

# 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 Kit (or its Meter) is referenced and designed to be used to make measurements in accordance with the test procedures in:

- Working surfaces, storage racks, trolleys and seating - IEC 61340-2-3
- Flooring - IEC 61340-4-1
- Garments - ANSI/ESD STM2.1 Garments
- Person/footwear / flooring system - IEC 61340-4-5

"A compliance verification plan shall be established to ensure the organization's fulfilment of the requirements of the 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 used for process monitoring and measurements. If the organization uses different test methods to replace those of this standard, the organization shall be able to show that the results achieved correlate with the referenced standards. Where test methods are devised for testing items not covered in this standard, these shall be adequately documented including corresponding test limits. 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." (EN 61340-5-1 clause 5.2.4 Compliance verification plan)

## Reference Literature

In addition to those noted above:

EN 61340-5-1 Electrostatics and PD CLC/TR 61340-5-2 User Guide Electrostatics

These documents can be obtained from British Standards at [www.bsigroup.com](http://www.bsigroup.com).

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, 25 cm and 91 cm           |
| <a href="#">19294</a>  | Test Leads                                   |
| <a href="#">19295</a>  | Handheld Electrode                           |
| <a href="#">19296</a>  | Measurement Location Labels, 25 Pack         |
| <a href="#">222634</a> | Replacement 2.27 kg Electrodes               |
| <a href="#">50004</a>  | Replacement T-Handles for 2.27 kg Electrodes |
| <a href="#">222002</a> | Concentric Ring Probe                        |

## Packaging

### [19290](#) Digital Surface Resistance Meter Kit

- 1 Digital Surface Resistance Meter
- 2 Test Leads, 1.5 m Length
- 2 2.27 kg Electrodes
- 1 Electrode Spacer, 25 cm
- 1 Electrode Spacer, 91 cm
- 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



Figure 4. Digital Surface Resistance Meter features and components

**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 colour coded for resistance decade quick checks.

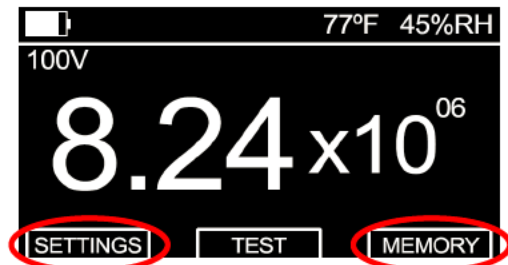
| Exponent             | Colour |
|----------------------|--------|
| <3, 3                | Yellow |
| 4, 5, 6, 7, 8, 9, 10 | Green  |
| 11, 12, >12          | Red    |

(i.e. 8 =  $10^8$  ohms or 100,000,000 ohms).

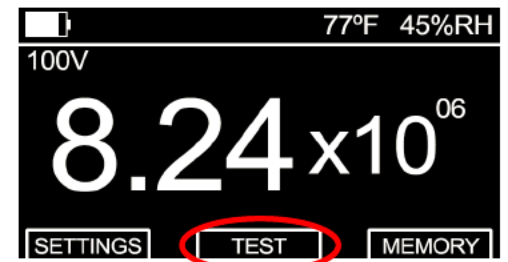
**C. OLED Display:** Displays the temperature, relative humidity, battery life, test voltage and resistance measurement.

**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-centre 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.



## Home / Test Results Screen

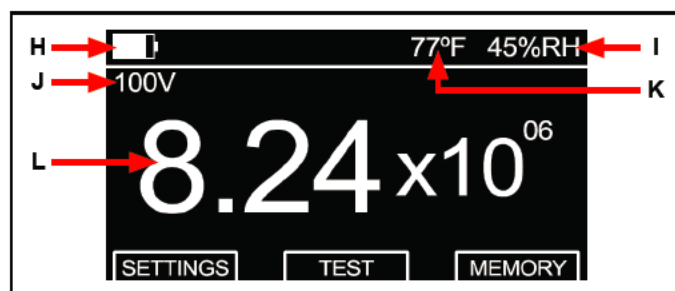


Figure 5. Home / Test Results screen

**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

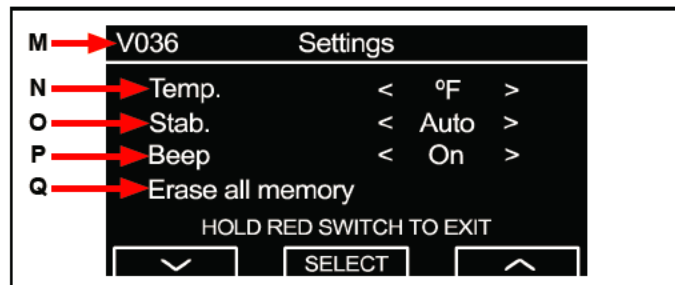


Figure 6. Settings menu

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

**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 EN 61340-2-3 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

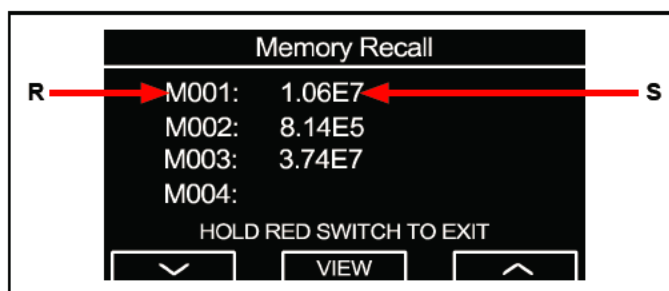


Figure 7. Settings menu

**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 2.27 kg electrodes for Resistance Point-to-Point (Rtt) measurements.

Use one 2.27 kg electrode, and connect the black test lead to ground for Resistance-to-Ground (Rtg) measurements.

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

Minimise crossing the test leads when possible.

When using 2.27 kg electrodes:

- Place them no closer than 5 cm from the edge of the surface being measured.
- Place them no closer than 8 cm to any groundable point.
- Place them about 25 cm apart from each other for Rtt measurements of a worksurface.
- Place them about 91 cm apart from each other for Rtt measurement of a floor.

Preferable electrode placements include:

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

If the surface to be measured has sections (i.e. floor tiles, garment panels), place the 2.27 kg electrodes on different sections for Rtt 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 IEC 61340-2-3 and EN 61340-5-1 Table 3 Note 2 "The test methods in the compliance verification column refer to the basic test procedure only. It is not expected that the test method will be followed in its entirety."

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 2.27 kg 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 (IEC 61340-4-5)

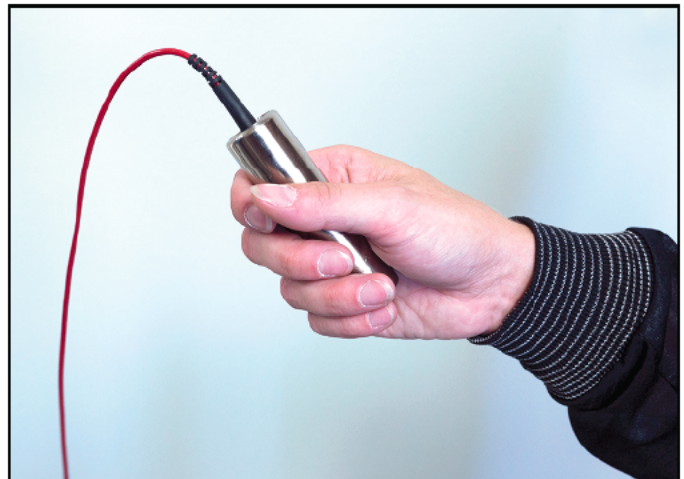


Figure 11. Using the Desco [19295](#) Handheld Electrode



### 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 2.27 kg electrodes, and place the electrodes on the most commonly used area of the surface. Use the 25 cm electrode spacer to space them 25 cm apart from each other. The electrodes should also be 5 cm away from any edge and 8 cm 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.

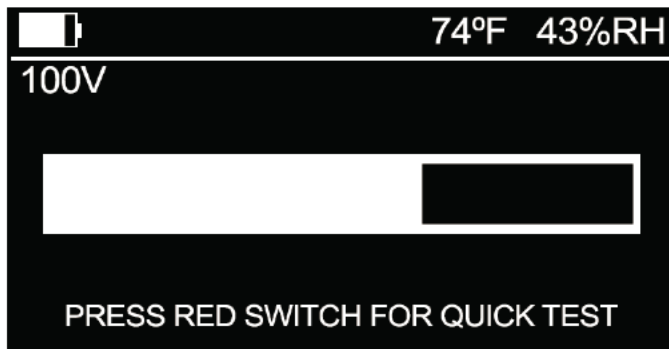


Figure 12. Electrification period timer

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.

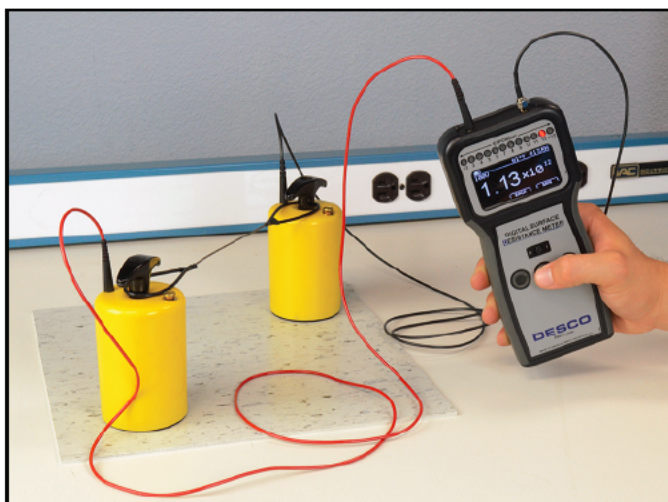


Figure 12. Measuring the Resistance Point-to-Point (R<sub>tt</sub>) of a floor tile



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

### 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

#### 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 Europe recommends cleaning this area once a month. Cable jackets should also be cleaned in this fashion.

#### Cleaning the 2.27 kg Electrodes

Clean the electrodes with a minimum 70 % isopropanol-water solution. Make sure the 2.27 kg electrodes' conductive pads are dry prior to use.

## 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 Europe 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. Minimise crossing the test leads when possible.

[Customer Service](#) should adjustments be necessary. Special equipment is required to adjust the meter.

### Required Equipment

- Digital Multimeter ( $\pm 1.25\%$  accuracy @10 VDC and 100 VDC)
- 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.

### Normalisation 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 normalised 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 normalising the meter for a minimum of 1 hour.

### Calibration Verification Procedure

- Use only the test leads that were supplied with the meter.
- 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.
- 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.
- 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.
- 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                        | <p>1 x 10<sup>3</sup> to 1 x 10<sup>6</sup> ohms @ 10 Volts, complies with EN 61340-2-3</p> <p>1 x 10<sup>6</sup> to 1 x 10<sup>12</sup> ohms @ 100 Volts, complies with EN 61340-2-3</p>                                 |
| 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 EN 61340-2-3. Under load voltages of 10 Volts ±5 % and 100 Volts ±5 % exceeds requirements of EN 61340-2-3 |
| 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               | <p>Indoor use only at altitudes less than 6500 ft. (2 km)</p> <p>Maximum relative humidity of 80 % up to 85 °F (30 °C)</p>  |
| Dimensions (meter)                       | 3.94" x 8.27" x 1.26"<br>(100 mm x 210 mm x 32 mm)  |
| Dimensions (carrying case)               | 15.0" x 14.5" x 3.5"<br>(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