR and PI tests are measurements of resistance over time expressed as a ratio of resistance at time t2 divided by resistance at time t1. The assumption is that insulation temperature does not vary widely over the duration of the test so the resulting DAR and/or PI value are temperature independent. Testing should be done at or below 40 °C, 104 °F for this assumption to hold.

DAR and PI timers t1 and t2 are set when DAR or PI is selected on the test mode rotary switch with the central rotary switch in the settings position. Timer t1 is set first followed by t2. Up and down arrow buttons are used to change the t1 and t2 default values and OK confirms each setting.

DAR and PI insulation test voltages are selected on the central rotary switch by simply aligning the switch opposite to the required insulation test voltage. Press and hold TEST to start a DAR/PI test.

To turn on PI prediction (**PI*p***) testing, select PI on the central rotary switch by simply aligning the switch opposite to the required insulation test voltage. Press the OK button to toggle the prediction test on and off. Then press and hold the TEST button to start the test.

8.3.1 What is a DAR test?

DAR is defined as the ratio of insulation resistance at 1 minute divided by insulation resistance at 30 seconds, although a 1 minute, 15 second DAR is also popular:

DAR = IR60s / IR30s

Insulation Condition	DAR result
Poor	<1
Acceptable	1 – 1,4
Excellent	1,4 – 1,6

8.3.2 What is a PI test?

IEEE standard 43-2000, Recommended Practice for Testing Insulation Resistance for Rotating Machines, defines PI as the ratio of insulation resistance at 10 minutes divided by insulation resistance at 1 minute:

PI = IR10 min / IR1 min

If IR1min > 5000 MΩ the PI may or may not be an indication of insulation condition and is therefore not recommended by IEEE std. 43.

Insulation Condition	PI result
Poor	< 1
Questionable	1 – 2
Acceptable	2 – 4
Good	> 4

PI results > 1.5 are regarded as acceptable by IEC60085:-01:1984 for thermal class rating A, and PI results > 2.0 for thermal class ratings B, F and H.

8.3.3 What is a PI predictor (PI*p*) test?

PI Predictor uses the first part of the IR curve to predict what the whole curve would be at the full 10 minute test. During the start of the PI test, the scale will NOT flash , then once the prediction has started the PI scale starts to flash. Prediction starts after 3 minutes.

As the confidence in the prediction grows, the scale will become more narrow. When the PI Predictor is 100% confident in the prediction, the test will end automatically and the predicted PI value will be displayed. The prediction can take between 3 and 7 minutes depending on the testing conditions.

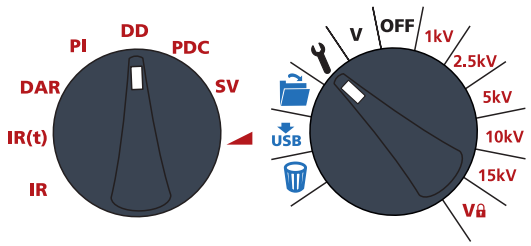
If an open circuit is detected, the PI Predictor test will automatically stop after 10 seconds and an error code will appear. See below for error codes.

8.3.4 PI predictor (PI*p*) Error codes:

If there is an error when running the test using PI predictor, the following error codes will appear on the instrument:

Error code	Description
UC10	Too noisy for prediction
UC20	Not connected (e.g. open circuit)
UC30	Under range (e.g. short circuit)

8.4 Dielectric discharge test



The Dielectric Discharge (DD) or re-absorption current test operates during the discharge of the dielectric under test. Originally developed by EDF, France's power utility company, it is a diagnostic insulation test that allows ageing, deterioration, and voids in the insulation to be assessed. The result is dependent on the discharge characteristic so the internal condition of the insulation is tested, largely independent of any surface contamination.

The insulator must first be charged for a sufficient time to be stable, i.e. charging and polarization are complete and the only remaining component of current is leakage current due to the insulation. On discharge the capacitive component of the discharge current decays from a high value with a relatively short time constant of a few seconds. The released absorption current decays from a lower value with a relatively long time constant of up to several minutes.

The DD timer defaults to 30 minutes of charging, which is generally sufficient time for full absorption to take place in an insulation material. The default test voltage is set to 500 V so the primary rotary switch must be set at or above 500 V.

The default DD test duration (t1) is 30 minutes insulation test followed by a fixed 1 minute discharge. The initial 30 minute period can be adjusted but care should be taken to ensure that full absorption will take place in the insulation test period. DD should be selected on the test mode rotary switch and settings on the central rotary switch. Timer t1 is set using the up and down arrow buttons and OK confirms the setting.

The 'DD' test requires the instrument to measure the discharge current 1 minute after the removal of the test voltage, which is greater than the primary time constant of the discharge. On completion of the test, the instrument uses this measurement along with the test voltage and calculated capacitance to produce a figure of merit indicating the quality of the insulation.

DD = I1min/(V x C)

Where I1min is the discharge current in mA one minute after removal of the test voltage V in Volts and C is the capacitance in Farads.

DD results can identify excess discharge currents that arise when a layer of multi-layer insulation is damaged or contaminated, a condition that will be missed by both the IR and PI tests. Discharge current will be higher, for a given value of voltage and capacitance, if an internal layer is damaged. The time constant of this individual layer will mismatch the other layers, giving rise to a higher value of current than for insulation that is 'good' in this respect.

Homogeneous insulation will have a DD value of 0, while good multi-layer insulation will have a value up to 2. The following table is a guide to DD test results:

Insulation Condition	DD result
Bad	> 7
Poor	4 - 7
Questionable	2 - 4
Good	< 2
Homogeneous	0

8.5 PDC Polarisation Depolarisation Current test

The **Advanced** and **Expert** ranges of MIT & S1 insulation testers (MIT525/2, MIT1025/2, MIT1525/2, S1-568/2, S1-1068/2 and S1-1568/2) have the ability to perform PDC tests.

The Polarisation and Depolarisation Current (PDC) analysis is a non-destructive dielectric testing method for assessing the condition of insulation in electrical equipment like cables, motors, transformers, and generators. This technique measures the polarisation and depolarisation current to gather insights into the moisture content, aging, and general health of the insulation material. Before starting a PDC test please ensure that the correct charge time and discharge times have been set. For more information, please refer to the PDC test application note

8.5.1 PDC test timer setting

Select the PDC test range, and select the spanner (settings range)	
The PDC setting screen will be displayed	
The T1 (charge time) and T2 (discharge time) are set at the same time as they are always the same duration.	
The current set timer duration is displayed together with a green tick to indicate that is the saved setting	

Use the up and down arrow keys to select the desired timer setting. When changed a red cross indicates that the current displayed timer value has not yet been saved

Press the OK button to save the displayed timer value which will confirmed with a green tick

8.5.2 PDC test operation

Select the PDC test range and select the desired test voltage
The instrument will flash the save icon, USB icon and Bluetooth icon. One of these options has to be selected or connected as the test results have to be graphed to be able to review the test results.

To save the test results into the instruments internal memory please **press the save button** or connect the instrument via Bluetooth or USB cable, to either PowerDB / Lite, or the CertSuite Asset mobile app. This allows the test results to be streamed to the device.

Once the instrument has be safely connected to the item under test press and hold the **TEST** button for more than 3 seconds to start the test.

During the test the applied test voltage, measured insulation resistance and test current will be displayed in the usual manner
During the charge phase of the test the timer displayed in the bottom left of the display will count up until the set time is reached. At that point the test voltage will be switched off the instrument will enter the discharge phase of the test. The final IR value will remain of the display. The timer will now count back down to zero and to the end of the test.

At the end of the test the instrument will display three dashes **'---'.** If internal storage was selected before the test, the memory location that the test was saved in will be displayed. For example **0008**.

The PDC test results can then be graphed using either PowerDB, Power DB Lite or the CertSuite Asset mobile application.

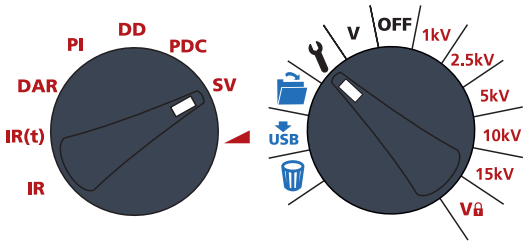
8.6 Step voltage test

The SV test is a controlled overvoltage test that can be applied to stator and rotor windings on synchronous and asynchronous AC motors and the armature and field windings on DC motors. It is advisable to perform a PI test before an SV test to determine if the insulation is suitable for overvoltage testing. If a PI test was performed to verify the winding's suitability for overvoltage testing, the winding must be completely discharged before an overvoltage test is performed.

The SV test is based on the principle that an ideal insulator will produce identical readings at all voltages, while an insulator which is being over stressed, will show lower insulation values at higher voltages.

The SV test is selected using SV mode switch position and any voltage range including V🔓 range setting. If no custom SV test has been setup then a standard five step test will be performed where each step is 1/5th of the test voltage and 1/5th of the test time If a standard 5 step test is required at the V🔓 voltage, set timer 1 to 0 sec. if a custom SV test has previously been setup.

8.6.1 Rotary switch setting indicated



The SV test is a controlled overvoltage test that can be applied to stator and rotor windings on synchronous and asynchronous AC motors and the armature and field windings on DC motors. It is advisable to perform a PI test before an SV test to determine if the insulation is suitable for overvoltage testing. If a PI test was performed to verify the winding's suitability for over voltage testing, the winding must be completely discharged before the overvoltage test is performed.

The SV test is based on the principle that an ideal insulator will produce identical readings at all voltages, while an insulator which is being over stressed, will show lower insulation values at higher voltages.

During the test the applied voltage steps incrementally by one fifth of the final test voltage each minute for 5 minutes, taking successive measurements.

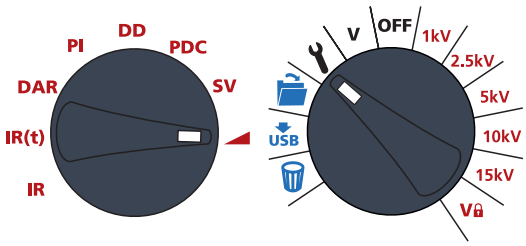
Resistance readings for the first four 'steps' are displayed under consecutive time designators '1 m' to '4 m'. The 5 minute reading is displayed by the main display. If the default 5 minute test duration is changed by the user the four readings will not show the respective '1 m' to '4 m' indicators.

The SV test duration can be adjusted if desired from the 5 minute default value using the up / down arrows and OK to save the setting.

The step timer will always be set to total test time divided by five. Too short a step time may result in incorrect readings and too long a step time may over stress a motor.

The reference standard for step voltage testing is IEEE 95-2002.

8.7 Ramp voltage test



The ramp voltage test is an overvoltage test similar to the SV test but with improved control and warning of potential insulation failure. The slow continuous voltage ramp is less likely to result in unpredictable damage to the insulation than the rapid step increases employed in SV test.

If a PI test was performed to verify the winding's suitability for over voltage testing, the winding must be completely discharged before the over voltage test is performed.

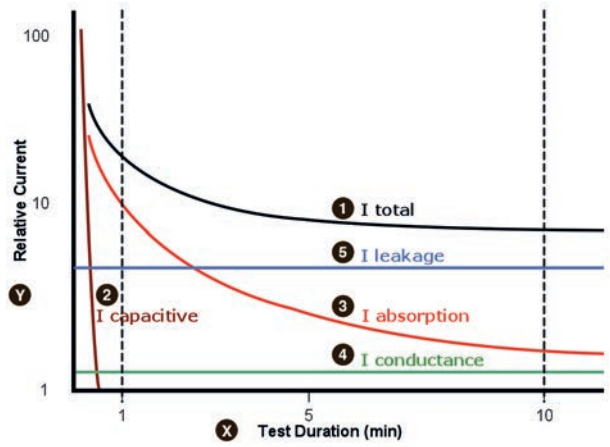
The typical voltage ramp (dV/dt) is 1 kV/min which is the default for the **Advanced** range. This value is user adjustable from the settings function with the mode rotary switch set to ramp. Up and down buttons are used to adjust dV/dt to the required rate and OK confirms the setting. Press and hold TEST to start.

The test will ramp the voltage until it reaches the selected test voltage unless a breakdown or sudden rise in current is detected. The result displayed after the test is the final insulation resistance, voltage and current. If the result is saved a complete curve of current (µA) and voltage (kV) is recorded and can be read into PowerDB, PowerDB Lite or converted to a spreadsheet so that the current vs. voltage curves can be compared to published curves in IEEE 95-2002.

9. Measurement techniques

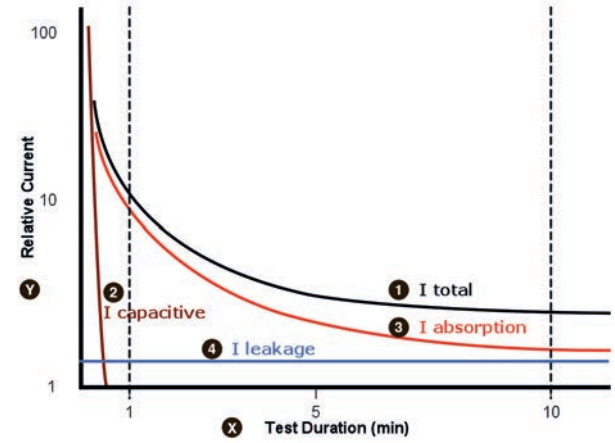
9.1 Understanding measurement currents

Insulation resistance is defined as the DC test voltage divided by the total current flowing in an insulator. The total current has four components; capacitive current, absorption current, conductance current and leakage current.



X = Test Duration (minutes)
Y = Relative Current
1 = Total current
2 = Capacitive current
3 = Absorption current
4 = Conductance current
5 = Leakage current

In the case of dry insulation, conductance current may be negligible and the leakage current may be low, in which case the absorption current will dominate the total current measured.



X = Test Duration (minutes)
Y = Relative Current
1 = Total current
2 = Capacitive current
3 = Absorption current
4 = Leakage current

9.2 Measurements in high noise environments

For information about measuring in high noise environments
click here or scan the QR-code

9.3 Measurements in high noise environments

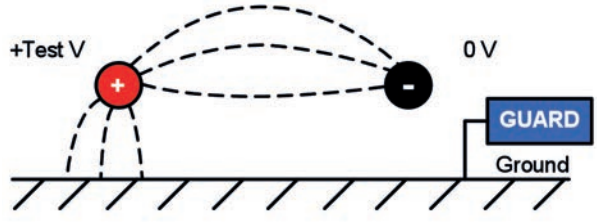
For information about measuring in high noise environments
click here or scan the QR-code

9.4 Insulation measurements above 100 GΩ

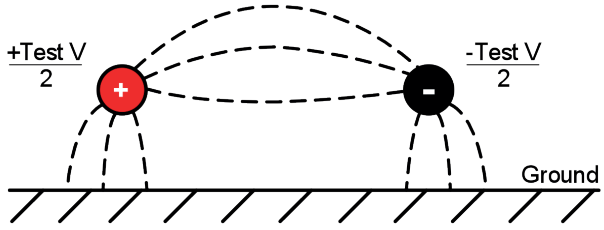
Measurements up to 100 GΩ can be made without any special precautions, assuming that the test leads are reasonably clean and dry. The guard lead can be used to remove the effects of surface leakage if necessary. When measuring resistances above 100 GΩ, the test leads should not be allowed to touch each other, or any other object since this will introduce leakage paths. Sharp points at the test lead connections should also be avoided since this will encourage corona discharge.

The output is isolated, and so will float relative to ground such that the positive terminal is at plus half of the test voltage, and the negative terminal is at minus half of the test voltage with respect to ground.

Leakages therefore occur between the positive terminal and ground, between the negative terminal and ground, and directly between the positive and negative terminals. These leakages have a significant effect and can occur through air.



If the guard lead is grounded, and since the negative terminal is at the same voltage as the guard terminal, the leakage into the negative terminal will be considerably reduced. This will improve accuracy because the current flowing into the negative terminal is measured by the instrument and used to calculate resistance. This technique is only permissible if the item under test is isolated from ground. In this context isolated means insulated by a resistance of at least 5 MΩ for the positive terminal, or at least 10 kΩ for the negative terminal.



Conversely, if the positive terminal is grounded, then the negative terminal will be at a voltage equal to the test voltage relative to ground, which will result in an increase in leakage current, and worsening of measurement accuracy.

When making measurements above 100 GΩ therefore, the user should ground the Guard lead where possible, otherwise parallel leakage paths may occur.

Alternatively, screened leads are available as an optional accessory from Megger. When using a screened lead the screen is plugged into the Guard terminal, diverting any leakage currents. This considerably improves measurements made with a floating output, where the leads might touch each other or another object other than the test piece.

9.5 Terminals

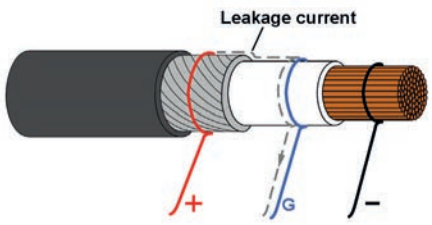
There are three test terminals marked +, - and GUARD. These terminals are designed to accept only genuine Megger test leads. Shutters across the terminals prevent accidental ingress of dirt and other objects. Test lead plugs interlock with the shutters and are released by rotating the test lead plug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

The GUARD terminal, as explained below, is 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.

9.6 GUARD terminal, screened leads

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.

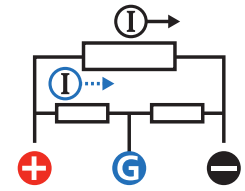
However in cable testing for example, there may be surface leakage paths across the insulation between the bare cable and the external sheathing due to the presence of moisture or dirt. Where it is required to remove the effect of this leakage, particularly at high testing voltages, a bare wire may be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



This diagram illustrates GUARD terminal used to prevent surface leakage on cable insulation from affecting a high resistance measurement.

Screened leads are available for the complete range of insulation testers. They are useful in HV switch yards where induced currents are an issue. The screen connects to GUARD and prevents induced currents in the lead.

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.



When measuring an insulation resistance of 100 GO at 5000 V the tester can guard out current IG at least 5000 times the insulation test current IL with a maximum additional resistance error of 1%.

I = 5000 x I
= ≤ 1% error

The display will show a warning and fuse terminal symbol if the internal guard terminal fuse has blown. The instrument must be switched off to clear the message before further testing is permitted. The fuse should be replaced by an authorised repairer. The instrument may be used in the meantime if the guard terminal not used. Refer to notes regarding measurements above 100 GΩ above

9.7 GILS kit (Guard Interconnecting Lead and Strap kit)

The GILS kits have been developed by Megger to supply the requirements for effective guarding against surface leakage affecting test results. Conductive elastic straps provide an easy and convenient method of making an efficient contact around an insulating bushing. This ensures that the effects of surface leakage currents are totally removed from all measurements. There are two kits available, GILS1 and GILS2 ***See 16. Accessories on page 48.***

GILS1

GILS2

Click here or scan the QR-code for information on the GILS kits

10. Running an insulation test

10.1 RE>Act test mode

The **RE>Act test mode** is a patent applied method to warn and indicate the level of impact any re-absorption or depolarisation current from previous insulation tests or any other external DC currents will have on an insulation test about to be performed.

When a test voltage is applied to insulation to measure its resistance, a test current will flow. The test current is made up of three main components. Firstly, a relatively quickly decaying capacitive current, a fairly constant leakage current, and a usually much lower decaying absorption current, also referred to as polarization current. The polarization current is caused by the polarization of electric dipoles in the dielectric material of the insulator created by the applied test voltage.

When an insulation test has stopped and the test voltage switched off, the insulation will start to depolarize. This causes a depolarisation current to flow in the opposite direction to the polarization current. If a subsequent insulation test is applied while the decaying depolarisation current is still flowing the test current from the instrument will be reduced by the opposing depolarisation current. The result can be a much higher measured insulation resistance than the actual value. Equally, if the polarity of the following insulation resistance measurement is reversed the measurement can be lower than the true insulation resistance value.

Generally it accepted that insulation should be discharged for four times the duration of the last test before attempting another to ensure re-absorption current is not going to effect the next test. However, monitoring the discharge with RE>Act can often greatly reduce that time.

Click here or scan the QR-code
For more detailed information please refer to the application note "Reliable DC insulation measurements using RE>Act"

10.1.1 RE>Act operation

Before performing an insulation test

1. Turning on the insulation tester and select a test type and test voltage. The instrument will display an initial screen indicating the selected display voltage and test current. Should an external live voltage be present this voltage will be measured and displayed.
2. Normally to start an insulation test the **TEST** button is held down for at least three seconds. However, if the user presses the TEST button as a short press (less than 1 second) the instrument will enter the **RE>Act test mode**.

The RE>Act test screen displays the following information:

- The selected test voltage or applied live voltage if present
- The DC current measured from the test piece connected, which generally will be the re-absorption current
- If the measured current is negative this will be indicated to the user.
- The analogue display indicates to the user what effect the measured current will have on an insulation test if it was to be carried out at that time

Should the DC current measured be determined to reduce the accuracy of an insulation test by more than 10% the scale effected will be blocked out and the scale points removed, as follows:

The **RE>Act** mode can be left on to monitor the discharge of the re-absorption current. As the current decays, the analogue scale will reappear, and the blocked-out area will be removed until the whole scale is available.

After an insulation test

The operation the same as when operated before an insulation test. There are safety benefits of using the RE>Act following a high voltage insulation test. The measured voltage will appear as 0 or 1 V and can therefore appear safe. However, if disconnected from a discharge path too early re-absorption current can cause the voltage to rise again to hazardous levels.

A quick press of the **TEST** button to activate the **RE>Act mode** can allow the user to monitor the re-absorption current and watch it decay to a safe low level before finally disconnecting from the insulation.

10.2 Warning tones

WARNING : Should electrical noise be present it will cause a current to flow through the instrument's internal discharge resistors. If this becomes excessive and exceeds instrument rating, damage to the instrument may result.

The MIT insulation testers have been designed to handle high noise currents up to 8 mA. If currents above 8 mA are detected the instrument will sound an urgent "warble" tone and be accompanied by the symbols ⚠ ∿ .

See 10.3 Warning tone levels on page 32

10.3 Warning tone levels

			Idle in test mode, NO testing in progress											
Levels of warnings =			**1. Live Voltage Warning**			**2. High Noise Warning MIT range at 75% of maximum specification exceeded S1 range at 75% of maximum specification exceeded**				**3. Extreme high noise, damage and over measurement limit warning**			
Model	**Noise Immunity Specification**	**Instrument input impedance Ω (ZIP)**	**Live Voltage Warning Level**	**Instrument action**	**User action**	**High Noise Warning Level mA (IN)**	**Voltage measured across instrument terminals (VT)**	**Instrument action**	**User action / comments**	**Damage Warning level (mA)**	**Voltage measured across instrument terminals (VT)**	**Instrument action**	**User action**
MIT515/2	3 mA	29000	30 V	Instrument will display the measured voltage and an intermittent beeper will sound	Be aware that a hazardous voltage is present on the instruments terminals.	2.1	60.9	Instrument will display a high noise warning symbol + Instrument will display the measured voltage and an intermittent beeper will sound	Be aware that a high level of electrical noise is present on the instruments terminals that may effect the insulation measurement + MIT and S1 users may wish to check whether the hardware filter is switched on. + S1 users may wish to check if the Adaptive filter is switched on. Also use averaging filters to smooth slow variations + Note in noisy locations the voltage on the terminals is dependant on discharge resistance value of the instrument VT = IN x ZIP			Instrument will sound an urgent 'warble' tone, together with the high noise warning symbol + Instrument will display the measured voltage	Instrument discharge resistors will now be getting excessively hot. Failure to disconnect will result in damage to the instrument + Measurement will still be possible but the measurements are taken outside of maximum specified noise limit. Measurements are of unspecified accuracy.
MIT525/2	6 mA	29000	30 V			4.2	121.8						
MIT1015	3 mA	29000	30 V			2.1	60.9						
MIT1025/2	6 mA	29000	30 V			4.2	121.8						
MIT1525/2	6 mA	180000	30 V			4.2	756						

			Idle in test mode, NO testing in progress				Testing in progress		
Levels of warnings =			**4. Double Noise Specification Exceeded Warning (Test lockout level)**				**5. Hazardous peak voltage danger warning**		
Model	**Noise Immunity Specification**	**Discharge Resistance Ω**	**Extra high noise Test Inhibit level mA (IN)**	**Voltage measured across instrument terminals (VT)**	**Instrument action**	**User action / comments**	**Danger Warning V**	**Instrument action**	**User action**
MIT515/2	3 mA	29000	16		Instrument will display a high noise warning symbol + Instrument will display the measured voltage and an intermittent beeper will sound + Testing will be inhibited	Be aware that the instrument noise current limits have been exceeded and the instrument is no longer able to test + Safely disconnect instrument	14.09 kV	Instrument will sound an urgent high pitch sound + Testing is automatically stopped to reduce terminal voltage + Error 12 displayed together with voltage hazard warnings	DO NOT TOUCH INSTRUMENT OR TEST LEADS! Instruments reinforced insulation limits may become breached and is now relying on basic insulation to protect user Safely disconnect from voltage
MIT525/2	6 mA	29000					14.09 kV		
MIT1015	3 mA	29000					14.09 kV		
MIT1025/2	6 mA	29000					14.09 kV		
MIT1525/2	6 mA	180000					19.5 kV		

10.4 Before starting a test

Before testing any reactive load ensure that the insulation is fully discharged.

15 kV - The functional earth (⏚) terminal. Refer to Note below. See page 7 for location on unit.

Great care should always be taken when connecting the leads to a system to be tested. Even isolated systems may exhibit charges or induced voltages and appropriate Safe Working Practices must be employed.

On connection of the test leads prior to starting a test, any voltages of 50 V or more will be indicated on the display, accompanied by an intermittent beeper, (***See 6.3 Voltmeter on page 16***). This is especially likely in electrically noisy environments.

Should electrical noise be present it will cause a current to flow through the instrument's internal discharge resistors. If this becomes excessive and exceeds instrument rating, damage to the instrument may result.

The MIT1525/2 has been designed to handle high noise currents up to 6 mA. If current above 6 mA is detected, the instrument will sound an urgent 'warble' tone and be accompanied by the symbols ⚠ ∿.

NOTE : When powered by battery and with the mains supply disconnected, the pins on the mains socket may be electrostatically charged to a high voltage. There is not enough energy for this to be hazardous but, to reduce discomfort from accidental discharge if the mains inlet plug is touched, it is strongly recommended that the functional earth terminal is connected to a convenient earth or unipotential protection circuit. The user is fully protected for safety by double insulation and this connection need not be capable of taking a fault current.

The instrument should be immediately disconnected from the supply after discharging the DC test voltage taking care to ensure Safe Working Practices (NB very high induced voltages may be present).

To assist user safety, the instruments will not permit a test to be started if the induced voltage exceeds 6 mA.

It is possible to adjust the test voltage using the up and down arrow buttons, either before or during a test. Once a test has begun, it is advisable to only adjust the voltage in the first 10s of the test to prevent interference with the capacitive and absorptive currents in the insulator.

10.5 Starting the test

A test can be started by pressing the 'TEST' button for approximately 3 seconds from the test screen or voltmeter screen. A timer will be displayed to indicate elapsed time during the test. The test is stopped, by pressing the TEST button. As soon as the test is stopped a discharge of the insulator is automatically initiated. An 'StP' indication informs the user that the test is terminating and after a few seconds the voltage on the terminals will be displayed. Left and right arrows can be used to scroll between terminal voltage, last test voltage and the set range voltage. In the event of a terminal voltage of ≥50 V a voltage and warning will be displayed.

	**Do not disconnect instrument leads or clamps until the LED and display warnings are switched off indicating that the unit under test is discharged! Significant current can be stored in reactive loads which act as capacitors or inductors, which can be lethal.**

The display shows the final resistance result, capacitance, test current and Time Constant (TC) in addition to test duration.

On MIT525/2, MIT1025/2, and MIT1525/2 models the result can be saved by pressing the dedicated save (💾) button after a resistance or voltage test is complete. The save button will appear momentarily to confirm the data is saved. If a full test curve is required the user must select logging by pressing the save button before starting the test. Data will be logged every 5 seconds for the duration of a resistance test. It is not possible to log voltages in voltmeter mode.

If temperature entry has been activated a prompt will appear for the user to enter a temperature reading after IR and IR(t) insulation tests. DAR, PI, SV, ramp and DD tests will not prompt for temperature input.

Display back-light is activated by pressing the (☼) button. The back-light button can be pressed a second time to deactivate the back-light. Automatic deactivation will occur after a preset timeout period if not deactivated manually.

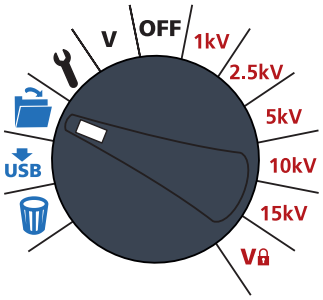
10.6 RE>Act mode after the insulation test

See 10.1.1 RE>Act operation on page 30, after the insulation test.

11. Memory functions, downloading

Models MIT525/2, MIT1025/2 and MIT1525/2 have advanced storage, recall and download functions to facilitate documentation of insulation tests.

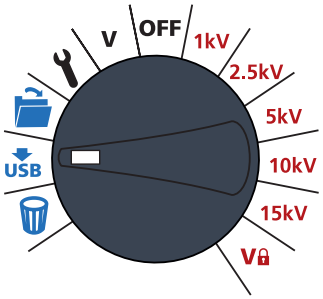
11.1 Recall results



Setting the central rotary switch to 'open folder' position enables the user to recall saved results beginning with the most recent result. Up and down arrow buttons enable the user to scroll through results based on a sequential four digit index. Left and right arrow buttons scroll through a single result showing all saved test data including time / date. Where logging has been enabled, only the final result is displayed on screen. The full result can be viewed by downloading to PowerDB / PowerDB Lite.

In saved results, the test mode is identified by the icon or abbreviation of each test on the display. In addition, the open folder icon is displayed to indicate recall memory mode.

11.2 Download results



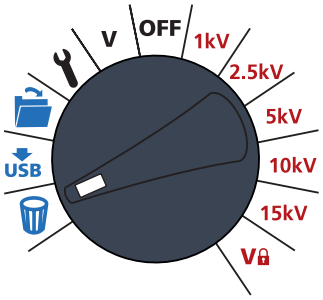
PowerDB Pro, Advanced and Lite are Megger's asset and data management software packages with integrated forms for MIT525/2, MIT1025/2, MIT1525/2 instruments.

The default download on the instrument is a single test log or summary result. To download all results press an arrow button.

Detailed instructions on how to interface with PowerDB are available on a document entitled 'Interfacing MIT525/2, MIT1025/2 and MIT1525/2 to PowerDB'.

PowerDB offers instructions specific to MIT525/2, MIT1025/2, MIT1525/2 regarding the download procedure. When results are downloaded the IRT can be disconnected from the PC after the application releases the port.

11.3 Deleting results



There are two delete functions; delete a single result and delete all results. Select the bin icon on the central rotary switch. The first record indicated contains the result of the last test performed. Up / down arrows navigate through records and the OK button is used to select delete where the 'X' changes to a tick and the on screen bin icon flashes. A subsequent press of the OK button activates the deletion.

The default delete is a single test result, press the right arrow button to select delete all test results from memory.

11.4 Real-time output during insulation tests

PowerDB or PowerDB Lite can be used to record real time data output from the MIT525/2, MIT1025/2 and MIT1525/2 models. Voltage, current and resistance data is sent at a rate 1 Hz from the IRT and displayed in real time on a graph, e.g. a plot of current (µA) versus voltage (kV) for the ramp test.

Before running a test where a real time output is required, attach a PC running PowerDB Pro, PowerDB Advanced or PowerDB Lite via a USB cable. Check the serial port allocation on Device Manager, and enter the serial port number allocated when starting PowerDB. PowerDB offers instructions specific to MIT525/2, MIT1025/2 and MIT1525/2 regarding the real time capture procedure.

Start the application and activate real time data capture in the form of choice. As soon as the test is started real time data output will begin. When the test is complete ensure that the form is saved in PowerDB Pro / Advanced / Lite.

11.5 Testing with CertSuite Asset via USB cable (MIT525/2 only)

The instrument can be connected to a laptop or desktop for receiving the test results and passing them to the cloud-based Megger CertSuite Asset software. The CertSuite Asset software runs in a browser (such as Chrome or Edge), or via the Android app.

Test results transferred to CertSuite Asset are synchronized with the cloud system every 90 seconds to reduce any risk of data loss.

To use CertSuite Asset with your MIT525/2:

1. Create an account on the CertSuite™ web site. ***See 11.6 Creating a CertSuite Asset account on page 37***
2. Connect the MIT525/2 with a Windows laptop or desktop via USB cable.
3. Open the browser on your Windows PC and log in to your account using the details from (1) above.
4. Connect CertSuite™ to your MIT525/2 from within CertSuite Asset by clicking on Get Data.

Click here or scan the QR-code
Visit CertSuite.info to create an account for CertSuite Asset

11.6 Creating a CertSuite Asset account

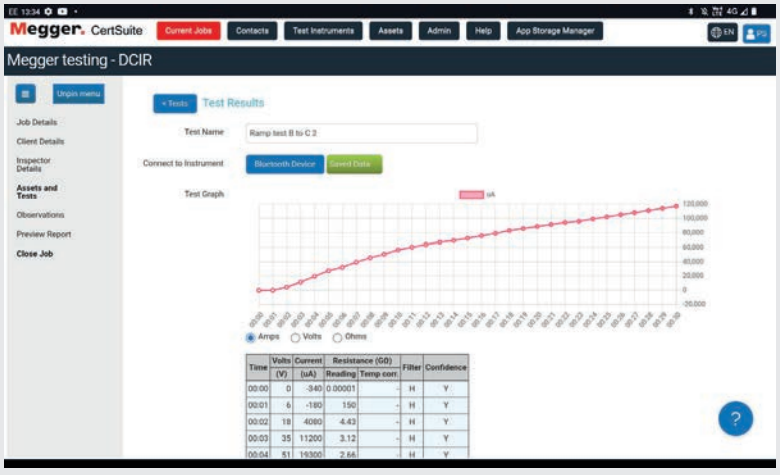
Before CertSuite Asset can be used an account has to be created. This can be done by going to **www.CertSuite.info** and select the **FREE TRIAL** option. Follow the guidance on the CertSuite™ web site.

Keep a record of your account information and password as you will need this when using CertSuite Asset.

If necessary, any assistance can be accessed through the CertSuite™ (**www.CertSuite.info**) or Megger web sites (**www.megger.com**) and Megger technical support (**uksupport@megger.com**).

11.7 Sending test results to CertSuite Asset

Once the MIT525/2 and CertSuite Asset are connected, results can be transferred to the Windows device. While the test is being run, the app builds a graph of the test results. It can store client's details, asset details, photos and comments.



12. PowerDB

PowerDB is software used for the collection and reporting of data from maintenance and inspection activities performed on electrical equipment used in the generation, transmission, and distribution of electric power.

The software includes interfaces for many test instruments and allows for automated testing and data acquisition, as well as imports from various file formats. Result and summary reports can be easily generated.

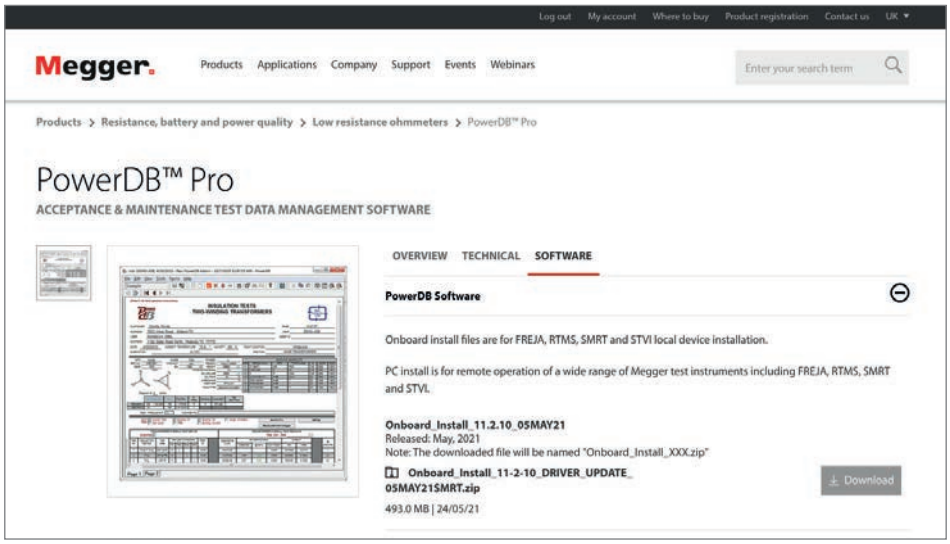
Three editions of PowerDB are available:

- PowerDB Pro
- PowerDB Advanced
- PowerDB Lite

PowerDB provides a simple and consistent user interface to many Megger instruments including the DELTA Series Power Factor Test Sets, 3-Phase TTR units, earth testers, 5 kV, 10 kV and 15 kV insulation resistance testers (IRTs), and many more. PowerDB Lite is bundled with the Megger's MIT.

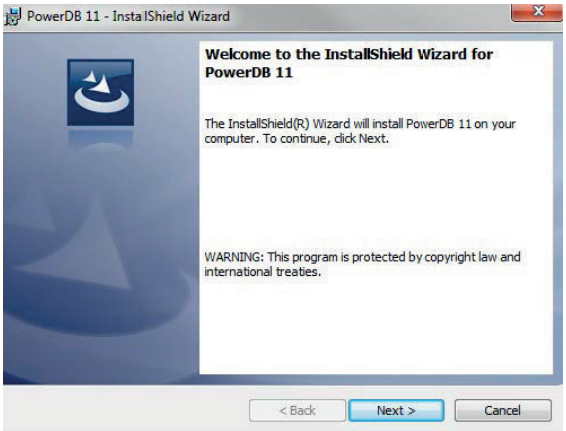
12.1 Download PowerDB

You can now download direct from the Megger website to ensure that you have the most recent version available. Visit **megger.com/powerdb**



The latest edition will be at the top. Click the "download" button beside the file.

This will ask if you want to open or save the file. By clicking "Save" you will begin to download the installation package, then just follow the onscreen instructions to complete installation.



12.2 Interfacing MIT range to PowerDB

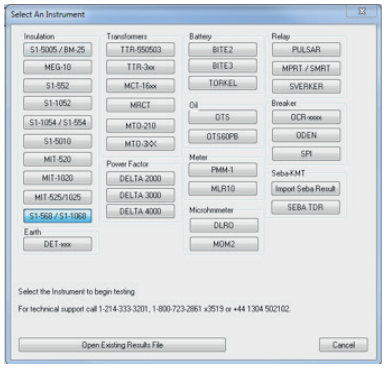
The MIT range has a USB cable connection.

Connect the MIT to a PC via the USB cable provided and enable the driver for the MIT to be found via the internet. The instrument does not need to be powered up to respond to the driver as it is powered via the USB cable.

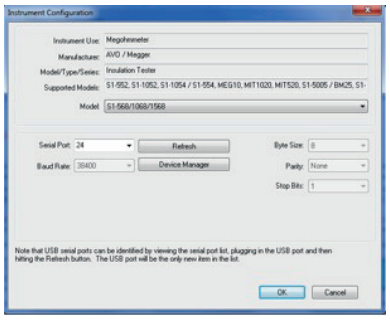
Run PowerDB Lite software by clicking the PowerDB Lite icon on your desktop. Make sure you are using PowerDB version 10.5 or higher.

Select the appropriate soft button for the instrument you are testing with from the window entitled, 'Select An Instrument'. This will take you to the Instrument Configuration window.

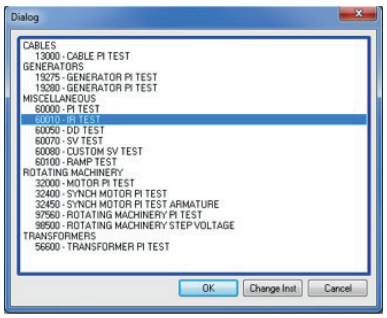
Expand the 'Ports' section in Device Manager. One serial port should be allocated to 'Megger Device (COMxx)' where xx is the port number.



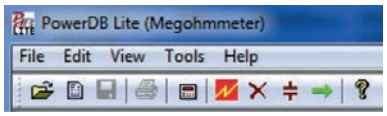
Ensure that port number xx is allocated correctly in the Instrument Configuration window, then click the OK to complete configuration after ensuring that the correct model is selected.



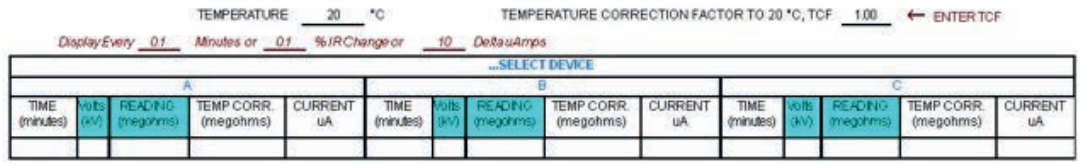
Select the required test mode from the Select a Form window and click OK to continue.



After the form loads, click the 'zap' icon on the toolbar to initialise the instrument. An 'OK' confirmation appears at the top of the form if communications have been successful.

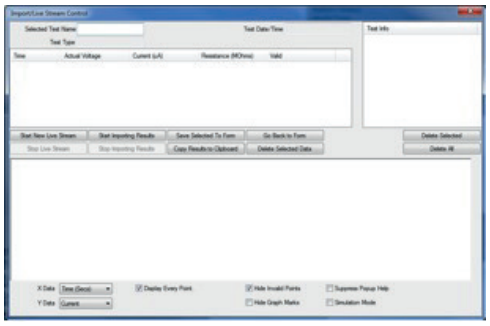


Scroll down the PowerDB form until you see a table with cyan filled headers. RIGHT CLICK once on one of the cyan coloured areas to activate the MIT control application. The cyan filled cells represent three phases A, B and C. Right clicking on a phase will open up the appropriate application.



12.3 Import / live stream control application

When using a MIT the Import / Live Stream Control Application will launch.

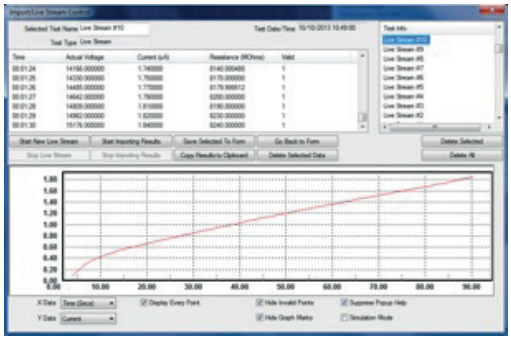


Import / Live Stream Control application enables capture of live streaming data directly by activating the Start New Live Streaming function. Results are recorded once a second for the duration of the test.

Other functions include:

- Save Selected To Form – this soft key saves a selected test result in top right hand menu to the current form in PowerDB Lite. Typically three tables are available in the PowerDB form representing three phases named A, B and C. Tests listed in the Import / Live Stream Control application listed under Test Info can be saved in any form by exiting the logger (Go Back To Form), right clicking the require phase in the form and selecting to Save Selected To Form from the logger
- Copy Results to Clipboard function facilitates a copy of all data to Excel and other popular software
- Delete Selected Data – removes test data from the Test Info section
- Start Importing Results – download results saved on the instrument

Sample Import / Live Stream Control application after a test.



13. On screen error reporting

Should an error be detected during the operation of the MIT, an error code is reported preceded by 'Err' with the read handbook warning.

Error codes are given in the following table.

'Err' code	Fault
2	Output voltage over limit
3	FIFO (memory) overflow
4	HV board mismatch with control board setup
5	Battery low error
6	Control board detected inter-board communication failure
7	Test button stuck
8	Measurement board i2c failed
9	Measurement board detected inter-board communication failure
10	Isolation power supply cut-out
11	Instrument attempted auto power off but failed
12	HV circuit control fault

If an error occurs do not attempt to repair the instrument. Obtain a repair number from Megger Instruments Limited, carefully pack in a suitable box and send the faulty instrument to the nearest Megger Approved Service Centre, if possible noting the error that was reported.

13.3.1 PI predictor (PI*p*) Error codes

For PI*p* Error codes please refer to ***See 8.3.4 PI predictor (PIp) Error codes: on page 22.***

14. Preventive maintenance

14.1 Cleaning

Disconnect the instrument and wipe it with a clean cloth slightly damped with soapy water or Isopropyl alcohol (IPA). Care should be taken near the terminals, IEC power and USB sockets.

14.2 Care of the instrument

The instrument should always be handled with care and not dropped. Always ensure that the instrument is secured when being transported to prevent mechanical shock.

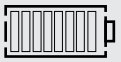
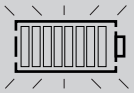
14.3 Leads

Leads are silicone insulated and perform well in all weather conditions. Always keep the leads in the clip-on lead pouch supplied with the instrument.

Regular inspection of leads is recommended to ensure they are not damaged in any way. Damaged leads could affect insulation resistance readings and are a safety hazard.

14.4 Battery indicator

The battery symbol on the LCD display contains four pairs of segments. The battery is monitored continuously when the instrument is turned on. The charge remaining in the battery is indicated by segment pairs as follows:

Fully charged battery	
50% charged battery	
Tests cannot be started, insufficient charge	
Symbol flashes when there is not enough charge for a test and the instrument will turn itself off.	

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

A blinking full battery icon indicates that the battery is prevented from charging due to the temperature being out of the allowable charge temperature range, 0 °C to 40 °C, or that the battery has failed.

14.5 Battery care

The battery should be charged on a routine basis at an absolute minimum of once a year. However more frequent charging, i.e. once per quarter is preferable.

Never attempt to charge the battery below 0 °C or above 40 °C. The battery is charged by connecting line power at the instrument IEC power socket.

Store the instrument in a cool, dry location to improve battery life. Storage temperatures below freezing should be avoided.

14.6 Replacing the battery

Read and fully understand the warnings on the Li-ion battery in the Safety Warnings section of this document.

The battery pack contains Lithium-ion cells and should be replaced when it no longer holds a charge. A new battery is available as a spare part from Megger. Genuine Megger battery packs must be used. Failure to use genuine parts may affect product safety performance and will invalidate your warranty.

Danger Electric Shock Hazard: Removing the lower case to change the battery exposes the AC supply wiring which will be at a hazardous voltage if the equipment is connected to the AC supply.

Replacement involves removal of four screws from the bottom of the instrument after which the base can be lifted away from the front panel and internal moulded assembly. Care should be taken to keep the front panel and moulding assembly together. The battery pack is housed within a grey moulded cover secured by four screws.

On no account must the transparent inner case be opened. Hazardous voltages up to 15 kV will be exposed. No user serviceable parts are inside. Refer servicing to qualified service personnel. If there is any damage to the inner transparent casing or its lid, then confirm that the Central Rotary Switch is in the OFF position, disconnect the old battery and DO NOT connect the new one. Refit the bottom cover and contact Megger Instruments for service.

14.6.1 MIT515/2, MIT525/2, MIT1025/2 battery replacement instructions

3. Remove the lid, switch the central rotary switch to OFF.
4. Disconnect the IEC AC power lead and all test leads before inverting the lower case, resting the front panel on a soft surface so as not to damage the keypad.
5. Remove the four case fixing screws and lift off case bottom.
6. Carefully unclip the battery cable connector leading from the main printed circuit board to the battery and remove the cables from recesses designed to hold them in place.
7. Remove the four screws and lift off the battery cover.
8. Remove the used battery and replace with a genuine spare battery ordered from Megger, ensuring correct orientation of cable exit.
9. Route the battery cables via the recesses and clip the battery connector to the printed circuit board battery receptacle ensuring correct orientation.
10. Replace the battery cover and secure with the four screws.
11. Ensure the alignment of the instrument panel and high voltage moulding, then replace the lower case and secure with the retaining screws. Take especial care not to leave foreign bodies inside the casing.
12. Check and verify instrument operation.

14.6.2 MIT1525/2 battery packs (x 2) replacement instructions

1. Switch the instrument OFF, and disconnect the AC supply, measurement leads, and all other equipment before opening the case to change the battery.
2. Always replace both battery packs together.
3. The instrument must not be operated with the case open. DANGER! Hazardous voltages are exposed with an AC source connected and the case open.
4. Remove the lid and invert the lower case resting the front panel on a soft surface so as not to damage the keypad.
5. Remove the four case fixing screws and lift off case bottom.
6. Remove the two screws holding the battery support bracket and remove the bracket.
7. Withdraw one used battery and carefully unclip its battery cable connector, then the other used battery and its connector.
8. Replace with two genuine spare batteries ordered from Megger, ensuring correct orientation of the cable in the socket.
9. With both new batteries fitted, replace the battery support bracket and the two retaining screws.
10. Replace the lower case and secure with the retaining screws.
11. Check and verify instrument operation.

15. Technical specification

15.1 Electrical specifications

Item	Description				
AC voltage input range					
5 kV, 10 kV	90-264 V rms, 47 / 63 Hz, 100 VA				
15 kV	90-264 V rms, 47 / 63 Hz, 200 VA				
Battery	11.1 V, 5.2 A hour, safety rated to IEC 62133:2003				
Battery life					
MIT515/2, MIT525/2	Typical capacity is 6 hours continuous @ 5 kV with a 100 MΩ load				
MIT1015, MIT1025/2	Typical capacity is 4.5 hours continuous @10 kV with a 100 MΩ load				
MIT1525/2	Typical capacity is 4.5 hours continuous @ 15 kV with a 100 MΩ load				
Auto power off	Instrument turns off after a few minutes if non-use to conserves battery life				
Battery charge time	2.5 hours from deep discharge 2 hours from normal discharge				
30 min. charge	1 hour continuous test at 100 MΩ, 5 kV				
Test voltages					
MIT515/2, MIT525/2	250 V,	500 V,	1000 V,	2500 V,	5000 V
MIT1015, MIT1025/2	500 V,	1000 V,	2500 V,	5000 V,	10000 V
MIT1525/2	1000 V,	2500 V,	5000 V,	10000V,	15000 V
User defined test voltage					
MIT515/2, MIT525/2, MIT1015	40 V to 1 kV in 10 V steps				
MIT1025/2, MIT1525/2	100 V to 1 kV in 10 V steps				
All units	1 kV to 5 kV in 25 V steps				
MIT1525/2 only	5 kV to 15 kV in 25 V steps				
MIT515/2, MIT525/2 accuracy (23 °C) from 1 MΩ to					
	5000 V	2500 V	1000 V	500 V	250 V
±5% to	1 TΩ	500 GΩ	200 GΩ	100 GΩ	50 GΩ
±20% to	10 TΩ	5 TΩ	2 TΩ	1 TΩ	500 GΩ
MIT1015, MIT1025/2 accuracy (23 °C) from 1 MΩ to					
	10000 V	5000 V	2500 V	1000 V	500 V
±5% to	2 TΩ	1 TΩ	500 GΩ	200 GΩ	100 GΩ
±20% to	20 TΩ	10 TΩ	5 TΩ	2 TΩ	1 TΩ
MIT1525/2 accuracy (23 °C) from 1 MΩ to					
	15000 V	10000 V	5000 V	2500 V	1000 V
±5% to	3 TΩ	2 TΩ	1 TΩ	500 GΩ	200 GΩ
±20% to	30 TΩ	20 TΩ	10 TΩ	5 TΩ	2 TΩ
Guard terminal performance	When measuring an insulation resistance of 100 GΩ at 5000 V the tester can guard out current IG at least 5000 times the insulation test current IL with a maximum additional resistance error of 1%. ***See 9.6 GUARD terminal, screened leads on page 29.***				
Display range analogue	100 kΩ to 10 TΩ				
Display range digital					
MIT515/2, MIT525/2	10 kΩ to 10 TΩ				
MIT1015, MIT1025/2	10 kΩ to 20 TΩ				
MIT1525/2	10 kΩ to 30 TΩ				

Item	Description
Short circuit current	
Essential range	3 mA nominal – Maximum power regulation technology ensure maximum power transfer throughout all loads not just at short circuit outperforming many 5 mA testers
Advanced range	1 mA, 3 mA Default, 6 mA @ 5 kV, 10 kV, 15 kV (6 mA only from mains supply)
Insulation alarm	100 kΩ to 1 GΩ
Capacitor charge	
MIT515/2, MIT525/2	< 3 s/µF to 5 kV
MIT1015, MIT1025/2	< 5 s/µF to 10 kV
MIT1525/2	< 6.3 s/µF to 15 kV
Capacitor discharge	
MIT515/2, MIT525/2	<250 ms/µF to discharge from 5 kV to 50 V
MIT1015, MIT1025/2	<250 ms/µF to discharge from 10 kV to 50 V
MIT1525/2	<3500 ms/µF to discharge from 15 kV to 50 V
Capacitance range (above 500 V)	
	10 nF to 25 µF (5 kV, 10 kV)
	10 nF to 50 µF (15 kV)
	dependent on measurement voltage
Capacitance accuracy (23 °C)	±10% ±5 nF
Voltage output accuracy	(>200 V, 0 °C to 30 °C): +4%, -0%, ±10 V nominal test voltage at 1 GΩ
Current measurement range	0.01 nA to 6 mA
Current measurement accuracy (23 °C)	
	±2% ±0.5 nA at all voltages
Interference (noise) rejection mA rms	
MIT515/2, MIT525/2	1 mA per 250 V to a maximum of 3 mA
MIT1015, MIT1025/2	1 mA per 600 V to a maximum of 3 mA
MIT1525/2	1 mA per 350 V to a maximum of 6 mA
Voltmeter range	30 V to 660 V AC or DC, 50 / 60 Hz
Voltmeter accuracy	±3%, ±3 V
Timer range	Up to 99 minutes, 15 second minimum setting
Memory capacity	5½ hours continuous logging every 5 s or 33 logged PI tests, or 350 logged IR tests
Test regimes	
MIT515/2, MIT1015	IR, IR(t), DAR, PI
MIT525/2, MIT1025/2	IR, IR(t), DAR, PI, SV, DD, ramp test
MIT1525/2	IR, IR(t), DAR, PI, SV, DD, ramp test
Interface	USB type B (device)
Real time output	USB, 1 reading / second (resistance, current and voltage)

15.2 Environmental conditions

Altitude	
MIT515/2, MIT525/2, MIT1015, MIT1025/2	3000 m, test lead CAT rating valid to 2000 m, safe working practices must be applied and clips must not be handled until discharge is complete
MIT1525/2	3000 m
Operating temperature	-20 °C to 50 °C
Storage temperature	-25 °C to 65 °C
Humidity	90% RH non-condensing at 40 °C
Ingress protection	IP65 (lid closed), IP40 (lid open)

15.3 General specification

Safety	
MIT515/2, MIT525/2, MIT1015, MIT1025/2	Meets the requirements of IEC 61010-1, CAT IV 600 V to 3000 m Instrument must be operated with all test leads connected above 2000 m
MIT1525/2	Meets the requirements of IEC 61010-1, CAT IV 1000 V to 3000 m
EMC	Meets the requirements of IEC 61326-1
Dimensions	
(5 kV, 10 kV)	L 315 mm x W 285 mm x H 181 mm
(15 kV)	L 360 mm x W 305 mm x H 194 mm
Weight	4.5 kg (MIT515/2, MIT525/2, MIT1015, MIT1025/2)
	6.5 kg (MIT1525/2)

16. Accessories

Included accessories (all models)	
3 m leadset x 3, medium insulated clips (5 kV, 10 kV)	1008-022
Power lead	
Included accessories (MIT525/2, MIT1025/2, MIT1525/2)	
USB cable	25970-041
3 m leadset x 3, large insulated clips (MIT1025/2 only)	1002-534
3 m 15 kV leadset x 3, 15 kV clip (MIT1525/2 only)	1002-949
HV test lead sets 5 kV, 10 kV	
3 m leadset x 3, medium insulated clips	1008-023
3 m leadset x 3, large insulated clips	1002-534
3 m leadset x 3, bare clips	8101-181
8 m leadset x 3, bare clips	8101-182
15 m leadset x 3, bare clips	8101-183
Screened HV test lead sets 5 kV, 10 kV	
15 m, 5 kV screened uninsulated small clips	6311-080
3 m, 10 kV screened uninsulated small clips	6220-834
10 m, 10 kV screened uninsulated small clips	6220-861
15 m, 10 kV screened uninsulated small clips	6220-833
Optional accessories	
CB101, 5 kV calibration unit	6311-077
Calibration certificate	1000-113
UKAS calibration certificate	1000-047
Spare Li-ion Battery	1008-002
GILS1 EHV Guard interconnecting lead and strap kit	1011-357
GILS2 Advanced Guard interconnecting lead and strap kit	1011-358
Transformer Test Kit	1015-158

17. Repair and warranty

If the protection of an instrument 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, 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 covered by a two year warranty from the date of purchase by the user, the second year being conditional on registration of the product on www.megger.com. Any unauthorised prior repair or adjustment will automatically invalidate the warranty.

These products contain no repairable parts, with the exception of the user replaceable battery, and if defective should be returned to your supplier in original packaging or packed so that it is protected from damage during transit. Damage in transit is not covered by this warranty and replacement / repair is chargeable.

17.1 Calibration, service and spare parts

For service requirements for Megger Instruments contact:

Megger Limited		**Megger Valley Forge**
Archcliffe Road		400 Opportunity Way
Dover		Phoenixville
Kent CT17 9EN	OR	PA 19460
U.K.		**U.S.A.**
Tel: +44 (0) 1304 502 243		Tel: +1 610 676 8579
Fax: +44 (0) 1304 207 342		Fax: +1 610 676 8625

Megger operate fully traceable and repair facilities, ensuring your instrument continues to provide the high standard of performance and workmanship you expect. These facilities are complemented by a worldwide network of approved repair and companies to offer excellent in-service care for your Megger products.

17.2 Returning product to Megger UK and USA service centres

1. When an instrument requires re, or in the event of a repair being necessary, a Returns Authorisation (RA) number must first be obtained from one of the addresses shown above. You will be asked to provide the following information to enable the Megger Service Department to prepare in advance for receipt of your instrument, and to provide the best possible service to you.
2. Model, e.g. MIT1025/2.
3. Serial number, to be found on the underside of the case or on the certificate.
4. Reason for return, e.g. required, or repair.
5. Details of the fault if the instrument is to be repaired.
6. Make a note of the RA number. A returns label can be emailed or faxed to you if you wish.
7. Pack the instrument in the original packing box to prevent damage in transit.
8. Ensure the returns label is attached, or that the RA number is clearly marked on the outside of the package and on any correspondence, before sending the instrument, freight paid, to Megger. Copies of the original purchase invoice and packing note should be sent simultaneously by airmail to expedite clearance through customs. In the case of instruments requiring repair outside the warranty period, an immediate quotation can be provided when obtaining the RA number.
9. You may track progress of your return online at www.megger.com

17.3 Approved service centres

A list of Approved Service Centres may be obtained from the UK address above, or by contacting Megger on ukrepairs@megger.com, and giving details of your location.

18. Decommissioning

18.1 WEEE Directive

The crossed out wheeled bin symbol placed on Megger products is a reminder not to dispose of the product at the end of its life with general waste.

Megger is registered in the UK as a Producer of Electrical and Electronic Equipment.
The Registration No is WEE/ HE0146QT.

For further information about disposal of the product consult your local Megger company or distributor or visit your local Megger website.

18.2 Battery disposal

The crossed out wheeled bin symbol placed on a battery is a reminder not to dispose of batteries with general waste when they reach the end of their usable life.

For disposal of batteries in other parts of the EU contact your local Megger branch or distributor.

Megger is registered in the UK as a producer of batteries (registration No.: BPRN00142).

For further information see **www.megger.com**

19. Worldwide Sales Offices

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USA – Dallas	T. +1 214 333 3201	E. USsales@megger.com
USA – Valley Forge	T. +1 214 333 3201	E. USsales@megger.com
USA – Dallas	T. +1 214 333 3201	E. USsales@megger.com
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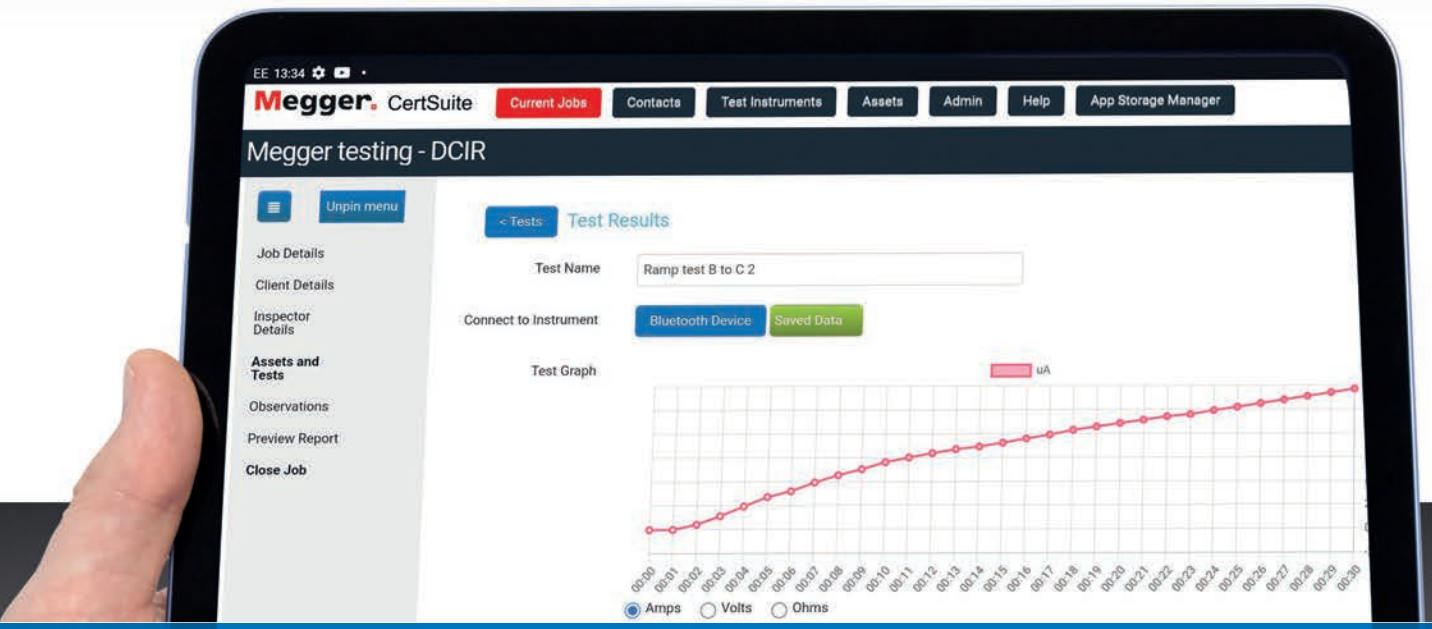
CertSuite **Asset**

Cloud based testing and reporting software that works with the Megger S1 and MIT insulation testers



Working with you, and your team, anywhere.

More details at

CertSuite.info

Connects to S1 and MIT

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MIT2500, MIT430/2, MIT525/2, MIT1025/2, MIT1525/2

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