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**Elektromagnetna združljivost (EMC) - 4-5. del: Preskusne in merilne tehnike -  
Preskus odpornosti proti napetostnemu udaru (IEC 61000-4-5:2005)**

Electromagnetic compatibility (EMC) - Part 4-5: Testing and measurement  
techniques - Surge immunity test (IEC 61000-4-5:2005)

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English version

**Electromagnetic compatibility (EMC)  
Part 4-5: Testing and measurement techniques -  
Surge immunity test  
(IEC 61000-4-5:2005)**

Compatibilité électromagnétique (CEM)  
Partie 4-5: Techniques d'essai  
et de mesure -  
Essai d'immunité aux ondes de choc  
(CEI 61000-4-5:2005)

Elektromagnetische Verträglichkeit  
(EMV)  
Teil 4-5: Prüf- und Messverfahren -  
Prüfung der Störfestigkeit gegen  
Stoßspannungen  
(IEC 61000-4-5:2005)

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This European Standard was approved by CENELEC on 2006-10-01. 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, 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**

## Foreword

The text of document 77B/467/FDIS, future edition 2 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 was approved by CENELEC as EN 61000-4-5 on 2006-10-01.

This European Standard supersedes EN 61000-4-5:1995 + A1:2001.

Particularly the clauses dedicated to coupling/decoupling networks and to test setups are more detailed.

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) 2007-07-01
- latest date by which the national standards conflicting with the EN have to be withdrawn (dow) 2009-10-01

Annex ZA has been added by CENELEC.

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## Endorsement notice

The text of the International Standard IEC 61000-4-5:2005 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 60664	NOTE Harmonized as EN 60664 (series) (not modified). <a href="https://standards.iteh.ai/catalog/standards/sist/en-61000-4-5-2007">SIST EN 61000-4-5:2007</a>
IEC 61643	<a href="https://standards.iteh.ai/catalog/standards/sist/f43a6ca3-875f-49d3-aa83-ef1a6155dc61/sist-en-61000-4-5-2007">https://standards.iteh.ai/catalog/standards/sist/f43a6ca3-875f-49d3-aa83-ef1a6155dc61/sist-en-61000-4-5-2007</a> NOTE Harmonized as EN 61643 (series) (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.

<u>Publication</u>	<u>Year</u>	<u>Title</u>	<u>EN/HD</u>	<u>Year</u>
IEC 60050-161	- <sup>1)</sup>	International Electrotechnical Vocabulary (IEV) Chapter 161: Electromagnetic compatibility	-	-
IEC 60060-1	- <sup>1)</sup>	High-voltage test techniques Part 1: General definitions and test requirements	HD 588.1 S1	1991 <sup>2)</sup>
IEC 60469-1	- <sup>1)</sup>	Pulse techniques and apparatus Part 1: Pulse terms and definitions	-	-

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<sup>1)</sup> Undated reference.

<sup>2)</sup> Valid edition at date of issue.

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# INTERNATIONAL STANDARD

# IEC 61000-4-5

Second edition  
2005-11

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BASIC EMC PUBLICATION

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**Electromagnetic compatibility (EMC) –**

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

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## COMMISSION ÉLECTROTECHNIQUE INTERNATIONALE

**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, *Electromagnetic compatibility – Guide to the drafting of electromagnetic compatibility publications*.

This second edition cancels and replaces the first edition published in 1995 and its amendment 1 (2000), and constitutes a technical revision. Particularly, the clauses dedicated to coupling/decoupling networks and to test setups are more detailed.

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

FDIS	Report on voting
77B/467/FDIS	77B/486/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.

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.

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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 (in so far 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

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### **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: 61000-6-1).

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

## 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 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 should be 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 tests for their products.

This standard defines:

- a range of test levels; [SIST EN 61000-4-5:2007](https://standards.iteh.ai/catalog/standards/sist/f43a6ca3-875f-49d3-aa83-ef1a6f55dc61/sist-en-61000-4-5-2007)
- test equipment; <https://standards.iteh.ai/catalog/standards/sist/f43a6ca3-875f-49d3-aa83-ef1a6f55dc61/sist-en-61000-4-5-2007>
- test setups;
- test procedures.

The task of the described laboratory test is to find the reaction of the EUT under specified operational conditions, to surge voltages caused by switching and lightning effects at certain threat levels.

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 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 60050(161), *International Electrotechnical Vocabulary (IEV) – Chapter 161: Electromagnetic compatibility*

IEC 60060-1, *High-voltage test techniques – Part 1: General definitions and test requirements*

IEC 60469-1, *Pulse techniques and apparatus – Part 1: Pulse terms and definitions*

### 3 Terms and definitions

For the purposes of this document, the terms and definitions in IEC 60050(161) and the following apply.

#### 3.1

##### **avalanche device**

diode, gas tube arrestor, or other component that is designed to break down and conduct at a specified voltage

#### 3.2

##### **calibration**

set of operations which establishes, by reference to standards, the relationship which exists, under specified conditions, between an indication and a result of a measurement

[IEV 311-01-09]

NOTE 1 This term is based on the "uncertainty" approach.

NOTE 2 The relationship between the indications and the results of measurement can be expressed, in principle, by a calibration diagram.

#### 3.3

##### **clamping device**

diode, varistor or other component that is designed to prevent an applied voltage from exceeding a specified value

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#### 3.4

##### **combination wave generator**

generator with 1,2/50  $\mu\text{s}$  or 10/700  $\mu\text{s}$  open-circuit voltage waveform and respectively 8/20  $\mu\text{s}$  or 5/320  $\mu\text{s}$  short-circuit current waveform

#### 3.5

##### **coupling network**

electrical circuit for the purpose of transferring energy from one circuit to another

#### 3.6

##### **decoupling network**

electrical circuit for the purpose of preventing surges applied to the EUT from affecting other devices, equipment or systems which are not under test

#### 3.7

##### **duration**

absolute value of the interval during which a specified waveform or feature exists or continues

[IEC 60469-1]

**3.8****effective output impedance** (of a surge generator)

ratio of the peak open-circuit voltage to the peak short-circuit current

**3.9****electrical installation**

assembly of associated electrical equipment having co-ordinated characteristics to fulfil purposes

[IEV 826-10-01]

**3.10****EUT**

equipment under test

**3.11****front time****surge voltage**

the front time  $T_1$  of a surge voltage is a virtual parameter defined as 1,67 times the interval  $T$  between the instants when the impulse is 30 % and 90 % of the peak value (see Figures 2 and 5)

**surge current**

the front time  $T_1$  of a surge current is a virtual parameter defined as 1,25 times the interval  $T$  between the instants when the impulse is 10 % and 90 % of the peak value (see Figures 3 and 6)

[IEC 60060-1, 24.3 modified]

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**3.12**

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**ground (reference)** <https://standards.iteh.ai/catalog/standards/sist/f43a6ca3-875f-49d3-aa83->

part of the Earth considered as conductive, the electrical potential of which is conventionally taken as zero, being outside the zone of influence of any earthing (grounding) arrangement

[IEV 195-01-01]

**3.13****high-speed communication lines**

input/output lines which operate at transmission frequencies above 100 kHz

**3.14****immunity**

ability of a device, equipment or system to perform without degradation in the presence of an electromagnetic disturbance

[IEV 161-01 -20]

**3.15****interconnection lines**

I/O lines (input/output lines) and communication lines

**3.16****primary protection**

means by which the majority of stressful energy is prevented from propagating beyond a designated interface