SLOVENSKI STANDARD
SIST EN 60664-4:2007

01-januar-2007

Koordinacija izolacije za opremo v okviru nizkonapetostnih sistemov - 4. del: Upoštevanje visokofrekvenčne napetostne obremenitve (IEC 60664-4:2005) (vsebuje popravek AC:2006)

Insulation coordination for equipment within low-voltage systems -- Part 4: Consideration of high-frequency voltage stress

Isolationskoordination für elektrische Betriebsmittel in Niederspannungsanlagen -- Teil 4: Berücksichtigung von hochfrequenten Spannungsbeanspruchungen

Coordination de l'isolement des matériels dans les systèmes (réseaux) à basse tension -- Partie 4: Considérations sur les contraintes de tension à haute fréquence

Ta slovenski standard je istoveten z: **EN 60664-4:2006**

ICS:

29.080.30	Izolacijski sistemi	Insulation systems

SIST EN 60664-4:2007 **en**

EUROPEAN STANDARD

NORME EUROPÉENNE

EUROPÄISCHE NORM

EN 60664-4

January 2006

ICS 29.080.30

Incorporates Corrigendum October 2006

English version

Insulation coordination for equipment within low-voltage systems
Part 4: Consideration of high-frequency voltage stress
(IEC 60664-4:2005)

Coordination de l'isolement des matériels dans les systèmes (réseaux) à basse tension
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(CEI 60664-4:2005)

Isolationskoordination für elektrische Betriebsmittel in Niederspannungsanlagen
Teil 4: Berücksichtigung von hochfrequenten Spannungsbeanspruchungen
(IEC 60664-4:2005)

This European Standard was approved by CENELEC on 2005-10-01. 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, Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, Netherlands, Norway, Poland, Portugal, Slovakia, Slovenia, Spain, Sweden, Switzerland and 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 109/51/FDIS, future edition 2 of IEC 60664-4, prepared by IEC TC 109, Insulation co-ordination for low-voltage equipment, was submitted to the IEC-CENELEC parallel vote and was approved by CENELEC as EN 60664-4 on 2005-10-01.

This European Standard is to be used in conjunction with EN 60664-1 or EN 60664-5.

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)	2006-08-01
– latest date by which the national standards conflicting with the EN have to be withdrawn	(dow)	2008-10-01

Annex ZA has been added by CENELEC.

The contents of the corrigendum of October 2006 have been included in this copy.

Endorsement notice

The text of the International Standard IEC 60664-4:2005 was approved by CENELEC as a European Standard without any modification.

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 60112	2003	Method for the determination of the proof and the comparative tracking indices of solid insulating materials	EN 60112	2003
IEC 60664-1 (mod) + A1 + A2	1992 2000 2002	Insulation coordination for equipment within low-voltage systems Part 1: Principles, requirements and tests	EN 60664-1	2003
IEC 60664-5	2003	Insulation coordination for equipment within low-voltage systems Part 5: A comprehensive method for determining clearances and creepage distances equal to or less than 2 mm	EN 60664-5	2003
IEC Guide 104	1997	The preparation of safety publications and the use of basic safety publications and group safety publications	-	-

NORME INTERNATIONALE

INTERNATIONAL STANDARD

CEI
IEC
60664-4

Deuxième édition
Second edition
2005-09

PUBLICATION FONDAMENTALE DE SÉCURITÉ
BASIC SAFETY PUBLICATION

Coordination de l'isolement des matériels dans les systèmes (réseaux) à basse tension –

Partie 4: Considérations sur les contraintes de tension à haute fréquence

Insulation coordination for equipment within low-voltage systems –

Part 4: Consideration of high-frequency voltage stress

International Electrotechnical Commission, 3, rue de Varembé, PO Box 131, CH-1211 Geneva 20, Switzerland
Telephone: +41 22 919 02 11 Telefax: +41 22 919 03 00 E-mail: inmail@iec.ch Web: www.iec.ch

Commission Electrotechnique Internationale
International Electrotechnical Commission
Международная Электротехническая Комиссия

CODE PRIX
PRICE CODE XB

Pour prix, voir catalogue en vigueur
For price, see current catalogue

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INTERNATIONAL ELECTROTECHNICAL COMMISSION

INSULATION COORDINATION FOR EQUIPMENT WITHIN LOW-VOLTAGE SYSTEMS –

Part 4: Consideration of high-frequency voltage stress

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 60664-4 has been prepared by IEC technical committee 109: Insulation co-ordination for low-voltage equipment.

This second edition cancels and replaces the first edition which was issued as a technical report in 1997. It constitutes a technical revision and now has the status of an International Standard.

The major changes made during the revision of IEC 60664-4 were the following:

– inclusion of more recent information about the withstand characteristics of insulation at high-frequency voltage stress (see Annexes A, B and C);

– inclusion of requirements for the dimensioning of clearances at high-frequency voltage stress (see Clause 4);
– inclusion of requirements for the dimensioning of creepage distances at high-frequency voltage stress (see Clause 5);
– inclusion of requirements for the dimensioning of solid insulation at high-frequency voltage stress (see Clause 6);
– inclusion of diagrams to provide guidance on dimensioning with respect to high-frequency voltage stress (see Annex F);
– specification of tests with respect to high-frequency voltage stress (see Clause 7).
– inclusion of test circuits for high-frequency voltage withstand testing and partial discharge testing (see Annex D.1 and D.2.1);
– inclusion of design criteria for partial discharge test circuits at high-frequency voltage (see Annex D.2.2);
– Inclusion of criteria for dealing with non sinusoidal voltage stress (see Clause 8 and Annex E).

It has the status of a basic safety publication in accordance with IEC Guide 104.

This International Standard is to be used in conjunction with IEC 60664-1 or IEC 60664-5.

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

FDIS	Report on voting
109/51/FDIS	109/53/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.

IEC 60664 consists of the following parts under the general title *Insulation coordination for equipment within low-voltage systems*:

Part 1: Principles, requirements and tests

Part 2: Application guide

Part 3: Use of coating, potting or moulding for protection against pollution

Part 4: Consideration of high-frequency voltage stress

Part 5: A comprehensive method for determining clearances and creepage distances equal to or less than 2 mm

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

High electrical stress also occurs in low-voltage equipment. The frequency is usually 50/60 Hz, but in some applications a higher frequency (400 Hz) or a lower frequency (16 2/3 Hz) or d.c. can occur. A particular situation exists in high-power RF transmitters. The development of such equipment had motivated earlier research on the withstand capability of insulation at radio frequencies. Since that time, the aspect of high-frequency voltage stress had not been pursued with much effort.

At present, high-frequency working voltages exceeding 30 kHz are often used in low-voltage equipment, and the use of frequencies in the MHz range is likely in the future. Many of the voltage shapes are non sinusoidal. Small dimensions are necessary for miniaturization and for high efficiency, for instance in high-frequency transformers. Consequently, very high stresses are common in solid insulation.

By increasing the frequency the deteriorating effect of partial discharges is also increased roughly proportionally to the frequency, so that the impact of partial discharges on dimensioning is much higher compared to power frequency.

As dimensions are likely to decrease further and frequencies increase, this situation will be aggravated in the future. Therefore, with respect to safety of personnel and reliability of equipment, the stress due to high frequencies up to 100 MHz has to be considered for insulation coordination of low-voltage equipment, (see note 2 in the Scope of Part 1).

This standard summarizes the most important available data concerning high-frequency stress of insulation, and identifies how materials and their dimensioning are influenced. Data for dimensioning of clearances, creepage distances and solid insulation are specified. This standard also describes how tests can be performed with respect to this stress.

INSULATION COORDINATION FOR EQUIPMENT WITHIN LOW-VOLTAGE SYSTEMS –

Part 4: Consideration of high-frequency voltage stress

1 Scope and object

This part of IEC 60664 deals with basic, supplementary and reinforced insulation subjected to high-frequency voltage stress within low-voltage equipment. The dimensioning values directly apply for basic insulation; for reinforced insulation additional requirements apply according to Part 1. It is applicable for the dimensioning of clearances, creepage distances and solid insulation stressed by any type of periodic voltages with a fundamental frequency above 30 kHz and up to 10 MHz.

This part of IEC 60664 can only be used together with IEC 60664-1 or with IEC 60664-5 (in this standard called Part 1 or Part 5). By using Part 1 or Part 5 together with this part the frequency limit of Part 1 or Part 5 is extended to frequencies higher than 30 kHz.

This part also applies to Part 3 for frequencies greater than 30 kHz and protection of type 1. For type 2 protection this question is under consideration.

NOTE 1 Dimensioning values for frequencies above 10 MHz are under consideration.

NOTE 2 This standard does not consider the high-frequency emission to the mains. In normal use of equipment, it is assumed that the interference of high-frequency voltages emitted to the mains is negligible with respect to insulation stress. Therefore it is not necessary to take it into account.

It applies to equipment for use up to 2 000 m above sea level having a rated voltage up to a.c. 1 000 V.

It specifies the requirements for clearances, creepage distances and solid insulation for equipment based upon their performance criteria. It includes methods of electric testing with respect to insulation coordination.

The minimum clearances specified in this part do not apply where ionized gases occur. Special requirements for such situations may be specified at the discretion of the relevant technical committee.

This part does not deal with distances

- through liquid insulation,
- through gases other than air,
- through compressed air.

NOTE 3 Higher voltages may exist in internal circuits of the equipment.

NOTE 4 Requirements for altitudes exceeding 2 000 m can be derived from Table A.2 of Annex A of Part 1.

The object of this standard is to guide technical committees responsible for different equipment in order to rationalise their requirements so that insulation coordination is achieved when specifying clearances in air, creepage distances and solid insulation for equipment.

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 60112:2003, *Method for determining the comparative and the proof tracking indices of solid insulating materials under moist conditions*

IEC 60664-1:1992, *Insulation coordination for equipment within low-voltage systems: Part 1: Principles, requirements and tests*

Amendment 1 (2000)

Amendment 2 (2002)

IEC 60664-5:2003, *Insulation coordination for equipment within low-voltage systems: A comprehensive method for determining clearances and creepage distances equal to or less than 2 mm*

IEC Guide 104:1997, *The preparation of safety publications and the use of basic safety publications and group safety publications*

3 Terms and definitions

For the purposes of this document, the terms and definitions given in Part 1, as well as the following terms and definitions, apply.

3.1
approximately homogeneous field
for frequencies exceeding 30 kHz, the field is considered to be approximately homogeneous when the radius of curvature of the conductive parts is equal or greater than 20 % of the clearance

3.2
inhomogeneous field
for frequencies exceeding 30 kHz the field is considered to be inhomogeneous when the radius of curvature of the conductive parts is less than 20 % of the clearance

3.3
U_{peak}
peak value of any type of periodic peak voltage across the insulation

3.4
f_{crit}
critical frequency at which the reduction of the breakdown voltage of a clearance occurs

3.5
f_{min}
frequency at which the maximum reduction of the breakdown voltage of a clearance occurs