5kV Digital Insulation Testers
MEGGER® *BM11D*
MEGGER® *BM21*

User Guide
Guide de l'utilisateur
Gebrauchsanleitung
Guía del usuario

MEGGER®

Contents

Symbols used on the instrument are:

Caution: Refer to accompanying notes.

Risk of electric shock.

Equipment protected throughout by Double Insulation (Class II).

Equipment complies with EU Directives

SAFETY WARNINGS

- The circuit under test must be switched off, de-energised and isolated **before** insulation test connections are made.
- Circuit connections **must not** be touched during an insulation test.
- After insulation tests, capacitive circuits **must** be discharged **before** disconnecting the test leads.
- Turning the instrument off, and manually discharging of circuits on completion of tests is recommended as standard procedure, **before** touching any connections.
- In certain circumstances, break-down 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, it is even more important that the '**ON/OFF**' key is pressed, and the circuit manually discharged **before** touching any connections.
- Test leads including crocodile clips must be in good order, clean and with no broken or cracked insulation.
- Replacement fuses **must** be of the correct type and rating.
- The instrument should not be used if any part of it is damaged.
- If water is present in the charger recess, the instrument **must not** be used. It is recommended that the instrument is not used in wet weather conditions.
- See **Battery Charging Power Cord** on page 4.

NOTE

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

General Description

The *BM11D* and *BM21* are compact, battery powered, high voltage d.c. insulation testers with resistance measurement capabilities to around 1 TΩ. The *BM11D* has a digital full scale of 500 GΩ whilst the *BM21* can measure up to 5 TΩ. The *BM21* can be set to display leakage current instead of resistance and this mode of operation also allows higher resistances to be measured, possibly up to 500 TΩ.

The instruments are microprocessor controlled and feature a large, clear LCD combining digital and analogue readings of insulation resistance.

Both instruments have test voltage positions of 500 V, 1000 V, 2500 V and 5000 V. The *BM21* has an additional range with a variable output voltage of 25 V to 5000 V in 25 V steps.

An integral timer is started automatically on commencement of the test, and displays elapsed minutes and seconds since the start of the test. The *BM21* timer can be used to set the duration of test, and will automatically stop the output voltage when the time has expired.

At the end of a test, capacitive loads are discharged automatically and the decaying voltage is displayed as the value returns to zero. The test leads should not be disconnected until the item has been discharged fully. Similarly, during a test the test leads should not be removed, and the item under test should not be touched. A flashing LED, and flashing high voltage symbols on the LCD remind the user that hazardous voltage is present.

A battery symbol is displayed continuously showing the condition of the battery.
Power is obtained from internal mains rechargeable batteries.

To recharge the batteries requires an input voltage within the range 95-265 V a.c., 50-60 Hz. The power input and fuses are located in a splashproof recess on the front panel.

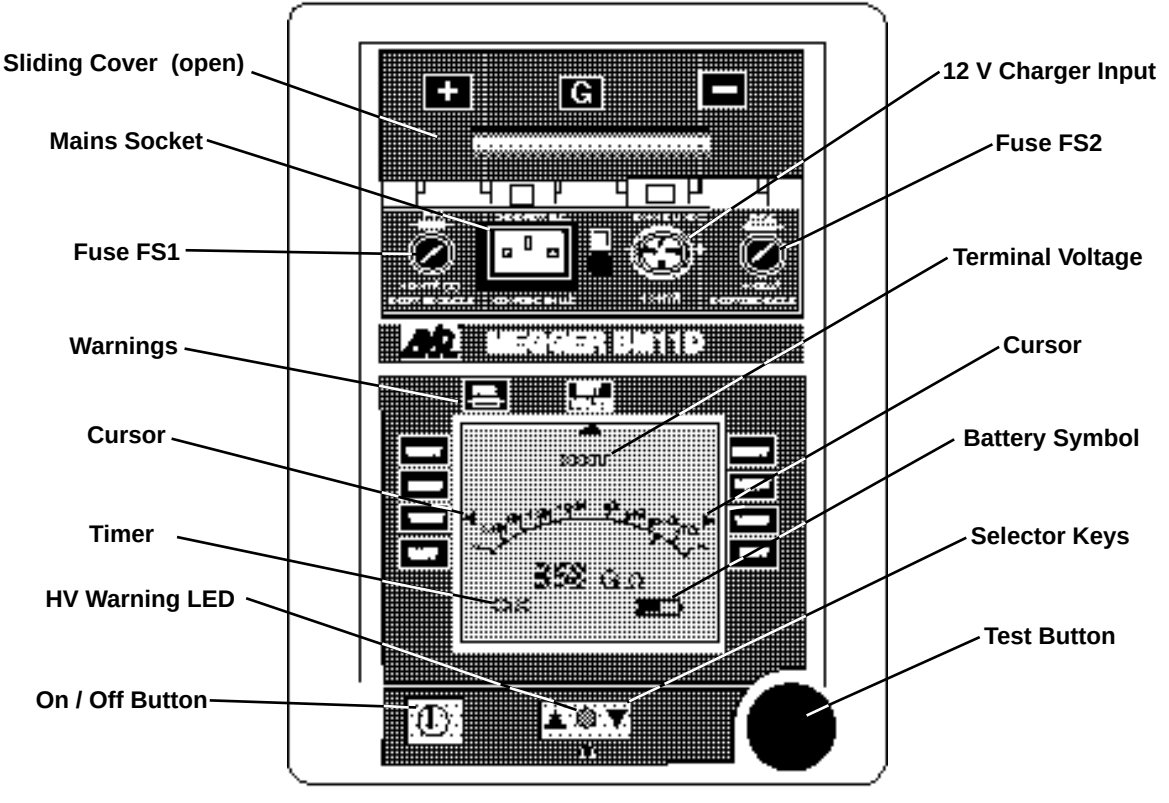
Battery Charging Power cord:
If the power cord plug is not suitable for your type of socket outlets (receptacles), do not use an adaptor. You should use a suitable alternative power cord, or if necessary change the plug by cutting the cord and fitting a suitable plug. The colour code of the cord is:

Earth (Ground)	**Yellow/Green**
Neutral	**Blue**
Phase (Line)	**Brown**

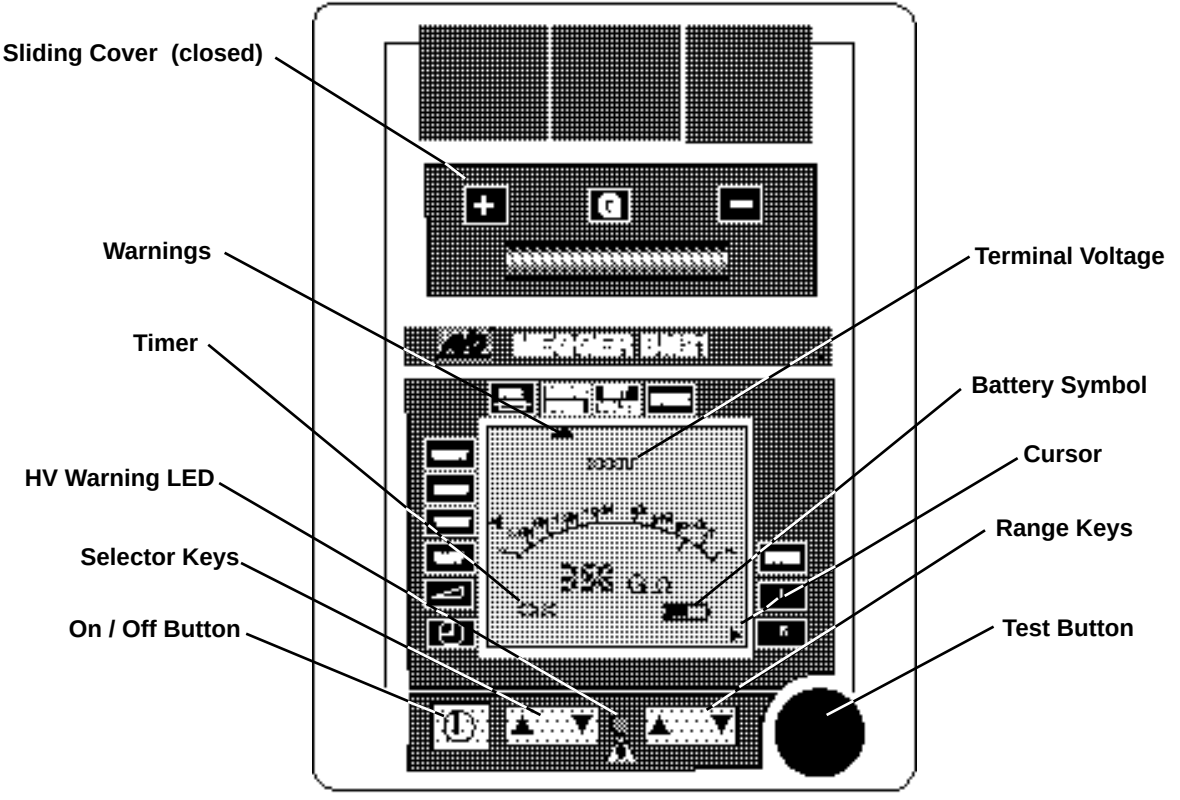
If using a fused plug, a 3 Amp fuse to BS 1362 should be fitted.

Note: A plug severed from the power cord should be destroyed, as a plug with bare conductors is hazardous in a live socket outlet (receptacle).

Features and Controls



BM11D **Front Panel Layout**



BM21 **Front Panel Layout**

Operation

INSTRUMENT CONTROLS

On/Off Button.
Pressing the **On/Off** button starts the instrument and initiates a self check and calibration. All LCD segments appear for 5 seconds, then the word '**CAL**' appears for about 5 seconds. When the word '**CAL**' disappears, the instrument is ready for use, and is in standby mode. To switch the instrument off, press the on/off button once. (Auto switch off will occur after 10 minutes of non-use).

Selector Keys
The test voltage is selected by moving the cursor. When the test button is pressed the instrument will operate at the voltage indicated.
BM21: In addition to the fixed test voltages the cursor can be used to select the variable voltage and test duration positions.

Range Keys (*BM21* only)
The range keys have two purposes. The first purpose is to select the measuring range, whether insulation resistance, leakage current or burn mode. The second function is indicated by two arrows which appear above the keys when either the variable voltage or test duration positions are selected. Using the range keys in this mode will raise and lower the applicable parameter. The change in voltage is shown at the top of the display, and the change in test duration is indicated in the bottom left hand corner of the display.

Test Button
Pressing the large '**TEST**' button for more than one second will initiate a test at the selected voltage, simultaneously starting the timer. Pressing the button again will terminate the test and connect the internal discharge resistors across the output.
If more than 50 V exists across the terminals, this will be indicated on the display. If the current flowing into the terminals exceeds 2 mA it will not be possible to start a test.

A test may be terminated if;
1) The test time is exceeded.
2) The insulation under test suffers a complete breakdown.
3) The battery becomes exhausted.
4) Excessive electrical interference (>2mA at 5 kV) (*BM21* **only**).

Battery Symbol
When the battery is fully charged, all segments of the battery symbol will be indicated. As the battery is used the segments will recede. The symbol flashes when the battery capacity is excessively low (See '**Battery**').

Cursor
The cursors on either side of the display indicate the ranges selected.

Condition and Warning Indication
Factors which may affect or inhibit a test are indicated by a large flashing cursor next to the appropriate warning label. (See '**Condition and Warning Indicators**').

FS1: Mains input fuse.

FS2: Guard fuse.

12 V Charger input
The rechargeable batteries within the instrument can be charged from a 12 V supply. Connection is made through this socket. **–** **+**

Mains socket
To recharge the internal batteries a mains input of 95-265 V a.c.

(50/60Hz) is required. The socket accepts a “Euro” plug.

Sliding cover
The sliding cover ensures that the input and the output terminals cannot be accessed simultaneously.

Terminals
The terminals marked ‘**+**’, ‘**–**’ and ‘**G**’ lock the test leads into the case to prevent accidental disconnection.

Terminal Voltage
At the end of a test, any voltage remaining on the terminals will be indicated until it has decayed to less than 50 V.
BM21:Output terminal voltage is indicated during a test.

Timer
*BM11D***:**The timer automatically starts when the test button is pressed. It indicates the time elapsed. Maximum test duration is 60 minutes, when the test will be stopped automatically.

*BM21***:** The test time can be set by the user. Selecting using the selector keys, and using the range keys to ramp the time up or down will set the duration of test. (Maximum 90 minutes). The timer will automatically start when the test button is pressed, and will stop when the test duration has elapsed (unless stopped in one of the other ways). Setting the timer to zero minutes effectively disables the instrument. A test time of 10 minutes is useful for Polarisation Index (PI) testing.
For more information on PI testing, see ‘**Application of Test techniques**’.

FEATURES

Automatic Discharge
Internal discharge resistors will be selected automatically

1) At the end of a test
2) If the instrument is switched off
3) If an internal error is detected

Variable Voltage (*BM21* only)
The variable voltage position provides the user with the option to select a non-standard voltage between 25 and 5000 V d.c.,or to continuously vary the voltage selected (in 25 V steps) during a test.
When operating on this range, the measurement range (either ‘**R**’, ‘**I**’ or ‘**BURN**’) cannot be changed. The measurement range must therefore be selected before the variable voltage position is chosen.
To select the test voltage required, move the cursor to the position and adjust the output terminal voltage using the Range keys. The terminal voltage is shown at the top of the display.

BURN Mode (*BM21* only)
Selecting ‘**BURN**’ mode will enable testing to continue after a breakdown, for fault location. Under some conditions, the breakdown will cause erratic display operation.The burn mode can only be selected before a test is started.

The detachable lid
Specially designed lid hinges enable the lid to be removed and replaced as required, and will protect the lid from strain or damage by unclipping itself if unintentionally opened past its full extent.
To replace the lid, hold it vertically and push the hinges back into their clips again while restraining the instrument. Then fold the lid shut.

Operation

TESTING PROCEDURES

When not testing, i.e. when in standby mode, the instrument acts as a voltmeter.

1. Select the required test voltage with the selector keys.

2. To start a test, press the red test button for more than one second. The HV warning LED on the front of the instrument flashes, together with the display HV warning symbols.

   When testing resistive or moderately capacitive loads (up to about 1 µF) the test voltage will appear within a few seconds. On large capacitive items the voltage rise will be noticeably slower and on low resistance (less than 10 MΩ) the voltage may never rise to its nominal value.

   Insulation resistance readings are updated once every second for readings up to about 100 MΩ. For readings between 1 GΩ and infinity the sample rate will slow down to once every 20 seconds.

   Changing the voltage during a test will upset the reading temporarily. The correct reading will appear when the new voltage has been stable over a full sample period.

3. When the test is terminated the item under test will be automatically discharged. The test can be stopped manually by pressing the red test button. The test will be stopped automatically if the test duration is reached, the instrument is turned off, an internal error occurs, a fuse blows or if excessive noise is detected (except in Burn mode on the *BM21*). When the test has stopped the final reading will be held on the digital display.

4. **(***BM21* **only)** Pressing either of the selector keys will change the display to show the capacitance of the item under test. **N.B.** The capacitance reading is only available if the test has run for more than one minute, and provided the reading was not over-range.

Reading Limitations

The *BM11/D* can measure currents down to 10 nA. The highest digital readings obtainable are therefore 50 GΩ at 500 V but rising to 500 GΩ at 5000 V. The analogue display works at all voltages up to 1 TΩ.

The *BM21* is considerably better at the high end of the scale. The highest digital readings obtainable are 500 GΩ at 500 V and 5 TΩ at 5000 V. It is possible to read even higher resistances by switching from '**R**' to '**I**' mode (using the right Range keys). The digital display then shows leakage current, resolving to 0.01 nA. Using this method it is theoretically possible to measure resistance up to 500 TΩ at 5000 V but it will be necessary to perform an open circuit calibration test to establish measurement circuit offset current and test lead leakage. (This is ±0,2 nA at normal temperatures with new, clean test leads). Note that if the variable voltage has been selected, the decision to read '**R**' or '**I**'' must be made before the test is started.

BATTERY

The instrument is powered by two rechargeable, sealed, lead-acid batteries. The state of charge is indicated by the battery symbol on the display. It is not possible to over charge or over discharge the batteries. When the last battery segment flashes there is very little energy left, probably less than 1 hour of testing. Turning the instrument off completely between tests will conserve the remaining battery energy. When batteries are completely exhausted the battery symbol will flash and the instrument will switch off. For maximum reliability, try to keep the batteries in a fully charged state and do not charge at extreme ambient temperatures. The batteries normally last

about 5 years; less if subjected to high temperatures for much of the working day. To reduce the chances of sudden failure, two batteries are used, operating in parallel. If either battery fails, the instrument will continue to operate on the good battery but the '**FS2**' indication will flash constantly. (See '**Condition and Warning Indicators**').

Charging the batteries should be done in a dry environment (the instrument is not waterproof with the charging cover open). Unplug the test leads and slide the charging cover open. (This operation renders the test lead sockets inaccessible and therefore prevents any danger of having the test leads connected to dangerous voltages). Connecting a.c. (50/60 Hz) voltages (95 V to 265 V) to the IEC socket will commence charging, which is indicated by the red lamp. An overnight charge will normally be sufficient. Turning the instrument on will show the state of charge.

It is possible to charge the batteries from a 12 to 15 V d.c. supply using the round socket. However, this is slow and unlikely to provide a full charge. Applying more than 15 V is likely to overcharge the batteries.

Battery Charging Notes

1) Do not leave batteries in a totally discharged state
2) If instrument is not used, recharge the batteries for at least 24 hours every 6 months. (More frequently if the storage temperature is >40 °C).
3) 16 hours charging (from a fully discharged state) will achieve at least 90% of a full charge. It is beneficial to continue charging for several days and no harm will be done if the charger is left on indefinitely.
4) The battery should only be charged at temperatures in the range 0 °C to 40°C.

GUARD TERMINAL

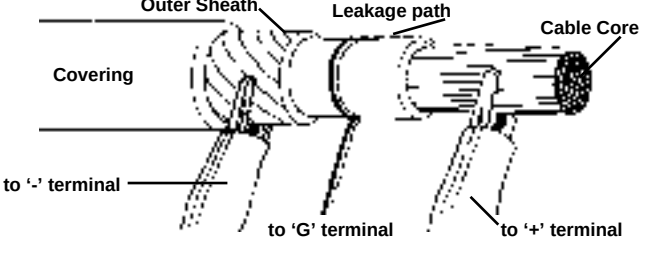
The guard terminal is at the same voltage as the negative terminal. A fuse (**FS2**) protects the low impedance guard circuit from the application of external voltage. Guard fuse failure will be indicated on the display only when the guard circuit is in use. To check whether the fuse has blown, connect the positive terminal to the guard terminal and start a 500 V test. If the display flag flashes by '**FS2**' the fuse has blown (see '**Condition and Warning Indicators**'). **FS2** is located in the charger recess.

Using The Guard Terminal

For basic insulation tests the guard terminal will not be used.

Most insulation tests can be performed by connecting the specimen between the '**+**' and '**–**' terminals. These tests will show up any deficiencies in the insulation, whether they are caused by leakage through the insulator body or across its surface.

To distinguish between body leakage and surface leakage the guard terminal '**G**' may be used. In this way surface leakage current is removed before it enters the measurement circuit via the **'–'** terminal.



In cable testing, there may be a path of leakage across the insulation between the bared cable and the external sheathing, perhaps 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**'.

Since the leakage resistance is effectively in parallel with the resistance to be measured, the use of the guard causes the current flowing through the surface leakage to be diverted from the measuring circuit. The tester, therefore, gives more nearly the true insulation resistance.

CONDITION AND WARNING INDICATORS

FS2
A failed guard fuse will not be detected unless the guard terminal is in use. If the **FS2** indicator flashes when the guard lead is in use it is likely that the guard fuse (**FS2**) has ruptured.

If the **FS2** indicator flashes when the guard lead is not connected, it indicates failure of one of the batteries or a battery fuse (which is not accessible externally). The instrument will operate normally in this condition, although the operating time between charges will be reduced, no capacitance readings will be provided and no warning will be given if the guard fuse blows.

BREAKDOWN
The *BM21* has a breakdown detector which terminates the test if a breakdown of the circuit occurs. The '**BREAKDOWN**' indicator cursor will then flash to identify the cause of the test termination. Selecting the '**BURN**' mode prior to the test disables the '**BREAKDOWN**' indicator.

The *BM11D* does not have a breakdown detector and is therefore effectively in permanent '**BURN**' mode. When using the *BM11D* (or *BM21* in '**BURN**' mode) testing will continue if a breakdown occurs in the circuit under test. In very dry conditions, a high frequency arc can be generated. This may cause a disturbance to, and possibly a complete loss of the instrument display. In these circumstances it is important to remember that the circuit may still be energised.
If in any doubt, switch the instrument to 'OFF' and manually discharge the circuit before touching any connections.

EXT VOLTS
Display of the '**EXT VOLTS**' cursor, indicates that the voltmeter is reading a voltage which originates from an external source. The voltmeter will show d.c. voltage of either polarity or a.c. voltage.

NOISE (*BM21* only)
If an external interference (normally 50 Hz or 60 Hz hum current) is excessive (>2 mA at 5 kV), testing will terminate, and the noise indicator will flash.
(**Note:** trips at approx. 1,5 mA at <2 kV).

Error Numbers
Internal faults and errors will cause the display to show '**E**' followed by a number. These error numbers can be invoked by extreme cases of electromagnetic interference or by internal faults, in which case the number is of little significance. The only meaningful error numbers are **E5** and **E11** which indicate that a negative current has been measured.

Calibration Errors
At switch-on there is a calibration check which automatically

adjusts the measurement system against an internal voltage and resistor. The calibration sequence will not finish unless the measurement system is giving consistent results within preset limits.

If the startup screen does not progress beyond the segment check or stops with '**CAL**' displayed, calibration has failed.

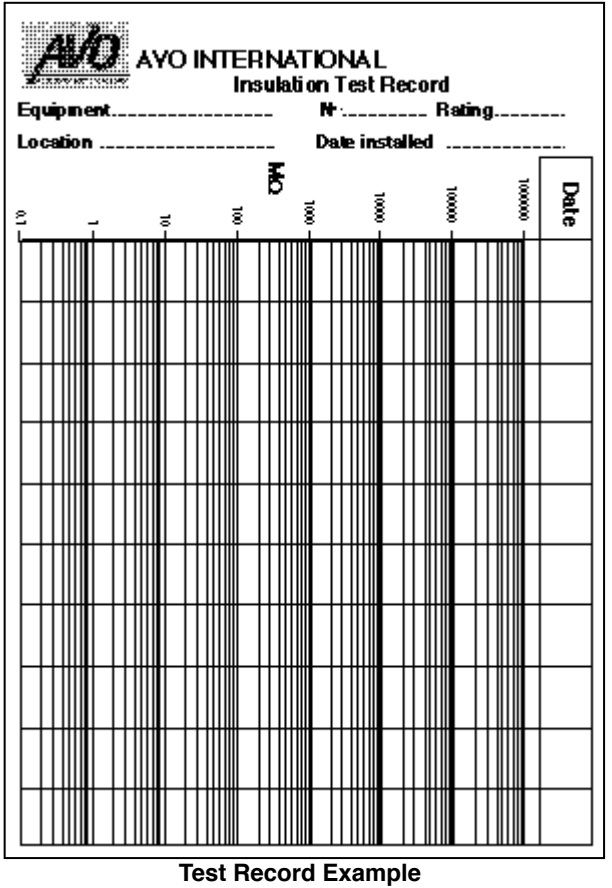
Application Notes

Preventive Maintenance
The proverb ‘A stitch in time saves nine’ inspired the title of an **AVO International** booklet on insulation testing, as it neatly sums up the benefits of preventative maintenance. The savings come in financial terms from costly repairs, lost production, lost profits and in human terms, from lives saved in the event of dangerous electrical faults.

Regular insulation testing of electrical equipment can help to detect deteriorating insulation. The effects which cause insulation to deteriorate include mechanical damage, vibration, excessive heat or cold, dirt, oil, moisture and localized voltage stresses - all of which can arise on most industrial or utility equipment.
Insulation tests are sometimes used in isolation as absolute measures of the **quality** of the insulation. This is most appropriate when equipment is being installed and checked for compliance with a specified ‘Pass’ level. For operational equipment the key factors are **trends** in the insulation readings.

It is therefore important that records of insulation readings are kept, relating to each piece of equipment or ‘Asset’ in your testing regime. **AVO** supplies test record cards to assist with such record keeping.

There are also a number of influences on the insulation readings - temperature, humidity and surface leakage for example and a range of test techniques have been developed to help with the interpretation of your insulation tests.



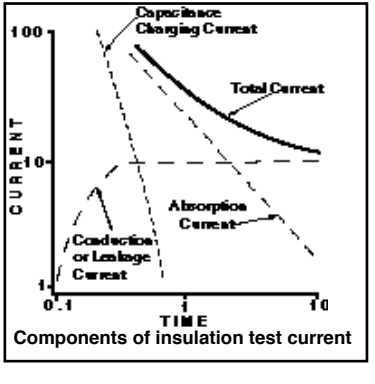
Test Record Example

Insulation Testing Concepts

Insulation resistance can be considered by applying Ohm's Law. The measured resistance is determined from the applied voltage divided by the resultant current, $R = \frac{V}{I}$

There are two further important factors to be considered. These are (i) the nature of the current through and/or over the insulation, and (ii) the length of time for which the test voltage is applied. These two factors are linked. The total current that flows is made up of three separate currents:-

1. Capacitance charging current. This current is initially high and drops as the insulation becomes charged up to the applied voltage.



Components of insulation test current

2. Absorption current. This current is also initially high but drops at a much slower rate than the charging current.

3. Conduction or Leakage current.This is a small steady current that can be sub-divided into two:-

   (a) A current flowing along conduction paths **through** the insulation material.

   (b) A current flowing along conduction paths **over the surface** of the insulation material.

As the total current depends upon the time for which the voltage is applied, Ohm's Law theoretically applies at infinite time.

The charging current falls relatively rapidly as the equipment under test becomes charged up. The actual length of time depends upon the size and capacitance of the item under test.

Larger items with more capacitance will take longer e.g. long supply cables. The absorption current decreases relatively slowly compared with the charging current. In essence it depends upon the nature of the insulation material.

The conduction or Leakage current builds up quickly to a steady value and then remains constant for a particular applied voltage under stable conditions. It is this current that is affected by moisture, dirt etc. and the degree to which it flows bears a direct relation to the quality of the insulation, and consequently to the value of the insulation resistance measured. An increase in the leakage current is a pointer to possible future problems.

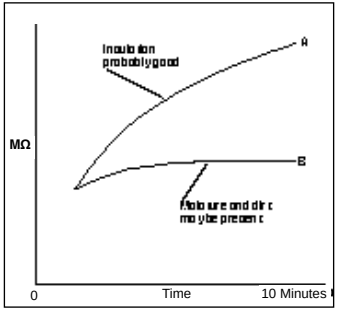
Application Notes

Short time or Spot Test

This is the simplest insulation test, giving a reading of insulation resistance in MΩ. The test is applied for a short but specific period of time, immediately after which a reading is taken. The time is typically 30 or 60 seconds and the *BM21* will allow you to set this time and the test will finish automatically. The reading will not necessarily be the maximum value but if the same time is used each test, then the same point on the curve of increasing apparent resistance is being compared. On installation these readings will be compared to the required minimum specification. Further readings taken for maintenance purposes must be monitored for any trend that they show. The readings are subject to variation from temperature and humidity and these factors may require the insulation reading to be corrected. Information on temperature correction is given in the **AVO** publication 'A Stitch in Time'. Alternatively, a Polarization Index (PI) test may be used.

Polarization Index (PI) Test

This test method is a particular example of the time resistance method. Time resistance tests take successive readings at specified times and are independent of temperature. They can often help in the situation where past test record frequency are limited. Good insulation generally shows an increase in resistance over a 10 minute period.



With contaminated insulation, absorption effects are masked by high leakage currents and the readings are therefore fairly flat. The PI test takes the ratio of the values at 10 and 1 minutes - this is the Polarization Index. The PI test also has the advantage of not requiring temperature correction. The value of PI can give a rough guide to condition of insulation, although the figures should always be interpreted in the context of the equipment history and your experience.

PI TEST RESULT	INSULATION CONDITION
<1,0	**Unsatisfactory**
1,0 to 2,0	**Dubious**
2,0 to 4,0	**Good**
>4,0	**Very Good**

There are two specific conditions to be aware of when interpreting PI tests results, particularly if a history of the equipment is unavailable.

1) Dry, brittle insulation (e.g. on windings) on can give a high PI but fail under shock conditions.

2) If multi-layered insulation fails in one of the layers while the others retain high resistances, the effect on the test current will tend to increase the PI value, masking possible problems from surface leakage caused by dirt and contamination.

Stress Considerations

Measurement above 100 GΩ

Figure 1. shows the stresses and subsequent leakages which will occur between the test leads if neither is connected to earth (ground). These leakages have significant effect and occur through the air itself.

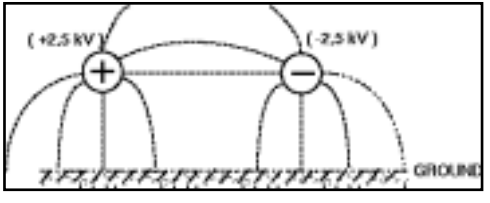


Figure 1.

Figure 2. shows the effect of connecting the guard lead to the ground. This reduces the stray leakage into the negative (measurement input) terminal considerably, but this technique is only permissible if the item under test is isolated from the ground. ('Isolated' means insulated by a resistance of at least 5 MΩ for the positive terminal or 10 kΩ for the negative terminal).

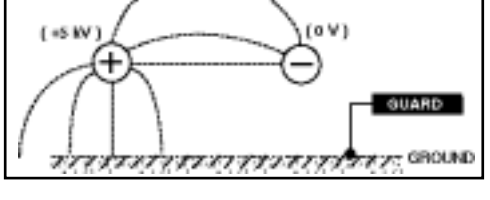


Figure 2.

Figure 3. shows a problem which can occur. If one end of the sample is grounded and this is required to be connected to the positive terminal, then the negative (measurement) lead is surrounded by a 5 kV field. This is likely to cause at least 1 nA of unwanted leakage current, representing a 5 TΩ resistance in parallel with the sample under test.

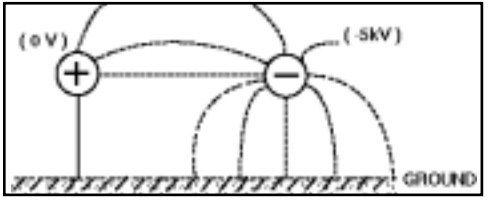


Figure 3.

When taking measurements above 100 GΩ therefore, the user should where possible ground the Guard Lead as shown in figure 2, otherwise parallel leakage paths may occur.

Specification

Test Voltages (d.c.): 500 V, 1000 V, 2500 V & 5000 V
BM21 **only**; 50 to 5000 V variable in 25 V steps

Accuracy (0 °C to + 30 °C): ±5% of nominal test voltages (load resistance >100 MΩ)

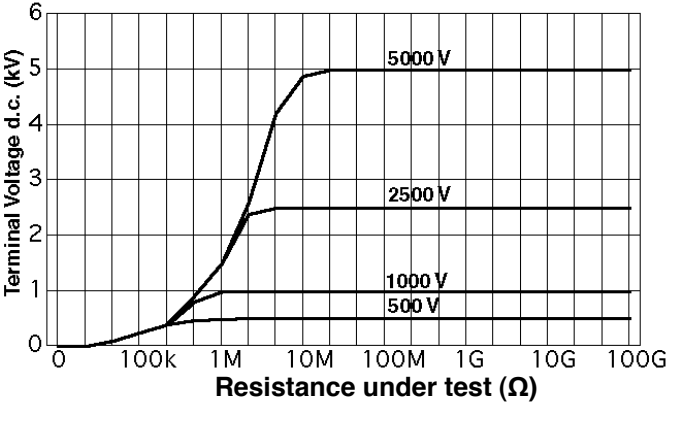
Insulation Range: 100 kΩ to 1 TΩ analogue
BM11D: 10 kΩ to 500 GΩ digital
BM21: 10 kΩ to 5 TΩ digital

Accuracy (0 °C to + 30 °C):

BM11D:	±5%	1 MΩ to 100 GΩ	at 5 kV
	±5%	1 MΩ to 10 GΩ	at 500 V
	±20% outside these limits (above 100 kΩ)		
BM21:	±5%	1 MΩ to 1TΩ	at 5 kV
	±5%	1 MΩ to 100 GΩ	at 500 V
	±5%	1 MΩ to 10 GΩ	at 50 V
	±20% outside these limits (above 100 kΩ)		

For extended temperature range -20°C to + 50°C the percentage error doubles

Short Circuit Current: 2 mA nominal



Typical Terminal Voltage Characteristics

Specification

Timer:	*BM11D*: 0 to 60 minutes *BM21*: 0 to 90 minutes: User selects test duration
Hum Rejection:	1 mA rms per kV test voltage 2 mA rms maximum
Voltage range:	*BM11D*: 50 to 1000 V a.c. or d.c. *BM21*: 50 to1000 V a.c. or d.c. (N.B. Display does not distinguish between V a.c. and V d.c.)
Accuracy (0 °C to +30 °C):	±2% ±1 V
Guard Terminal:	Will guard out parallel resistances to a minimum of 250 kΩ. When measuring 100 MΩ under these conditions, the additional error will be less than 5%.
Capacitor charging time:	5s per µF to charge to 5 kV
Capacitor discharging time:	2s per µF to discharge to <50 V
Maximum continuous overload:	1 kV rms
Temperature coefficient:	0,2% per °C (test current >100 nA) 0,1% per °C for test voltage
Temperature range:	Operating: -20 °C to +50 °C (Errors double outside range 0 to 30 °C) Storage: -25 °C to +65 °C
Power supply:	Two 12 V, 2 Ah Lead-acid rechargeable batteries. Recharge time: 16 hours Battery life: typically 8 hours continuous testing
Environmental protection:	IP54 (with the charging recess cover securely closed)
Altitude:	2000 m max. to operate within specification
Fuses:	FS1: 100 mA (T), 250 V IEC 127/1 FS2: 100 mA (F), 250 V IEC 127/1 Mains Power cord fused plug (when applicable): 3 A fuse to BS 1362
Safety:	The instruments meet the requirements for double insulation to IEC 1010-1 (1995) EN 61010-1 (1995) to installation Category III*, 300 Volts phase to earth (ground) and 500 Volts phase to phase
E.M.C:	The instruments meet EN 50081-1 and EN 50082-1 (1992)

Supplied with the instrument	**Part Number**	**Cat. Number (US only)**
User Guide	6172-033	
HV lead set, 3 m long	6121-403	
Set of 3 High voltage test leads, 3 m long		(210968)
Accessory Pouch	6420-096	
Mains (line) power cord		
Available as an optional extra		
HV lead set, 8 m long (x3)	6121-451	
HV lead set, 15 m long (x3)	6121-452	
12V d.c.charging lead with automotive cigarette lighter plug, 3 m long.	6231-584	
5 kV Shielded Lead set	6311-080	
5 kV Calibration Box - **CB101**	6311-077	
Carrying case		(218748)
Publications		
‘A Stitch in Time’	AVTM21-P8B	

Repair and Warranty

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

New Instruments are Guaranteed for 1 Year from the Date of Purchase by the User.

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

Instrument Repair and Spare Parts
For service requirements for *MEGGER*® Instruments contact:-

AVO INTERNATIONAL **or** **AVO INTERNATIONAL**
Archcliffe Road Valley Forge Corporate Centre
Dover 2621 Van Buren Avenue
Kent, CT17 9EN. Norristown PA 19403
England. U.S.A.

Tel: +44 (0) 1304 502243 Tel: +1 (610) 676-8579
Fax: +44 (0) 1304 207342 Fax: +1 (610) 676-8625

or an approved repair company.

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

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

AVO **INTERNATIONAL**

Archcliffe Road
Dover
Kent, CT17 9EN.
England.
Tel: +44 (0) 1304 502100
Fax: +44 (0) 1304 207342

P.O. Box 9007
Valley Forge
PA 19484-9007
U.S.A.
Tel: +1 (610) 676-8500
Fax: +1 (610) 676-8610

4651 S. Westmoreland Road
Dallas
TX 75237-1017
U.S.A.
Tel: +1 (800) 723-2861 (U.S.A. only)
Tel: +1 (214) 330-3203 (International)
Fax: +1 (214) 337-3038

Megger SA
29 Allée de Villemomble
93340 Le Raincy
Paris, France
Tel: +33 (1) 43.02.37.54
Fax: +33 (1) 43.02.16.24

This instrument is manufactured in the United Kingdom.

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

MEGGER is a registered Trade Mark of AVO **INTERNATIONAL LIMITED.**

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