Instruction of TR7138 Megohmmeter Test Kit

Hanchen Instrument

Please carefully read this instruction before using.

Introduction

TR 7138 megohmmeter is a simple instrument for measuring surface resistivity. It has two parallel electrodes on the back. It is suitable for testing according to ASTM-D-257 standard. If it is tested according to DIN EN 015/1 standard, it uses circular electrodes (optional). The instrument is suitable for all aspects of material production, including engineering maintenance, quality control, inspecting material, manufacturing and investigation. It is also used for anti-static pad, floor, wristband, work clothes, shoes, bags, turnover and other anti-static performance evaluation and testing.

The instrument has advantages: high measuring accuracy, simple operation and convenient carrying. It is an ideal choice for checking and measuring surface resistance and resistance point-to-point.

Decimal conversion table

10^3	= 1 kΩ
10^4	= 10 kΩ
10^5	= 100 kΩ
$3x10^5$	= 300 kΩ
10^6	= 1 MΩ
$3x10^6$	= 3 MΩ
10^7	= 10 MΩ
$3x10^7$	= 30 MΩ
10^8	= 100 MΩ
$3x10^8$	= 300 MΩ
10^9	= 1000 MΩ
$3x10^9$	= 3000 MΩ
10^{10}	= 10,000 MΩ
10^{11}	= 100,000 MΩ
10^{12}	= 1,000,000 MΩ

More test values to display on the LED, higher accuracy and closer to the measured value. An LED will illuminate at the corresponding test result, and the color represents the corresponding test value.

Color	Indication	Resistance Ω
Green	Conductivity	10^3 - 10^5
Yellow	Static dissipative: ideal range	$3×10^5$ - 10^9
Orange	Static dissipative: near insulation	$3×10^9$ - 10^{10}
Red	Insulation	10^{11} - 10^{12}

Test voltage

The test voltage is 10V and 100V. According to ESDA standard STM4.1 and S7.1, when the surface resistance of conductor is less than 10^6, the voltage of 10V must be selected; when it is greater than or equal to 10^6, the voltage of 100V must be selected. TR7138 will automatically simulate the appropriate voltage according to the test

measurement.

As defined by ESDA, the following values are indicated:

Voltage	Range	Definition
10V	$<10^6\Omega$ / square	Conductive material
100V	$<10^6$-$10^{11}\Omega$/ square	Dissipative material
100V	$>10^6\Omega$ / square	Insulating material

Notes on Voltage

In the past, resistivity or resistance measurements were based on ASTM D264, ASTM 991, NFPA 56A or NFPA 99 test standards, which required 500V or 1000V voltage. But it posed a safety problem for the people who were testing.

ESDA standardizes the testing process so that lower voltages can be used within a specific range.

TR7138 instruments use 9V batteries, but some instruments with 9V batteries can not guarantee the accuracy required for testing, especially for some impedance values greater than 10^7; TR7138 has a transformer to convert the 9V into 10V or 100V and apply constant charge throughout the voltage range. The accuracy

depends on the applied voltage, temperature and humidity.

Temperature and Humidity

Because humidity and temperature will affect the electrical properties of the tested materials: low temperature and humidity will increase resistance and slow down dissipation time.

Under high humidity conditions, a thin layer of water will condense on or be absorbed by the surface of the object to be measured. This hygroscopicity increases the conductivity of the material, especially for those materials with strong water absorption.

At high temperatures, the mobility of free electrons increases, thus increasing the conductivity of materials, especially those of carbon black, metal oxides, metals and other materials.

At low temperatures, internal stresses occur in materials, resulting in an increase in the distance between conductive materials, thus increasing the resistance value. Therefore, it is necessary to know the temperature and humidity.

Recording Data

ASNI/ESDA Association and European CECC recognize the impact of environmental conditions on measurement, so they require that

temperature and humidity should be recorded in their standards. If a material is measured under high humidity and all measurement requirements are passed, but when customers receive the material and use it at low temperature and low humidity, it is posslble that the material cannot reach the requirement. Upon request, this will inevitably lead to the return loss.

In ESD STM4.1 working surface-6.2.4 resistance measurement section and ESD S7.1-1994 material impedance parameters, ground material 5.2.4 and 5.3.3 all require reporting temperature and humidity while measuring.

Calibration

It is recommended that it be tested once a year. TR7138 instrument supports third-party inspection agencies to re-examine (payment item).

Internal Probe Measurement

Parallel electrode method conforms to ASTM-D-257 standard. Horizontally place two conductive rods on the surface of the tested object to quickly measure the resistivity of flat materials. Of course,

the temperature and humidity values should be written in the report.

Parallel electrodes

Exploration

When measuring between two parallel electrodes of the instrument, the instrument will indicate the surface resistivity of the material be measured.

A. Before testing, make sure that the surface to be tested is clean and free of contaminants.

B. To measure in a new environment, the instrument needs to be adapted for more than half an hour.

C. Place the instrument on the surface of the product to be tested. When measuring, the instrument must remain stationary and not be moved.

D. Press and hold the red test button, apply about five pounds of external force, and the meter will display the surface resistivity.

E. When using a built-in probe, the surface resistivity is measured in square ohms (although the display is still ohms).

F. The LED light will turn on when the test value is reached, indicating the test value.

External Probe Measurement

When measured with a 5-lb external probe, the tester will indicate the resistance of the material in ohms.

External probes are used for fast resistivity measurements on uniform planar materials. They can be used on multilayered materials. Of course, the temperature and humidity values of data should be written in the report.

When the cable has been inserted into the appropriate socket, the parallel probe under the instrument wil be disconnected.

The resistance point-to-point (RTT) and grounding resistance (RTG) can be measured by connecting the probe to the socket of TR7138. The heavy hammer probe can be used to meet various standards, including ANSI / ESDA STM4.1, ANSI / ESDA S7.1 material impedance and floor material for measuring the resistance of working surface.

After the inspection, please pull out the cable and put the probe into the protective box. If the cable is not pulled out, the instrument socket will become inelastic.

Resistance Point to Point (RTT)

RTT measurements can be used to evaluate floors, chairs, trolleys, working surfaces and other ESD control materials and products. Procedure changes and sample preparation are related to the distance of the 5-lb probe, and the correct test procedures and standards should be selected according to the need.

A. Insert the audio plugs of the two test lines into the two jacks of the meter and connect the other end of the two lines to two 5-pound heavy probes.

B. Place two probes on the surface of the object to be measured according to the test procedure or standard.

C. Press the test button and the value will be displayed on the LED. The instrument will select the correct voltage (10V or 100V) according to the measured value.

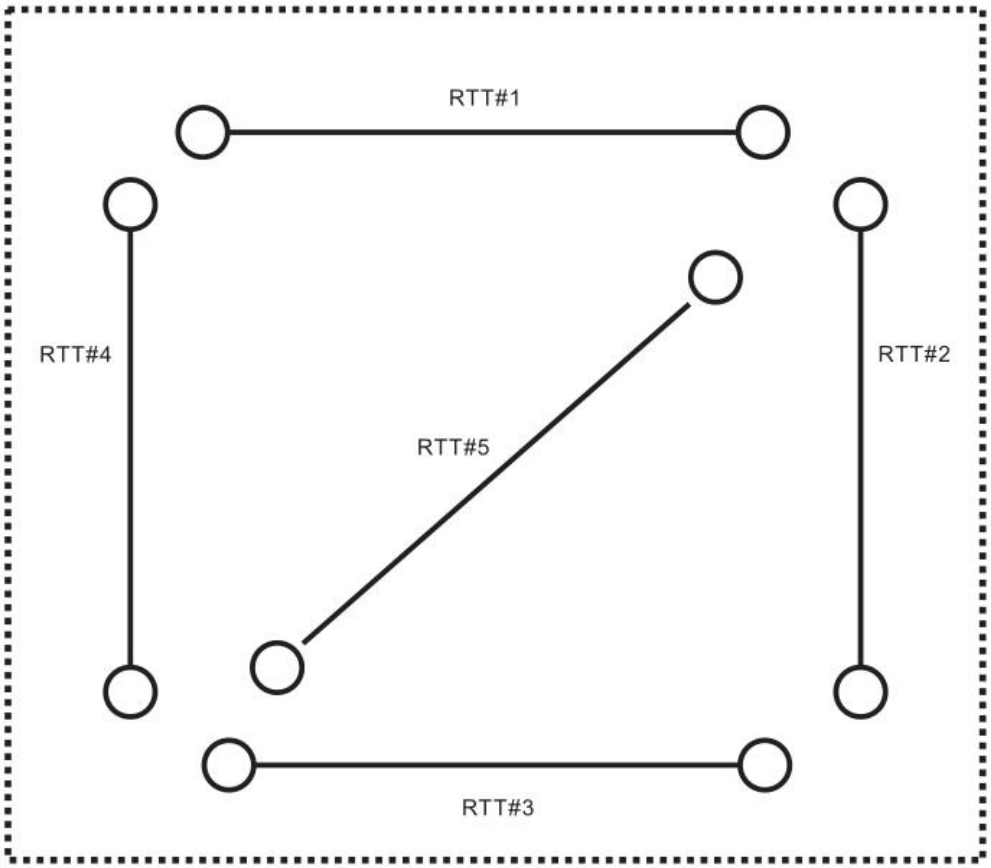
D. Be careful not to touch the probe or lead when measuring, and avoid overlap of lead, so as to make the reading more accurate.

RTT Example (Dissipative Floor Measurement)

Daily measurement is an important part of ground maintenance when the surface is coated with consumable materials. Any ground problems can be easily found by this method. The preservation of temperature, humidity and electrical performance test records can provide reference for maintenance of the ground. A good preservation record can ensure the discovery and maintenance of the ground in time.

In order to get the average measurement value of a ground, a 4’ * 4’ part and five test points (one at a time) need to be drawn in a square area. Each side of the square and the diagonal line through the center must be measured once (as shown below).

In each point-to-point (RTT) test, the 5-lb probe must be 36 inches (36 inches/91.4 cm) away, connected to the test line and instrument, and connected to a 5-lb probe at the end of each line (note the distance of 36 inches above). Press the measurement button and hold it until a value is displayed.



(RTG) Point-to-Ground Resistance Measurement Method

RTG measurements can be used to evaluate flooring, chairs, trolleys,

working surfaces and other ESD control materials and products. Recorded test results of temperature, humidity and electrical performance can provide reference.

RTG Example (Dissipative Floor Measurement)

For ground resistance measurements, S7.1 requires a minimum of 5 test points for 5,000 square feet. Connect the cable of the external probe to the instrument.

When the cable is inserted into the correct jack, the parallel probe under the instrument will be disconnected.

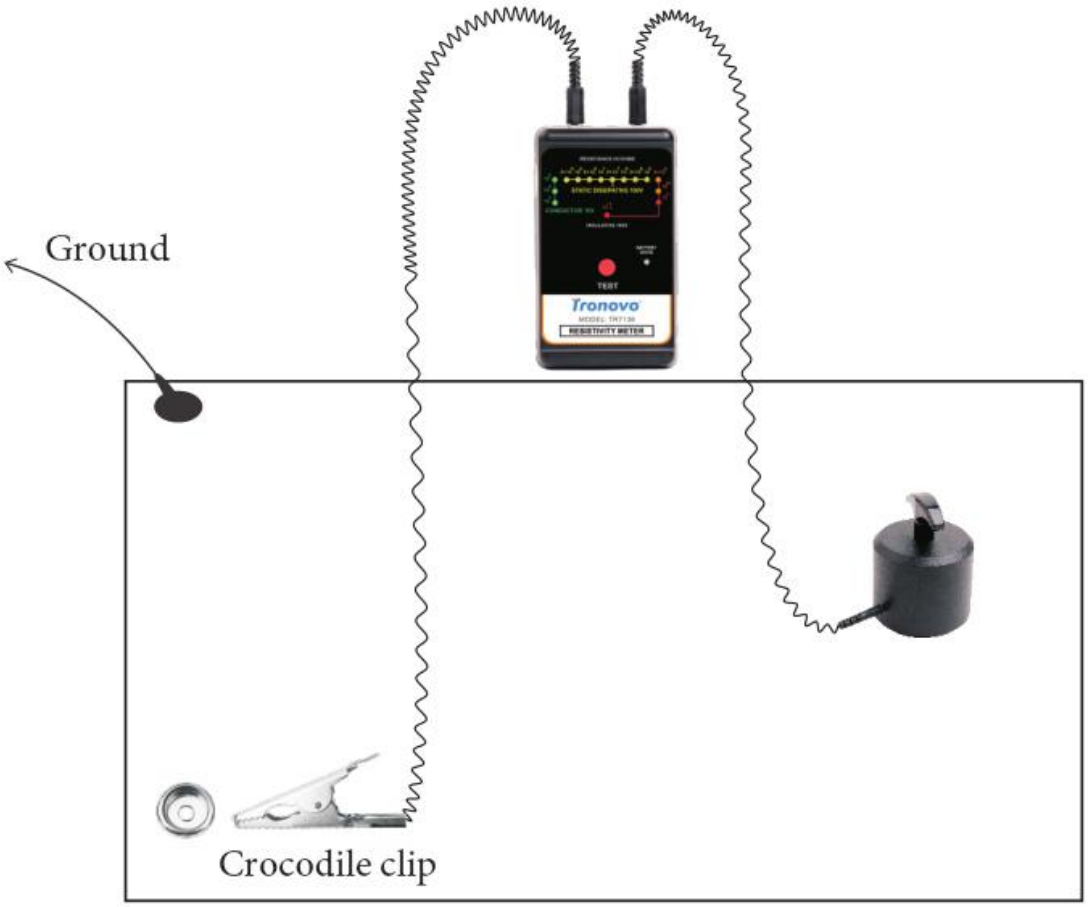
Connect a 5-lb probe to a cable and place the probe on the ground to be tested. Then connect an alligator clamp to another cable well and connect it to a ground or grounded point (RTGP). If you use a ground adapter, please insert a banana plug into the adapter.

RTG Example (Dissipative Table Mat Measurement)

A. Use point-to-ground resistance measurement to measure a work place. First connect the first cable to the instrument and connect a 5-lb probe. Then put the probe on the working table. Then connect the instrument and grounding point with the second cable. If connected to a point which can be grounded, the result is the resistance of the point can be grounded (RTGB) not ground resistance (RTG). Please use crocodile clips if necessary.

B Press the "Test" button and the value will be displayed on the LED. When measuring, we should pay attention not to touch the probe or lead and avoid overlap of lead, so that the reading can be accurate.

B. Resistance value is Ohm. Temperature and humidity should also be taken into account when recording the test value, because the environment will affect the test results.



Volumetric Resistance Measurement

Volumetric Resistance Measurement is an important data for passing the electrical property test of the material

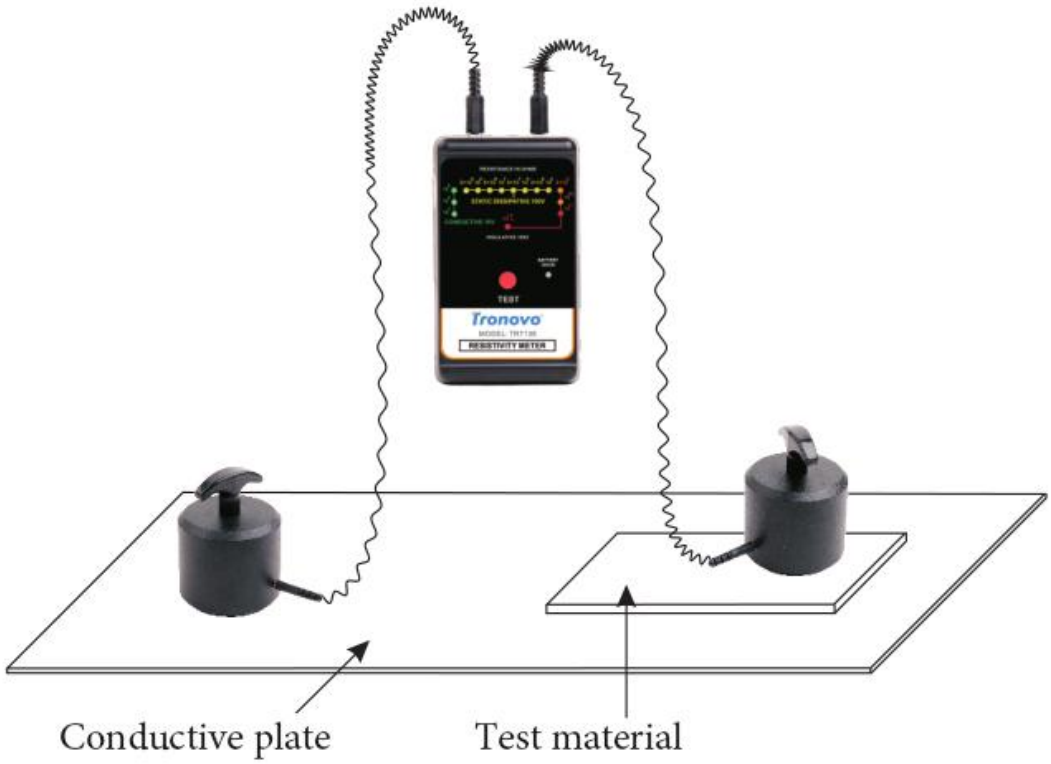
A. Connect one end of the banana test lead to the instrument socket. Connect the other end of the test coil wire to the 5-lb probe.

B. Place the sample material on a conductive metal plate (such as

stainless steel). Place a 5-lb probe on the material so that the material is sandwiched between the probe and the metal plate. (See below)

C. Place the second 5-lb probe on the conductive metal plate.

D. Press the "Test" button and the value will be displayed on the LED. (Volumetric resistance in ohms-centimeters)



Calibration description

This instrument should be calibrated every 12 months. In order to verify whether the tester is within the specification, the test resistance can be added to parallel electrodes by using the resistance decimal resistance box. Connect the two electrodes of the resistance

box to the two parallel electrodes of TR7138, adjust the resistance to 1K point, 10^3 LED of the meter will light up, and calibrate the other gears accordingly. When measuring the impedance conversion point, press the button while continuously adjusting the impedance value of the impedance bridge, and observe the impedance value of the next LED when it is always on (The value at this time is the conversion impedance value)

Product Parameters

Test range	10^3 to 10^{12}+
Dissipative range	3×10^5 to 3×10^9
Accuracy	±10%
Repeatability	±5%
Unit of measurement	Surface resistivity Per square ohm
	Resistance point to point Ohm
Connection	2 x 3.5mm plug for grounding
Power supply	9V Battery Power Supply
Size (approx.)	74mm×128mm×34mm
Weight (approx.)	103g

Testing Equipment in Use

*Decimal resistance box

* Test lead

A range from 1kΩ (10^3) to 999,999 MΩ (10^{*12}) is needed.

Connect the test lead from the decimal resistance box to the test probe of the instrument. Set the decimal box to the required resistance, that is, 10^3 = 1K, then hold down the test button of the instrument. The 10^3 LED light will be on, the 10K, 10^4 LED will be on. If you need to measure the transition point, rotate the decimal resistance while pressing the instrument test button. Record the resistance of each LED which is on (This is the conversion resistance).

Please note that the instrument has no internal components need to be adjusted, so you can verify the calibration by using the above process. If verification cannot be achieved, the instrument should be returned to the supplier.

TR7138 Resistivity Measuring Instrument

TR7138 is a lightweight pocket-type auto-range surface resistivity

measuring instrument. It is used to measure the impedance or resistance of all conductive, antistatic and electrostatic discharge surfaces.

Using Parallel Electrodes

Suitable for testing according to DIN EN100 015/1 and ASTM D257 standards.

Use with Heavy Hammer Kit (Purchased Separately)

It is suitable for testing according to IEC 61340-4-1, ANSI/ESDA STM 4.1 and ANSI/ESDA S7.1 standards.

TR7138 resistivity meter includes	*** Tester**
	*** Two telescopic connectors (audio plug to banana plug)**
Optional heavy hammer kits includes	*** Two 5-lb probes**
	*** Sponge lined portable protective box**
Measurement range	*** Resistivity: 10^3 -10^{12} Ohm/Square**
	*** Resistance: 10^3-10^{12} Ohms**
	*** Measuring Voltage: 10V and 100V**