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

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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 "Nordic ESD board".

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

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


4 Definitions

The definitions in this document follow the definitions in ref [1] and IEC 61340-1-2.

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 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 low charging 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.
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". The applicant must verify that variants are manufactured in the same way and by the same materials as tested products.
- 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 fulfill 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

Requirements correspond to IEC 61340-5-1.
Test methods correspond to IEC 61340 series.

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.

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 $10^5$ Ω at maximum 100 V, 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 thin metal plate (diameter 15 mm, 2 μF to ground) and its decay time. After 2 s of decay time the measured potential shall be maximum 100 V. (see note 1)

The metal plate is held parallel to the test item at one of the following distances:
- When the distance in operative use between the test item and an ESDS is known this distance is used.
- When the distance in operative use between the test item and an ESDS is not known the measurement is performed at a distance of 20 mm but not closer to the floor than 500 mm.

**Note 1:**

According to the standard IEC 61340-5-1 the following requirements are made:

The ESD threat associated with process essential insulators shall be evaluated to ensure that:

- the electrostatic field at the position where the ESDS are handled shall not exceed 10000 V/m

- if the electrostatic potential measured at the surface of the process required insulator exceeds 2000 V, the item shall be kept a minimum of 30 cm from the ESDS.
Both these requirements are difficult to apply to a product, since the situation where the product is used is not known. It is therefore necessary to assess the ESD risk at a very short distance to the test object, essentially when touching it. From experience SP has decided that the standard distance that should be used to make the risk assessment is two centimetres, however in some situations other distances are used depending the products design and its purpose.

To make the risk assessment a dummy device is used with a specific size and shape connected to dummy component, which is also connected to ground. The dummy device has the shape of a coin with the thickness $(0.5 \pm 0.1) \text{ mm}$ and the diameter $(15 \pm 0.2) \text{ mm}$. The dummy component is a $(2.0 \pm 0.4) \text{ pF}$ capacitor with a very low leakage current, smaller than 1 pA at voltages up to 1500 V. The size of the dummy device is chosen to correspond to a large chip. The value of the dummy component corresponds to a gate capacitance of a RF-MOS transistor used by the telecommunication industry. The voltage measured on the dummy device is proportional to the induced charge on the dummy device which is equal to the charge in the dummy component (the capacitor). The potential of the dummy device is measured with a non-contact voltmeter.

The potential of the dummy device shall not exceed 100 V at the required measurement distance. A product that fulfils this requirement also fulfils the IEC requirement that electrostatic field shall not exceed 10000 V/m.

Note 2:

When the test is performed according to SP-Method 2472 and no appendix is valid, instrument uncertainties shall be stated in the test report.

Note 3:

Electrostatic voltmeter and probe shall always before use be adjusted at 0 V and checked at both -100 V and +100 V.
Figure 1. Recommended marking for equipment.

Figure 2. Recommended marking for packaging products.

* Primary protection function:
S Electrostatic discharge shielding
D Electrostatic dissipative
C Electrostatic conductive