



BSI Standards Publication

## Electromagnetic compatibility (EMC)

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

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## National foreword

This British Standard is the UK implementation of EN 61000-4-5:2014+A1:2017. It is identical to IEC 61000-4-5:2014, incorporating amendment 1:2017. It supersedes BS EN 61000-4-5:2014 which remains current until 8 September 2020.

The start and finish of text introduced or altered by amendment is indicated in the text by tags. Tags indicating changes to IEC text carry the number of the IEC amendment. For example, text altered by IEC amendment 1 is indicated by **A1** **A1**.

The UK participation in its preparation was entrusted to Technical Committee GEL/210/11, EMC - Standards Committee.

A list of organizations represented on this committee can be obtained on request to its secretary.

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### Amendments/corrigenda issued since publication

Date	Text affected
28 February 2018	Implementation of IEC amendment 1:2017 with CENELEC endorsement A1:2017

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## EUROPÄISCHE NORM

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ICS 33.100.20

English Version

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

Compatibilité électromagnétique (CEM) —  
Partie 4-5: Techniques d'essai et de mesure — Essai  
d'immunité aux ondes de Choc (IEC 61000-4-5:2014)

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

This European Standard was approved by CENELEC on 2014-06-19. 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 CEN-CENELEC Management Centre or to any CENELEC member.

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

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## European 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

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### Endorsement notice

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

In the official version, for Bibliography, the following notes have to be added for the standards indicated:

IEC 60060-2	NOTE	Harmonized as EN 60060-2.
IEC 60364-4-44	NOTE	Harmonized as HD 60364-4-442 and HD 60364-4-444.
IEC 60664-1	NOTE	Harmonized as EN 60664-1.
IEC 60664-4-4	NOTE	Harmonized as EN 61000-4-4.
IEC 61643	NOTE	Harmonized as EN 61643 series and in CLC/TS 61643 series (partly modified).
IEC 61643-11	NOTE	Harmonized as EN 61643-11.
IEC 61643-12	NOTE	Harmonized as CLC/TS 61643-12.
IEC 61643-21:2000	NOTE	Harmonized as 61643-21:2000 (not modified).
+ A1:2008		+ A1:2009 (modified)
+ A2:2012		+ A2:2013 (not modified)
IEC 62305-1	NOTE	Harmonized as EN 62305-1.

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## Foreword to amendment A1

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.

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- 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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## Annex ZA (normative)

### Normative references to international publications with their corresponding European publications

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.

NOTE 1 When an International Publication has been modified by common modifications, indicated by (mod), the relevant EN/HD applies.

NOTE 2 Up-to-date information on the latest versions of the European Standards listed in this annex is available here: [www.cenelec.eu](http://www.cenelec.eu).

<u>Publication</u>	<u>Year</u>	<u>Title</u>	<u>EN/HD</u>	<u>Year</u>
IEC 60050	Series	International Electrotechnical Vocabulary (IEV) -	-	-

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## 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 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;

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- 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  $\mu$ s combined wave generator.

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 the base publication and its amendment 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.

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## 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.

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## **A1** 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. **A1**

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# 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 overvoltages 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](http://www.electropedia.org))

### 3 Terms, definitions and abbreviations

#### 3.1 Terms and definitions

For the purposes of this document, the terms and definitions given in IEC 60050 as well as the following apply.