Electrostatics -- Part 5-1: Protection of electronic devices from electrostatic phenomena - General requirements

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EESTI STANDARDIKESKUS

EESTI STANDARDI EESSÕNA **NATIONAL FOREWORD**

Käesolev Eesti standard EVS-EN 61340-5-1:2007 sisaldab Euroopa standardi prEN 61340-5-1:2007 ingliskeelset teksti. Käesolev dokument on jõustatud 17.12.2007 ja selle kohta on avaldatud teade Eesti standardiorganisatsiooni ametlikus väljaandes. Standard on kättesaadav Eesti standardiorganisatsioonist.	This Estonian standard EVS-EN 61340-5-1:2007 consists of the English text of the European standard prEN 61340-5-1:2007. This document is endorsed on 17.12.2007 with the notification being published in the official publication of the Estonian national standardisation organisation. The standard is available from Estonian standardisation organisation.

Käsitlusala: This part of IEC 61340 applies to activities that: manufacture, process, assemble, install, package, label, service, test, inspect, transport or otherwise handle electrical or electronic parts, assemblies and equipment susceptible to damage by electrostatic discharges greater than or equal to 100 V human body model (HBM). This standard provides the requirements for an ESD control program. The user should refer to IEC 61340-5-2 for guidance on the implementation of this standard. This standard does not apply to electrically initiated explosive devices, flammable liquids, gases and powders. The purpose of this standard is to provide the administrative and technical requirements for establishing, implementing and maintaining an ESD control program (hereinafter referred to as the “program”).	**Scope:** This part of IEC 61340 applies to activities that: manufacture, process, assemble, install, package, label, service, test, inspect, transport or otherwise handle electrical or electronic parts, assemblies and equipment susceptible to damage by electrostatic discharges greater than or equal to 100 V human body model (HBM). This standard provides the requirements for an ESD control program. The user should refer to IEC 61340-5-2 for guidance on the implementation of this standard. This standard does not apply to electrically initiated explosive devices, flammable liquids, gases and powders. The purpose of this standard is to provide the administrative and technical requirements for establishing, implementing and maintaining an ESD control program (hereinafter referred to as the “program”).

ICS 17.220.99, 29.020

Võtmesõnad: electrical safety, electronic eng, examination, operating stations, packing, safety, sample surveys, semiconductor dev, specification (approval), specifications, surveillance (approval), training, warning signs, work place layout, working places

EUROPEAN STANDARD

NORME EUROPÉENNE

EUROPÄISCHE NORM

EN 61340-5-1

October 2007

ICS 17.220.99; 29.020

Supersedes EN 61340-5-1:2001

English version

Electrostatics - Part 5-1: Protection of electronic devices from electrostatic phenomena - General requirements

(IEC 61340-5-1:2007)

Electrostatique -
Partie 5-1: Protection des dispositifs électroniques contre les phénomènes électrostatiques -
Exigences générales
(CEI 61340-5-1:2007)

Elektrostatik -
Teil 5-1: Schutz von elektronischen Bauelementen gegen elektrostatische Phänomene -
Allgemeine Anforderungen
(IEC 61340-5-1:2007)

This European Standard was approved by CENELEC on 2007-10-01. CENELEC members are bound to comply with the CEN/CENELEC Internal Regulations which stipulate the conditions for giving this European Standard the status of a national standard without any alteration.

Up-to-date lists and bibliographical references concerning such national standards may be obtained on application to the Central Secretariat or to any CENELEC member.

This European Standard exists in three official versions (English, French, German). A version in any other language made by translation under the responsibility of a CENELEC member into its own language and notified to the Central Secretariat has the same status as the official versions.

CENELEC members are the national electrotechnical committees of Austria, Belgium, Bulgaria, Cyprus, the Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, the Netherlands, Norway, Poland, Portugal, Romania, Slovakia, Slovenia, Spain, Sweden, Switzerland and the United Kingdom.

CENELEC

European Committee for Electrotechnical Standardization
Comité Européen de Normalisation Electrotechnique
Europäisches Komitee für Elektrotechnische Normung

Central Secretariat: rue de Stassart 35, B - 1050 Brussels

Ref. No. EN 61340-5-1:2007 E

Foreword

The text of document 101/249/FDIS, future edition 1 of IEC 61340-5-1, prepared by IEC TC 101, Electrostatics, was submitted to the IEC-CENELEC parallel vote and was approved by CENELEC as EN 61340-5-1 on 2007-10-01.

This European Standard supersedes EN 61340-5-1:2001 + corrigendum April 2001.

The main changes with respect to EN 61340-5-1:2001 are listed below:

EN 61340-5-1:2007 focuses on the requirements for an ESD control program. In addition, EN 61340-5-1:2007 has been aligned with other major ESD control program standards used throughout the world.

The following dates were fixed:

– latest date by which the EN has to be implemented at national level by publication of an identical national standard or by endorsement	(dop)	2008-07-01
– latest date by which the national standards conflicting with the EN have to be withdrawn	(dow)	2010-10-01

Annex ZA has been added by CENELEC.

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Endorsement notice

The text of the International Standard IEC 61340-5-1:2007 was approved by CENELEC as a European Standard without any modification.

In the official version, for Bibliography, the following note has to be added for the standard indicated:

IEC 60749-27	NOTE	Harmonized as EN 60749-27:2006 (not modified).

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Annex ZA
(normative)

Normative references to international publications with their corresponding European publications

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

NOTE When an international publication has been modified by common modifications, indicated by (mod), the relevant EN/HD applies.

Publication	Year	Title	EN/HD	Year
IEC 60364 (mod)	Series	Low-voltage electrical installations	HD 384/ HD 60364	Series
IEC/TS 60479-1	– [1)]	Effects of current on human beings and livestock - Part 1: General aspects	–	–
IEC/TS 60479-2	– [1)]	Effects of current on human beings and livestock - Part 2: Special aspects	–	–
IEC 60749-26	– [1)]	Semiconductor devices - Mechanical and climatic test methods - Part 26: Electrostatic discharge (ESD) sensitivity testing - Human body model (HBM)	EN 60749-26	2006 [2)]
IEC 61010-1	– [1)]	Safety requirements for electrical equipment for measurement, control, and laboratory use - Part 1: General requirements	EN 61010-1 + corr. June	2001 [2)] 2002
IEC 61140	– [1)]	Protection against electric shock - Common aspects for installation and equipment	EN 61140	2002 [2)]
IEC 61340-2-3	– [1)]	Electrostatics - Part 2-3: Methods of test for determining the resistance and resistivity of solid planar materials used to avoid electrostatic charge accumulation	EN 61340-2-3	2000 [2)]
IEC 61340-4-1	– [1)]	Electrostatics - Part 4-1: Standard test methods for specific applications - Electrical resistance of floor coverings and installed floors	EN 61340-4-1	2004 [2)]
IEC 61340-4-3	– [1)]	Electrostatics - Part 4-3: Standard test methods for specific applications - Footwear	EN 61340-4-3	2001 [2)]
IEC 61340-4-5	– [1)]	Electrostatics - Part 4-5: Standard test methods for specific applications - Methods for characterizing the electrostatic protection of footwear and flooring in combination with a person	EN 61340-4-5	2004 [2)]

[1)] Undated reference.

[2)] Valid edition at date of issue.

Publication	Year	Title	EN/HD	Year
IEC/TR 61340-5-2	– [1)]	Electrostatics - Part 5-2: Protection of electronic devices from electrostatic phenomena - User guide	–	–
ANSI/ESD S1.1	– [1)]	Standard Test Method for the protection of electrostatic charge susceptible items - Wrist Straps	–	–
ANSI/ESD STM2.1	– [1)]	Standard Test Method for the protection of electrostatic discharge susceptible items - Garments	–	–
ANSI/ESD STM3.1	– [1)]	Standard Test Method for the electrostatic discharge susceptible items - Ionization	–	–
ANSI/ESD STM11.31	– [1)]	Standard Test Method for evaluating the performance of electrostatic discharge shielding materials - Bags	–	–

IEC 61340-5-1

Edition 1.0 2007-08

INTERNATIONAL STANDARD

NORME INTERNATIONALE

Electrostatics –
Part 5-1: Protection of electronic devices from electrostatic phenomena – General requirements

Electrostatique –
Part 5-1: Protection des dispositifs électroniques contre les phénomènes électrostatiques – Exigences générales

IEC 61340-5-1:2007

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The International Electrotechnical Commission (IEC) is the leading global organization that prepares and publishes International Standards for all electrical, electronic and related technologies.

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La Commission Electrotechnique Internationale (CEI) est la première organisation mondiale qui élabore et publie des normes internationales pour tout ce qui a trait à l'électricité, à l'électronique et aux technologies apparentées.

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Restez informé sur les nouvelles publications de la CEI. Just Published détaille deux fois par mois les nouvelles publications parues. Disponible en-ligne et aussi par email.
- Electropedia: www.electropedia.org
Le premier dictionnaire en ligne au monde de termes électroniques et électriques. Il contient plus de 20 000 termes et définitions en anglais et en français, ainsi que les termes équivalents dans les langues additionnelles. Egalement appelé Vocabulaire Electrotechnique International en ligne.
- Service Clients: www.iec.ch/webstore/custserv/custserv_entry-f.htm
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IEC 61340-5-1

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INTERNATIONAL STANDARD

NORME INTERNATIONALE

Electrostatics – Part 5-1: Protection of electronic devices from electrostatic phenomena – General requirements

Electrostatique – Part 5-1: Protection des dispositifs électroniques contre les phénomènes électrostatiques – Exigences générales

INTERNATIONAL ELECTROTECHNICAL COMMISSION

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CONTENTS

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ELECTROSTATICS –

Part 5-1: Protection of electronic devices from electrostatic phenomena – General requirements

FOREWORD

1) The International Electrotechnical Commission (IEC) is a worldwide organization for standardization comprising all national electrotechnical committees (IEC National Committees). The object of IEC is to promote international co-operation on all questions concerning standardization in the electrical and electronic fields. To this end and in addition to other activities, IEC publishes International Standards, Technical Specifications, Technical Reports, Publicly Available Specifications (PAS) and Guides (hereafter referred to as "IEC Publication(s)"). Their preparation is entrusted to technical committees; any IEC National Committee interested in the subject dealt with may participate in this preparatory work. International, governmental and non-governmental organizations liaising with the IEC also participate in this preparation. IEC collaborates closely with the International Organization for Standardization (ISO) in accordance with conditions determined by agreement between the two organizations.
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International Standard IEC 61340-5-1 has been prepared by IEC technical committee 101: Electrostatics.

This first edition cancels and replaces the technical specification published in 1998. It constitutes a technical revision.

The main changes with respect to the previous edition are listed below:

This version of IEC 61340-5-1 focuses on the requirements for an ESD control program. In addition, this version of IEC 61340-5-1 has been aligned with other major ESD control program standards used throughout the world.

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

FDIS	Report on voting
101/249/FDIS	101/251/RVD

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 maintenance result 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

- reconfirmed;
- withdrawn;
- replaced by a revised edition, or
- amended.

INTRODUCTION

This part of IEC 61340 covers the requirements necessary to design, establish, implement and maintain an electrostatic discharge (ESD) control program for activities that: manufacture, process, assemble, install, package, label, service, test, inspect, transport or otherwise handle electrical or electronic parts, assemblies and equipment susceptible to damage by electrostatic discharges greater than or equal to 100 V human body model (HBM). This standard covers the ESD control program requirements necessary for setting up a program to handle ESD-sensitive devices (ESDS), based on the historical experience of both military and commercial organizations. The fundamental ESD control principles that form the basis of this standard are as follows:

– avoid a discharge from any charged, conductive object (personnel and especially automated handling equipment) into the ESDS. This can be accomplished by bonding or electrically connecting all conductors in the environment, including personnel, to a known ground or contrived ground (as on board ship or on aircraft). This attachment creates an equipotential balance between all conducting objects and personnel. Electrostatic protection can be maintained at a potential different from a "zero" voltage ground potential as long as all conductive objects in the system are at the same potential;
– avoid a discharge from any charged ESD sensitive device. Charging can result from direct contact and separation or it can be field induced. Necessary insulators in the environment cannot lose their electrostatic charge by attachment to ground. Ionization systems provide neutralization of charges on these necessary insulators (circuit board materials and some device packages are examples of necessary insulators). Assessment of the ESD hazard created by electrostatic charges on the necessary insulators in the work place is required to ensure that appropriate actions are implemented, according to the risk;
– once outside of an electrostatic discharge protected area (hereinafter referred to as an EPA) it is often not possible to control the above items, therefore, ESD protective packaging may be required. ESD protection can be achieved by enclosing ESD sensitive products in static protective materials, although the type of material depends on the situation and destination. Inside an EPA, static dissipative materials may provide adequate protection. Outside an EPA, static discharge shielding materials are recommended. Whilst all of these materials are not discussed in this standard, it is important to recognize the differences in their application.

Each company has different processes, and so will require a different blend of ESD prevention measures for an optimum ESD control program. It is vital that these measures are selected, based on technical necessity and carefully documented in an ESD control program plan, so that all concerned can be sure of the program requirements.

Training is an essential part of an ESD control program in order to ensure that the personnel involved understand the equipment and procedures they are to use in order to be in compliance with the ESD control program plan. Training is also essential in raising awareness and understanding of ESD issues. Without training, personnel are often a major source of ESD risk. With training, they become an effective first line of defence against ESD damage.

Regular compliance verification checks and tests are essential to ensure that equipment remains effective and that the ESD control program is correctly implemented in compliance with the ESD control program plan.

Any contact and physical separation of materials or flow of solids, liquids, or particle-laden gases can generate electrostatic charges. Common sources of ESD include charged: personnel, conductors, common polymeric materials, and processing equipment. ESD damage can occur when:

– a charged person or object comes into contact with an ESDS;
– an ESDS comes into direct contact with a highly conductive surface while exposed to an electrostatic field;
– a charged ESDS comes into contact with another conductive surface which is at a different electrical potential. This surface may or may not be grounded.

Examples of ESDS are microcircuits, discrete semiconductors, thick and thin film resistors, hybrid devices, printed circuit boards and piezoelectric crystals. It is possible to determine device and item susceptibility by exposing the device to simulated ESD events. The level of sensitivity, determined by test using simulated ESD events, may not necessarily relate to the level of sensitivity in a real life situation. However, they are used to establish a baseline of susceptibility data for comparison of devices with equivalent part numbers from different manufacturers. Three different models are used for characterization of electronic components - human body model (HBM), machine model (MM), and charged device model (CDM).

ELECTROSTATICS –

Part 5-1: Protection of electronic device from electrostatic phenomena – General requirements

1 Scope

This part of IEC 61340 applies to activities that: manufacture, process, assemble, install, package, label, service, test, inspect, transport or otherwise handle electrical or electronic parts, assemblies and equipment susceptible to damage by electrostatic discharges greater than or equal to 100 V human body model (HBM).

This standard provides the requirements for an ESD control program. The user should refer to IEC 61340-5-2 for guidance on the implementation of this standard.

This standard does not apply to electrically initiated explosive devices, flammable liquids, gases and powders.

The purpose of this standard is to provide the administrative and technical requirements for establishing, implementing and maintaining an ESD control program (hereinafter referred to as the “program”).

2 Normative references

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

IEC 60364 (all parts), *Low-voltage electrical installations*

IEC/TS 60479-1, *Effects of current on human beings and livestock – Part 1: General aspects*

IEC/TS 60479-2, *Effects of current on human beings and livestock – Part 2: Special aspects*

IEC 60749-26, *Semiconductor devices – Mechanical and climatic test methods – Part 26: Electrostatic discharge (ESD) sensitivity testing – Human body model (HBM)*

IEC 61010-1, *Safety requirements for electrical equipment for measurement, control and laboratory use – Part 1: General requirements*

IEC 61140, *Protection against electric shock – Common aspects for installation and equipment*

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 61340-4-1, *Electrostatics – Part 4-1: Standard test methods for specific applications – Electrical resistance of floor coverings and installed floors*

IEC 61340-4-3, *Electrostatics – Part 4-3: Standard test methods for specific applications – Footwear*

IEC 61340-4-5, *Electrostatics – Part 4-5: Standard test methods for specific applications – Methods for characterizing the electrostatic protection of footwear and flooring in combination with a person*

IEC/TR 61340-5-2, *Electrostatics – Part 5-2: Protection of electronic devices from electrostatic phenomena – User guide*

ANSI/ESD S1.1, *Standard Test Method for the protection of electrostatic charge susceptible items – Wrist Straps*

ANSI/ESD STM2.1, *Standard Test Method for the protection of electrostatic discharge susceptible items – Garments*

ANSI/ESD STM3.1, *Standard Test Method for the electrostatic discharge susceptible items – Ionization*

ANSI/ESD STM11.31, *Standard Test Method for evaluating the performance of electrostatic discharge shielding materials – Bags*

3 Terms and definitions

For the purposes of this document, the terms and definitions in the future IEC 61340-1-2 as well as the following, apply.

3.1
common ground point
grounded device or location where the conductors of two or more ESD control items are bonded

3.2
common connection point
device or location where the conductors of two or more ESD control items are connected in order to bring the ESD protective items to the same electrical potential through equipotential bonding

3.3
equipotential bond
electrical connection of exposed conductive parts (or items used to control ESD) so that they are at substantially the same voltage under normal and fault conditions

3.4
ESD control items
materials or products designed to prevent the generation of static charge and / or dissipate static charges that have been generated so as to prevent damage to ESD sensitive devices

3.5
functional ground
terminal used to connect parts to earth for reasons other than safety

3.6
organization
company, group or body that handles ESDS

3.7
protective earth
terminal used to connect parts to earth for safety reasons