

Insulation coordination for equipment within low-voltage systems

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

ICS 29.080.30

National foreword

This British Standard is the UK implementation of EN 60664-3:2003+A1:2010. It is identical with IEC 60664-3:2003, incorporating amendment 1:2010 and corrigendum November 2010. It supersedes BS EN 60664-3:2003+A1:2010, which is withdrawn.

The start and finish of text introduced or altered by amendment is indicated in the text by tags. Tags indicating changes to IEC text carry the number of the IEC amendment. For example, text altered by IEC amendment 1 is indicated by **A1** **A1**.

The UK participation in its preparation was entrusted to Technical Committee GEL/109, Insulation coordination for low-voltage equipment.

A list of organizations represented on this committee can be obtained on request to its secretary.

This publication does not purport to include all the necessary provisions of a contract. Users are responsible for its correct application.

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**Insulation coordination for equipment
within low-voltage systems
Part 3: Use of coating, potting or moulding
for protection against pollution
(IEC 60664-3:2003+A1:2010)**

Coordination de l'isolement des matériels
dans les systèmes (réseaux)
à basse tension
Partie 3: Utilisation de revêtement,
d'empotage ou de moulage
pour la protection contre la pollution
(CEI 60664-3:2003+A1:2010)

Isolationskoordination für elektrische
Betriebsmittel in Niederspannungsanlagen
Teil 3: Anwendung von Beschichtungen,
Eingießen oder Vergießen zum Schutz
gegen Verschmutzung
(IEC 60664-3:2003+A1:2010)

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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 109/24/FDIS, future edition 2 of IEC 60664-3, 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 60664-3 on 2003-04-01.

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The following dates were fixed:

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- latest date by which the national standards conflicting with the EN have to be withdrawn (dow) 2006-04-01

Annexes designated "normative" are part of the body of the standard.
In this standard, annexes A, B, C and ZA are normative.
Annex ZA has been added by CENELEC.

Endorsement notice

The text of the International Standard IEC 60664-3:2003 was approved by CENELEC as a European Standard without any modification.

Foreword to amendment A1

The text of document 109/79/FDIS, future amendment 1 to IEC 60664-3:2003, 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 amendment A1 to EN 60664-3:2003 on 2010-06-01.

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. CEN and CENELEC shall not be held responsible for identifying any or all such patent rights.

The following dates were fixed:

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- latest date by which the national standards conflicting with the amendment have to be withdrawn (dow) 2013-06-01

Annex ZA has been added by CENELEC.

Endorsement notice

The text of amendment 1:2010 to the International Standard IEC 60664-3:2003 was approved by CENELEC as an amendment to the European Standard without any modification.

CONTENTS

INTRODUCTION.....	4
1 Scope.....	5
2 Normative references	5
3 Definitions	6
4 Design requirements	7
4.1 Principles	7
4.2 Application range regarding environment.....	7
4.3 Requirements for the types of protection	7
4.4 Dimensioning procedures	8
5 Tests	9
5.1 General	9
5.2 Specimens for testing coatings	10
5.3 Specimens for testing mouldings and potting	10
5.4 Preparation of test specimens	10
5.5 Scratch resistance test	10
5.6 Visual examination	11
5.7 Conditioning of the test specimens	11
5.8 Mechanical and electrical tests after conditioning and electromigration	13
5.9 Additional tests.....	15
Annex A (normative) Test sequence	16
Annex B (normative) Technical committees' decisions	17
Annex C (normative) Printed wiring board for testing coatings	18
Annex ZA (normative) Normative references to international publications with their corresponding European publications	22
Bibliography.....	24
Figure 1 – Scratch resistance test for protecting layers	11
Figure C.1 – Configuration of the test specimen.....	20
Figure C.2 – Configuration of lands and adjacent conductors.....	21
Table 1 – Minimum spacings for type 2 protection.....	9
Table 2 – Dry heat conditioning	12
Table 3 – Degrees of severities for rapid change of temperature.....	12

INTRODUCTION

This part of IEC 60664 details the conditions in which the reduction of clearance and creepage distances can apply to rigid assemblies such as printed boards or terminals of components. Protection against pollution can be achieved by any kind of encapsulation such as coating, potting or moulding. The protection may be applied to one or both sides of the assembly. This standard specifies the insulating properties of the protecting material.

Between any two unprotected conductive parts, the clearance and creepage distance requirements of IEC 60664-1 or IEC 60664-5 apply.

This standard refers only to permanent protection. It does not cover assemblies after repair.

Technical committees need to consider the influence on the protection of overheated conductors and components, especially under fault conditions, and to decide if any additional requirements are necessary.

Safe performance of assemblies is dependent upon a precise and controlled manufacturing process for the application of the protective system. Requirements for quality control, e.g. by sampling tests, should be considered by technical committees.

INSULATION COORDINATION FOR EQUIPMENT WITHIN LOW-VOLTAGE SYSTEMS –

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

1 Scope

This part of IEC 60664 applies to assemblies protected against pollution by the use of coating, potting or moulding, thus allowing a reduction of clearance and creepage distances as described in Part 1 or Part 5.

NOTE 1 When reference is made to Part 1 or Part 5, IEC 60664-1 or IEC 60664-5 are meant.

This standard describes the requirements and test procedures for two methods of protection:

- type 1 protection improves the microenvironment of the parts under the protection;
- type 2 protection is considered to be similar to solid insulation.

This standard also applies to all kinds of protected printed boards, including the surface of inner layers of multi-layer boards, substrates and similarly protected assemblies. In the case of multi-layer printed boards, the distances through an inner layer are covered by the requirements for solid insulation in Part 1.

NOTE 2 Examples of substrates are hybrid integrated circuits and thick-film technology.

This standard refers only to permanent protection. It does not cover assemblies that are subjected to mechanical adjustment or repair.

The principles of this standard are applicable to functional, basic, supplementary and reinforced insulation.

2 Normative references

IEC 60068-2-1:2007, *Environmental testing – Part 2-1: Tests – Test A: Cold*

IEC 60068-2-2:2007, *Environmental testing – Part 2-2: Tests – Test B: Dry heat*

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

IEC 60068-2-78:2001, *Environmental testing – Part 2-78: Tests – Test Cab: Damp heat, steady state*

IEC 60326-2:1990, *Printed boards – Part 2: Test methods*
Amendment 1 (1992)

IEC 60454-3-1:1998, *Pressure-sensitive adhesive tapes for electrical purposes – Part 3: Specifications for individual materials – Sheet 1: PVC film tapes with pressure-sensitive adhesive*
Amendment 1 (2001)

IEC 60664-1:2007, *Insulation coordination for equipment within low-voltage systems – Part 1: Principles, requirements and tests* 

Ⓐ¹⁾ IEC 60664-5:2007, *Insulation coordination for equipment within low-voltage systems – Part 5: Comprehensive method for determining clearances and creepage distances equal to or less than 2 mm*

IEC 61189-2:2006, *Test methods for electrical materials, printed boards and other interconnection structures and assemblies – Part 2: Test methods for materials for interconnection structures*

IEC 61189-3:2007, *Test methods for electrical materials, printed boards and other interconnection structures and assemblies – Part 3: Test methods for interconnection structures (printed boards)*

IEC 61249-2 (all Parts 2) *Materials for printed boards and other interconnecting structures – Reinforced base materials, clad and unclad*

IEC Guide 104:2004, *The preparation of safety publications and the use of basic safety publications and group safety publications* Ⓐ¹⁾

3 Definitions

For the purposes of this document, the definitions given in IEC 60664-1 as well as the following definitions apply.

3.1

base material

insulating material upon which a conductive pattern may be formed

NOTE The base material may be rigid or flexible, or both. It may be a dielectric or an insulated metal sheet.

(IEC 60194, definition 40.1334)

3.2

printed board

general term for completely processed printed circuit and printed wiring configurations

NOTE This includes single-sided, double-sided and multilayer boards with rigid, flexible, and rigid-flex base materials

(IEC 60194, definition 60.1485)

3.3

conductor

single conductive path in a conductive pattern

(IEC 60194, definition 22.0251)

3.4

protection

any kind of measure which reduces the influence of the environment

1) To be published.

3.5

coating

insulating material such as varnish or dry film laid on the surface of the assembly

NOTE Coating and base material of a printed board form an insulating system that may have properties similar to solid insulation.

3.6

solid insulation

solid insulating material interposed between two conductive parts

NOTE In the case of a printed board with a coating, solid insulation consists of the board itself as well as the coating. In other cases, solid insulation consists of the encapsulating material.

3.7

spacing

any combination of clearances, creepage distances and insulation distances through insulation

4 Design requirements

4.1 Principles

Dimensioning of spacings between conductors depends on the type of protection used.

When type 1 protection is used, dimensioning of clearances and creepage distances shall follow the requirements of Part 1 or Part 5. If the requirements of this standard are met, pollution degree 1 applies under the protection.

When type 2 protection is used, spacings between conductive parts shall meet the requirements and tests for solid insulation of Part 1 and their dimensions shall not be less than the minimum clearances specified in Part 1 or Part 5 for homogeneous field conditions.

4.2 Application range regarding environment

The design requirements are applicable in all microenvironments.

Stresses such as temperature, chemical, mechanical or those listed in [A1](#) 5.3.2.4 [A1](#) of Part 1 shall be taken into account when the protective material is selected.

Absorption of humidity by the protective material shall not impair the insulation properties of the parts being protected.

NOTE Absorption of humidity can be checked by an insulation resistance measurement under humid conditions.

4.3 Requirements for the types of protection

Protection is achieved in the following ways:

- type 1 protection improves the microenvironment of the parts under the protection. The clearance and creepage distance requirements of Part 1 or Part 5 for pollution degree 1 apply under the protection. Between two conductive parts, it is a requirement that one or both conductive parts, together with all the spacings between them, are covered by the protection;