



## ZeroStat S-MTR-1000® Megohmmeter

**Digital Resistivity/Temperature/Humidity Meter**



### Meter Test Kit Contents:

- 1 ZeroStat® S-MTR-1000 Resistance-Resistivity-Humidity-Temperature Meter
- 1 Blow Molded, Foam-Lined Travel Case
- 1 Concentric Ring Probe (optional)
- 2 5lb, 2.5 inch Diameter Test Probes.
- 2 Coil Cord 6 foot Test Grounding Leads
- 1 Grounding Clip
- 1 9 volt Battery
- 1 Product Instruction Bulletin
- 1 AC Power Adapter
- 1 NIST Certificate of Calibration

As with all high quality test equipment proper storage and use of the ZeroStat S-MTR-1000 is required.

### CAUTION:

Because the AC power adapter will charge the battery, **ONLY USE** a rechargeable battery when operating the AC adapter with this meter.

### Description:

The **ZeroStat S-MTR-1000®** Resistance-Resistivity-Humidity-Temperature Test kit is an easy to operate, compact, lightweight, portable meter designed to measure temperature, humidity, and electrical resistance/resistivity. Using both internal and external test probes, the meter will measure resistivity, resistance between two points, and resistance to ground according to EOS/ESD Association Standards, - S4.1, S6.1, S7.1, S11.11, and European Standard CECC-EN 1000/15.

The **ZeroStat S-MTR-1000®** is designed and manufactured in the USA to allow accurate measurements for engineers, designers, quality control departments, incoming inspectors and sales/manufacturing personnel. Industries where the meter can be applicable include electronics, defense, maintenance, medical, photographic, printing, and other industries where accurate temperatures, humidity, and resistance measurements are required.

### Test Procedures:

Specific industries which require accurate measurements will dictate the correct test procedures. The procedure outlined in the Product Test Bulletin is specifically used in the electronics industry where the EOS/ESD and CECC procedures predominate. It is recommended that other industry procedures may be more appropriate for your industry. These may include MIL-HDBK-263, EIA-1S-5-A, ASTM D-257, and ASTM F-150. Failure to measure relative humidity and temperature at the time of testing is in non-compliance with ANSI/ESD-S4.1, S7.1. and S11.11

All materials must be tested on an insulated surface to avoid misleading measurements. It is possible to measure down through the surface and not along the surface. This is especially true with non-homogeneous or multilayer materials. It is possible to actually measure down through the dissipative surface layer and along the inner conductive surface and back up through the dissipative layer. This is why it is not technically correct to include a surface measurement value for two layer materials. Always measure material thickness when measuring electrical properties because thickness, temperature, and relative humidity can and will affect the resistance/resistivity readings.



Figure 1. -  
**ZeroStat MTR-1000®**  
Megohmmeter



## FEATURES

**A. Test Button** - The round black button will turn on the power. When depressed and held down with reasonable force the resistivity/resistance, humidity, and temperature values are displayed on the screen for approximately 45 seconds. At the completion of the test the power will be turned off automatically.

**B. Selector Switch** - The switch selects the desired applied test voltage of either 10 or 100 volts.

At 10 volts the resistivity range is  $1 \times 10^3 - 9 \times 10^6$  ohms/sq. At 100 volts the resistivity range is  $1 \times 10^5 - 1 \times 10^{12}$  ohms/sq.

If the battery is too low to give accurate readings the LCD will display "Low Battery".

If the resistivity is below  $10^3$  ohms/sq., the LCD will display "Less than 1K".

If the reading is over  $10^{12}$  ohms/sq., the LCD will display "More than 2e12".

If the reading is over  $10^6$  ohms/sq. the LCD will display "Change to 100 volts" if the meter is set on 10 volts. If the reading is under  $10^5$  ohms/sq., the LCD will display "Change to 10 volts" if the meter is set on 100 volts.

**C. External Test Jacks** - The external probe test jacks on the top of the meter are 3.5 mm monaural. For safety, banana plugs will not fit into these jacks. When the plugs are inserted into the jacks the parallel test probes on the bottom of the meter are deactivated.

**D. AC Power Adapter** - This plug allows the meter to be used with a center positive 9 - 12 volt 200 mA power adapter. Using the incorrect power adapter may cause serious damage to the instrument.

**E. Ground Jack** - Because of the possibility of 60 cycle electrical noise the enclosed ground cord is recommended when the power adapter is used. This jack is located on the top of the meter. Insert the plug into the meter jack and attach the other end to the earth ground of the building.

**F. Battery Compartment** - This compartment houses a supplied 9 volt battery which must be installed prior to use.

**G. Parallel Test Probes** - These probes are made from a highly conductive, low durometer elastomer. Care should be taken to avoid harsh solvents and extreme abrasion. Occasional cleaning with a mild soap and water solution will extend the life of the

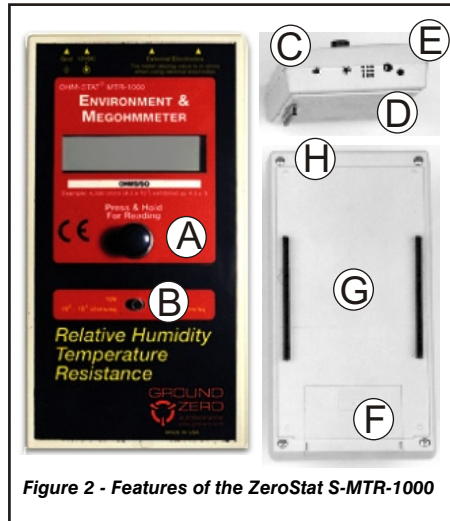


Figure 2 - Features of the ZeroStat S-MTR-1000

probe feet. If damage does occur, these probes are replaceable for a nominal charge. These probes are used to test electrical surface resistivity in ohms/square.

**H. Case** The meter case is injection molded from a high impact ABS polymer. Simple cleaning with a mild soap and water solution will remove any dirt or debris.

## OPERATION

Prior to testing, ensure that surfaces to be tested are clean and free of contaminants.

## SURFACE RESISTIVITY

### Parallel Probe Resistivity Method

The parallel resistivity probe method, complies with ASTM D-257. It is used to give fast electrical resistivity measurements on flat homogeneous materials. It may be used on multilayered materials, but this should be noted along with the temperature and humidity values on the data report.

**A.** Place the meter on the desired surface to be tested.

**B.** Move switch to desired test voltage position, either 10 or 100 volts.

**C.** Press and hold down the test button. After the meter has had time to measure the resistivity, humidity, and temperature these values will be displayed on the LCD screen. This will happen in approximately 15 seconds.

The resistivity reading will be in ohms/square, temperature in degrees, and relative humidity in percent.

The meter will keep updating the display while the button is held down and will continue to display the last test reading for approximately 45 seconds after the button is released.

## Concentric Ring Probe Resistivity Method

Insert both coil cords using the monaural plugs into the 3.5 mm meter jacks. Attach the banana plug coil cord terminations to the concentric ring probe. Place the probe on the surface to be tested. Press the test button and wait 15 seconds. The correct temperature and humidity will be displayed on the LCD screen. The resistivity value displayed MUST be multiplied by a factor of ten to achieve the actual test value. These values will read in ohms/square, e.g.,  $3.5 \times 10^4$  ohms/square (displayed value). Actual resistivity value will be  $3.5 \times 10^5$  ohms/square.





**Figure 4 - ZeroStat S-MTR-1000 Point-to-Point**

### Surface Resistance Measurements (RTT)

This procedure which complies with EOS/ESD-S4.1 measures resistance between two points independent of a groundable point. Procedures vary regarding sample preparation, probe preparation, and spacing of the 5 pound probes. Select and read the correct test procedure for the desired measurements.

- A.** Connect the monaural plug ends of the test leads into the 3.5 mm jacks of the meter. Connect the banana plugs of the test coil cords into the 2.5 inch disc ends of both 5 pound probes.
- B.** Place both probes on the material according to test procedures.
- C.** Move switch to desired test voltage position, either 10 or 100v.
- D.** Press and hold the test button until power is applied to the meter and a value is displayed. Keep the button depressed with sufficient force until the electrical resistance, relative humidity, and temperature readings are displayed on the meter screen.

### Surface-To-Ground Resistance Measurement (RTG)

This procedure measures the surface resistance between a ground point on the material surface and specific positions on the material being tested. This procedure complies with the EOS/ESD-S4.1 standard.

- A.** Meter Set-Up. With both test leads connected to the meter, attach the alligator clip to one lead and the other to the 2.5" disc end of one 5 pound probe.
- B.** Attach the alligator clip to a known ground point. Position the probe on the surface to be tested in accordance with the desired test procedure.
- C.** Press the test button until the resistivity, humidity, and temperature test values are displayed on the LCD screen. These readings will conform to: EIA, EOS/ESD, ANSI, IEC-93 CECC, and ASTM test procedures. When performing tests, especially with high resistance materials, be sure the test lead wires do not touch or overlap and that your hands are not in contact with the probes or wires during the actual testing of the materials. This will ensure accurate readings.



**Figure 5 - ZeroStat S-MTR-1000 Point-to-Ground Test**

### Calibration & Maintenance

The ZeroStat®MTR-1000 requires no service or maintenance except for an occasional cleaning of the rubber on the probes. A mild soap and water solution will remove dirt or other harmful contaminants from both the rubber probes and the meter case. Harsher solvents will affect the rubber probes and therefore should not be used. When the meter is not used for extended periods of time, remove the battery to prevent damage and/or leakage. The ZeroStat®MTR-1000 is calibrated to NIST traceable standards at the factory. The calibration is done by using a computer program and 1% resistors. This newly improved method assures many years of long life and accurate readings. Attaching 1% resistors to the probes or test leads will verify this accuracy.



**Figure 6 - ZeroStat CB-9900 Calibration Box**





# STOPESD S-MTR-1000 Megaohmmeter

## SPECIFICATIONS

### Resistivity Test Ranges

1 x 10<sup>3</sup> - 9 x 10<sup>6</sup> ohms at 10 volts.  
1 x 10<sup>6</sup> - 1 x 10<sup>12</sup> ohms at 100 volts.

### Power - Battery Supply

A 9 volt battery is supplied. If a rechargeable battery is used, the recharging can be done inside the meter.

The 12 volt power supply is both an adapter and a recharging device. With a 9 volt alkaline battery the expected life is approximately 30 hours or 5,000 twenty second measurements.

Using an adapter not designed for this meter may cause serious damage negating the warranty on the meter. Only a 12 volt DC, center positive 200 mA adapter is recommended. A low battery indicator will alert the user to replace a weak battery.

If a weak battery is not replaced the meter may continue to give test readings, but these readings should not be considered accurate.

### Current Limit:

1 milliamp DC current for 10 volts.  
0.1 milliamp DC current for 100 volts.

### Accuracy:

10<sup>3</sup> - 10<sup>8</sup> ohms +/- 5%  
10<sup>9</sup> - 10<sup>10</sup> ohms +/- 9%  
10<sup>11</sup> - 10<sup>12</sup> ohms +/- 25%

### Zero:

Automatic zeroing

### Operating Conditions:

32° F - 100° F (0° - 38° C)

### Display:

Two line, thirty two .20" character alpha numeric. LCD displays all test results simultaneously.

### Meter Weight:

10.2 oz. (289 mg) Meter and battery only.  
12 lbs. (5.476 kg) including meter, adapter, probes, leads, and case.

### Dimensions:

7.50 inch (19.05 cm) L. x 4.00 inch (10.16 cm) W.  
x 1.50 inch (3.81 cm) H.

### Probes:

Two 2.87 inch (7.2 cm) long, parallel, conductive rubber replaceable probes on the bottom of the meter case. They conform to ASTM, ANSI and CECC standards.

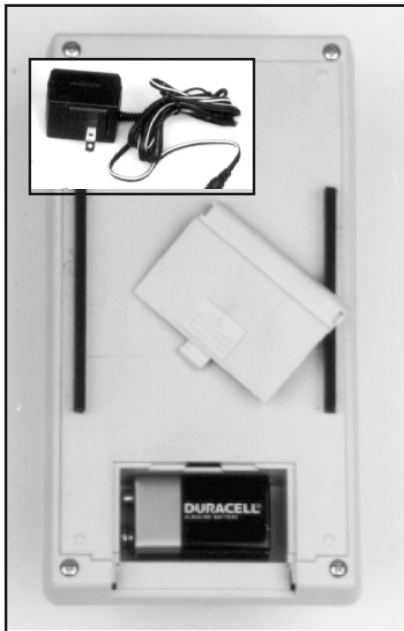
Two 5 pound (2.27 kg), 2.5 inch (6.4 cm) diameter, conductive rubber probes.

One 5 pound concentric ring probe conforming to EOS/ESD, ANSI and CECC standards. (optional)

Enclosed with these probes are two 6 foot (183 cm) coil cord test leads.

### Power Switch:

Momentary on, press button.



## Warranty Exclusion:

*The foregoing express warranty is made in lieu of other product warranties express and implied, including merchantability and fitness for a particular purpose which are specifically on indirectly disclaimed.*

*The express warranty will not apply to defects or damage due to neglect, misuse, accidents, alterations, operator error, failure to properly maintain, follow instruction, or failure to clean or repair products.*

## Limit of Warranty:

*In no event will Ground Zero Electrostatics, Inc. or seller be responsible or liable for special, incidental or consequential losses or damages, whether based on tort, contract, or the use of, or inability to use, the product.*

*Before using the product users shall determine the suitability of the product for their intended use. The users assume all risk and liability whatsoever in connection therewith.*

*Fulfillment of Ground Zero Electrostatics, Inc.'s warranty obligations will be the customer's exclusive remedy and Ground Zero Electrostatics, Inc., and seller's limit of liability for any breach of warranty or otherwise*

**Any questions regarding these procedures or other questions should be directed to our engineering staff or customer service representatives by calling 1-877-GND-ZERO (463-9376). Ground Zero Electrostatics, Inc. Cedar Village Executive Offices, 4916 26th Street West, Suite 100, Bradenton, Florida 34207**



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