

# Digital Surface Resistance Meter Kit Installation, Operation and Maintenance



Made in the  
United States of America



Figure 1. Desco Digital Surface Resistance Meter Kit

## Description

The Desco [19290](#) Digital Surface Resistance Meter Kit is an instrument designed to measure resistance point-to-point (Rtt) or surface to ground (Rtg).

Its test functions include:

- Resistance measurement accuracy of  $\pm 10\%$  ( $\pm 20\%$  accuracy for  $1 \times 10^{12}$  ohms and greater)
- Resistance range of  $< 1 \times 10^3$  ohms to  $> 1 \times 10^{12}$  ohms
- Under load voltages of 10 and 100 volts  $\pm 5\%$
- Electrification period of approximately 15 seconds

The Digital Surface Resistance Meter also measures ambient temperature and relative humidity. Up to 100 measurements may be stored and recalled from the meter's internal memory. This includes the resistance value, temperature, relative humidity and test voltage at the time of the measurement.

The Surface Resistance Meter is referenced and designed to be used to make measurements in accordance with the test procedures in:

- Compliance Verification - ESD TR53 - Resistance Measurements
- Worksurfaces - ANSI/ESD S4.1 Worksurfaces
- Floors - ANSI/ESD S7.1- Resistive Characterization of Materials Floor Materials
- Foot Grounders - ESD SP9.2 - Foot Grounders Resistive Characterization
- Garments - ANSI/ESD STM2.1 Garments Seating - ANSI/ESD STM12.1- Seating - Resistive Measurement
- Floor/Footwear - ANSI/ESD STM97.1 - Floor Materials and Footwear- Resistance Measurement in Combination with a Person

“A Compliance Verification Plan shall be established to ensure the Organization’s fulfillment of the technical requirements of the ESD Control Program Plan. Process monitoring (measurements) shall be conducted in accordance with a Compliance Verification Plan that identifies the technical requirements to be verified, the measurement limits and the frequency at which those verifications shall occur. The Compliance Verification Plan shall document the test methods and equipment used for process monitoring and measurements. If the test methods used by the Organization differ from any of the standards referenced in this document, then there must be a tailoring statement that is documented as part of the ESD Control Program Plan. Compliance verification records shall be established and maintained to provide evidence of conformity to the technical requirements. The test equipment selected shall be capable of making the measurements defined in the Compliance Verification Plan.” (ANSI/ESD S20.20 section 7.3)

The Digital Surface Resistance Meter and its accessories are available in the following item numbers:

Item	Description
<a href="#">19290</a>	Digital Surface Resistance Meter Kit
<a href="#">19291</a>	Digital Surface Resistance Meter
<a href="#">19292</a>	Carrying Case
<a href="#">19293</a>	Electrode Spacers, 10" and 36"
<a href="#">19294</a>	Test Leads
<a href="#">19295</a>	Handheld Electrode
<a href="#">19296</a>	Measurement Location Labels, 25 Pack
<a href="#">50003</a>	Replacement 5 lbs. Electrodes
<a href="#">50004</a>	Replacement T-Handles for 5 lbs. Electrodes
<a href="#">50005</a>	Concentric Ring Probe

## Packaging

### 19290 Digital Surface Resistance Meter Kit

- 1 Digital Surface Resistance Meter
- 2 Test Leads, 5' Length
- 2 5 lbs. Electrodes
- 1 Electrode Spacer, 10"
- 1 Electrode Spacer, 36"
- 4 AA Alkaline Batteries
- 1 Ground Plug Adapter
- 1 Gator Clip
- 25 Measurement Location Labels
- 1 Plastic Carrying Case
- 1 Certificate of Calibration



Figure 2. Desco 19290 Digital Surface Resistance Meter Kit

### 19291 Digital Surface Resistance Meter

- 1 Digital Surface Resistance Meter
- 4 AA Alkaline Batteries
- 1 Certificate of Calibration



Figure 3. Desco 19291 Digital Surface Resistance Meter

# Features and Components

## Digital Surface Resistance Meter



**A. Test Jacks:** The shielded black test lead's male SMA connector connects into the meter's female SMA connector, and the red test lead's banana plug connects into the meter's banana jack.

**B. Exponent LEDs:** These LEDs indicate the surface resistance exponent value. They are color coded for resistance decade quick checks.

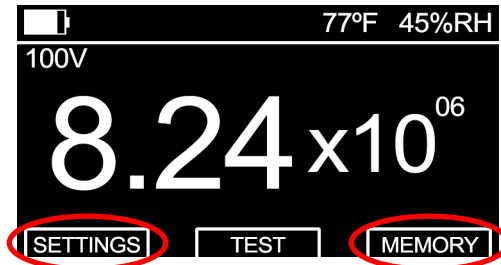
Exponent	Color
<3, 3	Yellow
4, 5, 6, 7, 8, 9, 10	Green
11, 12, >12	Red

(i.e. 8 = 10<sup>8</sup> ohms or 100,000,000 ohms).

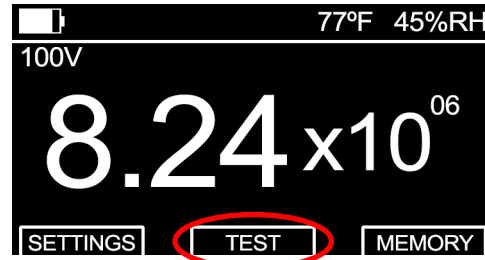
**C. OLED Display:** Displays the temperature, relative humidity, battery life, test voltage and resistance measurement.

**D. Power Switch:** Slide the switch to the left to power the meter OFF. Slide the switch to the right to power the meter ON.

**E. Black Pushbuttons:** Each black pushbutton corresponds to the prompts on the bottom-left and bottom-right of the display. These buttons are used to access the Settings and Memory Recall menus and scroll up and down between menu options.



**F. Red Pushbutton:** Corresponds to the prompts located in the bottom-center of the display. This button is used to perform tests and select menu options. Press and hold this button when in the Settings and Memory Recall menus to exit and return to the home screen.



**G. Battery Compartment:** Open this compartment to install the four AA alkaline batteries needed to power the meter. Replace the batteries once the battery icon on the display is empty.

Figure 4. Digital Surface Resistance Meter features and components

## Home / Test Results Screen

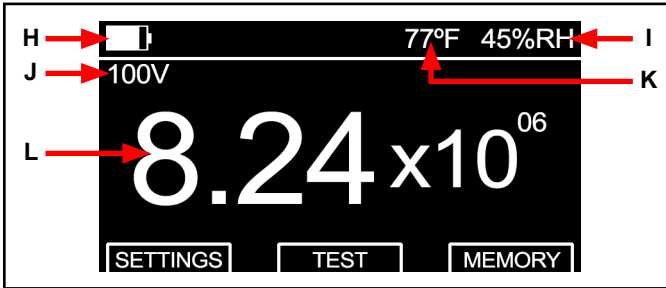


Figure 5. Home / Test Results screen

**H. Battery Life Indicator:** Displays the approximate life of the meter's 4 AA alkaline batteries.

**I. Relative Humidity:** Displays the relative humidity.

**J. Test Voltage:** Displays the test voltage used to complete the measurement.

**K. Temperature:** Displays the ambient temperature.

**L. Resistance Measurement:** Displays the resistance measurement in ohms ( $\Omega$ ).

## Settings Menu

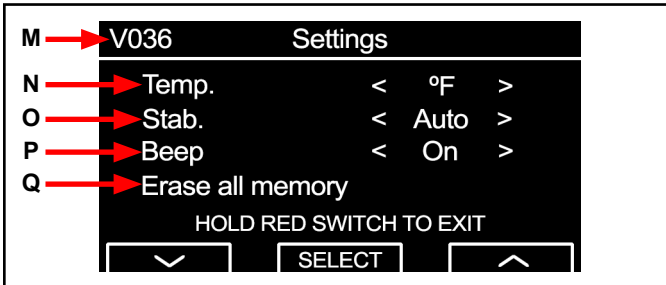


Figure 6. Settings menu

**M. Firmware Revision:** Displays the meter's firmware revision.

**N. Temperature:** Sets the unit of measurement for temperature to either Fahrenheit ( $^{\circ}\text{F}$ ) or Celsius ( $^{\circ}\text{C}$ ).

**O. Stabilization Mode:** Sets the meter's electrification period setting to either Auto and Fixed Stabilization.

Auto - Enables a 15-second electrification period when the measured resistance is  $1 \times 10^{10}$  ohms or greater to maintain test accuracy.

Fixed - Complies with ANSI/ESD S4.1 and enables a 15-second electrification period when the measured resistance is  $1 \times 10^6$  ohms or greater.

**P. Beep:** Enables and disables the audible beep when the meter's pushbuttons are pressed.

**Q. Erase all memory:** Erases all stored measurement transactions saved in the meter's memory.

## Memory Recall Menu

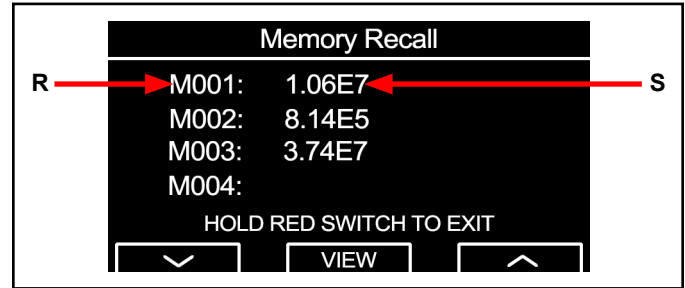


Figure 7. Settings menu

**R. Memory Slot Number:** Indicates the memory slot number.

**S. Resistance Measurement:** Indicates the resistance measurement value for the respective memory slot.

## Operation

### General Guidelines

Use both 5-pound electrodes for Resistance Point-to-Point ( $R_{tt}$ ) measurements.

Use one 5-pound electrode, and connect the black test lead to ground for Resistance-to-Ground ( $R_{tg}$ ) measurements.

Ensure that the item being measured is electrically isolated (placed on an insulative surface). The meter will measure the lowest resistance path.

Minimize crossing the test leads when possible.

When using 5-pound electrodes:

- Place them no closer than 2" from the edge of the surface being measured.
- Place them no closer than 3" to any groundable point.
- Place them about 10" apart from each other for  $R_{tt}$  measurements of a worksurface.
- Place them about 3' apart from each other for  $R_{tt}$  measurement of a floor.

Preferable electrode placements include:

- Most commonly used area of a surface
- Most worn area
- Center of surface
- Furthest area from a grounded point

If the surface to be measured has sections (i.e. floor tiles, garment panels), place the 5-pound electrodes on different sections for  $R_{tt}$  measurements.

Clean the material's surface for test lab measurements, but do not clean the surface for materials that are already installed. Only clean and re-test the installed material if failure occurs.



### Measure Resistance-to-Ground (Rtg)

Test Procedure in accordance with ANSI/ESD S4.1 section 6.4 Periodic Worksurface Testing:

1. Do not clean the surface.
2. Remove from the surface only those items that might interfere with the test. ESD sensitive devices shall also be removed.
3. Connect the black test lead to a grounded point.
4. Connect the red test lead to one 5-pound electrode, and place the electrode on the furthest convenient point on the surface.
5. Push the red pushbutton to perform a measurement. Should the 15-second electrification period appear, it may be bypassed by pushing the red pushbutton a second time.
6. Push the right black pushbutton to save the measurement, and apply an included measurement location label if desired.
7. Perform additional measurements by placing the electrode on the most commonly used or worn area.



Figure 8. Measuring the Resistance-to-Ground (Rtg) of a worksurface mat



Figure 9. Applying a measurement location label to the edge of a workstation



Figure 10. Using the Desco 19295 Handheld Electrode to measure Floor Materials and Footwear - Resistance Measurement in Combination with a Person (ANSI/ESD STM97.1)



Figure 11. Using the Desco 19295 Handheld Electrode

## Measure Resistance Point-to-Point (R<sub>tt</sub>) on the Surface

1. Do not clean the surface.
2. Remove from the surface only those items that might interfere with the test. ESD sensitive devices shall also be removed.
3. Connect both test leads to both 5-pound electrodes, and place the electrodes on the most commonly used area of the surface. Use the 10" electrode spacer to space them 10" apart from each other. The electrodes should also be 2" away from any edge and 3" away from any grounded point. If the most used area is not obvious, use two points near the center of the surface.
4. Push the red pushbutton to perform a measurement. Should the 15-second electrification period appear, it may be bypassed by pushing the red pushbutton a second time.



Figure 13. Measuring the Resistance Point-to-Point (R<sub>tt</sub>) of floor materials

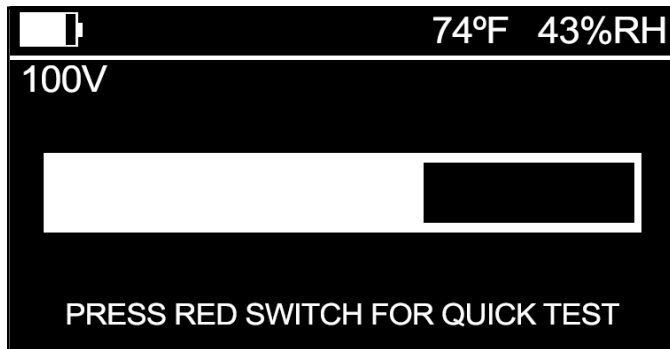


Figure 12. Electrification period timer

5. Push the right black pushbutton to save the measurement if desired.
6. Perform additional measurements by placing the electrode on the most commonly used or worn area.

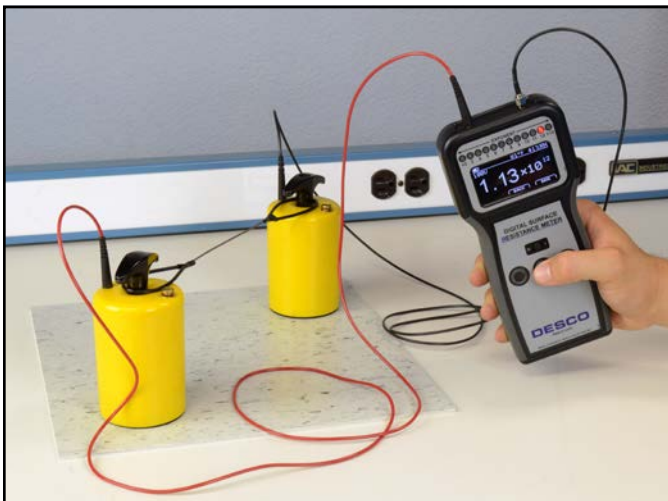


Figure 12. Measuring the Resistance Point-to-Point (R<sub>tt</sub>) of a floor tile

## Maintenance

The Digital Surface Resistance Meter requires little maintenance. There are no user serviceable parts. If the meter requires service beyond cleaning the electrodes or replacing the batteries, please contact the [Desco Customer Service](#).

### Battery Replacement

Replace the batteries once the battery life indicator is empty. Open the compartment located on the back of the meter to replace the batteries. The meter uses four AA alkaline batteries. Ensure that the batteries' polarities are oriented in the correct fashion to avoid any possible circuit damage.

### Cleaning the Digital Surface Resistance Meter

The area surrounding the test jacks at the top end of the meter should be wiped with a clean, isopropanol-alcohol moistened cloth to remove skin oils that will accumulate and affect the meter's accuracy at high resistances. The frequency of cleaning will depend on usage. Desco recommends cleaning this area once a month. Cable jackets should also be cleaned in this fashion.

### Cleaning the 5 lbs. Electrodes

Per ANSI/ESD S4.1 "Clean the electrodes with a minimum 70% isopropanol-water solution. Make sure the 5 pound electrodes' conductive pads are dry prior to use."

See specific product test standards for test lab specimen cleaning instructions. Per ANSI/ESD S4.1 Worksurfaces "The test specimens and electrodes shall be cleaned twice with a minimum 70% isopropanol-water solution using a clean, low-linting cloth each time." (Note: The item should then be conditioned for 72 hours minimum)

## Calibration

Frequency of recalibration should be based on the critical nature of those ESD sensitive items handled and the risk of failure for the ESD protective equipment and materials. In general, Desco recommends that calibration be performed annually.

In-house calibration can be performed by using  $\pm 1\%$  tolerance resistors in each of the meter's decade ranges. Connect the resistors to the test leads using clips and record the meter's display. Minimize crossing the test leads when possible. Contact [Desco Customer Service](#) should adjustments be necessary. Special equipment is required to adjust the meter.

### Required Equipment

- Digital Multimeter ( $\pm 1.25\%$  accuracy @10VDC and 100VDC)
- Resistance Decade Box with a range of  $10^3$  to  $10^{12}$  ohms ( $\pm 2\%$  accuracy @  $10^3$  to  $10^{10}$  ohms;  $\pm 5\%$  accuracy @  $10^{11}$  to  $10^{12}$  ohms)
- Thermometer ( $\pm 1^\circ\text{F}$  accuracy)
- Relative Humidity Meter ( $\pm 2\%$  accuracy)
- 99% Isopropyl Alcohol and Cleaning Wipes

### Setup

- **Test Area** - needs to be free of any high voltage transformers or power supplies and away from any type of fluorescent lighting or high power lighting.
- **Worksurface** - needs to be covered with a grounded conductive mat at  $1.0 \times 10^3$  or less.
- **Technician** - needs to be connected to equipment ground with a 0 ohm resistor in the ground cord.
- **Decade Box** - needs to be connected to equipment ground.

### Normalization of the Meter

The temperature inside the testing area needs to be  $75^\circ\text{F} \pm 3^\circ\text{F}$  ( $23.9^\circ\text{C} \pm 1.7^\circ\text{C}$ ) at 40% to 60% relative humidity. The meter needs to stay at a temperature of  $75^\circ\text{F} \pm 3^\circ\text{F}$  ( $23.9^\circ\text{C} \pm 1.7^\circ\text{C}$ ) for approximately 1 hour for proper readings. The meter cannot be normalized inside objects, enclosed boxes, containers or cases. The temperature inside an enclosed case will differ from the outside temperature. These cases will act as insulators. The meter must remain stationary in the testing area for about 1 hour without any significant changes to the temperature.

NOTE: Accuracy is measured after normalizing the meter for a minimum of 1 hour.

## Calibration Verification Procedure

1. Use only the test leads that were supplied with the meter.
2. Use 99% isopropyl alcohol to clean the two test jacks located at the top of the meter. Oil from human fingers can affect the accuracy of the meter.
3. Connect the test leads to the test jacks located at the top of the meter. Connect the opposite end of the test leads to a DC voltmeter.
4. Press the red pushbutton. The measured voltage should start at  $10\text{V} \pm 5\%$  and increase to  $100\text{V} \pm 5\%$  at the end of the test cycle.
5. Connect the test leads to the Resistance Decade Box. Apply the load resistance values indicated in the table below. The meter should display accuracy within  $\pm 10\%$  of the loaded resistance value.

Load Resistance ( $\Omega$ )	Accuracy	Display Value	Exponent LED
$1 \times 10^{12}$	+20%	$1.20 \times 10^{12}$	12
	-20%	$8.00 \times 10^{11}$	11
$1 \times 10^{11}$	+10%	$1.10 \times 10^{11}$	11
	-10%	$9.00 \times 10^{10}$	10
$1 \times 10^{10}$	+10%	$1.10 \times 10^{10}$	10
	-10%	$9.00 \times 10^9$	9
$1 \times 10^9$	+10%	$1.10 \times 10^9$	9
	-10%	$9.00 \times 10^8$	8
$1 \times 10^8$	+10%	$1.10 \times 10^8$	8
	-10%	$9.00 \times 10^7$	7
$1 \times 10^7$	+10%	$1.10 \times 10^7$	7
	-10%	$9.00 \times 10^6$	6
$1 \times 10^6$	+10%	$1.10 \times 10^6$	6
	-10%	$9.00 \times 10^5$	5
$1 \times 10^5$	+10%	$1.10 \times 10^5$	5
	-10%	$9.00 \times 10^4$	4
$1 \times 10^4$	+10%	$1.10 \times 10^4$	4
	-10%	$9.00 \times 10^3$	3
$1 \times 10^3$	+10%	$1.10 \times 10^3$	3
	-10%	$<1.0 \times 10^3$	<3

## Specifications

Resistance Ranges	1 x 10 <sup>3</sup> to 1 x 10 <sup>6</sup> ohms @ 10 Volts, complies with ANSI/ESD S4.1  1 x 10 <sup>6</sup> to 1 x 10 <sup>12</sup> ohms @ 100 Volts, complies with ANSI/ESD S4.1
Resistance Accuracy (@ 23°C, 40% R.H.)	Resistance measurements within ±10% (±20% accuracy for 1 x 10 <sup>12</sup> ohms and greater), complies with ANSI/ESD S4.1. Under load voltages of 10 Volts ±5% and 100 Volts ±5% exceeds requirements of ANSI/ESD S4.1
Temperature Accuracy	±10%
Relative Humidity Accuracy	±10 integers
Power Supply	4 AA alkaline batteries
Battery Life	Approximately 1,500 measurements
Display	OLED, 2.7" diagonal, 128 x 64 pixel resolution
Memory Capacity	100 measurements
Operating Temperature	41°F to 85°F (5°C to 30°C)
Environmental Requirements	Indoor use only at altitudes less than 6500 ft. (2 km)  Maximum relative humidity of 80% up to 85°F (30°C)
Dimensions (meter)	3.94" x 8.27" x 1.26" (100 mm x 210 mm x 32 mm)
Dimensions (carrying case)	15.0" x 14.5" x 3.5" (381 mm x 368 mm x 89 mm)
Weight (meter with batteries)	0.9 lbs (0.4 kg)
Weight (populated carrying case)	13.0 lbs (5.9 kg)
Country of Origin	United States of America

### Limited Warranty, Warranty Exclusions, Limit of Liability and RMA Request Instructions

See the Desco Warranty - [Desco.com/Limited-Warranty.aspx](http://Desco.com/Limited-Warranty.aspx)