



# SLOVENSKI STANDARD

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**Elektromagnetna združljivost (EMC) - 4-9. del: Preskusne in merilne tehnike -  
Preskus odpornosti proti impulznemu magnetnemu polju**

Electromagnetic Compatibility (EMC) - Part 4-9: Testing and measurement techniques -  
Pulse magnetic field immunity test

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EUROPEAN STANDARD

**EN 61000-4-9**

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**Electromagnetic compatibility (EMC) - Part 4-9: Testing and measurement techniques - Impulse magnetic field immunity test (IEC 61000-4-9:2016)**

Compatibilité électromagnétique (CEM) - Partie 4-9:  
Techniques d'essai et de mesure - Essai d'immunité au  
champ magnétique impulsionnel  
(IEC 61000-4-9:2016)

Elektromagnetische Verträglichkeit (EMV) - Teil 4-9: Prüf-  
und Messverfahren - Prüfung der Störfestigkeit gegen  
impulsförmige Magnetfelder  
(IEC 61000-4-9:2016)

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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**

**EN 61000-4-9:2016****European foreword**

The text of document 77B/728/CDV, future edition 2 of IEC 61000-4-9, 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 61000-4-9:2016.

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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	-	series

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# INTERNATIONAL STANDARD

# NORME INTERNATIONALE



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PUBLICATION FONDAMENTALE EN CEM

**Electromagnetic compatibility (EMC) –  
Part 4-9: Testing and measurement techniques – Impulse magnetic field  
immunity test**

**Compatibilité électromagnétique (CEM) –  
Partie 4-9: Techniques d'essai et de mesure – Essai d'immunité au champ  
magnétique impulsionnel**

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## INTERNATIONAL ELECTROTECHNICAL COMMISSION

**ELECTROMAGNETIC COMPATIBILITY (EMC) –****Part 4-9: Testing and measurement techniques –  
Impulse magnetic field immunity test**

## FOREWORD

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International Standard IEC 61000-4-9 has been prepared by subcommittee 77B: High frequency phenomena, of IEC technical committee 77: Electromagnetic compatibility.

It forms Part 4-9 of the IEC 61000 series. It has the status of a basic EMC publication in accordance with IEC Guide 107.

This second edition cancels and replaces the first edition published in 1993 and Amendment 1:2000. This edition constitutes a technical revision.

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

- a) new Annex B on induction coil field distribution;
- b) new Annex D on measurement uncertainty;
- c) new Annex E on mathematical modeling of surge waveform;

- d) new Annex F on characteristics using two standard induction coils;
- e) new Annex G on 3D numerical simulations;
- f) coil factor calculation and calibration using current measurement have been addressed in this edition.

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

CDV	Report on voting
77B/728/CDV	77B/745A/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 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 website 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

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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: IEC 61000-6-1).

This part is an international standard which gives immunity requirements and test procedures related to "pulse magnetic field".

## ELECTROMAGNETIC COMPATIBILITY (EMC) –

### Part 4-9: Testing and measurement techniques – Impulse magnetic field immunity test

#### 1 Scope and object

This part of IEC 61000 specifies the immunity requirements, test methods, and range of recommended test levels for equipment subjected to impulse magnetic disturbances mainly encountered in:

- industrial installations,
- power plants,
- railway installations,
- medium voltage and high voltage sub-stations.

The applicability of this standard to equipment installed in different locations is determined by the presence of the phenomenon, as specified in Clause 4.

This standard does not consider disturbances due to capacitive or inductive coupling in cables or other parts of the field installation. Other IEC standards dealing with conducted disturbances cover these aspects.

The object of this standard is to establish a common reference for evaluating the immunity of electrical and electronic equipment when subjected to impulse magnetic fields. 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 impulse magnetic fields caused by switching and lightning effects.

#### 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 abbreviated terms

#### 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.

##### 3.1.1

##### **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

Note 1 to entry: This term is based on the "uncertainty" approach.

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

[SOURCE: IEC 60050-311:2001, 311-01-09]

##### 3.1.2

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

##### **CWG**

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

Note 1 to entry: This definition is abbreviated from the equivalent definition in IEC 61000-4-5.

Note 2 to entry: This note applies to the French language only.

##### 3.1.3

##### **duration**

##### $T_d$

<surge current for 8/20  $\mu\text{s}$ > virtual parameter defined as the time interval between the instant at which the surge current rises to 0,5 of its peak value, and then falls to 0,5 of its peak value ( $T_w$ ), multiplied by 1,18

$$T_d = 1,18 \times T_w$$

SEE: Figure 2.

##### 3.1.4

##### **front time**

##### $T_f$

<surge current> virtual parameter defined as 1,25 times the interval  $T_r$  between the instants when the impulse is 10 % and 90 % of the peak value

SEE: Figure 2.

##### 3.1.5

##### **immunity**

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

[SOURCE: IEC 60050-161:1990, 161-01-20]

##### 3.1.6

##### **induction coil**

conductor loop of defined shape and dimensions, in which a current flows, generating a magnetic field of defined uniformity in a defined volume