

Guidelines to Ergomat anti-fatigue mats in ESD protected areas



NOTICE! This publication is a guideline.

The customer/user is responsible for the correct handling and installations in ESD protected areas as only he/she knows the existing conditions in the work-place. The supplier of the mat can only give guidance

What is ESD?

Static electricity is a stationary electrostatic charge.

It occurs in several ways; by friction between two materials, separation of materials (e.g. tearing off tape) or flow and evaporation (between liquids/gasses and surfaces).

Electrostatic discharge (ESD) is the transfer of an electrostatic charge between two objects. This is a very rapid event that happens when two objects of different potentials come into direct contact with each other.

One of the main causes of device failures in the electronic manufacturing industry is ESD.

The Electro Static Process

The process of “Charging (generating) – Storage – Discharge” is called the Electro Static Process.

Charging and storage of electro static charges cannot be avoided. But the speed, at which the discharge happens, can be influenced.

The electrical resistance of material is important for its faculty of conducting an electrical charge and with this the speed for discharge.

The speed for discharge is decisive. If the discharge happens too fast a short but very heavy heating of possible electronic parts happens, and a short-circuit takes place. If discharge happens too slowly you risk that the charge is built-up further or finds another discharge way.

To control ESD the disagreeable charges have to be dissipated constantly so they do not get too strong.

This can be done in several ways:

- Earthed bracelets.
- Conductive floors and earthed floor coverings.
- Conductive shoes to be worn on conductive floors.
- Earthed work tables and chairs.

Conductive work surfaces

The basic purpose of conductive work surfaces is to provide a surface that is free of static charge and also is capable of removing the static charge from conductive items placed on it. How capable the work surface is to remove the static charge will depend on the electrical resistance in the material.

Materials are generally grouped as follows:

Conductive:	$R < 10^4 \Omega$	(< 10 kilo Ω)
Dissipative/Static dissipative:	$R = 10^4 - 10^9 \Omega$	(= 10 kilo Ω - 1 Giga Ω)
Antistatic:	$R = 10^9 - 10^{12} \Omega$	(= 1 Giga Ω - 1 Terra Ω)
Insulating:	$R > 10^{12} \Omega$	(> 1 Terra Ω)

Measuring electrical resistance

Basically there are two ways of measuring the electrical resistance in work surfaces.

The point-to-point-resistance is the resistance in ohms measured between two electrodes placed on the surface.

The resistance-to-ground is the resistance in ohms between a single electrode placed on the surface and ground.

The resistance is measured at 100VDC. When the test voltage is applied the electrical resistance is recorded after it has stabilized or after 15 seconds has elapsed.



General guidelines regarding electrical resistance in work surfaces

- At low air humidity larger electro static tensions are loaded than at high air humidity
- The larger the relative air humidity, the larger discharge of static electricity will take place through the air (water is a conductive material)
- If the mats get stained with a liquid, it is the conductive ability / resistance of this one that decides the measured resistance – especially for measuring of point-to-point-resistance

Ergomat anti-fatigue ESD mats

Ergomat produces the following types of anti-fatigue mats suitable for use in ESD protected areas.

Model:	Electrical point-to-point-resistance:
ERGOMAT® EFB	$1 \times 10^8 - 6 \times 10^8 \Omega$
ERGOMAT® EFS	$1 \times 10^8 - 6 \times 10^8 \Omega$
ERGOMAT® Nitril ESD	$5 \times 10^4 - 1 \times 10^7 \Omega$
ERGOMAT® Nitril CON	$5 \times 10^2 - 1 \times 10^5 \Omega$
ERGOMAT® Plano ESD	$5 \times 10^4 - 1 \times 10^7 \Omega$
ERGOMAT® Plano CON	$5 \times 10^2 - 1 \times 10^5 \Omega$

These mats are all certified after the European **IEC 61340-65-1** standard which specifies that the resistance from ground to the mat surface must not be more than $1 \times 10^9 \Omega$ equal to one Giga Ω at any area of the mat.

The values for electrical resistance stated above for the mats are all point-to-point-resistance and can not be directly compared with the 1 Giga Ω resistance-to-ground level stated in IEC 61340-65-1.

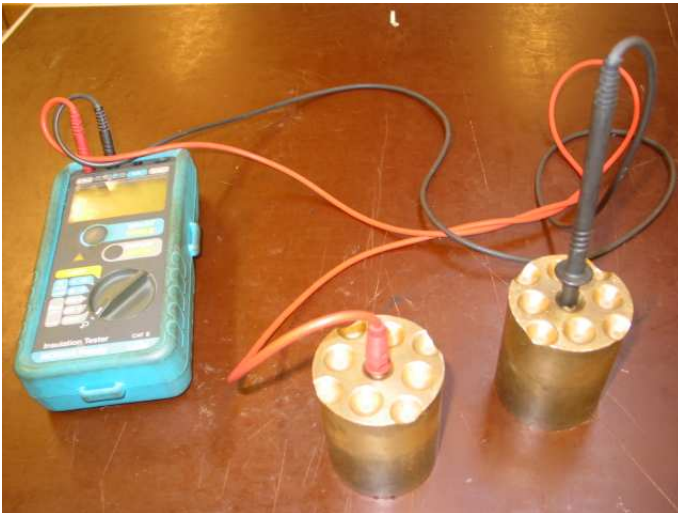
Measurement of point-to-point-resistance in ERGOMAT® ESD mats



Before measurement the mat is cleaned properly and allowed to air dry.

A rubber mat contains wax which over time might extract from the mat and form an isolating film on top of the mat. Other residues like dirt or other substances will have the same effect.

By using a degreasing cleaner that does not harm the mat (eg. isopropylalcohol) any isolating layers that may be on top of the mat will be effectively removed.



The measurements are done with an Isolator Tester “Norma Handy” and two conductive brass electrodes (2.27 kg., Ø65mm) following the guidelines in ESD STM7.1-2001.

Before measurement the electrodes are cleaned properly and allowed to air dry.



The electrodes are placed at the measurement points on the upper side of the mat.

Each 60x90 cm. mat has 12 pre-defined measurement points.



The measured value is recorded directly from the display.

If the values are too high then repeated cleaning of the mat is recommended before measuring again.

Installation of ESD mats

In addition to electrical or electrostatic properties, other factors may be important in the selection, application, installation or performance of working surfaces like an anti-fatigue ESD mat. Chemical resistance, durability, humidity dependency, maintenance and footwear may directly or indirectly affect the ESD performance of the mat. The importance of these factors and others is strongly dependent on the specific installation, and the types of products and devices being handled.

If ESD mats are used on a conductive floor the mats can be placed directly on the floor.

When ESD mats are placed on a non-conductive floor then it is important that the mats are properly connected to ground.

This can be done in many different ways. Ergomat recommends that an adhesive 5 cm. conductive copper foil is used. The copper foil should be glued to the floor under the mats in two parallel lines and properly connected to ground. The mat is placed directly on top of the conductive copper foil.



An installation like this should assure that that mat is grounded in a proper way.



NOTICE! After installation the electrical resistance must be measured to assure the performance of the mat. In the same way a periodically maintenance of the whole installation is necessary to assure that the performance is kept.

If the user is not familiar with installation and maintenance of ESD equipment external expertise is required to make correct installation and maintenance routines.

Cleaning

Mats should be periodically cleaned with a detergent and water solution. To reduce the possibility of leaving a residue, detergents (rather than soaps) should be used.

Normally, only a cloth that is thoroughly wetted with the detergent solution is needed to wipe off the mat; however, hardened stains may require brushing with a semi rigid bristled brush. The wiping or brushing action should be in a circular motion to ensure removal of the particles from the surface depressions. Extremely soiled mats may require several repeated cleanings with a water rinse between each cleaning. The water rinse should consist of wetting a cloth with clean water and wiping the surface to remove loosened dirt and detergent.

The final step should be to use a cloth dampened with isopropanol and wipe the mat to remove any organic contamination as well as the residual detergent.



NOTICE! The mats must be wiped dry after cleaning and be allowed to air dry completely.

Regardless of the technique used to clean the mats, the previously described resistance measurement should be monitored to verify that the mat is functional. Performance of the mats should be periodically monitored to assure that correct maintenance procedures are followed.

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