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**Insulation coordination for equipment within low-voltage supply systems –
Part 1: Principles, requirements and tests**



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CONTENTS

| | |
|--|----|
| FOREWORD..... | 7 |
| 1 Scope..... | 9 |
| 2 Normative references | 9 |
| 3 Terms, definitions and abbreviated terms | 10 |
| 3.1 Terms and definitions..... | 10 |
| 3.2 Abbreviated terms..... | 17 |
| 4 Basic technical characteristics for insulation coordination..... | 17 |
| 4.1 General..... | 17 |
| 4.2 Voltages | 18 |
| 4.2.1 General aspects | 18 |
| 4.2.2 Transient overvoltages | 18 |
| 4.2.3 Temporary overvoltages | 20 |
| 4.2.4 Recurring peak voltage..... | 20 |
| 4.2.5 Steady-state working voltage..... | 21 |
| 4.2.6 Steady-state peak voltage | 21 |
| 4.3 Overvoltage categories | 21 |
| 4.3.1 General | 21 |
| 4.3.2 Equipment energized directly from the mains supply..... | 21 |
| 4.3.3 Systems and equipment not energized directly from the mains supply | 22 |
| 4.3.4 Equipment requiring specific measures..... | 22 |
| 4.4 Frequency..... | 23 |
| 4.4.1 General | 23 |
| 4.4.2 Solid insulation | 23 |
| 4.5 Pollution | 23 |
| 4.5.1 General | 23 |
| 4.5.2 Degrees of pollution in the micro-environment..... | 23 |
| 4.5.3 Conditions of conductive pollution..... | 24 |
| 4.6 Insulating material | 24 |
| 4.6.1 Solid insulation | 24 |
| 4.6.2 Stresses | 24 |
| 4.6.3 Comparative tracking index (CTI) | 25 |
| 4.7 Environmental aspects..... | 26 |
| 4.7.1 General | 26 |
| 4.7.2 Altitude | 26 |
| 4.7.3 Temperature | 26 |
| 4.7.4 Vibrations | 27 |
| 4.7.5 Humidity | 27 |
| 4.8 Duration of voltage stress | 27 |
| 4.9 Electrical field distribution | 27 |
| 5 Design for insulation coordination..... | 27 |
| 5.1 General..... | 27 |
| 5.1.1 Means of insulation coordination..... | 27 |
| 5.1.2 Frequency above 30 kHz | 28 |
| 5.1.3 Reduced distances due to coating or potting..... | 28 |
| 5.1.4 Equipment which are not connected to public low-voltage systems..... | 28 |
| 5.2 Dimensioning of clearances | 28 |

| | | |
|-----------------------|---|----|
| 5.2.1 | General | 28 |
| 5.2.2 | Dimensioning criteria for clearances | 28 |
| 5.2.3 | Other factors involving clearances | 29 |
| 5.2.4 | Dimensioning of clearances of functional insulation | 30 |
| 5.2.5 | Dimensioning of clearances of basic insulation, supplementary insulation and reinforced insulation..... | 30 |
| 5.3 | Dimensioning of creepage distances | 31 |
| 5.3.1 | General | 31 |
| 5.3.2 | Dimensioning criteria of creepage distances | 31 |
| 5.3.3 | Other factors involving creepage distances..... | 32 |
| 5.3.4 | Dimensioning of creepage distances of functional insulation..... | 34 |
| 5.3.5 | Dimensioning of creepage distances of basic insulation, supplementary insulation and reinforced insulation..... | 34 |
| 5.4 | Requirements for design of solid insulation | 35 |
| 5.4.1 | General | 35 |
| 5.4.2 | Voltage stress..... | 35 |
| 5.4.3 | Withstand of voltage stresses | 35 |
| 5.4.4 | Withstand on environmental stresses..... | 37 |
| 6 | Tests and measurements..... | 37 |
| 6.1 | General..... | 37 |
| 6.2 | Verification of clearances | 38 |
| 6.2.1 | General | 38 |
| 6.2.2 | Test voltages | 38 |
| 6.3 | Verification of creepage distances | 41 |
| 6.4 | Verification of solid insulation | 41 |
| 6.4.1 | General | 41 |
| 6.4.2 | Selection of tests | 41 |
| 6.4.3 | Conditioning | 42 |
| 6.4.4 | Impulse voltage test..... | 43 |
| 6.4.5 | AC power frequency voltage test | 43 |
| 6.4.6 | Partial discharge test..... | 44 |
| 6.4.7 | DC voltage test..... | 46 |
| 6.4.8 | High-frequency voltage test | 46 |
| 6.5 | Performing dielectric tests on complete equipment..... | 46 |
| 6.5.1 | General | 46 |
| 6.5.2 | Parts to be tested | 47 |
| 6.5.3 | Preparation of equipment circuits..... | 47 |
| 6.5.4 | Test voltage values..... | 47 |
| 6.5.5 | Test criteria | 47 |
| 6.6 | Other tests | 47 |
| 6.6.1 | Test for purposes other than insulation coordination | 47 |
| 6.6.2 | Sampling and routine tests | 48 |
| 6.6.3 | Measurement accuracy of test parameters..... | 48 |
| 6.7 | Measurement of the attenuation of the transient overvoltages..... | 48 |
| 6.8 | Measurement of clearances and creepage distances | 48 |
| Annex A (informative) | Basic data on withstand characteristics of clearances | 54 |
| Annex B (informative) | Nominal voltages of mains supply for different modes of overvoltage control | 59 |

| | |
|---|----|
| Annex C (normative) Partial discharge test methods | 61 |
| C.1 Test circuits | 61 |
| C.1.1 General | 61 |
| C.1.2 Test circuit for earthed test specimen (Figure C.1)..... | 61 |
| C.1.3 Test circuit for unearthed test specimen (Figure C.2)..... | 62 |
| C.1.4 Selection criteria..... | 62 |
| C.1.5 Measuring impedance..... | 62 |
| C.1.6 Coupling capacitor C_k | 62 |
| C.1.7 Filter..... | 62 |
| C.2 Test parameters..... | 62 |
| C.2.1 General | 62 |
| C.2.2 Requirements for the test voltage | 63 |
| C.2.3 Climatic conditions | 63 |
| C.3 Requirements for measuring instruments | 63 |
| C.3.1 General | 63 |
| C.3.2 Classification of PD meters..... | 63 |
| C.3.3 Bandwidth of the test circuit..... | 64 |
| C.4 Calibration | 64 |
| C.4.1 Calibration of discharge magnitude before the noise level measurement | 64 |
| C.4.2 Verification of the noise level..... | 65 |
| C.4.3 Calibration for the PD test | 66 |
| C.4.4 Calibration pulse generator..... | 66 |
| Annex D (informative) Additional information on partial discharge test methods | 67 |
| D.1 Measurement of partial discharge (PD), PD inception and extinction voltage..... | 67 |
| D.2 Description of PD test circuits (Figure D.1) | 67 |
| D.3 Precautions for reduction of noise..... | 68 |
| D.3.1 General | 68 |
| D.3.2 Sources in the non-energized test circuit | 68 |
| D.3.3 Sources in the energized test circuit | 68 |
| D.3.4 Measures for reduction of noise..... | 68 |
| D.4 Application of multiplying factors for test voltages | 68 |
| D.4.1 General | 68 |
| D.4.2 Example 1 (circuit connected to mains supply)..... | 69 |
| D.4.3 Example 2 (internal circuit with maximum recurring peak voltage U_{rp})..... | 69 |
| Annex E (informative) Comparison of creepage distances specified in Table F.5 and clearances in Table A.1 | 70 |
| Annex F (normative) Tables | 71 |
| Annex G (informative) Determination of clearance distances according to 5.2..... | 80 |
| Annex H (informative) Determination of creepage distances according to 5.3..... | 82 |
| Annex I (informative) Electrochemical migration of creepage distances in DC applications | 84 |
| I.1 The phenomenon of electrochemical migration | 84 |
| I.2 Effect of electrochemical migration on creepage distances in DC applications | 84 |
| Bibliography..... | 86 |
| Figure 1 – Recurring peak voltage | 20 |
| Figure 2 – Determination of the width (W) and height (H) of a rib | 34 |
| Figure 3 – Test voltages | 45 |

| | |
|---|----|
| Figure 4 – Across the groove | 49 |
| Figure 5 – Contour of the groove | 50 |
| Figure 6 – Contour of the groove with angle..... | 50 |
| Figure 7 – Contour of rib | 50 |
| Figure 8 – Uncemented joint with grooves less than X | 51 |
| Figure 9 – Uncemented joint with grooves equal to or more than X | 51 |
| Figure 10 – Uncemented joint with a groove on one side less than X | 52 |
| Figure 11 – Creepage distance and clearance through an uncemented joint | 52 |
| Figure 12 – Creepage distance and clearance to a head of screw more than X | 52 |
| Figure 13 – Creepage distance and clearance to a head of screw less than X | 53 |
| Figure 14 – Creepage distance and clearance with conductive floating part | 53 |
| Figure A.1 – Withstand voltage at 2 000 m above sea level..... | 56 |
| Figure A.2 – Experimental data measured at approximately sea level and their low limits for inhomogeneous field..... | 57 |
| Figure A.3 – Experimental data measured at approximately sea level and their low limits for homogeneous field | 58 |
| Figure C.1 – Earthed test specimen | 61 |
| Figure C.2 – Unearthed test specimen | 62 |
| Figure C.3 – Calibration for earthed test specimen..... | 65 |
| Figure C.4 – Calibration for unearthed test specimen..... | 65 |
| Figure D.1 – Partial discharge test circuits..... | 67 |
| Figure E.1 – Comparison between creepage distances specified in Table F.5 and clearances in Table A.1 | 70 |
| Figure G.1 – Determination of clearance distances according to 5.2 (1 of 2) | 80 |
| Figure H.1 – Determination of creepage distances according to 5.3 (1 of 2)..... | 82 |
| | |
| Table 1 – Dimensioning of grooves | 49 |
| Table A.1 – Withstand voltages for an altitude of 2 000 m above sea level (1 of 2) | 54 |
| Table A.2 – Altitude correction factors for clearance correction..... | 55 |
| Table B.1 – Inherent control or equivalent protective control..... | 59 |
| Table B.2 – Cases where protective control is necessary and control is provided by surge protective device having a ratio of voltage protection level to rated voltage not smaller than that specified in IEC 61643 (all parts) | 60 |
| Table F.1 – Rated impulse withstand voltage for equipment energized directly from the mains supply..... | 71 |
| Table F.2 – Clearances to withstand transient overvoltages | 72 |
| Table F.3 – Single-phase three-wire or two-wire AC or DC systems..... | 73 |
| Table F.4 – Three-phase four-wire or three-wire AC systems | 74 |
| Table F.5 – Creepage distances to avoid failure due to tracking (1 of 2) | 75 |
| Table F.6 – Test voltages for verifying clearances only at different altitudes | 77 |
| Table F.7 – Severities for conditioning of solid insulation | 77 |
| Table F.8 – Dimensioning of clearances to withstand steady-state peak voltages, temporary overvoltages or recurring peak voltages ^b | 78 |
| Table F.9 – Additional information concerning the dimensioning of clearances to avoid partial discharge | 78 |

Table F.10 – Altitude correction factors for clearance correction 79

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INTERNATIONAL ELECTROTECHNICAL COMMISSION

INSULATION COORDINATION FOR EQUIPMENT WITHIN LOW-VOLTAGE SUPPLY SYSTEMS –

Part 1: Principles, requirements and tests

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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This consolidated version of the official IEC Standard and its amendment has been prepared for user convenience.

IEC 60664-1 edition 3.1 contains the third edition (2020-05) [documents 109/183/FDIS and 109/186/RVD], its corrigendum 1 (2020-10) and its amendment 1 (2025-05) [documents 109/235/FDIS and 109/240/RVD].

In this Redline version, a vertical line in the margin shows where the technical content is modified by amendment 1. Additions are in green text, deletions are in strikethrough red text. A separate Final version with all changes accepted is available in this publication.

International Standard IEC 60664-1 has been prepared by IEC technical committee 109: Insulation co-ordination for low-voltage equipment.

This third edition cancels and replaces the second edition published in 2007. This edition constitutes a technical revision.

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

- a) update of the Scope, Clauses 2 and 3,
- b) new structure for Clauses 4 and 5,
- c) addition of 1 500 V DC into tables in Annex B and F,
- d) update of distances altitude correction in a new Table F.10,
- e) addition of Annex G with a flowchart for clearances,
- f) addition of Annex H with a flowchart for creepage distances.

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

The text of this International Standard is based on the following documents:

| FDIS | Report on voting |
|--------------|------------------|
| 109/183/FDIS | 109/186/RVD |

Full information on the voting for the approval of this International Standard can be found in the report on voting indicated in the above table.

This document has been drafted in accordance with the ISO/IEC Directives, Part 2.

A list of all parts in the IEC 60664 series, published under the general title *Insulation coordination for equipment within low-voltage supply systems*, can be found on the IEC website.

Future standards in this series will carry the new general title as cited above. Titles of existing standards in this series will be updated at the time of the next edition.

In this document, the following print type is used:

- **Terms defined in Clause 3: in bold type.**

The committee has decided that the contents of this document and its amendment will remain unchanged until the stability date indicated on the IEC website under webstore.iec.ch in the data related to the specific document. At this date, the document will be

- reconfirmed,
- withdrawn, or
- revised.

INSULATION COORDINATION FOR EQUIPMENT WITHIN LOW-VOLTAGE SUPPLY SYSTEMS –

Part 1: Principles, requirements and tests

1 Scope

This part of IEC 60664 deals with **insulation coordination** for **electrical equipment** having a **rated voltage** up to AC 1 000 V or DC 1 500 V connected to **low-voltage supply systems**.

NOTE 1 Throughout this document, the term equipment is used with the meaning of **electrical equipment**.

This document applies to frequencies up to 30 kHz.

NOTE 2 Requirements for **insulation coordination** for equipment within **low-voltage supply systems** with rated frequencies above 30 kHz are given in IEC 60664-4.

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

It applies to equipment for use up to 2 000 m above sea level and provides guidance for use at higher altitudes (See 5.2.3.4).

It provides requirements for technical committees to determine **clearances**, **creepage distances** and criteria for **solid insulation**. It includes methods of electrical testing with respect to **insulation coordination**.

The minimum **clearances** specified in this document do not apply where ionized gases are present. Special requirements for such situations can be specified at the discretion of the relevant technical committee.

This document does not deal with distances:

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

This basic safety publication focusing on safety essential requirements is primarily intended for use by technical committees in the preparation of standards in accordance with the principles laid down in IEC Guide 104 and ISO/IEC Guide 51.

One of the responsibilities of a technical committee is, wherever applicable, to make use of basic safety publications in the preparation of its publications.

However, in case of missing specified values for **clearances**, **creepage distances** and requirements for **solid insulation** in the relevant product standards, or even missing standards, this document applies.

NOTE 4 Further explanations and examples with regard to the use of this document are provided in IEC TR 60664-2-1.

2 Normative references

The following documents are referred to in the text in such a way that some or all of their content constitutes requirements 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 60068-2-2, *Environmental testing – Part 2-2: Tests – Tests B: Dry heat*

IEC 60068-2-14:2009, *Environmental testing – Part 2-14: Tests – Test N: Change of temperature*

IEC 60068-2-78, *Environmental testing – Part 2-78: Tests – Test Cab: Damp heat, steady state*

IEC 60270, *High-voltage test techniques – Partial discharge measurements*

IEC 61140:2016, *Protection against electric shock – Common aspects for installation and equipment*

IEC 61180:2016, *High-voltage test techniques for low-voltage equipment – Definitions, test and procedure requirements, test equipment*

3 Terms, definitions and abbreviated terms

For the purposes of this document, the following terms and definitions apply.

ISO and IEC maintain terminological databases for use in standardization at the following addresses:

- IEC Electropedia: available at <http://www.electropedia.org/>
- ISO Online browsing platform: available at <http://www.iso.org/obp>

3.1 Terms and definitions

3.1.1

low-voltage supply system

all installations and plant provided for the purpose of generating, transmitting and distributing electricity

[SOURCE: IEC 60050-601:1985, 601-01-01, modified – The term "electric power system" has been replaced with "low-voltage supply system".]

3.1.2

mains supply

AC or DC power distribution system (external to the equipment) that supplies operating power to the equipment

Note 1 to entry: **Mains supply** includes public or private utilities and, unless otherwise specified in this document, equivalent sources such as motor-driven generators and uninterruptible power supplies.

3.1.3

insulation coordination

mutual correlation of insulation characteristics of electrical equipment taking into account the expected **micro-environment** and other influencing stresses

Note 1 to entry: Expected voltage stresses are characterized in terms of the characteristics defined in 3.1.7 to 3.1.16.

[SOURCE: IEC 60050-442:2014, 442-09-01, modified – "electrical" replaces "electric" and Note 1 to entry has been added.]