Conditions for "ESD-approval" of ESD-protective products and -materials

Contents list

Distribution: File of methods SP Internet

Author:

Quality Assurance:

1 General

"ESD-approval" is a certificate given for a product or material for use:
- as a protective mean for electronic items from being damaged by an uncontrolled electrostatic discharge or
- in the proximity of electrostatic sensitive items in electrostatic protected areas,

that has been verified to fulfil the requirements defined in this document and its appendices.

The approval of a product or material is limited to its electrostatic protective properties for electronics use. Its usefulness in other respects such as: durability, comfort are covered only by an assessment following a visual inspection. Its usefulness for other purposes, e g in potentially explosive atmospheres, has to follow other rules and standards.

The "ESD-approval" does not verify that the product fulfils other applicable rules and regulations (e g electrical safety regulations: LVD, electromagnetic compatibility: EMC-directive).

> The use of any of the "ESD-approved" products or materials shall fulfil applicable national and international regulations and laws, such as, but not limited to:
> - electrical safety regulations
> - safety for hazardous radiation (e g handling of ionizers using radioactive substances)

These conditions for "ESD-approval" are established in close cooperation with the ESD-group of "Association of Swedish Engineering Industries" (VI).

A granted "ESD-approval" is made public by inclusion in a list issued on the Internet (www.sp.se/certprod/esd/default.asp).

2 Scope and application area

This method defines the general conditions and the technical requirements for an "ESD-approval".

The conditions are valid for:
- all kinds of products and materials with the intended use as ESD-protective means in electronics manufacturing areas and
- all kinds of products and materials with the intended use as ESD-protective means for transportation and storage of sensitive electronic components and equipment (ESDS) and
- all kinds of products for use in EPA.

3 References

[1] EN 100 015-1 Basic Specification: Protection of Electrostatic Sensitive Devices. Part 1: General Requirements.

[2] IEC 61340-5-1 Electrostatics. Part 5: Specification for the Protection of Electronic Devices from Electrostatic Phenomena. Section 1: General requirements. (In process for issuance.)

[3] IEC 61340-5-2 Electrostatics. Part 5: Specification for the Protection of Electronic Devices from Electrostatic Phenomena. Section 2: User guide. (In process for issuance.)

4 Definitions

The definitions in this document follow the definitions in ref [2], explicitly defined in the following for terms used in this document and its appendices.

Electrostatic discharge (ESD): A transfer of electrostatic charge between bodies at different electrostatic potentials caused by direct contact or induced by electrostatic field.

Electrostatic discharge sensitive devices (ESDS): A discrete, integrated circuit or assembly that may be damaged by electric fields or electrostatic discharge encountered in routine handling, transit or testing.

ESD-protected area (EPA): An area in which ESDS can be handled with accepted risk of damage as a result of electrostatic discharge or fields, and in which the operator is not exposed to additional risk.

Dischargeability
A product is dischargeable if it is conductive or dissipative. Some types (e g outer surface of shielding bags) have the property of being possible to discharge even if the resistance is high. The charge decay time shall be less than 2 s from a charge potential of 1000 V to 100 V.

Triboelectric charging: An electrical charging process in which charge is generated by the contact and separation of two surfaces which may be solid, liquid or particulate carrying gases.

Materials for packaging: Any material in which ESDS are packaged for transportation or storage including bags, boxes, crates, wraps, magazines, cushions, foams, loose fill, etc.

1 *intimate packaging*: packaging (or that part of a packaging) which does or could physically come into contact with ESDS,
2 *proximity packaging:* packaging (or that part of the packaging) which comes into close proximity with, but which is unlikely to make contact with ESDS.

Packaging characteristics: For test conditions see appendix 1. (These definitions are supplemented with reference to ref [2].)

1 *(Electrostatic) Conductive*
Surface resistance: 10^2 to $<10^6$ Ω, measured at 10 VDC.

2 *(Electrostatic) Dissipative*
Surface resistance: 10^6 to $<10^{12}$ Ω, measured at 100 VDC.

3 *Charge decay time*
If the results of the resistance measurements show a surface resistance of $> 10^{10}$ Ω the charge decay time shall be measured and be less than 2 s when discharged from 1000 V to 100 V.

4 *Lowcharging*
A maximum potential of |300| V shall be measured on a test sample when charged with rolling cylinders made of FEP and epoxy respectively.

5 *Shielding*
A maximum voltage of 50 V shall be measured inside a package when tested with a HBM-discharge from 1000 V.

5 Recommended use of "ESD-approved" products

To give the intended protection it is imperative that the "ESD-approved" products and materials are applied in a correct way. The use is defined in EN 100 015-1 and IEC 61340-5-1 and -2. In some cases supplementary information is given for each product type (see Appendices).

Some combinations of protective means in a protection system may cause problems, why it is recommended to measure the performance of the combinations in field, e g the combination of certain shoe types and floor coverings can be detrimental even if they individually are approved.

"ESD-approved" products, applied in a protective system protects an ESDS from:
- a direct uncontrolled discharge through the ESDS of any charged object,
- an uncontrolled discharge of a charge on the ESDS itself,
- charging of the ESDS either by induction or by triboelectric charging.

If the application of an ESD-approved item is different from the application described in the standards and in the text above, either further or more stringent requirements have to be applied, or a relief can be accepted. For instance, a product which is neither dissipative nor lowcharging is not allowed to be brought into an EPA (and will not grant an "ESD-approval"). However the product can be used as long as no ESDS is brought close to it and the handling is performed according to strict rules.

All "ESD-approved" products and materials are allowed to be brought into an EPA.

Some "ESD-approved" (particularly packaging) products are not recommended for use in intimate contact with an ESDS (see application notes for each ESD-protective type).

6 General conditions for "ESD-approval"

6.1 Applicant

The applicant shall have such control of the design and production of the product/material that he is able to assure unchanged product properties during the approval period of time as defined in p 6.4.

The applicant shall verify the acceptance of the conditions of this document.

6.2 Application for "ESD-approval"

An application for "ESD-approval" shall be accompanied by a specification of:
- potential "ESD-approval" proprietor,
- manufacturer of the product,
- product name, designation, possible variants that can be justified to be covered by the same "ESD-approval",
- test samples, quantity, size and conditioning according to the respective product requirements, see appendices.
- technical description in cases required by the respective product requirements defined in the appendices.
- auxiliary material or products required for the installation or use of the product or material.

6.3 Marking

Products shall be marked to show that the product is allowed to be brought into an EPA. Preferably this should be done according to figure 1 (recommended by ref [2]). Products for packaging purposes shall be marked, preferably according to figure 2 (recommended by ref [2]).

For safe identification of a product or material it shall further be marked with manufacturer/supplier and type designation.

In cases where it is impossible or impractical to mark the product or material itself, the marking can be placed on the bulk package.

For products with time limited ESD-protective properties, the manufacturing date shall be indicated together with the marking.

6.4 Time limitation

A granted "ESD-approval" is valid for 3 (three) years from the date of issuance. See also p 6.6.

6.5 Changes of an "ESD-approved" item

The construction of an "ESD-approved" item shall not be changed during its "ESD-approval" validity time period. Any changes shall be notified to SP. SP decides the extent of the tests required for continuation of the "ESD-approval".

6.6 Withdrawal of an "ESD-approval"

The validity of an "ESD-approval" is reconsidered if:
- it has been observed that the item is unsuitable for its intended use,
- the construction of the product has been changed without any notice.

SP performs necessary investigations and tests for a decision of continuation or a withdrawal of the "ESD-approval". SP has the right to withdraw an "ESD-approval" even if its validity time is not expired if:
- tests have verified that the item is unsuitable for its intended use, or
- the product or its manufacture has been changed so that its ESD-protective properties do not fulfil the technical requirements of this document.

Before a withdrawal is executed the comments of the "ESD-approval" proprietor are asked for.

7 Technical requirements

7.1 Standards

It is the intention to apply requirements established by applicable international standards. Unfortunately the standard situation is not ideal for this technical area, why requirements have had to be altered, supplemented or deleted with reference to valid European standard. The same situation is valid for measurement methods. The adherence/deviations to the standards are explained for each type of product, see p 7.3 and appendices.

Generally, it is possible to claim that an "ESD-approved" product fulfils the basic requirements of the referenced standard. This standard is in most cases ref [1] or [2].

7.2 General requirements of the performance

In addition to requirements regarding measureable parameters, each "ESD-approved" item shall be "suitable for its intended use". Even if this is not tested for the "ESD-approval" SP

can refuse to grant "ESD-approval" for tested items which obviously do not have a reasonable life, may cause harm to the user or environment, or any other reason which makes it unsuitable for its intended use.

7.3 ESD-protective properties

These requirements are product/material dependent and each set of requirements is given for each type of product/material in the appendices.

As the ESD-protective parameters most often are dependant on temperature and, especially humidity the requirements are set at a certain environment. Most of the properties are getting worse at low humidity. All requirements are set at 12 %RH +/- 3 %RH and 23 °C +/- 2 °C. All measurements are performed in the same environment.

Specific requirements are defined for each type of product or material in the appendices. In the cases where no appendix exists for the product type, general requirements defined in the following shall be applied. Even if it is not specifically expressed in the appendices these requirements are valid for **all** products.

Exceptions from the requirements can be accepted if a small area only of the product does not meet the requirements, e.g. a small knob of equipment, which is intended to be used at least 0.5 m away from a working area where ESDS are handled.

A product intended to be brought into an EPA must not accumulate and keep an electrostatic voltage higher than 100 V for longer than a maximum of 2 s.

This is tested either:
- As a resistance measurement from all parts of the product to ground. The resistance shall be less than 10^9 Ω.
Or
- Charging of the test item by a slight touch with the operator's hand, his clothing or by working or handling the product in its intended way and observing the induced voltage on a metal plate (diameter 15 mm, 2 pF to ground) and its decay time. The metal plate is held parallel to the test item and at a distance corresponding to the minimum expected distance in operative use between the test item and an ESDS. If the test item is not intended to be used in intimate contact with ESDS the measurement is performed at a distance of minimum 20 mm.

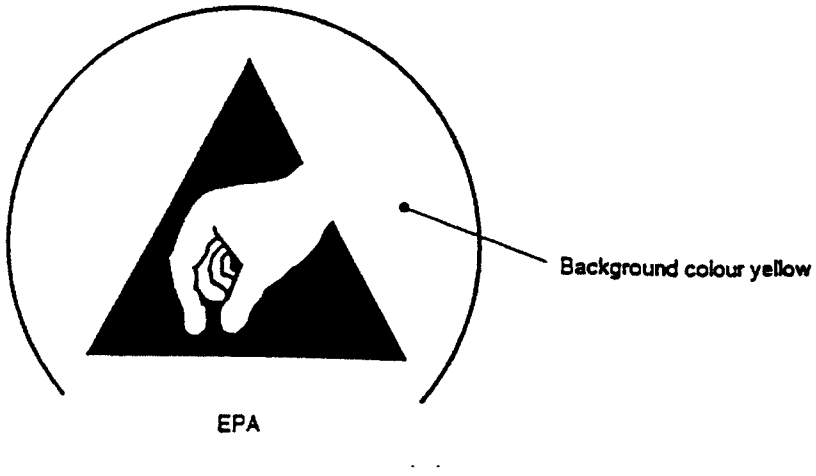
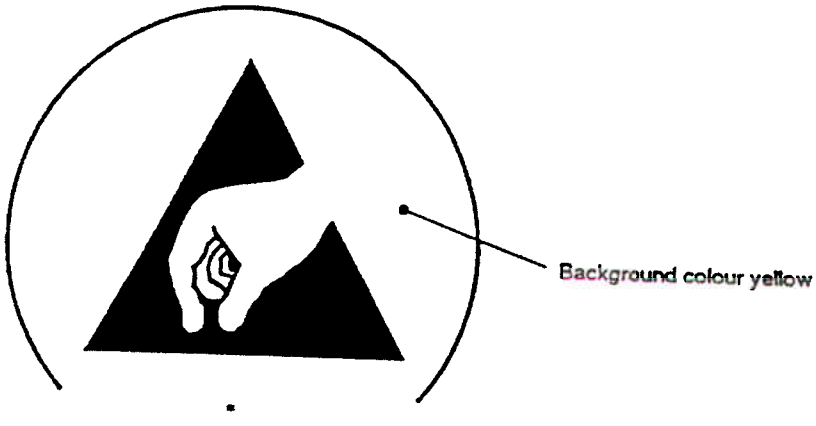


Figure 1. Recommended marking for equipment.



* Primary protection function:

S Electrostatic discharge shielding
D Electrostatic dissipative
L Lowcharging
C Electrostatic conductive

Figure 2. Recommended marking for packaging products.