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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

INTERNATIONAL ELECTROTECHNICAL COMMISSION

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INSULATION COORDINATION FOR EQUIPMENT WITHIN LOW-VOLTAGE SUPPLY SYSTEMS –

Part 1: Principles, requirements and tests

FOREWORD

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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 ~~1~~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 ~~2~~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*

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 22
4.4.1 General 22
4.4.2 Solid insulation 22
4.5 Pollution 22
4.5.1 General 22
4.5.2 Degrees of pollution in the micro-environment 23
4.5.3 Conditions of conductive pollution 23
4.6 Insulating material 23
4.6.1 Solid insulation 23
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 26
4.7.5 Humidity 26
4.8 Duration of voltage stress 26
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 27
5.1.3 Reduced distances due to coating or potting 27
5.1.4 Equipment which are not connected to public low-voltage systems. 27
5.2 Dimensioning of clearances 27

5.2.1 General 27
5.2.2 Dimensioning criteria for clearances 28
5.2.3 Other factors involving clearances 28
5.2.4 Dimensioning of clearances of functional insulation 29
5.2.5 Dimensioning of clearances of basic insulation, supplementary insulation and reinforced insulation 29
5.3 Dimensioning of creepage distances 30
5.3.1 General 30
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 33
5.3.5 Dimensioning of creepage distances of basic insulation, supplementary insulation and reinforced insulation 34
5.4 Requirements for design of solid insulation 34
5.4.1 General 34
5.4.2 Voltage stress 34
5.4.3 Withstand of voltage stresses 34
5.4.4 Withstand on environmental stresses 36
6 Tests and measurements 36
6.1 General 36
6.2 Verification of clearances 37
6.2.1 General 37
6.2.2 Test voltages 37
6.3 Verification of creepage distances 40
6.4 Verification of solid insulation 40
6.4.1 General 40
6.4.2 Selection of tests 40
6.4.3 Conditioning 41
6.4.4 Impulse voltage test 42
6.4.5 AC power frequency voltage test 42
6.4.6 Partial discharge test 43
6.4.7 DC voltage test 45
6.4.8 High-frequency voltage test 45
6.5 Performing dielectric tests on complete equipment 45
6.5.1 General 45
6.5.2 Parts to be tested 45
6.5.3 Preparation of equipment circuits 46
6.5.4 Test voltage values 46
6.5.5 Test criteria 46
6.6 Other tests 46
6.6.1 Test for purposes other than insulation coordination 46
6.6.2 Sampling and routine tests 46
6.6.3 Measurement accuracy of test parameters 47
6.7 Measurement of the attenuation of the transient overvoltages 47
6.8 Measurement of clearances and creepage distances 47
Annex A (informative) Basic data on withstand characteristics of clearances 53
Annex B (informative) Nominal voltages of mains supply for different modes of overvoltage control 58

Annex C (normative) Partial discharge test methods 60
C.1 Test circuits 60
C.1.1 General 60
C.1.2 Test circuit for earthed test specimen (Figure C.1) 60
C.1.3 Test circuit for unearthed test specimen (Figure C.2) 61
C.1.4 Selection criteria 61
C.1.5 Measuring impedance 61
C.1.6 Coupling capacitor C_k 61
C.1.7 Filter 61
C.2 Test parameters 61
C.2.1 General 61
C.2.2 Requirements for the test voltage 62
C.2.3 Climatic conditions 62
C.3 Requirements for measuring instruments 62
C.3.1 General 62
C.3.2 Classification of PD meters 62
C.3.3 Bandwidth of the test circuit 63
C.4 Calibration 63
C.4.1 Calibration of discharge magnitude before the noise level measurement 63
C.4.2 Verification of the noise level 64
C.4.3 Calibration for the PD test 65
C.4.4 Calibration pulse generator 65
Annex D (informative) Additional information on partial discharge test methods 66
D.1 Measurement of partial discharge (PD), PD inception and extinction voltage 66
D.2 Description of PD test circuits (Figure D.1) 66
D.3 Precautions for reduction of noise 67
D.3.1 General 67
D.3.2 Sources in the non-energized test circuit 67
D.3.3 Sources in the energized test circuit 67
D.3.4 Measures for reduction of noise 67
D.4 Application of multiplying factors for test voltages 67
D.4.1 General 67
D.4.2 Example 1 (circuit connected to mains supply) 68
D.4.3 Example 2 (internal circuit with maximum recurring peak voltage U_{rp}) 68
Annex E (informative) Comparison of creepage distances specified in Table F.5 and clearances in Table A.1 69
Annex F (normative) Tables 70
Annex G (informative) Determination of clearance distances according to 5.2 79
Annex H (informative) Determination of creepage distances according to 5.3 81
Annex I (informative) Electrochemical migration of creepage distances in DC applications 83
I.1 The phenomenon of electrochemical migration 83
I.2 Effect of electrochemical migration on creepage distances in DC applications 83
Bibliography 85

Figure 1 – Recurring peak voltage 20
Figure 2 – Determination of the width (W) and height (H) of a rib 33
Figure 3 – Test voltages 44

Figure 4 – Across the groove 48
Figure 5 – Contour of the groove 49
Figure 6 – Contour of the groove with angle 49
Figure 7 – Contour of rib 49
Figure 8 – Uncemented joint with grooves less than X 50
Figure 9 – Uncemented joint with grooves equal to or more than X 50
Figure 10 – Uncemented joint with a groove on one side less than X 51
Figure 11 – Creepage distance and clearance through an uncemented joint 51
Figure 12 – Creepage distance and clearance to a head of screw more than X 51
Figure 13 – Creepage distance and clearance to a head of screw less than X 52
Figure 14 – Creepage distance and clearance with conductive floating part 52
Figure A.1 – Withstand voltage at 2 000 m above sea level 55
Figure A.2 – Experimental data measured at approximately sea level and their low limits for inhomogeneous field 56
Figure A.3 – Experimental data measured at approximately sea level and their low limits for homogeneous field 57
Figure C.1 – Earthed test specimen 60
Figure C.2 – Unearthed test specimen 61
Figure C.3 – Calibration for earthed test specimen 64
Figure C.4 – Calibration for unearthed test specimen 64
Figure D.1 – Partial discharge test circuits 66
Figure E.1 – Comparison between creepage distances specified in Table F.5 and clearances in Table A.1 69
Figure G.1 – Determination of clearance distances according to 5.2 *(1 of 2)* 79
Figure H.1 – Determination of creepage distances according to 5.3 *(1 of 2)* 81

Table 1 – Dimensioning of grooves 48
Table A.1 – Withstand voltages for an altitude of 2 000 m above sea level *(1 of 2)* 53
Table A.2 – Altitude correction factors for clearance correction 54
Table B.1 – Inherent control or equivalent protective control 58
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) 59
Table F.1 – Rated impulse withstand voltage for equipment energized directly from the mains supply 70
Table F.2 – Clearances to withstand transient overvoltages 71
Table F.3 – Single-phase three-wire or two-wire AC or DC systems 72
Table F.4 – Three-phase four-wire or three-wire AC systems 73
Table F.5 – Creepage distances to avoid failure due to tracking *(1 of 2)* 74
Table F.6 – Test voltages for verifying clearances at different altitudes 76
Table F.7 – Severities for conditioning of solid insulation 76
Table F.8 – Dimensioning of clearances to withstand steady-state peak voltages, temporary overvoltages or recurring peak voltages [b] 77
Table F.9 – Additional information concerning the dimensioning of clearances to avoid partial discharge 77

Table F.10 – Altitude correction factors for clearance correction 78

INTERNATIONAL ELECTROTECHNICAL COMMISSION

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FOREWORD

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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.

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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*