

BM3546 digital insulating resistance tester operator's manual

Foreword

Distinguished users:

Thank you for purchasing the meter of our company. To use the meter correctly, please read the operating instructions thoroughly and carefully before use it, especially the section of "Safety information". Please keep the operating instructions in a safe place after reading it, putting it where the meter is or keeping it in handy for future reference.

I. Overview

Welcome to use the product!

BM3546 digital multimeter with auto range selection is a real digital insulating resistance tester. It has features of high accuracy, reliability in operation, and convenience in use. Output test voltage can be switched among 1000V/2500V. An ordinary insulating resistance meter can not measure the output high voltage of its own. When the output high voltage of the insulating resistance meter doesn't conform to the rated value, it is not easy for the user to find the unconformity so that deviation of the measured result is over large sometimes and causing hidden troubles in safety. It can monitor the output high voltage in a real-time way. At any time, the user can observe actual measurement voltage that is output by the meter, effectively avoiding misjudgment caused due to output voltage not conforming to the rated value. The measurement range of the meter can reach up to 40GΩ. The measurement time can be set up according to requirements. After a measurement is completed or in the measurement, the measured result can be kept automatically by push down any key. The product is applicable to measurement of the insulating resistance of various insulating materials and electric equipments such as transformers, motors, cables, switches, and electric apparatuses. It is also applicable to maintenance, test, and inspection of various electric equipments. It is compact in structure, convenient to carry, and an ideal electrical and electronic testing meter of yours.

II. Safety information

(1) Description of safety marks:

⚠ Warning: important safety information the user must read!

⚡ Danger: high-voltage electric shock is present!

☐ Double-insulated protection

- (2) Read the operating instructions carefully before use the meter.
- (3) It is strictly prohibited to use the meter before its rear cover is put in place. Otherwise, it might cause an electric shock.
- (4) Check and make sure the insulating layer of the test cable is in good condition without any breakage.
- (5) To avoid electric shock, do not touch the test cable and the circuit under test when performing a test.
- (6) Make sure one end of the test cable is securely inserted into the terminal.
- (7) DC voltage over 50V or AC voltage over 36V can cause danger of electric shock. Be careful when taking measurement.
- (8) Before performing insulation test, make sure the voltage range has been set properly.
- (9) Do not perform insulating resistance test in a combustible environment. Spark may cause explosion.
- (10) Stop using the meter, if its case or test cable is broken during use and the metal is exposed
- (11) When open the rear cover for changing battery, make sure the test cable has been removed out of the test terminal.
- (12) Take the battery out when the meter will not be used for a long time.
- (13) When "⚡" is displayed in the meter, it is necessary to change the battery in time to ensure measurement accuracy.

III. Name and function of parts (see the figure)



1. POWER、FUNC key

Switch among power ON/OFF, after starting the meter the key is used to choose the voltage of insulation resistance measurement and ACV measurement

2. HOLD/MIN key

Before starting the insulation resistance measurement, the key is used to set the measurement time to be 1, 2, 4 or 10 minutes, when it is in AC measurement function or after starting the insulation resistance measurement, the key is used to data hold. When the data is in holding, to avoid misoperation, it is invalid to press any other key, press "HOLD" key again to unlock data hold function. when it is in the operation of measuring insulation resistance, the data will be hold when press any key, to stop measurement easily.

3. TEST key. t is used to measure the insulating resistance

4. L (LINE) input terminal (connected to line terminal of the to-be-tested

object).

5. ACV positive input terminal
6. COM/G input terminal (COM is common EARTH of the multimeter /G is shielded terminal of the insulating resistance).
7. E (EARTH) input terminal (connected to EARTH terminal of the to-be-tested object)
8. Liquid crystal display

Small 8888: measured value of high voltage of the insulating resistance

Big 8888: insulating resistance or measured value of ACV

MIN: measurement time of the insulating resistance (minute)

OL: overflow display, indicating the measured value exceeds the maximum display value.

ERR: indicating that serious current leakage or short circuit occurs to the equipment.

~V: ACV

WORK: high voltage indicating when measuring insulation.

⚡: Battery capacity is insufficient

500V/1000V/2500V: indicating the voltage gear when measuring insulation.

IV. General characteristics

- (1) Auto range: "OL" will be displayed for overload.
- (2) Display mode: Liquid crystal display; maximum display: 3999;
- (3) Sampling rate: 2 times per second;
- (4) The meter can display actual insulation test voltage. LED light is used to indicate high voltage output status;
- (5) Operating environment: 0°C-40°C, less than 75%RH;
- (6) Storage environment: -10°C-60°C, less than 80%RH;
- (7) Maximum power consumption: 4.5W; minimum power consumption 18mW; Sleeping power consumption: less than 80uW.
- (8) Indication for insufficient battery capacity: "⚡" is displayed;
- (9) Power supply: 6 pieces of AA 1.5V battery (LR6×6)
- (10) Auto power off: The multimeter is turned off automatically in approx. 15 minutes after it is turned on if no key is pressed.
- (11) External dimension: 150(length)×101(width)×59(height)mm
- (12) Weight: Approx. 440 grams (including the battery)

V. Technical characteristics and operating description of the insulation tester

Accuracy: ±(reading% + number), one-year warranty

Environment to guarantee the accuracy: 23°C±5°C, less than 75%RH

Rated measurement voltage, valid measurement range, and precision

Rated voltage	Measurement range	Accuracy
1000V	1M-40G Ω	1M-200M Ω : ± (3%rdg+5), 200M-4G Ω : ± (5%rdg+5), 4G-40G Ω : ± (10%rdg+5)
2500V	2.5M-40G Ω	

Display range

Rated voltage	Display range (auto range)	Resolution
1000V	40M/400M/4G/40G Ω	10k/100K/1M /10M Ω
2500V	40M/400M/4G/40G Ω	10k/100K/1M /10M Ω

Characteristics of the measurement terminal

Rated voltage	Allowed range of open circuit voltage	The measurement resistance value that can maintain lower limit of the rated voltage	short circuit current
1000V	90%-110% of the rated voltage	2MΩ (ERR is displayed when it is less than 1MΩ)	Not less than 1mA
2500V		5MΩ (ERR is displayed when it is less than 2.5MΩ)	

ACV measurement

range	Resolution	accuracy	Input Impedance
600V	1V	± (1%rdg+5)	5M Ω

display: Mean value response (calibration of sine wave RMS)

Frequency range: 50-100Hz

Usage for insulating resistance measurement

⚠ **Danger**: If there is any measurement error, it may cause personal injury and meter failure. Operate it only after read the operating instructions carefully and thoroughly. Our company will take no responsibility for the accident not caused due to any reason of our company.

Operating description

1. Safety information

1) Watch out for high-voltage electric shock. When completing the insulating resistance test, remove the test cable only after making sure high voltage across the tested object is less than 50V.

2) During measurement, do not touch the object under test and watch out for high-voltage electric shock.

3) When test the insulating resistance, the object should not be electrified. Make sure the to-be-tested object is securely earthed. Before test, it is necessary to short-circuit and discharge two test terminals of the to-be-tested object.

4) When test the insulating resistance, make sure no external voltage is applied to the test circuit.

5) Before starting test, make sure the range has been set correctly and the test cable is securely connected.

6) After press the high voltage key, high voltage from 500V to 2500V will be output between L terminal and E terminal (depending on different models and positions). Here, be sure not to touch the meter and exposed part of the object under test. Otherwise, danger of electric shock would occur.

2. Insulating resistance test

1) Connection of the test terminals

Insert one end of the test pen with a high voltage test bar into L terminal socket of the meter. Insert one end of the red test cable with a test clamp into E terminal socket of the meter. Insert one end of the test cable with a black test pen (the pen with a clamp) into G terminal socket of the meter. Make a good connection

respectively (The G side can be ignore when it is no need to consider the impact of leakage) .

2) Test connecting cable

Connecting cable of E terminal socket of the meter is earthing cable;

Connecting cable of L terminal socket of the meter (with a high voltage test bar) is circuit cable;

Connecting cable of G terminal socket of the meter (the pen with a clamp) is shielding cable and connected to surface of the to-be-tested object to prevent surface leakage and affect impedance test.

3) Rated voltage selection

Press "FUNC" key to select a rated voltage you need in the insulating resistance test, and press "MIN" to make selection among 1min/2min/4min /10min(min is minute) according to test time requirement

4) Connect pen of the test bar to another terminal of the to-be-tested object. Press high voltage switch (TEST). Here, the red indicator light turns on, and the "WORK" symbol flashing in the LCD, indicating high voltage output for test is connected. Actual high voltage value can be displayed in the meter.

After the test is started, numerical value is displayed in the meter. The stable displayed value is the insulating resistance value of the object under test. For convenience of use, when the set test time comes, the meter cuts high voltage off automatically, and locks and saves the measured result. When the measured result is less than the set minimum resistance value under the measurement voltage, "ERR" is displayed in the meter. If there is a need to stop measure, press any key, the meter cuts high voltage off automatically and hold the measurement value. when it is in the data hold status, it is necessary to release the data hold status to start other measurement.

Attention: do not short-circuit the two test pens with high voltage output or take measurement of insulating resistance after high voltage is output. The improper operation is very easy to generate spark, cause fire disaster, and damage the meter.

Special attention in operation:

Before test, make sure the to-be-tested circuit is not electrified. Do not take measurement of any electrified equipment or electrified circuit. During test, dangerous voltage output exists in the meter, be sure to operate it carefully. Ensure the to-be-tested object is securely clamped and keep your hands away from the test clamp before press TEST key to output high voltage.

Attention in operation:

When use 1000V measurement voltage to measure resistance less than 5MΩ, 2500V to measure resistance less than 10MΩ, measurement time must not exceed 10 seconds.

5) Power off

After the test is completed, release lock status of the meter and observe voltage display value of the insulating resistance tester, when it is less than 50V, press the "power" key a moment longer to shutdown the meter, and then remove the test cable. The test is over.

Notices in use of the insulating resistance tester

1. Brief introduction

The insulating resistance tester can be used to verify completeness of motor, transformer, switching equipment, and coil and cable of electric equipment. For example, when electric cable or switching equipment (low capacitance equipment) is tested, time-related capacitive leakage current is not noticeable and would quickly drop to zero. Within a short time (one minute or less), it will reach a stable conductive leakage current flow, providing a good condition for spot-check of reading/short-time impedance test.

In the other hand, time-related current will last for several hours when the equipment under test is long cable, large-sized motor or generator (high capacitance equipment). The current would cause ceaseless change of the reading of the insulating resistance tester. It is impossible to obtain an accurate reading. If trend analysis among readings can be made, for example, step voltage or medium absorption test, the situation can be overcome. The analysis doesn't rely on a single reading, but on a large quantity of related readings. As time-related current drops quickly when low capacitance equipment is tested, results from multiply tests are the same. Therefore, use of the multiply test method will waste time.

2, Test in assembly

The most important reason of the insulation test is to ensure the public and individual safety. Through high voltage DC test among live wire, earthing and earthing wire, you can eliminate short circuit or earthing phenomenon that is dangerous to the human life. Usually, the test is performed after preliminary equipment installation is completed. Performing the test can find connection error and defective equipment, guarantee high quality installation, and prevent fire disaster or explosion.

3. Test in maintenance

Another important reason of the insulation test is to protect and lengthen service life of electric system and motor. Electric system is affected by such factors as dust, grease, temperature, stress, and vibration for a long time. These conditions may cause insulating deterioration, loss in production, and even fire disaster. Regular maintenance and test can provide very valuable information of system wear and tear status and help forecast system failure possibility. Solving problems in time can guarantee that a system operates without any fault and effectively lengthen service life of various equipments.

To obtain meaningful insulating resistance result, an electrician should check the to-be-tested system carefully before take measurement. When the following conditions are satisfied, the best results will be obtained:

1) Shut down the system or equipment and disconnect it from other circuits, electric switches, capacitors, electric brushes, lightning rods, and circuit breakers. Ensure the test is not affected by leakage current that flows through switches and over-current protection components.

2) The temperature should be higher than dew point of the environmental air. If the

condition is not satisfied, a layer of water smoke will be formed in the insulating surface. In some cases, it would be absorbed by insulating material.

3) In surface of the conductor there should be no carbon and other impurity that are easy to form a conductor.

4) The applied voltage should not be too high. When low voltage system is tested, too high voltage would cause overload or damage a insulator.

5) The to-be-tested system should be fully discharged to the earth. The earthing discharge time should be approx. fivefold of the charge time.

6) Temperature influence is worth attention. As insulating resistance is in inverse ratio with insulating material temperature (the higher the temperature is, the lower the impedance is). The recorded impedance reading would be changed by insulating material temperature. It is suggested to perform measurement in a standard temperature of 20°C (68 °F). Compare a reading with a result at a temperature of 20°C according to conventional practice. with a temperature over 20°C, the impedance value at 20°C will be twofold of its reading every time the temperature goes up for 10°C (18 °F); with a temperature under 20°C, the impedance value at 20°C will be one half of its reading every time the temperature goes down for 10°C (18 °F). For example, when 10MΩ impedance at 40°C is converted into the impedance at 20°C, its value is 40MΩ. The conductor temperature can be measured with a non-contact infrared temperature tester

4, ⚠ Work safety

To guarantee safety is responsibility of every body. However, your safety is at your own hands. No tool can guarantee your safety. Only safe equipment and safe work habit can provide you with the safest protection. The followings are some safety tips you should obey:

★ In any time, put the circuit in power-off status as possible as can. Take appropriate cut-off/turn-off steps. If the ON/OFF status is undetermined, assume the circuit is electrified. You can use AC/DC voltage measurement function of the meter to determine if the circuit is in power-on status.

★ Use protection device for the power-on circuit: Use insulating tools. Put up wear fireproof suit, goggle, and insulating gloves. Take off watch or other adornment. Stand on an insulating pad.

★ Draw lesson from experienced electricians: Keep one hand away from other objects. This way will reduce the possibility that closed-loop current goes through your thorax and heart.

★ When perform insulating resistance test:

※ Do not connect the insulation tester to an electrified conductor equipment. Follow manufacturer's suggestions to perform the test.

※ Cut off fuse, electric switch, and circuit breaker. Turn off the to-be-tested equipment.

※ Disconnect branch circuit wire, earthed wire and other equipment from the to-be-tested equipment.

※ Before and after the test, discharge capacitors of the to-be-tested object. Some equipment may have automatic discharge function.

※ Check if there is leakage current going through fuse, electric switch, and discharge circuit breaker. Leakage current would cause incorrect test result.

※ When the insulation is in bad condition, equipment would generate electric arc. Therefore, do not use the insulation tester in a dangerous environment with combustible and explosive gas.

※ When connect test cable, use a pair of insulating rubber gloves.

5, Important tips

What the insulating resistance tester measures is surface-to-surface resistance value of the object under test, but not point-to-point one. Therefore, the wire should not be connected to surface of a non-conductive object (such as cable rubber and plastic case). It is necessary to use a conductive material (such as silver paper) to cover surface of the to-be-tested object, and next, connect a wire to the conductive surface, and then, you can perform the measurement.

VII. Maintenance of the meter

⚠ Warning! It is necessary to turn the power off and disconnect test pens before open the case of the meter or battery cover to prevent danger of electric shock.

1. When the sign "E" is displayed in the meter, the battery needs to be changed. Open the battery cover, and replace the old battery with a new one of the same type to ensure the meter works normally.
2. Keep the meter and the test pens clean, dry, and undamaged. Use a clean cloth or eradicator to clean the case of the meter. Do not use abrasive or organic solvent.
4. Avoid mechanical damage, shock, and impact; avoid exposure to high temperature and strong magnetic field.

VIII. Accessories

1. Test cable: one set, including one red high voltage test pen, one black test pen, one black test cable, and one test clamp.
2. Operating instructions: one copy
3. Conformity certificate/Warranty card: one piece