# ELEKTROMAGNETILINE ÜHILDUVUS. OSA 4: KATSETUS- JA MÕÕTETEHNIKA. JAGU 5: LIIGPINGEKINDLUSE KATSETUS

# Electromagnetic compatibility (EMC) - Part 4-5: Testing and measurement techniques - Surge immunity test (IEC 61000-4-5:2014 + IEC 61000-4-5:2014/A1:2017)

EESTI STANDARDIKESKUS
ESTONIAN CENTRE FOR STANDARDISATION

## EESTI STANDARDI EESSÕNA

## NATIONAL FOREWORD

| | |
|---|---|
| See Eesti standard EVS-EN 61000-4-5:2014 +A1:2017 sisaldab Euroopa standardi EN 61000-4-5:2014 ingliskeelset teksti ja selle muudatuse A1:2017 ingliskeelset teksti. | This Estonian standard EVS-EN 61000-4-5:2014 +A1:2017 consists of the English text of the European standard EN 61000-4-5:2014 and its amendment A1:2017. |
| Standard on jõustunud sellekohase teate avaldamisega EVS Teatajas.<br><br>Euroopa standardimisorganisatsioonid on teinud Euroopa standardi rahvuslikele liikmetele kättesaadavaks 22.08.2014, muudatus A1 24.11.2017. | This standard has been endorsed with a notification published in the official bulletin of the Estonian Centre for Standardisation.<br><br>Date of Availability of the European standard is 22.08.2014, for A1 24.11.2017. |
| Sellesse standardisse on muudatus A1 sisse viidud ja tehtud muudatused tähistatud topeltpüst-kriipsuga lehe välisveerisel.<br><br>Selles standardis on rahvusvahelise standardi ühismuudatused tähistatud püstkriipsuga teksti välimisel veerisel.<br><br>Standard on kättesaadav Eesti Standardi-keskusest. | The amendment A1 has been incorporated into this standard and changes have been marked by a double vertical line on the outer row of the page.<br><br>Common modifications has been incorporated into this international standard and changes have been marked by a vertical line on the outer row of the page.<br><br>The standard is available from the Estonian Centre for Standardisation. |

Tagasisidet standardi sisu kohta on võimalik edastada, kasutades EVS-i veebilehel asuvat tagasiside vormi või saates e-kirja meiliaadressile standardiosakond@evs.ee.

ICS 33.100.20

EUROPEAN STANDARD

NORME EUROPÉENNE

EUROPÄISCHE NORM

# EN 61000-4-5 + A1

August 2014, November 2017

ICS 33.100.20

Supersedes EN 61000-4-5:2006

English Version

# Electromagnetic compatibility (EMC) - Part 4-5: Testing and measurement techniques - Surge immunity test (IEC 61000-4-5:2014 + IEC 61000-4-5:2014/A1:2017)

Compatibilité électromagnétique (CEM) - Partie 4-5: Techniques d'essai et de mesure - Essai d'immunité aux ondes de choc
(CEI 61000-4-5:2014 + IEC 61000-4-5:2014/A1:2017)

Elektromagnetische Verträglichkeit (EMV) - Teil 4-5: Prüf- und Messverfahren - Prüfung der Störfestigkeit gegen Stoßspannungen
(IEC 61000-4-5:2014 + IEC 61000-4-5:2014/A1:2017)

This European Standard was approved by CENELEC on 2014-06-19. Amendment A1 was approved by CENELEC on 2017-09-08. 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.

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

**CEN-CENELEC Management Centre: Avenue Marnix 17, B-1000 Brussels**



Ref. No. EN 61000-4-5:2014 E
+ IEC 61000-4-5:2014/A1:2017 E

## Foreword

The text of document 77B/711/FDIS, future edition 3 of IEC 61000-4-5, prepared by SC 77B "High frequency phenomena", of IEC/TC 77 "Electromagnetic compatibility" was submitted to the IEC-CENELEC parallel vote and approved by CENELEC as EN 61000-4-5:2014.

The following dates are fixed:

| | | |
|---|---|---|
| – latest date by which the document has to be implemented at national level by publication of an identical national standard or by endorsement | (dop) | 2015-03-19 |
| – latest date by which the national standards conflicting with the document have to be withdrawn | (dow) | 2017-06-19 |

This document supersedes EN 61000-4-5:2006.

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. CENELEC [and/or CEN] shall not be held responsible for identifying any or all such patent rights.

## Endorsement notice

The text of the International Standard IEC 61000-4-5:2014 was approved by CENELEC as a European Standard without any modification.

## A1 European foreword

The text of document 77B/762/CDV, future IEC 61000-4-5:2014/A1, prepared by SC 77B "High frequency phenomena" of IEC/TC 77 "Electromagnetic compatibility" was submitted to the IEC-CENELEC parallel vote and approved by CENELEC as EN 61000-4-5:2014/A1:2017.
The following dates are fixed:

| | | |
|---|---|---|
| • latest date by which the document has to be implemented at national level by publication of an identical national standard or by endorsement | (dop) | 2018-06-08 |
| • latest date by which the national standards conflicting with the document have to be withdrawn | (dow) | 2020-09-08 |

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# ELECTROMAGNETIC COMPATIBILITY (EMC) –

## Part 4-5: Testing and measurement techniques – Surge immunity test



## 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 61000-4-5 has been prepared by subcommittee 77B: High frequency phenomena, of IEC technical Committee 77: Electromagnetic compatibility.

It forms Part 4-5 of IEC 61000. It has the status of a basic EMC publication in accordance with IEC Guide 107.

This third edition cancels and replaces the second edition published in 2005, and constitutes a technical revision.

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

a) new Annex E on mathematical modelling of surge waveforms;
b) new Annex F on measurement uncertainty;
c) new Annex G on method of calibration of impulse measuring systems;
d) new Annex H on coupling/decoupling surges to lines rated above 200 A;

e) moreover while surge test for ports connected to outside telecommunication lines was addressed in 6.2 of the second edition (IEC 61000-4-5:2005), in this third edition (IEC 61000-4-5:2014) the normative Annex A is fully dedicated to this topic. In particular it gives the specifications of the 10/700 μs combined wave generator.

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

| FDIS | Report on voting |
|---|---|
| 77B/711/FDIS | 77B/715/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 61000 series, published under the general title *Electromagnetic compatibility (EMC)*, 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

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

**IMPORTANT – The 'colour inside' logo on the cover page of this publication indicates that it contains colours which are considered to be useful for the correct understanding of its contents. Users should therefore print this document using a colour printer.**

# INTRODUCTION

IEC 61000 is published in separate parts according to the following structure:

**Part 1: General**

General considerations (introduction, fundamental principles)

Definitions, terminology

**Part 2: Environment**

Description of the environment

Classification of the environment

Compatibility levels

**Part 3: Limits**

Emission limits

Immunity limits (insofar as they do not fall under the responsibility of the product committees)

**Part 4: Testing and measurement techniques**

Measurement techniques

Testing techniques

**Part 5: Installation and mitigation guidelines**

Installation guidelines

Mitigation methods and devices

**Part 6: Generic standards**

**Part 9: Miscellaneous**

Each part is further subdivided into several parts, published either as international standards or as technical specifications or technical reports, some of which have already been published as sections. Others will be published with the part number followed by a dash and a second number identifying the subdivision (example: IEC 61000-6-1).

This part is an International Standard which gives immunity requirements and test procedures related to surge voltages and surge currents.

# INTRODUCTION TO THE AMENDMENT

Rationale:

The method for testing DC products in the current revision of IEC61000-4-5 is causing many field related problems for test labs and manufacturers. Many products will not power up through the power CDN in the standard and in some cases may be damaged by the inductance that is necessary to apply the surge (see 77B/734/DC for further information).

The DC./DC converter problem is related to the switching of the converter which produces a voltage drop at the decoupling inductors on one hand and oscillations produced by the EUT impedance in combination with the source on the other hand. Measurements were performed using different brands of CDNs with a device known to show that problem as an EUT. The result shows different oscillations and signal forms of the voltage at the EUT for different CDNs. According to the outcome, the use of a CDN with a higher current rating (i.e. smaller decoupling inductivity) can solve the problem. At the meeting of SC77B/MT12 in Akishima, Japan on August 26, 2016, it was decided to add a statement into 7.3 allowing surge tests with higher current rated CDNs and to add a new Annex I to explain the problem in detail.

# ELECTROMAGNETIC COMPATIBILITY (EMC) –

# Part 4-5: Testing and measurement techniques – Surge immunity test



## 1 Scope and object

This part of IEC 61000 relates to the immunity requirements, test methods, and range of recommended test levels for equipment with regard to unidirectional surges caused by over-voltages from switching and lightning transients. Several test levels are defined which relate to different environment and installation conditions. These requirements are developed for and are applicable to electrical and electronic equipment.

The object of this standard is to establish a common reference for evaluating the immunity of electrical and electronic equipment when subjected to surges. The test method documented in this part of IEC 61000 describes a consistent method to assess the immunity of an equipment or system against a defined phenomenon.

NOTE As described in IEC Guide 107, this is a basic EMC publication for use by product committees of the IEC. As also stated in Guide 107, the IEC product committees are responsible for determining whether this immunity test standard is applied or not, and if applied, they are responsible for determining the appropriate test levels and performance criteria. TC 77 and its sub-committees are prepared to co-operate with product committees in the evaluation of the value of particular immunity test levels for their products.

This standard defines:

– a range of test levels;
– test equipment;
– test setups;
– test procedures.

The task of the described laboratory test is to find the reaction of the equipment under test (EUT) under specified operational conditions to surge voltages caused by switching and lightning effects.

It is not intended to test the capability of the EUT's insulation to withstand high-voltage stress. Direct injections of lightning currents, i.e. direct lightning strikes, are not considered in this standard.

## 2 Normative references

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 60050 (all parts), *International Electrotechnical Vocabulary (IEV)* (available at www.electropedia.org)