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INTERNATIONAL STANDARD

NORME INTERNATIONALE

Electrostatics – Part 5-3: Protection of electronic devices from electrostatic phenomena – Properties and requirements classification for packaging intended for electrostatic discharge sensitive devices

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Électrostatique – Partie 5-3: Protection des dispositifs électroniques contre les phénomènes électrostatiques – Classification des propriétés et des exigences relatives à l'emballage destiné aux dispositifs sensibles aux décharges électrostatiques

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IEC Central Office
3, rue de Varembé
CH-1211 Geneva 20
Switzerland

Tel.: +41 22 919 02 11
Fax: +41 22 919 03 00
info@iec.ch
www.iec.ch

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INTERNATIONAL ELECTROTECHNICAL COMMISSION

COMMISSION ELECTROTECHNIQUE INTERNATIONALE

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ELECTROSTATICS –

Part 5-3: Protection of electronic devices from electrostatic phenomena – Properties and requirements classification for packaging intended for electrostatic discharge sensitive devices

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International Standard IEC 61340-5-3 has been prepared by IEC technical committee 101: Electrostatics.

This second edition cancels and replaces the first edition published in 2010. This edition constitutes a technical revision.

This edition includes the following significant technical changes with respect to the previous edition:

a) removal of all references to ANSI/ESD STM11.13, replaced by normative reference IEC 61340-4-10;

b) additional notes added to Table 1;

c) addition of a new Table 3 related to the “ESD classification symbol” and the “primary function code”.

The text of this standard is based on the following documents:

CDV	Report on voting
101/428/CDV	101/457/RVC

Full information on the voting for the approval of this standard can be found in the report on voting indicated in the above table.

This publication has been drafted in accordance with the ISO/IEC Directives, Part 2.

A list of all parts in the IEC 61340 series, under the general title *Electrostatics*, can be found on the IEC website

The committee has decided that the contents of this publication will remain unchanged until the stability date indicated on the IEC web site under "http://webstore.iec.ch" in the data related to the specific publication. At this date, the publication will be

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INTRODUCTION

Packaging is necessary to protect electrostatic discharge sensitive devices (ESDS) from physical and environmental damage during manufacture, transportation and storage.

Additionally, packaging for ESDS should also prevent damage from static electricity.

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ELECTROSTATICS –

Part 5-3: Protection of electronic devices from electrostatic phenomena – Properties and requirements classification for packaging intended for electrostatic discharge sensitive devices

1 Scope

This part of IEC 61340 defines the ESD protective packaging properties needed to protect electrostatic discharge sensitive devices (ESDS) through all phases of production, rework/maintenance, transport and storage. Test methods are referenced to evaluate packaging and packaging materials for these product and material properties. Performance limits are provided.

This standard does not address protection from electromagnetic interference (EMI), electromagnetic pulsing (EMP) or protection of volatile materials.

2 Normative references

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The following documents, in whole or in part, are normatively referenced in this document and are indispensable for its application. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

IEC 61340-2-3, *Electrostatics – Part 2-3: Methods of test for determining the resistance and resistivity of solid planar materials used to avoid electrostatic charge accumulation*

IEC 61340-4-8, *Electrostatics – Part 4-8: Standard test methods for specific applications – Electrostatic discharge shielding – Bags*

IEC 61340-4-10, *Electrostatics – Part 4-10: Standard test methods for specific applications – Two-point resistance measurement*[1]

IEC 60417, *Graphical symbols for use on equipment* (available at http://www.graphical-symbols.info/equipment)

3 Terms, definitions and abbreviations

3.1 Terms and definitions

For the purposes of this document, the following terms and definitions apply.

3.1.1
electrostatic discharge
ESD
rapid transfer of charge between bodies at different electrostatic potentials

Note 1 to entry: This note applies to the French language only.

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[1] At the time of writing, it is proposed withdrawing IEC 61340-4-10: 2012 and incorporating the test method into the next edition of IEC 61340-2-3.

3.1.2
electrostatic discharge sensitive device
ESDS
sensitive devices, integrated circuit or assembly that may be damaged by electrostatic fields or electrostatic discharge

Note 1 to entry: This note applies to the French language only.

3.1.3
ESD protected area
EPA
area in which an ESDS can be handled with acceptable risk of damage caused by electrostatic discharge or fields

3.1.4
unprotected area
UPA
areas outside an EPA

SEE: Figure A.1

Note 1 to entry: This note applies to the French language only.

3.1.5
intimate packaging
material which makes contact with ESDS

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3.1.6
proximity packaging
material not making contact with ESDS, which is used to enclose one or more devices

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3.1.7
secondary packaging
material used primarily to give additional physical protection to the outside of a proximity package

3.1.8
volume resistance
R_V
ratio of a d.c. voltage (V) applied between two electrodes placed on two (opposite) surfaces of a specimen and the current (A) between the electrodes

Note 1 to entry: Volume resistance is expressed in ohms.

3.1.9
point-to-point resistance
$R_{p\text{-}p}$
ratio of a d.c. voltage (V) applied between two electrodes on a surface of a specimen and the current (A) between the electrodes

Note 1 to entry: The electrode configuration for point-to-point resistance measurements is usually a pair of circular faced electrodes with a defined distance apart.

Note 2 to entry: Point-to-point resistance is expressed in ohms.

3.1.10
surface resistance
R_S
ratio of a d.c. voltage (V) applied between two electrodes in a defined configuration on a surface of a specimen and the current (A) between the electrodes

Note 1 to entry: The electrode configuration for surface resistance measurement is usually a pair of parallel rectangular electrodes or a pair of circular concentric electrodes.

Note 2 to entry: Surface resistance is expressed in ohms.

3.2 Abbreviations

Term	Meaning
CDM	Charged device model
ESD	Electrostatic discharge
ESDS	Electrostatic discharge sensitive device
EMI	Electromagnetic interference
EMP	Electromagnetic pulsing
EPA	ESD protected area
HMB	Human body model
MM	Machine model
UPA	Unprotected area

4 Tailoring

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This standard, or portions thereof, may not apply to all applications. Tailoring is accomplished by evaluating the applicability of each requirement for the specific application. Upon completion of the evaluation, requirements may be added, modified or deleted.

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5 Packaging application requirement

5.1 General

Transportation of ESDS requires packaging that provides protection from electrostatic hazards (for example from an electrostatic discharge). Within an EPA in which all ESD risks are well controlled, ESD protective packaging may not be necessary.

5.2 Inside an EPA

Packaging used within an EPA shall consist of dissipative or conductive materials for intimate contact.

Items sensitive to <100 V human body model (HBM) may need additional protection depending on application and program plan requirements.

NOTE Dissipative materials are preferred for intimate packaging in situations where charged device model (CDM) damage is a concern.

5.3 Outside an EPA

Transportation of sensitive products outside of an EPA shall require packaging that provides both

a) dissipative or conductive materials for intimate contact,

b) a structure that provides electrostatic discharge shielding.

If electrostatic field shielding materials are used to provide discharge shielding, a material that provides a barrier to current flow should be used in combination with the electrostatic field shielding material.

NOTE Dissipative materials are preferred for intimate packaging in situations where charged device model (CDM) damage is a concern.

6 Classification of ESD packaging material properties

6.1 General

Materials and packages that are useful in preventing damage to sensitive electronic devices exhibit certain properties. These properties include:

a) resistance properties:
   – conductive;
   – dissipative;
b) shielding properties:
   – electrostatic discharge;
   – electrostatic field.

6.2 Material resistance properties

6.2.1 General

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Most standard packaging materials are electrically insulating and insulating materials retain charge. Making the package less insulating provides a path for the charge to dissipate from the package to a material at a lower potential.

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Specific ranges of resistance are useful for different purposes. Packaging can be classified by these resistance ranges of the material used in its construction.

6.2.2 Resistance of conductive materials

Conductive materials may be surface conductive, volume conductive or both.

a) Surface conductive materials

A surface conductive material shall have a surface resistance of $<1 \times 10^4\ \Omega$.

b) Volume conductive materials

Volume conductive materials shall have a volume resistance of $<1 \times 10^4\ \Omega$[2].

6.2.3 Resistance of electrostatic field shielding materials

Within the conductive materials classification, electrostatic field shielding materials shall have a homogeneous layer with a surface resistance of $<1 \times 10^3\ \Omega$ or a volume resistance of $<1 \times 10^3\ \Omega$.

Other methods may also define the electrostatic field shielding classification.

NOTE These resistance values do not necessarily imply EMI/EMP shielding.

2 The thickness of the material might have a significant influence on the measured value of a volume resistance.

6.2.4 Resistance of dissipative materials

Dissipative materials may be surface dissipative, volume dissipative or both.

a) Surface dissipative materials

Surface dissipative materials shall have a surface resistance $\geq 1 \times 10^4$ and $< 1 \times 10^{11}$ Ω.

b) Volume dissipative materials

Volume dissipative materials shall have a volume resistance $\geq 1 \times 10^4$ and $< 1 \times 10^{11}$ Ω[3].

6.2.5 Resistance of insulating materials

Electrostatic insulating materials may be surface insulating, volume insulating or both.

a) Surface insulating materials

Electrostatic surface insulating materials have a surface resistance $\geq 1 \times 10^{11}$ Ω.

b) Volume insulating materials

Electrostatic volume insulating materials have a volume resistance $\geq 1 \times 10^{11}$ Ω.

6.3 Material electrostatic shielding properties

NOTE Electrostatic shielding materials protect packaged sensitive electronic items from the effects of electrostatic discharges and fields that are external to the package.

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6.3.1 Electrostatic discharge shielding

Electrostatic discharge shielding packaging is capable of attenuating an electrostatic discharge. The calculated energy allowed inside a static discharge shielding bag shall be less than 50 nJ when tested according to IEC 61340-4-8 or equivalent test method modified to accommodate the product.

6.3.2 Electrostatic field shielding

Electrostatic field shielding packaging is capable of attenuating an electrostatic field.

NOTE Classified field-shielding materials can allow current flow through their volume.

7 Technical requirements for ESD protective packaging

7.1 Packaging and material properties

Table 1 and 2 provide test methods for determining material classifications for finished packages and materials. When possible, testing shall be performed on the finished package. When testing cannot be performed on a finished package, the material classification shall be defined by the bulk material used for the production of the final package.

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3 The thickness of the material might have a significant influence on the measured value of a volume resistance.