# The Essential Guide

# How to Use an Anti Static Mat

ELIMSTAT

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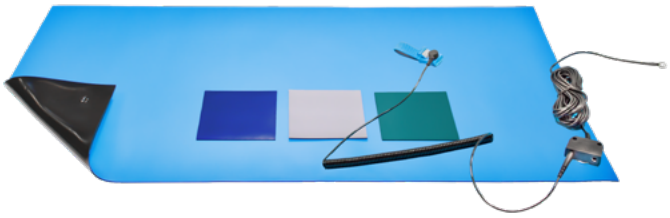

ELIMSTAT

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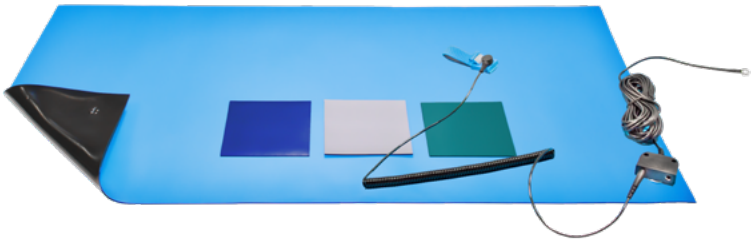
# What is an Anti Static Mat?

"The single most important concept in the field of static control is grounding. Attaching all electrically conductive and dissipative items in the workplace to ground allows built-up electrostatic charges to equalize with ground potential. A grounded conductor cannot hold a static charge." **- ANSI / ESD S6.1-2014**

Anti Static Mats are placed over tables and shelves to dissipate static charges from those work surfaces.

In practice, most anti static mats are **"grounded"** to ensure that there is no risk of electricity becoming static on the top surface of the mat.

**Electrical outlets** are normally the best ground for a mat in any building. This is because the wiring of outlets typically follows the piping of the building to earth underneath the building.



The **top surface** is static dissipative.

The **bottom surface** is impregnated with carbon which is why it is black.

Since **carbon is conductive**, if the mat is laid on a conducting surface static will travel through the mat to ground.


A material is conductive if it offers less than $1 \times 10^6$ ohms of resistance.

A material is static dissipative if it offers between $1 \times 10^6$ and less than $1 \times 10^{12}$ ohms of resistance.

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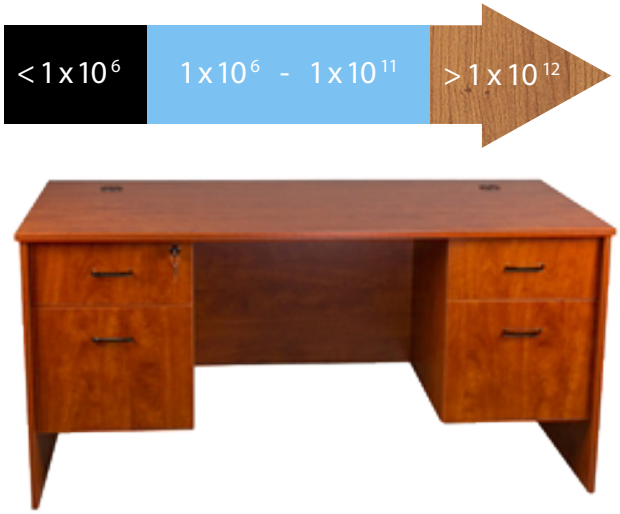
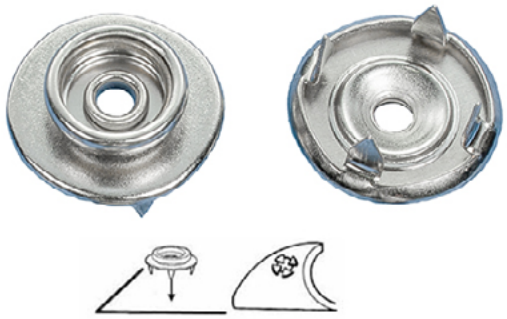
# Snaps

A material is insulative if it has greater than $1 \times 10^{12}$ ohms of resistance.

Common insulators are carpets, glass, floor paints, plastics, and wood.

Insulating materials cause static to build up on work surfaces and contribute to electrostatic discharges (ESD) being created.



**4730 Series Snaps are pushed into mat and their prongs are bent inwards to secure to mat.**

**4732 Series Snaps are installed on mats by punching a hole through mat and screwing on a socket or stud, whichever is preferred.**

If an anti static mat is **isolated from electrical ground** by insulators (carpets, painted floors, or tables) you need to connect it to an electrical outlet by using a **grounding cable**.

First, you install metal snaps onto your anti static mat. Some mats are pre-installed with snaps. Snaps are typically either push-in or sold as a kit.

The snap is where you will connect the grounding cable. The conductivity of the snap will **create a dedicated path** for static to travel off the mat and into the cable.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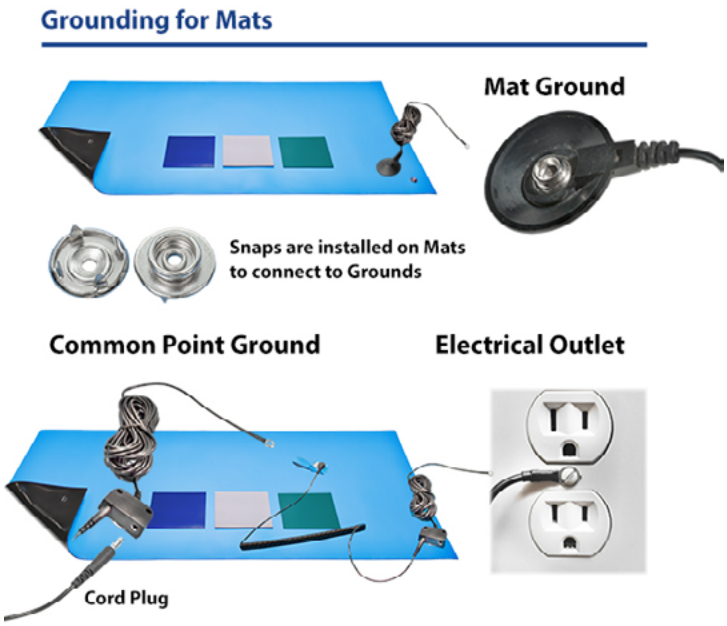
# Grounding Cables

There are two primary types of grounding cables you can use to connect an anti static mat to an electrical outlet.

A mat ground is used to ground the mat separately from other surfaces.

A common point ground is used to ground the mat and a wrist strap at a common point.

Grounding cables made in the United States typically end in an "eyelet" - a #10 ring terminal- to screw directly into a standard US electrical outlet.


Grounding cables typically come with **1 meg ohm ($1 \times 10^6$ ohms) resistors** to ensure that electricity moving through them is always traveling at a static dissipative rate.

The purpose of the resistor is to slow down an electrostatic discharge event (ESD) from a highly charged ungrounded surface from discharging instantaneously through the cord.

The resistor slows down ESD a few more milliseconds than if it were not present.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# Continuous Monitors

"Typical Test programs recommend that wrist straps that are used daily should be tested daily. However, if the products that are being produced are of such value that knowledge of a continuous, reliable ground is needed, then continuous monitoring should be considered or even required." **- ANSI / ESD TR20.20 5.3.2.4.4**

A continuous monitor is an alternative to using mat grounds, and common point grounds.

Monitors are used to guarantee the ground connection of an anti static mat and a wrist strap.

They audibly and visually alert you when the mat or the wrist strap is not grounded.

"Wave Distortion" or vector impedence, is the most reliable technology for continuous monitoring of wrist straps.

It works by applying a continuous test voltage to the wrist strap and monitoring the distortions.


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# Testing Anti Static Mats

"The degree of protection afforded by a worksurface is strongly related to the time needed to discharge an object.... [R]esistance seems the best single predictor of performance of ESD-protective worksurfaces."
**- ANSI / ESD S4.1-2006**

The standard used internationally to test anti static mats is ESD Association Standard Test Method (STM) 4.1-2017 "Worksurfaces-Resistance Measurements".

It recommends two tests - resistance measured top-to-top (RTT), and resistance measured top-to-ground (RTG).

The resistance top-to-top test measures whether or not the mat is static dissipative on its top surface.

The resistance top-to-ground test measures whether or not the mat is conducting to ground at a static dissipative rate.

To perform these tests you would use an ESD Resistance Meter.

The meter will charge voltage through the mat to measure its resistance.

**ANSI / ESD S4.1** "Worksurfaces - Resistance Measurements"

**Point to Point Test**
**> 1 x 10⁶ Ohms of ESD Resistance**

**Test Method:**
**ESD S4.1**
**6.4.3**


**ANSI / ESD S4.1** "Worksurfaces - Resistance Measurements"

**Resistance to Groundable Point Test**
**< 1 x 10⁹ Ohms of ESD Resistance**

**Test Method:**
**ESD S4.1**
**6.4.2**


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