T1-140:
Standard for Handling Conductive Mat

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PRODUCTION DEPARTMENT

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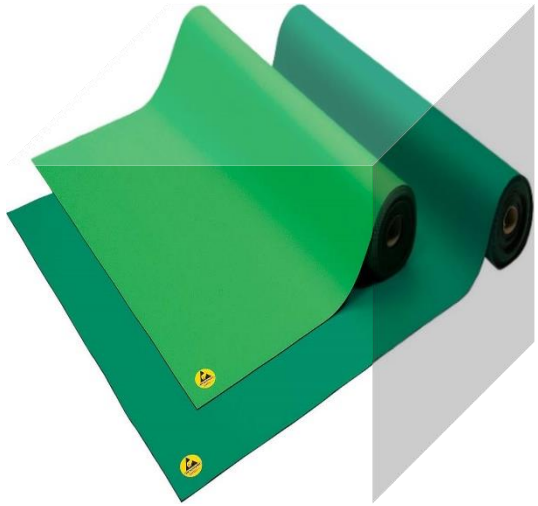
① Purpose of “Standard for Handling Conductive Mat“

Purpose

To **specify methods for selection and installation of conductive mats**, thereby facilitating stable production quality.



② Definition of Terms

1. Compliance Rules

The requirements mentioned under **Compliance Rules** shall be strictly followed to adhere to the standard. Ensure that such requirements will not be violated.

2. ESD protective grounding line

A grounding line installed to prevent electrostatic discharge (ESD)

② Definition of Terms

3. Wrist strap

Used to ground the human body and consisting of a band and a cord.

4. Dielectric resistance tester

This tester is used to measure a resistance exceeding the measurable range of other instruments. It is determined from the resistance of a circuit whether the circuit is insulated from the ground and other circuits.

② Definition of Terms

5. Conductive mat

An electrically conductive mat that discharges the static electricity built up in the human body, products and tools through a ground plane. Static electricity dispersive materials are used on the surface, and static electricity conductive materials are used on the back.

6. Surface resistivity

The electrical resistance measured between opposing sides of a square and expressed in Ω. In this standard, the surface resistivity is referred to as: electric conductivity if 1 x 102 or higher but lower than 1 x 105 [Ω], electric dissipativity if 1 x 105 or higher but lower than 1 x 1011 [Ω], or dielectric resistance if 1 x 1011 or higher JIS K 6911 should be consulted for the surface resistivity measurement method.

② Definition of Terms

7. Conductive material

A rubber, plastic or similar material mixed with carbon to improve the electric conductivity and used for electrically conductive polyethylene bags, returnable containers, etc. (See T1-103 “Standard for Electronic Component Packaging.”)

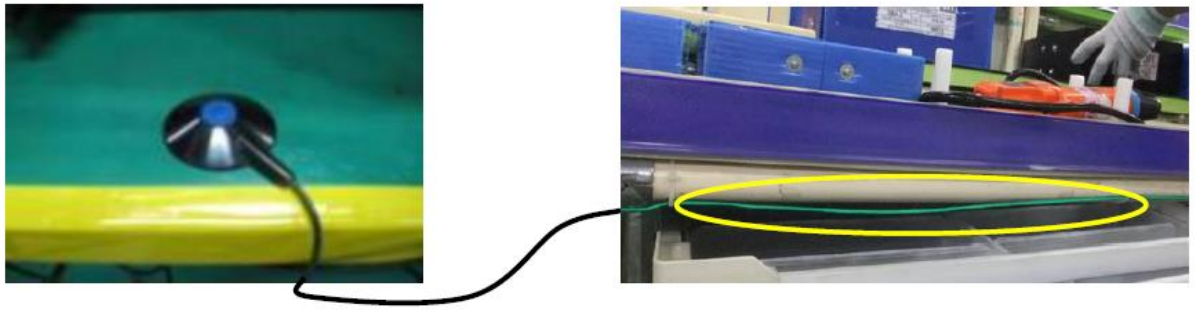
8. Antistatic material

A film or another material coated with an organic compound to make its surface hydrophilic and ionic. It prevents frictional charging and is used for antistatic foamed sheets, antistatic compound film bags, etc. Its surface resistivity must be 1013 Ω or lower. (See T1-103 “Standard for Packaging Electronic Components.”)

② Definition of Terms

9. Grounding cable

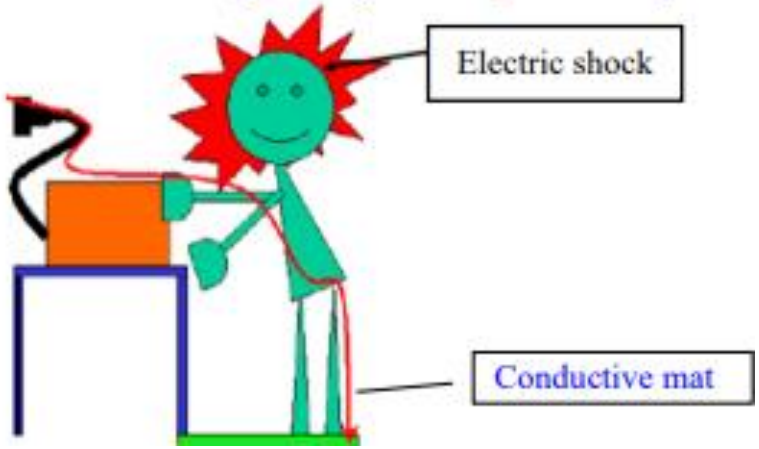
A ground connecting cable.



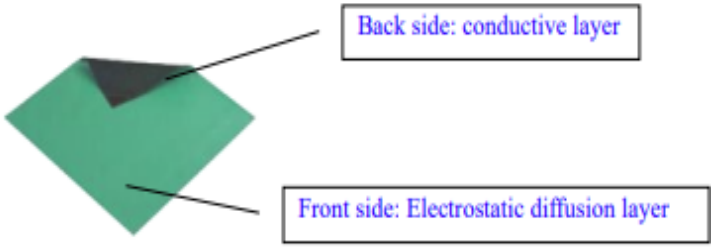
③ Selection of Conductive Mats

- Conductive mats have various kinds of structures and should be selectively used according to the location and purpose.
- Double-layer mats each consisting of a hard rubber coated with an antistatic material at its top and a conductive material at its back are frequently used.
- Fiber-reinforced ones for reduced elasticity and shock absorbing ones for improved operability are also available

<Insulation withstand voltage testing not accepted example>



A conductive mat offered by HOZAN



③ Selection of Conductive Mats

brother at your side

3.1 When using a conductive mat on a workbench or part shelf

- Discharging the static electricity built up in products, parts and tools during the work through the conductive mat and grounding cable to prevent damage from electrostatic discharges requires selection of an appropriate conductive mat.

3.2 When using a conductive mat on a floor

The conductive mat should be selected with attention not only paid to:

- wear resistance and durability,
- easiness to clean,
- color fitness to the working environment, and
- reasonableness.

④ Installation of Conductive Mats

4.1 Connection with the grounding cable

(1) The conductive mat must be securely connected with an ESD protective grounding line.

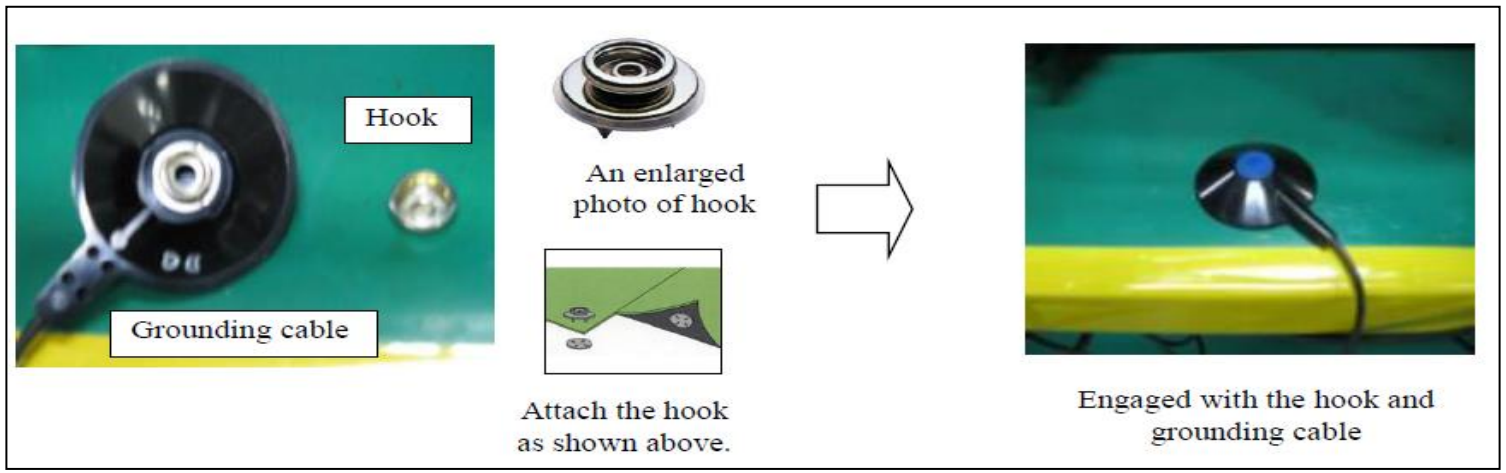
(2) Install grounding wires connected to conductive mats in a location that does not interfere with work or inspection.

④ Installation of Conductive Mats

Examples of conductive mat grounding methods are listed below with cautionary notes.

Example 1: Connection using a hook

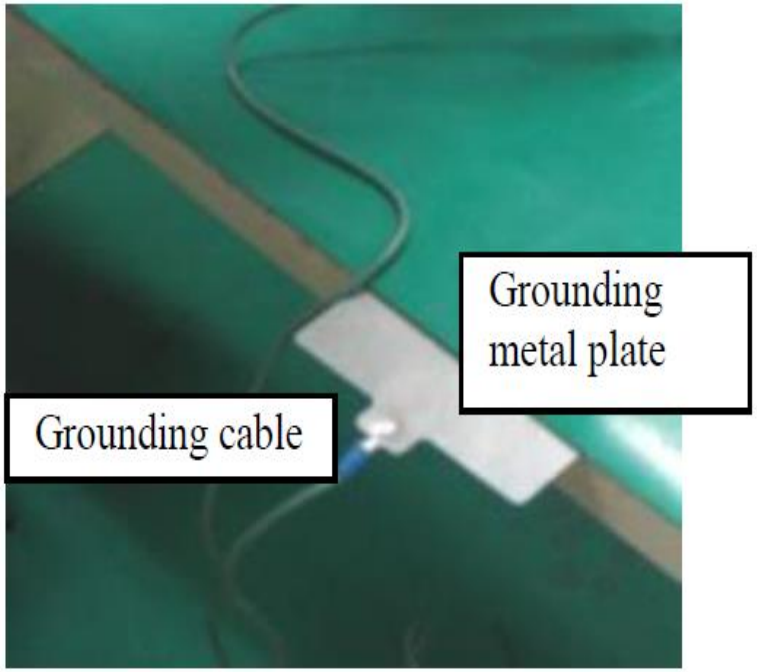
❖ A hook is attached to the conductive mat and connected with a grounding cable. The hook shape depends on the manufacturer and should be confirmed in advance to ensure that the conductive mat will be completely engaged with the hook and grounding cable.



④ Installation of Conductive Mats

Example 2: Connection using a grounding metal plate

❖ A grounding metal plate is brought into contact with the conductive material at the back of the conductive mat. It is visible from the outside in the left photo but, in the reality, should be covered with the mat to ensure reliable connection.



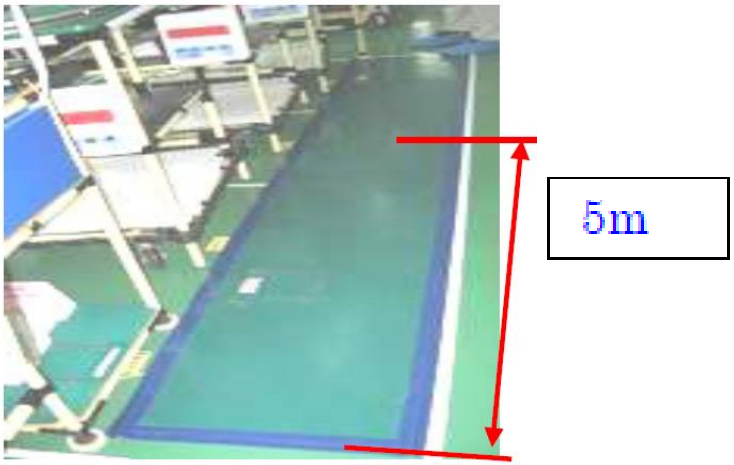
❖ The grounding metal plate is slippery and preferably fixed with a double-sided adhesive tape. Do not attach the tape to the conductive mat.

❖ To connect the conductive mat securely to the grounding metal plate, do not place paper or other items between the conductive mat and work bench.

④ Installation of Conductive Mats

Example 3: Connection from multiple points

❖ When the conductive mat is long, multiple grounding cables should be installed at intervals of about 5 meters to avoid a hazardous situation in case of a cut wire.



(2) By installing the grounding wire in a location that does not interfere with work or inspection, it is possible to improve efficiency of work, ensure safety and prevent troubles or accidents.

④ Installation of Conductive Mats

4.2 Location of conductive floor mat

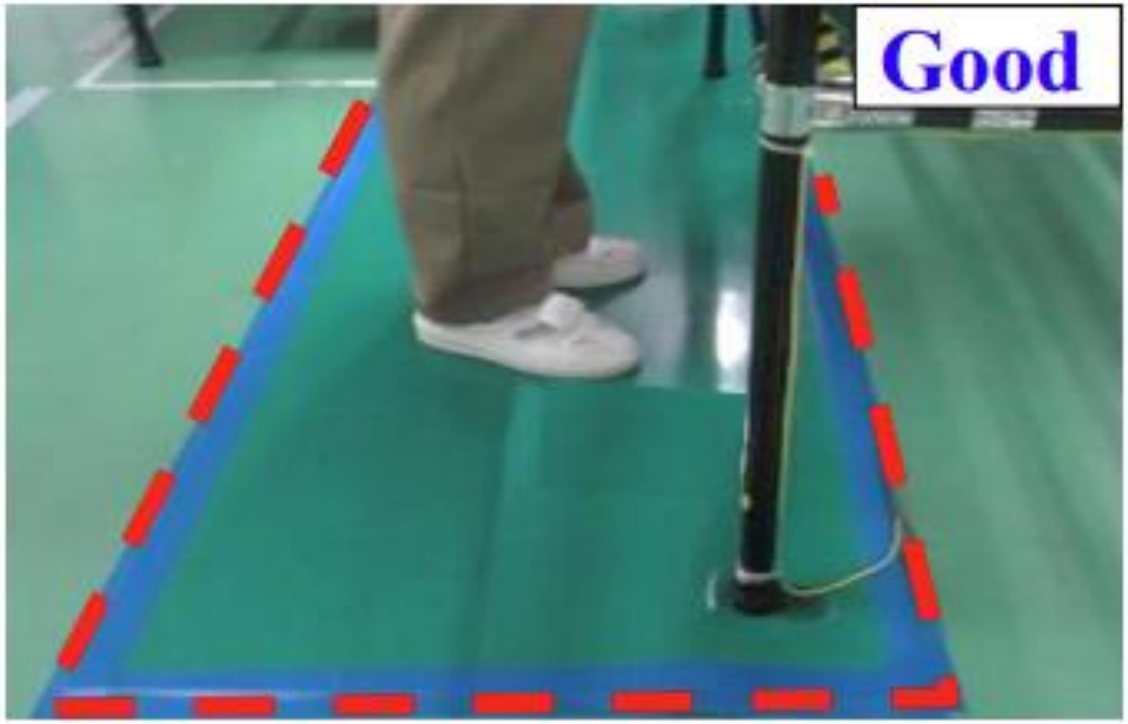
- (1) Wear a pair of antistatic shoes when using a conductive mat on the floor.
- (2) Locate the conductive mat to prevent the operator's toes from protruding from the mat.
- (3) Ground the conductive mats to the floor so they do not overlap.
- (4) Secure so they do not move when installing the conductive mat to the floor

The mat is located with its edge 10 to 15 cm inward from the front of the workbench so that toes of antistatic shoe will not protrude from the mat.

The conductive mat is located with its edge outside the front of the workbench to allow toes of antistatic shoes to protrude from the mat and make the electric connection instable.

⑤ Working on the Conductive Mat

- If the operator stands on his/her toes, the static electricity in his/her body even inside the conductive mat will not be discharged and the mat will be of no use. The operator should keep his/her shoes in contact with the conductive mat during the work.



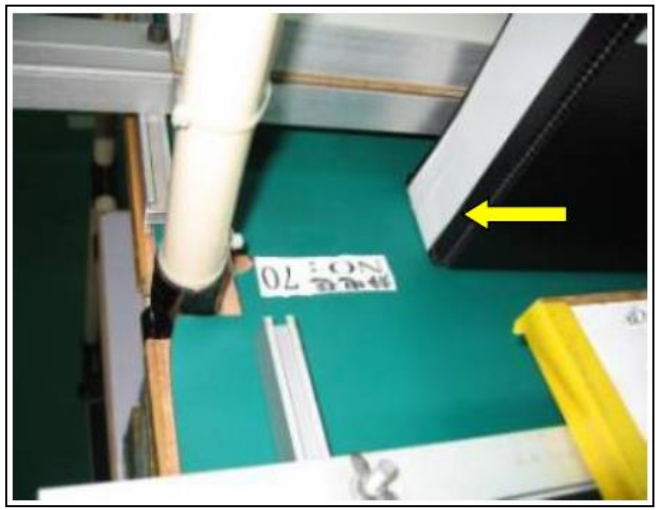
⑥ Inspection and maintenance of Conductive Mats

6.1 Identification

Conductive mats should be numbered for identification.

- Conductive mats need to be regularly checked for adequate performance.
- An ID number label should be attached to each conductive mat in such a manner that it will not peel off or fade away. The mat should be regularly checked according to the ID number.

Example of indication of conductive mat ID number



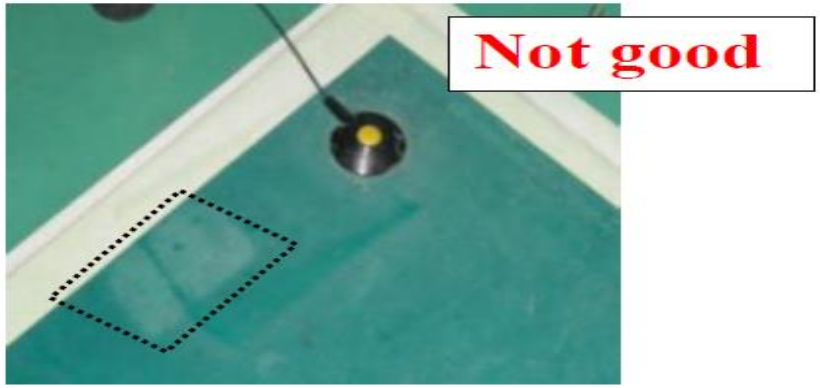
A coated label indicating the **ID number** should be attached by taping to a point not easily accessible to the operator.

⑥ Inspection and maintenance of Conductive Mats

6.2 Periodical inspection

- Conductive mats should be checked more than once a month for appearance and resistance value.
- The compliance of **conductive mats with the resistance requirement** should be checked at **least once per month** and recorded. This is based on RCJS-5-1 (3rd Ed.): 2016 Protection of Electronic Devices from Electrostatic Phenomena.

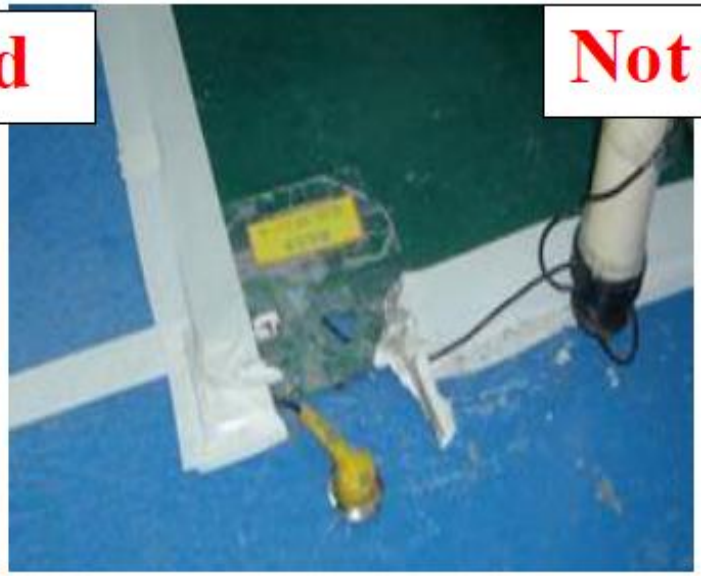
The conductive mat surface has been darkened due to contamination and degradation.



The ID number label is missing on the conductive mat.

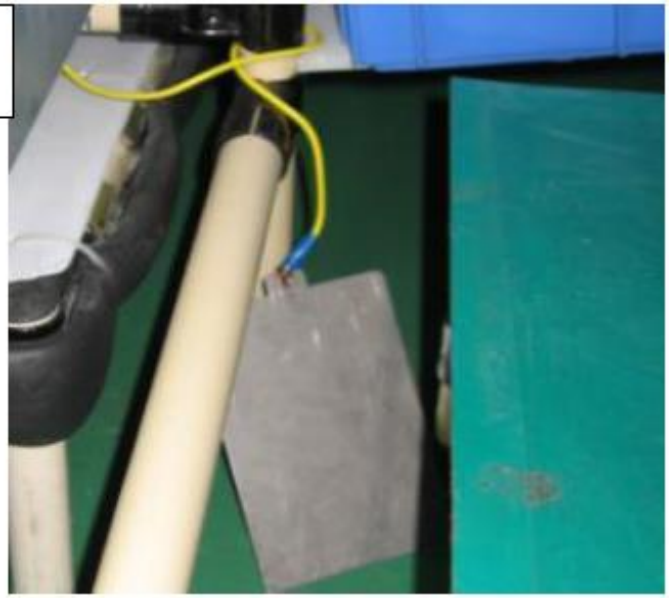
⑥ Inspection and maintenance of Conductive Mats

Not good



The conductive mat has been torn to disconnect the grounding hook.

Not good



The grounding metal plate has been disconnected from the conductive mat.

⑥ Inspection and maintenance of Conductive Mats

6.3 Troubleshooting

➢ Conductive mats found to have a problem should be cleaned or replaced with new ones. Faulty ones should be immediately disposed of.

- Contaminated conductive mats should be cleaned by wiping with a dry cloth or using water and neutral detergent.
- Torn ones should be immediately replaced with new ones. If the measured resistance is not acceptable, take the following action after checking that the dielectric resistance tester is sound and correctly connected.
- If higher than the upper limit: The conductive mat may have been contaminated and should be cleaned and tested again.
- If lower than the lower limit: The conductive mat may have water drops on its surface and should be wiped dry and tested again.
- If the problem cannot be solved, immediately replace the conductive mat with a new one.

⑦ Maintenance of Measuring Instruments

The dielectric resistance tester should be inspected every year.

- Measuring instruments should be inspected according to GR3301-03 “Measuring System Maintenance Procedures.”

Thank You!